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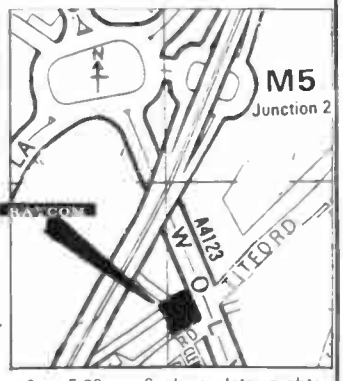

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Sony ICF-SW1 short wave receiver

PUBLISHER'S ANNOUNCEMENT

You may have noticed that Amateur Radio's cover price has increased. This has been made necessary because of continually increasing paper and production costs.

As we are publishing a very specialised magazine, appealing to a dedicated band of readers, we are subject to higher unit production costs than other magazines of more general appeal.

Our research indicates that the magazine content is what you have asked for, so in order to continue publishing Amateur Radio for you, we need to charge an economic cover price.

I hope you continue to enjoy the magazine.

Best wishes

Peter Williams
Publisher

SERVICES

SONY ARE JUST 1 OUT OF 131 COMPANIES WHO CLAIM TO HAVE THE WIDEST RANGE OF SHORTWAVE RADIOS.

Don't worry, Sony haven't stooped to making bogus claims.

The companies opposite are all those who stock our shortwave radios.

As you can see, the widest range of shortwaves is only available in a narrow range of shops.

This might give you the impression that they're fairly exclusive.

Far from it.

With prices between £69.95 and £299.95, Sony shortwaves cater for everyone, from the everyday business traveller to the most demanding enthusiast.

At one extreme you'll find the ICF 5100.

It may look like the standard tranny found in most people's kitchen. It's as easy to use as your average tranny. But don't let that fool you.

A flick of a dial and Radio 1 is replaced by stations from every corner of the World (and the top, bottom and sides as well). To reduce interference it has a dual conversion circuit, a feature usually reserved for the most expensive models.

Speaking of which, at the other extreme is the ICF 2001D.

It does everything an enthusiast could want. And quite a few things he didn't know he wanted but will soon swear he couldn't do without. Like a synchronised detection system for instance, something you'd only expect in professional equipment.

You'll even find the World's smallest shortwave radio, the ICF SW1.

Slightly larger than a cassette box, it's just what you need when you wake up in a strange hotel room in Papua New Guinea, and feel a hankering for the news back home.

Whether it's a simple case of homesickness you want to cure, or an advanced case of 'enthusiast's fever', Sony shortwaves are the answer.

For a free trip around the World (well, its radio stations anyway), ask your nearest Sony Shortwave Centre for a free demonstration.

SONY.

London: SKB Limited, Video & Audio, 100 Ballards Lane, Finchley, London N3 2DN.

Edgware Electronics Centre, 194 Edgware Road, London W2.

Harrods Ltd., Radio & TV Dept., Brompton Road, Knightsbridge, London SW1X 7XL.

Knightsbridge Electronics, 155 Knightsbridge, London SW1 7PA.

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Westminster Audio, 169 Piccadilly, London W1.

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Spatial Audio & Video, 29 Tottenham Court Road, London W1P 9RE.

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David Ingram (Hi-Fi Centre), 42-43 Lower Marsh, Waterloo, London SE1.

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Southern England: Suttons Limited, Bournemouth Sony Centre, The Quadrant, Bournemouth BA1 2AB.

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Nicholls Bros., 82 High Street, Braintree, Essex.

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Whitstable Teleradio, 75 Biggin Street, Dover, Kent.

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South Midlands Communications, SM House, School Close, Chandlers Ford Ind. Estate, Eastleigh, Hants. SO5 3BY.

Barretts of Canterbury, 1 Rose Lane, Canterbury, Kent.

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Tru-Fi Sound & Vision, 2 Central Parade, London Road, Redhill, Surrey.

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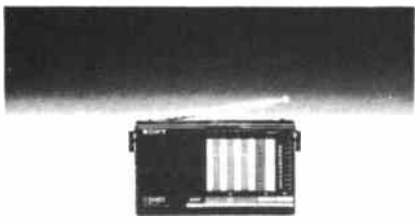
ICF SW1



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Waters & Stanton Electronics, 18/20 Main Road, Hockley, Essex.

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Merrow Sound, 34 West Street, Horsham Sussex.

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Tape Recorder & Hi-Fi Limited, Weston Sony Centre, 4 Waterloo Street, Weston-Super-Mare, Avon.

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Ray Withers Communications, International House, 963 Wolverhampton Road, Oldbury, W. Midlands.

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Jones of Oakwood Limited, Wakefield Sony Centre, 35 Cross Square, Wakefield, W. Yorks.

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Williams Electrical Shops, Sheffield Sony Centre, 955 Ecclesall Road, Banner Cross, Sheffield S11 8TY.

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Radiocraft Sonus Ltd., 231 High Street, Swansea SA1 1NY.

Tele-Electrical Services, 9 The Brackla Street Centre, Bridgend, Mid. Glamorgan CF31 1DD.

Northern Ireland: F. Rea & Co., 24-30 Chichester Street, Belfast, Northern Ireland.

Laser Electrical Ltd., Unit 3, Abbey Trading Estate, Newton Abbey, Northern Ireland.

Audio Times, 85 Royal Avenue, Belfast, Northern Ireland.

Channel Islands: Reg Mauger (Sales) Ltd., 20 Halkett Place, St. Helier, Jersey, C.I.

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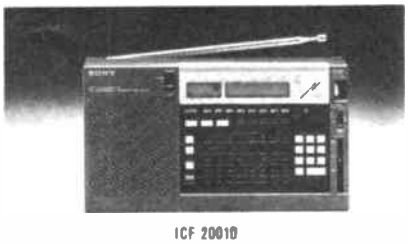
ICF 7600DS



ICF 2001D

STRAIGHT & LEVEL

NEW CATALOGUES

Maplin's 1989 catalogue contains over 500 new products and hundreds of price reductions in its 550 pages.

Products highlighted include a new range of toggle switches and relays, a miniature loudspeaker, a collection of speakers and sounders including an extra loud multi-tone Piezo buzzer. Many Maplin projects are now available ready-made.

The Maplin 1989 Buyer's Guide to Electronic Components costs £1.95. It is available from Maplin Mail Order, Maplin Stores or W H Smith. As an introduction to the new range of cassette tapes, every buyer of the catalogue can send for two free C60 ferric tapes or one C60 chrome tape.

The 1988/89 Winter Edition Cirkit Constructors' Catalogue has 184 pages featuring a wealth of new products for the electronics constructor.

Included for the first time in the publication's 3,000+ product lines are new scanning receivers, offering an extended frequency range and an increased number of channels. Also new are a 2m transceiver of ergonomic British design and an 8-channel logic probe, a 2.4GHz frequency counter and the latest Loadstar RF and AF signal generator with LED frequency counter.

Among the additions to Cirkit's components range are bigger selections of capacitors, connectors, knobs, semiconductor switches and tools.

Once again the catalogue carries discount vouchers for use with pre-paid orders, and by popular demand there is another competition offering rich rewards for the sharpest-eyed readers. First prize is a Loadstar RF signal generator, second and third prizes an Easiwire prototyping kit, fourth and fifth prizes are useful miniature analogue multimeters.

Another attraction is a construction project challenging readers of all ages and vocations to build their own prog-

rammable frequency generator.

The catalogue costs £1.30.

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

STC Instrument Services has produced its first full-colour catalogue which features a large selection of products from over sixty-five leading manufacturers.

The 320-page publication highlights several new products including the Marconi 893B AF Power Meter; the HEME International 2000L current clamp meter; the Keithley 197 autoranging microvolt digital multimeter; the Advance Bryans 2020 photoplotter; the Voltech frequency response analyser; the Hitachi VC6265 digital storage oscilloscope; the Coutant VME Eurocard power supplies; the Megger BM200 Series insulation testers; the Fluke 8840A/8842A digital multimeters and the DR Series dc/dc converters from Computer Products.

Of particular significance are the Siemens PC instrument range, complete with sophisticated yet simple-to-use software and the Wayne Kerr products, as both manufacturers appear in the catalogue for the first time.

Copies of the catalogue are available free of charge.

For further details contact: *STC Instrument Services, Dewar House, Central Road, Harlow, Essex CM20 2DF. Tel: (0279) 641641.*

LINEAR POWER SUPPLY

The TS-1541S is a laboratory quality linear power supply with remote sensing, able to provide 0 to 4 amps at 0 to 15 volts.

Dual 0.5in 3.5 digit liquid crystal displays simultaneously display output voltage and output current. With the output switch off the display can be used to pre-set the output voltage and current limit prior to connection of the load. The power supply operates in constant current or constant voltage modes with automatic crossover. A display annunciator indicates constant current mode.

Coarse and fine controls permit the output voltage to be set within 5mV, and the current limit control is logarithmic to give good resolution at low current settings. The output is protected against forward and reverse voltages.

Load and line regulation are better than 0.01% with ripple and noise typically better than 1mV. Linear operation and the use of LCD meters ensure that RFI and interference generated by the display are minimised.

The power supply has a steel case, rubber feet, integral mains lead and is priced at £165.00 + VAT.

For further information please contact: *Thandar Electronics Ltd, 2 Glebe Road, Huntingdon, Cambridgeshire PE18 7DX. Tel: (0480) 412451.*

SURGE ARRESTOR

New from Rendar is the Spikemodule, a new throw away device which protects against power line overloads.

Spikemodule plugs into an available socket in any IEC-320/CEE22 power distribution system and absorbs lightning induced surges up to 4500A, equivalent to 75J. It also controls constant excessive surges in the line. If these reach an unacceptable level a small panel on the component body changes colour, indicating that the unit is

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

inoperative and requires replacing.

Operating voltage is 250VAC, frequency 50Hz. Maximum continuous power rating is 0.6W, maximum peak current 4500A. Response time is 25ns.

For further information contact: *Rendar Ltd, Durban Road, South Bersted, Bognor Regis, West Sussex PO22 9RL. Tel: (0243) 825811.*

WP FOR THE BLIND

Word processing is now a practicality for the visually handicapped, whether or not they have braille or keyboard skills.

The Soundwriter, developed by GTL of Fareham, Hants, utilises an adaptation of Morse code as an interface between keyboard and operator so that the blind are able to produce written text for sighted people.

Only nine keys of the full 'QWERTY' keyboard are required to operate the system – the basic 'dit' and 'dah' of Morse and a combination of 'command' and the other keys to provide word processing features (word wrap, word search, file handling, punctuation, tabulation and editing including block text moves).

GTL field trials indicate that Morse can be mastered quite easily and the Soundwriter package includes a full audio taped training programme.

Editing of material is achieved aurally; in Morse for text and an extensive range of sound signals to inform the user of punctuation, page layout, command functions and errors.

Although the system has been kept simple for the visually handicapped to operate, it can readily be integrated into the sighted person's office environment as it retains its original word processing capabilities.

The Soundwriter comes complete with processor and printer and is compatible with domestic TVs. It is priced at £880.00.

For further information contact: *Gravatom Technology Ltd, Portsdown House, West Street, Fareham PO16 0EF. Tel: (0329) 285827.*

SHORT WAVE CENTRES

Sony has nominated 100 dealers around the country as short wave specialists. They will lead the push into this underdeveloped market with a complete range of exciting products.

'We feel there is enormous potential to the market and the best way to lead the drive to increase public awareness of short wave listening is to create a partnership with the most active radio outlets in the form of Sony short wave centres,' says Yoshi Nagayama, Radio Marketing head at Sony(UK).

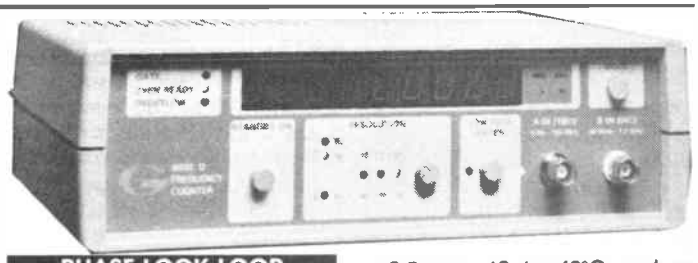
Sony currently has a range of ten short wave radios, priced between £69.95 and £299.95 and targeted to appeal to the business traveller through to the short wave enthusiast.

Special sales and technical training courses will be given to the staff of the nominated dealers. See pages 4 and 5 of this issue for a list of the short wave centres.

NEW BOOK

A new book entitled **Practical Ideas for Radio Amateurs** (ISBN 0-85242-917-7) has been recently published by Argus Books. Written by Ian Poole G3YWX, a well-known author and regular contributor to ***Amateur Radio,*** it gives a wealth of practical ideas, hints and tips about amateur radio. It is split into chapters about the shack, aerials, components, constructional techniques, circuits and testing and it covers most aspects of the hobby which are likely to be encountered by the average enthusiast. At the back of the book there are three appendices covering formulae, conversion tables, and useful data.

The book is available from bookshops and amateur radio dealers priced £5.95. Alternatively it can be obtained directly from the publishers: *Argus Books, PO Box 901, Sudbury, Suffolk CO10 6FR.* Allow 60p for p&p.



PHASE-LOCK LOOP

An updated version of the Model 6002D 1.3GHz frequency counter is now available from Global Specialties.

The inclusion of a phase-lock loop means that low frequencies up to 10kHz can be measured to an accuracy within 0.01Hz in a time of one second.

Three frequency modes are featured, with period A providing measurement from 1μs to 200ms. A 10MHz oven crystal oscillator time-base is also included, ensuring temperature stability of ±0.5ppm, 10 to 40°C and an ageing stability of 1ppm per year.

Input A is able to accept signals from 5Hz to 100MHz with an impedance of 1Mohm/20pF. Input B accepts signals from 80MHz to 1.3GHz with a 50 ohm impedance.

The model is ideally suited to applications such as audio, communications, quality control and data processing.

For further information contact: *Global Specialties, 2nd Floor, 2-10 St John's Street, Bedford MK42 0DH. Tel: (0234) 217856.*

G4ZPY PADDLE KEYS

Gordon G4ZPY has upgraded some of his keys. The pump key now has forty threads to the inch on its adjustable contact and the return spring is now adjustable down to zero tension to suit operators with a very light touch. He feels that the single paddle key cannot be improved but welcomes opinions. The twin paddle mk2 has several slight improvements over the mk1 which will be appreciated by artisans of CW.

Gordon has extended his range of variations even further to a total of sixty-five. New to this range are a nickel-plated pump key mounted on a chromium-plated brass plate, which is mounted on mahogany wood, priced at £42.95; a nickel-plated single paddle key (Grande Luxe) mounted on a chromium-plated steel base, priced at £68.95 and a nickel-plated twin paddle key mk2 (Grande Luxe) mounted on a chromium-plated steel base, priced at £82.95.

Gordon will even make a gold-plated key for you if you have a bottomless pocket!

For further information contact: *Gordon Crowhurst, G4ZPY Paddle Keys, 41 Mill Dam Lane, Burscough, Ormskirk, Lancs L40 7TG. Tel: (0704) 894299.*

SPECIAL EVENT STATION

To help celebrate the 75th anniversary of the RSGB, two members of Radio Link – Derby Hospital Broadcasting, will be operating the special event station GB75RLD between 1 and 4 December.

The event will be staged from the outside broadcast caravan at Derby's City Hospital on the amateur radio band – 2m VHF.

It aims to promote amateur and hospital radio and help other amateur radio people collect points for the GB75 award.

MANSFIELD ARS

The Mansfield Amateur Radio Society welcomes anyone interested in amateur radio and short wave listening. Meetings are held on the second and fourth Friday of each month at the Westfield Folk House, Westfield Lane, Mansfield at 7.30pm.

There is a full programme of events through the year, with lectures and demonstrations

on amateur radio and associated subjects.

At present the yearly subscription is £5.00.

For further information contact Keith Lawson. Tel: Mansfield 642719.

CLUB OPENING

On Saturday, 24 September at 2pm, councillor, Mrs Emma Bloomer, chairman of Bassetlaw District Council, cut the red, white and blue ribbon and declared Worksop Amateur Radio Society's new club house and headquarters open.

Present at the opening ceremony were leading members of Bassetlaw District Council, Mrs Joan Heathershaw – immediate past-president of the RSGB and representing them at this event, representatives of the local business community who helped in the project and four German amateurs from Worksop's twinned town of Phungstadt. Also present were the general management committee of Worksop Amateur Radio Society and the club members.

Inside the new headquarters, Mr George Pool G0DKQ, chairman of Worksop Amateur Radio Society, welcomed all visitors. He proceeded to explain how WARS would be taking the RSGB's Year Initiative firmly on board, by visiting schools in the Bassetlaw area to demonstrate amateur radio and talk about career opportunities in the electronics field. WARS will also be running an RAE course, filling a huge hole left by the withdrawal of the North Nottinghamshire College from RAE teaching. Mr Pool concluded by explaining the excellent work carried out by the RAYNET organisation, in particular, 288 Group – Bassetlaw RAYNET.

He told the guests present how 98% of 288 group – Bassetlaw RAYNET were on the air and ready for action within six minutes, after being called up by the county emergency planning officer during a recent gale-force winds alert. Almost all of 288 group – Bassetlaw RAYNET are members of Worksop Amateur Radio Society.

The opening ceremony at the new headquarters of Worksop Amateur Radio Society

Mrs Bloomer and Mrs Heathershaw paid tribute to the club members for their hard work in taking a derelict shell of a building and turning it into a modern and luxurious headquarters for the club. Also for creating a centre to encourage the youth of today and tomorrow into a career in electronics via amateur radio.

After the speeches, Mrs Bloomer and Mrs Heathershaw were invited behind the bar to pull the first pints of beer for the members. Finally, they and the club's president, Mrs Elsie Chadwick, were presented with bouquets by Adel Cooper, daughter of the late Colin Cooper, a much missed club member.

Kevin M Fox

ALINCO DUAL BANDER

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- ★ 25 Watts output
- ★ Full duplex operation
- ★ 21 Memories
- ★ 2 Call channels
- ★ Priority channel
- ★ Dual VFO's
- ★ 12.5 & 25kHz steps
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- ★ Memory Skip

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ALD-24E

This transceiver could transform your operating habits! It contains completely separate 2m and 70cms transceivers, permitting full duplex operation. To the un-initiated, this means you can transmit on 2m whilst receiving on 70cms, or vice versa. The built-in duplexer means a single antenna socket with a full 25 watts output on both bands. Measuring only 5.5"x2"x6.5" it is the ideal mobile rig. Its comprehensive memory and scanning facilities provide rapid access to both simplex and repeater channels on 2m & 70cms. Using the dual VFO's you can instantly switch between 2m & 70cm and the single knob tuning provides simple and quick frequency selection. The large LCD readout incorporates an S-meter and is back lighted. If you are looking for a completely self contained 2m & 70cm station, then look no further. At this price it has to be a bargain. For further details of this amazing transceiver, send today for the full colour brochure.

OUR FAMOUS FREQUENCY MANUALS!

UK LISTENERS CONFIDENTIAL FREQUENCY LIST 5th EDITION

This publication has now sold well over 3500 copies since it was advertised only a few months ago. Now the recent updated version is selling even better. No self respecting listener should be without a copy. If you enjoy exploring the short wave bands then this publication will add to your enjoyment. It covers the hf spectrum from 2 to 30 mHz and gives details of transmissions outside the amateur bands. Specially designed for the UK and European listener it sets out in a very easy way a comprehensive list of hundreds of interesting transmissions that will keep you occupied for days on end! Only a fraction of the cost of other similar publications it contains details of Marine, Air, Military, Embassy, Press and News agencies. Many listings have time schedules included together with comprehensive RTTY details. It tells you the frequencies used by civil and military aircraft whilst flying the Atlantic, when and where to pick up the press bulletins, long distance marine traffic etc and much more. Send today for your copy of this worthwhile publication.

NEW 1988 EDITION £6.95 p&p 90p

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New 1988 Edition. Many listeners have asked for a guide to the wide VHF/UHF spectrum and to meet this request we have recently published this frequency manual. It covers the range 26 to 2000 mHz and has been specially prepared for the UK listener. Anybody who has used a scanning receiver will know that the wide frequency range involved means that it is difficult to know exactly where to listen. This guide takes all the guessing out of monitoring. It lists all the services throughout the spectrum together with both simplex and duplex frequency splits. If you've spent your hard earned money on a scanning receiver or are considering buying one you'll find that this publication contains a wealth of information that has previously remained un-published!

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4th EDITION VHF-UHF AIRBAND FREQUENCY LIST

This frequency manual is without doubt the most comprehensive list of VHF/UHF aircraft listings available in the UK. Of vital importance to the airband enthusiast or indeed any keen VHF/UHF listener it sets out in a very easy to follow manner full details of a whole host of stations. Every known UK airfield frequencies, etc. Included are Civil, RAF, USAF, MOD, Naval fields on both VHF and UHF bands. There are also air to air frequencies, the Red Arrows frequency, and much more. Send today for your copy and find out just how much you have been missing!

£5.95 p&p 90p

HF OCEANIC AIRBAND COMMUNICATIONS 1988 EDITION.

Prepared in response to many requests for more information about the air traffic on the hf bands this little guide sets out to explain to the beginner how the hf band works in relation to air traffic. It contains full details of the world aircraft frequency bands in the range 2 to 23 mHz together with control frequencies and those commonly used for Oceanic control. Also included are many VOLMET frequencies, the Search and Rescue frequencies used by RAF helicopters and Nimrods, the Hf RT network, London Company frequencis, European control centres etc. An ideal companion for the hf airband listener. Send today for your copy.

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VISA

The Pac-Comm TNC-220 Dual Port Unit

by
Steven Goodier G4KUB
and
John Goodier G4KUC

Packet radio has greatly increased in popularity over the last few years, and without doubt this was helped by the acceptance of an international protocol standard by the ARRL at a meeting of the Digital Communications Committee in September 1984. The standard accepted is officially known as AX.25 level 2 version 2. This now means that almost all packet users will operate to a single protocol. Having a single standard also means that designers and manufacturers of Terminal Node Controllers (TNCs) can now concentrate all their efforts on producing the hardware, without the added worry of whether their operating system is going to be accepted by other users.

Increased production and competition offered by a single standard is ultimately good news for the operator, as it means the price of the hardware will gradually fall to a level most people can afford. Proof of this is demonstrated if we look back at prices over the past two years. For example, a basic PK-80 was retailing for around £239.00. Today, similar models such as the Tiny-2 can now be purchased for just over £100.00, yet it offers more facilities, an up to date operating system and 32K of RAM.

Another example of value for money is the decreasing cost of dual port units, these TNCs have two input/output ports and have been designed to operate on both the VHF and HF bands. One of the most popular and successful dual port units is the Pac-Comm TNC-220 which is distributed by Siskin Electronics. This unit is now widely used and recommended by many packet operators around the world and forms the basis of this review.

Pac-Comm TNC-220 description

The TNC-220 is housed in a high quality aluminium case, measuring 150mm x 45mm x 185mm (WHD). The front panel has a single push button switch and five LEDs which indicate the state of the TNC during operation, their meaning is as follows:

PWR Power is connected.
CON You are connected to another packet station.
STA There is outstanding data to send.
PTT You are transmitting.
DCD There is activity on the channel.

The display window on the front panel is for the optional high frequency tuning indicator. The fitting of this optional board and its use will be described later on.

The back panel has four sockets labelled: 12V dc, Radio-1, Radio-2 and Terminal. The supply voltage can range from 12 to 16V. It was found that the unit ran well from 13.8V, with a current consumption of around 475mA. The ports that are connected to the radio equipment are both 5 pin DIN, carrying 'audio in' from the rig and 'audio out' from the TNC and the PTT line; this is used to automatically put the transceiver 'on the air'.

Radio-1 is set for 300 baud operation and is the HF port, whilst Radio-2 is the VHF port and is set for 1200 baud operation. Port-1 is also equipped with a separate frequency shift keying (FSK) circuit for direct keying of FSK compatible transceivers. Both baud rates can be changed via software operation and the two rates set are the standard baud rates in use at the present time.

The remaining port is a 25-way D connector labelled 'Terminal'. This connects to the RS-232 interface port on your computer. If your computer is not fitted with a standard RS-232, then it is possible to configure the output for TTL operation by selecting the TTL position on Jumper JP-T which is situated on the main PCB. This saves the extra expense of having to purchase an RS-232 interface and is particularly useful for owners of the Commodore 64 and Vic 20 range of computers. It is possible to purchase additional RS-232 interface kits for most computers from Maplin Electronics, but don't let the lack of an RS-232 port put you off. All the popular home micros are up and running on packet, and Siskin Electronics and their distributors are always willing to help with advice and software.

