MAY 1985 95p

Australia $1.75
New Zealand $1.95
Malaysia $4.95

ISSN 0141-0857

Practical Wireless

THE RADIO MAGAZINE

THE SATELLITE TV SCENE

INSIDE

Free Pull-out COMPUTING IN RADIO

ANTEX
a world of soldering

Tomorrows Soldering Technology Today.

ANTEX has a worldwide reputation for quality & service & for many years has been one of the best known & most popular names in soldering. Always at the forefront of technology, ANTEX is continually researching new and better ways of achieving more accurate, reliable, and cost effective soldering. On ANTEX Soldering Irons, the advanced design of the interface between the element & the bit allows more efficient heat transfer to the bit and improved stability of the temperature at the point of contact with the work. Indeed, experiments have shown that an XS25 watt iron can be used for tasks where a 40 watt iron would normally have been required.

ANTEX Soldering Irons exhibit exceptionally low leakage currents & hence are suitable for use on Static Sensitive Devices. Sophisticated temperature controlled soldering units have recently been added to the ANTEX range.

Model C
– 15 Watts. Available for 250, 220, 115, 100, 50 or 24 volts.

Model XS
– 25 Watts. Available for 240, 220, 115, 100, 50, 24 or 12 volts.

Model XS-BP
– 25 Watts. 240 volts, fitted with British Plug.

ST4 Stand
– To suit all irons.

SK5 Soldering Kit. Contains model CS 240v Iron, an ST4 Stand and solder.

SK6 Soldering Kit. Contains model XS240v Iron, an ST4 Stand and solder.

SK5-BP and **SK6-BP** Soldering Kits as above with British Plug.

Model CS
– 17 Watts. Available for 240, 220, 115, 100, 50, 24 or 12 volts.

Model CS-BP
– 17 Watts. 240 volts, fitted with British Plug.

TCSU1
– Very robust temperature controlled Soldering Unit, with a choice of 30 Watt (CSTC) or 40 Watt (XSTC) miniature irons. Range 65°C to 420°C. Accuracy 2%.

TCSU-D
Elegant Temperature Controlled Soldering Unit with 50 W Iron (XSD) and built around FERRANTI custom-made ULA. Range Ambient to 450°C. Accuracy ± 5°C. Zero crossing switching. Detachable sponge tray.

PW

ANTEX Made in England

ANTEX (Electronics) Ltd., Mayflower House, Plymouth, Devon. Tel: 0752 667377 Telex: 45296

Please send literature, price list and my nearest stockist to:

Name

Address

Telephone

VOL. 61 MAY 1985 NO. 5 ISSUE 938

Practical Wireless

STAFF

EDITORIAL OFFICES
Practical Wireless
Westover House
West Quay Road
Poole, Dorset BH15 1JG
℡ Poole 671191

Geoff Arnold T.Eng(CEI) G3GSR Editor

Dick Ganderton C.Eng., MIERE, G8VFH Assistant Editor

Steve Hunt Art Editor

John Fell G0API Technical Editor

Alan Martin G8ZPW
News & Production Editor

Elaine Howard G4LFM
Technical Sub-Editor

Rob Mackie Technical Artist

Kathy Moore Secretary

ADVERTISEMENT OFFICES
Practical Wireless
King's Reach Tower
Stamford Street
London SE1 9LS
Telex: 915748 MAGDIV-G

Dennis Brough
Advertisement Manager
℡ 01-261 6636
℡ 01-261 6872

Roger Hall G4TNT (Sam)
Ad. Sales Executive
℡ 01-261 6807

Barbara Blake
Classified Supervisor
℡ 01-261 5897

Ian Sweeney
Make-up & Copy
℡ 01-261 6570

NEXT MONTH

JUNE '85 ISSUE

BATTERY CHARGER CONTROLLER

If you use a car battery to run your linear, this unit will ensure it's not under- or over-charged

PW 144MHz QRP CONTEST 1985

Rules for this very popular event which takes place on Sunday 16 June

ON SALE 3 MAY

PW COMMENT

AS I WRITE, the Notices of Variation allowing Class B licensees to use Morse code are dropping through the letter-boxes. The Notice contains just one basic rule, which is that Morse transmissions may only be made from the licensee's station address, and no other location. So, no /A, /M or /P operation!

