FEBRUARY 1986 £1.20

Amateur RADIO

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Getting going on 6m

Eddystone EA12: A user review

On test: Icom IC1271E multimode transceiver

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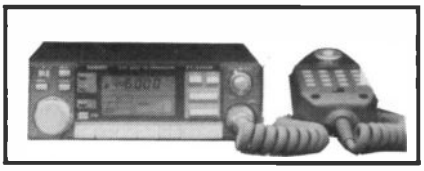

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Anita Ley
Editorial Assistants:
Jane Berry
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Advertisement Manager:
Marian Vidler
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Front cover: Icom IC1271E (p23). Photo by Jay Moss-Powel G6XIB

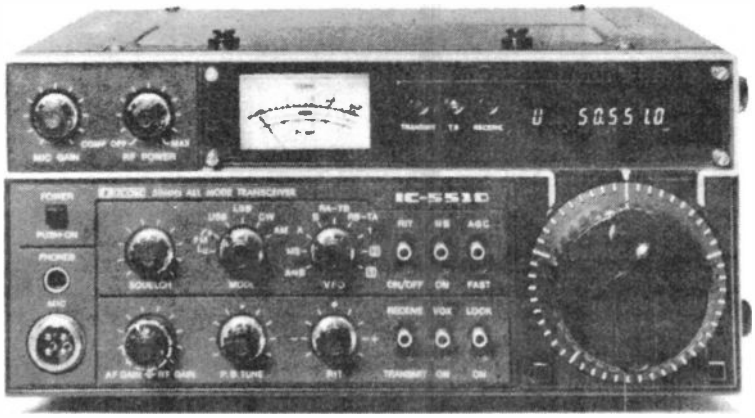
SERVICES

50MHz, A New Dimension for the U.K.

IC-505. 50MHz transceiver

The IC-505 is a 50MHz band SSB, CW, FM (optional) transceiver, and has already gained an excellent reputation worldwide. The dual VFO system has been developed using advanced computer and PLL technology. The IC-505 features 6 channel memories and can be used independent of emission modes, memory scan, program scan which searches only specified frequency band. LCD ensures clear visibility even in sunlight. The R.F. amplifier, a dual gate MOSFET features high gain and low noise characteristics. The IC-505 accepts a standard dry cell pack, rechargeable nicad battery pack (BP10) or 13.8v external power supply, 3 watts R.F. output, 0.5 watts low power, 10 watts at 13.8v. Accessory circuits include split frequency operation, noise blanker, squelch and CW break-in. Options include:- EX248 FM unit, PS45 AC Power Supply and LC10 Carrying Case.
All these features make the IC-505 a great transceiver for operation on the 50MHz band.

IC-551. 50MHz Base station



This base station has all mode capability, SSB, CW, AM and FM (when optional FM is installed). It covers 50-54MHz with 80 watts variable R.F. output power (40 watts A.M.), Dual VFO's for split frequency operation. 3 memory channels and memory scan, program scan with adjustable scanning speed and auto stop when a signal is received. A powerful audio output, 2 watts at 8ohms for easy listening even in noisy surroundings.
Other features include a noise blanker, AGC fast or slow RIT, VOX passband tuning and speech processor. Options include:- PS15 20 amp external power supply, IC-EX106 FM unit and IC-HP1 headphones.
These two transceivers allow you to explore this fascinating part of the spectrum. UK stations have worked int VE, VO, W1,2,3,4 and 8. The UK beacon GB3NHQ has been received as far west as Washington State. Please contact Thanet Electronics Limited or your local ICOM dealer for more information on these 6m transceivers.

British TELECOM Approved Dealer for Mobile Phone Division

Cellnet

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ICOM

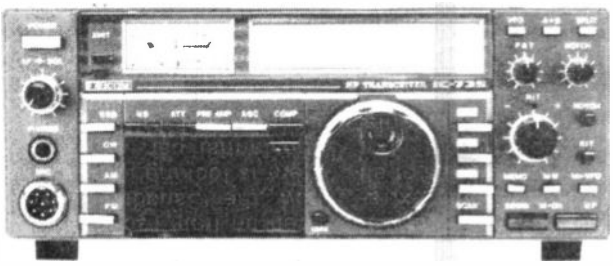
IC-751 The ICOM Flagship

SM-10 Desk-top Mic

The IC-751 is the Flagship of the ICOM range, it is a competition grade ham transceiver with a 100KHz – 30MHz continuous tuning, general coverage receiver and a full featured all mode solid state transmitter that covers all the WARC bands. Utilising an ICOM developed J-Fet DBM, the IC-751 has a 105dB dynamic range and a switchable choice of pre-amp 0-20dB attentuator. The transmitter features a high reliability 2SC2904 transmittors in a low IMD (−32dB @ 100W) full 100% duty cycle. Other features include 32 tunable memories, mode selective scan, frequency scan and memory scan, full break in on CW and Amptor compatibility, Pass band tuning, notch filter, variable noise blanker, Dual VFO's for DX or 10m repeater operation. The IC-751 is fully compatible with ICOM auto units such as the AT500 and IC-2KL. Options include internal **or** external power supplies, frequency controller, Speech synthesizer, various optional filters and SM6 or SM10 Desk Microphone.

The **SM10** desk top microphone consist of an electret condenser microphone element with a compressor amplifier, plus tunable equalisizer for maximum control of the audio characteristics of your transmitted signal. The SM10 is highly sensitive and produces clean crisp audio.

IC735 compact HF Transceiver



As predicted the ICOM IC-735 has rapidly gained the reputation it deserves. When compared with similar 'top names' transceivers the IC-735 towers above them (despite its smaller size). The IC-735 has a larger number of programmable channels, but notably most important is the superb sensitivity in all modes SSB, CW, AM and FM. This superior sensitivity is due to the excellent front end performance. All amateur frequencies from 1.8MHz to 30MHz are available including the three new bands 10, 18 and 24MHz. RF output is approximately 100 Watts. Tuning ranges from 100KHz to 30MHz, made continuous by using a high-side IF and a CPU control system. RTTY operation is also possible.

Dynamic range is 105dB with a 70.451MHz first IF circuit. Pass-band tuning and a sharp IF notch filter provide clear reception even under duress. Preamp is 10dB and attenuator 20dB. Computer remote control is possible via the RS-232C jack. Options include: the AT-150 automatic antenna tuner, the PS55 AC power supply and the SM-6, SM-8 and SM10 desk mics.| Why not find out more about the IC-735 by ringing us or your local ICOM dealer.

STRAIGHT & LEVEL

SOLDERING ON

The second-generation spherical powder used in the new Indalloy solder creams from Induim Corporation offers less surface area than conventional non-spherical powders and suffers less oxidation, leading to reduced tendency for solder balling.

Indium employs a proprietary technique to produce a highly uniform spherical powder, available in three sizes: −100/+200 mesh, −200/+325 mesh, and −325 mesh.

Indium Corporation custom-configures solder creams based on unique and one-off requirements, as well as manufacturing a range of about 50 more commonly used creams. The production of alloys, powder and flux, and the formulation and packaging of the creams, all takes place in Utica, New York State.

For further information contact: *Dage (GB) Limited, Intersem Division, Rabans Lane, Aylesbury, Bucks HP19 3RG. Tel: (0296) 33200.*

40W AMP KIT

A high quality kit that results in a general purpose 40 watt power amplifier for all types of audio applications is now available from Electronic and Computer Workshop Ltd (ECW).

The kit, designated K2576, is easy to build and includes all the necessary items to construct the amplifier. The finished unit is compact, even with its generous heatsink, and can be incorporated into many types of equipment.

Fully protected against short circuit and thermal overloads, the amplifier conforms to DIN45500 standards and operates from economical unstabilised PSUs with voltage outputs from 6 to 18 volts dc. Current consumption is typically 2 amps, with a quiescent current of 40mA.

The input sensitivity is 250mV into 22kohms and the amplifier will operate with loads from 4 to 8 ohms. Frequency response (±3dB) is from 10 to 50000Hz. Power supply hum rejection is typically 50dB.

The K2576 kit is £16.86 including post/packing and VAT.

For more information, contact: *Electronic & Computer Workshop Ltd, 171 Broomfield Road, Essex CM1 1RY. Tel: (0245) 262149.*

AMPROM

CTP Software have announced the release of their new amateur radio communications ROM for the BBC Micro, AMPROM.

AMPROM utllises the cassette port of the BBC to generate and monitor audio tones to and from a radio transceiver.

Thus the BBC Micro becomes a radio data communications terminal, without needing any special interface (other than the appropriate cables).

An AMPROM user can send and receive data over the air in the 'teletype' mode and copy files across a radio link, with full error protection and correction of data. This provides an easy means of transferring (non-copyright!) programs, text, or other data from one station to another.

AMPROM is easy to use, but at the same time offers advanced functionality. The manufacturer claims that its use becomes instinctive in a short space of time but brief reminder prompts are displayed, making frequent reference to the manual unnecessary.

For the advanced programmer AMPROM also provides operating system extensions for use in programs. For instance, the Rx command could be used to write a Basic program that constantly monitors the radio and alerts the operator (with an alarm) if a particular callsign is heard.

For further information contact: *CTP Software, 107a Shacklewell Lane, Shacklewell, London E8 2E8. Tel: 01-249 0035.*

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

SMOOTHLINE

Conblock Electrical Limited have introduced the new 'Smoothline' connector. It costs no more than a couple of computer games and allows the enthusiast to almost totally eliminate system problems caused by interference transmitted via the mains supply.

This neat unit, moulded in 'high tech' grey polycarbonate, provides four filtered outlets (each rated at six amps maximum) from one thirteen amp mains socket, comes complete with mains lead and plug and is fitted with four miniature plugs for wiring to the computer equipment.

Program loading and running problems and other data corruption in computer systems can often be attributed to mains-borne interference. This interference is generated by a variety of electrical equipment and may be attributed in the home to any appliance being switched on or off either manually or by means of a thermostat, for example a fridge or central heating.

Voltage 'spikes' appearing on the mains supply can, if transmitted to a computer, appear on the supply line and cause data to be corrupted, but very little has been done to eliminate these until the advent of Smoothline.

For further details contact: *Conblock Electrical Limited, Mochdre Industrial Estate, Newtown, Powys SY16 4LF. Tel: (0686) 27100.*

REPRO PRODUCTS

Currently available from Repro Electronic Systems is a mic switcher box, the Model MS/2-1, which enables the user to switch two mics into one radio without continual plugging and unplugging.

Housed in a neat cabinet measuring 9×3×7cm, the front panel incorporates 2 4-pin chassis sockets and a switch. From the rear there is a short lead terminating in a 4-pin standard mic plug. The plugs and sockets are supplied ready wired for either Cybernet or Uniden chassis radios, but other makes can be accommodated on request.

To operate the unit just plug the 4-pin lead into the radio and connect any 2 mics (of the same wiring combination) into the front sockets. Each mic can then be selected in turn by throwing the switch. Any type of microphone can be used.

The MS/2-1 is available for just under £10.00.

Also from Repro is the LA/2502 linear amplifier, designed to produce an output power of 25 watts when driven by a maximum input of 4 watts. Usable on the 26-30MHz band, the amplifier is constructed into an extremely neat case measuring 11×3×6cm.

Powered by any 3 amp power supply or car battery, the unit is fitted with a reverse polarity protection circuit. Externally the layout is simple and easy to operate. On the rear of the case are two SO239 sockets for connection of the aerial and patch lead to the transceiver, and on the front are two LED indicators and a switch.

The facility of the on/off switch is most useful as it means that the amplifier can be left in line whilst switched off, unlike many other amplifiers which have to be removed from circuit when not in use.

The Repro LA/2502 is made from high quality components and every single unit is tested for correct working and power output before despatch. A comprehensive instruction leaflet is also enclosed.

For more details contact: *Repro Electronic Systems Ltd, Gravesend, Kent.*

NEW SOLDERING IRONS

The comprehensive Oryx soldering iron range has been extended by the introduction of the Oryx 15. This is a 15 watt, 240 volt lightweight iron. The low cost iron is based on a successful unit Oryx has built for a national public service organisation, which has used a similar device for many years.

Now in 'civvy' colours, with an orange handle and black bush, and presented in a point-of-sale transparent package, this unit will serve all aspects of the market, from the hobbyist through to industrial applications. The temperature is set at 350°C nominal from a wire wound element in a tubular ceramic insulator..The soldering tip is iron plated for long life.

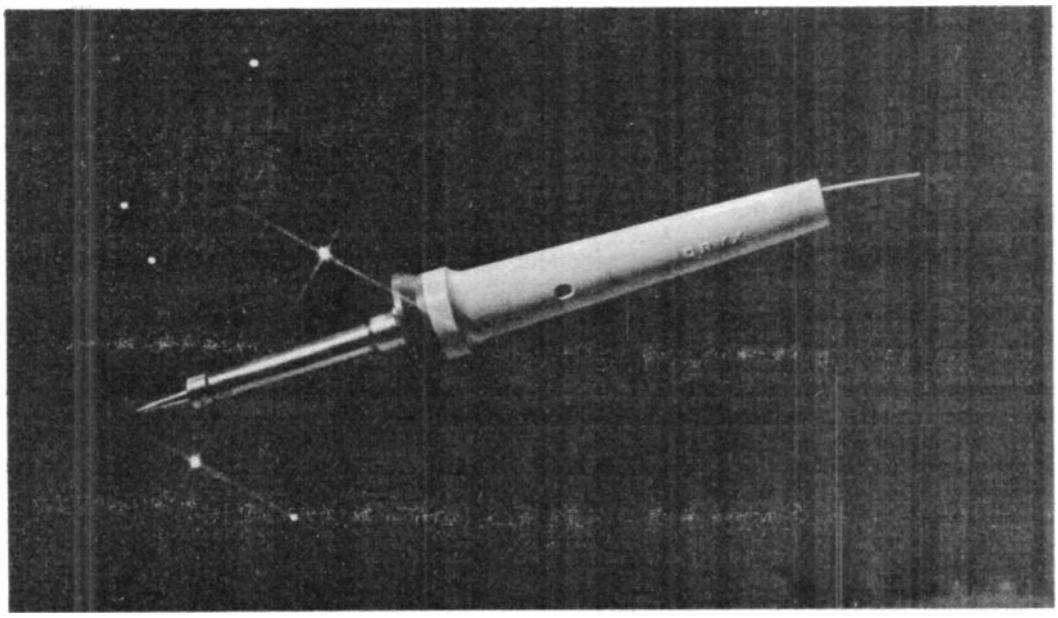
Oryx has also announced an advanced electronically controlled soldering iron, the Oryx Platinum 45, which is designed for use in the most demanding of production environments.

The new iron incorporates a unique thick film cermet element and an ultra stable platinum resistance temperature sensor, together with miniaturised electronic control circuitry. The control circuit is built into the handle of the iron.

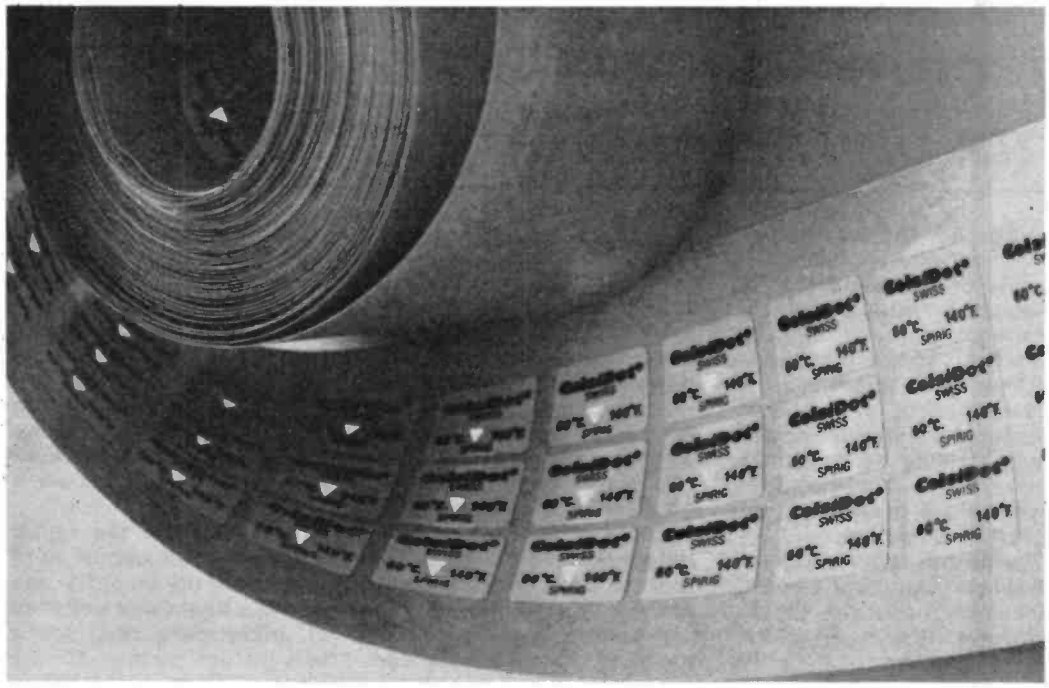
The Oryx Platinum 45 is available in 24 volts, 45 watts. Its tip temperature is controllable to within ±2°C over the range 260°C to 420°C, and nominal temperature is easily adjustable by the user.

The electronic control circuitry features zero point switching to ensure spike-free switching of the heating element, and temperature overshoot is avoided by means of a special proportional control circuit.

More information can be obtained from: *Greenwood Electronics, Portman Road, Reading, Berks RG3 1NE. Tel: (0734) 595843.*



STRAIGHT & LEVEL



HOT DOTS

CelsiDot single level temperature sensitive labels are now available on rolls with 1,200 pieces.

There are 40 different temperature ratings available between 40°C (105°F) and 260°C (550°F). The original white temperature sensitive indicating triangle will turn permanently black when exposed (even for a fraction of a second) above its rated temperature level.

The self-adhesive labels can be applied to any clean, dry surface to monitor the safe or unsafe temperature levels reached during actual practical use, be it over hours, days, weeks or even years. A blackened CelsiDot will clearly document that it has been exposed in its monitoring control history above its specified temperature level.

Such visual proof is very useful in guarantee claim control, in actual field testing of equipment where no electronic recorders could be installed, and thousands of other measurement and recording tasks.

For further information contact: *Cobonic Ltd, 32 Ludlow Rd, Guildford, Surrey GU2 5NW. Tel: (0483) 505260.*

BULGIN'S BULGING RANGE!

A F Bulgin and Company plc has recently introduced into the UK three new series of single-row terminal strips and a new cost-saving method for mounting this type of connector on circuit boards. The moves represent the latest developments in a sole distribution agreement between Bulgin and the Vernitron Corporation's Beau Products Division of Laconia, New Hampshire, USA.

The three new series of barrier terminal strips are the 24000, rated at 15 amps, and the 60000 and 61000, which are both rated at 10 amps.

With terminals spaced on 0.33 inch centres, the 24000 series offers the choice of either screw terminals or a vibration resistant, low cost riveted construction. Made of general purpose phenolic insulating material in open back style, the products can be furnished with up to 30 circuits. The barrier height is 0.41 inch and the strip width is 0.56 inch.

Made of resilient, heat resistant thermoplastic, the 60000 and 61000 series have terminals spaced on 0.25 inch centres, a strip width of 0.55 inch and a barrier height of 0.5 inch.

A feature of the 60000 is its closed-side construction, which provides increased protection by acting as a wire stop, thus virtually eliminating any risk of short circuits.

Also introduced by Bulgin is the new Rap-Attach method for fastening barrier terminal strips to PC boards.

Available as an option with Beau products, Rap-Attach both simplifies and speeds up the mounting process and requires no special tools. To secure the barrier terminal strip to a PC board or panel all that is necessary is to press in the drive pin of the fastener which opens the prongs underneath to provide the same effect as a blind rivet.

For more details, contact: *A F Bulgin & Company plc, Bypass Road, Barking, Essex IG11 0AZ. Tel: 01-594 5588.*

ANTS AND TIGERS?

Ant Products, owners of the trade marks Tiger Antenna, Silver 70 Antenna, Fox Antenna and Phoenix Antenna, inform us that they have established a licence agreement with Telecommunications Antenna Systems Limited, trading as Tiger Antenna, for them to manufacture the range of Tiger and Silver 70 Antenna products and accessories at their Scunthorpe premises. Tiger Antenna will also handle the supply and distribution of these products to their numerous dealers across the country.

New products in the pipeline from Ant Products include HF and microwave antennas.

To obtain a copy of a catalogue containing product details send 50p in stamps (refundable against purchase by presenting the catalogue cover) to: *Ant Products, All Saints Industrial Estate, Baghill Lane, Pontefract, West Yorkshire WF8 2HA.*

SHORTFORM CATALOGUE

New from Advance House of Instruments is a 16-page, two-colour shortform catalogue on the company's range of electronic test and measurement instruments.

The catalogue includes realtime and digital storage oscilloscopes; LCR meters; digital and optical power multimeters; function generators; frequency counters; cable length checkers; logic analysers; line conditioners; dc bench power supplies; and accessories.

For each product range the catalogue provides basic technical details together with part numbers and photographs.

Copies of the shortform catalogue are available free of charge from: *Advance House of Instruments, Raynham Road, Bishop's Stortford, Herts CM23 5PF. Tel: (0279) 55155.*

TANTALUM CAPACITORS

The Mepco/Electra 40SS range of metal-cased, hermetically-sealed solid tantalum electrolytic capacitors is now available, ex-stock, from Greenwood Electronics.

The 40SS series has been developed for industrial and professional applications requiring high stability, high reliability capacitors with low dissipation factors. These tantalum capacitors are particularly suitable for use in timing circuits, where high stability is required because of the sensitivity of such circuits to capacitance change.

The 40SS range can also be used in decoupling, blocking, bypassing and filtering applications where high grade components are specified.

Constructed using a high purity porous sintered tantalum anode and a highly refined tantalum oxide dielectric, Mepco/Electra's 40SS capacitors feature very low dc leakage currents and low dissipation factors. They are available in 8 voltage ratings from 6 to 100 volts and in preferred capacitance values from 0.1 microfarads to 330 microfarads (at ±10% tolerance).

Further information can be obtained by contacting: *Greenwood Electronics, Portman Road, Reading RG3 1NE. Tel: (0734) 595843.*

STRAIGHT & LEVEL

MARCO MAIL ORDER

Marco Trading recently launched their 1986 mail order catalogue.

The 135 page, fully illustrated catalogue includes an extended range with many price reductions. It also contains a 6 page special offer list, an order form and a prepaid envelope, together with a 50p credit note. You can obtain a copy by sending £1 to the address below.

Visa and Access cards are welcome and all orders are despatched by return of mail, subject to availability.

For more information contact: *Marco Trading, The Maltings, High Street, Wem, Shropshire SY4 5EN. Tel: (0939) 32763.*

REWORK STATION

A self-contained unit for reworking assembled printed circuit boards is now being offered by Oryx. The rework station, HSR-1, is especially efficient for the removal of components from through-hole plated boards. An integral soldering iron and an outlet for 12V dc hand-held tools provide the capabilities for fast and complete PCB correction and repair.

The station plugs into a standard 115V ac 3-wire outlet and requires no exterior air or vacuum supply. The hand-tool provides proper tip temperature for quick solder melting. A large capacity electric vacuum pump removes the molten solder through the HSR hand-piece. The tip automatically maintains temperature, despite the flow of air drawn through it under vacuum.

Tip temperature is dial-set for various board materials at the control panel. This feature is especially important for working boards which are easily damaged by high heat.

Within the hand-piece is a clear glass tube for collecting solder. Replacement filter material or the complete collector are both available. Three different size tips accommodate all common conditions. A push-button switch on the hand-piece activates the vacuum pump, which can also be controlled by a separate footswitch.

For complete product data and price information contact: *Greenwood Electronics, Portman Road, Reading RG3 1NE. Tel: (0734) 595843.*

KINKY!

The unique Oxley range of Kinky Pins for use in plated through holes has been extended to include lead-through versions suitable for a range of hole sizes from 0.27in to 0.064in.

The Kinky Pin retention device has been engineered to retain the pin for soldering in widely toleranced holes, whilst an extension to the pin provides for solder joints on both sides of the PCB.

The no-damage insertion of the compliant pin with a relatively low insertion force is particularly advantageous with expensive and multi-layer PCBs, where the elimination of possible damage can be critically important.

The lead-through facility is also extended to the Oxley Snaplok Kinky Pin test point range, where quick and consistent connections are required. Due to its ball and socket arrangement, the socket is able to rotate through an angle of 60°, beyond which it detaches itself without damage to any contact part.

For further details contact: *Oxley Developments Company Limited, Priory Park, Ulverston, Cumbria LA12 9QG. Tel: (0229) 52621.*

TANDY TELLS ALL

Tandy, one of the UK's leading suppliers of consumer electronics, toys and business products, has produced its 1986 catalogue.

The new range constitutes what the company claims is one of the most innovative, low cost introductions it has ever made in its UK stores. This includes their own-branded quality LCD pocket televisions, personal and portable stereos, BT approved telephones for home and office, video recorders and business computers.

More information is available from: *Tandy Corporation, Tameway Tower, Bridge Street, Walsall, West Midlands. Tel: (0922) 648181.*

BABYPHONE

A complete battery-powered, highly sensitive combination microphone and transmitter, ideal for listening for a baby's cry, is now available from Electronic and Computer Workshop Ltd.

The unit includes a microphone and amplifier that can detect very weak sounds up to a distance of six metres. The transmitter has a typical range of 100 metres without an antenna and 300 metres with a small external antenna.

Transmission frequency is from 90 to 105MHz, adjustable, allowing its output to be picked up by a normal domestic FM receiver.

Powered by a 9V battery, the transmitter measures 57× 46× 14mm overall.

ECW offers the kit at £9.25 including post/packaging and VAT.

For further information contact: *Electronic and Computer Workshop Ltd, 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.*

SPACE-SAVERS

Two new series of crystal filters for radio frequency selection applications, now available in the UK from Selectronic, are constructed using 2-pole monolithic elements to optimise high performance advantages with minimum case size and cost.

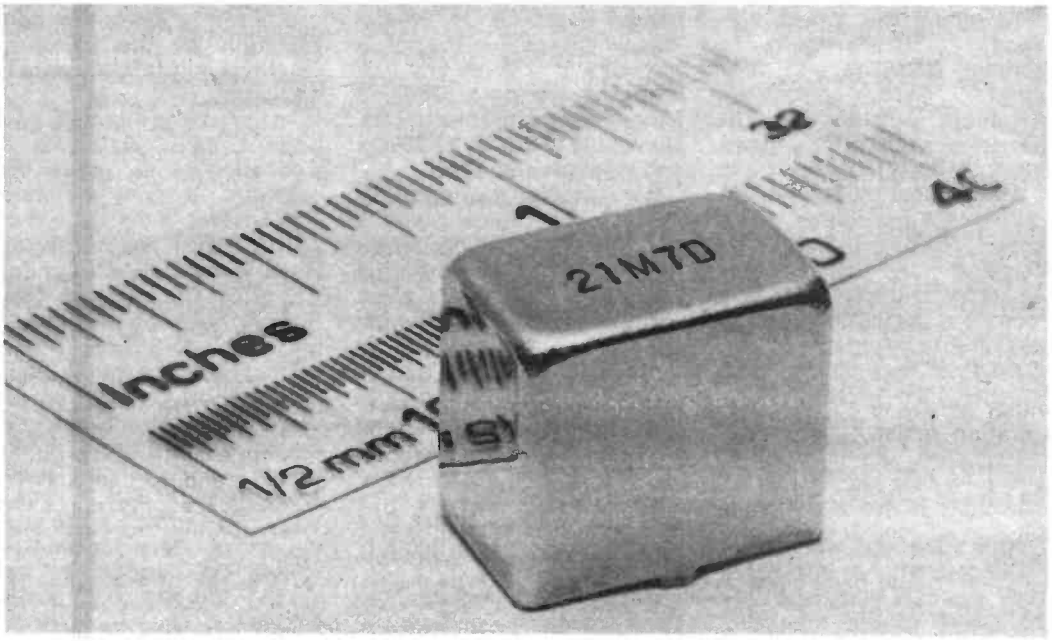
The KM series of filters is designed for intermediate frequency selection in UHF and VHF radio telephone systems, while the 45MHz band model 45M20B is intended for cellular radio systems of 800 to 900MHz.

The KM series features good stability over a wide temperature range, high attenuation ratio and impressive shock and vibration resistance characteristics.

Nominal frequencies are 10.7MHz, 16.9MHz and 21.4MHz, and pass bandwidths are between ±3.75 and ±10kHz at 3 or 6dB.

The Model 45M20B has nominal frequencies of 44.988, 44.987, 44.986 and 44.985MHz, with a frequency tolerance of ±500ppm. Pass bandwidth is ±12kHz at 6dB, and stop bandwidth is ±48kHz at 40dB. Ripple is 1dB max, and insertion loss is 5dB maximum.

More information is available from: *Selectronic Ltd, The Old Stables, 46 Market Square, Witney, Oxon OX8 6AL. Tel: (0993) 73888.*



STRAIGHT & LEVEL

75th anniversary award

As part of their 75th anniversary celebrations, the Derby and District Amateur Radio Society, incorporating Derby Wireless Club which was founded in 1911, are issuing a special commemorative certificate.

The certificate, issued in conjunction with the Derby City Council, is for contacts with the special event station GB3ERD during the anniversary year 1986. The station is operational each month. The first occasion was on 8 January from the Council House in Derby.

To obtain the award, stations in the UK are required to contact GB3ERD and four other Derby stations. Amateurs outside the UK have to work GB3ERD and two other stations in Derby.

All contacts must be made during 1986 and claims, with a copy of log details, should be certified by two other amateurs and sent with a 9 inch by 6 inch SAE plus 75p (UK) or 5 IRCs (outside UK) to: *G4HDP, 97 Woodlands Road, Allestree, Derby DE3 2HH.*

Special QSL cards are to be issued for contacts with GB3ERD and claims should be sent to G4HDP.

Dubus subscriptions

Readers with an interest in UHF projects will doubtless be aware of the magazine *Dubus*. It is published in Germany four times a year and distributed in the UK by Kenneth J Hatton.

Dubus is a non-profit making publication, with no advertising or support from commercial enterprises.

Subscriptions for 1986 are currently being collected, and cost £7.50 from: *Mr K J Hatton, 'Thorneycroft House', Shield Hill, Haltwhistle, Northumberland NE49 9NW.*

Satellites in education

The UK Co-ordinating Committee on Satellites in Education has published a strategy paper, *Satellites in Education*, which outlines the possible uses in schools and colleges of the data received from radio amateur satellites, University of Surrey satellites and weather satellites.

It will provide the opportunity for technological projects such as constructing detecting apparatus and creating computer models; allow experimentation which reflects many aspects of large-scale research, that is, collecting, processing and interpreting considerable amounts of live data; promote cross-curricular activities linking mathematics, science and technology with the humanities, particularly geography.

Other educational applications currently under way include the use of direct broadcasting satellites as an aid in modern language teaching.