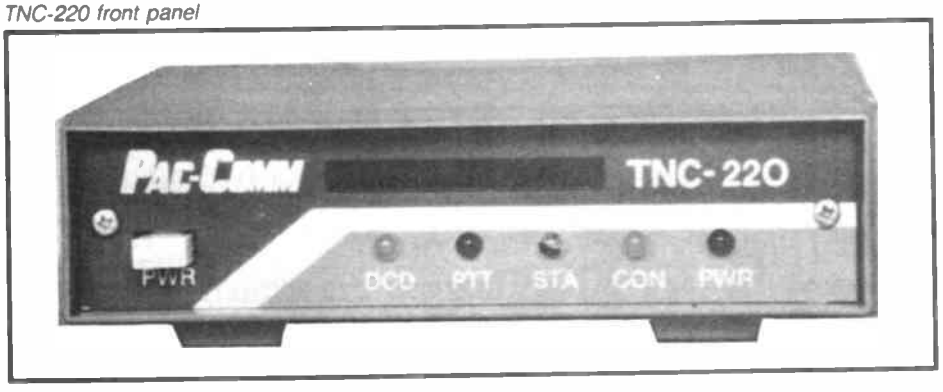
Let's take a look inside

Dismantling the unit can be done by removing the screws from the front and rear panels which are easily pulled away. The only thing holding the PCB in position is a single screw which is used to fix the 5V voltage regulator to the metal case. Once this is removed, the PCB will slide out of the cabinet. For test purposes the TNC can be run outside its case, but the handbook warns you about overheating the 7805 voltage regulator which is usually bolted to the metalwork of the case. If you plan to operate the unit outside of the cabinet for any length of time, then you are advised to attach a temporary heatsink to this component.

Dismantling the unit reveals a complex double-sided lacquered PCB containing a number of large integrated circuits, plus many discrete components. The heart of the unit is a Z80 microprocessor, running at 2.45MHz, which controls all the basic operations of the TNC. The serial input/output is handled by a Z80 serial Communications Controller (SCC). The operating system is the latest 1.1.5 and is contained in a 32K EPROM which can always be updated in the future.

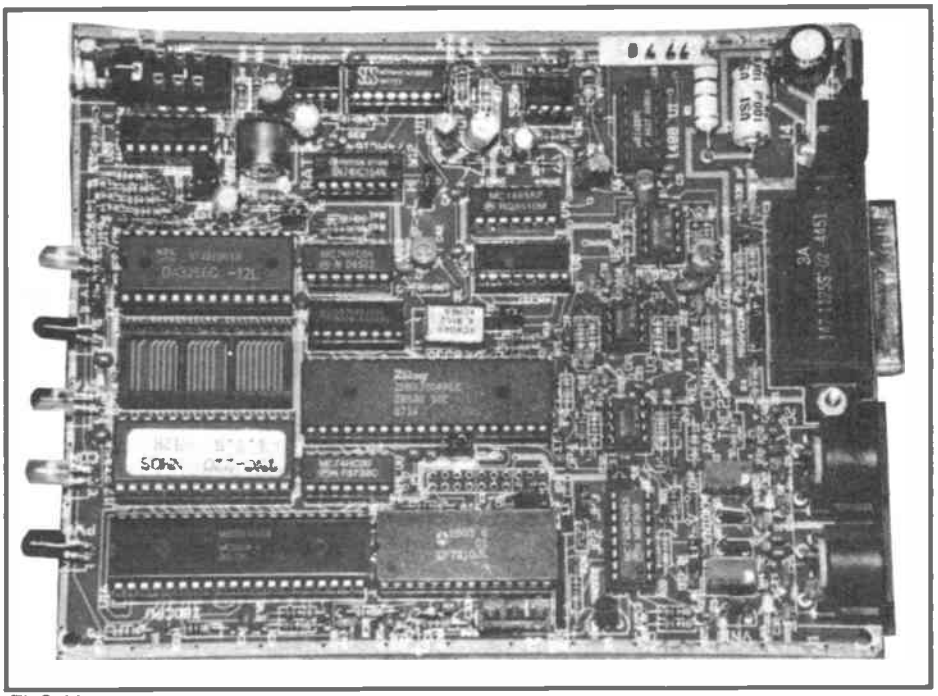
Every station's information and operational parameters are held in a battery aided RAM, so this data is retained even when the TNC is switched off. There is also a total of 32K of user RAM which should be ample for most users. The unit talks to the outside world via a 7910 modem chip (which is complex to use). It performs modulation, demodulation and all the necessary filtering with its own internal digital filters. The outputs are software switchable

TNC-220 front panel



between the two radio ports, and each port has its own filter to optimise performance for the band conditions. This is an important feature, particularly for HF operation.

The HF filter is a preamplifier limiter, followed by a six-pole bandpass filter; whilst the VHF filter is also a preamplifier limiter which is followed by a two-pole low pass filter. Each filter may be bypassed by jumpers on the PCB. Provision is made for an off board HF filter on the second port if required. Each radio port is designed to take an audio input of between 200 and 700mV. This can be provided by most modern transceivers via the 'fixed audio output' on the back panel. Having said that, the TNC-220 is quite happy running from the external loudspeaker socket found on most rigs.



TNC-220 printed circuit board

Handbook

The comprehensive 108 page instruction handbook is easy to understand and well written. It deals clearly with computer interfacing, radio interfacing and includes a detailed operator's guide for the first time packet operator. There are well over thirty pages devoted to the TNC's commands and messages, although the beginner can start operating without having to understand a majority of these commands.

A pull-out reference card lists all the TNC commands, arguments, defaults and descriptions. This is very helpful and saves one from having to thumb through the handbook to find each command. If more detailed information is required about a particular function, then it is always possible to turn to the relevant section within the handbook.

Contained towards the back of the handbook are all the technical and hardware specifications which include: circuit diagrams, circuit descriptions, jumper functions, a PCB layout, a fault finding guide and a well laid out index. Each section is clearly marked, and there is no difficulty in finding the information one needs very quickly.

The handbook also carries many diagrams, including a schematic illustration of an external interface box which should be suitable for most rigs. It is felt that this informative handbook also gives a tremendous amount of help with connecting the TNC to both the transceiver and computer equipment. The newcomer to packet radio should be able to gain quite a lot of useful information by reading through its pages.

Making the connection

If you are using the TNC-220 with a computer that has an RS-232 interface, it will probably be better to purchase a ready-made lead from the dealer, who should be able to supply leads for most of the popular computers. Failing that, it is always possible to make your own connecting lead, as most simple programs only require three wires to interface your TNC, these are: Ground, Tx-data and Rx-data. If you require 'handshaking' then additional connections will be needed.

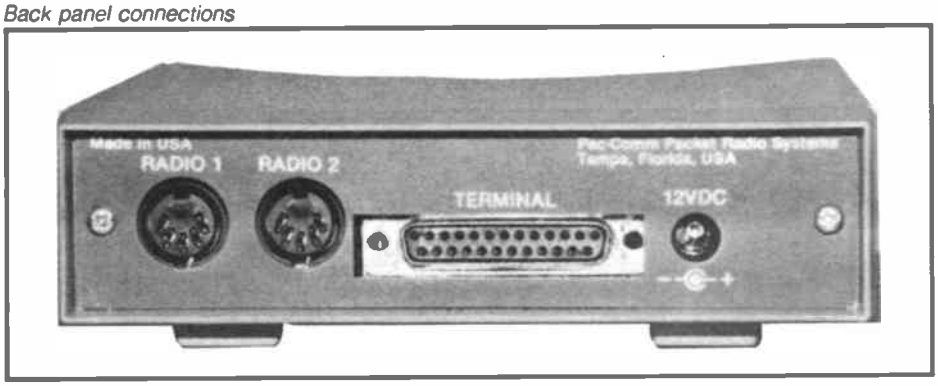
Once this lead has been made, you can check if it has been wired correctly by simply plugging one end into the TNC and the other end into the RS-232 port of your computer. Run your packet software and switch the TNC on. If all is well, the TNC should announce itself with a message on the monitor. If the message appears, but overprints itself several times, then the chances are that the auto-line feed wants switching on. This is one of the preset parameters inside the TNC (auto-line feed is switched on with the command 'AUTOLF ON'). It is worth checking your handbook for other important TNC commands, and it is also advisable to read chapter four of the manual before operating.

You will certainly have to make a couple of leads to connect your transceiver to the TNC. The first thing you will have to do is connect the TNC's output to the microphone input of your rig, along with the PTT line. These connections can be made on the microphone socket, although some HF transceivers have an auxiliary DIN socket on the back containing all the necessary connections you will need. The other connection is 'audio In' from the rig's loudspeaker. This is usually provided from the external speaker socket on the back of most rigs, but if you use this method try and arrange some way of monitoring the received signal. It is worth noting that some VHF/UHF transceivers provide an audio output on one of the microphone pins, which is usually intended for a speaker microphone. This audio output can be used to drive the input of the TNC.

On 2 metres, we used a Yaesu FT-209 hand-held transceiver which required slight modification to enable the TNC to automatically put it on air. The reason for this is that most hand-helds have the PTT line incorporated within the microphone input. To put the rig on air simply requires the mic line shorting to earth via a 2k2 resistor. This resistor was wired inside the DIN plug and then was soldered across the PTT line and audio output line.

We also used a Kenwood TS-440S on HF and an Atari 520ST FM computer which was upgraded to 1 megabyte. We used the Packet-Et-Term, version 3.3 software package which was written by Chuck Harrington (WA4GPF) and is free of charge. It incorporates a triple split screen display, with transmit and receive screens divided, as well as the connect

Back panel connections



status and time display. The software offers a host of other features which are too numerous to describe in this article. All its features and operating tips are fully explained within its twenty-six page, A4 size manual contained on the disc.

Setting up the TNC

A number of parameters have to be set up before the TNC is ready for use, these are stored in the battery-aided RAM. Before doing this, it's worth checking that the receive line is wired and working correctly. This can be done by running your packet software and turning the TNC on, you should be greeted with the usual start-up message and then left with a command line. Tune your VHF rig to 144.650 or UHF rig to 432.675, these channels should be busy most times of the day.

We can monitor the traffic by typing 'MONITOR ON', this should produce on your monitor all the traffic that is operating on the channel at that time. As data is received, the 'DCD' LED on the front panel should light, as this indicates any activity on the frequency. As you are now receiving everybody's data, the display will not make much sense, but it does prove that the receive line and TNC are working. This also gives you the opportunity to jot down the callsigns of any mailboxes you may see. These usually end with a '-2', for example: G3WCS-2, G4GHT-2 etc. Most mailbox callsigns are shortly to be changed to a GB7 prefix and may well already be operating when this article appears in print.

Before you can operate on packet radio, you must change the systems parameters for your own. Changing these will greatly depend upon the computer, software and type of rig. One parameter you will have to change is the callsign, and this should be changed of course, to your own. It is beyond the scope of this review to detail all parameters, but as an example, to change the callsign to G8VHF, you simply type 'MYCALL G8VHF'. The instruction manual included with the TNC lists all the commands and I would advise you to read it carefully before making any changes, although very few will have to be changed to get the system up and running.

Using the TNC-220

As we were still waiting for the HF tuning meter to arrive, the TNC-220 was first tried on VHF. Contact was made with the local mailbox G3WCS-2, and the connection was achieved by typing 'C G3WCS-2' (C is the abbreviation for 'CONNECT'; most of the TNC commands can be abbreviated to one or two letters). As soon as a connection was made, the mailbox produced its welcome message and the 'CON' LED lit up indicating a connection to another packet station; this LED will remain lit for as long as the connection is made. If you are a new user on the mailbox, then you will be asked to enter your name which is usually done by typing 'N YOUR NAME'. Once entered, your name is stored by the system's computer and each time you log on, you will be greeted with a friendly message which will include your name.

The TNC-220 handled packet on 2 metres effortlessly and was an excellent compliment to both the Atari 520ST and the WA4GPF software. Packet radio operation on the VHF bands is fairly simple and once mastered, you should have very few problems. Contact was also made with other mailboxes as well as a number of local stations. All the usual features of packet radio such as downloading and uploading of files and messages to other mailboxes around the country etc, were tried with great success. It must be remembered that file transfer and TNC control are greatly helped by the use of good software.

HF tuning meter

The Pac-Comm TNC-220 tuning indicator arrived about seven days after the TNC. The first step was to open the box and study the fitting instructions. This consisted of five single-sided A4 size sheets containing operating notes, circuit descriptions, a fault finding guide and circuit/PCB overlays. The tuning meter is basically a solid state voltmeter, and its job is to change the incoming audio tones into a visual display which is indicated on the bar-graph LEDs. The incoming signal drives a 2211 which is an FSK demodulator/tone decoder. In turn, these chips produce two output signals which are used to eventually drive two LM3914 linear bar-graph displays. These chips contain almost all the circuitry necessary to be used as a voltmeter, their outputs are connected to the LEDs which are stepped one at a time to form a moving display.

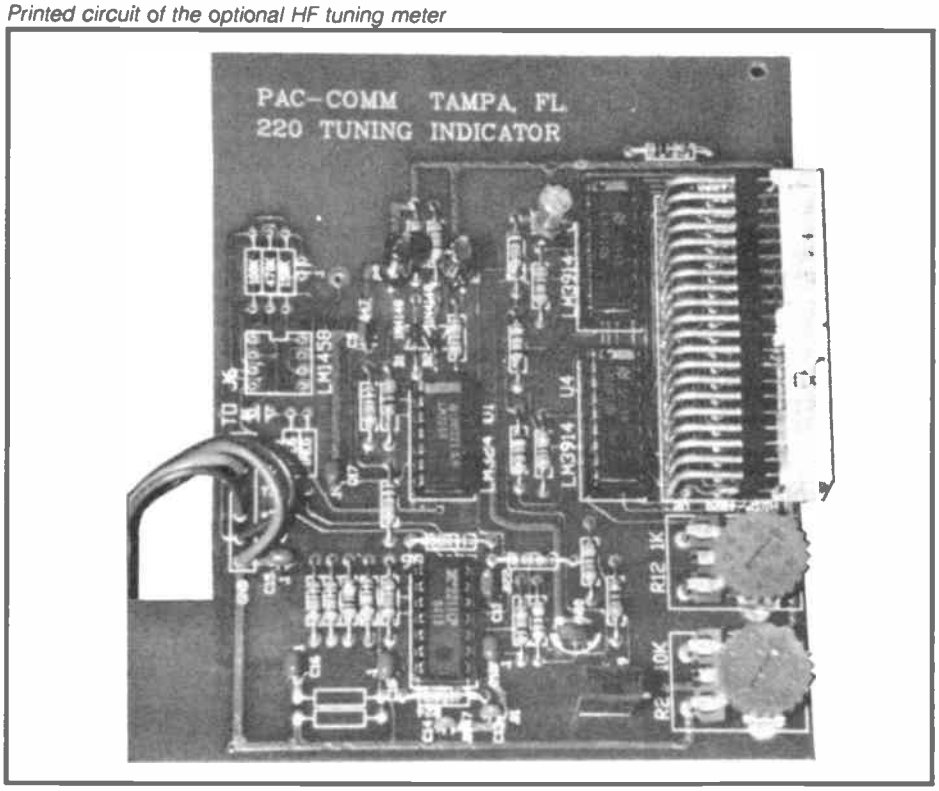
The tuning indicator consists of a double-sided printed circuit board with the component location silk-screened on top for ease of identification. As with the TNC-220, the board is extremely well made and is of the highest quality. All of the ICs are fitted into holders for ease of servicing. Towards the front of the board are two bar-graph LEDs which form the basis of the tuning indicator. These are three preset variable resistors and two of these, which are mounted towards the front of the board are adjustable. The third is factory set for a centre frequency of 2125Hz and should not be adjusted.

Fitting the indicator

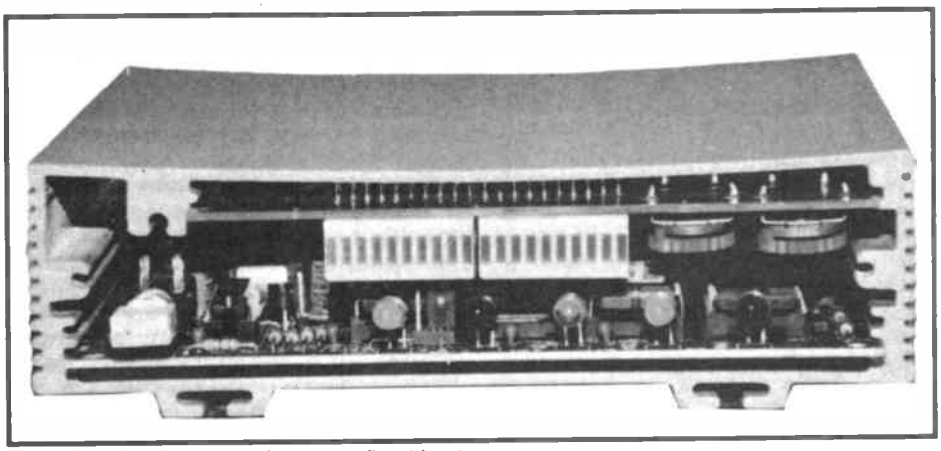
There are a number of different versions of the TNC-220. To determine which version you have, look for the serial numbers printed on the main board. If you have purchased the latest version of the TNC-220, fitting the tuning indicator will be a very simple job. The fitting instructions explain how to establish which version of the TNC you have and also explain the fitting procedure for each model. The latest version is 1.3 and 1.4.

First, you will have to remove the main circuit board from the case by removing the front and back panels, but don't forget the screw which bolts the voltage regulator to the case. Once you slide the board out, it's just a matter of changing a link and plugging the tuning indicator into J6 on the TNC's circuit board. When complete, slide the two PCBs back into the cabinet and refit the back panel only, as the two controls which may need adjustment are reached from the front. The installation procedure is fairly

Printed circuit of the optional HF tuning meter



THE PAC-COMM TNC-220 DUAL PORT UNIT



Front view showing the tuning meter fitted in place

detailed, although you should not encounter any difficulty if you follow the instructions stage by stage.

We tried to tune HF packet before the indicator arrived with very little success, this was mainly due to the short duration of packet transmissions. After the tuning meter was fitted, packet tuning was made very much easier. The idea is to tune carefully across the transmission until the bar-graph is about centre scale. If you find that packet is correctly tuned, but the bar-graph is not centre scale, then you can adjust this by using R12. R27 is used to reduce the input signal into the board and can also be set to reduce the sensitivity of the tuning indicator to band noise etc.

Summary

Without doubt, the TNC-220 is an excellent TNC, and for a modest price enables the user to operate both VHF and HF packet radio with ease. Many of the facilities it offers would have been in the £300.00 bracket only a few years ago and would have probably comprised two separate units. Once all the system parameters are set up, the TNC, in conjunction with good and user friendly packet software, is extremely easy to use and becomes a 'plug-in and go' unit without sacrificing versatility.

Everything that is needed for a complete packet Modem is contained within a single box which includes an optional HF tuning meter (incorporating the important feature of an HF packet system) and filters for both HF and VHF operating. Another added benefit is being able to upgrade the system's software, and since this is on a 32K EPROM, no problems should be encountered as new and better operating systems become available. All in all, the TNC-220 offers excellent value for money and is highly recommended for those who wish to explore the expanding world of packet radio on both HF and VHF.

Expert advice

Packet radio is a growing form of communication, but for most people it is still full of computer jargon and difficult to understand. Therefore, it is important to obtain your TNC from a supplier who has experience with this form of communication and understands what sort of equipment and software is needed to suit a particular computer. It also benefits the potential buyer if the supplier is willing to discuss his needs and problems before purchase, and

THE PAC-COMM TNC-220 DUAL PORT UNIT

TNC-220 FACT-FILE

Product: TNC-220 Packet Radio TNC
Price: £139 (less tuning meter)
Suppliers: Siskin Electronics
Tel: (0703) 849962 (24hrs)
Andrews Computer Services Ltd
Tel: 01-950 9381 (24hrs)

Features

Dual radio ports (software switchable)	HF tuning meter (optional)
HF/VHF filters	Battery back-up 32K RAM
RS-232 or TTL computer interface	12V operation
TNC-2 compatible	5× colour coded LEDs (large)
AX.25 level 2.Version 2 protocol	Handbook

willing to offer helpful advice afterwards.

Siskin Electronics was formed in 1986 and started with only one product, the Pac-Comm TNC-200. Since then, the company has gone from strength to strength and have supplied many amateurs with TNCs. They are in regular contact with Pac-Comm, and were closely consulted during the development of the Tiny-2 and Micropower-2; the Tiny-2 is one of the fastest selling TNCs in the country today.

Another problem you may encounter is obtaining good software for your computer. Siskin can supply specialist programs for many of the popular micros, and as most of this software is in the public domain, it is free of charge. They can also help with computer connecting leads and those difficult to obtain plugs and sockets etc.

Siskin Electronics have also appointed a number of dealers who have been carefully chosen to give support and advice to both the novice and the experienced operator. Andrews Computer Services is just such a company and it was from there I obtained my TNC. Like Siskin, this company offers sound advice and is able to supply a complete range of computers, including software and packet radio systems. A free disc of software was enclosed with my TNC, containing the latest version of the WORLI mailbox. They also supplied the very useful 'Guide to Operating Packet', which offered lots of advice to the novice operator.

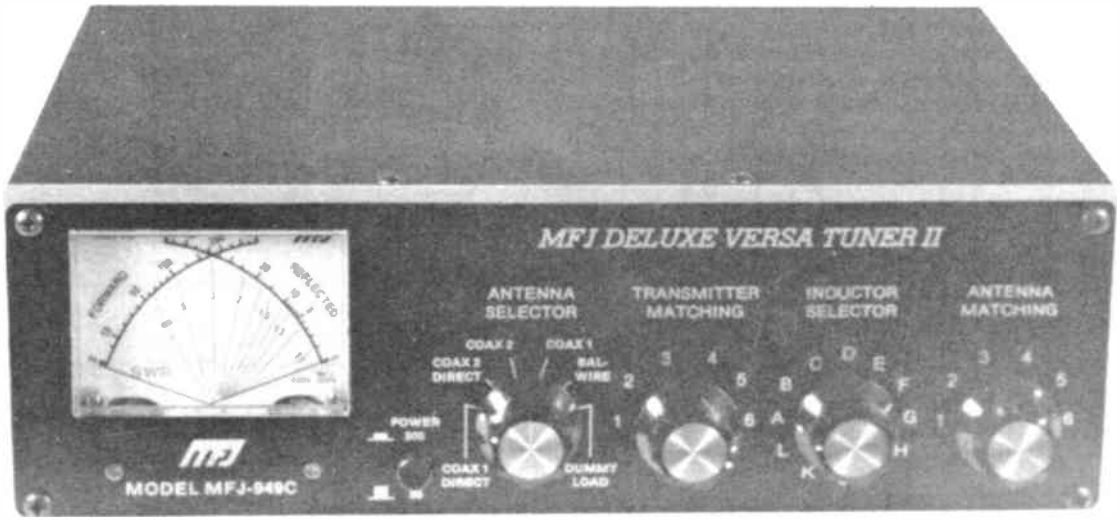
If you are going to contact the above companies for more information, they would appreciate a large sae for all postal enquiries. They can of course, always be contacted by telephone (both run a 24hr answering service).

The TNC-220 is available from: Siskin Electronics, Southampton Road, Hythe, Southampton SO4 5HU; or from: Andrews Computer Services Ltd, 6 Ash Hill Close, Bushey Heath, Herts WD2 1BW.

A PRACTICAL LOOK AT TWO NEW AMATEUR RADIO ACCESSORIES

by Ken Michaelson G3RDG

I am always watching out for new items which are relevant to the hobby and I have taken a close look at two recent offerings. The first is an antenna tuner coded the MFJ-949C and manufactured by MFJ Enterprises Inc of Starkville, Mississippi, USA. This is quite an instrument as it is designed to match virtually any transmitter to almost any antenna. This includes dipoles, inverted Vees, verticals including mobile antennas, random wires, those fed by coax, balanced lines or a single wire. A 1:4 balun is built in for connection to balanced lines. The unit measures 10in × 3in × 7in and is finished in matt black paint. The front panel has a band of polished aluminium around the outside.



MFJ-949C Versa Tuner

The lettering is also in polished aluminium.

This is one of the new units having a cross needle meter (two meters in one) so that forward power, reflected power and SWR can all be read off at the same time, either with a maximum of 30 watts or 300 watts. No SWR sensitivity adjustment is needed. Apart from the meter, there are four knobs on the panel together with the 30/300 watt switch. There are three SO-239 sockets on the back panel labelled 'Coax1', 'Coax2' and 'Transmitter', together with three red terminals, the left-hand one accepting a wire antenna and the other two intended for balanced line; all will take wire or a 4mm plug. Below them is the 2.5mm socket for the meter illumination light (12 volts) and a large earthing post.