The accompanying guidelines remind you that your licence requires you to identify your transmissions (using telephony), and say that this must still be done because your Morse cannot be guaranteed to be readable. They go on to say that you should avoid the exclusive c.w. sections in the Bandplans, where your telephony ident signals might otherwise disturb weak-signal c.w. operation and experimentation. I hope that Class A c.w. users will come on to those sections of the bands that the Class B's can use, and give them the practice they are seeking.

I was intrigued to see that the guidelines recommend the use of emission modes having codes ending in the letter "B" (Telegraphy—for automatic reception) as well as in the letter "A" (Telegraphy—for aural reception). Automatic reception usually implies automatic transmission too (a keyboard, rather than a Morse key). Certainly, if you can't send c.w. well enough for your callsign to be readable, there is no decoder I've come across, other than the human brain, that stands a chance of understanding your signals. Was the intention to encourage the use of c.w. sent and received by computer?

G3GSR

Name .....
Address .....
.....
.....
Code .....

TICK YOUR SPECIAL INTEREST

☐ RECEIVERS
☐ VHF/UHF
☐ HF

I ENCLOSE £1 PLEASE SEND ME CATALOGUE & ANTENNA BOOK.

You don't need a 1750 Hz tone to gain access to the fastest mail order service for all radio amateurs and short wave listeners. With a copy of the LOWE ELECTRONICS catalogue and antenna book in the shack (send £1 for your copy) the best in amateur radio is quickly available.

LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the 'Emporium' awaits you. Free street parking is available outside the shop.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

TRIO
TS830S

hf transceiver

The TRIO TS830S is for the operator who wants a dedicated amateur bands only transceiver, who is used to and wants a pair of rugged 6146B valves in the PA stage and who wants a compact rig which has its own in-built power supply. The TS830S is for the radio amateur who requires a rig capable of rising above today's crowded band conditions, a rig that has, as standard, the necessary features that will produce consistently good contacts where other lesser equipment would fail. The TRIO TS830S, a proven rig with an impeccable pedigree.

The TS830S covers on USB, LSB and CW the full amateur bands from 160 through to 10 metres.

Convenient to use, the transceiver has its own in-built power supply.

VBT (variable bandwidth tuning) enables the operator to, at will, vary the IF filter passband width and establish optimum IF bandwidth relative to the interference being experienced.

The IF shift control allows the IF passband to be moved up or down in frequency without having to retune the receiver. Hence, an unwanted signal, present in the IF passband, may be attenuated significantly by moving the passband in the appropriate direction.

As the IF shift and VBT are independently adjustable they can, to advantage, be used together.

The tunable notch filter in the TS830S is a high-Q active circuit in the 455KHz second IF. Sharp, deep notch characteristics will eliminate a strong interfering carrier within the passband of the receiver section.

The RF speech processor in the TS830S provides added audio punch and increases the average SSB output power whilst suppressing sideband splatter. Compression levels can be monitored and controlled from the front panel.

To cope with pulse type (such as ignition) noise, the transceiver has an in-built noise blanker.

For perfect listening, a tone control adjusts receiver audio frequency response to suit operating conditions.

Both RIT and XIT, transmitter as well as receiver incremental tuning are included to aid operating, XIT being a distinct advantage when calling a station that is listening 'off frequency'.

It is possible to monitor the transmitted audio in order to assess the effects of the speech processor: a most useful feature ensuring perfect signal reports.

TS830S amateur band transceiver .....£832.75 inc VAT, carr £7.00

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

the TRIO two metre base station, the TS711E.

Several weeks have passed since I took delivery of my own TRIO TS711E. The Japanese home market model has returned whence it came and I am using the version designed specifically for the UK market. The rig is perfection epitomised. For todays two metre operator any base station with less facilities and performance then the TS711E would be far from acceptable. The TS711E's receiver performance in sensitivity and in its ability to reject unwanted adjacent signals is outstanding. I'm not talking about test equipment figures though undoubtedly these will soon be published. My own on air operating with the rig has enabled me to hear what I previously couldn't.