A large number of interested organisations have joined forces to form The UK Co-ordinating Committee for Satellites in Education. The group will assist and liaise with teachers who wish to become involved in using satellite data in education, individuals or institutions who wish to conduct research on the educational uses of satellites, and agencies that may fund projects.

An immediate task that the group will tackle is the identification of the roles of satellites and satellite data in education.

As part of the initiative a 40-page booklet, *Satellites in Education – a guide for teachers,* is now available. The booklet is distributed by AMSAT (UK), 94 Herongate Road, Wanstead Park, London E12 5EQ. The price is £3.50 (inc p&p) and cheques should be payable to SEUK.

The strategy paper is available free of charge from Dr John Gilbert, Dept of Educational Studies (AA), University of Surrey, Guildford GU2 5XH. Other enquiries regarding the activities of the committee should be directed to the UoSAT project, tel: (0483) 509143.

Communications museum

On 13 December 1985, at the launch of the Communications and Electronics Museum, Joan Heathershaw, President of the RSGB, presented art student Paul Newson, of Portsmouth CFE, with a cheque for £50 for his winning logo design.

The museum is dedicated to preserving and restoring equipment and documents from the history of modern technology. All the exhibits are less than 100 years old, but represent crucial developments in both domestic and military communications and electronics.

Specially designed exhibitions will tour the United Kingdom, and the logo will be used in association with all the museum's activities.

The Russians are coming!

In an article entitled *Conspiracies thrive on seventy-five* in the December 1985 issue of *Media Monitor*, a bulletin for DXers, the following report was made:

'Right-wing American hams are using amateur radio to swap horror stories about alleged threats to the American way of life.

'The Soviet Union, 'world government', liberal US politicians and sexual permissiveness are all targets on the Liberty Net, monitored in London on Sundays at around 03.45-4.30UTC.

'The participants meet on 3950kHz (75 metres) in LSB. Prominent among them is KI2J/Maritime Mobile.'

KI2J's operator has apparently said of the Russians: 'All the people in our government that are talking to these monsters, these jailers, these Gulag operators, are in my opinion party to the crime. Shame on them; shame on them indeed. . .soon we will all be behind the same Gulag when they've colonised the entire planet.'

Many readers may disapprove of the hobby being used as a political mouthpiece, although, according to *Media Monitor*, Liberty Net is not the only political forum conducted by radio amateurs.

Media Monitor makes interesting reading. The subscription rates for the UK are £30 for 52 issues or £15 for 26 issues. Contact Roger Tidy at: *11 St Philip House, Lloyd Baker Street, London WC1X 9BA. Tel: 01-833 0978.*

Maritime Channel 70

The Department of Trade and Industry has announced a change in the designated use of international maritime VHF radio Channel 70 (156.525MHz), which took effect on 1 January 1986.

Channel 70 was available for 'intership' communications but now it will be used exclusively for distress and safety purposes using digital selective calling, and all 'intership' use of that frequency must cease.

The change is necessitated by Resolution 317 of the International Radio Regulations. It follows a decision made at the 1983 World Administrative Radio Conference (WARC) for mobile services, and the clearing of that channel will enable testing of the future global maritime distress and safety system to get under way.

Feedback

The November 1985 issue of *Feedback*, the journal of the Bury Radio Society, includes a review of Gwynedd-based Technical Software's RTTY and CW package.

Norman Webster G2DWB was responsible for scrutinising this Rx multimode receive system, which is available for £40, or £25 in kit form. He found few problems in construction of the kit, except for the very small PCB – about the size of a postage stamp!

Overall, he was impressed with the interface kit and software and found that the program does everything one might expect and includes facilities which are not available in packages costing considerably more.

More information is available from Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF.

Prospective members of the Bury RS should contact the club's secretary, B Tyldesley G4TBT, at 4 Colne Road, Burnley, Lancs.

Junk extravaganza

The Cambridgeshire Repeater Group is holding its fourth annual junk sale on Sunday 23 February at Pye Telecommunications, St Andrew's Road, Cambridge. Starting at 10.30am, it is an all day event featuring many trade stands as well as a bring-and-buy junk sale.

Admission will be 50p and there will be food and drink available, free parking and talk-in on 2m S22 by G3PYE.

All proceeds from the event are going to benefit amateurs by the provision of repeater services.

For further details contact: *Chris Lorek G4HCL, 11 Bevills Close, Doddington, March, Cambs PE15 0TT. Tel: (0354) 740672 (24hr answering).*

Welsh rally

On Sunday 2 March 1986, the Barry College of Further Education's Radio Society will present the Welsh Amateur Radio Rally at the Barry Leisure Centre, off Holton Road, Barry, South Glamorgan.

This is an annual event where there are many trade and club stands of interest to radio, television and electronics enthusiasts. There is a bring-and-buy stand (no commission), with a small display charge only. Refreshments, licensed bar and swimming pool are available at the centre.

The rally will be open from 11am-5pm with talk-in on S22. For further information contact Reg Rowles GW4FOM. Tel: (0222) 565656 (evenings).

February in Fareham

The Fareham and District Amateur Radio Club has sent us its club programme for the next few months and, although some of the promised talks have yet to be confirmed, it looks as though 1986 is going to be a busy year in Hants.

February sees two on the air 'natter' nights on the 5th and 19th, and G4ITG will give a project box presentation on the 12th, and a talk about component types on the 26th.

The club meets at the Porchester Community Centre, Westlands Grove, Porchester, Near Fareham, Hants at 7.30pm. For details contact Brian G4ITG.

BEARS bare all

The AGM of the Borehamwood and Elstree Amateur Radio Society (BEARS) takes place in February and should be full of the usual soul-searching questions and heart-felt suggestions we have come to expect on such occasions. Remember your own AGM?

The society meets at 'The Wellington' at the Elstree Station end of Theobald Street, Borehamwood, Herts at 7.30pm on the third Monday of each month.

Want to know more? Phone Ivor G4XEW during the day on 01-953 5287, or Tony G0DDJ in the evening on 01-207 3809.

Sexist corner

We recently heard some most intriguing news from the QTI Talking Newspaper Association for radio amateurs. Apparently, the organisation has a new employee, Shirley Evans, described as: '18, blond with blue eyes' and the QTI-TNA 'fully expects amateurs to beat a path to its door' in future.

We are sure that Shirley Evans has many talents other than her ability to be decorative and are curious as to what the association is suggesting. Anyway, good luck in your new job, Shirley, and we hope that the QTI-TNA's press release doesn't bring you too much unwanted attention!

The QTI-TNA can be contacted at: *2 Cartmel Walk, North Anston, Sheffield S31 7TU. Tel: (0909) 566301.*

Full steam ahead!

The Three Counties Amateur Radio Club will be hosting a lecture by Allan Latham G8CMQ on satellite television on 5 February, followed on the 19th by a talk from Mike Payne G3ZRM on steam railways.

The club meets at the Railway Hotel, Liphook in Hampshire on Wednesday evenings at 8.00. For more details contact: *Keith Tupman G0BTU, 23 Moggs Mead, Petersfield, Hampshire. Tel: (0730) 66489.*

GB3KB apologies

We would like to apologise to the Kent Border Repeater Group (GB3KB) for some erroneous information published in *Straight & Level* in the December 1985 issue.

In an article entitled *Biggin Hill repeater* we referred to the GB3KB repeater as a project of the Biggin Hill ARS, when in fact it is under the control of the Kent Border Group.

It is correct that the group are currently negotiating about the possible use of a site in Farnborough, Kent, but it is apparently too early to say whether the repeater will be installed there.

Up to date information can be obtained from the Honorary Secretary G4NSY QTHr, and not, as previously stated, from Robert Senft G0AMP.

METEOR SCATTER ACTIVITY PERIODS 1986

For the second year running the *VHF/UHF Newsletter* is promoting activity periods on the Random MS calling frequencies. It is hoped that this will encourage stations to be more active on random meteor scatter throughout the year.

The following dates have been arranged and this information has been passed to VHF managers and societies within IARU Region 1

SATURDAY 2200 – 2400GMT	SUNDAY 0600 – 0800GMT
11 January	26 January
8 February	23 February
8 March	23 March
12 April	27 April
10 May	25 May
7 June	22 June
12 July	27 July
9 August	24 August
6 September	21 September
11 October	26 October
8 November	23 November
6 December	21 December

Each month has two activity periods:

1. Saturday 2200 – 2400GMT
2. Sunday 0600 – 0800GMT

Call on 144.1MHz (CW), 5 minutes, or 144.4MHz (SSB), 1 minute

Please send your results heard or worked to: *VHF/UHF Newsletter, PO Box 73, Hereford HR2 9EW. Tel: (087) 387 679.*

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L·E·T·T·E·R·S

CRITIC

I have been reading your magazine since I started studying for the RAE in 1982.

I very much like about 60% of the articles but much of the other 40% I dismiss out of hand as being either repeated articles of dubious value or just plain rubbish. This is not your fault; it stems mainly from the lack, on the part of the writers, of any interest in anything that smacks of progress.

I'd like, however, to put forward my thoughts upon the letters for the month of December.

Open letter: I totally agree with G4UXC's comments and support the comment concerning the lack of communication between the majority of members and the insular group that run the RSGB. If you listen you'll learn.

934MHz: This is another one of those letters from an insular mind which fails to take into account the basic factors of economics. For example, the humble but much used PL259 antenna plug, before the advent of the much maligned CB system in the UK, was nearly four times dearer in 1980 than it is now. Why? Because of CB, that's why.

So with just a little luck and a bit of grey matter instead of a vacuum between the ears, it's not hard to theorise that implementing a novice licence now, based upon the experiences of countries with successful novice licencing, would stabilise the price of rigs, etc and increase the funds in both the RSGB's and the DTI's coffers, as well as giving the whole amateur scene in the UK more political muscle. We need enlightenment, not stagnation, apathy and the hear no evil, see no evil, speak no evil of the three wise monkey types.

Morse Margaret: Absolutely fan-bloody-tastic! An excellent example of the voice or the art of never say die.

This poem should be immortalised as both the spirit and the soul of amateur radio operators.

27MHz or 934MHz: As both an ex-service radio operator (professional) as well as an ex-CBer I fully agree with N Ashby and I wish that people like Mr McKenzie and those with a little CBing, no CBing, nor any type of professional radio operating experience would say the following prayer before making any further comments regarding legal CB or illegal CB: 'Lord, please help me to keep my big mouth shut until I truly know all that I need to know about the many and varied subjects on which I'm commenting. Especially I ask you Lord to forgive me for my bigotry and excessive pride and teach me, Lord, to be as humble as your son, Jesus, Amen. PS: Lord, we have IQ zeros on ham radio, the same as CB, over and out.'

All the answers: Mr Richard E Freeman, I support you sir and I wish you well for the December RAE. If this letter is printed I hope that by now you've received confirmation of a pass mark. If you fail again do please remember these famous words: 'If at first you do not succeed try, try and try again. Keep on trying – you will win in the end'.

Finally, I'd like to say that I've known many CBers who now hold B or A licences, some of them still use CB as well, and for the most part they were good as CBers and have proved to be even better hams.

But I must also state that there are one, two or more who for the most part were fair CBers who did the odd wally bit a couple of times before going in for the RAE and who for the most part are bigger wallies now they have their A or B licences.

Their forte now is key outs or rude noises. They've brought a 'mafia' mentality into the local ham scene and it's not on. They also do not have the legal power nor the authority to go on with their stupidity.

They tried it on whilst on CB and almost came to a very sticky and bloody end. Not to mention the visits from the RIS officers. Leave it out lads and lasses or you'll get your knuckles rapped. You are being watched (the RIS has your numbers)!

J Bolton G4XPP, Cheshire

Yes, well! Some of you have very strong opinions on certain topics. Mr Bolton's letter was actually considerably longer, but due to space restrictions, etc, we were forced to cut it a little. Of course, we should like to state that the opinions expressed in the letter are not necessarily those adopted by the editorial staff of the magazine. Dosage: to be taken with a pinch of salt. Ed.

UP THE ORGANISATION!

One must remember that the RSGB is there to represent the views of amateur radio, however good or indifferent, and it is there to put pressure on the powers that be to get a fair deal out of any legislative changes that may effect us all on amateur radio. It takes a lot of organisation and influence in the right places to get changes for the benefit of us all on the air waves.

This type of organisation needs the support of its members and if changes are needed internally *vote accordingly*. Even the smallest of organisations has internal differences, but these can be sorted out if there is support from all ranks. It may take time, but if it means a better run society surely the better for us all.

If there was a split from the RSGB, how many would follow and could the alternative society be as effective? What would an alternative society achieve, and would it merely be a duplicate of resources?

OK, so I might be green about the workings of the RSGB, but if we do not give support and show that support who will? It could mean the loss of certain bands, etc which the society has fought for (look at what may be happening in Belgium).

Brian L Navier, G1PRO

OLD FASHIONED

The comments I am about to make are inspired by articles in your sister publication *Radio and Electronics World*, but also apply to similar articles in *Amateur Radio*, and indeed to most other radio/electronics publications.

I am referring to the continued use of the imperial system of measurement in constructional features, coil winding formulae, aerial design and the like; all this despite the change to metric sizes in most constructional materials. Surely there can be no excuse for continuing this hotch-potch of measurements in electronics of all things, a science where all the units of inductance, capacitance, frequency etc are SI ones? Where, for example, is the logic in measuring a half wave dipole for 80 metres in *feet*?

The majority of younger readers, the amateurs of tomorrow, have been brought up on metric units, as have virtually all readers from the continent of Europe (and these latter are numerous judging by the correspondence columns). To those must be added people like myself, who have long since converted to metric and would never revert to imperial. For all of us, calculations using imperial measures are both irritating and frustrating.

There is no way of pleasing the 'imperial lobby' by the consistent use of imperial measures, even if this were considered desirable, since such measures do not exist for most electronic parameters (thank goodness!). There is a way of pleasing the rest of us, with the consistent use of SI units.

Perhaps *Amateur Radio* would care to take the initiative? Let the only feet we read of in *AR* be attached to cabinets or propping up the Editor, and the only pounds be those charged for bargains!

Philip Lane, Dyfed

SORRY!

We must apologise to Mr K Gosling G1LOE for incorrectly printing his callsign in *Letters* in the January issue of *Amateur Radio*. We actually gave him the callsign G1LDE, which belongs to Mr R Hughs of Bedfordshire.

So, apologies all round!

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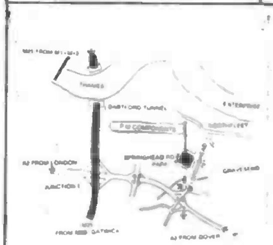

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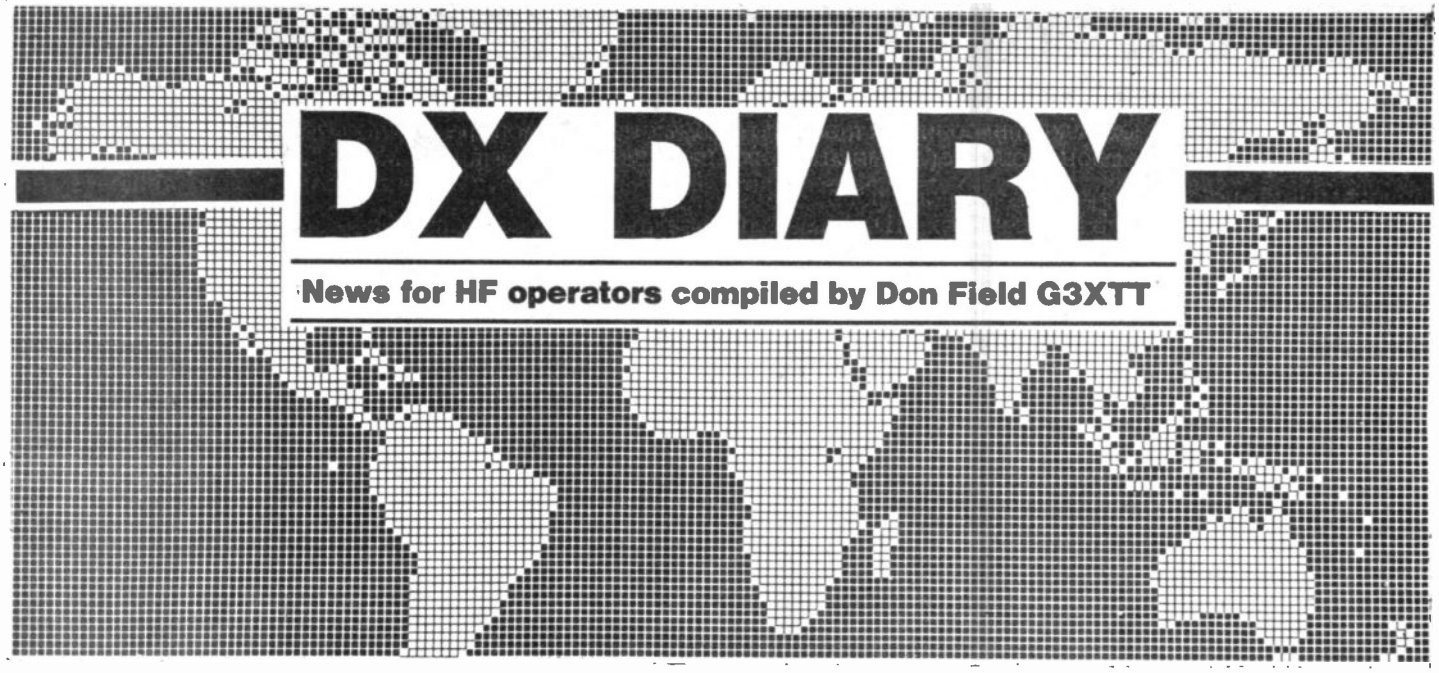


DX DIARY

News for HF operators compiled by Don Field G3XTT

Once or twice recently I have noticed readers' ads in this and other publications offering gear for sale because of TVI problems. Even where amateurs hang on to their equipment, I have a feeling there are all too many cases where the gear is never used to its full potential, at least during TV hours. I wonder whether, perhaps, this is why so few British amateurs are found chasing DX in the evenings on the HF and LF bands?

Use your power

Ragchewing across the country is easy enough because low power is adequate, and a look around 80 metres in the evenings will reveal a number of British amateurs exchanging chitchat. How many, though, do you hear chasing DX with the linear busy generating the full legal output? The amateur radio dealers seem to do well enough selling HF gear. It's a pity it isn't used more often.

It has to be said that there is probably a higher proportion of the VHF fraternity active in the evenings (just listen around 2 metres) than of the HF fraternity. Maybe I have jumped to the wrong conclusion. Perhaps it is the problem of installing HF antennas on the typical modern postage stamp of a garden. Or perhaps it's just that the serious DXer spends much more time listening than transmitting, and so we simply don't hear him for much of the time.

Whatever the reason, it would be nice to see more HF operation from the UK, and more participation in the major international contests. To my mind, by far the best piece of news in recent months has been the release of 6 metres to UK amateurs. Although only for class A licensees in the first instance, and with limited effective radiated power, it will give many amateurs their first taste of ionospheric propagation (not yet, but in a few years when the sunspots start to return) and perhaps attract them to lower frequencies. After all, it must be more interesting to talk to Tom Christian on Pitcairn Island than to Tom Smith 10 miles down the road? Or am I missing something?

The TVI menace

As far as the problem of TVI is concerned, I can understand that this is a worry to HF operators, particularly now that it is no longer possible to rely on the co-operation of a friendly and helpful team of people from the Radio Interference Service as and when problems arise. However, the fact is that most TVI problems are relatively easy to deal with, even if it may not always be possible to effect a full cure on all bands.

For those of us with a long history in HF amateur radio, the present problems (even with the advent of the dreaded video recorder) are but a shadow of what was once experienced with VHF television. In my own case, when first licensed I lived in an area where the local BBC1 transmitter fell almost directly on the third harmonic of 15 metres, which meant avoiding 15 completely during peak TV hours. Those days, thank goodness, are now past and I would urge all budding HF operators to get to grips with TVI and RFI problems (with help from a local club or from the RSGB if necessary) rather than give up (or, worse, stay on VHF!).

The ARRL deliberates

The ARRL awards committee has now approved a resolution to the effect that the following will *not* be eligible for consideration as separate countries: embassies, consulates and extra-territorial legal entities of all kinds including, but not limited to, monuments, offices of UN agencies and related organisations, and other inter-governmental organisations, diplomatic missions, etc.

This decision means that 4U1VIC in Vienna (see July 1984 *DX Diary*), 4U1UP in Costa Rica (August 1984), and other similar stations could not in future even be considered for separate country status. 4U1ITU and 4U1UN remain as separate countries because the new ruling is not retroactive.

Aruba

The news is better regarding Aruba in the Netherlands Antilles. On 1 January Aruba started on the road to complete independence from the Netherlands, and word from the ARRL was that separate status from the rest of the Netherlands Antilles could well be considered later this year.

In anticipation, KQ2M was hoping to operate from Aruba with the new P4 prefix from 13 to 20 January. You may well have him in the log by the time you read this. It has to be said, though, that Aruba's full independence is not due until 1996 so, depending on the mood of the various ARRL committees, we just might be in for a long wait.

With rulings like that described above, some may wonder whether the supply of 'new' countries has almost dried up. However, careful newspaper readers may have seen an item recently about how the Canadian government is looking into giving a substantial part of northern Canada back to the Eskimos to be an independent homeland. This is being referred to as Nunavut, meaning 'our land'. If the go-ahead is given, we may see this one come into being before the end of the decade.

Political

On a similar note, readers may be asking themselves about the status, in amateur radio terms, of those unpronounceable South African homelands of Ciskei, Transkei, Bophuthatswana and Venda, all of which have separate prefixes (S4, S8, H5 and V9). The answer is political. At the present time they are not internationally recognised in the same way as Lesotho and Swaziland, but if we wait this one out we may eventually see them counting as separate countries for the various awards.

As WA2HZR, who has operated from the various home-

lands, said in an article in *CQ Magazine*, 'How some building can be called a country while a self-governing, independent people cannot get country status makes a sham of the DXCC process...'

Awards

Some readers may regard the above discussion about countries as stuff and nonsense, but for many radio amateurs the chasing of countries for awards is their reason for breathing, just as other hobbyists may chase that elusive stamp or that rare species of bird.

For those with the hunting instinct the DXCC programme, even in its recently extended form, does not go far enough. It does not include credit for achievements on a single band (with the exception of 160 metres), it does not include the new WARC bands, and it fails to accept some of the more dubious operations from countries such as Burma (the XZ9A operation is the classic example).

Fill a gap

To fill the gap, the International Radiosport Association (based in Canada) is sponsoring a new awards programme, the DX Century Award (DXCA). Single and multi-band versions have been available for confirmed countries since 1 January 1986, and all 9 HF bands are included in the programme.

Provision is also made for recognition of countries worked before the starting date, and for total countries on all bands. Thus the designation 7BDXCA (856/1265) on a QSL card would signify that the station concerned has confirmed a minimum of 100 countries on each of seven bands and that the total count is 856 countries confirmed since 1 January 1986, and 1265 on seven bands since 1945. An 'Honor Roll' listing will appear twice a year in the Canadian Radiosporting magazine.

Operations such as XZ9A, where there is every reason to believe that they did indeed take place from the country in question, will be accepted with the proviso that if they should later be cast into doubt they may eventually be disallowed for credit.

The above is an abridged version of what is obviously a complex and comprehensive awards programme. It remains to be seen whether it will ever attain the international following and credibility that attends the DXCC programme, but the idea is certainly an interesting one. Further details can be obtained from IRSA-DXCA, Box 65, Don Mills, Ontario M3C 2R6, Canada.

DX news

During December, 80 metres was producing some useful DX with good signals from Japan and Australia most evenings and VR6JR on Pitcairn Island frequently to be heard in the mornings. KH0AC was on several times in the evenings, often, to the frustration of G stations, being worked by stations on mainland Europe but completely inaudible in the UK.

To add insult to injury, he was an excellent signal in the UK on the evening of Christmas Day. Not surprisingly, there were very few G stations around to take advantage! He was also heard in the mornings on 40 metres.

Another nice one reported on 80 was a ZXO station. This one was operating from a Brazilian base in the South Shetland Islands. In a similar vein, a Norwegian group was due to be operational from the Antarctic in January and may still be operational when you read this. They were hoping to use a 3Y prefix or their own calls /3Y.

Lloyd and Iris Colvin continue their travels, having operated as 7P8KG from Lesotho,followed by 3D6QL from Swaziland. They should have moved on yet again by the time this appears in print. Lloyd now seems to have less stamina than he used to for CW operation, but Iris can still be heard for long periods handling the SSB pile-ups. There is, incidentally, an award to be had if you have worked them under (I think) 30 of the various calls they have held over the years.

Jim Smith

Jim Smith, well known as P29NS and VK9NS, should have left Papua New Guinea at the end of January, to return to Norfolk Island by mid-February after a short visit to Australia. Jim is well known to all who chase Pacific DX, particularly on 20 metres. He and his wife Kirsti VK9NL expect to be at the Dayton Hamvention in April.

Willis Island

VK9ZB has now left Willis Island and has been replaced by VK9ZG. This new operator is reported to have a full (rather than novice) licence and should appear on CW,which will delight many.

Sudan

ON7IP/ST2 was active in December and should have returned to the Sudan for a further 6 month tour by the time you read this. This is the first official operation from the Sudan for some time. QSLs go to his home call.

Zaire

Stu Honeysett, ex-H44SH, is now back in the UK after having given many people their first contacts with the Solomon Islands (in some cases on 80 metres). He is reported to be leaving shortly for a four year spell in Zaire (9Q5) and hopes to get a licence. If successful, G3LQP will handle the QSLs.

Comoros

Walter DJ6QT is said to be planning a spring operation from the Comoro Islands which will include some operation on RTTY. Walter has an impressive list of operations to his credit including, recently, 5V8WS, 3V8AS and DJ6QT/CT3.

This one will be no picnic. An article by Ian G4LJF, which appeared in the January 1985 issue of the American *CQ Magazine*, tells how he was forced off the air and interrogated at length by the secret police when he operated as D68AAB in 1982. Not a place for the faint-hearted!

Tokelaus

Ron ZL1AMO's expedition to Tokelau has been postponed yet again, and may now take place in March. Ron got as far as Samoa and operated as 5W1CW for several days, but was unable to go on as most of his gear, which was being air-freighted from New Zealand, failed to materialise. By the time he located it it was time to return to New Zealand. Another example of the perils which can befall the expeditioner.

Contests

The two most important international contests to take place in February are the ARRL CW contest on 15/16th and the CQ WW 160 SSB contest on 21st/23rd. The French SSB contest also takes place on this latter weekend.

The ARRL contest is a 6 band affair running for the full 48 hours and is a good opportunity to work those elusive American states, particularly on the LF bands. The SSB leg takes place over the first full weekend in March (1st/2nd).

The CQ 160 metre contest follows the same format as its CW equivalent which I described in last month's column. A few years ago it was something of a non-event in Europe, but European SSB activity on Top Band has increased enormously over the last few years, at least during contests, and this event is well worth looking at.

That's it

That's it for another month. Please keep me up to date with news, especially if you are planning expedition operating over the summer. Good DXing. 73 de Don.

EDDYSTONE EA12

Ian Poole G3YWX offers a user review of a trusty communications receiver

Eddystone is a name synonymous with quality communications receivers. Although they only make equipment for the commercial market now, many of their earlier receivers were produced for both commercial and amateur use and are now available on the secondhand market.

Receivers such as the 888, 830, EA12 and so forth are still sought after, and while most of them are general coverage, the EA12 is an amateur band only receiver covering all of the bands of the day, from Top Band to ten metres.

They were produced in the 1960s as a high quality receiver and at that time they represented some of the best in British amateur receiver technology. However, since they were first introduced, technology has changed and valves have died out to be replaced by transistors, integrated circuits and circuit designs using microprocessors, as well as frequency synthesisers which are now commonplace.

Yet, in spite of these advances, the EA12 can still produce good results in today's crowded band conditions, and for anyone looking for a secondhand receiver possessing a good specification but not adorned with modern day processor controlled frills they are an attractive proposition. Fortunately they were in production for several years in reasonably large numbers, so they can be seen quite frequently in the readers' advertisements in the amateur press for between £100 and £150.

Circuitry

The receiver consists of a double conversion superhet with a crystal controlled first conversion to convert the signal down to a variable first IF stage. This is followed by a second mixer controlled by a variable frequency oscillator to convert the signal to the second and fixed intermediate frequency. The use of this type of configuration enables the VFO to run at a low frequency and not have to be switched, which gives improved stability. In addition to this, the higher frequency of the first IF enables better image rejection to be obtained.

The second IF has variable selectivity and this can be selected according to the mode in use or as conditions suit. Then the signal can be detected using an envelope detector for AM or a product detector for CW or sideband. There is also a detector for the AGC whose output acts on both the RF and IF stages. The audio signal is amplified and is available for driving either an internal or external loudspeaker or headphones, if they are preferred.

Although this line-up may sound as if it is fairly conventional for a receiver of its day, a closer look reveals that there are several unusual and interesting features embedded in the circuit design, making a closer look at the circuitry very worthwhile.

On entering the receiver the signal first passes into a high-pass filter to stop breakthrough from the aerial to the first IF. This may not seem particularly important, but there are many strong signals present within the range of the first IF and these are attenuated by 90dB or more.

Having been filtered the signal passes into the first RF amplifier, which consists of a double triode valve in a cascode configuration. This not only gives a good cross modulation performance, which will be of interest to anyone keen on 7MHz, but also gives a better noise performance than if a pentode were used.

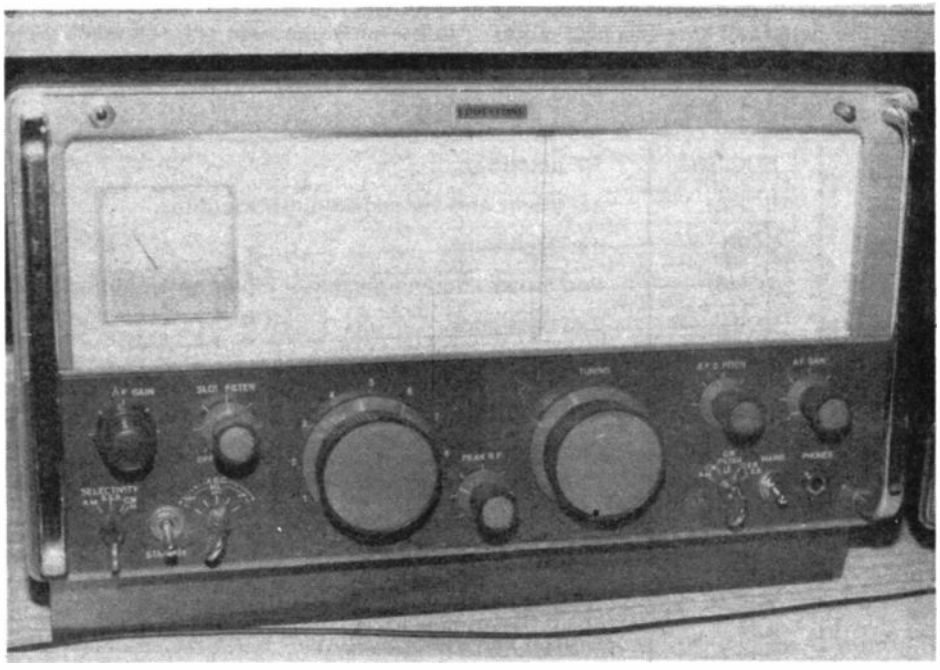
The signal is then passed into the first mixer stage, which converts the signal down to the first intermediate frequency. This mixer is driven by a crystal oscillator which is fairly standard and warrants little comment. The first IF lies between 1.1 and 1.7MHz and is surprisingly low as many other designs favour 9MHz, yet it still enables the image rejection to be quoted at 50dB for the highest frequencies and proportionally better for the lower ones. However, the choice of this low IF does enable the variable frequency oscillator to be run between 1.0 and 1.6MHz, which is low and leads to good stability.