On the front panel the double meter is clearly marked, forward and reflected power are shown in black and the SWR markings in red. The left-hand knob controls a six-way switch, its positions being Coax1 and Coax2 direct, Coax2 and Coax1 through unit, 'Balanced Wire' and 'Dummy Load'. The transmitter matching and antenna matching knobs are variable capacitors rated at 1000 volts and the inductor selector is a continuously rotatable switch with twelve positions. The inductor itself is 3 inches in diameter and is air-wound giving greater efficiency than the normal coil wound on a former. The interior of the MFJ-949C is well constructed using generously rated components. The design is in the form of a standard 'pi-tank' as is shown by the circuit diagram and, in my view, is a very efficient way to match a variety of antennas to the 50 ohm unbalanced output from a transmitter.

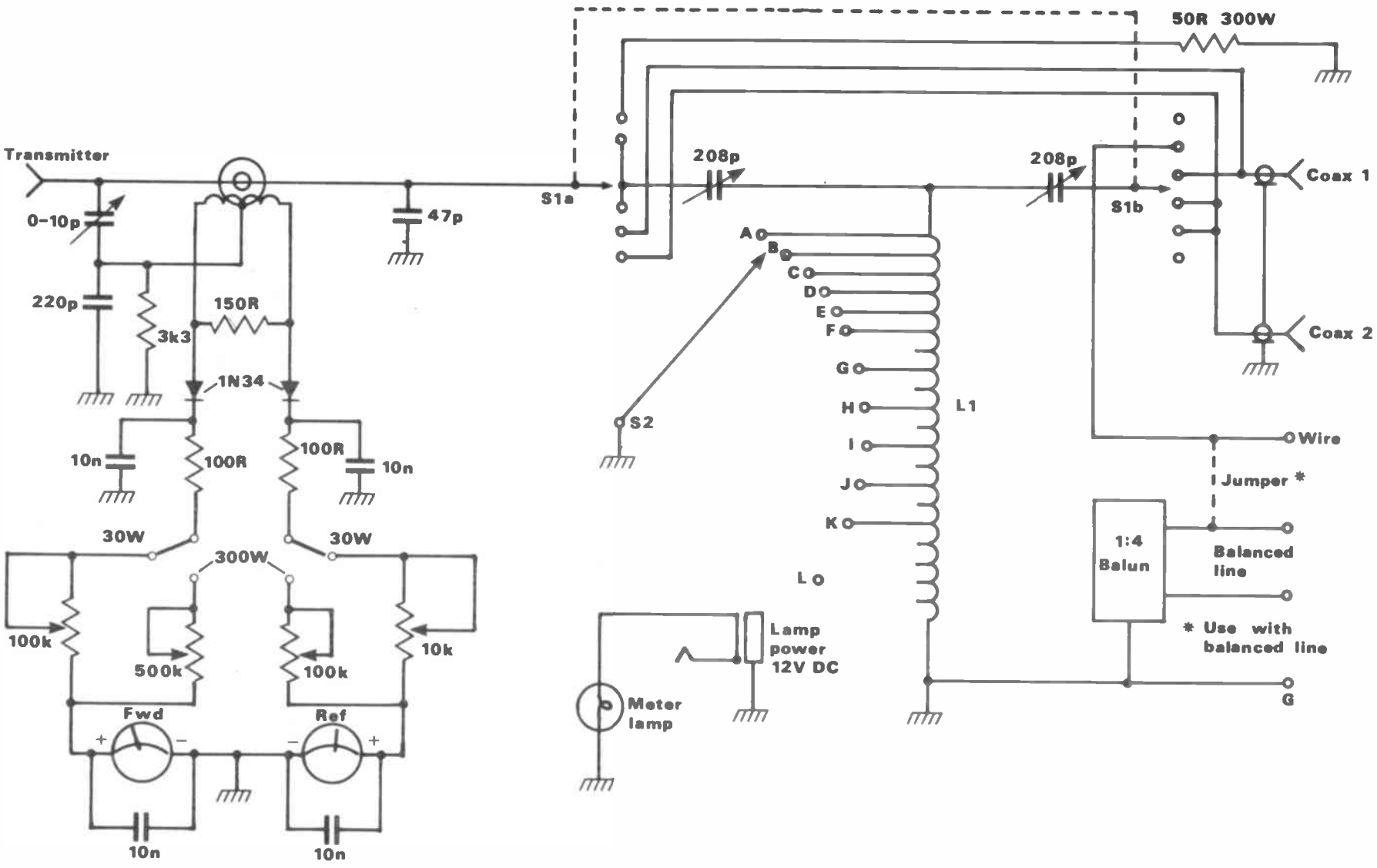
In use, I found that all the manufacturer's claims for it were met. I have a very odd antenna which started off as an 80m dipole and then was lengthened. I found that I could tune this peculiar piece of wire to *all* the amateur band segments without any difficulty at all. I was able to tune top band on the dipole, a thing I have never been able to do before, and what is more, get a 1:1 SWR reading. Whether most of the power was circulating round the inductor I don't know, but I did achieve a couple of QSOs with it! As regards the other bands, 29MHz FM was tuned with it and resulted in my first QSO in the FM mode on HF.

All in all I was very impressed with this new product, primarily because of the ease with which it was possible for me to tune my antenna. I have, however, two criticisms to make. I feel that the transmitter matching and antenna matching knobs should have some form of slow motion drive attached to them, as does my old KW 107 Supermatch tuner. On certain frequencies the positioning of these knobs was very critical and operating would have been made much easier with a slow motion drive. The other point is that I feel there should be a switch to turn the meter illumination on or off, instead of having to pull out the plug at the back every time you want the light out. That being said, for those of you who have given thought to a tuner and not yet made any decision, I can thoroughly recommend the MFJ-949C. It is priced at £157.75 including VAT. Thanks to Amcomm Services Ltd, 373 Uxbridge Road, London W3 9RH. Tel: 01-992 5765, for the loan of the unit for this review.

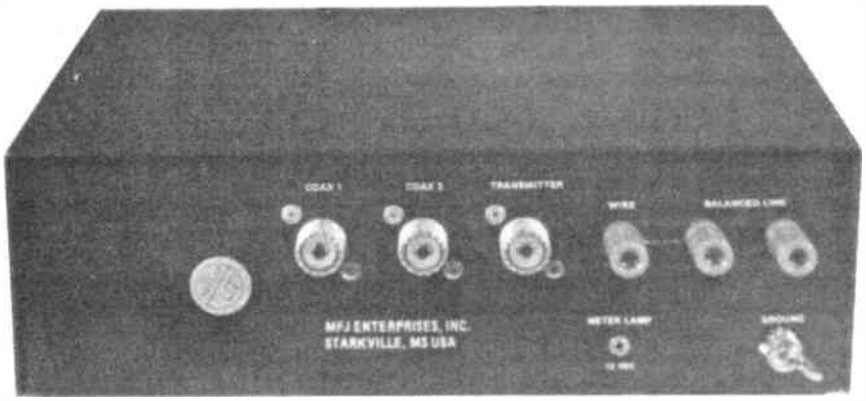
This brings me to the second piece of equipment, the Adonis model AM-805G microphone for base station use manufactured by the Adonis Electronics Corporation of Japan. This is undoubtedly the microphone for the discerning amateur, as one could not wish for more facilities. It is 185mm (7.5in) wide × 120mm (4.75in) deep × 30mm (1.25in) high and has a high-quality unidirectional condenser microphone unit which helps to reduce background noise. This is supported on a flexible swan neck, which projects 255mm (10in) above the base. The unit includes a built-in speech compressor. High (45dB) or low (35dB) levels are selected by a slide switch, the third position cuts out the compressor, thus giving a 'manual' position.

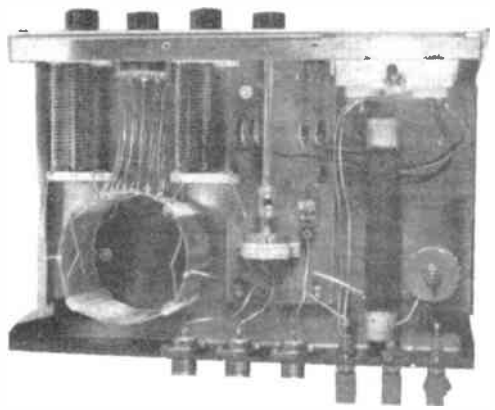
In fact, there are four controls on the front edge of the panel, the first on the left is the slide switch to select either of two transmitters which may be permanently connected to the microphone. There are two male standard eight-pin sockets on the rear for this purpose, labelled 'Out-A' and 'Out-B'. Next comes a rotary control for manually altering the level of output. The other two slide switches actuate the compressor (high, low and manual) and the 'mode'.

This mode switch is interesting because firstly it has two positions of microphone input, labelled 'FM' and 'SSB', the output being internally tailored for whichever mode is selected by the switch. Secondly, the control acts as the



MFJ-949C Versa Tuner circuit diagram





Above: *back view of the MFJ-949C Versa Tuner*
Left: *interior view*

power on/off switch and as a battery level indicator. The latter works for the first couple of seconds after switch-on. So long as the needle of the 'VU' meter goes over to a green band on the scale of the meter, it can be assumed that the battery is all right. The needle then returns to the far left of the meter. In addition, there is a small red LED marked 'on air' at the top right of the switch area, which flashes continually on receive (to remind you that the unit is on) and remains on when transmitting. When this switch is in the 'off' position no current is drawn from the battery.

The last switch in this line is called the 'talk switch'. This is a centrally pivoted micro-rocker switch. The left-hand side is labelled 'PTT' in red and the right-hand side is called 'Lock', the lettering being in blue. Pressure on the PTT switch works in the same way as it does on any other type of microphone, and pressure on the Lock side will put the switch permanently on. It can be released by pressing the PTT side.

Also provided is a switch for operating the frequency stepping facility available on a number of new rigs. The switch is similar to the PTT and Lock switches, in that it is also a centrally pivoted micro-rocker switch marked 'DWN' and 'Up' and when pressed moves the frequency of the transceiver in accordance with the steps programmed into the rig.

The final item to look at in this comprehensive microphone assembly is the VU meter situated on the top right-hand side of the panel. This is calibrated in dB, 0 to −20dB markings are in white and up to +3dB in red. There is a green line under the dB markings going from −3dB to +dB. This is the battery state indicator. On the underside is a plate held in place by two screws. The opening is intended for the two R6 size cells used to power the unit.

A few technical details might be of interest to the reader. There are fourteen transistors, and four diodes. The unit will match all impedances between 500 ohms and 100k ohms. The output voltage can be varied between 0V and 30mV with the manual level controllable between 0V and 70mV. The power source is two R6 (UM3) batteries and the current consumption in the transmit mode is 5mA; in the receive mode it is only 1.6mA. Nevertheless, it is a good idea to always switch it off when not in use.

I used this microphone for some time connected to my own rig, an Icom IC-751. The IC-751 has its own compressor but leaving that out of circuit, I had a number of QSOs using the compressor in the AM-805G with complete satisfaction. I could take my choice of speaking 18in to 2ft away from the mic with the compressor in the high (45dB) position, provided there wasn't too much locally generated noise, or (my personal preference) in the low (35dB) position with my mouth close to the microphone. I also had some QSOs without the compressor, using the manual position and controlling the output of the AM-805G by means of the 'manual level' knob. In this case, I had to be careful not to allow the meter to exceed 0dB. The compressor was not required when using FM on 2 metres, and when reports were asked for, they were always complimentary. On the HF bands, of course, the compressor came into its own, and again the reports I received were of clear, intelligible speech.

I enjoyed having the unit attached to my rig and think that it would enhance anyone's set-up. The price of the AM-805G microphone is £96.00 including VAT. Thanks to Waters & Stanton, 18-20 Main Road, Hockley, Essex SS5 4QS Tel: (0702) 204835, for the loan of the unit.

Adonis AM-805G desk microphone

P.M. COMPONENTS LTD

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AN303	3.50	M5155L	2.95	SN76660N	0.90	TBA120AS/B/C		TDA1035	2.50	UPC1024H	
AN313	2.95	M51513L	2.30	STK011	7.95		1.00	TDA1037	1.95		1.50
AN315	2.25	M51521L	1.50	STK014	7.95	SA/SB/T/U		TDA1044	2.15	UPC1025H	
AN316	3.95	MB3705	1.50	STK015	5.95	TBA395	1.50	TDA1170	1.95		1.95
AN331	3.95	MB3712	2.00	STK018	7.95	TBA396	0.75	TDA1180	2.15	UPC1028H	
AN342	2.95	MB3756	2.50	STK025	11.95	TBA440N	2.55	TDA1270Q			0.95
AN362L	2.50	MC1307P	1.00	STK032	7.95	TBA480Q	1.95		3.95	UPC1032H	
AN612	2.15	MC1310P	1.95	STK078	11.95	TBA510	2.50	TDA1327	1.70		1.50
AN6362	3.95	MC1327	1.70	STK085	8.95	TBA510Q	2.50	TDA2002	0.95	UPC1158H	
AN7140	3.50	MC1327Q	0.95	STK415	7.95	TBA520	1.10	TDA2003	1.95		0.75
AN7145	3.50	MC1351P	1.75	STK433	8.95	TBA520Q	1.10	TDA2010	1.95	UPC1167C2	
AN7145M	3.95	MC1357	2.35	STK435	7.95	TBA530	1.10	TDA2020	2.95		1.95
AN7150	2.95	MC1358	1.55	STK437	7.95	TBA530Q	1.10	TDA2030	2.50	UPC1181H	
AN7151	2.50	MC1496	1.75	STK439	7.95	TBA540	1.25	TDA2040	3.95		1.25
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CA3086	0.46	MC3401L	2.50	STK0015	7.95	TBA560C	1.45	TDA2160	2.50	UPC1185H	
CA3123E	1.95	MC14106P	2.95	STK0029	7.95	TBA560Q	1.45	TDA2524	1.95		3.95
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	2.50		7.50	TA7061AP	1.50	TBA651R	2.50	TDA2532	1.95	UPC1350C	
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CA3140T	1.15	ML231B	1.75	TA7073	3.50	TBA750	1.95	TDA2541	2.15	UPC1353C	
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HA1156W	1.50	MSM5807	8.75	TA7120P	2.50	TBA810AS		TDA2582	2.95	UPC1365C	
HA1306	1.50	SAA500A	3.50	TA7130P	1.50		1.65	TDA2593	2.95		3.95
HA1322	1.95	SAA1025	7.25	TA7137P	1.00	TBA810P	1.65	TDA2600	6.50	UPC20002H	
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HA1366W	2.75	SAA5010	5.35	TA7176AP	2.95	TBA820Q	1.45	TDA2611A	1.95	UPD2114LC	
HA1406	1.95	SAA5020	5.75	TA7193P	3.95	TBA890	2.50	TDA2540	3.50		2.50
HA1551	2.95	SAB3210	3.50	TA7203	2.95	TBA920	1.65	TDA2655	4.50	555	0.35
LA1201	0.95	SABB5608	1.75	TA7204P	2.15	TBA950/2X		TDA2680A	2.75	556	0.60
LA1230	1.95	SAS5708	1.75	TA7205AP	1.15		1.50	TDA2690	2.45	723	0.50
LA3201	0.95	SA580	2.85	TA7208	1.95	TBA990	1.49	TDA3310	2.95	741	0.35
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LA4140	2.95	SL917B	6.65	TA7228P	1.95	TCA270SQ				7808	0.50
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AC126	0.45	BC182lB	0.10	BD237	0.40	BF493	0.35	MRF453	17.50	TV106	1.50
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AC141	0.28	BC204	0.25	BD379	0.45	BFR40	0.23	MRF477	14.95	2N1308	1.35
AC141K	0.34	BC207B	0.26	BD410	0.85	BFR81	0.25	OC16W	2.50	2N1711	0.30
AC142K	0.45	BC208B	0.20	BD434	0.85	BFR88	0.30	OC23	9.50	2N2219	0.28
AC176	0.22	BC212	0.09	BD436	0.60	BFR90	1.50	OC25	1.50	2N2626	0.55
AC176K	0.31	BC212L	0.09	BD437	0.60	BFR91	1.75	OC26	1.50	2N2905	0.40
AC187	0.28	BC213	0.09	BD438	0.75	BFT42	0.35	OC28	5.50	2N3053	0.40
AC187K	0.28	BC213L	0.09	BD510	0.95	BFT43	0.35	OC29	4.50	2N3054	0.59
AC188	0.28	BC214	0.09	BD518	0.75	BFW10	0.55	OC32	5.50	2N3055	0.52
AC188K	0.37	BC214C	0.09	BD520	0.65	BFW11	0.75	OC42	1.50	2N2702	0.12
AD142	2.50	BC214L	0.09	BD534	0.45	BFW16A	1.15	OC44	1.25	2N3703	0.12
AD149	0.70	BC237B	0.15	BD535	0.45	BFW61	0.60	OC45	1.00	2N3704	0.12
AD161	0.50	BC238	0.15	BD575	0.95	BFW92	0.85	OC70	1.00	2N3705	0.20
AD162	0.50	BC239	0.15	BD587	0.95	BFX29	0.30	OC71	0.75	2N3706	0.12
AF106	0.50	BC251A	0.15	BD588	0.95	BFX84	0.26	OC72	2.50	2N3708	0.12
AF114	1.95	BC252A	0.15	BD698	1.50	BFX85	0.32	OC75	1.50	2N3733	9.50
AF121	0.60	BC258	0.25	BD701	1.25	BFX86	0.30	OC81	1.00	2N3773	2.75
AF124	0.65	BC258A	0.39	BD702	1.25	BFX88	0.25	OC84	1.50	2N3792	1.35
AF125	0.65	BC284	0.30	BD707	0.90	BFY18	1.35	OC139	12.50	2N4427	1.95
AF126	0.65	BC300	0.30	BDX32	1.50	BFY50	0.32	OC171	4.50	2N4444	1.15
AF127	0.65	BC301	0.30	BDX53B	1.65	BFY51	0.32	OC200	4.50	2N5294	0.42
AF139	0.40	BC303	0.26	BF115	0.35	BFY90	0.77	OC201	5.50	2N5296	0.48
AF150	0.60	BC307B	0.09	BF119	0.65	BLY48	1.75	OC205	10.00	2N5298	0.60
AF178	1.95	BC327	0.10	BF127	0.39	BR100	0.45	R2009B	1.45	2N5485	0.45
AF239	0.42	BC328	0.10	BF154	0.20	BR101	0.49	R2009	2.50	2N5496	0.95
AU106	6.95	BC337	0.10	BF177	0.38	BR103	0.55	R2010B	1.45	2SA329	0.95
AY102	2.95	BC338	0.09	BF160	0.27	BR303	0.95	R2322	0.58	2SA715	0.55
BC107A	0.11	BC347A	0.13	BF173	0.22	BRC4443	1.15	R2323	0.65	2SC495	0.80
BC107B	0.11	BC461	0.35	BF158	0.22	BRY39	0.45	R2540	2.48	2SC496	0.80
BC108	0.10	BC478	0.20	BF178	0.26	BSW64	0.95	RCA16029	0.85	2SC784	0.75
BC108B	0.12	BC527	0.20	BF179	0.34	BSX60	1.25	RCA16039	0.85	2SC785	0.75
BC109	0.10	BC547	0.10	BF180	0.29	BT100A/02		RCA16181	0.85	2SC789	0.55
BC109B	0.12	BC548	0.10	BF181	0.29		0.85	RCA16334	0.90	2SC931D	0.95
BC109C	0.12	BC549A	0.10	BF182	0.29	BT106	1.49	RCA16335	0.85	2SC937	1.95
BC114A	0.09	BC550	0.14	BF183	0.29	BT116	1.20	RCA16572	0.85	2SC1034	4.50
BC115	0.55	BC557	0.08	BF184	0.35	BT119	3.15	S2060D	0.95	2SC1096	0.80
BC116A	0.55	BC558	0.10	BF185	0.28	BT120	1.65	SKE5F	1.45	2SC1106	2.50
BC116A	0.50	BC639/10	0.30	BF194	0.11	BU105	1.95	T602IV	0.45	2SC1124	0.95
BC117	0.19	BCY33A	19.50	BF195	0.11	BU108	1.69	T6027V	0.45	2SC1162	0.95
BC119	0.24	BD115	0.30	BF197	0.11	BU124	1.25	T6029V	0.45	2SC1172Y	2.20
BC125	0.25	BD124P	0.59	BF198	0.16	BU125	1.25	T6036V	0.55	2SC1173	1.15
BC139BC	0.20	BD131	0.42	BF199	0.14	BU126	1.60	T9002V	0.55	2SC1364	0.50
BC140	0.31	BD132	0.42	BF200	0.40	BU204	1.55	T9011V	0.75	2SC1413A	2.50
BC141	0.25	BD133	0.50	BC240	0.20	BU205	1.30	T9015V	2.15	2SC1449	0.50
BC142	0.21	BD135	0.30	BF241	0.15	BU208	0.95	T9034V	2.15	2SC1628	0.75
BC143	0.24	BD136	0.30	BF245	0.30	BU208A	1.15	T9038V	3.95	2SC1678	1.50
BC147B	0.12	BD137	0.32	BF256LC	0.35	BU208D	1.35	THY15/80	2.25	2SC1945	3.75
BC148A	0.09	BD138	0.32	BF257	0.28	BU326	1.20	THY15/85	2.25	2SC1953	0.95
BC149	0.09	BD139	0.32	BF259	0.28	BU326S	1.50	TIP25	0.40	2SC1957	0.80
BC153	0.30	BD140	0.30	BF271	0.28	BU407	1.24	TIP29C	0.42	2SC1969	2.95
BC157	0.12	BD144	1.10	BF271	0.26	BU408	1.80	TIP30C	0.43	2SC1985	1.50
BC159	0.09	BD150C	0.29	BF273	0.18	BU500	2.25	TIP31C	0.55	2SC2028	1.15
BC161	0.55	BD159	0.65	BF335	0.35	BU508A	1.95	TIP32C	0.42	2SC2029	1.95
BC170B	0.15	BD160	1.50	BF336	0.34	BU526	1.90	TIP33C	0.95	2SC2091	0.85
BC171	0.09	BD166	0.50	BF337	0.29	BU807	2.25	TIP34B	0.95	2SC2098	2.95
BC171A	0.10	BD179	0.72	BF338	0.32	BUY20	2.15	TIP41A	0.45	2SC2314	0.80
BC171B	0.10	BD182	0.70	BF355	0.37	BUY69B	1.70	TIP41C	0.45	2SC2371	0.36
BC172	0.10	BD201	0.50	BF362	0.36	BUY71	2.50	TIP42C	0.47	2SC931D	0.95
BC172B	0.10	BD202	0.50	BF363	0.65	BUV41	2.50	TIP47	0.65	2SD325E	1.65
BC172C	0.10	BD203	0.50	BF371	0.25	MJ3000	1.98	TIP48	0.65	2SK19	0.55
BC173B	0.10	BD204	0.70	BF394	0.19	MJE340	0.40	TIP50	0.65	2SK33	0.55
BC174A	0.09	BD222	0.46	BF422	0.32	MJE350	0.75	TIP120	0.60	2SK105H	1.50
BC177	0.16	BD223	0.59	BF423	0.25	MJE520	0.48	TIP125	0.65	3SK88	0.95
BC178	0.15	BD225	0.48	BF457	0.32	MJE2955	0.95	TIP142	1.75		
BC182	0.10	BD232	0.35	BF458	0.36	MPSA13	0.29	TIP146	2.75		
		BD233	0.35	BF467	0.68	MPSA92	0.30	TIP161	2.95		
		BD236	0.49			MRF237	4.95	TIP2955	0.80		
						MRF450A		TIP3055	0.55		
							15.95	TIP31	0.20		

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BA156	0.15	BZX61	0.15
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BY182	0.55	1N4148	0.02
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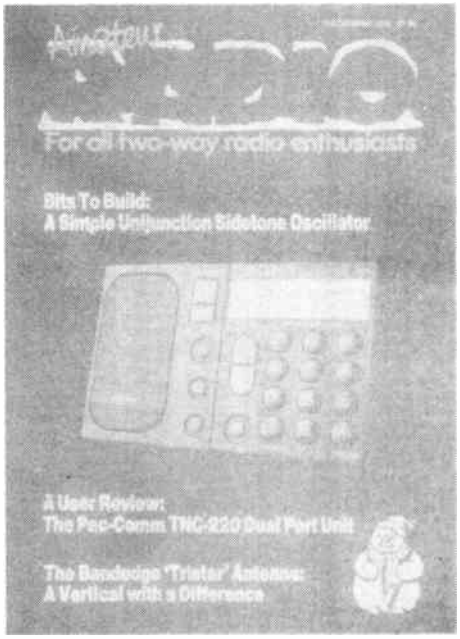

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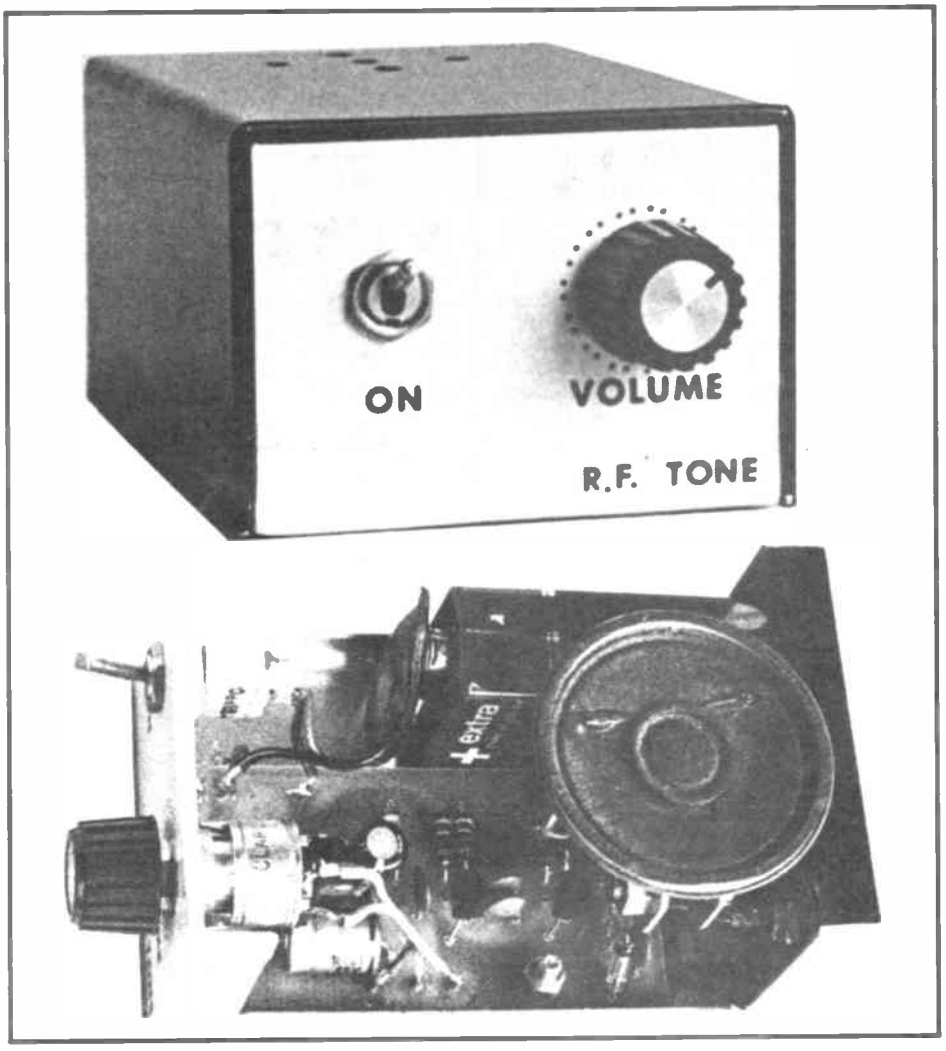
HEAR YOURSELF: PRACTICAL SIDETONE CIRCUITS



I have always admired those old American telegraphists who sat in their boxes by the railroad with a Morse key and a sounder, listening to the clicks of the sounder and sending perfect Morse with no aid other than the thump of the key. I would find it almost impossible to read Morse without listening to a tone and I know that my Morse is even worse than usual if I cannot hear my own sending as a tone. Some can 'key deaf' but I find monitoring my CW sending is essential.