The circuit of this oscillator is where one of the unusual design features can be seen. Contrary to normal practice, the VFO HT voltage is not stabilised. The explanation given in the manual says that any variation in the mains will result in fluctuations in both the HT and the heater voltages, both of which will affect the frequency of the oscillator. However, it is said that they act in opposite directions and therefore tend to cancel one another out in this case – a fact which seems to be perfectly true as the receiver is quite stable.

Not standard

Using this VFO the signal is converted down to the second IF of 100kHz which, although it is not standard, does allow for LC filters to be used where other receivers would use a selection of crystal or mechanical filters. In the case of the EA12 the selectivity is varied by mechanically moving some of the coils in the IF transformers. This enables the selectivity to be varied continuously from 6kHz to 1.3kHz (at 6dB) which is an unusual feature in itself. A further narrowing of the selectivity is brought about by switching in a single close tolerance crystal to give a 50Hz bandwidth. In addition to all of this there is a notch filter capable of giving a sharp 40dB notch, which can be very useful to remove annoying carriers on either CW or sideband.

The AM and AGC detectors are fairly standard, although the product detector and beat frequency oscillator are contained within one valve. This idea can



Band no	Frequency coverage (MHz)
1	29.4 - 30.0
2	28.9 - 29.5
3	28.4 - 29.0
4	27.9 - 28.5
5	20.9 - 21.5
6	13.9 - 14.5
7	6.9 - 7.5
8	3.4 - 4.0
9	1.8 - 2.4

Frequencies covered

sometimes lead to overloading and pulling of the oscillator on strong signals, but in this case it has been found to give good performance even with strong signals.

Once the audio has been generated it is then passed through an audio filter whose bandwidth is set for the mode in use. While no filtering is used on AM, on SSB or CW a filter is introduced which gives a 30dB fall in response at 5kHz, which can remove much of the annoying high frequency 'monkey chatter'. In addition to this there is a further position which can be used for copying CW under difficult conditions which switches in a 300Hz wide bandpass filter centred on 1kHz. This can be used on its own or in conjunction with the crystal filter when conditions become really bad.

After the filters the signal then passes into the audio amplifier, which consists of a triode followed by an output pentode. This amplifier develops a maximum output of about 2.5 watts, which should be more than adequate for most people.

There is also a crystal calibrator included in the receiver which generates 100kHz markers. The output from the calibrator is injected into the second mixer and the second IF. Therefore, with the BFO switched off, a beat can be heard between the two signals. The manual says that it is unnecessary to inject the calibrator into the first mixer as this is crystal controlled and it is unlikely to need calibrating.

Construction

In keeping with the Eddystone style of construction the EA12 is very sturdily built. Both the coil box and front panel are cast and the remainder of the receiver is built to a similar standard. This does mean that the whole receiver is quite heavy, weighing around 47lbs, which means that even though it is not as heavy as the Murphy B40 that was reviewed recently it is still not a piece of portable equipment!

Internally the layout is well set out, enabling easy servicing, and in addition to this the standard of construction is high, which should mean that it will only occasionally require attention. These points are particularly important in a receiver of this age because unreliability or difficulty in servicing could leave the receiver off the air for long periods.

Front panel controls

The appearance of the EA12 is dominated by the large tuning scale and the two main knobs for bandchange and tuning. The left-hand knob is the bandchange whilst the right-hand one is for tuning and is geared to give a reduction ratio of 140:1. This means that the tuning of sideband and CW signals is particularly easy and has a nice sense of bandspread, but it does make tuning from one end of the scale to the other a little tedious! As already mentioned the tuning scale is long – a total of 10.5 inches – and it is calibrated every 10kHz, which means that frequencies can be read to within a kilohertz or so, which is all that is really necessary.

At the left-hand end of the tuning scale is the S-meter, which is quite large and calibrated in S units from S1 to S9 and then directly in dBs above S9. Unlike a large number of receivers and transceivers, and judging by the results of the tests that I have carried out, this appears to be fairly accurate and responds well to both weak and strong signals.

Below the tuning scale are the main receiver controls. At the left-hand end of the panel are the RF and IF gain controls. These are mounted concentrically and they can be manipulated to give the optimum performance under any particular conditions. However, it is normally quite sufficient to use just the RF gain control except for very strong signals when both can be used, but in any case this is a matter of personal preference.

Next to these gain controls is the slot filter. When not in use this control is left in the fully counter-clockwise position so that it lies outside the passband of the receiver. However, turning it clockwise makes the slot transverse the passband so that it can remove the unwanted carrier. This filter can be very useful, giving a sharp notch anywhere within the passband to remove even fairly strong carriers.

Located beneath the gain and slot filter controls are the filter bandwidth, standby and AGC/noise limiter controls. Unfortunately these are a little cramped, but not nearly as bad as some of the modern pieces of equipment which are available today. The left-hand control gives the selectivity, and although this is continuously variable there are click stops which have been conveniently included so that the standard bandwidth for each mode can easily be selected. The crystal filter is also selected using this switch by turning the control slightly further than the CW position, so that a microswitch is operated to connect it.

Next to this is the standby switch which can be used manually to mute the receiver, or if it is left in the standby position this function can be controlled remotely by transmitter. Alternatively this switch can be used to control the transmitter via a connection on the rear panel.

AGC and noise limiter

The AGC time constant and noise limiter functions are controlled by one switch. There are two AGC time constants, slow for SSB and fast for CW. Each of these can be selected with the noise limiter either in or out of circuit and in addition to this there is a position where the AGC and noise limiter are disabled.

In the centre of the panel between the tuning and band-change controls there is an RF peak knob which is used to tune the RF stages. Although the setting of this is not particularly critical on the higher frequency bands, the setting becomes more critical for the lower frequencies and on Top Band it needs adjusting every few kilohertz.

Further to the right are the BFO pitch and AF gain controls. The AF gain control is self-explanatory but the BFO warrants a little more comment. First it is controlled by a reduction gearing, and then in addition to this the amount the pitch can be controlled is altered between CW and SSB, giving about ±100Hz on SSB and ±3.5kHz on CW.

Valves used in the EA12

VALVES		
V_1	ECC189	RF amplifier
V_2	ECH81	1st mixer and 1st osc amplifier/doubler
V_3	EC90	1st oscillator
V_4	ECH81	2nd mixer and 2nd oscillator isolation amplifier
V_5	EC90	2nd oscillator
V_6	EF93	1st 100kHz IF amplifier
V_7	EF93	2nd 100kHz IF amplifier
V_8	EB91	AM detector and AGC rectifier
V_9	ECC83	Cathode follower and audio amplifier
V_{10}	EK90	CS/SSB product detector
V_{11}	EL90	Audio output amplifier
V_{12}	150C2	HT stabiliser
V_{13}	EF94	Crystal calibrator oscillator

Below these are located the mode, mains on/off controls and the headphone socket. The mode switch is the only one which requires any explanation and has five positions: AM where the BFO is not in use; CW where the BFO is switched and the wide audio filter included; CW where the narrow audio filter is then used; and USB and LSB which of course use the wide filter again.

The only remaining controls on the front panel are for the crystal calibrator. The push switch for this is located in the top left-hand corner of the panel above the tuning scale, and then in a symmetrical position on the right-hand side is the cursor adjuster.

Rear panel

At the back of the receiver there are three rectangular access holes cut in the outer case whch give access to the connectors and controls which are mounted on the rear of the chassis. Looking at the back of the receiver the left-hand cut-out contains the mains input and fuse. There is also an S-meter zero control which has a slot cut in its spindle so that it can only be adjusted using a screwdriver. This does make it a little difficult to use as one has to look at the S-meter at the front while it is being adjusted, but it does prevent it being accidentally tuned when setting the control next to it which is labelled 'MUTE LEVEL'. This adjusts the muting of the receiver when it is in the standby position, so that when it is used in conjunction with a transmitter the transmitted signal can be monitored.

The next access cut-out contains an earth point and the aerial input. Unfortunately the socket for this is one of the old Belling Lee TV types. Although these connectors would never be used nowadays they were in common use in amateur equipment back in the 1960s.

The right-hand cut-out reveals six connectors of various types. Two of them carry the speaker output and this can either be connected to the internal speaker or to an external one if required. Next to the speaker output is another Belling Lee co-ax socket, which carries a buffered IF output. This is very convenient for driving any ancilliary units which might require an IF output such as an FM detector, although it should be mentioned that even in the AM selectivity position the IF may be too narrow for perfect FM demodulation.

Below these are three connectors labelled RELAY, MUTE AND AGC, which are for muting the receiver when it is used in conjunction with a transmitter. The first is intended to control a relay or PTT type line in the transmitter and in fact consists of a contact on the STANDBY switch which is shorted to ground when the switch is in the standby position. The second is intended to be controlled by the transmitter, and with the switch permanently in the standby position uses a transmitter relay contact to short the terminal to ground for receive. Finally, the third contact is intended for use with valve controlled transmit/receive switches which were popular in the 1960s. This terminal should normally be at earth potential for receive, but when the receiver is to be muted a voltage of about −50 volts should be applied. The exact voltage can be varied slightly to give the correct degree of muting for monitoring the transmission.

Instruction manual

All too often the manual which accompanies a piece of amateur gear gives only a brief technical specification, some operating instructions and sometimes a circuit diagram which is small and difficult to read. Fortunately, the manual for the EA12 does not fall into this category and is in fact very comprehensive. Not only does it give a technical specification and detailed operating instructions but also the circuit diagram is easy to read. On top of this there is a circuit description detailing each stage and a section on servicing and aligning the receiver. This is written in such a way that any reasonably competent user should be able to re-align the receiver with little difficulty and also without a vast array of equipment.

On the bands

From the point of view of its performance the stage is set by its sturdy well engineered appearance. This is reinforced by using the tuning control, which has a weighted flywheel to give it a better feel. Then having turned the receiver on it does not take long to find out that it performs remarkably well. Many receivers of comparable age take quite a while to become stable after they are turned on. Not so for the EA12. Within a minute or two it is quite able to hold a sideband signal with only very slight corrections and then, of course, once it has warmed up it becomes rock solid.

POSITION	−6dB	−50dB
Crystal	50Hz	2kHz
SW	1.3kHz	5kHz
SSB	3kHz	8kHz
AM	6kHz	12kHz

Receiver selectivity

One of the other features about this piece of equipment, which very soon makes itself obvious, is the filter arrangement. Although the skirt selectivity may not quite be up to the standard of some of the highest quality crystal filters, the flexibility given by the filters more than makes up for this.

Then for anyone interested in 40 metre operation the cross modulation performance is superb. It is a well-known fact that bipolar devices suffer badly from cross modulation and therefore many transistorised receivers had front-end attenuators to try to overcome the problem. Although the situation is much better now with the use of FETs, it still takes a lot to beat a good valve design.

Overall the receiver is nice and easy to use and because of the way it is constructed it has a great feel of luxury about it, as if cost had been of little object. In spite of the fact that it may be somewhat large by today's standards, the sheer quality more than makes up for this.

Final thoughts

Before buying any receiver, it is worth looking at what you really want. If it is a new box with lots of bells and whistles then buy Japanese, but if it is a second-hand receiver with a good specification then one could do a lot worse than to buy an Eddystone EA12.

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Two versions are available at the moment, one for 40M (3W output) and one for 80M (5W output). These are great fun, and are an ideal introduction to QRP CW operating. The output power level is adjustable, and one crystal is supplied. You can add the CVF VFO to give full band coverage if you wish.
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ANGUS McKENZIE TESTS

ICOM IC1271E

23/24cm multimode transceiver

This remarkable new 23cm transceiver follows much the same pattern as the 271 and 471 models previously reviewed in this magazine, but there are a few differences in the facilities. Since the receiver has to cover such a colossal range, a special MHz button is provided which, when held in, allows you to tune the VFO dial from one end of the band to the other very rapidly. There are also 1MHz up/down buttons on the front panel.

On SSB and CW tuning steps are 100Hz or 1kHz, these being selected by a front panel button; on FM the steps are 1 or 25kHz. I found the 100Hz steps inadequate to tune in someone on SSB properly, but there is a continuously variable RIT knob which allows for receive frequencies to be offset by up to 2.5kHz up or down, and this resolves the received pitch problem quite nicely.

Two VFOs are provided and buttons select A/B, A=B, VFO split Tx/Rx, VFO to memory, memory to VFO, memory or VFO, and VFO dial for changing memories. 32 memories are provided, which can also store mode. Duplex plus or minus shifts can be inserted for repeater operation, and toneburst is available.

There are two AGC speeds, but even 'slow' was too fast, and you cannot turn AGC off. The TV IF output is also subject to a degree of AGC which is very useful. The S-meter can alternatively be used as a centre zero tuning meter for FM, whilst on Tx it reads output power on a 0 to 1 scale, the transmitted power being reducible with a power control down to around a 1W level.

Normal functions

All the normal Icom front panel functions are available, eg scanning, including selecting only the required mode from memory, and searching from one frequency to another. A most useful provision is a masthead pre-amp on/off switch which allows 13V dc to appear on the 50 ohm N type antenna socket on Rx. This was specifically designed to work with an Icom GaAsfet masthead pre-amp accessory which is not yet available. However, I found it worked perfectly with my SSB Products masthead, and no problems whatsoever were encountered with its automatic operation when selected.

The rig is normally supplied for just 13V dc operation, but a built-in mains power supply unit is available with an interlinking dc lead and mains IEC socket. Other connections on the rear panel include a 3.5mm speaker jack, another 3.5mm jack for a Morse key, TV IF input and outputs on phono sokets, a ground terminal and a 13V dc input socket.

There is the usual Icom accessory socket which can provide a fixed 13V dc output when the rig is switched on, earth, 6V output from squelch control when operated, inputs to operate FM or SSB squelch, outputs from mic amp and from the top of the receiver gain control for data or audio interconnections, an 8V on Tx line (max 5mA), external PTT, an ALC input, meter voltage, a separate TV ALC interconnection, and some spare pins.

The loudspeaker is underneath, and the rig has a pull forward bail stand under the front which allows the sound to escape adequately, although I found it to be rather muffled.

A bug hutch cover on the top panel can be removed to gain access to presets for CW delay, VOX delay, VOX gain, anti-VOX and CW monitor level when on Tx. Front panel illuminated indications include complete frequency with just 1kHz resolution and basic status of the various VFOs and memories and modes.

Somewhat curiously, the optional speech readout gives a resolution to 100Hz, and this accessory costs an additional £42 including VAT. The main PSU optional extra costs £99 including VAT, but the rig itself costs £959 including VAT.

Subjective tests

I had been eagerly awaiting the arrival of this rig, as rumours about its existence had been whirling around the microwave world for over six months.

The first sample arrived towards the end of November, and on turning it on we were all bitterly disappointed with its dreadful stability problem; the frequency on SSB wavered up and down by around 100Hz for many minutes. Quite clearly this one had a temperature stability problem, but the importers kindly supplied a replacement very rapidly, so a few days later I had the only two models delivered to the UK on *my premises!*

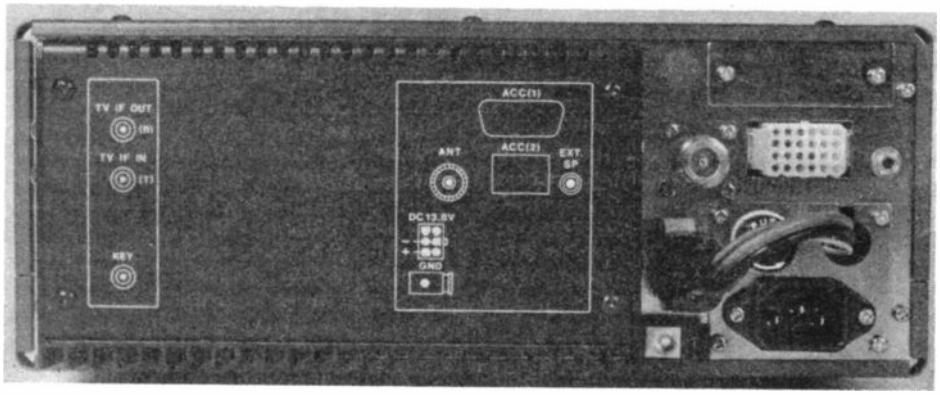
The second sample, on which all the tests were made, proved to be far more satisfactory, but there was still a very slight remnant wobble some of the time. I think that this would not trouble the majority of users, however, but it just happens to be one of those areas that I am personally rather prickly about, as I am over sensitive to pitch.

I have had many QSOs with this box, both running it barefoot into my masthead system and driving it into my EME valve linear, which gave around 160W PEP output. Incidentally, there was more than enough drive for it and I had to back off the power control by quite a degree to avoid over driving, so in practice you should find that there is enough output to drive even less efficient linears.

Unfortunately, and as usual, Icom omitted to put in a short to ground on the Tx pin of the accessory socket, so we made up a simple little box which was driven from the fixed 13V dc pin, the 8V on Tx pin and finally an earth interconnection. The 8V line was fed to the base of a BFY50 npn transistor via a 6.8K resistor, with 10K from base to deck. A change over relay was connected with the coil from the 13V fixed line to the collector, whilst the emitter was connected to ground. The relay was a 2 pole change over: one pole giving an earth on Tx for driving the main installation, whilst the other pole was used to feed the 13V through to an extra coaxial relay to switch the drive through to the linear on Tx.

This worked extremely well, but of course I did not use the pre-amp on/off facility as the Tx shorting line was used via the SSB products masthead control box, with the latter controlling the linear change over.

Virtually every contact I had included a comment on the rather limited quality of the transmitted audio on SSB and it is



high time that Icom improved this. With the masthead amplifier switched on there was easily enough system gain to make the system very sensitive indeed, the pre-amp easily overcoming the input noise figure of the IC1271.

Received quality

The received quality on SSB was also rather squawky, but FM was better. I quite liked the general feel of all the controls, and did not have any particular problems with them.

It was interesting and depressing to note the staggering intensity of continuous radar signals around 1253 and 1269MHz, the signals being at least 2MHz wide. When I beamed on Heathrow, I have to describe the received signals as completely flattening the front-end almost all of the time, but the disturbance at 1296MHz was not too bad, even at its worst, showing that the front-end intercept point was quite adequate. The microphone supplied was an HM12, which includes up and down stepping buttons.

On its own, the rig was surprisingly sensitive for a Japanese transceiver, and at least the equal of the best Japanese multimodes on 2m and 70cm. Co-ax losses are so much higher on 23cm, though, that I would very strongly recommend the use of an appropriate masthead pre-amp, which in practice will win you almost two subjective S-points on Rx, and this is essential on the band.

You might think that 10W or so is not really adequate for the band, but surprisingly, once two DX stations are beaming on one another, 10W will suffice for most QSOs. I have to admit though, that 100W at least can make a very big difference in getting the DX station to be aware of your existence.

This rig would be ideal for portable use, especially in a contest, and you should not experience any blocking from VHF or UHF stations in the same locality, which is a strong plus point. You should find that the transmitted SSB is very clean indeed, especially if you keep the power down to around 7W, which is all you need to drive a 2C39 linear – even a twin valve one. There are now repeaters on the band, so I feel that we may see quite a lot of mobile operation developing in the next year or two.

When I reviewed the Icom IC271 and 471 models, I found that there was some appreciable IF filter breakthrough on Rx when the filter had attenuated by around −60dB. Unfortunately, this model has exactly the same problem, for when I peaked my antenna system on GB3NWK, I could hear its tones way outside the normal filter bandwidth until they reached inaudibility as the beat frequency reached a level beyond my hearing capabilities.

This suggests once again that the selectivity is controlled below −60dB or so by the bandwidth of an earlier roofing filter rather than by the final SSB filter, and it is surprising that the manufacturers have not yet taken heed of the first criticisms of this problem made nearly two years ago. It is clearly due to PCB layout, and several friends have attempted to correct it, on the 271 and 471.

This problem should not concern you, however, unless you have an extremely strong station reasonably close to you, although this is not quite as uncommon as it used to be since many operators are now running at least 100W on the band into antenna gains of at least 20dB, and perhaps 26dB. It will mean that you might have to keep at least 20kHz away from a strong local station, but this is not as frustrating on 23cm as on 2m for example! For this reason, I don't think the problem is too serious, and if you are away from very strong stations you can totally ignore it in pratice.

Laboratory tests

Measuring sensitivity at 1296MHz is not at all easy, and so we checked it by two methods: 12dB sinad on FM and an actual measurement of approximate noise figure using a manually operated noise figure meter source.

I estimate the front-end noise figure to be in the region of 4dB or better, and this gives a sensitivity on FM of around −124.5dBm and an SSB sensitivity which is surprisingly good at around 0.1μV for 12dB signal-to-noise. The sensitivity seemed similar across the entire range.

The RF input intercept point was not too easy to measure, but we estimated it by taking the TV IF feed to a spectrum analyser. The approximate figure obtained for intercept point was −12dBm – a good figure for the band, although it could actually have been better with higher tec front-end design.

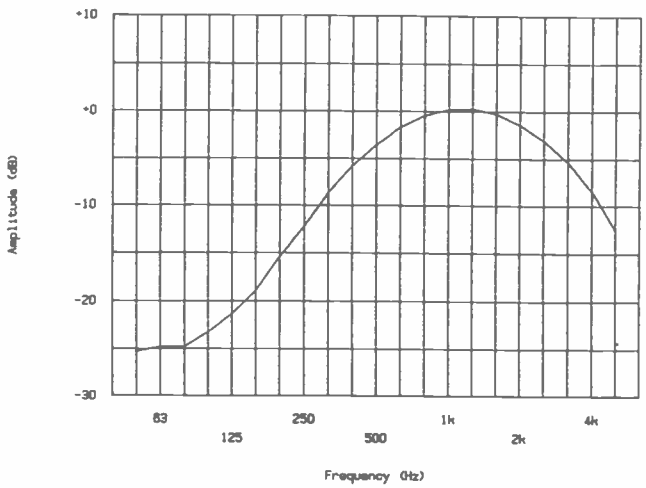
The first sample tested unfortunately had a most dreadful noise and wobble on the first local oscillator, and was almost unusable until the rig had warmed up for about two hours, but the second sample was as good on switch on as the first one had been after many hours. After several minutes warm up, the second one was quite adequate, although from time to time when listening to a carrier I noted a very slight wobble.

It was not possible to measure reciprocal mixing, although it is clearly rather worse than good rigs are on the lower bands, but I did not hear any problem subjectively once the rig had warmed up, which would indicate a problem in the reciprocal mixing area.

Tests had necessarily to be somewhat simpler as, at the moment, I do not possess two signal generators with good enough performance at 1296MHz.

The SSB selectivity was clearly very good, and the product detector distortion seemed adequate on carriers, but there was a tendency to slight clicking on peaks of SSB under normal service. On FM, the receiver distortion was very low, at 2% from a signal of 3kHz deviation at 1kHz. The maximum audio output power was 2.3W into 8 ohms, but was very usefully 3.7W into 4 ohms.

A signal-to-noise ratio on FM of 48dB was attained, which is very good, and I did not note any synthesiser whistles or whines.



Icom IC1271 FM received audio response (750μS pre-emphasis)

The television output nominal intermediate frequency was centred at 133.86MHz, which is very broadband, and sufficient to cover audio and video with the usual separations. There is a useful gain of around 15dB between the RF input level and the TV IF output when this is loaded with 50 ohms.

The S-meter, AGC and audio characteristics seem to be very similar to those of the IC271 and 471. The tone control gave a good range of adjustment and the FM response from a 750μS pre-emphasised signal showed the typical Icom rather muffled HF to be 6dB down at 3kHz, and around −12.5dB at 5kHz.

200Hz was −15dB, and I find this rather surprising. Since there is so much space on 23cm, and our channel spacing is nominally at 50kHz, I would have expected a rather wider FM response since surely we will all be using the mode for much higher quality audio than is reasonable on the lower frequency bands.

I can see no reason why Icom could not have given us a flat response from 200Hz to 5kHz followed by rapid cuts outside these limits. The SSB response was similarly curtailed at the bass end, in addition to the filter action, and this led to a slightly thin sound from the receiver.

Impressive performance

The transmitter gave a most impressive performance, and I was delighted to find that the transmitted frequency accuracy was phenomenally good, a negative error of only 200Hz being quite remarkable. Even so, Icom can offer a high stability crystal option if you really want something better than this!

What is perhaps more important is that when we transmitted an FM carrier at well over 10W for a minute we noted no more than 150Hz drift, showing that components are very well temperature compensated around the oscillators. On SSB, I did not notice any significant drift at all over average transmit and reception periods.

The FM output power was checked over the full frequency range, and this never fell below 10.5W (1270MHz), whilst on most other frequencies, including the 1296MHz area, the average output power was between 12 and 12.5W. At 1240MHz power actually reached 15W, with 14W at 1250MHz, so you could probably adjust the rig, if you have the appropriate test equipment, to give nearly 15W output at 1296MHz.

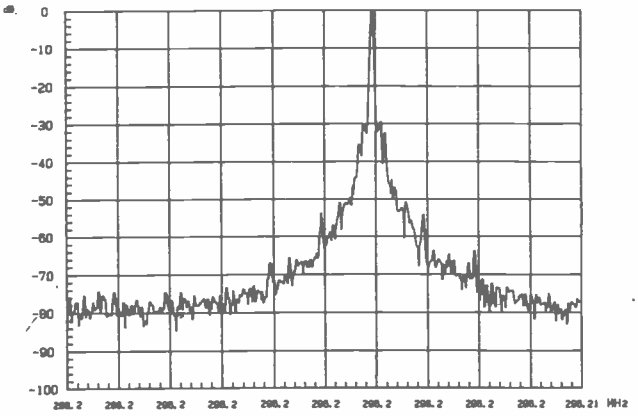
On SSB, the PEP was found to be very similar to that of continuous FM. We interconnected the rig with two audio signal generators into the mic socket as a test source, whilst the RF output, after attenuation, was examined on our Marconi 2380 spectrum analyser. It was necessary to use an MCL passive mixer to bring the frequency down to one within the analyser range, and sufficient attenuation was used to keep the mixer products way down. At full output power of around 12W PEP we noted −21dB third order products, with 5th order at an average of −38dB, although slightly lopsided.

The plot shows the good two-tone test performance for the band, and I have to admit that most 10W solid-state PAs at microwave are rather worse than this. What is particularly astonishing is the performance at half power, the plot showing that there is almost certainly 3rd order product cancellation between that developed in the driver and in the PA stage itself. There is a moderately good attenuation of higher order products.

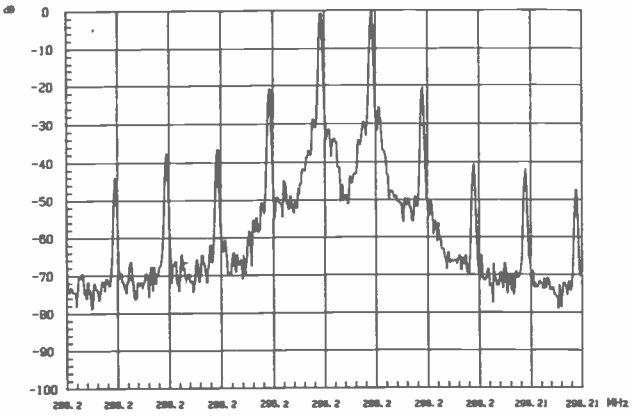
We could not take our normal AF/RF plot because of general test equipment stability, so we plotted a conventional single carrier at 1kHz/10W output, and the plot shows both the carrier breakthrough and the alternate sideband rejections, these being −54dB and −67dB respectively. Note that both second and third audio harmonics are at extremely low levels on the RF output, and this correlates with the very low levels of audio intermodulation products evidenced in the two-tone plots.

We checked the FM deviation setting and typical speech averaged around 5kHz when driven into clipping, with an absolute provoked deviation at 5.9kHz. The FM clipper came in at 3.6kHz, at which transmitted distortion was a mere 3%, 3kHz deviation being only 1.7%, which is very good indeed. On checking the FM transmitted response, we noted that it was quite well set at 750μS pre-emphasis down to around 300Hz, and below this there was a fairly steep LF roll-off, which is about right.

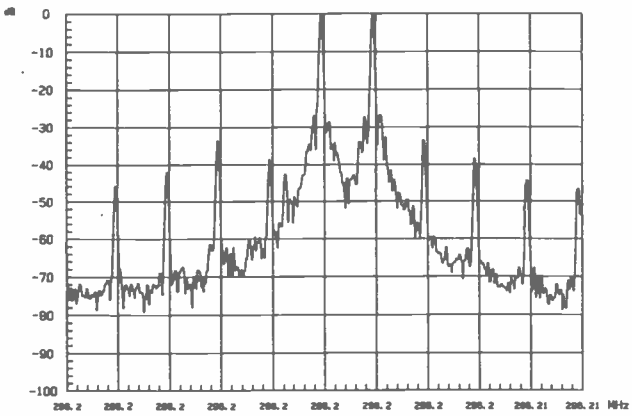
The pre-emphasised response was about 3dB down at 3kHz, and 13dB down at 5kHz. In the context of repeater



Icom IC1271 1kHz USB 10W Resolution bandwidth 30Hz



Icom IC1271 full SSB two-tone test Resolution bandwidth 30Hz



Icom IC1271 half power SSB two-tone test Resolution bandwidth 30Hz

operation and very basic communication, this is a reasonable enough curve, but I personally would have preferred it to have been more extended at HF for a higher quality system.

We manually plotted the SSB transmitted response and there was a very clear sign here of severe LF tailoring, as 500Hz (well within the IF filter passband) was already −6dB ref 1kHz. The IF filter was not really biting hard until around 300Hz, and I do wish that Icom could appreciate that European voices do require a little bit more middle frequency throughput, so as to better resolve the vowel sounds.

Response was attenuated significantly before the IF filter started acting above 2kHz, so that 2.5kHz was −6dB. As 2kHz was already −3dB, there seemed to have been an excellent correlation of our measurement with some comments from 23cm operators that my voice sounded much thinner, more nasal and narrower than it has ever done before on the band!

Commendation

I have to commend Icom very highly, though, for the superb IF filter, since by 3kHz the response was −41dB, by 3.5kHz −66dB, and 4kHz was actually −80dB, showing a remarkable shape factor.