It was easy in the days I started on the bands with my Morse key. We all used 'separates': a separate transmitter and receiver. Usually the receiver incorporated some form of muting when transmitting which enabled the operator to hear the actual signal being sent. A good system because not only could oddities of the signal be noted but also the receiver tuning control could be moved around to vary the pitch of the monitored signal. These days transceivers are arranged to emit a sidetone to monitor the Morse and I do wish that they had a pitch control so that the sidetone could be varied occasionally to ease the tedium of a monotone.

Sometimes the constructors among us require a sidetone circuit to monitor our Morse. Perhaps for a home-built transmitter or in the case of some commercial 2m rigs which can be keyed but provide no monitoring facilities. There are several circuits in the amateur radio literature which serve the purpose but I have known some of them to be more complex than a simple QRP transmitter which might provide the actual transmitted signal.

A unijunction sidetone oscillator

A very simple oscillator can be made from a unijunction transistor. The unijunction is the ideal device because, above all things, it 'wants' to oscillate. The unijunction is a three terminal instrument physically indistinguishable from other transistors. The symbol (see **Fig 1**) shows that it has an emitter and two base terminals. Two terminals are connected to the base and one to the rectifying contact: the emitter. The bases are interchangable but are designated B1 and B2 and commonly B1 is connected to the earthy end of the circuit.

Fig 1 shows how simply the unijunction can provide audio oscillation. There is a dc resistance of several thousand ohms between B1 and B2. Incidentally, this resistance offers a simple way of sorting out unijunctions from other types of transistor, by using an ohmmeter between the two base connections. If a supply voltage is connected across these, the emitter being left unconnected, the emitter will have a potential between the voltage extremes of B1 and B2. This is called the natural voltage of the emitter.

If the emitter is not connected, very little current will flow in the circuit. This will remain very low until the voltage at the emitter rises to above the natural voltage. If this happens, the junction E-B1 acts as a forward biased diode and conducts heavily.

Fig 1 shows the unijunction connected as a relaxation oscillator. When the circuit is switched on, E is below its natural voltage and the device is in a non-conducting state. The capacitor, C1, will begin to charge up through R1. When the charge on C1 exceeds the natural voltage of the emitter the unijunction will conduct heavily through E, B1 and R3. This heavy conduction will discharge C1 and when the charge on C1 is less than the natural voltage on E, the unijunction no longer conducts. Then C1 will charge up again and the whole process will be repeated, giving the relaxation oscillator action. The values R1 and C1 control the frequency of the oscillations and the value of C1 also controls the length of the pulse.

Fig 1 also shows that two types of pulse appear at the emitter and Base 1. Because of the build-up and discharge action, the pulse shape at the emitter is a sawtooth waveform. The pulse waveform at B1 is the inverse of the sawtooth. The rate of oscillation can be varied from a pulse every few minutes to oscillations at high audio pitches.

Practical unijunction circuits

Fig 2 shows a practical sidetone oscillator circuit. This would also provide

a very simple audio oscillator for a Morse practice source. In such an application the Morse key would be placed in the supply line.

To use this circuit as a sidetone, the transmitter must have a supply line which only goes on when the key is down. The resistance in B1 is a preset potentiometer which takes the output via a coupling capacitor, C2. The value of Rx controls the pitch of the oscillator and can be chosen according to requirements. A suggested value range of 47k to 100k should meet most needs. The pitch obtained for particular value of Rx will vary with samples of unijunction used.

The output can be taken to the audio amplification stages of the receiver in use. Try connecting it to the centre terminal of the audio gain (volume) control potentiometer of the receiver. The output would also drive a high impedance earpiece or a crystal one if the constructor does not want to make connections to the receiver. **Fig 2** also shows the connections for the two commonmost unijunction transistors: the TIS43 and the 2N2646.

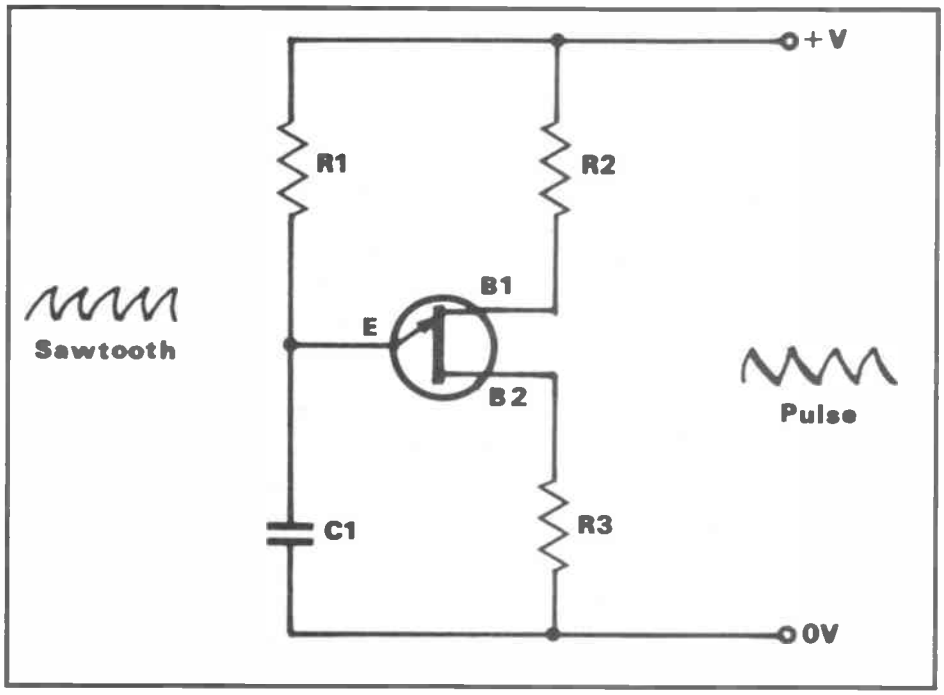
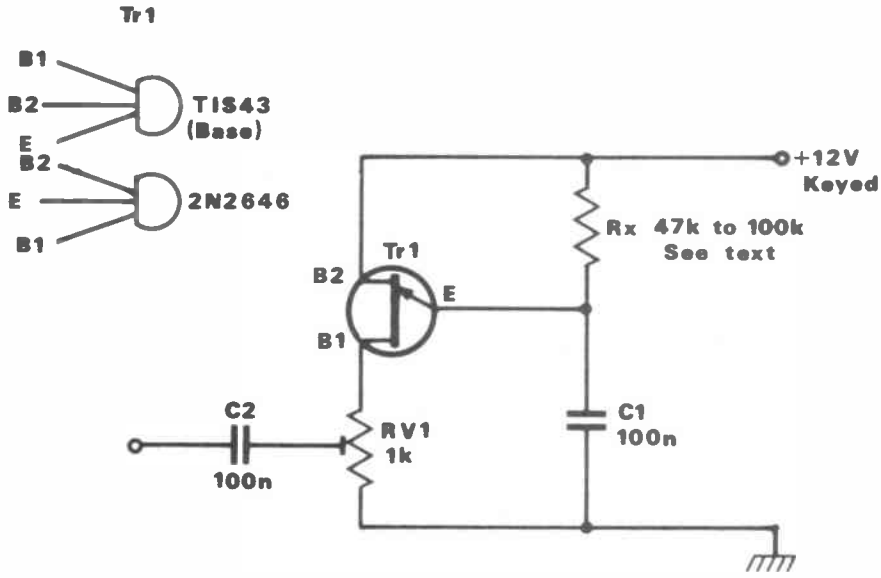


Fig 1: Unijunction oscillator

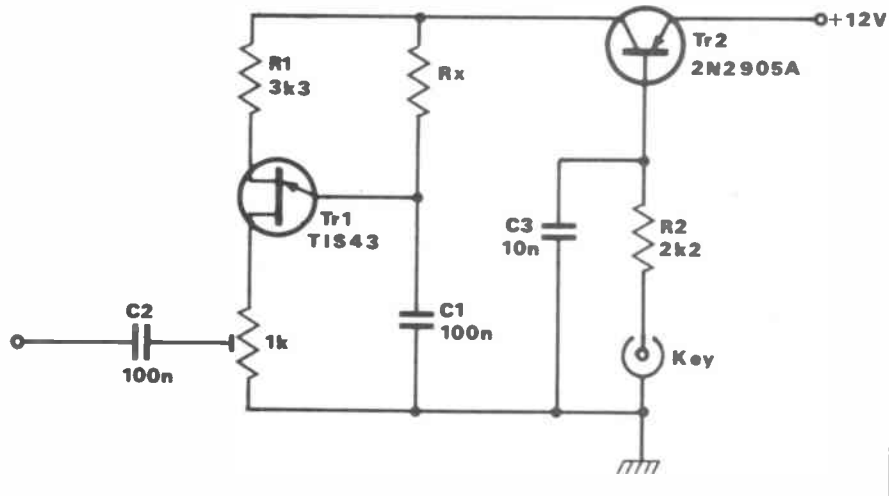
Fig 2: Simple sidetone



Parts List

TR1	TIS43 (2N646)
VR1	1K preset
Rx	47 to 100K
C1	0.1μF
C2	0.1μF

Fig 3: dc switched sidetone



Parts List

TR1	TIS43 (2N646)
TR2	2N2905A (or similar)
R1	3.3K
R2	2.2K
Rx	See Text
C1	0.1μF
C2	0.1μF
C3	10nF

The circuit of **Fig 2** is very simple but it does require a 12V (the range 6 to 15 volts will do the job) keyed line from the transmitter. This may not be available or the constructor may not know if it is or not. A better method is to connect the sidetone directly to the Morse key. To do this a transistor dc switch is required to use the key to switch the supply to the unijunction oscillator.

Fig 3 shows such a circuit. TR1 is the unijunction oscillator which requires the keyed supply to monitor the CW signal. TR2 is a pnp transistor acting as a dc switch. Although the 2N2905A is advised on the circuit diagram, almost any silicon pnp transistor could be used.

A 12V supply is connected to the emitter of TR2, this could be from the transmitter supply. When the key is depressed, the base resistor, R2, is pulled down to ground causing TR2 to conduct and supply TR1. The oscillation of TR1 will follow the switching action of the key. C3 provides a little shaping of the keying to round off the sharpness of the action.

Like the circuit of **Fig 2**, **Fig 3** could provide a simple Morse practice oscillator for those learning to send Morse.

An RF activated sidetone

Fig 4 shows the circuit of a very useful sidetone unit which does not require any connections to be made to either transmitter or receiver. The tone is actuated by the radio signal from the transmitter. The output of the sidetone is amplified enough to drive a loudspeaker built into the unit. Such a sidetone unit could be used for a whole range of CW transmitters. It only needs to be placed close to the antenna lead of any transmitter and whenever the transmitter emits radio signals, the sidetone unit will emit a tone.

In this circuit, the tone is provided by a multivibrator oscillator: TR2 and TR3 crosscoupled by C4 and C5. The output from this oscillator is fed via a volume control, VR1, to an integrated circuit oscillator, IC1. TR1 acts as an RF actuated transistor switch.

A small antenna picks up the radio signal which is detected by D1 and D2. The resulting dc voltage on the base of TR1 switches on the multivibrator oscillator which is amplified by IC1. An external AF input socket is also suggested on the circuit. This may be added to extend the usefulness of the unit. It will enable the audio amplifier to be used for general purpose, a useful addition to any amateur radio shack.

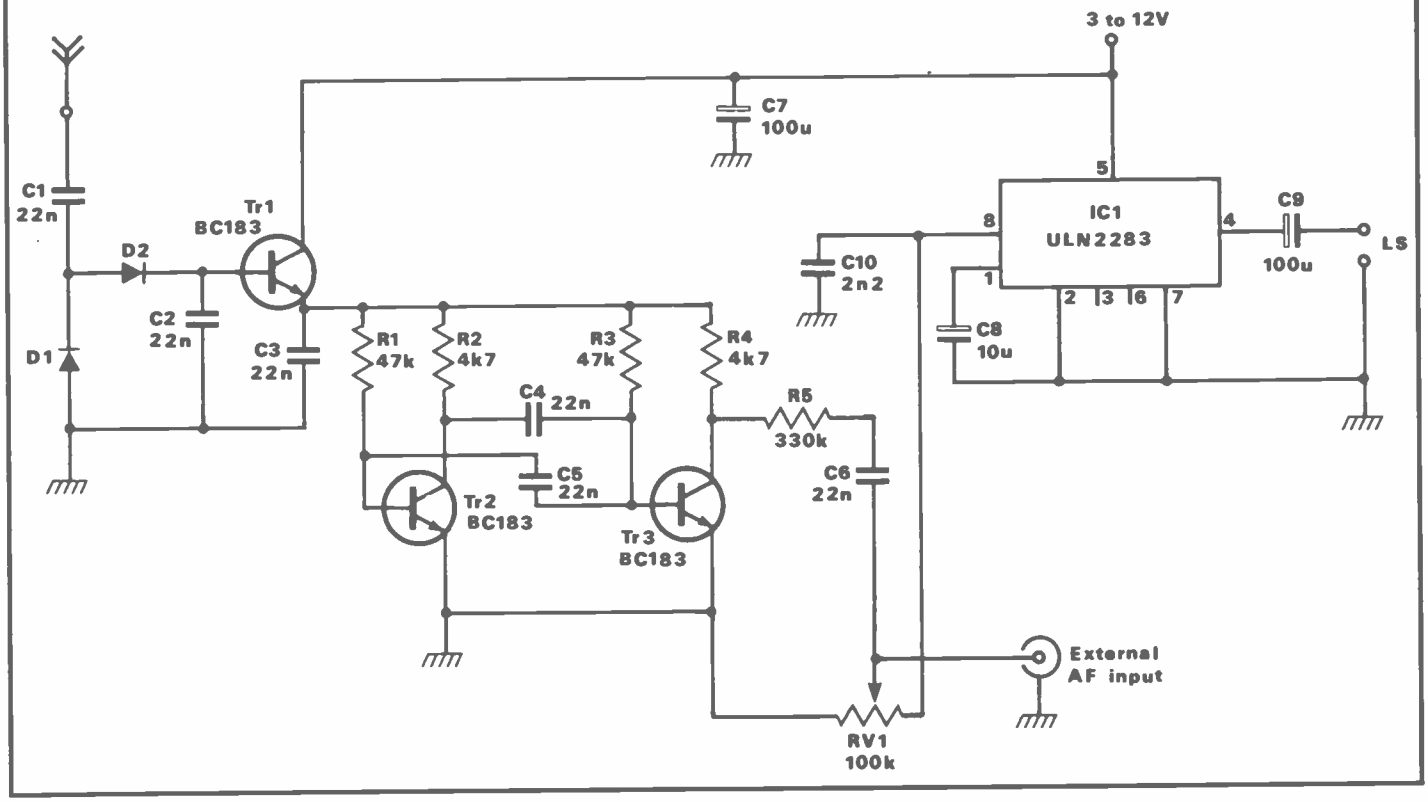
The sidetone can be actuated by low levels of RF signal. My example of this circuit used about 2ft of wire as an antenna and could be switched on by the 1 watt of RF signal from my 2m hand-held transceiver several feet away.

Fig 5 shows a suitable layout circuit for the RF actuated sidetone. This follows

Fig 4: *RF activated sidetone*

Parts List

TR1	TR2 TR3 BC183	C1	22nF
IC1	ULN2283	C2	22nF
R1	47K	C3	22nF
R2	4.7K	C4	22nF
R3	47K	C5	22nF
R4	4.7K	C6	22nF
R5	330K	C7	100μF
VR1	100k Log Pot	C8	10μF
D1&D2	Germanium Diodes	C9	100μF
	(any type)	C10	2.2nF



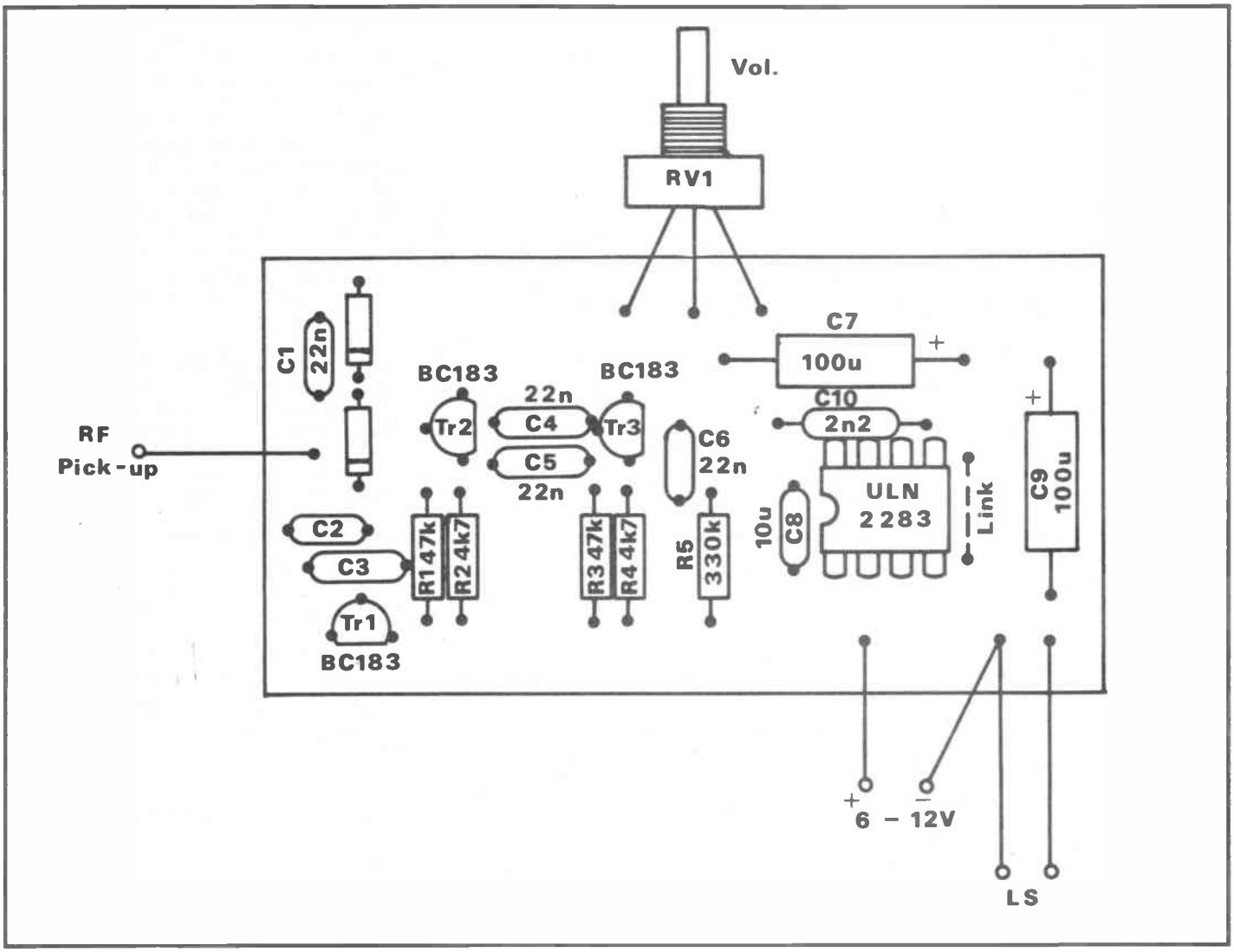


Fig 5: *RF actuated sidetone layout*

the design of the PCB supplied by Kanga Products for this circuit. The photograph shows how I built this circuit into a small case to make a compact unit. The case is an aluminium box 2in wide by 3in deep and 1½in high, supplied by Minfford Engineering. The case also holds a PP3 battery and a miniature 1½in diameter loudspeaker. The on/off switch and the volume control are also miniature items.

I built the RF sidetone from the kit supplied by Kanga Products and since building it have not had to add sidetone facilities on any little transmitters I have built or used. The unit sits beside my HF bands antenna tuning unit and provides sidetone monitoring for any transmitter I care to use.

Sources:

R F Sidetone Generator Kit: the full kit with PCB costs £6.45 plus 85p postage from Kanga Products, 3 Limes Road, Folkestone, Kent CT19 4AU.

Case-Type A9 (2 × 3 × 1½in [WDH]): available from Minffordd Engineering, Sun Street, Ffestiniog, Gwynedd. Tel: (076 676) 2572.

THE BANDEDGE 'TRISTAR'

A Vertical with a Difference

A user review by Trevor Morgan GW4OXB

Trapped vertical antennas are nothing new. Over the years I have had a couple (the HF5V and the MB5VH) with only average results, they are useful to people like however, myself, who have small gardens.

The current vogue seems to be to have tuned radial systems attached to the base of the driven element, sometimes as an 'add-on' and sometimes as part of the system.

I first saw the 'Tristar' while visiting the stands at the NEC Convention in July, but travelling by train prevented me from getting one at the time, so I ordered it by post direct from the manufacturers . . . yes, it's British made!

The aerial arrived a week later and the parts were checked against the supplied list. The driven element and radials come in two parts each. The base section of the former is fitted to the main support bracket, which is drilled to take the radials and fitted with a shielded SO239 socket for coaxial feed. The base sections of the two radials are fitted to brackets which are cut at 45 degrees and are fixed to the main bracket with stainless steel nuts and bolts. The fixing is simple and the prepared brackets present a very snug fit.

The trapped sections are clearly marked 'R' and 'A' and also have markings to show how far they should be inserted into the base sections. The tubes, which are of high quality tensile alloy, fit tightly into each other with no slackness and stainless steel hose clamps secure the sections once they are in place. Instructions advise you to seal the joints with self-amalgamating tape.