The transmitted signal-to-noise ratios were quite adequate, and we noted at least 40dB on FM ref 3kHz deviation. On delivery, the repeater shift had been set at 35MHz, but on resetting this to 6MHz we noted that the new setting was retained after the rig had been disconnected from its power supply.

Conclusions

Having interconnected the IC1271 with my EME linear, and SSB products masthead pre-amp, I used the set-up instead of my normal one on the 23cm cumulative on 3 December. Conditions were not at all good, but even so I heard and worked a fair amount of DX. The system sensitivity seemed at least as good as usual, but I was troubled with marginally more radar interference than usual when beaming south-west, as I was not using the interdigital filter which I normally have in circuit.

I found that extremely strong stations caused exactly the effect referred to earlier: a blocking combined with twittering sound audible up to ±20kHz from the strong station, three stations causing this effect when I beamed right on them. DX stations came through extremely well, and in particular I was quite surprised to work G6LEU in Truro, who was 5/4, and running only 10W.

The AGC was indeed too fast, but the set-up did sound very lively, and I did not hear any sprogs anywhere. The rig was very easy to tune, and I very much liked having the two VFOs; in the chosen memory I selected the calling channel so that at one push of the memory to VFO button I could retune from the channel.

I noted that if I set a reasonable listening level on a weakish station, the audio amplifier/inbuilt speaker combination did not provide enough acoustic output, and the speaker was clearly rather inefficient acoustically. Consequently, peaks of strong modulation tended to crack, as well as sounding rather thin. Many stations complimented me on the RF quality of the transmission, but preferred the audio quality of my normal set-up. The noise limiter seemed to be of no use whatsoever for removing any of the radar interference, whereas many other limiters are decidedly more effective.

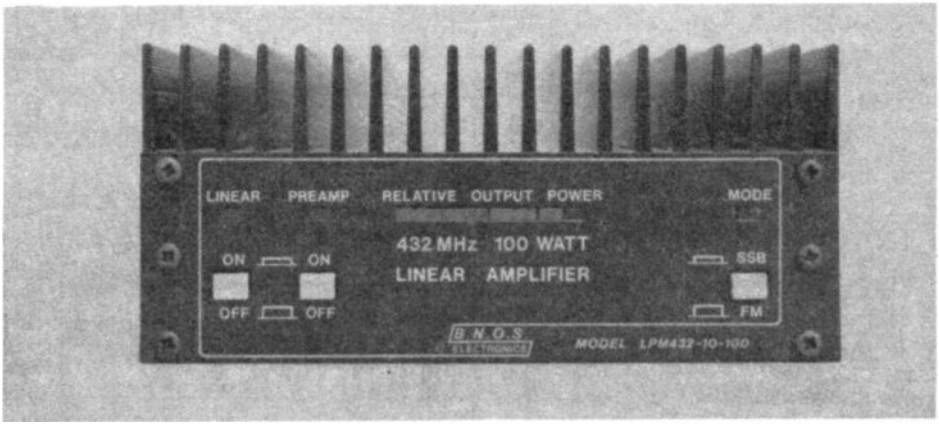
I can strongly recommend the system for contest use and for DX hunting, but for relaxed QSOs I have to be slightly lukewarm because of the poorer audio quality. I feel that Icom should have put a switchable processor in for the high price.

Despite its being costly, I think the rig will sell quite well and may do quite a lot for the band. The second sample, in general use in the contest, did not show up any local oscillator problems at all, and CW always seemed clean, but I did turn it on half an hour before the beginning of the contest.

Congratulations to Icom for introducing a most interesting rig, very many thanks to Thanet and to Phil G6TLI, who purchased the rig, for assisting me with this review.

BNOS LPM432-3-100 and LPM432-1-100

solid-state linears



just 3W input for full output, whilst an almost identical version, having a fixed passive attenuator on the input, requires 10W for full output. BNOS have designed them so that they should be suitable not only for SSB, CW and FM, but also for amateur television. They have taken care to design the circuits for good linearity at

A few months ago I reviewed the BNOS LPM432-1-50 linear and recommended it, although the Rx pre-amp did not seem quite as good as I had hoped. Many readers have been waiting for the 100W models which have been rumoured for some months now. There are several versions, the review sample requiring low and medium levels, and to give quite a reasonable linearity near full output.

The circuit employs a driver transistor type MRF646, taking the power up to 25W, feeding into a phase splitter which drives two PA devices type MRF648 in push-pull with their outputs coupled with a phase combiner to the output relay. This relay is a heavy duty coaxial type, whilst the input and pre-amp bypass relays are lower power devices as used for many other BNOS products.

The main bias supply is controlled by an integrated circuit and has thermal tracking. It allows quite high peaks of bias current to be dumped, and thus provides improved linearity as compared with some competing products. The receive section includes a pre-amplifier which at present employs a Motorola GaAsFET type MRF966. BNOS have found these rather unreliable, however, as both the noise figure and gain parameters have had rather a high spread, so they are likely to be changing to a more reliable type.

The linear is supplied with a row of LEDs on the front panel, which indicate the output power, and we checked these and found that they gave most useful indications. Also on the panel is a red LED to indicate Tx shut down, which occurs if the input is overdriven or if the output load is inappropriate. This red light also comes on momentarily on switch on. There are three push-buttons to switch linear on, Rx pre-amp on and FM/SSB hold times, FM being almost

instantaneous whilst SSB is just over 1 sec. You can also use a 3.5mm jack socket interconnection for external PTT and, as the circuit is sensibly high impedance, the current drawn by the PTT line is extremely low, making it suitable for interconnection with most available rigs.

Also on the back panel are 50 ohm N type sockets for RF interconnections, and tightly twisted, very thick 13V dc power leads, which are quite long (1.7m). The positive line includes an in-line fuse rated at 25A, although we could not get the linear to draw more than 20A in normal service. The case is the normal BNOS type with an enormous heatsink right across the top panel. In general operation we found that heat was dissipated extremely well, and it should provide trouble free service as long as it is adequately ventilated, even in a mobile installation.

Subjective tests

We noted that the review sample had an incredibly high sensitivity for the RF sensing circuit (if anything it was too high), for unless the RF pre-amp was switched on, once the linear had changed over to Tx it tried to stay there even when one went to receive. When the RF pre-amp was switched on this sufficiently drained the sensing circuits to allow a normal fall back. The sensing circuit has now been modified so that between 25 and 50mW is sufficient to pull the rig over to the Tx or through-path mode, which should be more than adequate – even for SSB working.

The linear worked extremely well on Tx and the power LEDs were particularly useful in helping to set appropriate mic gain and drive power levels. We found that only a very slight overload tended to trip the protection circuit, which is quite a good bit of design as it will stop some users from causing severe spreading with overdrive!

I was not completely happy with the performance of the original pre-amp circuit in the first sample; the gain was much too high at around 17dB and the intercept point was none too good. However, this was redesigned so that the gain was reduced considerably; the bandwidth was tightened slightly, and the intercept point was then rather better. However, the through-loss on Rx caused a considerable deterioration of system noise figure, and when the pre-amp was switched in there was virtually no audible difference to the apparent sensitivity of the Trio TW4000A, which is very good on 70cm anyway. It is quite clear that the input RF circuitry, including the relay, input matching and the GaAsFET itself, were not really good enough, and BNOS are determined to put matters right by the time this review is published.

Only a matter of hours before I had to send this copy in to the Editor, BNOS delivered a revamped pre-amp with improved input matching, and this proved to be a lot better than the two previous samples. They have assured me that they will be using the new circuit in production models of all their 70cm linears from now on. The performance of the TW4000A with the BNOS out of circuit showed virtually the same sensitivity as the BNOS placed in series and switched on. There was less through-loss and everything seemed rather happier.

The linear is very well presented, and can be supplied with a mobile mount to the usual BNOS design.

Laboratory tests

The RF pre-amp of the final sample, when switched in, gave a sensitivity into the TW4000A of around −124.7dBm (0.13μV) for 12dB sinad, the rig barefoot with the linear totally out of circuit being approximately −125dBm better than this. When the pre-amp is switched off and the linear is in through-path mode, the system sensitivity became −123.5dBm, which thus shows a noise figure deterioration of 1.5dB, which is slightly too much.

The input RF intercept point measured just adequately at −13dBm, but this could be better in production as BNOS should be changing the type of GaAsFET to a better one. We noted just over 11dB gain at 432MHz on the second sample, marginally more gain at 437MHz and 3dB bandwidth points at 428 and 443MHz; this gain flatness across the band should allow good reception of amateur TV signals. The gain was 10dB down at 414/453MHz and 20dB down by 372/488MHz; an acceptable bandwidth, although I would have liked it slightly tighter. The final sample had around 15dB gain, but there was no time to remeasure the Rx bandwidth.

We very carefully measured the through-loss on Tx, which measured 1.5dB and clearly explains some of the noise figure deterioration when the unit is in-line on Rx (1dB loss on the final sample). I suspect that the pre-amp bypass relays are not well enough matched, but this is all too common with virtually all UHF solid-state linears employing a switchable pre-amp.

There would be a lot of sense in ordering a model without the pre-amp and bypass relays, relying on a masthead unit to obtain an optimum Rx system noise figure. If you wanted to use the system mobile with a fairly deaf rig the pre-amp could be useful, and in its improved state it may in the end be fully satisfactory. However, I would still recommend a masthead unit, such as the muTek type reviewed last month.

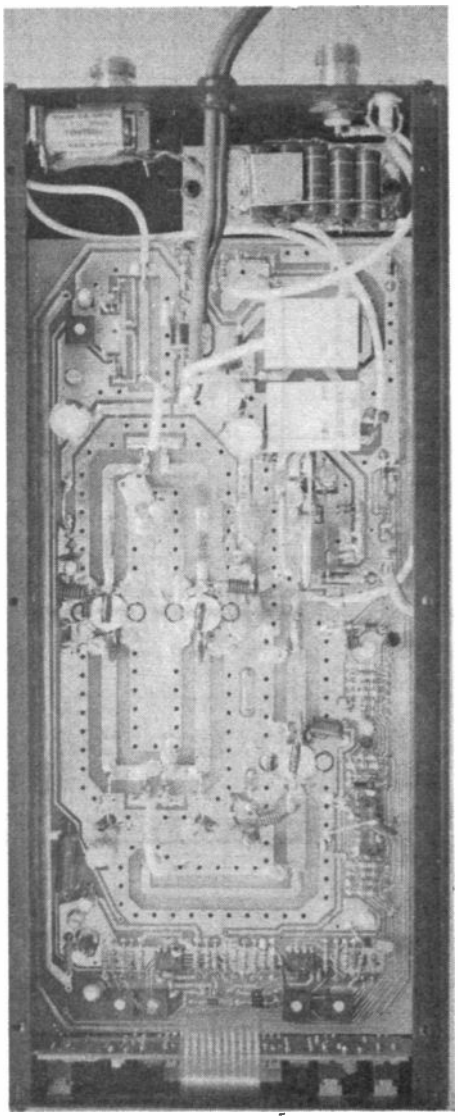
Transmitter tests

For the transmitter tests we used two Marconi 2019 signal generators connected via a hybrid coupling transformer to the input of a Marconi 2177 linear power amplifier. The output from this drove the input of the linear via a Bird 4410 thruline power meter, used to check input drive power and SWR. We noted that the linear gave 100W output for exactly 3W drive, which was rather remarkable in terms of meeting the specification precisely! When we drove at 1W input, we obtained approximately 50W out, thus showing that there was some, but not too much, compression at 100W. Lower drive levels were very linearly amplified.

The input SWR was as good as we have ever seen on an amplifier, for we could not see any significant reverse power, even on the 1W range when driving at 3W, so it must be better than 1.1:1. However, do remember that there will always be a pulse of bad SWR for a few mS after Tx if you are using the RF sensing circuits, which is another reason why you would be better advised to use PTT wherever possible.

We carried out many two-tone tests with carriers spaced at 10kHz, and at 55W PEP output (see *Figure 1*) you can see that the third order products are surprisingly good for a solid-state linear at this frequency. We used the new Marconi 2380 analyser and HP plotter for examining the spectrum, but as the analyser only covers up to 400MHz we used a mixing down technique employing an MCL mixer, with a local oscillator provided from a Marconi 2017 generator.

We took great care to ensure that the RF carriers into the mixer were at quite



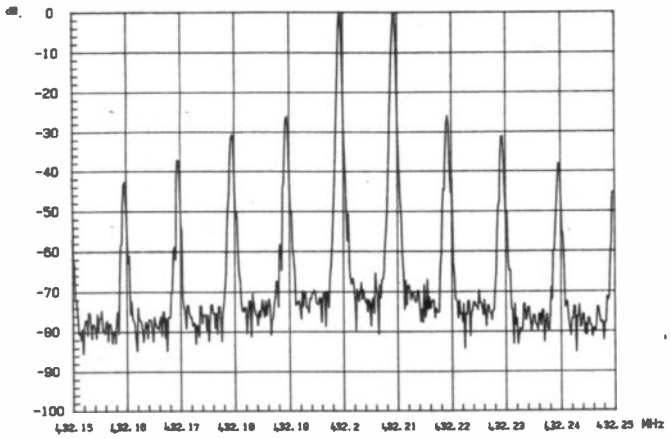
low levels so that the mixer products were always at least 25dB better than those we were measuring. You can see that the 9th order at −42dB is fairly well attenuated, although a valve linear would be much better here.

What is fascinating here is that the low and high intermodulation sidebands are reasonably equal in level, which shows good circuit design and PA push-pull linearity. On looking at some linears from other manufacturers I have often noted with puzzlement upper and lower sidebands of very unequal levels, especially third order, which can be a sign of power losses and phase problems in the circuitry. Lifting the output PEP power up to around 88W (*Figure 2*) causes the third order products to increase to around −21dB, which is quite good, whilst at 110W PEP, (*Figure 3*), just below the onset of protection, the third order degrades to around −18dB, which is just about acceptable. Note that the higher order products do not really significantly degrade with increasing levels.

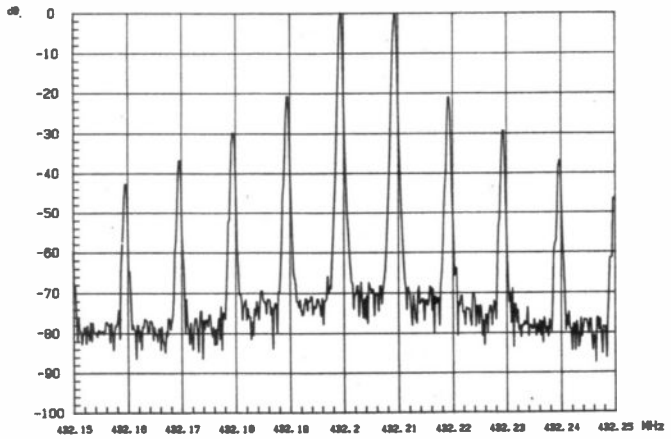
We checked the onset of overload and found that whilst we could just about get away with 110W PEP on two-tone (55W rms), 106W of a single carrier became the onset of protection, showing that you will have to be very careful to avoid overdriving. For ATV, one requires good response linearity as well as a fairly tight gain linearity for different levels.

I had already been satisfied with the gain linearity but we thought it relevant to look at the half power bandwidth. Accordingly, we set up an output carrier power of 34W continuous and then swept the input frequency until output power had reduced by 3dB. The half power points were 424 and 451MHz, and we noticed excellent response linearity from 430 to 440MHz. The power dropped off very rapidly indeed outside the 3dB down points. The maximum dc power taken by the linear was 20A, which shows quite a good efficiency for a 70cm high power product, bearing in mind that the 3W and 10W drive models both include a driver stage.

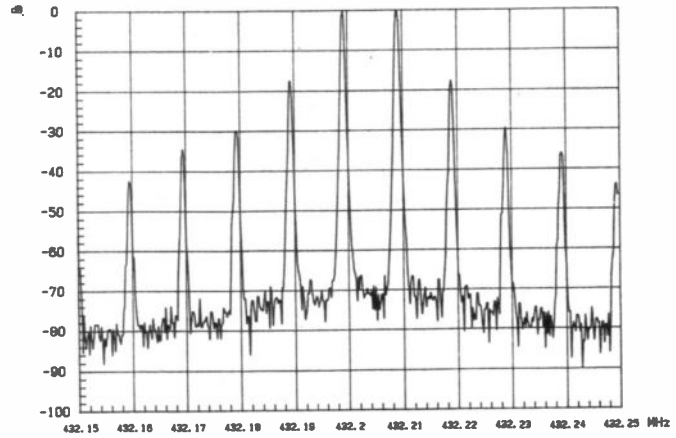
The output power LED indicators came on at 8, 20, 33, 42, 55, 67 and 72W, the overload protection light coming on at 106W. I would have preferred the final 72W light to have come on at nearer 100W, but I would imagine that this is just the value of a resistor being slightly in error.



LPM432-3-100 1W PEP drive 55W PEP output. Resolution bandwidth 300Hz



LPM432-3-100 88W PEP two-tone test. Resolution bandwidth 300Hz



LPM432-3-100 3W PEP drive 110W PEP output. Resolution bandwidth 300Hz

Conclusions

One has to bear in mind the competition for this linear, its most popular alternative being the 100W model made by Microwave Modules, which is by today's standards a very old design. The new BNOS models I feel, are more attractive and offer far better facilities, and it seems that the transmit linearity is appreciably better.

Although I have not tried the linear on ATV, I have no reason to suppose that it should not be excellent for this mode because of its very good linearity and response flatness. If you buy the 3W model, note that 1W input from a rig such as the FT790 will give you 50W output, the same output as given by the 1-50 model, but with improved linearity; this one will probably be more useful as you will be able to obtain full power for a number of rigs market which deliver up to 3W.

The Rx pre-amp was not good enough until the final sample was delivered, and it is to be hoped that BNOS might even further improve it. There are actually six versions of the linear available; models LPM432-3-100 and 10-100 with RF pre-amp and power LEDs costing £335 including VAT, the LPM432-25-100 costing £295 including VAT (this model requiring 25W drive power for full output, and omitting the driver stage), and you can buy the models without RF pre-amp with its associated bypass relay and without the power LEDs for a significantly lower price: the L432-3-100 and 10-100 costing £295 and the L432-25-100 costing just £255 including VAT. The 25W input versions should have even lower distortions, and could be most suitable if you have a 25W main rig.

I would prefer to give a stronger recommendation to the L models which omit the pre-amp and which represent excellent value for money, as I believe they are cheaper than the equivalent, but older, Microwave Modules model. The L models without the Rx pre-amp should have around 0.75dB through-loss, which is quite acceptable on Rx.

BNOS F50 – L/U and F144 – L/U

High power low pass filters

It is becoming ever more important to ensure that the rejection of harmonics on VHF transmitting equipment is sufficiently good that no possible disturbance is created to present, or even future, spectrum users.

Most VHF rigs have excellent harmonic rejection and spurious outputs are kept to a minimum, but unfortunately there are many linears that have quite poor harmonic suppression.

I remember . . .

I remember an example of this when testing a solid-state 100W 70MHz linear which had a second harmonic on 140MHz of only around –25dB.

I was demonstrating this to a visiting radio interference officer some years ago, and he nearly fainted when he saw the analyser! Needless to say, I did not use it in this condition, but insisted that the manufacturer put a proper low-pass filter into the rig, which promptly reduced the maximum power output to 80W!

As a result of an ever increasing demand, BNOS have now designed, and are about to market, low-pass filters for 6m, 2m and 70cm, having a claimed maximum power throughput of around 200W.

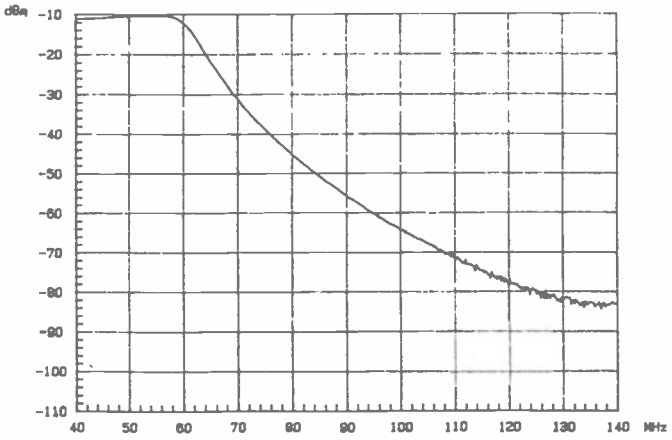
The submitted 6m and 2m models, both of which are in small boxes, are fitted with SO239 sockets at either end. The circuit includes three series inductors, and from either side of each to deck are capacitors, the circuit being computer designed.

The accompanying plots show the bandpass responses, from which it will be seen that there is a through-loss of around 0.4dB, which is quite tolerable. I would be hesitant to put more than 100W FM through them, although more power on SSB should be satisfactory. They are well-constructed and should provide superb harmonic rejection, this being particularly important in the 50MHz model as a clean signal is imperative on this band.

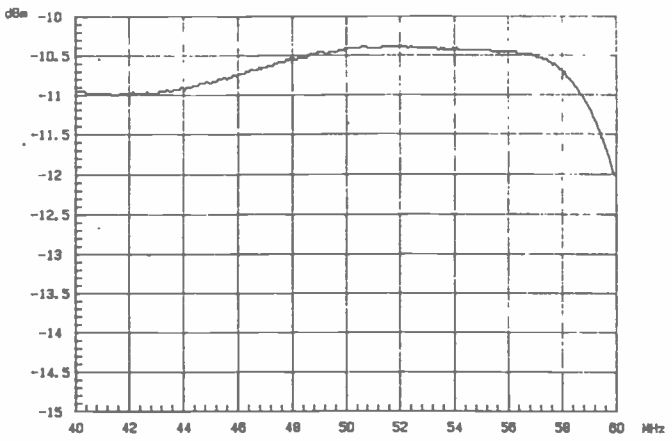
When using filters such as these it is important to ensure that the antenna is a good match, as a mismatch can cause more power dissipation in the filter. The filters are also useful in rejecting strong signals at higher frequencies than the required one on Rx; eg the 50MHz model will give a superb rejection of strong Band II signals from the 50MHz installation, and so local oscillator harmonics and intermodulation products within the receive converter should be greatly reduced if caused by strong signals above 80MHz.

144MHz model

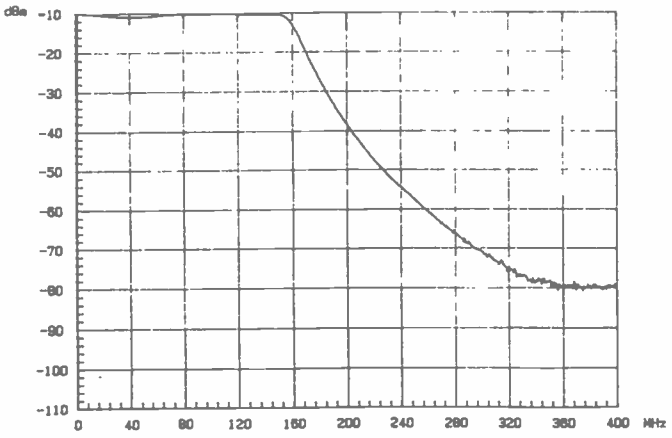
We checked the 144MHz model with a Trio TS711 feeding through a 3dB power pad into a Bird Thruline wattmeter, feeding a 50 ohm dummy load via the filter. The dummy load is an extremely good match to 50 ohms. We set up a forward power level through the filter of 10W, and noted an SWR introduced by the filter of 1.33:1 in one direction, but in



BNOS F50-L/U 50MHz low-pass filter. Resolution bandwidth 10000Hz

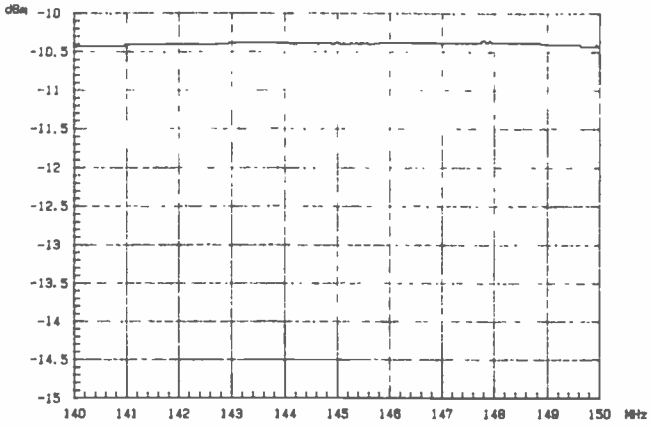


BNOS F50-L/U 50MHz low-pass filter through-loss. Resolution bandwidth 10000Hz



BNOS F144-L/U 144MHz low-pass filter. Resolution bandwidth 30000Hz

G3OSS TESTS



BNOS F144-L/U 144MHz low pass filter through-loss. Resolution bandwidth 3000Hz

the other direction it unfortunately measured 1.5:1, which is not really good enough.

Look into it

BNOS should be looking into this and are likely to be introducing an additional trimmer internally to set for optimum SWR, which will mean that the filter should always be inserted in the labelled direction.

The 50MHz model will be particularly useful for removing second harmonic problems, as these occur on Band II and can cause disturbance to neighbours listening to FM broadcasts.

6M

Angus McKenzie G3OSS discusses his experiences of the band, how to get started and the band's enormous potential

By November 1984, 100 very fortunate amateurs in the UK had been allocated a special licence to use the 6m band for Tx and Rx, with the same power ratings and modes as are already allocated for class A amateurs on the 4m band. Much useful work, however, had already been carried out on the band by UK amateurs who worked duplex by receiving on 6m, usually transmitting on 10m.

In the sunspot maximum years of 1978 to 1980, reaching a peak for us around the end of November 1979, the incredible band potential became very obvious, with DX contacts to the States and Canada, for example, often reaching signal strengths of 30 or 40dB over S9. Forty UK amateurs received the first 6m licences in February 1983, followed by an additional sixty in November 1984. Some very exciting contacts have been made, both duplex and simplex, by this relatively small group, and in recent months they have greatly contributed to propagation research. The band from 50.0-50.5MHz will become available to Class A operators from 0001hrs on 1 February 1986.

Equipment

Various antennas are already available for the band, the most popular one being the 5-element tonna. Larger antennas are available from several importers but are appreciably more expensive. J-beam also make a 50MHz antenna. Many amateurs have made their own, or have modified old Band I antennas.

For my early duplex QSOs at sunspot maximum I received the band on a 13-element log antenna at 55ft, having a gain of only 3dB or so over a dipole. I had been using this antenna for Tx since November and when I first erected the tonna at 40ft, immediately obtained a gain of around 4dB, despite the height loss. More recently, I put the tonna at 55ft and gained a further 6dB, the installation working out extremely well and proving the advisability of putting the antenna as high up as possible.

Transceivers for the band include the Icom IC551, the Trio TS660, 670 and 9300, and the Yaesu FT680 and 726. Transverters have also been available, including the muTek series and the Yaesu FTV107R types.

Many of these rigs have been reviewed by myself in *Amateur Radio*. I suggest that the best way to get on the band is with the muTek transverter, but I also especially recommend the Trio TS670, reviewed in the November 1985 issue of *Amateur Radio*.

Linears for the band include the Lunar (125W PEP) and one recently issued by BNOS (100W PEP), both requiring 10W PEP input.

50MHz propagation

Propagation seems to be mid-way between 10m and 4m. When there is some sunspot activity, F layer propagation comes in during the middle of the day when the UF is at its highest. Sporadic-E and other fascinating forms of propagation also appear. Sporadic-E reaches its maximum around July at, or near, sunspot minimum, and ample evidence of this was given by the extraordinary happenings last summer.

During June 1985 US amateurs reported hearing the RSGB headquarter's beacon, GB3NHQ, and a week or so later several UK amateurs, including myself, worked the States at around midnight.

A month later, at the end of July, I received a phone call from G3COJ at 22.00GMT warning me of an intense sporadic-E opening to the States on 10m; he suggested that 6m might open up. In betweeen 22.38 and 23.37GMT I worked, on SSB, sixteen East Coast US amateurs at up to S9+. Many others also had a field day on the band.

I sent all my log results and details of the propagation to my friend Dick Grubb W0GM, who is an expert on propagation, and it seems certain that all these contacts were double or triple hop sporadic-E.

Meteor scatter

The 50MHz band is also an excellent one for meteor scatter and auroral propagation, the ionisation often being far more intense than on higher frequencies. You will often hear meteor pings on DX stations and beacons, and I can remember working GM3WOJ in November 1984 when I was only using 10W CW into the log antenna!

Band conditions for contacts over 100km or so vary greatly from night to night, in very much the same way as on 4m. The original 100 licensees have only been allowed to transmit from 22.30 to 07.30GMT, and one might say that some have preferred the night shift whilst others are morning people!

The am shift are in the majority, and most of them have had QSOs with Norway, Spain and Portugal. Every now and then other countries pop up via sporadic-E or even long tropoducts.

The fun for me on 6m started in 1978 when I installed a simple Rx set-up. I will never, ever forget a QSO in November 1979 with VE1ASJ, in which the received 50MHz signals were so strong (I was on 28.88MHz) that I asked him to reduce power. VE1ASJ cut power down to 1W, then 100mW and finally only 10mW measured output to his antenna, and he was still readability 5 at the lowest power level.

I recorded the QSO and it is one of my most valued cassettes. I believe the contact to have been the lowest power SSB contact across the pond, and it just shows the band's capability at its best! Local QSOs are typically of up to 300km without too much difficulty, but contacts beyond 400km are often as possible as they would be on 4m.

Lower band noise

The band noise is somewhat lower than that on 10m and just a little higher than on 4m, but there is one unfortunate snag. Thermostats and other forms of electrical interference seem to peak up on the band, which is another reason for having your antenna as high up as possible and well matched to the co-ax. At night-time the band noise can be surprisingly low, and a sensitive front-end can be very useful, but during the day noise increases somewhat, especially when tropoducting is present, or even more if there is any F-layer propagation. When sporadic-E is present noise also increases and so band noise can often be a good indication of interesting band conditions.

At the moment virtually all stations are using horizonal polarisation, as mobile operation is not allowed.

Only CW and SSB modes have been in common use up to now, but in the proposed RSGB band plan two FM channels have been suggested for 50.45 and 50.475MHz. CW is recommended below 50.1MHz and SSB immediately above this frequency. There are three useful beacons: GB3SIX on 50.020, GB3NHQ on 50.050 and GB3RMK on 50.060MHz. Look out for many other beacons in Gibraltar, Cyprus, South America and South Africa, all of which pop up every now and then.

I have enjoyed every moment of my time on the band, as have all the existing 6m operators, and I very strongly recommend the band. It has proved to be an extremely fascinating one, which seems to have so many of the best and most interesting aspects of both the 10m and VHF bands. Perhaps during 1986 there will be thousands of operators using the 500kHz wide segment, but it is to be hoped that we will be granted, eventually at least, a 2MHz wide band.