Once the aerial is assembled, it is a pretty big beast as the radials are, in fact, mirror images of the driven element. However, as it weighs only five kilograms it is easy to handle.

The main bracket is fitted with clamps for 2in masts so I set the aerial on my thirty footer above the shack. It didn't look quite so obtrusive once it was in the air.

Before I go into the testing, my location deserves some description as it plays a big part in my activities on the air. I live about a mile from Swansea docks between two large hills to the east and west. It is a built-up area and only some twenty feet above high tide. Activity on two metres is limited to local contacts or via GB3SWA (by reflection off the GPO building to the south!). HF activity has, so far, virtually excluded Asia, Africa and Canada.

The first test was for standing wave ratio and for this the aerial was fed to the station TS-430S via the Trio SW200 meter. SWR at 14.0MHz was 1.3-1 at 14.200, rising to a maximum of 1.65-1 at the edges of the band. On 21.0MHz the reading was 1-1 on 21.200, with 1.5-1 at 21.000 and 1.35-1 at 21.350. On 28MHz the reading was 1-1 at 28.500, with 1.3-1 at 28.000 and 1.25-1 at 29.000.

The first listening tests were carried out with the following stations logged. On 20m: UM8MDX 5V7WD, VE3NIC, PP3HX, AX2HD, OD5GV, VK3YJ, HD8X and C31LHK. On 15m: HK3N, LU1YUD, YV2RM, CP6SR, YV4ACY, PY2GOS, VE2FQX. On 10m: N2DLK, WA8ZVK, N9HEW, TR8SA and FR4FD. Not bad for a start.

The following weekend was the RSGB 21/28MHz Contest; a good chance to try the aerial 'in combat'. Suffice to say that on 21MHz I contacted all the US call areas, all but one of the VE call areas, JA, VK, HL, VP9, LU and CU, and on 28MHz contacted all the US call areas plus VS6, CE9, ZS1, PY2, LU, JA and Z2. With nearly 37,000 points scored, I thought I'd done quite well for my first contest.

During the following week or so I also worked YB1AQC (I was actually calling CQ USA but he reported an outstanding signal); JA7QVI(5/8); WA9JWN(5/9 super signal); ZS11ADM ('great signal' . . . we had a forty-minute QSO!); JL3VUL (59+); JI3KGS (59+) and JA7QVI who gave me a 5/8 report when I could only just hear him on the G5RV but was 5/9 on the Tristar! However, probably the most enjoyable contact was K6XO/M on the San Francisco turnpike on his way home to lunch!

So, how does the Tristar compare with the usual station aerials? The first report is with the Tristar followed by the G5RV and the AQ6/20 (see table below).

Needless to say, I'm very pleased with the results so far. I am now getting into VE with ease and into Asia and ZS, which were 'no go' areas before. I know conditions are up, but I was around during the last high sunspot level and having compared the old logs with present ones, can only say that if we haven't reached the maximum yet, I've got a lot of DXing ahead.

Just one point about the construction. Due to my location, I suffer from very turbulent winds. During the past week, we have had gales with gusts to 85mph. The good news is the aerial is still dead straight!

W1IDP	5/7	5/5	5/5	a regular contact 'best I've heard you'
TR8SA	5/9	5/6	5/5	'sounds very good'
OH2NGS	5/7	5/3	5/2	
IK2LRB	5/9++	5/7	5/6	
CT1BBW	5/9++	5/8	5/6	(near Lisbon using ⅛ size G5RV!)
WA9JWN	5/9	5/6	5/5	
W8OTH	5/7	5/4	5/3	'sounds like a great antenna!'

Tristar Vertical Technical Information

Designed and manufactured by: Myandering Ltd, Barnwell House, Barnwell Drive, Cambridge. Tel: (0223) 410699

Construction	High tensile alloy tubing. Cast alloy fittings
Traps	Traps wound on Tufnol
Band coverage	10, 15 and 20MHz
Feed	50ohm impedance, S0230 fitted
Power capability	1kW pep
Size	6 metres overall, 5 metre span. Weight 5 kilograms All tubing treated with 'Waxoil' prior to despatch. The driven elements is also available as a ground post mounted vertical or paired as a rotable dipole
Price	Vertical £63.25 inc VAT Dipole £75.00 inc VAT without balun, £80.00 inc VAT with balun Tristar £86.25 inc VAT

ICOM

IC-3210E Dual Band FM Mobile

- **Full crossband duplex.**
- **20 double-spaced memory channels.**
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- **25 watts output.**
- **Programmed, memory and selected band memory scan.**
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If you are newly licensed or just undecided about which band to operate first, then the new ICOM IC-3210 is just the answer. This dual band FM transceiver is ideally suited for the mobile operator. Transmit on one frequency and receive on the other and you're operating full duplex. It's just like talking on the telephone.

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Seasons Greetings to you all

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ICOM have a winning line-up for fixed, portable and mobile operations. The deluxe "75" series of transceivers offers a new standard of excellence from VHF to UHF communications. Each compact all mode unit delivers maximum performance, reliability and ease of operation.
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These transceivers can be used in a variety of ways, for propagation experiments, satellite communications, moonbounce, D'xing or straight rag chewing contacts.
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2 Meters

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

70cms

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

6 Meters/10 Meters

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

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

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USING YOUR OSCILLOSCOPE

PART ONE

Introducing the first part of a new series exploring the various uses for your oscilloscope

by Joe Pritchard

The aim of this series of articles is to explore the ways in which oscilloscopes can be used by electronics enthusiasts or radio amateurs to help with design, testing and repair of electronic equipment. I won't be discussing how they work, or how to use the 'scope; all that can be found in text books or the instruction book that came with the oscilloscope. What I will do, though, is look at a variety of techniques that allow us to get the best from our 'scopes, whether it's a single channel, 5MHz unit or an all singing, all dancing, dual channel, 100MHz bandwidth digital storage device!

This month I'll start with the most basic of all measurements, those of voltage. Let us start by looking at some potential problems we might encounter and how to deal with them.

We can view the 'scope as a high input impedance voltmeter, the input impedance depends on the 'scope and the probes that are connected to the 'scope input. Typically, an oscilloscope 'Y' input has a resistance of 1M shunted by a capacitance in the 15 to 30pF region, 20pF or thereabouts being quite popular. Examining the resistance side of this, then, it's clear that we must take care when using a 'scope to measure signals from high impedance circuits; where the 'scope's 1M input resistance could disturb the usual working conditions of the circuit.

For example, look at **Fig 1**. Here, we would expect the voltage measured by the oscilloscope to be the same at points 'A' and 'B'. The probes used are ordinary multimeter probes connected to the 'scope via a length of coaxial cable, and the 'Y' amplifier of the 'scope has a dc input resistance of about 1M. The voltage at point 'A' can be calculated using the equation:

Va = 8 · (R2/[R1+R2])

This will be about 4V in each case, if we allow for tolerance in the resistor values. A similar calculation can be done for the voltage at point 'B'.

In practice, Va comes in at about 4V, which is what we would expect from a potential divider where both resistors are of equal value, while Vb is only about 1V! What happened? Well, the 1M resistance of the 'scope input is in parallel with the lower of the two 5M6 resistors, thus creating an effective resistance of about 850k. If we now calculate that Vb will be using the above equation for the *actual* value of R2, 850k, then we get a result of about 1V – which is what we do in fact get. So, a first rule of thumb is to watch our circuit resistance, and remember that for measurements across resistance of greater than a few hundred k, that the 'scope input resistance will have an effect. The solution to this is to increase the input resistance of the 'scope, as we shall soon see.

Once ac measurements are considered, then we need to take into account the input capacitance of the system as well as the resistance. If we were to connect a couple of multimeter-style probes to the input of the 'scope via a length of coaxial cable, it's quite feasible that the input capacitance of the probes, connecting cable and 'scope could easily be 100pF or more. Although this isn't a real problem when we are doing measurements on dc circuits (or even on some ac circuits), it can cause serious problems in circuits where this capacitance will be connected in parallel with whatever circuit capacitance is already there. This can change the behaviour of the circuit undergoing measurement quite severely. For example, it can, in some cases, stop or cause oscillation! In addition, the capacitance can form part of a potential divider with ac signals and so cause errors of

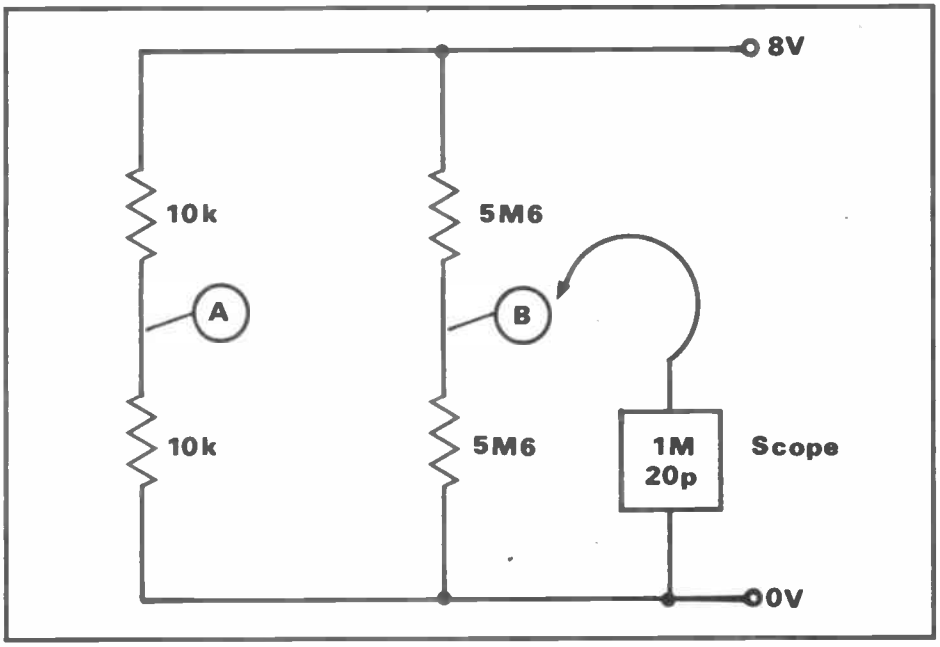


Fig 1

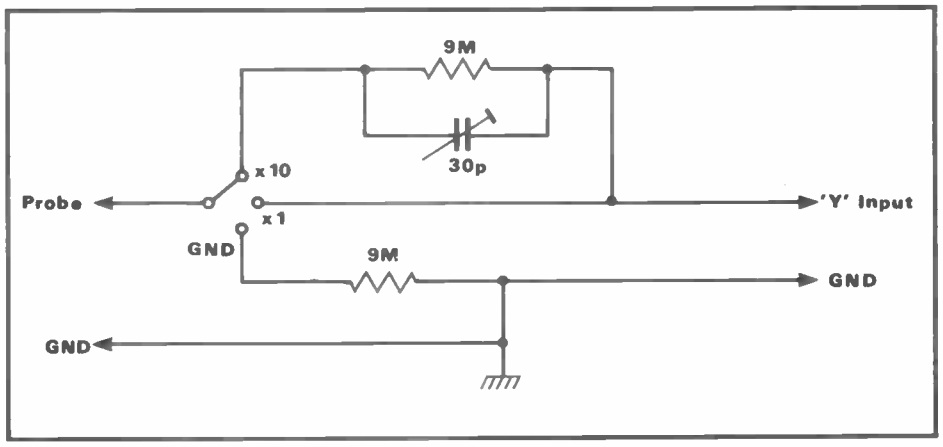


Fig 2

measurement, even when the working of the circuit under test appears to be unaffected.

The x10 Probe

One solution to both of these problems is in the use of something called an x10 probe. **Fig 2** shows a typical unit, which is usually made switchable, with two or three positions. As you can see, GND is optional. This position connects the tip of the probe to ground via the resistor. x1 is a direct connection from the probe to the oscilloscope input, and thus exhibits the same problems as were mentioned earlier. The x10 input connects to the 'scope input via a 9M resistor shunted by a trimmer capacitor. This has the effect of raising the input resistance to 10M (1M 'scope input resistance and 9M from the probe) and dividing input dc voltages by a factor of ten.

Thus, a 1V dc signal applied to the probe in the x1 mode would deliver 1V to the 'scope. The same signal applied with the probe in the x10 mode would deliver 0.1V to the 'scope, but the circuit providing the 1V would be loaded to a much lesser degree.

The capacitor is adjusted to compensate for the extra capacitance added to the system by the input capacitance of the 'scope and the cable capacitance. This will then provide a divide by ten function for ac signals, where the probe will display an input impedance of 10M with a lower capacitance than would be obtained if the trimmer were omitted.

Adjusting the compensation capacitor

Most x10 probes I've seen have a 'screw head' type of adjuster for the trimmer. The probe has to be adjusted for the cable to which it is connected, and for the 'scope to which it is feeding signals. Once adjusted, the probe should be occasionally checked, as outlined below.

Once adjusted for a particular cable/'scope combination, it may require further readjustment if this arrangement is significantly changed.

Adjustment of the trimmer is done with a 1kHz square-wave of a few hundred mV peak-to-peak amplitude. Such a signal is often available on 'scopes for this purpose. Alternatively, it could be generated by a simple RC oscillator based on TTL devices. For amateur work, it doesn't really matter if the frequency used isn't exactly 1kHz. The 'scope should be adjusted so that a cycle of a wave should be present on the screen at a reasonable size. The trimmer can then be adjusted to get as 'square' a square-wave as possible. (See **Fig 3**). That's all there is to setting up your x10 probe.

Small signal measurements

Due to the x10 setting on a probe dividing the input voltage by ten, small signal (a few mV or less) measurements are a little awkward with the x10 probe. One way around this would be to use straightforward x1 probes, as we did in the experiment above (remember to connect them to the 'scope input with low capacitance cable).

Direct current measurements are easy. Set the 'scope for 'dc coupling' on the 'Y' amplifier input, and set the auto trigger and timebase controls to give a straight line across the screen. Now connect the probe of the 'scope to ground, select the 'vertical volts/division' for the voltage that you intend to measure, and adjust the vertical position of the line to be in-line with one of the horizontal graticule lines. Now move the probe to the point in the circuit where you wish to measure the voltage. The line on the 'scope's screen will move up or down depending upon the polarity of the voltage at that point. The size of the voltage can be obtained by carrying out the following calculation:

Volts = Nd · Vd

Where Nd is the number of divisions of the graticule between the 0V position and the position taken up by the line for the measured voltage, and Vd is the number of volts per vertical division, as set by the 'Y' gain amplifier control. As an example, if the 'Y' amplifier was set to 1V per division, and a distance of 1.6 divisions was noted when measuring the voltage, then the voltage present is:

1 · 1.6 = 1.6V.

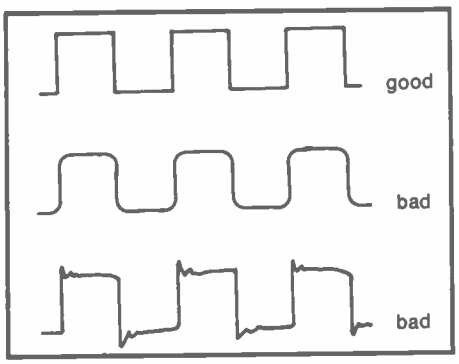


Fig 3

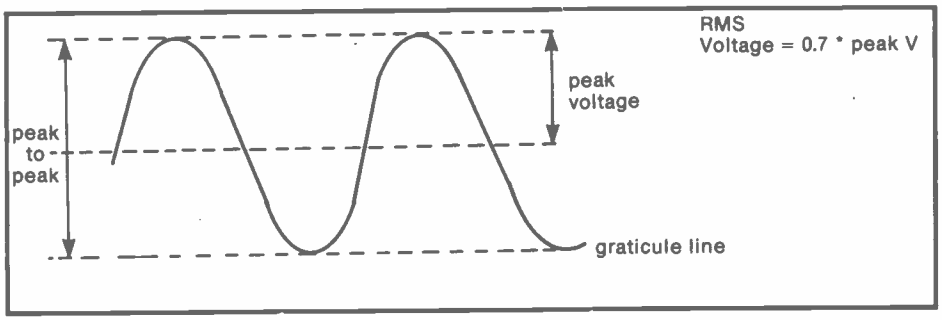


Fig 4

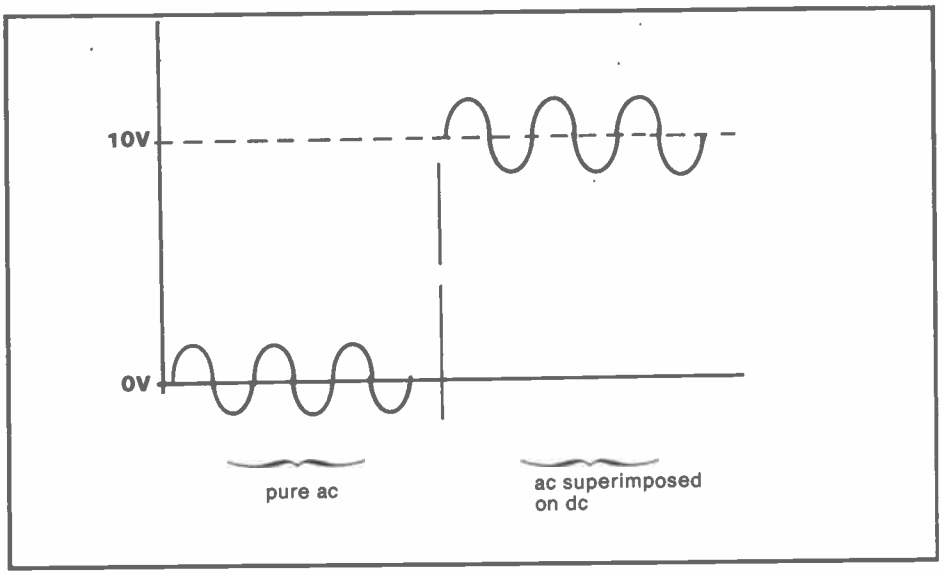


Fig 5

Ac voltage measurements

For ac measurements, the timebase control needs to be set so that a cycle or two of the ac waveform can be viewed on the screen of the 'scope. You can do this fairly quickly, even by trial and error. Adjust the 'Y' gain to give a suitably sized display, and then adjust the vertical position of the trace so that the 'bottom' of one of the cycles is on a horizontal graticule-line. **Fig 4** shows the type of voltage measurements that can now be made from the 'scope display. Most oscilloscopes offer 'ac coupling' and 'dc coupling' of the input signal to the 'Y' amplifier. Dc coupling will pass all the voltage input to the 'Y' amplifier, which can be quite annoying; especially if you have a relatively small ac voltage on a large dc voltage (see **Fig 5**).

Here, the accuracy of the ac measurement would suffer as we would need to use quite a high volts per division setting on the 'Y' amplifier to get the dc voltage on the 'scope. Ac coupling, on the other hand, would only pass the ac part of the input signal through to the 'Y' amplifier; the standing dc signal would be removed, thus making measurement of a small ac signal much easier.

Next month, I will examine the measurements of current and resistance, and start to examine frequency and time measurement on the 'scope.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Although it may seem like a contradiction in terms, medium wave listening is an integral part of the short wave listening hobby. In fact, many ardent short wave DXers and, indeed, many licensed amateurs, have been, or are still interested in, the somewhat different techniques involved in medium wave DXing.

Medium wave reception is often overlooked by the newcomer to serious listening and all too often forgotten in the excitement of logging the exotic stations to be heard on short wave.

Domestic band

If you already have a reasonable quality short wave receiver, it will most probably have adequate coverage of the medium wave section of the spectrum. The important specification for medium wave reception is selectivity, or the ability of the receiver to separate stations that are close together; excellent if filtering is essential. However, even the humble 'Vega' range of receivers can give good reception if you are prepared to accept the limitations of the set.

The frequencies we are interested in here are from 526.5 to 1705kHz. The broadcast stations in this region transmit on AM (amplitude modulation) so no BFO is necessary. Single sideband has still not been accepted by the majority of broadcasters, although tests in this mode have been carried out for some time.

The medium wave band is the prime domestic band and most broadcasting companies have their regular 'spot on the dial', and there lies the major problem for the would-be DXer. The very strong signals from local radio and the big European broadcast stations, tend to swamp any weaker signals coming from distant stations. This makes daytime DXing extremely difficult and needs a keen ear and a lot of patience. Couple this with the fact that, during daylight, sky-wave signals are absorbed by the D layer in the ionosphere and reception is by ground wave.

The best medium wave DXing is done after dark and, for the best DX, after midnight. At this time many of the local stations, and a good proportion of the major broadcasters, are closing down for the day. And, more importantly, the sky-wave signals are reflected by the E layer, enabling signals to be received over greater distances. Sometimes, both the ground-wave and the sky-wave signals can be received and this will cause severe fading.

Antennas

As well as a reasonable receiver, of course, you need a good antenna, and this is where medium wave differs from the short waves. The 'long wire' antenna, strung up for short wave DXing, will certainly bring in the signals. However, due to the strength of these and the close proximity on the bands, this can cause extreme overloading of the receiver. The answer is an antenna that can be adjusted to 'null out' the unwanted signals and give preference to the one you are searching for.

The medium wave loop has been around since the early days of radio and, if used properly, can be successful. Although intended for indoor use, it is rather large to sit on top of an operating bench, especially if the shack is a corner of the lounge.

The top is of reasonable size and has a deep and effective 'null' of the broadside. It can be made from quality hardwood, copper wire and a variable capacitor. As the weather can cause problems, a good coat of yacht varnish should be applied to the finished coil to prevent the ingress of moisture (see **Fig 1**).

Remote control of the tuning capacitor, which should be of the continuous rotating type, is simple enough. An insulated shaft is connected to the capacitor drive shaft through a ten to one reducer and fixed to a small 12V model motor (obtained from hobby shops or your youngster's toy box). This can be controlled using a variable resistance such as a spare model railway controller which will give you variable speed drive and reversing so that you get the tuning spot-on. A reversing switch will also suffice. Fit the assembly into a water tight box with the connecting wires fed through a grommet in the capacitor housing.

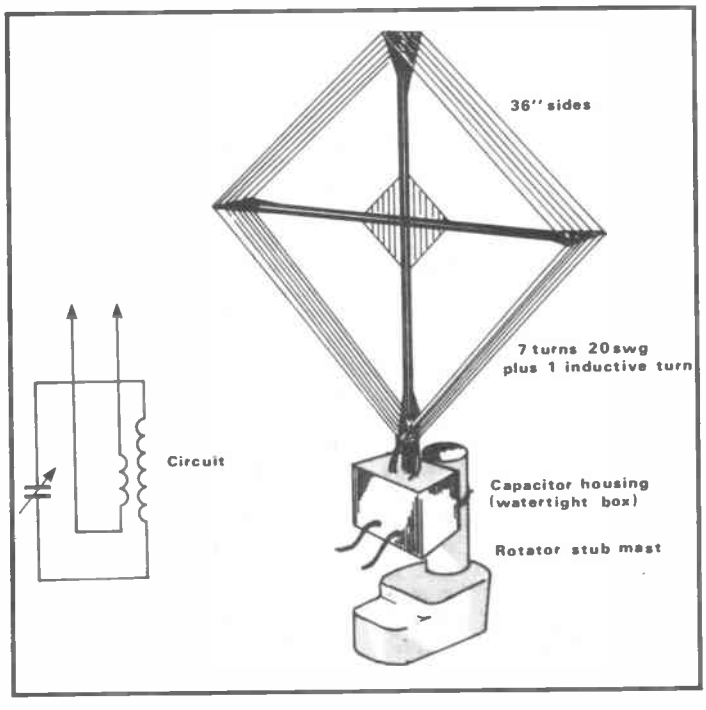


Fig 1: *Medium wave loop antenna*

Ferrite aerials

One alternative to the loop is the active ferrite aerial. This consists of a rotatable ferrite rod which is coupled to a broad-band, low noise amplifier. This aerial can be homebrew or purchased ready-made. Nevertheless, the common problem of all indoor aerials is that they collect and amplify local interference, such as that from electrical wiring or domestic appliances.

Another alternative is the 'Inverted L' aerial which is simply a horizontal wire aerial as long as convenient, fed vertically at one end. As with all aerials of this type, it is best to use coaxial cable for the vertical section, earthing the screen will help to prevent static and other interference. Horizontal wires can also be fed from the centre ('T' aerial).

As with all radio, there is nothing to beat experimenting, and many a good idea has come from something used as a 'temporary lash-up'.

Safety

It is amazing how many radio enthusiasts, listeners and amateur operators, pay little, or no attention, to earthing. In the old days, equipment had three core cable. The green covered cable was the earth and this was coupled to the chassis of the equipment and fed to an independent earth terminal which, most often, was tapped to a lead water pipe near the mains junction box. Things have changed, and equipment now has two-wire cable. We are advised not to trust the mains earth but to con-

nect a separate earth lead to our equipment. The trouble is, many people do not!