Take care

Finally, I should mention two important precautions, the first requiring you to watch the level of your second harmonic in Band II, and the second being to be very careful if you use a 96MHz local oscillator, as this frequency could break through 'backwards' into your antenna and interfere with a Band II station, eg Capital Radio 95.8MHz.

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EXPEDITION TO THE ARC

Kevin Fox G4MDQ fearlessly goes where all amateurs have been before ... by the most complicated route!

Amateur radio clubs are an essential part of the amateur radio scene, but what goes on there? What are all those grim faced men sitting in rows at the local community centre week after week really up to? Your intrepid and fearless club reporter has spent a year undercover visiting various clubs and societies. Here is what I discovered. The names have been changed to protect the innocent!

The first problem I encountered was *where are the clubs?* Amateur radio clubs tend to be very selective. Naturally, if they were easy to find, then any Tom, Dick or Harriet would be turning up, so your truth sleuth approached the problem scientifically. I toured likely looking areas such as open waste land, old quarries and the Yorkshire Moors. After several weeks of this I began to compile a list of possible places. Finally I found what I had been looking for: a clue!

I had disguised myself as a potential club man. I grew a beard, let my hair grow long and stopped brushing my teeth. It was about this time that the family cat stopped jumping onto my knee to have her ears tickled. Yet still I wasn't quite happy with my appearance – I was a bit short in the dandruff department and I was still having trouble perfecting the technique of bellowing at people I was speaking to. A quick squirt of talcum powder over the head cured the dandruff problem, and wearing headphones for a week soon perfected my bellowing technique.

Subtle changes

I made subtle changes to the family saloon car; a dent here, a scratch there. I removed the front bumper, put out one of the headlamps and then smothered the car in strawberry jam and vacuum cleaner dust. That dealt with the exterior, but I was still left with the internal problem: the car looked far too smart to belong to a dedicated radio ham. I solved this by sub-letting the car out, bed and breakfast, to the local firm of dossers for a week. As a final touch, I attached about thirty different aerials to the car, naturally not connected to anything. I was then ready for phase two of my ingenious master plan.

I was on my way to a school I had previously marked down as a potential club meeting place. I approached in typical club member fashion: through the gates at sixty, into the car park, slam the brakes on full, and scream to a stop, the space where the front bumper should have been missing a brick wall by just two thousandths of an inch. Revving the engine flat out a couple of dozen times, I switched off, got out of the car, carefully slamming the door as hard as I could, and then began to slouch around the building looking for the way in.

I soon encountered an old fellow complete with regulation scarf and flat cap. He sniffed me, looked me straight in the eye, then took a smart step backwards. His nose turned up, as his mouth turned down.

He spoke. 'Yoo wanna them there wireless blokes as cums 'ere of an evening?'

'YES!', I bellowed at him. He took two more steps backwards because the strength of my bellow had lifted his flat cap a good two inches.

Composing himself, he continued, 'Well lad, tha's a bit early y'nno, it don' meet 'ere 'til nex' Wednesday neet.'

'THANKS!', I bellowed again, but this time he was ready for me; he kept one hand clamped down firmly on his flat cap. I felt a warm glow of satisfaction at the effectiveness of my disguise and the fact that I had located a club!

Wednesday evening. I began to prepare myself for this first club visit. Not knowing exactly what to expect, I decided to cover all my options. I fastened my two metre handheld in my top left-hand breast pocket and seventy centimetre handheld in my top right and slung my twenty-three hundred nonchalantly over my left shoulder. I hung my headphone, complete with attached boom mic, around my neck like a doctor's stethoscope. Finally, I pinned on my masterpiece: a callsign badge which, when activated by a voice command (wot's your call, pal?) would cheerfully send out my callsign in CW then RTTY and finally in synthesised voice, whilst flashing my callsign in three inch high letters using multi-coloured LEDs. Very natty, and a real conversation piece.

A quick squirt of talcum powder over the head, and voila! I was ready. Just as I was leaving the bathroom my wife entered. She screamed, then told me that I had exactly one minute to leave her house before she called her husband to throw me out. I left. Walking out to the car, I could see a policeman peering intently at my vehicle. As I approached, he rocked back on his heels. 'This your car, sir?' Isn't it funny how all policemen manage to make the *sir* bit sound like an accusation?

Anyway, I accepted responsibility for the car and when the policeman had finished laughing he told me that leaving scrap on the Queen's highway was an offence and would I remove the aforementioned pile of scrap to the home for ex-cars! The cheek of him.

I stopped the car a few streets away from the club; I thought it would be bad form to drive straight up to the club. Grabbing the mic, I decided it might be a good idea to ask for talk-in to the club, CQ, CQ, CQ etc.

An hour later, a Dutch Amateur took pity on me, and started to give me talk-in directions based on a 1922 Michelin road map. 'Pliss vat iss theese em wun motorvay?' I thanked him for his help, agreed that the very next time I passed his bungalow I would pop in for a coffee, then drove on to the club. This time I was more sedate as I entered the car park, hardly a squeal from the brakes and I only slammed the door shut once!

Something amiss

As I got out of the car something struck me as not being quite right. The car park was very full of very new and shiny Volvos, Porsches and Jaguars. Thinking back, this should have been all the warning I would normally have needed, but I never realised at the time.

Entering the building, strange thing number two. Every one in the room was wearing a three piece suit, collar and tie. It looked like a convention for tailor's dummies. Now, when you look like I do, (and act as I do) you do tend to get used to people staring at you with their mouths hanging open. But even I felt uncomfortable when all conversation in the room died away as I walked through the door. It was really uncanny the way they synchronised their eyebrows to shoot up into their foreheads, all at the same time.

There was a chap standing on a small wooden stage at the front of the small hall in which I had made my grand entrance. He was giving a clear and lucid account of propagation and MUF. I really began to panic, what the hell was going on? People actually talking about

EXPEDITION TO THE ARC

amateur radio in an amateur radio club? Absolutely unheard of.

A cold and chilling thought began to dribble down the back of my neck. I noticed that a few of these Hooray Henries were wearing callsign badges pinned to their breast pockets. I remember scratching my head in perplexity at the latest antics of the Department of Trade and Industry (or Dirty Trix Inc to you and me). I remembered vague rumours of GIs and even wierder rumours of GOs, but to the best of my knowledge I couldn't recall any mentions of 'Superstud'or 'Dolphin Boy' and I can state categorically that 'Zippy' and 'Brain Damaged' are not bona fide amateur calls.

The realisation hit me like a baseball bat on the back of the neck. 'AARGHH! It's a CB club!' I remember shouting out. All the old hoary tales of amateurs being dismantled by irate CB persons flitted through my panic frozen brain.

Hiding the evidence

Breathing deeply, I surreptitiously began to remove the many rigs which adorned my fragile and easily damaged body. I pushed my two metre and seventy centimetre rigs down the waistband of my trousers. I unclipped my last-word-in-one-upmanship callsign badge and I slipped it into my left shoe. Finally, at a loss as to what to do with the twenty-three hundred, I sat on it.

Desperately I tried to think of some way to escape, when some clown began to tune up on two metres. The squelch broke on the twenty-three hundred, the six foot thirteen inch CB person on my immediate right gave me a disgusted look. 'Pardon me', I said, throwing him a red herring.

The situation was rapidly reaching critical mass. They were all staring at me. 'Er, er 'xcuse me, is this the basket making class?', I pleaded. They did the stunt with the eyebrows again. Just as I was about to bolt for the door, all my rigs suddenly burst into life.

The local seventy centimetre repeater chimed in just as the two metre handheld burst into life with, 'Er, that G4 station wanting talk-in to the local CB club: I wouldn't go there pal, they might make you president, har, har, har!'

Humiliation

They were all staring at the source of this radio activity: my trousers. As a final humiliation my callsign badge erupted from its hiding place in my left shoe, sending out a continuous stream of CW synthesised voice and RTTY. The CB clubbers flipped their gaze from my left shoe to the crotch of my trousers, their mouths making delightful 'ohs' as I stuffed my head into my underpants yelling, *'SHURRUP! SHURRUP!'*, into various microphones. Their hysterical laughter stayed with me all the way home in the car.

A few weeks later, having got over my CB experience, I decided to continue my quest for an amateur radio club. After gaining definite information from a friend, I began to prepare myself for this first visit. The beard and the dandruff were all gone, the family saloon car was once more the family saloon car and the cat, wife and kids were all talking to me again (although I still catch the cat staring at me and silently shaking her head). This time I decided to leave all my options open. I left the rigs at home and fastened that vacant 'this-isn't-really-happening – it's-all-a-dream' expression on my face.

Plumber's dream

Pulling into the car park I could see that it was full of old Morris 1000's and Beatles, all smothered with various bits of aerial plumbing. I was staring at one particularly fine example of the aerial plumbing art when the owner asked me what the matter was. I replied, 'Oh nothing, I was just admiring your aerials.'

He looked baffled, then replied, 'Oh, the antennas, yes, OK aren't they?'

'Oh you're American?' I enquired. He scowled and walked off in a huff.

At the door of the club I hit a snag. A young spotty faced youth blocked my way. 'Yoo a member?' he demanded.

'Thank you, well that was jolly quick', I riposted.

'Er, no, er that is, er I mean, are you a member?' Having released these gems from his 100 word vocabulary, spotty face placed his arm across the door jamb, effectively blocking my entrance and exceeding my spotty faced youth toleration index by many points.

I sighed. 'The hair on the donkey's foot will never know the pain and suffering of human anguish', I recited. Spotty face backed away from the door, casting nervous glances around.

'Er, what?' he asked, nervously.

'Well?' I demanded, 'You're supposed to give me the response, then I roll up my left trouser leg, put on the pinny and the blindfold, then you beat me with a two year old copy of *RadCom'*.

Poor spotty face, he was nearly out of his mind. Like a vulture settling onto a corpse, determination settled into spotty face. 'Look pal, this is an amateur radio club. The psychiatrist's surgery is down the next road.' Round two to spotty face.

'Yes I know all that. I come as a visitor to your club. Take me to your leader,' I said whilst grinning like the lunatic spotty face was now certain I was. Spotty face agreed to let me in, but at a price. He demanded fifty pee.

Mission accomplished

At last I was in an amateur radio club! I savoured the atmosphere, listened to the buzz of conversation, choked on the clouds of tobacco fog and selected a seat at the back of the room.

As soon as I spotted my first visitor my hackles began to rise. He had the sort of face you would never get tired of thumping. Sensing impending trouble, I began to fire up all my mental cylinders. V1 (visitor number 1) stopped in front of me and folded his arms across his chest. Rocking back on his heels he began to spout. 'Are you aware that this is an amateur radio club?' V1 demanded. I gave him my idiot grin (it wasn't difficult). His voice had this most peculiar habit of starting off at the top of a scale, then

working its way down the scale to finish on a note of doom. 'Do you have a licence?' V1 further demanded. I told him that, no, I didn't.

His face lit up with that 'I-knew-you-didn't' look. He stopped rocking back and forth on his heels and adopted a more threatening posture. 'I suppose you are a CBer?' I nodded enthusiastically. V1 changed colour from lobster pink, to annoyed red.

He continued: 'I hope that you are a legal CBer with a proper licence and not running AM or sideband?' I asked him how it was possible to run sideband without AM, which seemed to disturb him a bit. 'Well!' V1 exclaimed. I decided that one more turn should just about set him off. His chin was out-thrust, petulantly awaiting my reply. 'Well', I said, 'when the skip is running and the old FM won't reach . . .'

Cabaret and fireworks

I had always wondered what colour puce was, and found out that it is the colour which people turn when they are just about to explode. Poor V1 was hopping from leg to leg in rage. He was having tremendous trouble forming his words. All he could manage was, 'Well . . . you . . . of all the . . . well!' I was just beginning to enjoy the cabaret when my callsign badge chimed out my callsign from its hiding place in my pocket. V1 realised that he had been had and stomped off in high dudgeon. There was a polite ripple of applause from behind me. I took a bow.

I became bored with sitting so I decided to explore the club for a while. 'Cor! Crumpet!' I muttered to myself. I had spotted an appealing mop of blonde hair sitting two rows in front of me. I nonchalantly strolled over to the blonde mop.

'Hello darlin', are you licensed?' I asked in my best introduction-to-strangers voice. The blonde mop whizzed around. Panic! I noticed that the blonde mop also sported another blonde mop, but this was on his top lip. 'Only to kill', he said.

So far it hadn't been the most memorable of evenings. I felt much cheered in the knowledge that Harry's tomatoes were coming on fine, Charlie's missus would be out of hospital on Friday and Arthur's kids were doing very well at their new school. Doesn't anyone talk radio?

Painful rendition

I toddled over to the beard and dandruff corner. As I approached my heart started to pound. I reset the shutter on my photographic er, er, oh yes, memory. Goose pimples erupted on the back of my neck. Could I believe my ears? Chap with the longest beard and most dandruff had just told his acolytes: '. . . and there I was. 8 inch floppy caught in the drive and not a leg to stand on!' Well, he wouldn't have would he?

A youngish (well my age) chap who had been watching took pity on me. He came over. 'They are the computer freaks,' he explained. 'Don't know why they bother coming, they only ever talk about computers.' I began to talk to my new found friend. We discovered that we had quite a bit in common – we both shared an awe of people and life, and a love for the code. My friend explained that he usually did the slow Morse for the CW class and that it was due to start shortly. He invited me to do some sending.

Immediately the offer was given and accepted, I felt the cold wind of imminent disaster blow across my neck. It was with much trepidation that I wrapped my sending hand around the sticky taped hacksaw blade which sufficed for a paddle on the electronic keyer.

Turning on the keyer, I gave it an experimental bat from side to side. Some joker had set the speed at forty million words per minute. Nothing untoward happened, so turning to the dozen people sat at the table, I said, 'Right chaps, if you are ready I'll send you some plain English at about twelve words per minute . . . OK?' Nods all 'round.

Settling back in the chair, confident in my ability to send the best Morse these students had ever heard, I gave the Heath Robinson hacksaw blade paddle of the keyer an almighty swipe to get it moving. There was a very loud and very prolonged 'boyyying' sound. The hacksaw blade paddle left the keyer at 200 miles per hour, flew over my left shoulder and embedded itself into the back of the neck of the spotty faced youth from the front door soap opera. 'Well,' I said to the Morse class, 'that concludes this evening's session, same time next week chaps?'

A hero in their eyes

A dozen pairs of eyes stared at me with open admiration and hero worship. My new found friend pumped my hand. He said, 'I'm going to stick close to you pal, strange and wonderful things happen when you are around. I don't think things are ever going to be the same here again. You really must become a member.' I was flattered at my friend's words, but I had a sneaking suspicion that becoming a member of that club might not be all that easy.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Welcome, listeners, to another month... and what a month it has been. With claims for the Prefix Awards pouring in and the GB2WFF awards being finalised, I have been kept busy at this infernal machine almost constantly.

Airwise, it's been another peculiar month with good conditions hard to find to say the least, but the listeners who have had a bit of time to spare have managed to hunt down some tasty morsels.

Suffering 'glitch'

I've had a bit of a 'glitch' with the promised RTTY program so will be reviewing it next month, but I do have a very nice CW program for you this month.

OK, so to the mailbag, with the first letter from Don Pye in London who had time off (for good behaviour?) from wielding the paintbrush and putting up wallpaper to hear some nice stuff, including 9M2CW (West Malaysia), YB0AQI (Indonesia), ZD7CW (St Helena), EL2CO (Liberia), and A35RB (Tonga). He also heard BY100 but noted that nobody seemed interested in him!

Charlton Cole, of Pontnewydd, wrote to say that he had had correspondence in reply to his cry for help with the RAE (thanks due to Fred Bull), but he is still finding things a bit of a struggle. As he said, it's like trying to teach a collier to bake bread! I think that anyone going for the RAE at 72 years of age must be as keen as mustard.

J H Dean from Ringwood is a new one to the fold. Using a Trio R2000, he comments on the rotten conditions but hopes to be hunting the prefixes with his nice new rig. His older R820 served him well with catches such as CO8, 9Y5, EL2, ZS6, VP9, PJ2, HC8 and various others, so he's not doing so badly. Welcome to the gang!

Basil Woodcock, one of our first Gold Award winners, is a glutton for punishment. Having achieved the thousand he found things a bit passive, so swiftly began searching for new targets and quickly became the first SWL to receive the Canadian National Parks Award. Well done Basil! If you want another challenge... read on!

Next in the frame is Bill Ousack from Letchworth. Bill has been listening seriously since 1984 when he bought a Trio R600 and strung up a 66ft Marconi antenna. He then proceeded to search the bands for prefixes, encouraged, no doubt, by his mate Gary Hendricks who, says Bill, has put him to shame by passing the RAE!

Mike Hudson in Canterbury, not satisfied with getting the Gold Award, has now claimed the Royal Jordanian Award! He makes the observation that perhaps the 250 prefixes are a bit easy to get for the Bronze award and suggests raising the target.

Although I know what you mean, Mike, I believe the relatively low score is an encouragement to listeners to have a try at awards when they haven't previously. As you say, getting the higher scores becomes a bit of a strain as you reach the premier award standards, but once you've started it's a challenge to finish.

A tougher challenge

Having said that, I have pleasure in announcing that I am offering a further and even tougher challenge to those who really enjoy one.

With immediate effect, I am offering a really super trophy to *anyone* submitting a verified claim for an all-time list of 2000 prefixes! Knowing you lot out there, this is going to prove expensive from my end, but what the hell!

The contest is for listeners only and the claims *must* include full callsigns, frequency and date and must be verified by a licensed amateur or another listener. The trophy will be fully engraved with the details so let's see who our top listeners are (class 'B' licensees may enter as HF listeners).

Judging by your letters, more and more of you are using computers to great effect for translating Morse, RTTY, Amtor and even satellite transmissions. It's funny how the computer has become an almost essential part of the average shack. With the initial popular phase in computers having run its course, plenty of secondhand ones are coming onto the market. Even new ones are being slashed in price, putting excellent pieces of high technology into even a modest listener's range of expenditure. Software is becoming increasingly more sophisticated and previously unheard of facilities are to be found in programs.

Every refinement

Some time ago I reviewed a simple program for use with the Spectrum which translated Morse very effectively without the use of an interface. I have recently been able to try out a new program which has just about every refinement one could want, yet still needs no interface (although I did use my own homebrew unit). Produced by G1FTU (the same chap who does the RTTY program reviewed previously), this program is for receive and transmit and has excellent facilities.

On loading, you are presented with the menu. This offers the usual transmit, receive and receive only options, memory facilities, QSO review, sensitivity adjustment, and a facility to alter the border colours and switch off the sound. In the transceive mode, there is split screen display and 'type ahead', and at the bottom of the screen a strip display gives the QSO number, transmit speed and pause rate. In the receive mode it gives the tracking rate and receive speed. Transmit mode offers adjustable tone (400-1500Hz) and adjustable speed (1-99wpm). There is also automatic speed facility which tracks the incoming speed and transmits at the same speed. The built-in QSO counter is a three-digit display that can be incremented, cleared or transmitted as part of a QSO, or even called from a pre-prepared memory response.

The special Morse characters are dealt with in a novel way. A strip of legends of the characters is printed in the excellent instruction leaflet and can be copied or cut out, and is placed at the top of the computer showing the corresponding keys. For instance, pressing the KN key sends the complete message 'de (callsign) AR KN'. This saves a lot of time and keying.

The memory bank consists of nine memories each holding 255 characters plus a special memory which enables you to pre-prepare standard messages that automatically modify themselves according to the present callsign, signal report or whatever you decide to use the special memory for.

For receiving, this program comes into its own and is the best I've seen. It has a built-in tunable bandpass filter for rejection of unwanted signals present in the receive audio, automatic tracking of the received Morse speed with a switchable tracking rate and lock facilities to deal with wander due to sudden 'spikes'.

There is a large buffer that can be recalled for viewing or printing hard copy, which is very useful to the keen listener as a copy of the QSO can be sent with the QSL card. The 'special' characters are dealt with (AR,K,KN,BK etc) and are displayed as linked letters.

Designer display

On the display scrolls you can set up your own favourite screen colours, which are memorised when you save the memory bank to tape. The print facility is superb, and in QSO review mode the receive buffer can be viewed a page at a time or as a scrolling review, and relevant pages dumped to the printer.

There are other facilities available on this program that are too involved to go into in this review, but having played

with it for a month I can say with all honesty that it is superb and a delight to use.

My thanks to John Pearson G1FTU for the chance to try the program. Details are available from 62 Chesterfield Road, Barlborough, Derbys S43 4TT.

From Morse to RTTY

From the world of Morse to the RTTY scene, and I have received an award claim for 250 prefixes logged using RTTY only! This really is a superb effort which has been suitably rewarded with an engraved trophy.

Presenting me with a computer derived list (Apple 11E), John Taylor of Teignmouth certainly scanned the bands and included 5B4, 5N8, A4X, C31, CT4, FY7, PY1, SV4, VE7 and ZS6 just to prove that there's plenty of DX to be had – even on this mode!

Leslie Goddard was fast in getting his Bronze claim to me from Whetstone. Les has the Trio R2000 and is enjoying his new hobby, regarding the awards as a challenge when DX is thin on the ground. His claim included ZS3, HJ6, YT2, PZ1, AP2, 4N3 and a nice mixed bag for a total of 306 prefixes.

Philip Begley gets in on the act again with his Silver claim, featuring A22, C31, J88, PZ1, SW2, VQ9, VK8zb/P/VP9, 3B8, 5N9 and 6W1 in a very comprehensive list. His major band was twenty with a good sprinkling of eighty.

Mike Hudson BRS87259 made it this month to the Gold award! With a very interesting list, including 3A2, 5B4, 5J5, 5Z4, 6W2, 8R5, 9Y4, A71, J87, ZC4, HC5, J87, PT7br/P/PY6, and a good selection for the 1000. Despite his comments regarding the low starting scores required for the awards, Mike found the whole thing an exciting challenge and I wouldn't be surprised to see him in the leader board for the new award.

John Simpson of Macclesfield, is the proud owner of the Gold award, submitting well over the requirement. John comments that it's been an 'interesting year', but doesn't amplify the statement save to say that the XYL may not be as enthusiastic as he has obviously been. Been leaving the washing up again, John?

John Hart from Fordingbridge, Hants, gets his first claim in for Bronze with AA2, A4X, SW2, VP9, YV6, 7S2, and 8P6 among a very mixed bag. John G4POF runs the Yaesu FT102 with a choice of antennas, including an HF5 vertical and a G5RV. Having caught the bug, I'm sure John will soon be after the plaque.

Charles Morgan, of Addiscombe, waded in with a super claim for Silver adding to his previous score with A71, AD8, J37, J88, VP9, XT2, 3A2, 4N8, 6W1 and sundry others for a 500 plus score.

Finally, Bill Cusack of Letchworth submits his first claim for Bronze with a list including AA6, AL7, J28, NC5cjy/P/5N1, S79, VK8DN/MM (SS Sea Shepherd), VP8 (Falklands), XJ3, YB0 and a good mixed bundle for the rest.

Featured listener

Our featured listener this month is Don Pye of Edgware. Don's interest in radio was kindled by visiting an old friend, Bob Hatter K7RDH, who introduced him to his shack and injected him with the bug.

An injury sustained on duty as a member of the fire service required much surgery and left Don with a stiff wrist and early retirement, only for him to be re-employed running the brigade's video unit.

As a retirement gift, Don was presented with a Trio R600 and with the addition of the AT1000 and Datong PL3 filter this has replaced the previously well-used SME direct conversion receiver.

Antennas are a problem locally as the authorities frown on them, but a discreet inverted V has served well and it is hoped to improve this later if the council has a change of heart.

Don is also into the computer side of the hobby with a Commodore Plus 4 (for which he is in desperate need of relevant programs – can anyone help?) and a C16 from the same stable.

The shack is situated in a corner of the living room, but with vacation of the spare bedroom imminent, great things are in the planning stage.

Don is also a member of the Master Photographers Association, International Fire Photographers Association and the International Television Association, so he certainly needs the space!

He is currently threatening me with a pass in the RAE and claims for 'worked' prefixes. Good luck to you mate!

Now I come to a very pleasant piece of news. As you may know, during the JOTA I conducted a contest for listeners to hear as many Scout stations as possible. I was hoping to extend this to licensed amateurs but this scheme was frowned upon by the JOTA committee so it didn't get off the ground.

However, I had a fine response from the listening fraternity and have pleasure in announcing the results below.

I must say thank you to all those who took part and also to those who couldn't make it but sent a donation anyway! Entries came from all over the UK and from Malta, Belgium and Malawi.

The first five places went to: Steve Reed G0AEV (350 pts); Tony Blackburn RS87156 (268 pts); Sue Squibb RS47568 (235 pts); Eddie Gauci 9H1/15357 (184 pts) and Stan ORS45992/7Q001 (152 pts). Engraved plaques have been sent to these stations.

Runners up were; Peter Oliver, Clifford Tooke, T P Edwards, John Kempston, Egbert Hersten, Peter Cardwell, P R Darley Dawson, Norman Henbury, Fred G0ALS, Eric Franks, Les Goddard, Don Pye, George Wall, T P Garvery, Michael Heels, Luciano Marquardt, Edward Baker, Derek Simms, Ron Clarke and Andy Banthorpe. These stations have been awarded the White Fang Fellowship Certificate.

I am pleased to inform you that the sum of £52.17 has been donated to the Ethiopia appeal on behalf of the contestants. Thank you all very much! See you next year!

Outriggers negotiation

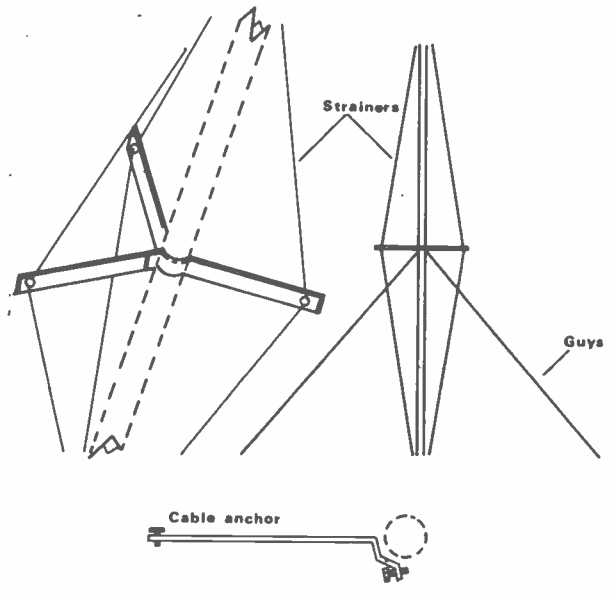
As stated in this column last month, I am negotiating with a company to obtain the special 'outriggers' for the whip free mast published some time ago in this column.

The idea is to fix a set of three outriggers to the centre of the mast and run steel wires from the top of the mast, through the outriggers and to the bottom of the mast using turnbuckles to create tension in the wires (see diagram). In this way, an extremely stable mast can be constructed which will not whip or bend in very high winds.

The original mast is still in use at this QTH after four years and has been raised and lowered countless times, even with a six element quad and rotator on top. It requires only three guys from the centre to ground during field conditions but has been used unguyed quite successfully when fixed to a shed using an offset wall bracket four feet from the base.

Well that's it for this month. I hope to review the RTTY program next month and will be looking into the QSL card question. Good listening.

'Outriggers' for the whip free mast



COBRA CONVERSION

PART I

Roger Alban GW3SPA details the conversion of the Cobra multi-mode CB sets for the 10m amateur band

During the late '70s when CB was all the rage in America, a small number of manufacturers designed and produced a 120 channel multimode transceiver to fill the hole in the market created by the demand for a larger number of channels.

One of these manufacturers was Cobra, who produced a high quality transceiver which, although it did not comply with the FCC specification, was, and still is, on sale throughout America.

When the CB boom hit Britain in 1979 a large number of these sets found their way into the UK. They appeared under a variety of different names ranging from Superstar 360 to the more popular name of Cobra 148GTL. However, one thing is unmistakable, and that is the layout of the controls on the front panel.

The main circuit difference between the various models of Cobra is the RF power amplifier stage, depending upon the transmit power output. The method of frequency generation within the set is the same between the various models, and therefore the method of converting the set for use on the ten metre amateur band remains the same.

Frequency generation

The required frequency generation for the transmit and receive local oscillator is accomplished using a phase locked loop designed around the Motorola MC145106 PLL chip. This integrated circuit was designed in the mid-seventies and has an upper operating frequency range for the programmable input of approximately 4.5MHz.

To enable this PLL chip to generate the required frequencies for CB operation (which is well above the maximum operating frequency of the chip) down mixing is employed to enable the voltage-controlled oscillator to operate at around 16.5MHz, while the input frequency to the programmable divider is kept well below 4.5MHz. *Figure 1* shows the simplified schematic diagram of the phase locked loop circuit.

A 10.24MHz crystal is connected directly to the PLL chip which contains the remaining part of the crystal oscillator circuitry. The output frequency of the oscillator is divided by 1024 in the reference divider, to arrive at a frequency of 10kHz which is sampled by one input of a phase comparator.

The other input to the phase comparator is obtained from the output of a programmable divide-by-N divider. The value of N is determined by the binary code applied to the program lines P_0 through to P_8.

The frequency input to the divide-by-N divider is obtained from the voltage-controlled oscillator via a frequency mixer. The phase difference between the two inputs to the phase comparator will determine the dc value at the output. The dc output also contains a small amount of the RF sampled at the input to the phase comparator. These unwanted RF components are filtered out by a low-pass filter installed between the output of the phase comparator and the VCO.

The resulting dc voltage is fed to a capacitance diode which forms part of the tuned circuit of the VCO. Therefore, a change in frequency of the VCO will result in a change of frequency appearing at the output of the programmable divider. This frequency is compared with the 10kHz reference frequency, and any change in phase between the two will result in a different dc voltage being produced at the output of the phase detector. This varying dc voltage is applied to the capacitance diode in the VCO tuned circuit and will therefore adjust the VCO frequency. Thus the loop is complete.

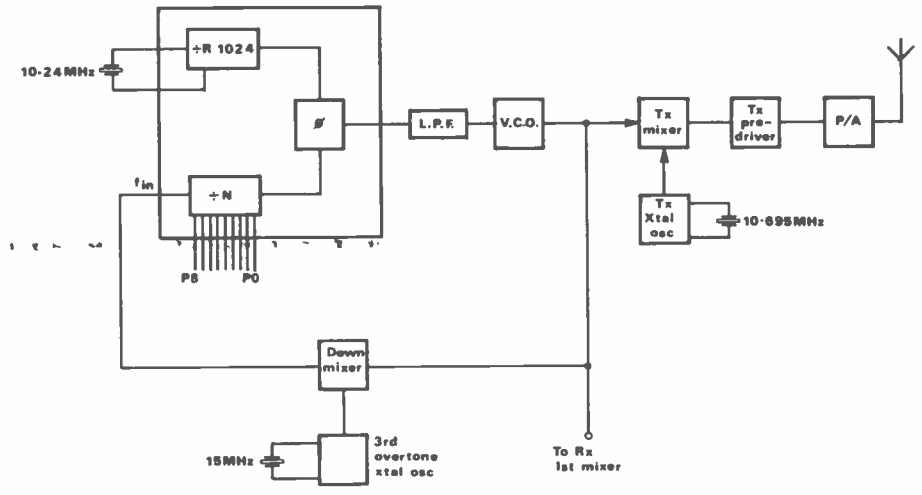
The final frequency produced by the VCO will depend upon the value of N in the programmable divider, the value of R in the reference divider and the frequency of the reference crystal oscillator. The degree of stability of the VCO frequency will be determined by the stability of the frequency of the reference crystal oscillator.

If the divide-by-N number is increased by 1, the frequency of the VCO will increase by the amount of the reference frequency being sampled by the phase comparator: namely 10.24MHz divided by 1024, which equals 10kHz. Therefore, the frequency of the VCO, and consequently the operating frequency of the set, will be incremented in 10kHz steps. In the American CB set the VCO will be operating at a frequency of around 16.5MHz.

The maximum value of input frequency, F_{in}, which can be injected into the input of the programmable divider of the MC145106 PLL chip, is approximately 4.5MHz. The manufacturer of the Cobra range of models has opted for a mixer to be installed between the output of the VCO and the input to the programmable divider. 15MHz is injected into the down mixer from a 5.0MHz third overtone crystal oscillator, to produce an output frequency which is fed to the programmable divider, and is well below the maximum operating frequency for the PLL chip.

The frequency generated by the VCO has been designed to be 10.695MHz below the operating frequency of the set. This seems to be a standard practice adopted by most CB manufacturers and assists in keeping the frequency of the VCO low.

Fig1 *Block schematic diagram of transceiver*



Operating frequencies

When the set is on transmit the output of the VCO is fed to the transmit mixer, where 10.695MHz is added to produce the final transmit frequency. On receive, the output of the VCO is fed directly into the receiver first mixer to produce an IF frequency of 10.695MHz. The operating frequencies of the set corresponding to channel numbers are shown in *Table 1*.

There are, however, a small number of Cobra sets which have a slightly different range of operating frequencies – the mid-band range of frequencies have been transposed to become the frequencies associated with the high-band, as shown in *Table 1*. The low-band frequencies of the set become the mid-band and

a new group of 40 channels, lower in frequency, become the new low-band. This difference in operating frequencies is quite easy to achieve without necessitating major alterations to the printed circuit board and the technique for carrying out a similar modification to place the set on the FM portion of the amateur ten metre band will be discussed later in this article.

It should also be noted that the frequency and channel number relationship are not sequential in 10kHz steps. In stepping between channels 3 and 4, 7 and 8, 11 and 12, 15 and 16, 19 and 20, the frequency jumps 20kHz.

Between channels 22 and 23 the frequency jumps 30kHz, and between channels 23 and 24 the frequency jumps back 20kHz. All rather strange, but it conforms with the American FCC specification.

These odd jumps in frequency between one channel and another are achieved by the channel switch. The switch is constructed out of a number of wafers of double-sided printed circuit board, so that the etched copper pattern, when in contact with a metal wiper, produces the required logic codes. In fact, the contacts of the channel-switch ground the logic lines to the input of the binary adder circuitry, which are normally held at logic level 1 by means of 47kΩ pull-up resistors.

Frequency calculations

If we take, for example, channel 30 on the high-band, *Table 1* gives the set operating frequency as 28.205MHz. The VCO will be operating at a frequency 10.695MHz below 28.205MHz, viz 17.51MHz. The VCO frequency is injected into a down mixer, where it is mixed with 15MHz.

A broadband low-pass filter at the output of the mixer ensures that the resulting value of F_{in} will be 17.51MHz minus 15.0MHz. This gives an F_{in} of 2.51MHz which is injected into the input of the programmable divider.

The divide-by-N number required for the output of the programmable divider to produce a frequency of 10kHz will be 2.51MHz divided by 10kHz, which equals 251.

To obtain an N value of 251, the logic levels on the program lines P_0 to P_8 can be calculated from *Table 2*.

Program lines P_7, P_6, P_5, P_4, P_3, P_1 and P_0 are set to logic level 1 with the remaining program lines at logic level 0 grounded. This will give a binary value of 128+64+32+16+8+2+1, which equals 251.

If we now select channel 30 on the mid-band the set will operate on a frequency of 27.755MHz. The VCO will be operating on 17.06MHz, and F_{in} will be 2.06MHz; the value of N will be 206.

Program lines P_7, P_6, P_3, P_2 and P_1 will be at logic level 1, therefore some device must be inserted between the channel switch and the program lines to ensure that the required binary values are obtained when switching between bands.

FREQUENCY RANGE OF COBRA TRANSCEIVER			
CHANNEL	LOW-BAND	MID-BAND	HI-BAND
1	26.965	27.415	27.865
2	.975	.425	.875
3	.985	.435	.885
4	27.005	.455	.905
5	.015	.465	.915
6	.025	.475	.925
7	.035	.485	.935
8	.055	.505	.955
9	.065	.515	.965
10	.075	.525	.975
11	.085	.535	.985
12	.105	.555	28.005
13	.115	.565	.015
14	.125	.575	.025
15	.135	.585	.035
16	.155	.605	.055
17	.165	.615	.065
18	.175	.625	.075
19	.185	.635	.085
20	.205	.655	.105
21	.215	.665	.115
22	.225	.675	.125
23	.255	.705	.155
24	.235	.685	.135
25	.245	.695	.145
26	.265	.715	.165
27	.275	.725	.175
28	.285	.735	.185
29	.295	.745	.195
30	.305	.755	.205
31	.315	.765	.215
32	.325	.775	.225
33	.335	.785	.235
34	.345	.795	.245
35	.355	.805	.255
36	.365	.815	.265
37	.375	.825	.275
38	.385	.835	.285
39	.395	.845	.295
40	.405	.855	.305

Table 1 *Frequency range of Cobra transceiver*

Prog line number	P_{10}	P_9	P_8	P_7	P_6	P_5	P_4	P_3	P_2	P_1	P_0
Binary value	1024	512	256	128	64	32	16	8	4	2	1

Table 2 *Logic table*

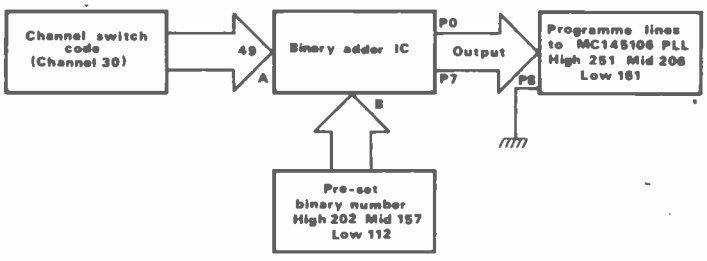


Fig 2 *Block schematic diagram of binary adder circuit*

Binary addition

The method used by Cobra for changing the binary code between each band is binary addition using the Motorola MC14008 integrated circuit. The binary code produced by the channel switch will be the same for each group of 40 channels, irrespective of the band selected. The channel switch logic code is shown in *Table 3*.

It can be seen that the channel switch produces a binary code of 49 on channel 30, irrespective of the band selected. The required logic on channel 30 on the high-band to appear on the logic lines of the programmable divider is 251. Therefore, a binary code of 202 is required to be

B LOGIC CODES									
	P_0	P_1	P_2	P_3	P_4	P_5	P_6	P_7	Binary
High	1	1	0	0	1	0	1	0	202
Mid	1	0	0	1	1	1	0	1	157
Low	0	1	1	1	0	0	0	0	112

Channel	Pin 5 ICb	Pin 7 ICb	Pin 1 ICa	Pin 3 ICa	Pin 5 ICa	Pin 7 ICa	Binary Value
	A_1	A_0	A_3	A_2	A_1	A_0	
	P_5	P_4	P_3	P_2	P_1	P_0	
1	0	0	1	1	1	1	15
2	0	1	0	0	0	0	16
3	0	1	0	0	0	1	17
4	0	1	0	0	1	1	19
5	0	1	0	1	0	0	20
6	0	1	0	1	0	1	21
7	0	1	0	1	1	0	22
8	0	1	1	0	0	0	24
9	0	1	1	0	0	1	25
10	0	1	1	0	1	0	26
11	0	1	1	0	1	1	27
12	0	1	1	1	0	1	29
13	0	1	1	1	1	0	30
14	0	1	1	1	1	1	31
15	1	0	0	0	0	0	32
16	1	0	0	0	1	0	34
17	1	0	0	0	1	1	35
18	1	0	0	1	0	0	36
19	1	0	0	1	0	1	37
20	1	0	0	1	1	1	39
21	1	0	1	0	0	0	40
22	1	0	1	0	0	1	41
23	1	0	1	1	0	0	44
24	1	0	1	0	1	0	42
25	1	0	1	0	1	1	43
26	1	0	1	1	0	1	45
27	1	0	1	1	1	0	46
28	1	0	1	1	1	1	47
29	1	1	0	0	0	0	48
30	1	1	0	0	0	1	49
31	1	1	0	0	1	0	50
32	1	1	0	0	1	1	51
33	1	1	0	1	0	0	52
34	1	1	0	1	0	1	53
35	1	1	0	1	1	0	54
36	1	1	0	1	1	1	55
37	1	1	1	0	0	0	60
38	1	1	1	0	0	1	61
39	1	1	1	0	1	0	62
40	1	1	1	0	1	1	63

Table 3 *Channel switch codes*

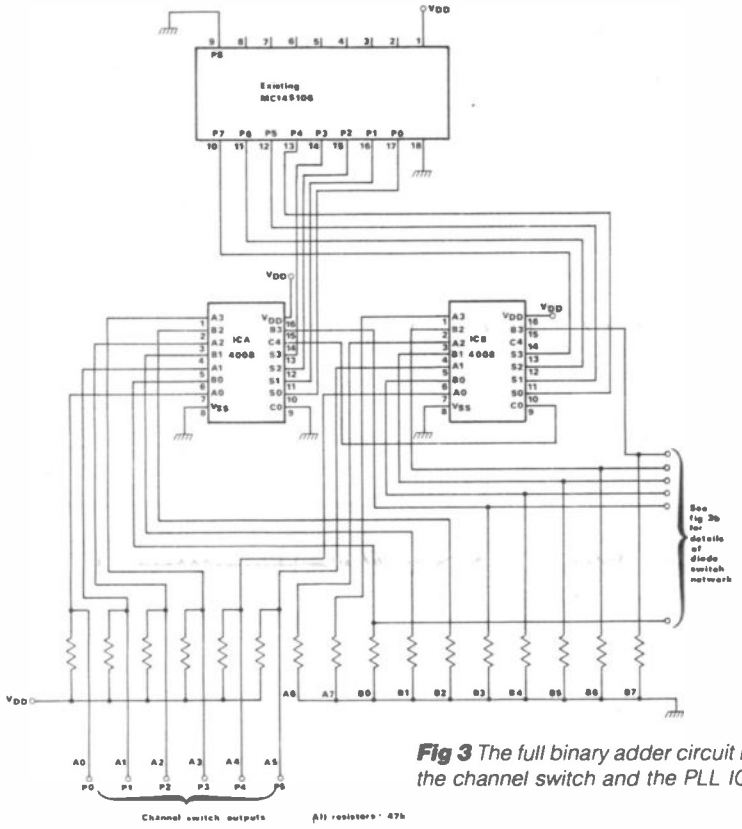


Fig 3 *The full binary adder circuit interposed between the channel switch and the PLL IC*

added to the binary code produced by the channel switch, to arrive at the correct logic code. On the mid-band for channel 30, a program line code of 206 is required; therefore it is necessary to add a binary code of 157 to the channel switch code to produce the correct program line code.

On the low-band for channel 30 a program line code of 161 will be required and it will therefore be necessary to add a binary code number of 112 to the channel switch code. *Figure 2* shows the block schematic diagram for the binary adder circuit.

The program code generated by the channel switch is fed directly into the binary adder on input lines A. The fixed binary code required for each band of 40 channels, which is to be added to the channel switch code, is fed directly into the binary adder on input lines B.

The binary adder adds together the binary inputs on lines A and B, and presents the addition onto the output lines which are directly connected to the program lines P_0 through to P_7 on the PLL integrated circuit. Program line P_8 is permanently at logic level 0 and is therefore connected to the set's earth by means of a soldered wire link.

Binary adder circuit

The binary adder circuit is constructed from two Motorola MC14008 integrated circuits. This chip is a four-bit binary full adder with two four-bit data inputs, A_0 to A_3 and B_0 to B_3, a carry input, C_0, four sum outputs, S_0 to S_3 and a carry output, C_4.

The MC14008 incorporates full look-ahead across 4 bits to generate the carry output C_4. This minimises the necessity for extensive look-ahead and carry cascading circuits. The circuit diagram of the binary adder is shown in *Figure 3.*

The channel switch produces the required binary code by grounding the inputs of the A input lines, which are otherwise held at logic level 1 by means of pull-up resistors connected to V_{DD}. The logic outputs of the channel switch are connected to A_0 through to A_3 of ICa, and A_0 through to A_2 for ICb. A_3 of ICb is not used and is therefore grounded through a 47kΩ resistor.

The B inputs for both binary adder ICs are connected to ground via 47kΩ resistors. Diode switching is used to achieve the required binary value for each band selected, as shown in *Figure 4.*

Lower group of 40

As mentioned earlier, a small number of sets contain a lower group of 40 channels which is achieved by making the binary value of the B inputs equal to 67. The binary value for the mid-band becomes 112 and 157 for the high-band. From *Figure 4* it can be seen that the band switching is achieved by a matrix of diodes connected to the B inputs. If another group of 40 channels is required, it is a relatively simple thing to rearrange the diodes to give the correct binary code required by the B input to the binary adder.

Modifications for ten metres

If we now need to modify the set to operate on the FM portion of the ten metre amateur band, then we need to take a fresh look at the frequency calculations.

Let us first assume that we adopt a standard practice, ie channel 30 on the high-band will correspond to the FM calling frequency of 29.6MHz. This in turn will ensure that channel 40 will correspond with 29.7MHz, the highest frequency in the amateur ten metre band.

Let us look again at the block schematic diagram shown in *Figure 1*. If the set is to operate on 29.6MHz the VCO will have to operate on a frequency of 10.695MHz below 29.6MHz, which will be 18.905MHz.

The value of F_{in} will be 18.905MHz minus 15.0MHz, which will be 3.905MHz. The required divide-by-N number to produce a 10kHz input into the phase comparator will be 3.905MHz divided by 10kHz, which gives 390.5: ha! Here we have a problem.

It is not possible to have a divide-by-N number which is not a whole number. Therefore, if we make the divide-by-N number 391, this will produce an F_{in} of 3.91MHz. To generate an operational frequency of 29.6MHz it is essential that the VCO should remain operating at 10.695MHz below the operating frequency.

To achieve this, and at the same time modify the divide-by-N number, we must adjust the frequency of the down mixer crystal oscillator. The new frequency of the crystal oscillator will be 18.905MHz minus 3.91MHz, which equals 14.995MHz.

The next question that needs to be asked is whether it is possible to reduce the frequency of the 15.0MHz crystal oscillator by 5.0kHz down to 14.995MHz without changing the crystal. The answer is yes, it is possible. The crystal oscillator uses a 5.0MHz crystal in a third overtone circuit. By adjusting the core of L32 and observing the output frequency of the crystal oscillator on a digital frequency metre it is possible to reduce the frequency.

Binary code

To change the binary code value it is necessary to adjust the value of the fixed value B inputs to the binary adder for each band.

The new value of binary code of the divide-by-N programmable divider for channel 30 on the high-band is 391.

From previous calculations we know that the channel switch code for channel 30 will be 49. Therefore, the binary value of the B input to the binary adder will be 391 minus 49, which equals 342. Here, however, we have another problem.

The maximum binary number obtainable on the B inputs to the binary adder will be obtained when all the program lines are at logic level 1. From *Table 2* this will give a maximum binary value of 128+64+32+16+8+4+2+1, which equals 255, which is not high enough. However, the problem can be solved.

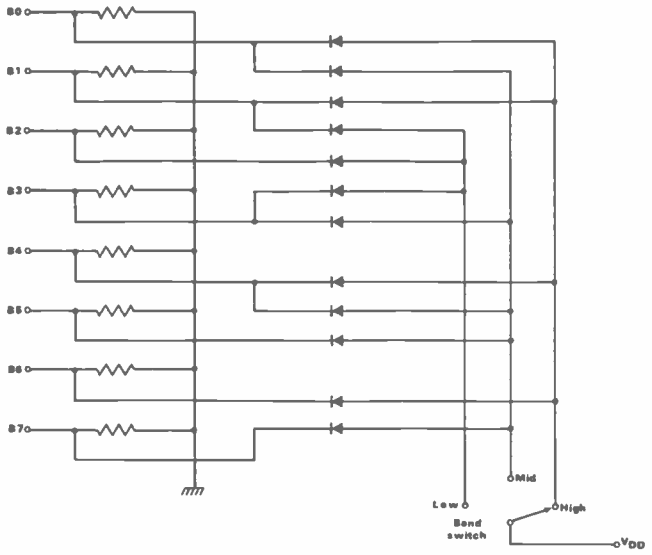


Fig 4 *Diode switching matrix for unconverted set*

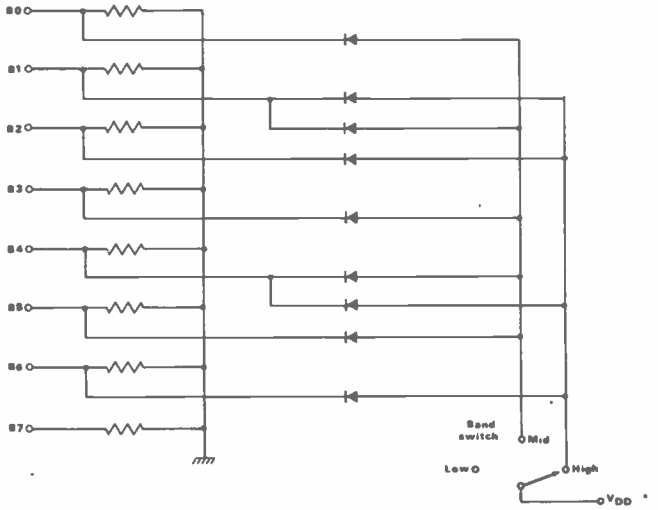
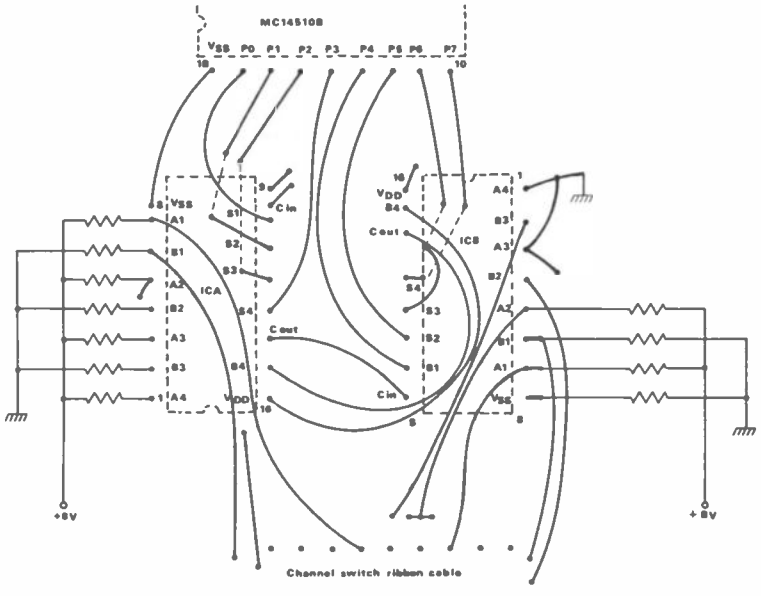


Fig 5 *Modified diode matrix for 10m conversion*

Fig 6 *Printed circuit layout of binary adder circuit (track side)*



COBRA CONVERSION

CHANNEL	÷N	÷N ($P_0 - P_7$)	B INPUTS	A INPUTS	BINARY B INPUTS							
					B_0	B_1	B_2	B_3	B_4	B_5	B_6	B_7
High 40	401	145	86	59	0	1	1	0	1	0	1	0
High 1	357	101	86	15	0	1	1	0	1	0	1	0
Mid 40	356	100	41	59	1	1	0	1	1	1	0	0
Mid 1	312	56	41	15	1	1	0	1	1	1	0	0
Low 40	315	59	0	59	0	0	0	0	0	0	0	0
Low 1	271	15	0	15	0	0	0	0	0	0	0	0

Table 4 *Modified binary values for the binary adder circuit*

Remember that program line P_8 to the PLL chip in the unmodified Cobra set is always held at logic level 0. If we now desolder the wire link and connect program line P_8 to V_{DD} we will make it permanently at logic level 1. Taking the value from *Table 2* (binary 256) we can use this with the binary value on the PLL chip program lines.

Binary value

Now the required binary value on the program lines P_0 to P_7 will be 391 minus 256, which equals 135. The binary value for the B input to the binary adder will now be 135 minus 49, which equals 86. *Table 4* shows the binary values and logic levels required for the Cobra set to operate on three bands of 40 channels within the amateur ten metre band.

Again we experience a minor problem with the binary values on the low-band. The required binary value on the program lines for the PLL chip on channel 30 on the low-band is 301. The required binary output from the binary adder will be 301 minus 256, which gives 45. The corresponding binary value for the B input will be 45 minus 49, which gives a negative number.

The solution to the problem seems to be to make the logic level for the B input zero. This will result in an overlap in frequency between the top of the low-band and the bottom of the mid-band of 40kHz. Also, 40kHz will be lost from the bottom of the low-band. A small price to pay to resolve the problem.

Strange jumps

The set is now capable of operating over a frequency range of between 28.4MHz and 29.7MHz. However, the strange jumps in binary values produced by the channel switch will still continue to influence the binary values on the program lines to the PLL chip and will therefore continue to affect the relationship between channel number and operating frequency.

Modified binary adder

The circuit diagram of the modified binary adder circuit is shown in *Figure 5*. The modified diode matrix was constructed on a piece of Veroboard which was attached to the inside case of the set. The printed circuit layout of the binary adder is shown in *Figure 6* and should assist readers in identifying the pin functions of the two Motorola binary adder chips.

NEXT MONTH . . .

- Alignment of the phase locked loop chip
- Adjustment of the transmitter and receiver tuning
- A simpler modification changing the value of the 15MHz crystal instead of altering the binary adder
- Solving the problem of frequency jumping using a 2716 EPROM

Northern Amateur Radio Societies Association

Name & Address:	Narsa 24th Annual Exhibition & Mobile Rally, Belle Vue, Hyde Road, Manchester
Date & Time:	March 9th 1986 doors open 11.00-5.00pm (10.45 for disabled in wheel chairs)
Cost:	£1.00 per person, 50p OAP's, under 14's free
Talk In:	Will be (S22) 2 metres & 70cms
Car Parking:	Ample parking
Attractions:	Amateur radio, electronics, computers, tools, club stands, bring & buy, raffles, competitions, club quiz, also attractions for ladies & childrens entertainment
Traders:	M&B Radio/Marco Trading/A&M DIY Tools J Birkett/Amateur Radio Exchange Display Electronics/Chester Electronics The Computer Junk Shop/MGR Services W H Westlake/PLM Communications Arrow Electronics/Royd Electronics Newton Engraving/Poole Logic TW Wraith/Scarab Systems RSGB/RA Kent/TAR Communications Heatherlite Mobile Mikes

INDOOR ANTENNAS

Richard Marris G2BZQ with some ideas on transmitting with indoor aerials

Many amateurs live in apartments and flats and in most cases are unable to erect an outside antenna, either because it is physically impossible or just not permitted. A lucky few may have a loft in which an antenna can be erected, but the majority are confined to several rooms on the same floor level. Lucky are those who live in a tower block (near the top) because they have the advantage of height.

To help solve these problems the following antenna designs, one for 20m and one for 80m, are detailed with the high-rise TXer in mind.

The 'Indoor 20'

The Indoor 20 antenna is a simple and effective 20 metre transmitting/receiving antenna for use in an apartment or flat, and is based on experiments carried out by the writer while living in apartments in the UK and the USA.

A good indoor antenna will not outperform a good outdoor antenna, but *will* perform better than a mediocre or badly matched/designed outdoor antenna. It is not unusual for an outdoor antenna to produce DX by virtue of a large number of RF watts being pumped into it, and this is not necessarily because it is a good antenna. The selfsame antenna, if properly matched and constructed, will produce more DX with a lot less power!

Very little, if anything, is said about indoor T/R antennas in the textbooks produced in various countries, with the exception of the *ARRL Antenna Handbook* which goes some way towards looking into the problems involved. However, it is usually said that a long piece of wire should be taken around the walls of the apartment (presumably rambling from room to room with bends here and there) and matched to the transmitter with a transmatch.

Well, a good transmatch ATU will just about match anything to anything (it is claimed). However, it is suspected by the writer that the literary advocates of this procedure have a good outside antenna, and are, of course, technically correct in expounding the virtues of the transmatch with such an indoor antenna. But it seems unlikely that they have exclusively used an indoor antenna year after year and really studied in depth the problems, and the possible answers, to these.

An alternative suggestion is to use a dipole with the ends bent up, down, or sideways, etc. If you have the room, then that could be fine. A dipole on 20 metres consists of around 33 feet of wire, which could be made to fit with the ends bent down, but this immediately suffers from the practical fact that the feeder drops down from the centre, which to say the least looks funny in the living-room, will form an obstruction, and will find little favour with the XYL.

More seriously, it means that the parts of the dipole which have been bent down (say 6 or 8 feet at either end) will be very close to the walls. In these walls will be house wiring and various pipes which will inject noise into the receiver via the dipole and also inject transmitted RF into the mains wiring, pipes, etc, causing TVI and BCI. This will mean that the TXer will not exactly win the local popularity contest!

All is not lost

Having expounded the pessimistic view...all is not lost! Somebody once said: 'Man will look for the most complicated solution to the simple problem, and yet will find a simple answer to the most difficult problem!'

After a lifetime of reasonably successful operating with indoor antennas as an apartment dweller, the writer has reached the conclusion, the hard way, that the textbooks usually gloss over, or ignore, the basic problems, and therefore do not provide a practical answer. The following observations are therefore offered:

1. In an apartment, the 'enemies' are walls, ceilings, electrical and telephone wiring, water, gas and heating pipes, metal girder framework construction of the building, and metal windows. There is also a maximum amount of electrical noise radiation from thermostats, and other household appliances from surrounding apartments.
2. As a result of (1), above, on receive the operator can be subjected to an enormous amount of noise.
3. Conversely, on transmit a high percentage of the radiated RF power can be dissipated into these 'enemies', and, of course, produce such nasty and unpopular problems as TVI and BCI. Remember the problem is not just to put the transmitted RF 'up the spout' but to get it *outside* the apartment.

Experience has shown the writer that the transmitting/receiving antenna in the apartment must conform to the following rules:

a) The antenna should be *straight*, of maximum possible length (however long or short that may be) and erected as far away from the walls and ceiling as possible. By juggling with the ATU design and with end loading, a situation must be produced whereby the maximum RF current appears in the straight piece of the antenna.

b) Ideally the antenna should run diagonally across the room, from opposite corners, and at least 6in below the ceiling level.

c) A transmatch can be used, but it is an expensive compromise. It is far better (and produces better results) to tailor-make a simple effective ATU for each band used, and lock the tuning of each ATU at the optimum position. In practice it is much quicker to change simple ATUs than to reswitch and retune a transmatch when changing bands.

The indoor apartment antenna designer/erector has several advantages over his outdoor compatriot:

1. Masts and towers are not needed.
2. The antenna can be erected with lightweight, low cost construction very speedily, and if it does not work to expectations it can just as quickly be demolished or modified.
3. Using a good old-fashioned neon bulb hand-held, one can prod about with discretion and establish the high and low voltage (maximum current) points, and if these are not as required they can be moved by changing the loading at either end of the antenna.
4. Heavy gauge wire is not required. Use white PVC-covered flex. It is nearly invisible against a white ceiling.
5. Heavy insulators are not required. The writer uses transparent nylon fishing line to support the antenna.
6. A hole (with insulation) does not have to be bored or excavated into the building to bring in the antenna.
7. Because one is using a lightweight antenna construction and a moderate power transmitter (because of possible TVI), then the whole set-up costs a lot less than the high power transmitter fed into an outside antenna on a mast or tower.

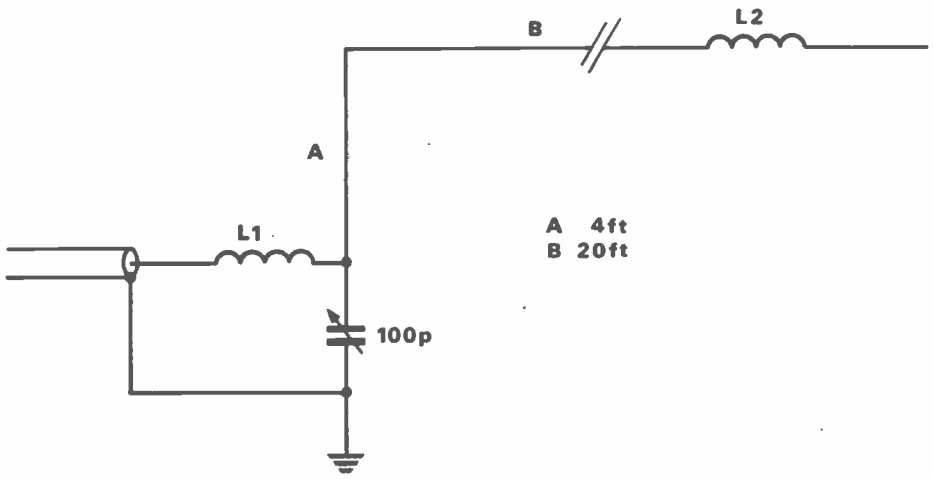
'Indoor 20' design

Figure 1 shows the 'Indoor 20' antenna. It can be seen that the antenna consists of a horizontal section B, with a simple L-network ATU fed to the transceiver by 50 ohm coaxial cable. At the remote end is the end loading coil, L2.

Horizontal section B is 20 feet long. At the ATU end 4 feet of wire (A) drops down to the ATU. The writer uses about 4 feet of coaxial cable between the ATU and the transceiver. At the other end loading coil L2 is located. Loading coil L2 is wound onto 10½in of ⅝in diameter wooden dowel. It consists of 21 feet of PVC-covered flex, close-wound, giving 110 turns. The PVC wire has an overall diameter of 2mm, with a stranded core. The whole of L2 is neatly covered with white PVC insulation tape.

In the ATU the variable capacitor used is a 100pF good quality small transmitting type. The inductance L1 is wound on a

Fig 1 *The 'Indoor 20'*



short piece of 1¾₁₆in diameter plastic tubing. The winding is 7 turns, close-wound, of PVC-covered hook-up wire, with an overall diameter of 1.2mm and with a single conductor. The whole thing is assembled into a small box, with suitable plug/socket arrangements for quick connection/disconnection of the antenna, transceiver and the ground connection. The ground connection is made to a metal water pipe with 15 feet of stout PVC insulated cable. An alternative, used in the past, has been a ¼-wave wire or counterpoise.