This can be the cause of all sorts of problems and can be **fatal.** Always earth your receiver, and by that I mean use a good heavy cable to tap from the chassis (usually a tapping point is provided) to a sound earth spike. Electricity will always follow the shortest way to earth.

RF in the shack

The RF, or radio frequency earth, also serves the same purpose and allows the RF to feed away to ground. When coupled to an aerial feeder or ATU, it will reduce static and generally clean up the signals. RF in the shack is unpleasant and can result in burns. Evidence of scorched or non-existent grass can be seen around buried radial wires.

If you have absorbent soil, you can make a ground plane by simply digging a hole about 6ft square and 2ft deep. Line the bottom and half way up the sides with a polythene sheet. Put a couple of layers of old sacking or carpet in the bottom and then lay some heavy copper wire (I used about 200ft). Tap the end with heavy uPVC covered wire and feed into the shack. Fill in the hole and finish with some moisture loving plants (see **Fig 2**).

At the shack end, secure the feeder to a 3ft length of half inch copper pipe and secure this behind the operating area with plastic pipe clips. You can then tap on to this from any equipment using hose clamps.

Flat dwellers have different problems. The mains earth is difficult, but an 'artificial' RF earth can be made by running a good length of covered wire around the room under the carpet. If this is fed to the receiver earthing point it can be effective.

Tuning the band

So to the band itself. As with all tuning, this has to be done slowly, looking for those faint signals between the 'big guns'. You can list the more powerful stations as you go. Some may be 'image' signals and you may be able to check these later from schedules.

The cheaper receivers often have station names printed on the scale or dial, but these are often inaccurate as stations change frequency at times. Note that if the receiver components become worn drifting can occur.

Listening regularly will enable you to identify specific stations, either by announcements or identifying signals that are transmitted before the programmes start. These signals can take the form of tunes, bells or some other easily recognised form.

Because of the difficulty of receiving medium wave stations over long distances, broadcast stations are often pleased to receive reports but they should be clear, precise and give details of what was heard, where and when.

Medium wave broadcasts are usually intended for domestic audiences and are generally in local language, so it is a nice touch to put at least part of the report in that language – even a greeting at the end.

ILRs

ILRs (Independent Local Radio stations) do accept reports but many do not send QSL cards. Instead, you may receive station 'stickers' and a thank you note, but they are usually interested to know that they are being heard outside their normal target area.

The medium waves are full of interesting listening and well worth a try. If you want to know more about this side of the hobby, contact: The Medium Wave Circle, 69 Alderney Way, Cramlington, Northumberland NE23 9UQ.

Rallies

Having reached the end of 1988, it is time to plan for rallies in the coming year. The Northern Amateur Radio Societies Association will be holding their rally at Norbreck Castle Hotel, Exhibition Centre, Blackpool on Sunday 29 January. Doors open at 1100. They offer the usual trade stalls plus a homebrew (equipment) stand and inter-club quiz. Admission is £1.00. For more details, contact Peter, G6CGF.

The Trafford Rally is on Sunday 12 March at the Greater Manchester Exhibition Centre. All the usual stands are offered and details are available from: Trafford ARC. Tel 061-748 9804.

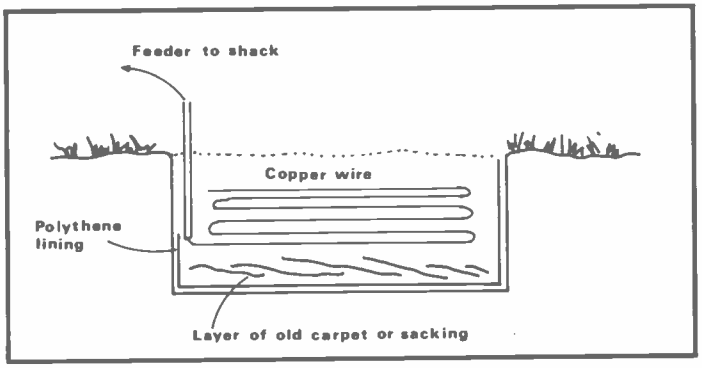


Fig 2: *Ground plane*

Our DXers have been busy again and some interesting reports are coming in. Ten is now the place to be with excellent reports from all corners of the globe and even some FM reported from the USA. Fifteen is also well up and good DX has been reported. Twenty is getting crowded and it's getting harder to make decent QSOs. Forty still has its ardent few, but DX is not as easy to come by as it was earlier this year. Eighty is getting decidedly noisy during daytime hours and even the regular nets are finding it difficult.

Reports

So to reports. Geoff Hughes, of Chelsea, used his Tatung TMR7602 to log TU2QQ and S0RASD on ten; D44BC, 9Y4NJ, ZK3RVC, BY4SZ, KC200LB, KL7XD and VS6UZ on fifteen; and VR6KY, V44KI, J73LC, FY0EK, ZZ2JE, T77G, 3A2LF, HV3SJ and masses of others on twenty; while forty brought CY9DXX, VP2VM, A92BE, YS1GMV and XE1ND.

Darrell Jacobs, of Reading, said there was so much DX about he could not list it all, but ten found T22 (Tuvalu) and PR8MG; fifteen found 3J3, JH4, JT1, VP8 and ZD8. Tonga, A3CAB, was the best catch on twenty, but masses of Indonesians were about.

Awards

The claims for awards keep coming in and this month we have some real corkers! Steve Joyner, RS8898, Dagenham, claimed the North American and Asian awards with such choice loggings as KP2FB/HP, G4PET/HH2, HK0EFU, 6K24SO, VS6UP, V47NXX, FP/AG9A, CY9DXX and FG/PA0CRA/FS.

Darrell Jacobs claimed the European award for 40m along with YO4BXT/MM in the Black Sea as the most interesting logging.

Ian Shelton of Ripley, claimed the North American award with all the call areas logged and most on fifteen.

Ian Baxter of Blackburn, claimed the African award with ZS6, Z21, 6W6, C53, 9Q5, 3B8, S42, 5T5, 5V7, 6W1, J52 and 5R8 among the crowd. Fifteen was the best band for Ian as well. Also, his claim for the Bronze Prefix award came in at the same time with ZB2, D44, A92, 8P6, VX3, K4YT/DU1, V85, T77 and DU9.

Herbert Yeldham of Burnham-on-Crouch, came up with a pile of claims for North America, Asia, USSR and Europeans for 80, 40, 20 and 15 metres.

Peter Cardwell of Sheffield, claimed African, Oceania and Asian awards to add to those he already has.

Eddie Gauci of Sliema, Malta, claimed the North American award and says he is still after the 'Lifeboat' award. This award has proved the most challenging. Only 100 towns in the UK with Lifeboat services have to be logged, but it is not easy, although there are well over 200 lifeboat stations.

Peter Uhren of Waren, DDR, claimed the Premier Prefix award for 2000 prefixes logged, and is hoping to visit Bulgaria before his new college term starts.

Well, that about wraps it up for this month and, indeed, for 1988. It has been an interesting year with excellent propagation which hopefully will improve even more over the next twelve months.

Yuletide greetings

During the year, I have had the pleasure of meeting many readers at various rallies and I hope to meet more of you during 1989. Meanwhile, I wish listeners everywhere, all the best for Christmas and the New Year!

50MHz

by Ken Ellis G5KW

The excellent propagation conditions on 50MHz, reported last month, have continued during the period under review and indications are that the improvement will stay with us. We have had some very interesting openings and there are signs of unusual propagation to come during the next few months.

Major TEP openings to South Africa

October, the main TEP month, has again lived up to form. Some long and consistent openings have taken place between ZS3, ZS6 and the south coast of the UK, with occasional openings to GW, GM and GI.

I have received from Hal Lund ZS6WB, copy of his *ZS 50MHz DX Report*, dated 30 September, and an issue of *ZS VHF News* (15/88) dated 6 October. He writes that conditions have improved greatly in ZS during the month with zones extending further north and south. The furthest south worked was ZS4AAB and GJ4ICD at 40.5 north was worked quite often.

On 5 September conditions seemed poor in ZS6 but ZS3s fared much better, with an opening to Europe during which ZS3AT and ZS3DM worked a number of stations including: 9H3EO, F5QT, G3COY, G3JVL, G3SED, G3ZSS, G4AFY, G4GLT, G4IGO, G4ILL, G4IJE, G6XZA, G8BCL and PA3EON. 14 September was another good day with ZS3AT having many QSOs with European stations between 1410-2013. On 20 September during an evening opening, ZS3AT contacted GM3WOJ, GJ4ICD and later heard K1JRW at 1750. ZS3AT was also heard by GW3MFY, WB4SLM and OH1AYQ, but no QSOs resulted.

On 27 September the band opened at 1035 until 1400. By that time ZS6s had QSO'd about 35 Gs mostly in JO 01 and 10-70/80/90/91, plus CTs, Fs, GJs and PAs. The band reopened about 1630 and contacts were made with GJ4ICD again, PAs, Fs and CT1WW. Conditions were so strong that ZS6s were working ZS3 and ZS4 on backscatter.

The remainder of the month was quiet with little to report.

The South African 6m Award

This award is made for contacting two-way on 6m and confirming ten grid squares on the African mainland south of the equator after 1 January 1986. A number of European stations have now qualified and are probably waiting for the last few QSL cards to arrive. As awards will be serial numbered, only the first five will be issued after 1 January 1989 in consecutive order to stations whose QSLs show the tenth contact on the earliest date. After the first five awards are made, serial numbers will indicate the order in which the applications are received. QSLs or photocopies with five IRCs should be sent to: VHF Awards Committee, POB 1259, Pretoria 0001, Republic of South Africa. If you want a low serial number application must be made before 1 January 1989.

50MHz reporting club

Ray Cracknell G2AHU, reports that the propagation picture in September 1988 was influenced by the earlier disappearance of Sporadic-E and rising F2 muf resulting from increased solar activity as well as seasonal effects. Es occurred almost exclusively in the first half of the month and backscatter in the second half. The equinoctial rise in transequatorial reliabilities is evident in the African, South American and the Antarctic beacons and in the outstanding 50MHz results.

The remarkable 50MHz opening to the Transvaal and Namibia reported on 28 August was repeated one cycle later on 27 September, with what was probably a 3 hop-F2 opening from South Africa to most of England lasting for upwards of two hours and peaking at noon at the mid-point of circuit.

Other significant results were an opening from Argentina on 8 September, an almost daily TEP across the equator extending as far north as the Channel Isles and the surprisingly regular reception of Zimbabwean TV video on 48.258MHz by G4GLT in Leicester. Dave received the GWVRU video on eleven days during September at various times between 1747 and 2023. He makes the point that the 8kHz offset of the ZTV video leaves it a clear frequency away from the 48.250 QRM (of significance as Zimbabwean amateurs may now use 50MHz).

From the mailbag

Mike Walters G3JVI, reports that Paul 9H1BT on 28.885kHz has the wonderful news that the long path from Malta to Japan has been worked. Since 25 September 1988 Paul has been working into South America and South Africa virtually every day. The characteristics of the signals are interesting; the early opening (1300 F2) to South Africa are 'pure tone' and very strong in general, while the late afternoon (1700 class 1 TEP) are quite strong with some flutter and seem to merge with the class 2 TEP normally expected around 1930. Paul also reports that the South American opening overlaps with the ZS opening as often ZS3E/B is still audible for some time when LU/PY/CX is being worked. These later signals always have slight flutter fading on them. Beacons heard regularly in Malta are: PY2AA – 50.060, PY2AMI – 50.075, LU1MA – 50.086 and FY7THF – 50.039. On 8 October 1988 9H1BT worked fifty Japanese stations on 50MHz between 2145 and 2345, with signal reports between 55 and 57 over the long path of around 29500km!

On 10 October it was the turn of the French to work Japan the long way round. The nearest F was just 200km south of Jersey. Our turn will come!

John GW3MHW, IO 72, heard the ZS3E keyer on 27 September and again on 8 October for over one hour. He had a two-way QSO at 1608, 55 each way. He then worked two-way: ZS6AXP, ZS6LW, ZS6XJ and ZS4TK. On 9 October he had QSOs with ZS3AT and ZS6LN. These ZS3s and ZS6s raise John's two-way country total to twenty-seven.

First DXCC reported on 50MHz

PY5ZBU is reported to have worked 100 countries on 50MHz – the first DXCC on the band. Several other stations are in the upper 90s.

RSGB 50MHz Contest

This contest on 23 October seems to have been well supported, with many stations contacting G3GJQ/5N28 Lagos. Several stations had serial numbers in excess of 300.

The latest in a series of welcome surprises this season, was the unexpected arrival on the band of Roy Handley G3GJQ/5N28 from Lagos, Nigeria, on 22 and 23 October, giving many 50MHz operating enthusiasts a new country.

Here at Folkestone the band was dead around midday, until about 1330 when I heard a weak station on 50.110, peaking from the south. I expected it to be one of the South African stations, but to my surprise I eventually identified the call as G3GJQ/5N28 in QSO with G3NOH.

I joined the queue and at 1355 had a QSO 57/57. His signal built up to S9+ and Roy had twenty-seven QSOs in twenty-five minutes. The following day, during the RSGB 50MHz contest, Roy again broke through, this time a little earlier. While he was audible at Folkestone, he worked twenty-nine stations in the UK and Europe. With the various multipliers this should give him a very high score.

Very few DX stations were heard. I was his thirteenth contest QSO and then had a QSO with ZS6BMS in KG44 square. I was called by a ZS3 station but could not complete a QSO due to QRM.

During a QSO later with Ken Willis G8VR, Roy told us he had put up the 3 element Cushcraft Yagi at 85 feet on 22 October, installed the Icom 575 – 8 watts, plugged it in and then the whole band

exploded! It was his first experience of VHF – what a way to start!

Roy will be home for a short time next month at a new QTH in Wales. QSL via his home address. The 5N28 suffix is to commemorate Nigeria's twenty-eight years of independence. He will be reverting to 5NO next month.

As I conclude this month's column the solar flux is starting its monthly uplift and promises well for the remainder of this TEP season.

Next month I shall refer to the coming F2 season and hope to report the first transatlantic QSOs of cycle 22 by F2. Until then, good luck and DX from Ken Ellis G5KW, 18 Joyes Road, Folkestone, Kent CT19 6NX.

News and comment from Glen Ross G8MWR

Canary Islands

You may remember that I recently reported an exceptional 144MHz contact between G0AEA in the Scilly Isles and stations in EA8. More interesting information has been reported by Colin about these contacts. It seems that the path involved was very narrow or that Colin was right on the eastern edge of the path. During the period of the contacts, Colin alerted several stations in Devon and Cornwall that the DX stations were available and this obviously raised a fair bit of excitement as you can imagine.

No go

The problem was that although the DX stations were a good S9 on the Scilly Isles, they were completely inaudible only a few miles to the west on the mainland. Perhaps this was an example of ducting in which the transmission path can be likened to a hose-pipe or rainbow, connecting the two stations and through which the signal travels. This does happen from time to time and it can be very mystifying when you hear someone two or three miles away giving S9 reports to continental stations which you cannot even hear. The conclusion you usually come to is that your receiver is on the blink and you reach for the lump hammer!

Going up

It has been some time since we had a review of the happenings in the microwave world so let's see what has been going on up there. The first thing of note is the great increase in the amount of people using 10GHz and the sort of thing they are using the band for. A recent conversation with Ray GI0BRO, revealed that he has coerced a couple of locals to try out some packet radio on the band. This has certainly resulted in the first GI contacts on this mode even if, at the moment, the distances are fairly short. Efforts are being made to get the gear to the standard where it can make contacts into Scotland where GM4ISM will probably be interested in a GI to GM first.

Cash flow

The only snag from my point of view is that Ray has conned me into getting going on packet; these lads from Northern Ireland have a great way with words. He made it sound so easy that eventually a dealer at the Leicester show parted me from my cash, a painful experience, and I am now trying to decipher the instruction book!

Why is it that so many of the authors of these books assume that you can understand all the technical terms? If I knew enough to follow what they have written, I would not need the book in the first place. Apparently, I have to keep an eye on the RCVDFRMR in case of trouble. I doubt if I would recognise it even if I knew where to find it. If you are on packet you might give me a call to see if I have had any success so far, or to leave some news and comments.

In view

Another operator doing unusual things on 10GHz is G8OZP from Burton on Trent. He is playing around with television on the band and doing it the hard way. To get some really long paths he has been taking the gear out portable, which takes a bit of humping when you stop to think what is involved. His usual partner in crime is G8NND and between them they have come up with some excellent contacts.

The best so far is from Exmoor to Nottingham Hill which is near Malvern. They have got some good pictures over a distance of 142km. This is even more impressive when you think that the transmitter only runs 12mW to the aerial. A 30in dish does help of course.

Round table

Microwave men do it on round tables; sort out problems and put the microwave world to rights, that is. The latest one was held at Winchester and was blessed with a good attendance. Some interesting points were brought up, including the traditional one of which way is forward. In this case that means do we all shift to SSB from the simpler FM systems? Now there are several facets to this problem not the least important being that the FM system, usually based on an ex-burglar alarm, is incredibly cheap. A complete set of gear costs well under £50.00. Not only that but it is also very effective, with paths of around 250km having been worked.

Upgrading

The next step is to go to SSB where, at least in theory, longer and even obstructed paths can be worked. I say in theory because there is rather more to the point than the simple and technically correct statement would indicate. The problem lies in expense and availability.

Most people have to settle for the system designed some years ago by G3JVL. This is a transverter system which is not too difficult to build and get running. The problem comes in the output power. With careful selection of the two, fairly expensive diodes that the unit uses, it is possible to get about 1mW of output. However, most of us can only afford to buy one of each and have to make do with what we get. Under these circumstances it is unusual to see more than about ⅓mW.

Decibels

Now, taking into account the narrower bandwidth of SSB compared to wide-band FM and several other factors, it can be shown that SSB has about a 16dB advantage over the FM system. This seems a lot but we really need to do our sums to see if we have a real advantage. The average FM rig runs around 10mW of output and 16dB down on this is a ¼mW; just about what we get from the average JVL transverter. Having gone to all the trouble of building the new gear, you end up with a virtually identical performance on your wide-band FM job. If you run around 25mW of FM you then find yourself in the position of actually setting up an SSB contact by using FM, because the FM system out performs the SSB unit by about 4dB.

Power

Unless you can generate 10mW or so of SSB it is really not worth the effort. To do this you are going to need a two-stage GasFet amplifier and, at these frequencies, semi-conductors do not come cheap. Fortunately, because of the low power levels involved, you can use the same amplifier as a low noise preamp on receive and so improve the system performance. It is still going to cost you though, because you are now going to need a four-port waveguide switch. These are neither cheap nor do they grow on trees, although they have been known to fall off the back of a lorry!

What now?

For those who want the ultimate performance, and that is the only way to make real progress, then the answer is to spend big money and run 100mW or more of SSB. Before you go down this path there is something else to keep in mind.

If you are regularly working long, obstructed paths then you need some excellent 2m talk-back facilities. One of our leading microwave men is now using 100W on 144MHz feeding stacked beams on a portable mast.

Talk-back

There has also been a considerable amount of discussion as to the best band to use for talk-back. Rather than worry about this it would be nice simply to get some agreement on the frequency to use. Some of the country uses 144.33MHz while others use around 144.170MHz.

To come back to the main point; the problem is that, particularly under 2m contest conditions, talk-back can be a bit hairy. The proposals have been to move to 70 or even 23cm. This would certainly make life easier but, when you consider that most people already have a 2m rig, how many newcomers are you going to get when you tell them that they are also going to have to buy a new multimode just for talk-back? Also, if you need 100W and stacked yagis to maintain long distance talk-back on 2m, then what the heck are you going to need if you move to 23cm?

Forward

In this push for progress let us not forget the guy who just wants to have some inexpensive fun. It has taken a long time to dismiss the idea that you needed a lab full of expensive gear, a well equipped machine shop and a Master's degree in communications to make a start on the microwave bands. Over the last few years the mystery has been blown away, but if Joe Ham now gets the idea that it is going to cost an arm and a leg for the gear, then we are going to lose the steady influx of new operators that the simple and cheap approach has generated. If they do not come in at the bottom end there will soon be no-one to move on to better things.

Awards man

For many years the man who has handled the job of RSGB VHF awards has been Jack Hum G5UM. Now Jack feels that the time has come to hand it over to someone else and have a little more time to spend relaxing and enjoying his hobby. Those of us who know him will realise that this has not been an easy decision to make. I am sure he will miss the regular correspondence and interest that he has got from seeing the boundaries of the VHF world slowly expand over the years.

Contests

We are coming up to the end of the year and contests are getting a bit thin in the air. You still have five opportunities to play radio to look forward to. There are two legs of the 23 and 13cm cumulatives to come. The first one is on 1 December and the second is on 17 December. In between those two there is the 144MHz fixed (not the score!) and SW1 event on 4 December. Five days later on the 9th there is another leg of the 432MHz cumulative, and this is followed on the 11th by the 70MHz CW contest. There seems to be something for everyone in there.

Odds and ends

With a bit of luck you have managed to get in on some of the good tropo conditions on 2m. Great opportunities there to increase your country and squares scores. There has also been some good aurora around over the last few days, the ghostly voices sounding as weird as ever. 50MHz is a band which keeps coming up with some good conditions when least expected. There have been reports of UK stations working into ZS3, ZS6 and other desirable places. Our awards programme is still in full swing and if you want a copy of the rules drop me an SAE at the QTH below.

Close down

Christmas is just around the corner, closely followed by the new year. Time for resolutions; I wonder what new activity you will get up to in the new year? Keep all your news and comments coming to me at: 81 Ringwood Highway, Coventry. You can also try me on Prestel using 203616941. Hey! it says here that this packet thing knows about handshaking, sounds friendly after all.

SECOND-HAND

by HUGH ALLISON G3XSE

The rallies

Old Warden/Shuttleworth. Wow. Super. Amazing. It goes from strength to strength. Last year 250 radio 'car booters', this year 300. There were 3,000 visitors through the gate and nine amateurs arrived by plane. Bargains everywhere, from brand new, bagged, assorted Greenpar RF connectors (and adaptors) at 5p a throw, through to a very clean, boxed TS-520S for £200.00 – £75.00 to £100.00 is too cheap! A brilliant event and still the bargain hunting highlight of the year.

Pye Cambridge

These VHF transceivers come in most types: low, mid and high band, AM or FM. All are transistor receive, transistorised inverter and valve transmit strips. The valves are the normal 'run all the time' sort, ie they are not quick heat. This can have a devastating effect on the health of your average car battery. Sure, the heaters can be switched off for receive only, even then expect a couple of hundred milliamps, but select up 'standby', ie heaters on, and there go a couple of amps. Go over to transmit and it's bye-bye to the best part of four or five amps. Definitely no long overs when the engine is off!

Talking of transmit current, if setting up a Cambridge on the bench and running it from an average 5 amp lab-type power supply, forget it. Get a well charged car battery or a 10 amp PSU. This is because an off tune transmit strip really sucks amps. Use a deficient-in-current PSU and one stage, being off tune, will take lots of current out of the inverter. Not enough current availability only leaves the inverter with one option – it drops its HT volts. Now the previous stages cannot give the required drive and it's all bad news. I learnt this one the easy way. I watched a very experienced engineer take a fully working Cambridge and put in new crystals to shift the Tx 5MHz. He was using a 5 amp 'Farnell' bench PSU and could not set it up. In desperation, he tried to reset it to the original frequency (after refitting the original crystal). He could not do it. In with a 10 amp Farnell and it could be set up a treat. In short, an aligned Cambridge will only take about 4 amps but you need ten or so to set it up.

One final point on aligning Cambridges. The transmit coils in the cans all have one core in each, except the slightly longer can which has two. The number of people that cannot align their machines until they are told this, is staggering! Incidentally, cores are hexagonal-hole-all-the-way-through. Use only the correct trimming tool.

Prices. £15.00 is too much for any Cambridge, even in immaculate condition, full of useful crystals and fitted with a tone-burst. £3.00 to £5.00 is fair for one 'off the pile' straight from a taxi firm, really £10.00 should be top whack.

FT290

Quite a surprise at the Peterborough rally. The MK1 FT290 is normally going to sell at a touch under the £200.00 mark, maybe just about making that £200.00 with a linear, mobile aerial and mount etc, ie with a big box of goodies included. A 'nude' one, ie no accessories, is normally about £180.00. The surprise at Peterborough? People in the excellent car boot area were putting 290s out at £160.00 to start with, and were happily selling them for £150.00. The price is dropping.

Oh dear!

We all make mistakes. In comes a mains powered unit for repair. I plugged it in, nothing. An avo (on ohms) down the mains lead indicates no ohms, so off with the cover and, sure enough, the fuse was open circuit. The fuse was also the mains voltage selector – put it in at 120° intervals to select 120, 200 or 240 volts.