The writer uses CW only with an input capability of 50 to 100 watts, but usually employs the lowest power. Operation is between 14000 and 14080kHz, and the ATU is matched to the transceiver at 14050kHz and does not have to be retuned to cover this range.

Tuning procedure

The tuning procedure is as follows:

1. Tune up the transmitter into a dummy load in the usual way on 14050kHz.
2. Attach the ATU to the transceiver, and on receive adjust the ATU variable capacitor to the maximum signal at 14050kHz. This gives an initial setting on the ATU. Apply the transmitter and make the necessary minor adjustments for minimum SWR in the usual way, and off you go! For readers using a different part of the 20 metre band, then a similar procedure should apply.

In the following situations it might be necessary to add or subtract a turn from L1:

1. If the full length of 20 feet for horizontal length B cannot be accommodated. In this case B can be shortened by dropping down L2 on the end of a few feet of wire, with the length of that piece of wire plus B coming to 20 feet.
2. If radical changes are made to the layout and horizontal length of the antenna (B). For example, if B is shorter and running alongside the wall, and not diagonally across the room.
3. With a completely different ground system.

The writer has spent many happy hours using the Indoor 20 antenna, and when DX is worked there is a feeling of some achievement.

The 'Apartment 80'

Most apartment blocks have a steel framework construction, a network of hidden electric wiring, telephone wiring, plus an assortment of water, heating and gas pipes, and of course, metal window frames.

Dreams of an 80 metre beam antenna, a half-wave dipole, or a quarter-wave vertical antenna can be forgotten. A short helical-wound vertical antenna is a possibility, but the writer, so far, has found the results disappointing. Also, of course, a satisfactory ground system is practically impossible!

So what is left? The answer seems to be the longest convenient horizontal antenna with suitable loading.

The Apartment 80 is a simple and effective indoor 80 metre antenna which will produce plenty of QSOs, and is illustrated in *Figure 2*. On 80 metre CW at the LF end of the band (between 3500 and 3580kHz) the writer works, from a QTH in southern England, all over Europe and all over the USSR, with a maximum estimated distance of 5,350 miles to date. Operating time is invariably restricted to an hour or so, between 0330 and 0530GMT when the band is at its noisiest. More sustained and serious operating would, no doubt, produce more DX, but real DX hunting is not the target these days.

Transmitters used with the Apartment 80 consist of one which is adjustable between 50/100 watts input and another between 10/12 watts input. Tests have indicated little difference to the results obtained. Results with the Apartment 80 will, of course, depend on height, construction and location of the apartment, as well as a good ground connection. The same applies to an outdoor antenna as far as height, location and ground connection are concerned. The current height of the antenna is about 20 feet above ground level and it runs approximately north/south.

When constructing such an antenna it has been found that the maximum straight length of wire is advisable, erected diagonally across the room which keeps it away from the walls. It should not be less than 6in below ceiling level (who knows what is hidden there in the way of wiring?).

Referring again to *Figure 2*, it will be seen that the antenna consists of 24 feet of wire. PVC covered flex is used, identical to that used for L2 (see below).The horizontal part (B) is 18 feet long and is suspended 7in below ceiling level with nylon fishing line, and runs diagonally across the room from opposite corners. At the far end, about 24in from the corner, loading coil L2 is suspended by 24in of wire (C). At the operating end, again about 24in from the corner, 4 feet of wire (A) drops down to the ATU.

The simple ATU consists of L1 and a 365pF variable capacitor of the airspaced type, salvaged from an old receiver. Feed to the Tx/Rx is via about 3 feet of 50 ohm coaxial cable. The ground connection is made to a convenient water pipe with about 15 feet of stout PVC insulated cable. And that is all there is to it!

Experiments have indicated that end loading, with L2, was easier to use and gave better results than centre loading, or loading at the ATU end of the antenna.

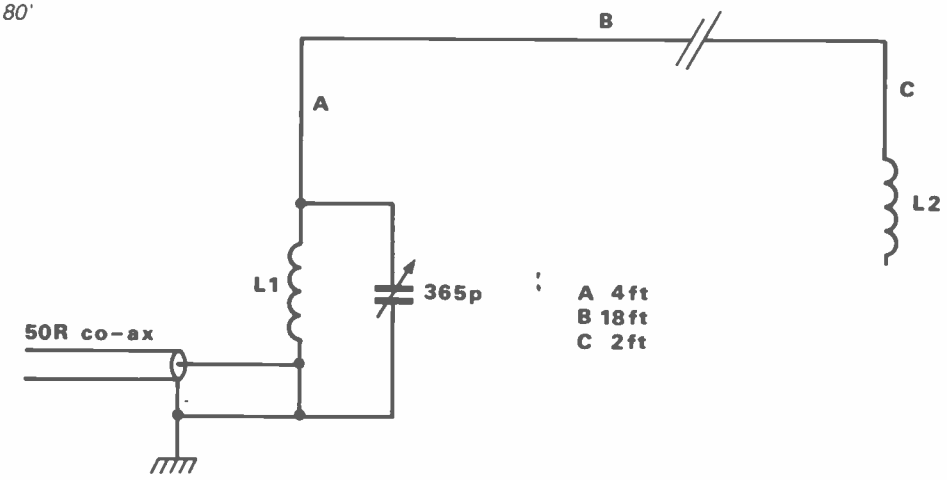
The ATU is a simple L-network assembled into a small metal box, with suitable antenna and ground connection sockets. The variable capacitor used is a 365pF good quality airspaced receiving type.

Testing, testing . . .

Testing the antenna is simple. Tune up the Tx into a dummy load. Then, on receive, adjust the ATU variable capacitor for maximum signal strength to get a preliminary setting. With the SWR meter in place between the ATU and Tx input, and with a few watts of power, adjust for minimum SWR in the usual way. An SWR of close to 1 : 1 should be obtainable.

Anyone building this antenna, but having difficulty in matching it to the Tx because they have departed from the specified dimensions/layout, inductance windings, ground connections, or erection/location of the antenna, should be able to make the necessary adjustments by a slight change (plus or minus) in the number of turns on L1. The writer wished to avoid using taps on L1, but, of course, this could be done by making L1 a few turns larger and fitting tapping points. But why make life difficult? It has been found that once L1 is right, and the

Fig2 The 'Apartment 80'



tuning capacitor has been adjusted for optimum results, there is no need to alter anything over the whole of the CW part of the 80 metre band.

Absolutely clean

With up to a 100 watts input, a good airspaced receiving-type variable capacitor should be all right. If it has been salvaged from an old receiver, then make certain that it is absolutely clean and does not have dust between the plates. If in doubt, a simple rule of thumb method is to ensure that the spacings between the plates and insulation are not less than the PA tuning capacitor in the Tx used.

The inductance L1 consists of 14 turns of 18 gauge enamel copper wire, close-wound on a piece of 2.2in diameter tubing (plastic), obtained from a local hardware store.

The end loading coil L2 is wound onto 10½in length of ⅝in diameter wooden dowel. It consists of 21 feet of PVC covered flex, close-wound, giving 110 turns. The wire used had 22 strands and the overall diameter, including PVC insulation, was 2mm. The same type was also used for the antenna.

Take care

In conclusion, remember that the results with an indoor transmitting antenna depend on so many factors, such as location, construction of building, equipment used, and, of course, let us not forget the operator! If care is taken to avoid getting the antenna close to wiring, pipes and other metalwork, it is possible to get worthwhile results. Be sure to use as little Tx power as possible to avoid TVI problems.

You can have great fun with a good indoor antenna. Good hunting with the Apartment 80.

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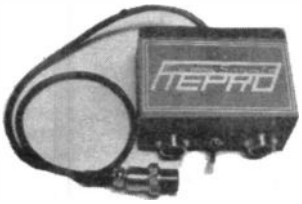

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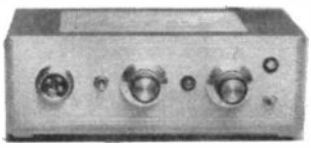

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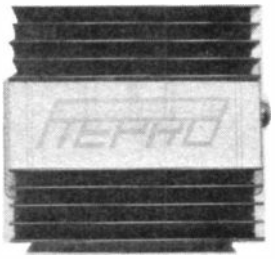

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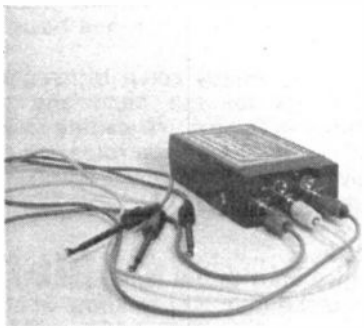

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News and comment from Glen Ross G8MWR

It's here

Congratulations to those of you who got 50MHz and sympathy to the rest of us who, predictably, did not. The great thing is that as from 1 February the area from 50 to 50.5MHz is an amateur band, and we can now start the fight to get everyone on the band and to have the limitations removed.

The RSGB deserve our congratulations for pushing this through against much opposition from our continental neighbours. They also deserve your support; without them we would not be there at all. There was no one else capable of fighting for it, so let us give credit where it is due.

The limitations

First of all let's look at the various limitations and then see why these were needed. First, all the existing permits are being withdrawn as they are no longer required. Several operators are known to have made *no* use of the permit at all.

The band will be available 'round the clock', and there are no restrictions on the modes that may be used. The allocation is as a *primary user* of the band and it will only be available initially to class A operators.

There is a power limitation and this is at 14dBW (25W) for carrier type transmissions, ie, FM. AM, RTTY, and 20dBW (100W) for SSB.

These powers are ERP and so you must take into account the gain of your aerial system. Equally, you take into account the losses in the co-ax to the aerial, although in most amateur installations at this frequency these are likely to be quite low.

High-rise

Restrictions are also placed on the aerial system itself. This must be horizontally polarised and must not be more than 20 metres above ground level. In the case of an amateur living in a high-rise block of flats with the aerial mounted on the roof there is no way that he could comply with this requirement. The DTI have said that such cases will be reviewed on an individual basis. No mobile, portable or temporary location operation will be allowed. There is also a complete embargo on the installation of repeaters.

Regulations

Now let us look at some of the reasons for the restrictions. As you should all be aware, we are governed by international agreements and article 8 of the regulations does *not* allow for an amateur location in Europe at 50MHz. Therefore, those who claim that class B operators have an international right to this band now that it is available in this country are barking up the wrong tree. It is, like 70MHz, a 'grace and favour' band. The powers that be *may* grant class B facilities if they so wish but they have said that this action will depend on no interference problems arising under the present arrangements.

Non interference

Article 342 of the regulations is also of great interest to us because this states that any country which allocates spectrum to other than the authorised users in the region, in our case the broadcast boys, must ensure a degree of immunity from interference; these levels are very carefully laid down.

We can now see the reason for some of the restrictions. Nearly all television and land mobile stations who have limited use of the band on the continent use vertical polarisation; hence the insistence on horizontal polarisation here. The loss due to cross polarising can be as much as 30dB (1000 times apparent power reduction) and so we are away to a good start.

The embargo on repeaters is also now obvious. They would have to use vertical polarisation to cater for mobile operation and they are normally placed on the highest sites available. Add to this the fact that they are in use for the greater part of the day and you can see the sort of problems that could arise. There was no way we could expect to get that past our continental brothers.

TV frequencies

The station most likely to be affected by interference is that located at Antwerp using channel E2. This gives a carrier frequency of 48.25MHz for vision and 53.75 for sound, and incidentally runs only 100 watts ERP with vertical polarisation.

Remember that TV uses the bandwidth between these spot points to actually carry the picture information and the TV set has to respond to the whole of this area if you want a decent picture. If you now check the new amateur allocation you will find that it drops very neatly into this passband and in fact is nearly 10% of it. Add to that the fact that the eastern side of the country has a sea path into Belgium and the picture becomes more clear; or, at the Belgium end, muddled due to interference.

The numbers game

I think it was a foregone conclusion that the band would be released to class A operators only at the start, but the reasons given are not very convincing. It was simply that the number of people operating had to be limited so as to avoid interference.

This is fine as far as it goes, but the interesting point is that the numbers of A and B class licences is nearly equal, so the same effect could be achieved by giving it to the class B people. It really comes back to the idea that a B licence is in some way technically inferior, an argument that is easily shown to be untrue. How does 12 wpm make you technically more aware?

The future

The great thing is that we are there. The authorities have said that they are prepared to reconsider the matter at the end of a twelve month period, with a view to removing restrictions and allowing general use of the band. Perhaps the most interesting point is that the band up to 52MHz has not been allocated as yet, and the DTI letter states 'a prospect of additional spectrum at 50MHz being made available for amateur operation.' Great things are in store,especially when the sunspots start to do their thing in a couple of years time.

Even more

More good news about 50MHz has just been received. It is being issued in Portugal on an individual basis. Anyone wanting to operate on the band must apply for permission, and this is granted on the same non interference basis as here.

There are already some Norwegians with permits for the band and the authorities in Cyprus are waiting to see the UK conditions before releasing the band over there. We really are breaking through!

Beacons

Until we start to get some activity on the band the only way to know what is going on is to have a listen for some of the beacon stations which are active. The list in the table is nowhere near complete but it does make a useful starting point.

Morse tests

The other big RSGB achievement has been to get the contract for Morse tests in the face of opposition from other departments. They will take responsibility for the tests as from April, by which time they hope to have set up seventy regional test centres. The idea is to have

one in each county or island and the tests will be held every two months at each centre.

By staggering the dates of adjacent centres it should be possible to take a test in any week you care to name without having to travel very far to do it. The fee is also being reduced to £7.00 and this will be held for two years. The whole scheme is going to rely on volunteer effort, as does so much of the work the RSGB undertakes and is obviously open to abuse unless it is well policed. Hopefully, with the right people doing the job this will not be much of a problem.

Openings

Openings on the VHF bands do not only happen in the summer months: we have reports of LA9DL and LA2AB being contacted on 50MHz on 13 and 14 December, while on the 15th there were good contacts made from GI country to EA land.

Stations known to have been contacted were EA1CYE, EA1BLA and EA1QJ with distances around 1250kms. There is also a report of a contact with I1GXB on the same day.

The Geminids meteor shower also payed off with good contacts into I and YU round about 0600 on 12 December. It pays to keep an ear open on the bands at all times.

4 metre award

There will be a special four metre award,details of which can be obtained from G4WND or G4SEU, both QTHr. The special callsign GB4MTR will be used by 13 different stations for four weeks each during the year.

We will keep you up to date with the monthly locations so that you know where to look, and for February the operation will be from GW4HBK in Gwent. They are still looking for stations to complete the year's schedule so if you are interested in giving a helping hand please contact them.

Odds and ends

There is a new QSL manager for the call series G8DAA to G8OZZ. Please send your envelopes to G4IEY (QTHr) at Cheltenham.

Many people do not understand the way in which this system works and it is hoped to give a description of how you can get the best out of it, possibly in next month's issue.

The 13cms beacon, GB3NWK, which is located near Orpington, is now operational on 2320.85MHz running 10 watts ERP from an Alford slot aerial located 30 feet above ground. Reports on this and the 23cms unit, which uses the same callsign on 1296.81MHz would be welcomed by G4GLN.

The death of HB9CV has been reported. He developed his well-known aerial system originally for the HF bands but its greatest use has certainly been on VHF, where it is in use up to 1296.

The 'News on repeater' experiment was due to start on 5 January; listen for it on GB3SL, GB3PY, GB3SK, GB3HQ, GB3NI and GB3CF.

You thought you knew all about locators? The Japanese have a system known as the 'Human Language' but have now agreed to use both that and Maidenhead.

That runs me out of space for this month.

Any information or comments to me at 81 Ringwood Highway, Coventry or on Prestel 203616941.

BEACONS IN OPERATION ON 50MHz

ZS2SIX	50.005	Cape Province
GB3RMK	50.006	Inverness
ZS1STB	50.010	Still Bay
SZ2DH	50.015	Athens
GB3SIX	50.020	Anglesey
ZB2VHF	50.035	Gibraltar
OX3VHF	50.045	Greenland
GB3NHQ	50.050	Potters Bar
ZS6DN/B	50.060	Pretoria
VS6HK	50.075	Hong Kong
VE1SIX	50.088	Brunswick
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DC power requirements	:	13.8V DC at 0.5A
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Power connector	:	5 pin DIN socket
Size	:	187x120x106mm
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Transmit Section

Input impedance	:	50 ohm
Input modes	:	SSB, FM, AM or CW
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Power output	:	2 watts continuous rating
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Level of spurious outputs	:	Better than -40 dB

Receive Section

Overall converter gain	:	25 dB typical
Noise figure	:	1.9 dB maximum
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IF output impedance	:	50 ohm

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DESCRIPTION

This 1296 MHz solid-state linear transverter, MMT 1296/144, is intended for use with a 144 MHz transceiver to produce a high reliability transceive capability at 1296 MHz. The inclusion of an RF vox network minimises the necessary connections to the drive source,and will automatically switch the transverter into the transmit mode when 144 MHz drive is applied.

The transverter incorporates two main sections: (1) MMK 1296/144, low-noise receive converter incorporating MMG 1296 low-noise GaAsFET preamplifier and (2), a low distortion transmit converter an power amplifier module. This modular construction technique ensures excellent electrical nd mechanical stability, and the unit is ideal for all types of communication, particularly where a high degree of stability, sensitivity and linearity are of prime importance. The transverter is enclosed in a dual compartment case, and all circuitry is constructed on high quality glass-fibre printed circuit board, with the exception of the preamplifier which is constructed on TEFLON PCB. The high power linear amplifier stage is housed in a separate internal compartment.

Receive Converter

Incoming 1296 MHz signals are fed into the preamplifier module via the PIN diode aerial switch. An NEC GaAsFET is employed in this stage operating under accurately controlled DC conditions. The use of microwave matching techniques ensures the very low noise figure inherent in this converter, and a stripline pre-mixer image filter ensures rejection of out of band signals.

The preamplifier is constructed on high quality TEFLON pc board. The output from the preamplifier is then passed to a printed quadrature hybrid mixer incorporating a pair of a low-noise schottky diodes, and IF gain is achieved by the inclusion of a MOSFET amplifier stage at 144 MHz.

Transmit Converter

Incoming 144 MHz drive to the transverter is attenuated via the supplied 15 dB attenuator. This attenuated signal (400 mW approx) is fed into an onboard variable attenuator, and is then mixed with the 1152 MHz local oscillator injection in a balanced mixer utilising a pair of BFR 34a transistors, to produce the wanted signal of 1296 MHz. This signal is then amplified by two linear stages, before further amplification in the power amplifier compartment.

Power Amplifier Compartment

This linear amplifier uses a highly rugged and well proven silicon transistor which produces a highly reliable continuous output power of 2 watts. Printed stripline techniques are utilised and aerial changeover is achieved by a PIN diode quarter-wave relay. This type of changeover relay has many advantages over a conventional type, the most important being its low insertion loss of less than 0.5 dB. For independent operation, the receive converter may alternatively be connected without the use of the internal PIN diode changeover relay.

Our sales team will be visiting as many mobile rallies as possible this year. Also Mick, G4EFO, our man on the road is able to give lectures to clubs on our equipment including full METEOSAT demonstrations. This could be a good evening for your club, so rally and club secretaries take note and give Mick a ring on 0403 730 767.

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SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

Typical, absolutely typical. The day after I post off last month's copy about the fun I had been having learning about the various cheap microwave heads, a friend says: 'This any use to you?', and gives me a Mullard Technical Communications bulletin (Number 131) in which there is an article on microwave doppler intruder alarms. This recommends RF and dc bias on the receiving (or mixing) diode, such that, for their particular module, the sum of the currents is 42μA. This is made up of 35μA of dc bias and 7μA of RF. It is also interesting to note that they say the exact amount of RF bias may depend upon the material used for the microwave window.

Adding external dc bias to some of my previous experiments seems to result in an improvement in range of about 15%. This is probably as much a result of not using up precious RF energy from the gunn to bias the diode as it is biasing the diode correctly. As I said last month, great cheap fun, although I don't profess to be an expert on the subject at all.

The post

I had an interesting letter from a Scottish amateur regarding a dead Icom rig. A friend of his had an IC240 which was duff, and he confessed to being a computer engineer more than an electronics engineer. It's a bit difficult to repair a rig which you haven't seen that is hundreds of miles away, but several examples I have had to repair have had dodgy joints in and about the synthesizer, so I advised him accordingly. I was very pleased to receive a reply, almost by return of post, saying that he had fixed it. So often I give advice and get no feedback. It's nice to know that, just once or twice, you have scored a hit.

For the book, joints through the board can be bad news; a gentle tap about with the rig on, and a signal up the aerial socket *on a known channel* can work wonders. In this case one of the faults was in fact a poor joint, the other was a totally unsoldered, indeed it never had been soldered, frequency address line.

An obscure problem that I first came across in a 240 is that of coils (IF, VCO, low power Tx etc) going open circuit. The first time this happened to me I thought my sanity had gone. There was no receive, but Tx was OK. I soon found an IF stage with no volts on it, the voltage coming through a coil. I turned it off and checked the coil with the AVO on ohms. Sure enough it was naff, so I whipped it out. I checked it (for some strange reason) when it was out and it appeared OK. After soldering it back in the rotten thing worked! I was sure that the joints to the coil had been OK and it took a couple of other similar sanity shaking repairs before I caught on.

What happens is that the coil proper, ie the wound bit, is wound with ultra fine wire which is terminated onto the pins inside the can by winding the fine wire round it a few times and soldering. This internal joint is the suspect one and now, older and wiser, I deal with open circuit coils by giving each pin of the suspect winding a ten second burst with a hot iron well before even contemplating the coil's removal. This often cures the aggro because the fine wire is self fluxing, and this method seems to make a good joint to the pin without the hassle of getting the can assembly off the board.

Codar

The Codar Radio Company, in Sussex, is no more. It was in its heyday about fifteen to twenty years ago and produced presentable items of amateur radio equipment of fairly simple design. If you had built most of the stuff yourself, you would be justifiably proud of it. Neat little boxes contained such items as Q-multipliers, RF pre-amps, mobile receivers, transmitters etc.

Although long gone as a company, the products live on as a tribute to solid British engineering. I don't think I've ever seen a circuit diagram of any of Codar's stuff, but you don't really need one, the layout is so straightforward. Some of the products are now available ridiculously cheaply on the secondhand market and may be of use to the amateur on a limited budget.

RF pre-amp

This unit contains a single EF183 valve and can pep life into some receivers. If you own a solid-state, state of the art, all bells and whistles receiver, forget this pre-amp. If you have an older valve receiver it's worth a try, and for one of the receivers without any RF stage at all, ie a mixer/IF/detector/audio line-up, they are ideal. Beware, though, because the Codar RF pre-amp was available in two versions: mains powered and unpowered. With the latter variant you had to provide 6.3 volts for the heaters and a couple of hundred volts or so for the HT. This voltage can often be 'robbed' from the host receiver since its requirements are modest. This unit has a tendency to oscillate, especially if run unterminated. To cure, lower the HT voltage. Its secondhand price is £5 to £7.

Q-multiplier

I'll bet there is a generation of amateurs about today which doesn't know what a Q-multiplier is. In the bad old days people couldn't afford such luxuries as crystal filters, and the selectivity of receivers was gained, with the exception of audio filtering, by the IF coils alone. The Q-multiplier was a device that, basically, relied on an RF amplifier about to break into oscillation. In this condition the resonating coil will exhibit high Q, with consequential narrow selectivity.

The Codar Q-multiplier was only designed for 455-ish kHz, so while ideal for HROs and the like, forget it for anything with an 'odd' IF – viz RA1s and similar. It was quite popular at one time to sharpen up KW2000s on CW. It can be very difficult to connect up, and hell to use (going great guns then suddenly, plop, the damn thing breaks into oscillation and all is lost, often to the accompaniment of howls and screeches), but in their day an economical solution to a difficult problem. Nowadays, again, it can be obtained secondhand for about £5 to £7. Only for masochists.

The AT5 transmitter

Smashing! I can remember as a kid dreaming of owning one. In those days rigs were so big and heavy they could cover a table, and most receivers were bigger than today's transceivers. Codar used to advertise their AT5 transmitter as having a base area half the size of a magazine page, and in those days magazines were smaller than today. Measuring in at 8½ × 5 × 4 inches, and capable of 10+ watts out on 160 and 80 metres AM and CW, they were the business. The bad news was that there was no internal power supply.

Two Codar power supplies were available, a mains one and a 12 volt inverter one. The latter had a tendency to burn out, normally destroying the inverter transformer, which was not a good thing. Remember that you are going to need some form of switching – both aerial change over and 'net' (ie VFO only), 'receive' and 'transmit' – if you are providing your own power supply.

On the subject of power supply, the heaters can be configured for 12 or 6 volts. The power comes into the AT5 via a

B9A plug, and these can be difficult to get hold of at times.

Quite a lot of these rigs were used by naughty people to transmit on the medium wave, and it amazes me that ten plus years after the medium wave pirate craze, at last year's Shuttleworth amateur radio car boot sale they were still surfacing modified to transmit between about one and one and a half megs.

It is no sweat at all to convert them back; normally all that has happened is that the naughty brigade have added capacitors of about 150pF across the VFO, driver and PA coils to tune them down. Snip these capacitors out and it's back to normal, legal operation.

The switch on the back, normally unlabelled, selects CW or AM. Normally this is CW with the slider towards the aerial socket and AM with the slider towards the PSU socket. The big red neon light on the front panel should flash on mod peaks, and is a useful reminder that you have left it in the wrong position. Mikes for this rig should be one of the high impedance crystal types.

A rig that suddenly fails to work has succumbed to the famous AT5 failing of falling out with its VFO valve. This is an EF80, and merely changing it for another example will get it going again. Remember that this dear sweet little rig runs on hundreds of volts and can KILL. Be careful when working inside all valve rigs.

For some reason there is a great demand for these transmitters just now, in fact several recent magazines have even carried 'wanted' adverts. I cannot explain the resurgence in their popularity, but I can give a guide to prices. £15 to £25 will get you a basic transmitter, £30 maximum should get you one with a power supply and, incredibly, I saw one go for £35 with mains and mobile power supplies, switching and harnesses etc. Quite honestly they are of limited value mobile, being big and devouring amps, and AM is all but dead on 160 and 80 metres. However, it's great fun playing with a real valve rig on low power CW. I quite enjoyed using the ex-medium wave one I bought.

T28 receiver

This is a little 12 volt 160 and 80 metre transistorised receiver. Prices seem all over the place for these now, from about £8 to over £20. Never seen a dead one yet, although I've come across some disgustingly filthy ones. Not superbly sensitive, but something to play with.

CR70A receiver

This is a very basic superhet, covering 560kHz to 30MHz. I've had a few letters about the valve line up, so for the record it's ECH81 mixer/oscillator, EF183 IF amplifier, solid-state diode detector. ECC81 first audio and BFO and ECC81 audio output. The rectifier is an EZ80. Drifts like a pig, almost unusable on 20 metres and above on SSB unless an OA1 has been used to stabilise the HT supply to the local oscillator.

The lack of an RF stage makes this an ideal recipient of the RF pre-amp above. The BFO is switched (the actual switch is CW/SSB, then AM, then standby). Since it covers ranges where you would expect to find LSB (below about 10MHz) and USB (above 10MHz) the fact that the BFO is fixed will tell you much about the width of the one IF stage. Also, the receiver suffers badly from second channel, especially above about 12MHz or so (again the pre-amp or an ATU will help). Although only suitable for beginners on a restricted budget, they nevertheless seem to fetch a price well above what I think they are worth. Originally selling for about £20 when new, they still fetch £20 to £25 today, and the number of letters I've had that mention them shows that there are still a number in use.

Common faults are failing valve emissions, no capacity mains smoothing capacitors, and shorted turns on the big, open framed aerial input coil. If this coil is damaged it's fairly easy to straighten out by pushing a scalpel between adjacent turns. One shorted turn here can reduce the set's gain from its normal bad to appalling.

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■ Microwave Modules MM2000 RTTY reader, £100. Corona CD6000AR air band receiver with digital readout, 110.000MHz to 139.995MHz, coverage AM. Also scan facility in 5kHz steps, £80. Both come with full instructions and are 12V dc operated. Alan Batho, 28 Ancaster Court, Scunthorpe, South Humberside DN17 2UF. Tel: Scunthorpe 845735.

■ Cobra 148 GTLDX Mk II, Q5 audio, unlocked, bleep on/off, in executive case, £140 (without case £120) or best offer. Also Trio R1000 Rx, excellent condition, fantastic for mobile use, or base for SWLs, £230. Replies to Mr Mell, PO Box 2, Market Drayton, Shropshire.

■ HW80 .22 air rifle. Tuned, asl 4 × 32 scope fitted. New, never used, will sell or p/ex for BNOS LPM10-100 or BNOS PSU or muTek 2m transverter. Tel: (0743) 67087.

■ Exchange my microcomputer system, multi-tuning, Panasonic RFB600LBE for any scanner covering 25 to 550. Must be mint condition. W J Bannister, 3 Eastbourne Walk, Liverpool 6l LW. Tel: (051) 263 6724.

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■ W538 sets, one pair in working order, C/W mics, headphones, spare valves, photocopy manual, one control box missing, £50 the pair. Might split or exchange for Q-multiplier for 455kHz, HF pre-amp, VHF UHF converters, GDO that covers VHF, or WHY. Pair GPO-type telephones, £6 the pair or exchange radio mags, books etc. Tel: Bob G8ATE on Leicester 392842 after 6pm weekdays, anytime weekends.

■ Drake SPR4 receiver, fitted with all extra boards, ie noise blanker, callibrator, transceive board, RTTY board, plus 33 crystals. Very good condition, cost about £850 when new, would swap for old 51J receiver or WHY. Brian Pollard, 3 Deepdene Mns, Rostrevor Road, London SW6. Tel: 01-736 6581.

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■ Icom SM5 microphone, boxed and unused, suits IC72OA series, £25 post paid. Minox EC miniature 'spy-type' camera, never loaded, includes flash, case, films etc, only £75, postage extra. Tel: 01-472 9058 evenings or weekends.

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■ Panasonic RFB600 LBS/LBE commun receiver, full band, digital readout, direct access, tuning manual, tuning memory, tuning memory scan, zone auto tuning, power ac main, battery 12V dc, as new, boxed. £250. Tel: 01-688 1255.

■ Frequency counter, 10Hz to 600MHz, 8 digit display, four gate times, three ranges. Offers around £85. Also Lowe HF5 10m to 80m vertical aerial with ground plane, offers around £55. Crystal callibrator, 1MHz to 500MHz, £15. No offers. J Carter G1BOF, 19 Hurleybrook Way, Leegomery, Nr Wellington, Shropshire. Tel: (0952) 52126.