I sorted out a fuse of the correct rating and fitted it, 240V uppermost. When it was plugged in, nothing, the fuse had gone again.

'Try a bigger fuse' suggests a colleague, attracted by the colourful language. When I refused, he suggested disconnecting the transformer outputs in case there was a short in the power supply or rectifiers, a much better idea. The fuse blew.

Things were now getting desperate, there was only one fuse left in the stores of the correct size and rating. After a careful look round the mains input circuitry, which appeared reasonable enough, I was bordering on despair. Then the aforementioned colleague started examining the back cover of the unit and suddenly burst out laughing. Although the mains voltage selector was printed so the numbers were upright when inserted with the 'required' voltage in the 12 o'clock position, the back cut-out was showing the voltage at the 3 o'clock position, with the printing on its side. Apparently the owner had just arrived in the UK from America, where he had bought the equipment. I had not noticed '110' quite clearly displayed in my rush to remove the back cover. Arrgh!

Test equipment

Quite a lot of the recent mail I have received has come from amateurs who are thinking of building equipment. They are wondering what test equipment to buy and whether second-hand is a good idea. Well, first things first, the number one requirement in any shack is a multimeter.

New multimeters which are quite good and cheap, are available for around £10.00 from the high street, mail order and rallies, and are worth considering. A second-hand example can often be picked up for a couple of pounds and, provided you check it out carefully before use *on every range*, it can be an acceptable, cheap way out. If you have a friend who has a good, reliable meter you can use it as a rough guide to judge the accuracy of yours. It is also surprising what exists as a rough and ready calibration 'standard'. A charged up car battery is about 12V, while a single cell, the AA or U2 type (not Ni-Cad) is 1.5V. The mains (be careful) is about 240V ac. Ohms? Well, car bulbs can roughly be worked out as ohms, since the wattage is usually known, say 6W for a sidelight. It's 12V and $P = I \times V$ (watts = current × volts) so we are talking 0.5 of an amp. In with ohms law, $V = I \times R$, so $12 = 0.5r$, we have a 24 ohm resistor! A low wattage mains bulb, say 15W, will be 3.8k.

Personally, I dislike dvms – digital volt meters. Give me a needle every time when I am tweaking something up – it's so much easier for my brain to correlate a needle moving up to an increase of something, as against changing numbers. Having said that, there are some good dvms available from as little as £20.00 new (half the price second-hand).

I would go for a second-hand avo every time. Fifteen to twenty sovs will get you a reasonable one, twenty-five should see an excellent one in your shack. My avo was £5.00 twenty years ago and was old then. It has had one change of batteries and still works a treat, despite daily use (and abuse). It is probably still worth what I paid for it, perhaps £5.00 or more. Avo reliability is legendary.

Frequency counters

A lot of people ask silly money for second-hand counters. Stop and think carefully. You can now buy, new, a 1GHz counter for £120.00. There is your yardstick. Anything second-hand has got to be less than £50.00 and still do that GHz. I have recently seen Racal 150MHz counters in excellent order selling at £25.00 and the HP ones cost about the same. Beware, second-hand prices here are dropping rapidly.

Signal generators

Really decent stuff, such as would have graced a research lab five years ago, is now turning up on the surplus market at bargain prices. The classic HP608 is well worth the £15.00 or so it is now fetching, provided you have a big strong bench.

Some variants have FM capability, some pulse. Most start about 10MHz and finish around 500MHz. Give them a quarter of an hour from switch on to drift a kHz or two, then they are stable for the rest of the day. Again, legendary reliability, it would take a direct hit from a bomb to damage them. There are also some excellent Marconi designs about, notably the 995 (another classic), again in the £15.00 to £25.00 price range. Advance stuff was also good, their 'J' series is remarkably useful and should not set you back more than £15.00.

If you can, go for a big 'lab grade' signal generator (or two, one LF and one HF) in working order rather than one of the smaller, originally cheaper, hobbyist devices. My experience here is that they drift, are poorly calibrated and both frequency and output level can be suspect.

One final point on signal generators. I tend to accidentally transmit up signal generators at times. The 'piston type' attenuator, as found in the 608, which varies its output by moving in or out a coupling loop, is immune from damage in this way, but a resistive attenuator can be a gonner. A practical point worth bearing in mind.

'Scopes

Think about the frequency you wish to look at. Audio, HF (say 30MHz), or 100s of MHz – very expensive. With any 'scope there is a relationship between its frequency response and its price, and that relationship appears to be logarithmic! 'Scopes up to 100kHz or so, maybe even a MHz, can be picked up dirt cheap for £10.00. There are some reasonable, adequate designs. Heathkit 'scopes are ideal to learn on and mainly single beam, so are worth considering as a first machine.

There are some reasonable 5 to 10MHz 'scopes, mainly valve and some dual beam at about £30.00. Valve Telequipment 'scopes are a little unreliable, nearly always resistors open circuit and easy to repair. Old Solitron, Advance and Tektronix stuff are well worth considering. In this price range you might be lucky enough to get a 'scope with a 'beam finder' button, which I find most useful.

30/50MHz or so is getting expensive. Valve 'scopes are going to cost you a pound a MHz, but transistor ones – probably less than ten years old – will cost double this. Most of these designs are going to be dual trace and have lots of tricks available, such as delayed trigger, bright up etc.

A hundred MHz or greater is getting into the 'super scope' area and will cost a lot. Nearly all solid state, it's a lucky man that gets one below a couple of hundred pounds.

Note that battery powered 'scopes, or some with special functions or unusual plug-ins (such as spectrum analysers) can push up prices. Protective covers, probe kits and overall condition also play a part in determining overall worth. Good 'scopes are not cheap.

UHF Tadpoles

A few years ago I alerted readers to the 'Tadpole' VHF hand-portable. These were 2W or so FM transceivers, ex PMR (private mobile radio). They are a bit big, but, almost conversely, that means that they can accommodate pencell batteries and have an excellent life between charges. We are, incidentally, talking crystal control.

One of the few bargains I picked up at the Derby rally was a UHF Tadpole. I knew it was UHF because the back has a printed panel on which the frequency is scratched. This one said 460MHz. Apart from this indication there is no visible external difference between VHF and UHF variants. I think I was lucky with my purchase, the seller seemed to have no idea what the rig was and let it go for £15.00.

Since then, I have seen more UHF variants and they seem to fetch between £30.00 and £40.00.

Do they work? They are excellent. The Tx produces a 1.5W to 2W, with modulation that is crisp and punchy. The receiver is brilliant, 0.3μV for 12dB quietening.

Obviously, crystal control is a slight drawback, Tx is ×24, ie an 18MHz rock is required. Rx is ×12 +21.4, ie 34MHz. If you budget at £5.00 a channel for the crystals then an uncrystalled, but working Tadpole at £35.00 might compare favourably with, say, a secondhand Palm IV between £60.00 and £70.00 with three channels fitted.

POLICE WORK AND RADIO

by R L Freail

In the early 1960s, when I had been in the police force for a number of years, the Home Office decided that the Coventry City Police Force would have a dog section of just three dogs. My interest made me one of some sixty-eight applicants and in due course I was selected to be one of the three handlers.

On our return from the Police Dog Training School at Stafford Police HQ, we found that we were regarded as a poor relation when it came to transport. For the first eighteen months divisional vans were employed to take dogs and handlers to calls. One of these Bedford dormobiles was in use on each of the three divisions, and from 10.00pm at night until 02.00am the following morning the dog handler and his dog would ride in the back of the van. If a call came in for the dog then off they went. This sometimes turned out to be a rather hit and miss operation, as if only one dog and his handler were on duty and the call was to another division, then the handler, his transport and its crew finished up at the call. The division owning the van was not pleased as it could have lost the use of the van for a couple of hours.

Mobile radio

It soon became apparent that if the section was going to be efficient then it must have its own transport, ie, a small van equipped with cages. It arrived in the form of a Hillman Husky van. Unfortunately, we found that no provision had been made to fit a radio in our new van.

It was agreed that one must be fitted but even with the aid of a small miracle it would be a couple of months before this happened.

It seemed we would have to devise our own R/T system. By now we had been joined by a further three dog handlers. A quick check confirmed that we had a total of three domestic radio sets that would tune into the Coventry City Police radio frequency of 99.2MHz on the VHF band. It was decided to try and make use of these sets so that while out on patrol we could at least hear what was going on.

It was not just a question of trying to scounge bits of equipment from radio amateurs or the like, as it would still be a few years before hams became /M and as for CB, that was years away, also there was little mobile R/T going cheap.

Today it might be a simple matter to obtain a black box, a mag mount, etc, for a quick lash-up, but in the early 'sixties the only choice seemed to be to place one of the receivers on the passenger seat of the van and hope for the best.

This was a somewhat unsatisfactory arrangement, since the lack of an external aerial became responsible for more than a few garbled messages, together with our inability to transmit.

Knowing the drawbacks of the receiver, the information room at Coventry headquarters would transmit all messages at least three times to ensure that we heard our calls. The procedure was that when the van was ready to go out on patrol, the handler would telephone the control room to tell them to broadcast a signal so that the receiver could be tuned in. Once this was done the van could go out.

On patrol

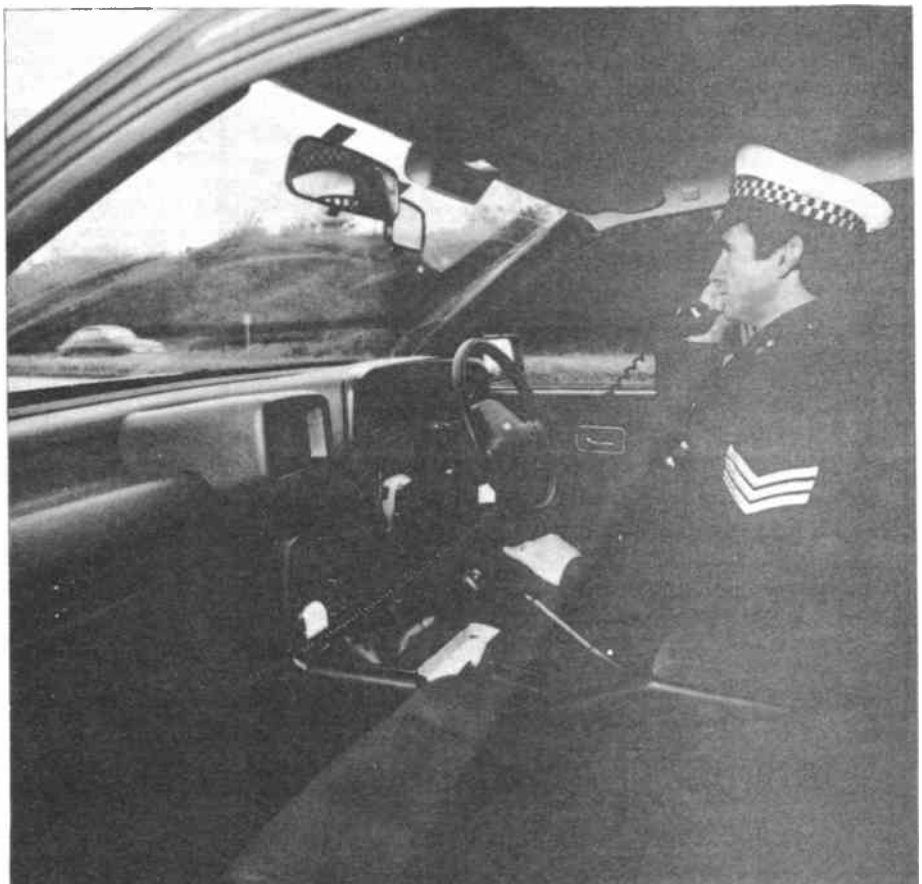
Once on the streets the problem was how to let the information room know that we had received the message and understood it. For the routine messages we drove to the nearest police box, these, painted green and white, were all over the city, or we went to the nearest police telephone pillar call-box.

When the message was directing us to an address following a '999' call, we usually drove towards the incident hoping to meet another car going to the same call. We would then use hand signals to tell the other crew to let the control room know that we were on our way.

As the van radio was unofficial we had no callsign as such, but the control room staff called us K9–what else? Although it was rather haphazard, in the weeks we had to operate the system we did not miss any calls.

Later when the van was fitted out with the official radio, it seemed a little strange to simply switch on and talk to someone. We also lost our K9 call and became instead YN9.

The next great leap forward in radio communications came about with the arrival of the transistor, leading to smaller radios in the home and, in due course, to the true pocket radio for the man on the beat.



A modern example of mobile police communications **(photograph courtesy of The Marconi Company Ltd)**

POLICE WORK AND RADIO

Home Office

The Home Office decided to hold a number of trials to test the first radio sets being introduced by the manufacturers. Coventry was selected, along with others, to carry out field trials on a number of these sets.

The first to be tried out was a 'Lancon', made by GEC. This radio operated a receiver and a transmitter in two units, and was secured to the body by straps that also doubled as the antenna. The Lancon worked on the normal police band on VHF, the frequency being about 97.2MHz. The antenna for this scheme was located on a block of flats, situated about a mile from the police station.

The scheme came into operation on a Monday and all went well until the Saturday when a snag appeared in the shape of TVI. Complaints were soon coming into the police station from residents of the flats who lost their television picture every time a police message was sent. Then, to make matters worse we received more complaints from householders living near the flats.

While some thought was being given to this problem, it was laid down that the radio could not be used between 6.00pm and 12 midnight. At this time the public houses closed at 10.00pm and this meant that at one of our busiest times we could not use the latest aid to police work. However, after a couple of weeks the system had to be used. In fact, it assisted us in the arrest, just after 11.30pm, of two men who had been seen to steal property and make off.

The second radio to be issued was a 'Bruce Campbell' and it again operated on VHF. The radio consisted of two units, each silver in colour and only a little larger than a cigarette case.

The antenna on the receiver was self-contained but the transmitter consisted of a long, telescopic whip that pulled out to some 25 or 30 inches. These often got caught in the branches of trees and other obstructions and snapped off. After a week or so each unit was supplied with three spares.

Pocket-fones

Finally, these were withdrawn and there was a short period of time when there were no units on test. However, a few weeks later the next radio arrived, a Pye pocket-fone, now of course very well known. This was a UHF unit with a separate receiver and transmitter. The great advantage of this radio was that you could carry the Rx in one pocket, the Tx in another and with the aid of an earphone, hear all the messages. When the Tx was in use, you always had one hand free.

In fact, the more usual method was to clip the receiver to your jacket and forget about it. This was all right until you noticed that no-one appeared to be talking to you and you found it had gone. To find it you had to get another officer to ask control to send you a message and when this was being transmitted, hope to hear the radio talking to you from someone's front garden! Most of these radios were lost during incidents where the officer had chased a suspect over gardens and had turned the set down or even off.

If this method failed to find the radio, then the dog handler was called in to assist, sometimes having to 'sniff out' the elusive pocket-fone over a few square miles of farmland.

The water test

One test I do not think was in the manufacturer's mind was the water test. This took place when a police dog was drinking at a water trough and the receiver unit fell from the handler's jacket into the trough. However, I am pleased to say that the radio was fished out from the trough and after being given a quick shake, did not appear to have suffered. A warm-up on the dog-van heater restored it to full health. This prompt action almost certainly saved a lot of paper work!

PROJECT BOOK

by Martin Williams

This month we return to another in the series of useful data tables which have proved so popular with readers. It is one thing to know what you want to do but quite another to get down to working out the maths involved. In this edition of 'Project Book' we become involved in attenuator design.

Basic ideas

An attenuator is simply something which lowers the level of a signal, although it can also be used to act as a

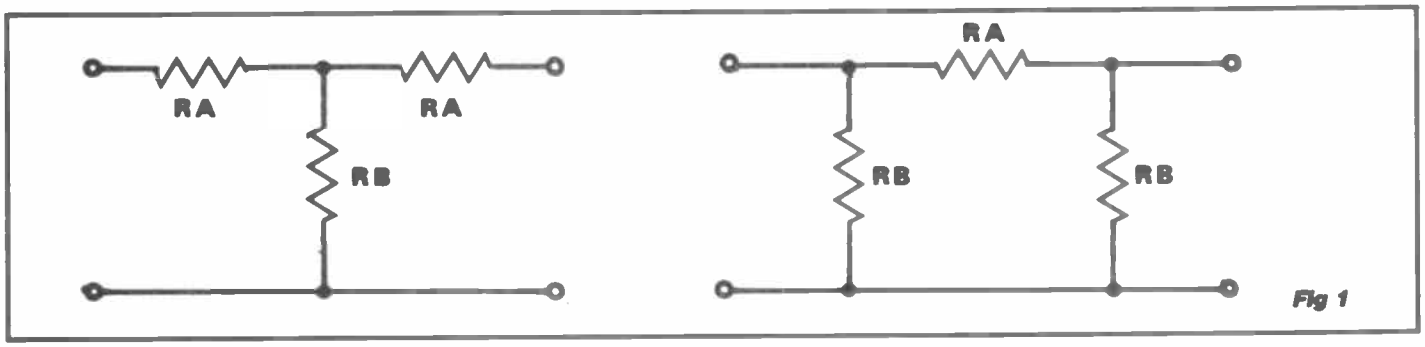


Fig 1

matching device between two dissimilar impedances. Probably the simplest attenuator is the volume control found on all radios. Here we have an example of a continuously adjustable control, but at any given setting it can also be thought of as two fixed resistors of suitable values to provide the required attenuation.

There is a problem with this type of control in that the impedances seen by the equipment connected to each side of the control vary as the control is adjusted. This is of little consequence in an audio amplifier but it would be important if you were trying to change the levels between two circuits, both of which were matched to 50 ohms.

The system

The simplest way around this problem is to use three resistors connected in either a T or PI configuration as shown in **Fig 1**. By using these systems it is possible to design for any given attenuation on any impedance lines. As stated earlier, it is also possible to match between different impedances but this usually involves high rates of attenuation and will not be described here. Instead we will confine ourselves to the usual 50 ohm lines that are common in amateur equipment.

Values

The resistor values required for a particular rate of attenuation often turn out to be quite different from those in the standard ranges supplied by manufacturers. Unless great accuracy is required it is often possible to use the nearest standard values and accept some change in both the loss and impedance from that calculated. For example, if an attenuator designed to give 6db loss on 50 ohms actually turns out to be 5.7dB on 54 ohms it is doubtful you will notice the difference in practice.

The table

The table gives the resistor values needed for most commonly used attenuator values and is calculated for use in 50 ohm lines. Two sections are included giving values for T and PI types. For any given loss the first row of figures gives the theoretical values required and the second line shows how this value can be made up, using standard values, to reasonable accuracy.

As examples of how this works, P,39,22 means parallel one 39 ohm and one 22 ohm resistor. S,82,25 means connect an 82 ohm and a 25 ohm resistor in series. In next month's article I will describe how to construct attenuators for various uses.

The January 1989 *Amateur Radio* will be on sale: 29 December 1988

ALL VALUES IN OHMS

Loss (dB)	T		PI	
	RA	RB	RA	RR
1	2.9 P, 12, 12, 12, 12	433 S, 390, 39	5.8 P, 12, 12	869 S, 820, 56
2	5.7 5.6	215 S, 180, 33	11.6 P, 22, 22	436 S, 220, 220
3	8.5 P, 15, 18	142 S, 120, 22	17.6 P, 33, 33	292 S, 270, 22
4	11.3 P, 22, 22	105 S, 82, 22	23.8 P, 47, 47	221 220
5	14 P, 39, 22	82 82	30 S, 22, 8.2	178 180
6	16.6 P, 33, 33	67 S, 33, 33	37 S, 33, 4.7	150 150
7	19 P, 39, 39	56 S, 47, 8.2	45 S, 39, 5.6	131 S, 120, 10
8	21.5 22	47 47	53 S, 47, 5.6	116 S, 100, 15
9	24 S, 12, 12	41 S, 22, 18	62 S, 56, 5.6	105 S, 100, 4.7
10	26 P, 47, 56	35 P, 68, 68	71 S, 56, 15	96 S, 82, 25
11	28 P, 56, 56	31 S, 15, 15	82 82	89 S, 82, 6.8
12	30 S, 15, 15	27 27	93 S, 82, 12	83 S, 68, 15
13	32 S, 22, 10	24 S, 12, 12	106 S, 100, 5.6	79 S, 68, 10
14	33 33	21 S, 10, 10	120 120	75 S, 68, 6.8
15	35 S, 18, 27	18.4 18	136 P, 270, 270	72 S, 56, 15
16	36 S, 27, 10	16 P, 33, 33	154 150	69 68
17	38 S, 27, 10	14.4 P, 39, 22	173 S, 155, 22	66 S, 56, 10
18	39 39	12.8 S, 10, 2.7	195 S, 180, 15	64 S, 56, 8.2
19	40 S, 27, 12	11.4 P, 22, 22	220 220	63 S, 47, 15
20	41 S, 22, 18	10.1 10	247 S, 220, 27	61 S, 39, 22

DX DIARY

News for HF operators compiled by Don Field G3XTT

If you need me to tell you how good the bands were during October, then your aerial must have fallen down! The dramatic surge in conditions was an eye-opener for anyone who had come on to the HF bands during the sunspot minimum. Contacts well into the Pacific on 10m have been a daily occurrence and the level of activity on the higher bands has been very intense indeed. For many, of course, the high spot was the CQWW SSB Contest, though there was also a surprise offering when the expedition to Vietnam, promised by the Hungarians, actually turned up on schedule.

The Vietnam operation used the callsigns 3W8DX on SSB and 3W8CW on CW. For the first few days they were using a simple transceiver and wire antennas, but eventually managed to clear their beams and external VFO through customs and were going great guns by the time the contest came round. I worked them on 10m in the contest with the greatest of ease. There were much bigger pile-ups for common DX like A4 and JY! In a recent survey of active DXers, Vietnam was the most wanted country for European operators, so this operation should be in great demand. They were due to go QRT in early December.

The good high-band conditions should mean that CQWW Contest scores this year are higher than last year. During a reasonably serious contest effort I worked stations in 129 DXCC countries, and an SWL friend had heard 100 countries on 10m alone by the Sunday morning. Last year's scores appear in the table. Congratulations in particular to Steve GW4BLE, who was third in Europe in the single-op all-band category, to Rick G3VZT, who signed GB5NN to come sixth in Europe on 21MHz, to Al G3FXB, who was seventh in Europe on 14MHz, and to the gang at GW8GT who were fourteenth multi-single in Europe.

Rotuma

As well as Vietnam, the Rotuma DXpedition also took place as promised during October, although it wasn't particularly easy to work. Ironically, OH1RY and OH2BAZ, who were operating from Fiji itself at the same time, seemed to be much more in evidence on the bands, being worked in the UK with relative ease on 10, 15, 20 and 40m.

For the record, Rotuma, a group of nine islands located over 280 miles north of the main Fijiian group of islands, was discovered by the British in 1793 and annexed to Fiji in 1881. Two of the Rotuma islands are inhabited, with a Polynesian population of about 3,000. There is no tourist accommodation in Rotuma, but the DXpeditioners were able to arrange an official invitation through relatives of Ed VK8XX, one of the DXpedition operators. QSLs for this operation go to Ross Forbes WB6GFJ, PO Box 1, Los Altos, CA 94023, USA.

No decision has yet been made on whether Rotuma will count as a new DXCC country, but I suspect the ARRL will find it hard to argue with the case that has been made based on the new wording of the DXCC rules (see last month's 'DX Diary').

10 metres

Looking back at what I have written concerning recent band conditions, I am reminded of something I read in another magazine during the last sunspot maximum. The writer described 10m as a gimmick band inferring, or so I presume, that it wasn't a serious HF band because you could work DX without having to really put any effort into it in terms of antennas or equipment. For my own part, that's the kind of gimmick I could do with! Though things do seem to have changed. I recall back in 1978/79 working the world on 10m with an old FT-101 mk1 running barefoot to an HQ-1 mini-beam at about 25ft. This time round I get the feeling that, during the weekends at least, activity is much higher and the competition more intense. Nevertheless, 10m offers much more scope than the lower bands for DX working if you are pushed for space or gear. A gain antenna of some sort need not take up too much space (you can knock up a quad in no time with eight garden canes) and when it is buzzing, signals are so strong that modest power will get you a long way. I know, for example, that stations near me have been working Japan on FM with 20 watts from a converted CB rig to a vertical.

Talking about simple rigs, I had the chance recently to try out one of the popular all-band portable radios that can be bought nowadays. It even had a BFO for resolving SSB and CW. Although its internal antenna is hardly the stuff for winkling out rare DX, it struck me that at least you could sit by the fireside and still monitor the bands for pile-ups. When you heard one, all you would then need to do would be to rush out to the shack and check what all the activity was about.