■ IC251E transceiver with muTek board, £450. SM5 desk microphone for above, £25. Datong PC1 HF 2m converter, £110. Tono 2m 90G linear amplifier, £115. Microwave Modules 432-28MHz down converter, £25. Heathkit HW202 2m FM, Tx/Rx, 6 channel xtal rig, 20 watts, no crystals, £45. G1GZA QTHr. Tel: Thornbury (0454) 412185.

■ SX200N scanning receiver. 26-514MHz, no gaps, excellent condition, with manual, £180 ono. Smith, 43 Oak Way, Huntley, Glos GL19 3SD. Tel: Glos 831167.

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■ Drake TR5, mint condition, reasonable offers. Tel: (0432) 59056.

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■ FT757GX, scan-mic, manuals, boxed, excellent, £575, prefer buyer inspects, or exchange HF mobile TS120S, FT707 or equiv, plus transceiver for shack with 160m, CW filter if possible. All considered, no rush. G4YSS. Tel: Scarborough (0723) 863137.

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■ CB transceiver storker 9 DX, FM, AM, LSB, USB, good condition, £90. Stereo Hitachi radio cassette recorder, 4 wavebands, large, portable, and record deck, £130. Tel: 01-207 0706.

■ Trio 8400 70cms 10 watt FM mobile transceiver, £150. Yaesu FT720RU 70cms 10 watt FM mobile transceiver, £150. Both radios in mint condition with manuals, boxes and scanning microphones/mobile mounts etc. Tel: (021) 360 5429 or (021) 360 2319 after 6pm.

■ KW2000E complete with PSU, mike, manual, £180, or swap for WPO Alpha SSB transceiver on 160m. G4TQG, QTHr. Tel: Dane End 254 evenings.

■ Heathkit OS2 'scope, £39. Minnimitter low-pass filter, 30MHz, £10. Microphones – AKG, D509, £20. Shure 5885B Unisphere B, £20. Reslo ribbon, £10. Film industries ribbon, £10. Junkers Morse key, £12. Pair of Quad ESL63 loudspeakers, still under warranty, £995. No offers. Pair of Spendor speaker stands, £18. Two Revox A77 power amp boards, £18 each. One A77 record amp board, £15. B J Whitty, 'Fourways', Morris Lane, Halsall, Ormskirk, Lancs L39 8SX. Tel: (0704) 840328.

■ Thorens 160II T table, series III arm, Goldring G900IEC spare tube arm, boards, oak plinth, orig plinth and packing, new, £450 + £260. Will exchange either of the following recorders – Akai stereo auto rev recorder, new, £340 + £135 ono, or Yamaha stereo recorder TC800GL, leather case new, £300 + £125 ono, or exchange for Icom R70, Trio 2000 or similar. Tel: B/stoke 882825.

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■ Trio TS780 2m/70cm multi-mode. As new with manual and orig box, £650.00 ono. G1HBR QTHr Tel: 01-856 6917.

■ Trio R600 receiver 150kHz-30.0MHz as new – two months old. Still boxed, no offers £250. Also 60 channel scanner receiver VHF LO 68.87 – 995MHz FM 88 – 107.95MHz VHF, air 108-136, ham 144-148, VHF HI 138-174 ham 410-450, UHF LO 450-470, UHF HI 470-512, no offers cash only, with both receivers. Tel: Melksham, Wiltshire 705803.

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■ Super Star 2000, 5 bands, blocks of 40. Zetagi linear amplifier B300P. Zetagi SWR power meter, M201. Zetagi hatcher, M27. All in very good condition. £180 the lot. Tel: (0539) 23438 from 6.30pm.

■ Had enough of CB? Get on 11m SSB with my cobra 148 GTL DX 26.065 to 27.990 AM, FM, USB, LSB, CW. Includes CB brand. Join the elite sidebanders on 11 metres. Also freq counter Bremi BRI8100, ATV, Bremi BV131 linear amp, 3 element Yagi beam for 11 metres, ham power meter ROS-4, £250 ono only decent operators need apply. All in excellent condition. R Williams, 53 Claude Road, Cardiff, Wales.

■ 2m 4 ele quad as new, £20. Archerotor as new, £30. AEC 3-way co-ax switch, CX-3, £5. Hall, 4 Tamar Close, Kearsley, Bolton. Tel: (0204) 791179.

■ Trio 2200GX 13ch R0, R1, R3, R4, R6, R7, S16, S18-23, Nicads, charger, ¼λ whip, case, helical leads, manual. All boxed, £80. Microwave Modules 28/144 2m converter, fits any receiver with 10m, £15. Bang and Olufsen reel to reel hi-fi tape recorder, 3sp echo, 3 spools of tape and leads, £60. Between 9am and 2pm. Tel: (0524) 417120.

■ Pye 1955 WS C12 transmitter receiver, ex mod, in brilliant working order, only £60. Also Tasco astronomic telescope with tripod, focal length 700mm, not suitable for land use, £49. E Giacani G1KSW, 26 Langdale Grove, Selby, North Yorks YO8 9BQ.

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■ Collins KWM-2A, vgc, match L/S SM-2 pencil mic, h/book, some spare valves, £350. Buyer to collect. Tel: Peter (0642) 456327. Days only (Cleveland).

■ 1950s Vogue. The unique Bush DAC 10 radio in full working order in superb British bakelite case. Offers invited for this genuine period piece. Tel: (0252) 722144, evenings only.

■ 934 Cybernet Delta 1, as new, £300. Daiwa Search 9 monitor receiver, 9 xtals fitted, £27. CB PSU 13.8V 5-7A, £12. Mike, tel: Saffron Walden 27155.

■ J beam, 10 element parabeam. As new, in use 3 months only, but unsuited to location, £20, no offers. Mr H T Wood, 14 Orpwood Way, Abingdon, Oxon OX14 5PX. Tel: Abingdon 27128.

■ Colt 1200DX FM, USB, LSB, AM, built-in SWR meter, VXO. Also Avanti Astro plane antenna, £100 or part exchange 934MHz CB. Tel: (0947) 604716.

■ AOR2001 communications receiver and accessories, unwanted gift, new unused, £290. Clark. Hythe, Kent. Tel: (0303) 68132.

■ KW2000A transceiver, with power supply, complete with mike and ready to go! Several new valves, including outputs. Many happy hours spent with this good old rig, but circumstances dictate its removal. If you feel you could provide a good home, feel free to phone for further details. £140 or nearest offer. Would prefer buyer to inspect and collect. Eddie Green G0AQI, 53 Holden Road, North Finchley N12 7DP. Tel: 01-846 5554 or 01-445 0528, anytime.

■ Sharp MZ80A microcomputer. Integral screen and data recorder plus expansion unit, together with Sharp P5 matrix printer. All in excellent condition. Tapes and books, £400 ono. Buyer collects. GW6MOB, QTHr. Tel: (0222) 625908, evenings.

■ TAU SPC3000 3kW ATU, superb, £195. Yaesu FT290 plus muTek mobile brkt, Nicads, 30 watt linear, £250. Tel: (0462) 813235 or 811930.

■ Mast, two section, 40ft galvanised, good condition, self-supporting, buyer collects. Offers. Contact Chris G1DQN. Tel: 01-841 2862.

■ Free electronic bits and pieces, transistors, resistors, diodes, wire, pots, capacitors. But it's pot luck. Just send 3 12p stamps for post/packing by post only. D Martin, 6 Downland Garden, Epsom, Surrey KT18 5SJ.

■ Mint, boxed, copy *Manual of Modern Radio* by John Scott Taggart, 1933 edition. Offers or WHY? N M Barrowman, 33 Burntbroom Gardens, Glasgow G69 7NB. Tel: (041) 771 6302.

■ Trio TS130V 10 watt 8 band HF transceiver in immaculate condition, complete with unused mobile mounting bracket, workshop manual, etc, £365. Yaesu FT708 and FT208, both perfect and complete, £160 each. Remote LS/mike and PA3 unit may also be available. Telephone G3KLF on Fareham 236906.

■ Icom 2 metre hand-held IC2E speaker/mike, charger, spare battery, £180. Sait marine gen/cov prof Rx digital readout, £325. Racal RA17 with SSB adaptor, £275. Hammarlund SP400SX complete, £150. Marine Callbuddy Tx/Rx 2182kHz, £90. All in fbc and inc handbooks for Sait and Hammarlund. (Purley, Surrey). Tel: 01-660 0794.

■ 20MHz dual trace scope, HP, vgc, £70 ono. Aircraft band converter, 118/24, £20 ono. Cassette head de-magnetiser, £5. Buyer collects, will sell separately. Tel: (031 229) 7012, office hours. Ask for Tommy.

■ Microwave Modules 2m linear amp, MML144/100S, £95. Tel: (0926) 498388.

■ HRO with PSU and eleven coil packs. Offers to GW1PNH (Alex). Tel: (0792) 299342.

■ FAX: Rank Xerox telecopier 400 with paper, £20 or nearest offer. Casio FAX80, as new with paper, £40 or nearest offer. Buyer to collect please. Tel: 01-845 4008 (Ruislip).

■ President Grant transceiver FM/AM, USB/LSB, £120. Trio 9R/59DS communication receiver with Yaesu FRT7700 ATU, £95. Frequency counter, £30. Sadelta Echo Master mic, £40. Nevada pre-amp, £10. Power pack, £10. SWR FS-meter, £15. Bremi BRL200 linear, £40. Tel: Scunthorpe 854424.

■ Cobra 148GTL, £95. Hy-gain 5, offers. FRG7000 digital read, also clock, £250. Slim Jim, offers. Tel: (0283) 221870.

■ Yaesu YO901 with bandscope, £120 ono. FTV901R 2m transverter, £130 ono. FV901DM VFO, £130 ono, or all for £360 ono. All in good condition with manuals. Buyer collects. Tel: 01-471 0669 after 5pm, ask for Danny.

■ Yaesu 901DM HF tcvr, all options, fan, FM, VOX, speech processor, Curtis keyer etc, mint, boxed, manual, £550 ono. Kenwood AT200 aerial tuner, £90. Swap for BMW motorcycle or may take 2m SSB p/ex. Brian G4ZPA. Cosham, Hants. Tel: (0705) 370576.

■ Ham International Concorde 26.965-28.305, all mode, £60. Power mic, SWR meter, antenna matcher, pre-amp, £15, or £70 the lot. Complete colour/bw darkroom, cost £250, accept £100 or exchange either above for 2m linear or 2m beam and rotator or 70cm transverter, or exchange all above plus Realistic DX302 gen coverage receiver and AMU for HF transceiver. Contact Ian GM1RSV. Bonnybridge. Tel: (0324) 813300.

■ Complete electronic RTTY terminal: comprises Radsoft terminal/interface, Video Genie computer, fully featured transceive unit, does all speeds, all shifts, split screen, Morse ident, scroll back, ten memories, auto callsign capture and message sending, type ahead buffer. Cost £400 new, £99. AR40 rotator, £40. Transformer 230V input, 850V at 480mA, 315V at 350mA, £12.50. TV game, £7.50. Pioneer TS22A car stereo speakers, 20W each, £15. Shaun G8VPG, 15 Witney Close, Saltford, Bristol BS18 3DX. Tel: Saltford 3098.

■ UHF TV aerial for caravan, boat or lorry, £12. Stereo amplifier, 30 watts per channel, made by Leak, £45. 8 track cartridge player, £10. Various cartridges, £1.50 each. Some records, various prices, punk bands, etc. Tandy scanning receiver, crystalled for two metres, R1, R2, R7 repeaters, £45. Mike, 14 Doverfield Road, Brixton, London SW2 5NB. Tel: 01-674 0513.

■ Trio AT230, mint, £123. DX160 gen/cov Rx, 15-30MHz, SSB/CW, AM, £31. Altai GDO KDM-6, mint, £47. Supertester 680G multimeter, 20KΩ 1V, also measures capacitance, reactance, decibels, bargain £19. PW ZX81 programs 1 and 4, £2 each. Altai mono headphones, 2000Ω, model OH-10, £3. Miranda chassis punch set, new, size 16, 18, 20, 25, 30mm, £8. All ono, prefer buyer collects or carriage extra. Tel: (021) 777 6086.

■ Trio-Kenwood TS-120V, 10 watts Tx/Rx, TL-120 linear (100W), DFC230 digital VFO (4 mem), AT120 ATU, SP120 ext speaker, VFO-120 (EX-VFO), PS 30 (20 amp) power supply, MC50 de-luxe dual-impedance mic, TS7800 25 watt Tx/Rx (15 mem), Midland twin-meter SWR bridge, all leads and cables. All equipment in mint condition. No modifications! All to be sold as one matched unit. £750. Tel: (08874) 329. Perthshire.

■ Five AR88D knobs, £3. Multi-screened cable, 57ft 12 coded-wires, about 20G PVC covered 9/16in dia, £4. FT101B CCT diagram plus new coil T107 5MHz trap, £3. Meter 500μA round 1½in dia, £3. Radiospares 50W auto-transformer, tapped mains to 115V, £4. TR1986 new modulator, small unit EF92, EL91, pair 6C4 with circuit for FM mod, £4. Vibrator, Plessey, 7 pin for early power pack, £3. Ross mains unit 240V ac to dc 3, 4.5, 6, 7.5, 9, 12V at 500mA, universal plug, £5. New headphones, communication type, black, 300Ω, £7. Pocket barometer, altimeter, feet, inches. Mountain climbing Japanese, new, £6. Ceramic stand-off insulators, brown, 3in tall, 2in base, £2 each. Pye marine grey battery box, takes 8 U2 (12V), £5. Valve xtal converter to obtain 160m on 80m receiver tuning, £4. Valves, 6GM6, 150B2, 6EW6, £2 each. Tel: Bury St Edmunds (0284) 60984.

FREE CLASSIFIED ADS

■ Ham International Major, just serviced, £75 ono. Alan. Tel: Longworth 820553.

■ Realistic PRO2002 30 channel scanner receiver. Covers VHF-HI, VHF-LO, UHF-HI, UHF-LO, 12V dc mains operation, £125 ono. Stuart Thompson, 118A Albyn Road, Deptford, London SE8 4ED. Tel: 01-692 0944.

WANTED

■ Info on valves used in Taylor model 65B signal generator, mfrd in 1940s. Tel: Wolverhampton 20636.

■ Power supply unit for WS C12 ex MOD Tx/Rx wanted, 12V or 24V input. Must be in good working order, will pay for mail delivery and good money paid for good condition. G1KSW, 26 Langdale Grove, Selby, North Yorks YO8 9BQ.

■ FT101 frequency readout unit, FM board also for FT101. Also 3 element triband beam. Good price paid for good condition units. Trevor Barry, 26 Gatcombe Road, Hartcliffe, Bristol BS13 9RB. Tel: (0272) 642867.

■ Could anyone with knowledge of TV help me get a dead set working again? I have to get it going before I can set up my radio. I will pay post and send full details by post only. D Martin, 6 Downland Garden, Epsom, Surrey KT18 5SJ.

■ Shure 444 microphone. Also HF SWR/power meter. P Smith, 3 Raven Avenue, Tibshelf, Derbyshire DE5 5NR.

■TS820S in mint condition with all filters. Handbook for Plessey Rx, type PR155G, or photo Pcopy. Handbook for Marconi oscilloscope TF2201 with TB TM6967 and amplifier TM6971. G I Sydenham. Tel: (0502) 715419. 41 Alexandra Road, Beccles, Suffolk NR34 9OD.

■ Collins 51J-2 receiver manual and or circuit diagrams wanted. Buy or borrow for copy all expenses paid. Mr E Turner, 70 Cleaswell Hill Guide Post, Northumberland NE62 5DY.

■ Help! we need a Bird thruline watt meter for our contest group. Also elements for VHF and UHF – 500W. There must be a few lying round somewhere! We are desperate. Money waiting. Ron Bentham G4SHC Tel: (0706) 350748.

■ 4GHz satellite TV down converter/LNA. Home made will do but must be reasonable price. Also gaAsFETs, head units, plumbing etc, considered. Philip Lane, Springfield Lampeter Road, Aberaeron, Dyfed SA46 0ED. Tel: (0545) 570162.

■ Superstar 360 or Cobra 148 for conversion to ten metres, must be in very good condition. Also wanted, 70cms multimode in very good condition. G0BUK. Tel: Hastings (0424) 751960.

■ Yaesu SP107P speaker with phone patch, FC107 aerial tuner, (grey), Yaesu monitor scope, Yaesu HF linear amp, what have you? Cash waiting. Chris Lorek G4HCL, 11 Bevills Close, Doddington, March, Cambs PE15 0TT. Tel: (0354) 740672 anytime.

■ Any spares for AR88D: valves, transformers, etc also receiver handbook. J Edwards, Beeches Coach House, Burton Hill, Malmesbury, Wiltshire SN16 0EE.

■ Microwave Modules transverter, 28MHz to 144MHz, 70cm or 23cm plus 15dB attenuator. Have FDK700 2m FM 25W output, Eddystone 770R covers 19-165MHz, AM, FM, SSB/CW, and Cybernet B3000 CB rig and service manual. All for part exchange. Tel: (0269) 822325 evenings, and ask for Richard.

■ Aerial tuning unit for SOKA747 in exchange for Scarab MPTU1 RTTY and program for BBC computer. Please tel: (0694) 722131. Emilio G0CYQ.

■ Wanted by SWL – either Trio R300 or Realistic DX200 receiver. Please write with details and price to: Ted Kimber, 1 Moorlands, Bishops Lydeard, Taunton TA4 3PG.

■ Cushcraft A147-20T or A144-20T cross Yagi required urgently, imperative new, boxed and unassembled. New, boxed and unmodified Icom 1050 transceiver also required. Tel: 01-472 9058 evenings or weekends.

■ Cushcraft A147-20T or A144-20T cross Yagi required urgently, imperative new, boxed and unassembled. New, boxed and unmodified Icom 1050 transceiver also required. Tel: 01-472 9058 evenings or weekends.

■ Service data required for: Airmec wave analyser type 248, TV Rank International BC8318, Heathkit single side band converter, model SB10U, Victor 16mm sound projector. Robins, 290 Priory Road, St Denys, Southampton SO2 1LS.

■ Yaesu FL-DX2000 linear amplifier, good working order preferred but will consider non working. Also workshop and operating manuals required for Yaesu FR400 and FL400. Reasonable price please. Mr M Jones, 11 Shaymoor Lane, Pilning, Nr Bristol, Tel: Pilning 2701.

■ Circuit and/or handbook for Heathkit model FM4U and SD1. Send price to Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL21DA.

■ Trio TR7930 VHF mobile transceiver wanted, must be in mint condition. Tel: Colchester 394336 (evenings) Essex.

■ Racal Syncal 20 watt transceiver, good condition – sensible price. BJ Whitty, 'Fourways', Morris Lane, Halshall, Ormskirk, Lancs L39 8SX. Tel: (0704) 840328.

■ Marconi TM9954 log amp, AR88 receiver table mounting cabinet, AR88 S-meter, Marconi TF2172 HF amp. Tel: Winchester (0962) 56064.

■ Elderly gent new to SWL requires the following books or any relevant literature, and maps etc: *Complete Shortwave Listeners Handbook – Shortwave Listeners Antenna Handbook – How to Pass RAE – Morse Code for Radio Amateurs – RSGB Amateur Radio Call Book.* Mr Ken Harse, 31 New Road, Woodstock, Oxon OX7 1NZ.

■ Xtals for Realistic PRO47 patrolman scanning receiver, 68 – 88MHz, 144 – 174MHz, 430 – 490MHz. Also Yaesu FL2100Z, Yaesu FC707. Please tel: (0202) 734586 B/mouth.

■ Trio TS700S must be perfect with original packing and manual. Contact Graeme Wormald G3GGL, 20 Sandbourne Drive, Bewdley, Worcs. Tel: (0299) 403372.

■ 11 metre SSB operator requires an FT101ZD MK111. Must be crystalled for 11 metres, and if possible 45 metres 6.5MHz. Also PDL11 beam antenna for 11 metre band 26.000 – 27.999MHz. Willing to pay up to £450. Apply to R Williams GW11DX, 53 Claude Road, Cardiff, Wales.

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ADVERTISERS INDEX

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	£66.00	£62.00	£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
Jan 86	26 Nov 85	4 Dec 85	6 Dec 85	26 Dec 85
Feb 86	2 Jan 86	8 Jan 86	10 Jan 86	30 Jan 86
Mar 86	30 Jan 86	5 Feb 86	7 Feb 86	27 Feb 86
Apr 86	27 Feb 86	5 Mar 86	7 Mar 86	27 Mar 86

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
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.
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SPDT 68p SPST 65p
DPDT 72p
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SPST On/Off Plate 48p
DPDT On/Off Plate 58p
Miniature DPDT Slide 15p
Push-To-Make 28p
Push-To-Break 25p
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1 pole 12 way, 2 pole 6 way, 3 pole 4 way, 4 pole 3 way 50p

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Total: 730 resistors ONLY £7.95
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4007	0.24	4024	0.49	4040	0.58
4011	0.23	4025	0.24	4042	0.48
4012	0.24	4027	0.44	4043	0.42
4013	0.35	4028	0.44	4044	0.48
4014	0.58	4029	0.73	4046	0.58
4015	0.58	4030	0.33	4049	0.38
4016	0.38	4031	1.28	4050	0.34
4017	0.54	4033	1.25	4051	0.68

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LS14	48p
LS15	24p
LS20	24p
LS21	24p
LS22	24p
LS30	24p
LS32	24p
LS37	24p
LS74	33p
LS122	58p
LS138	44p
LS139	58p
LS151	70p
LS155	550p
LS157	45p
LS158	58p
LS160	62p
LS161	68p
LS162	70p
LS163	68p
LS166	1.56

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AC127	0.28	BB105B	0.30	BC184L	0.10	BD136	0.26	BF183	0.32	BFX87	0.44	BY122	0.60	OA202	0.10	IN5408	0.19
AC128	0.30	BB105G	0.48	A B or C	0.10	BD137	0.28	BF184	0.30	BFY50	0.22	BY126	0.10	OC26	2.65	IS920	0.07
AC128K	0.34	BB110B	0.42	BC207	0.15	BD138	0.30	BF185	0.28	BFY51	0.22	BY127	0.08	OC28	3.15	2N697	0.55
AC141	0.58	BC107	0.10	BC208	0.45	BD139	0.30	BF194A	0.15	BFY52	0.22	BY133	0.08	OC35	4.75	2N706A	0.20
AC141K	0.38	A or B	0.12	BC212	0.10	BD140	0.28	BF195	0.12	BFY90	0.80	BY135	0.35	OC36	2.75	2N2904	0.48
AC142	0.56	BC108	0.10	A B or C	0.10	BD144	1.62	BF200	0.30	BFY90S	1.34	BY164	0.45	OC42	0.72	2N2926G	0.14
AC142K	0.38	A B or C	0.12	BC212L	0.09	BD145	1.82	BF222	0.38	BR100	0.25	BY179	0.56	OC44	0.72	2N3053	0.30
AC151	0.45	BC113	0.42	A B or C	0.10	BD150A	0.68	BF224	0.20	BR101	0.40	BY182	0.80	OC45	0.68	2N3054	0.60
AC152	0.45	BC114	0.12	BC213	0.10	BD160	1.58	BF224J	0.20	BR103	0.50	BY184	0.38	OC71	0.60	2N3055	0.65
AC176	0.30	BC115	0.12	A or B	0.10	BD165	0.45	BF240	0.30	BRY39	0.50	BY187	0.65	OC72	0.70	2N3702	0.12
AC176K	0.44	BC116	0.12	BC213L	0.10	BD183	0.70	BF241	0.30	BRY56	0.42	BY189	6.75	OC81	0.68	2N3704	0.12
AC187	0.28	BC117	0.22	A or B	0.10	BD201	0.52	BF244	0.34	BSX19	0.32	BY198	0.64	OC200	2.46	2N3708	0.12
AC187K	0.38	BC118	0.16	BC237	0.11	BD202	0.57	BF244A	0.30	BSX20	0.30	BY199	0.72	ORP12	0.85	2N3772	2.65
AC188	0.28	BC119	0.28	BC238	0.14	BD204	0.57	BF244B	0.28	BSX59	0.78	BY206	0.14	R2008B	1.20	2N3773	2.80
AC188K	0.38	BC125	0.14	BC239C	0.16	BD222	0.80	BF257	0.22	BSX76	0.65	BY207	0.16	R2010B	1.20	2N3904	0.20
ACY41	0.90	BC140	0.27	BC251	0.14	BD225	0.40	BF258	0.26	BT100A/02	0.90	BY210/400	0.21	TIC44	0.38	2N3906	0.20
AD142	0.80	BC141	0.26	A B or C	0.14	BD232	0.45	BF259	0.30	BT101/300	2.75	BY210/600	0.24	TIC45	0.45	2N5294	0.80
AD143	0.88	BC142	0.24	BC301	0.30	BD234	0.30	BF262	0.34	BT101/500	3.25	BY210/800	0.28	TIC46	0.48	2N6107	0.80
AD149	0.72	BC143	0.26	BC302	0.30	BD235	0.30	BF263	0.38	BT102/300	3.60	BY227	0.22	TIC47	0.70	2SB337	1.80
AD161	0.42	BC147	0.18	BC303	0.30	BD236	0.38	BF270	0.30	BT106	1.15	BY228	0.46	TIC106A	0.95	2SC1172Y	1.70
AD162	0.52	A or B	0.14	BC307A	0.18	BD237	0.38	BF271	0.28	BT108	1.25	BY238	0.65	TIP30A	0.35	2SC1279	0.50
AD161/162	1.20	BC148	0.10	BC323	0.90	BD410	0.76	BF273	0.22	BT109	1.15	BYX10	0.20	TIP31C	0.39	2SC1306	0.92
AF114	1.20	A or B	0.12	BC327	0.16	BD434	0.58	BF274	0.34	BT116	1.20	BYX36/150	0.40	TIP32	0.35	2SC1307	1.50
AF115	2.10	BC149	0.10	BC328	0.16	BD438	0.58	BF324	0.46	BT119	3.30	BYX36/600	0.48	TIP32C	0.40	2SC1413A	2.70
AF116	2.10	BC157	0.12	BC337	0.12	BD439	0.85	BF336	0.32	BT120	3.50	BYX48/300	0.70	TIP33A	0.55	2SC1444	1.40
AF118	1.85	BC158	0.12	BC338	0.12	BD507	1.05	BF337	0.28	BT121	2.99	BYX56/350	0.26	TIP34A	0.70	2SC1507	0.60
AF121	0.56	BC159	0.12	BC350A	0.24	BD518	0.88	BF338	0.28	BT138/600	1.30	BYX55/600	0.30	TIP41C	0.46	2SC1678	1.00
AF124	0.42	BC160	0.30	BC440	0.36	BD520	1.20	BF363	0.35	BTY79/400R	2.80	BYX71/600	1.18	TIP42A	0.44	2SC1758	0.68
AF125	0.58	BC161	0.30	BC441	0.40	BD699	1.89	BF367	0.24	BU100A	2.30	BYZ12	0.78	TIP47	0.42	2SC1909	1.20
AF126	0.58	BC168B	0.20	BC461	0.58	BD707	0.74	BF371	0.27	BU104	1.80	C106D	0.48	TIP110	0.60	2SC1923	0.30
AF127	0.38	BC169C	0.12	BC547	0.12	BDX18	1.60	BF422	0.20	BU105	1.20	E1222	0.32	TIP2955	0.70	2SC1945	2.88
AF139	0.40	BC170	0.16	BC548	0.12	BDX32	1.48	BF450	0.38	BU105/02	1.55	E5024	0.30	TIP3055	0.58	2SC1953	0.70
AF178	2.28	BC170B	0.16	BC549	0.10	BF115	0.32	BF457	0.36	BU108	1.75	GET872	0.60	TIS43	0.88	2SC1957	0.70
AF239	0.50	BC171	0.10	BC550	0.10	BF117	0.50	BF458	0.37	BU124AE	0.90	ITT2002	3.34	TIS88	0.30	2SC2028	0.73
AF279S	1.40	BC171	0.14	BC550C	0.10	BF119	0.82	BF459	0.35	BU126	1.40	MEU21	0.62	TIS90	0.27	2SC2029	2.70
AL100	5.40	A or B	0.08	BC557A	0.10	BF120	0.38	BFR51	0.36	BU133	1.40	MJ400	1.45	TIS91	0.25	2SC2078	1.05
AL102	4.40	BC172	0.16	BC558	0.10	BF125	0.42	BFR61	0.32	BU204	1.30	MJ2955	1.00	ZTX107	0.14	2SC2091	0.70
ASY80	5.20	A or B	0.12	BCX34	0.29	BF127	0.44	BFR90	0.86	BU205	1.30	MJ3000	1.80	ZTX212	0.28	2SC2098	2.90
AU110	2.80	BC177	0.24	BCY70	0.18	BF154	0.23	BFT41	0.68	BU206	1.50	MJE340	0.46	IN4001	0.04	2SC2122A	3.20
AY102	4.32	BC178A	0.30	BCY71	0.17	BF157	0.46	BFT43	0.38	BU208	1.40	MJE371	0.85	IN4003	0.05	2SC2166	1.20
BA110	0.68	BC182	0.10	BCY72	0.16	BF158	0.30	BFW11	0.84	BU208A	1.40	MJE520	0.44	IN4004	0.05	2SC2314	0.80
BA121	0.42	A B or C	0.09	BCZ10	3.21	BF160	0.23	BFW44	0.88	BU208/02	2.05	MJE2955	1.60	IN4006	0.07	2SC2335	1.50
BA129	0.38	BC182L	0.12	BCZ11	2.60	BF167	0.32	BFX29	0.28	BU326S	1.75	MJE3055	1.40	IN4007	0.07	2SK134	3.80
BA148	0.16	A B or C	0.09	BD124P	0.70	BF177	0.42	BFX30	0.40	BU407	1.10	OA47	0.10	IN4148	0.04	2SK135	3.80
BA154	0.12	BC183	0.10	BC130Y	0.68	BF178	0.26	BFX80	6.46	BUX80	3.70	OA90	0.07	IN5400	0.12	3N211	3.52
BA155	0.12	A B or C	0.10	BD131	0.36	BF180	0.27	BFX84	0.28	BUY20	2.75	OA91	0.07	IN5402	0.13	3SK88K	0.60
BA157	0.28	BC183L	0.10	BD132	0.36	BF181	0.27	BFX85	0.35	BUY69A	2.60	OA95	0.12	IN5405	0.16		
BA164	0.14	A B or C	0.10	BD135	0.26	BF182	0.32	BFX86	0.44	BUY69B	1.98	OA200	0.06	IN5406	0.17		

ALL SERVISOL PRODUCTS

	Posted
Switch Cleaner	1.18
Circuit Freezer	1.34
Foam Cleanser	1.16
Aero Klene Silicone Grease (Aerosol)	1.42
Antistatic Spray	1.18
Plastic Seal	1.28
Excel Polish	1.12
Fire Extinguisher 640g	3.06
Video Head Cleaner	1.06
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LM317K	3.50

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3x2x1"	0.35
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4x3 1/2	0.70
4 1/2x4x1 1/2"	0.83
6x4x2 1/2	1.15
8 1/2x5x3 1/4"	2.15

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