Okino-Torishima

The Sunday Telegraph of 2 October carried a report about Japan's efforts to rebuild Okino-Torishima, something which I mentioned in these pages back in November of last year. The cost will be very high, but Japan reckons it worthwhile because by bringing the reef back above sea level they can extend their territorial waters very considerably. Whether the ARRL will then be sympathetic to putting Okino-Torishima back on the DXCC list remains to be seen. Some argue that it should never have been on in the first place but was done as a favour by the ARRL to the JARL (Japan's national radio society).

What's new?

A round-up of old news is all very well, but what is there to look forward to on the bands? Firstly, if you missed the Vietnam operation, fear not. I suppose we can now take the promise of a January operation by a Russian group with more than a pinch of salt. The RL8PYL gang should be there from 20 January until 8 February using the callsign 3W0A. They plan to take beam antennas plus two 1kW linears, so should have an excellent signal, at least on the higher bands.

If you still need to work the SMOM station in Rome (callsign 1A0KM) then listen around 20-22 December. Often this station appears with no advance warning, but DX News Sheet recently carried these dates, so let's hope they are accurate.

XE1BEF and XE1IAK are planning to operate as XF4C from Revilla Gigedo from 15-20 December. My experience of previous expeditions there by Mexican operators is that they tend to chat in Spanish to amateurs in Spanish speaking countries, much to the frustration of everybody else. Let's hope this time will be different!

G4DMA and his wife will once again be in the arctic in support of the forthcoming attempt on the north pole by Sir Ranulph Fiennes. They will be there during much of March, April and early May and will sign home call portable VE8 as and when their other duties permit. The HF gear will consist of an FT-757GX, tribander and wire antennas of various sorts.

DXCC notes

The word from the ARRL is that, despite having four peo-

ple manning the DXCC desk, there is currently a five to six week backlog for handling DXCC claims. The workload can only increase with the new single-bands awards, the general growth in the amateur population and the improvement in band conditions. While waiting for your cards to come back, though, you should be thankful to the ARRL for running the DXCC programme. I don't suppose any other national society could afford to mount such an operation, at least not without making some pretty hefty charges.

The world of RTTY

The recent good band conditions have led to an increase in RTTY activity, with some very rare callsigns appearing on this mode. Many DXpedition operations now make a point of including RTTY, so it's frequently worth a check around the RTTY frequencies when there is something interesting on the bands. Some rare stations use RTTY almost exclusively, to avoid the massive pile-ups they would get on SSB. SU1ER and 6T2MG fall into this category.

The latest BARTG magazine carried the results of a couple of RTTY contests. In the 1987 SARTG event, G4SKA was the leading G (and sixth overall) with G4MKO and G4JLU the only other single-op entries from the UK. In the multi-op category G0ATX was world seventh. G8CDW came eighth in the SWL category.

In the 1988 BARTG Spring Contest, G4PKP came world sixth with 538,692 points. Other UK entrants were G0ARF, G0ATX, G0AZT/W6, G3HJC, G8VF, G0BRY, G3XON, G0IUW and GM4VDI. G3UUP came world eighth in the multi-op category, while G8CDW and G6LAU took fourth and fifth places in the SWL category. Congratulations to all.

Licensing in China

The American DX Bulletin recently carried an interesting feature on the issuing of individual licences in China. Apparently the CRSA (the Chinese Radio Sport Association) has made some proposals for individual licensing to the government. These are for a four tier incentive licensing system similar to those found in the USA and elsewhere. The wheels of bureaucracy grind exceedingly slowly in China and it could be some years before the proposals are adopted.

Meanwhile, individuals' callsigns (with a BW prefix) are being allocated by the CRSA, but with no licence to operate! Station operators at the various club stations have verbal authority to operate and have all been trained at one of the two key stations, BY1PK and BY4AA. Short term licences are available to groups for special purposes, such as the various mountain climbing expeditions in Tibet, which took place recently.

It will obviously be some time before we see vast numbers of Chinese amateurs operating from their homes, but meanwhile the level of club activity continues to increase and BY stations are much in evidence in the major contests. A far cry from the long years when China was off the air completely.

Talking about countries which are off the air, recent political changes in countries like Afghanistan, Burma and elsewhere mean that we may see some of these countries return to the airwaves in the not too distant future. Even the Albanian authorities now seem to be encouraging more fraternisation with the outside world, so the next ZA station you hear on the bands may actually turn out to be genuine!

Joint expedition

Amateur radio is already benefiting from political changes in the USSR. This year we saw a joint USSR/Canadian communications effort during the transpolar ski-trek and a USSR/Finnish operation from 4J1FS. Next February some US amateurs should join UA0KK and others for an operation from Ayon Island, north of Siberia, in honour of the voyage of the steamship **Cheluskin** in 1934.

The **Cheluskin** story comes from when the ship set out from Murmansk to Wrangel Island to supply an expedition group which was trying to open up a polar passage between European Russia and the Pacific. The ship was trapped in ice and sank and the crew had to take their chances. A rescue was possible as a result of the efforts of Ernst Krenkel, the communications officer on the

UK SCORES IN 1987 CQWW SSB CONTEST

Callsign	Category	Score	QSOs	Zones	Countries
GW4BLE	All-band	2,928,000	2,417	116	372
G3SNN	All-band	1,068,795	1,142	108	297
G3SJX	All-band	656,700	1,052	78	252
GM3BCL	All-band	376,124	798	55	141
GI4BBV	All-band	174,240	410	59	81
GM4WEW	All-band	131,440	457	42	113
G6QQ	All-band	64,736	284	36	100
G0CCH	All-band	56,457	314	40	113
G6NK	All-band	4,488	55	12	22
G3VMY	28MHz	7,626	127	12	29
GI0AEV/P	28MHz	3,234	65	11	22
GB5NN	21MHz	438,900	1,132	34	116
GM3MOR	21MHz	6,280	76	10	30
G3FXB	14MHz	610,426	1,724	38	108
GM4FDM	14MHz	167,343	665	33	88
G3TXF	14MHz	130,305	559	31	88
GM4HQF	14MHz	31,104	271	17	47
GM4JFS	14MHz	19,140	221	13	45
GM4ENF	14MHz	6,734	76	13	24
GW4BKG	7MHz	62,790	547	18	73
G4VMM	7MHz	41,032	319	18	74
GW4RHW	3.8MHz	16,506	205	12	51
GM3VLB	1.8MHz	3,096	86	5	31
GW8GT	Multi-single	3,710,162	2,898	132	391
G3NAS	Multi-single	2,536,434	2,455	119	367
G3UOA	Multi-single	900,990	1,275	94	261
G4XOM	Multi-single	91,770	372	44	94
GI4MWA	Multi-single	52,635	269	28	93
G4FKG	Multi-single	34,643	249	24	77
G3CWL/A	QRP, 14MHz	1,360	43	6	14

DX DIARY

ship, who managed to call for help. Ernst was later given the ship's callsign RAEM as his personal amateur call as a reward for his efforts in maintaining communications during the emergency.

The rescue involved planes and ships from both the USSR and the USA, hence the desire to have a joint expedition to commemorate the events of 1934. Mind you, as one writer comments, why anyone should want to go on a DXpedition to Siberia and beyond in February defies the imagination!

Contests

If you are not heartily sick of contests by now, I can recommend the ARRL 10 metre contest on 10/11 December. With band conditions so good this should be a real treat. With a bit of luck you could well manage to work all US states in one weekend.

The EA DX Contest (on CW only) takes place over Christmas weekend, so presumably it won't be too popular this year. The Hungarian Contest (again a CW event) is on 21/22 January. On my favourite band, 160m, there is the ARRL 160 Contest to look forward to on 3/4 December, and the CQWW 160 CW Contest on 27-29 January.

Resolutions

With the new year coming up it is time to start thinking about what you want to achieve on the HF bands. I always like to give myself some goals by way of awards I want to achieve, new antennas I want to try and so on. These give me something to work towards as I tune around the bands.

The 18 and 24MHz bands will become generally available to amateurs in July, which means activity should increase and power restrictions should be lifted, so one goal for the year might be to prepare for the happy day when this happens.

Meanwhile, I hope Santa brings you that new linear amplifier or whatever it is you could do with. A happy Christmas. 73 de Don.

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■ Eddystone 830/9 receiver, 300kHz to 30MHz, £135. Realistic DX160 receiver 150kHz to 30MHz, £50. Advance E1 signal generator, 100kHz to 60MHz, £18. All above perfect. Technical manuals, CR100, SX28, HRO, AR88, £4 each. Others available. Bentley. Tel: 01-554 6631

■ Yaesu FT-7B 50W, £235 ono. Tristar 747, £35. 5 band vertical, £20. Please write to John G0FGC, 33 Hicks Close, Warwick CV34 5ND

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■ Service manual for a Trio communications receiver, model JR-500S. Tel: (0884) 255842

■ Collins 51J R388 receiver. Must be working properly, unmodified, complete and of good appearance. Write with price and thorough details of condition to: Mr K Barker, 29 St Andrews Court, Fairways, Benton, Newcastle upon Tyne NE7 7UT

■ Ham Int Jumbo Tx/Rx, it must cover from 26.065 to 28.305MHz or around them and the set must have the full UK FM. Must be in good working order and the outside must be immaculate. Tel: (0504) 46313 after 6pm and ask for Gary

■ FT-767GX, must have 2m, 70cm and 6m modules. G1XGM. Tel: (0302) 875330

■ Workshop manuals or circuit diagrams (or photocopies) for Marconi CR300 and Mimco-Eddystone type 2245A receivers. Tel: Southall (0526) 20520

■ IC2E. Andy G4MYS. Tel: (0703) 221481

■ KW107 ATU in good condition required. Your price paid. Davies G13HNM. Tel: (02318) 3460

■ Short wave receiver with digital display in good working order. Will exchange a Marco 747, 120 channel all mode transceiver in working order. Ideal for 10 metre conversion. Cash adjustment if necessary. Tom, PO Box 4, Montrose, Angus. Tel: (0674) 76503

■ Nato 2000, must be in perfect working order and not tampered with. Tel: (0283) 221870

■ Trio TS-830S HF transceiver. Also telereader RTTY decoder or similar. Anything considered. Walkie-talkies, not TRF circuit. 'Academy' or similar. VHF scanner, Rx anything considered. Tel: (0843) 294446 (Thanet)

■ Trio/Kenwood RM76 info. Also the RM76 remote unit (for TR-7625 Tx/Rx). Tel: (0634) 49112 (Medway)

■ Hand-held scanner, Tandy PRO32, Regency HX-850E, Bearcat 100XL, etc. Will swap Praktica MTL 5B camera, 35mm, 50mm, 135m lenses, flash, strap, holdall. All in excellent condition. May consider other scanners or 2m hand-helds FT208, FT209, etc. Dave G1CCL, 192 Ambleside Road, Lancaster LA1 3ND anytime

■ Scanner or receiver. I have nothing to listen to. All letters answered. Michael Tansley, 10 Telscombe Drive, Holmewood, Bradford

■ KW2000 (range) Tx/Rx. KW204 Tx. Both in gwo. Tel: (0287) 34397 daytime

■ Racal Tactical (green) items, anything considered. Particularly looking for PRM 4700A, TA4703, MA934 battery, MA4705 battery, antennas, h/sets WHY? Also any Clansman Tx/Rx. Need new style Commodore 64 home computer. Philip. Tel: 01-845 4008

■ HQ129X, HQ170, SX25 manuals. Bentley. Tel: 01-554 6631

■ SP70 VFO700S Trio desk mic IC402. Exchange FT-290R, FL-2010. Mint for above or sell, haggle etc. Tel: 021-427 8701

■ Trio R600 or R1000. Must be in first class condition. Cash waiting. Will travel. No time wasters. G R Creed, Cartref Villa, Rectory Road, Crumlin, Gwent. Tel: (0495) 243944

Amateur RADIO SMALL ADS

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ITT UHF TX-RX base station **£40.00**
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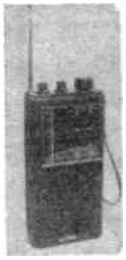

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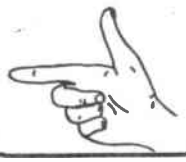

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Amateur RADIO

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depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛ page	£86.00	£82.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

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colour rates exclude cost of separations

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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
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issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Dec 88	27 Oct 88	2 Nov 88	4 Nov 88	24 Oct 88
Jan 89	30 Nov 88	7 Dec 88	9 Dec 88	29 Dec 88
Feb 89	21 Dec 88	4 Jan 89	6 Jan 89	26 Jan 89
Mar 89	25 Jan 89	1 Feb 89	3 Feb 89	23 Feb 89

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

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Display Ad and Small Ad series rate contracts are not interchangeable.

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

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(0277) 219876

Commission to approved advertising agencies is 10%.

CONDITIONS
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ADVERTISERS INDEX

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All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

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BD2 5 13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.
BD7 4 In flex switches with neon on/off lights, saves leaving things switched on.
BD9 2 6V 1A mains transformers upright mounting with fixed clamps.
BD11 1 6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.
BD13 12 30 watt reed switches, it's surprising what you can make with these – burglar alarms, secret switches, relay, etc , etc.
BD22 2 25 watt loudspeaker two unit crossovers.
BD29 1 B.D.A.C. stereo unit is wonderful value.
BD30 2 Nicad constant current chargers adapt to charge almost any nicad battery.
BD32 2 Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.
BD34 48 2 meter length of connecting wire all colour coded.
BD42 5 13A rocker switch three tags so on/off, or change over with centre off.
BD45 1 24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day original cost £40 each.
BD49 10 Neon valves, with series resistor, these make good night lights.
BD56 1 Mini uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
BD59 2 Flat solenoids – you could make your multi-tester read AC amps with this.
BD67 1 Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.
BD91 2 Mains operated motors with gearbox. Final speed 16 rpm, 2 watt rated.
BD103A 1 6V 750mA power supply, nicely cased with mains input and 6V output leads.
BD120 2 Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.
BD122 10m Twin screened flex with white pvc cover.
BD128 10 Very fine drills for pcb boards etc. Normal cost about 80p each.
BD132 2 Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.
BD134 10 Motors for model aeroplanes, spin to start so needs no switch.
BD139 6 Microphone inserts – magnetic 400 ohm also act as speakers.
BD148 4 Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.
BD149 6 Safety cover for 13A sockets – prevent those inquisitive little fingers getting nasty shocks.
BD180 6 Neon indicators in panel mounting holders with lens.
BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.
BD196 1 In flex simmerstat – keeps your soldering iron etc. always at the ready.
BD199 1 Mains solenoid, very powerful, has 1in pull or could push if modified.
BD201 8 Keyboard switches – made for computers but have many other applications.
BD210 4 Transistors type 2N3055, probably the most useful power transistor.
BD211 1 Electric clock, mains operated, put this in a box and you need never be late.
BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.
BD246 2 Tacho generators, generate one volt per 100 revs.
BD252 1 Panostat, controls output of boiling ring from simmer up boil.
BD259 50 Leads with push-on ¼in tags – a must for hook-ups – mains connections etc.
BD263 2 Oblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress.
BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.
BD275 1 Guitar mic – clip-on type suits most amps.
BD283 3 Mild steel boxes approx 3in x 3in x 1in deep – standard electrical.
BD293 50 Mixed silicon diodes.
BD296 3 Car plugs with lead, fit into lighter socket.
BD305 1 Tubular dynamic mic with optional table rest.

Most other packs still available and you can choose any as your free one.

VERY POWERFUL 12 VOLT MOTORS – ½rd HORSEPOWER Made to drive the Sinclair C5 electric car but equally adapable to power a go-cart, a mower, a rail car, model railway, etc. Brand new. Price £15.00 plus £2.00 postage. Our ref.15P8.

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ATARI 65XE COMPUTER At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 insured delivery.

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JOYSTICK FOR ATARI OR COMMODORE for all Atari and Commodore 64 and Vic20. New. Price £5. Order ref 5P126.

EXTRA SPECIAL OFFER We will supply the Atari 65XE, data recorder XC12, joystick and six games for £57.50 plus £4 insured delivery.

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Ex GPO MULTI-RANGE TEST METER 12/C1 Complete in real leather case with carrying handle – this is a 20,000 OPU instrument, with 19 ranges including AC and DC volts-dc current 5mA to 1A 3 ohms ranges up to 20meg — the low ohms range is particularly useful, you will be able to read right down to one ohm and below. Not new but are in first class condition — tested and guaranteed. Price is £7.00. order ref 7P5.

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These are tagged for easy joining together but tags, being spot welded, are easy to remove. Virtually unused, tested and guaranteed £2.00 ref 2P141 or 6 wired together for £10.00 ref 10P47.

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LASER TUBE

Made by Philips Electrical. New and unused. This is helium-neon and has a typical power rating of 1.6mW. It emits random polarised light and is completely safe provided you do not look directly into the beam when eye damage could result. DON'T MISS THIS SPECIAL BARGAIN! Price £29.95 plus £3 insured delivery.

POWER SUPPLY FOR PHILIPS LASER is now available in kit form. Price £13 plus £2 postage, or make-up ready-to-use at £18 plus £2.50 postage. Our ref 13P1 for the kit and 18P1 for the made-up version.

PAPST AXIAL FAN–MANUFACTURERS REF NO. TYP4580N.
This is mains operated, 15 watt rating and in a metal frame with metal blades so OK in high temperatures. Body size approx. 4¾" square x 1⅝" thick. £6.00 each, plus £1.00 postage. Our ref 6P6.
VERY POWERFUL MAGNETS Although only less than 1" long and not much thicker than a pencil these are very difficult to pull apart. Could be used to operate embedded reed switches, etc. Price 50p each, 2 for £1.00. Ref BD642.

ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has gold plated contacts and is complete with ribbon cable and edge connector. Brand new, only £15 plus £3 postage. Order ref 15P15.

MUSIC FROM YOUR SPECTRUM 128 We offer the Organ Master three octave keyboard, complete with leads and the interface which plugs into your 128. You can them compose, play, record, store, etc., your own music. Price £28 plus £3 special packing and postage. Order ref 28P2.

20A DOUBLE POLE RELAY WITH 12V COIL complete with mounting brackets, made by the Japanese Omron Company. Price £2 each. Our Ref. 2P173A.
TORROIDAL MAINS TRANSFORMER with twin outputs. 6.3V 2A and 12V 600mA, so ideal for FDD power supply. Price £5. Our Ref. 5P122.
DOUBLE MICRO CASSETTE DECK made by the Japanese ABS company. This takes two micro cassettes and is complete with motors, solenoids to select the deck to use and record and playback heads. Price £10. Our Ref. 10P49.
QUICK FIX MAINS CONNECTOR A must for your workshop. Saves putting on plugs as you just push the wires under the spring clips. Automatically off when lid is up. Price £7.50. Our Ref. 7P5/1.
BT HANDSET with curly lead terminating with flat BT plug. Colour cream. Price £5. Our Ref. 5P123.

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MAIL ORDER TERMS: Cash, PO or cheque with order. Orders under £20 add £1.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/card orders accepted. **Brighton (0273) 734648 or 203500**

POPULAR ITEMS
Some of the many items described in our current list which you will receive if you request it

3½in FDD CHINON 80 track 500k. Shugart compatible interface. Standard connections, interchangeable with most other 3½in and 5¼in drives. Brand new. £28.50 plus £3 insured post.

CASE NOW AVAILABLE FOR THE CHINON F353 This is the 80 track, single sided one which we have been selling at £28.50. The case is sheet metal, finished in hammer-beige with ample ventilation and rubber feet. Overall size 4¼in x 7in x 1½in approx. Designed to take the ribbon cable and 3 core power lead. Price £8. Our ref 8P21.

3in FDD HITACHI HFD305SXA Shugart compatible interface. 500k on 3in disc. Recommended for many Amstrads but interchangeable with most drives. £29.50 plus £3 insured post.

FDD CASE AND POWER SUPPLY KIT for the 3in or 3½in. £11.00. Ref 11P2 for the Chinon, 11P3 for the Hitachi.

9in MONITOR made for ICL, uses Philips black and white tube. Brand new and complete but uncased. £16.00 plus £5.00 post.

ACORN COMPUTER DATA RECORDER REF ALF03 Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44.

POWERFUL IONISER Uses mains transformer. Generates approx. 10 times more ions than the normal diode/cap ladder circuits. Complete kit £11.50 plus £3.00 post.

FREE POWER! Can be yours if you use our solar cells – sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine – they work just as well in bright light. Voltage input is 45 – you join in series to get desired voltage – and in parallel for more amps. **Module A** gives 100mA. Price £1. Our ref. B0631. **Module C** gives 400mA. Price £2. Our ref. 2P199. **Module D** gives 700mA. Price £3. Our ref. 3P42.

SOLAR POWERED NI-CAD CHARGER 4 Ni-Cad batteries AA (HP7) charged in eight hours or two in only 4 hours. It is a complete, boxed ready to use unit. Price £6. Our ref. 6P3.

50V 20A TRANSFORMER 'C' Core construction so quite easy to adapt for other outputs – tapped mains input. Only £25 but very heavy so please add £5 if not collecting. Order Ref. 25P4.

SWITCH AC LOADS WITH YOUR COMPUTER This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kW isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1K ohm. AC loads up to 10A can be switched. Price is £2 each. Ref. 2P183.

METAL PROJECT BOX Ideal size for battery charger, power supply etc., sprayed grey, size 8in x 4¼in x 4in high, ends are louvred for ventilation other sides are flat and undrilled. Order Ref. 2P191. Price £1.

BIG SMOOTHING CAPACITOR. Sprague powerlytic 39,000uF at 50V. £3. Our ref. 3P41.

4-CORE FLEX CABLE. Cores separately insulated and grey PVC covered overall. Each copper core size 7/0.2mm. Ideal for long telephone runs or similar applications even at mains voltage. 20 metres £2. Our ref 2P196 or 100 metres coil £8. Order ref. 8P19.

6-CORE FLEX CABLE. Description same as the 4-core above. Price 15 metres for £2. Our ref. 2P197 or 100 metres £9. Our ref. 9P1.

TWIN GANG TUNING CAPACITOR. Each section is .0005uF with trimmers and good length ¼in spindle. Old but unused and in very good condition. £1 each. Our ref. B0630.

13A PLUGS Good British make complete with fuse, parcel of 5 for £2. Order ref. 2P185.

13A ADAPTERS Takes 2 13A plugs, packet of 3 for £2. Order ref. 2P187.
28V-0-28V Mains transformers 2½ amp (100 watt) loading, tapped primary. 200-245 upright mountings £4. Order ref 4P24.

BURGLAR ALARM BELL – 6" gong. OK for outside use if protected from rain. 12V battery operated. Price £8. Ref. 8P2.

24 HOUR TIME SWITCH – 16A changeover contacts, up to 6 on/offs per day. Nicely cased, intebnded for wall mounting. Price £8. Ref. 8P6.

CAPACITOR BARGAIN – axial ended, 4700µF at 25V. Jap made, normally 50p each, you get 4 for £1. Our ref. 613.

PIEZO ELECTRIC FAN – An unusual fan, more like the one used by Madame Butterfly than the conventional type, it does not rotate. The air movement is caused by two vibrating arms. It is American made, mains operated, very economical and causes no interference, so is ideal for computer and instrument cooling. Price is only £1 each. Ref. BD598.

SPRING LOADED TEST PRODS – Heavy duty, made by the famous Bulgin company, very good quality. Price 4 for £1. Ref. BD597.

ASTEC P.S.U. – Switch mode type. Input set for +230V. Output 3.5 amps at +5V, 1.5 amps at +12V, and 3 amps at +5V. Should be OK for floppy disc drives. Regular price £30. Our price only £10. Ref. 10T34. Brand new and unused.

APPLIANCE THERMOSTATS – Spindle adjust type suitable for convector heaters or similar. Price 2 for £1. Ref. BD582.

3-CORE FLEX BARGAIN No. 1 – Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. ref. 2P189.

3-CORE FLEX BARGAIN No. 2 – Core size 1.25mm so suitable for long extension leads carrying up to 13 amps, or short leads up to 25A. 10m for £2. Ref. 2P190.

ALPHA-NUMERIC KEYBOARD – This keyboard has 73 keys giving trouble free life and no contact bounce. The keys are arranged in two groups, the main area is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" x 4" – brand new but offered at only a fraction of its cost, namely £3, plus £1 post. Ref. 3P27.

WIRE BARGAIN – 500 metres 0.7mm solid copper tinned and p.v.c. covered. Only £3 plus £1 post. Ref. 3P31 – that's well under 1p per metre, and this wire is ideal for push on connections.

INTERRUPTED BEAM KIT – This kit enables you to make a switch that will trigger when a steady beam of infra-red or ordinary light is broken. Main components – relay, photo transistor, resistors and caps, etc. Circuit diagram but no case. Price £2. Ref. 2P15.

1/8th HORSEPOWER 12 VOLT MOTOR Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 5/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6p1, discount for quantities of 10 or more.

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