The transceiver covers the 2 metre band from 144 to 146 MHz in FM, USB, LSB and CW modes. When switched to the auto position the rig correctly selects mode according to frequency, a great advantage to the blind operator. Simple up/down frequency shift is provided both on the transceiver front panel and microphone.

IF shift is available, an essential when considering todays crowded 2 metre band. For more penetrating transmitted audio when working DX speech processing can also be switched in.

The TS711E has two separate VFO's and forty channels of memory. Each memory remembers frequency, operating mode, simplex or repeater shift and whether or not a tone burst is to be included. Frequencies stored in memory can be readily transferred to either VFO A or B. The VFO can be either free running as for SSB or CW operation or electrically switched to a "click" stop where it changes frequency in 12.5 or 5 kHz steps. The two VFO's can quickly be put on the same frequency, an aid when checking the position of a strong adjacent signal with one VFO whilst remaining on your operating frequency with the other.

Frequency scan on VFO can be either between or outside user set limits. On memory the transceiver can either scan the entire memory contents or be instructed to look at those frequencies of a particular mode. The TS711E has a timed hold on an occupied channel.
Both priority channel and the immediate recall of your local net frequency are possible with the TS711E.

For those with failing sight or a blind operator the TS711E is a dream come true, not only is the operating mode identified by the appropriate CW letter sent in tone (F for FM, U for upper side band etc.), other rigs just bleep but, when fitted with the VS1 optional board, a digitally encoded girls voice will announce both frequency and where applicable, whether the rig is switched to repeater shift.

TS711E 2 metres £831.77 carr £7.00

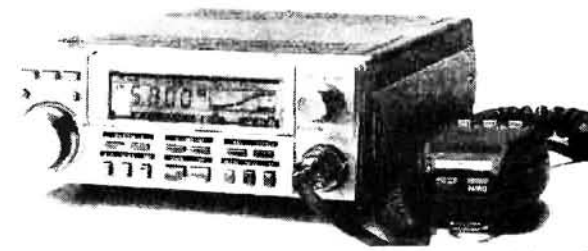
also on seventy, the TS811E.

TS811E 70 centimetres £964.97 inc. VAT carr £7.00

TS430S

The TS430S combines the facilities of a solid state HF transceiver with those of a general coverage receiver It's the ideal rig for the radio amateur who not only wants to communicate with his fellows but also enjoys listening to the world. As an amateur band transceiver the rig covers top band to ten metres, as a short wave receiver coverage is from 150KHz to 30MHz. Operating on AM, FM, USB, LSB and CW the TS430S is extremely compact and, as such, is the perfect transceiver for mobile, portable or base station operation
TS430S HF transceiver with general coverage receiver .....£769.50 inc VAT.

TW4000A



Taking into account the amount of activity on the 2 metre FM channels it is not surprising that many people have turned their attention to the wide open spaces of 70 centimetres. With the TW4000A, TRIO have produced a dual band FM transceiver that gives its owner the best of both worlds. Facilities include 10 memories, two VFO's, priority channel, full repeater operation, band scan and memory scan. In memory scan mode the rig can be instructed to look for either 2 metre or 70 centimetre signals The transceiver produces 25 watt RF output on both bands and comes complete with mobile mount and microphone. For greater safety whilst mobile the optional VS1 board will announce frequency, memory channel and whether or not the rig is set on repeater shift.
TW4000A dual band FM mobile.....£536.51 inc VAT.

R600

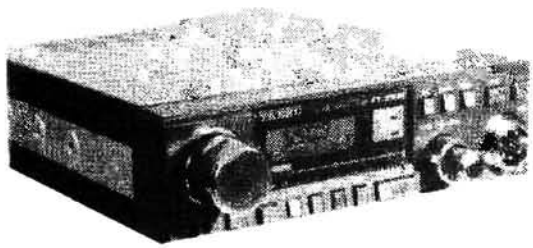
For those who are banned from the house and have to operate from the shed at the bottom of the garden why not consider an R600 to monitor the bands from the comfort of the fireside. No wife would forbid such an attractive looking receiver in the lounge, after all it could also be used to listen to *Women's Hour*. The R600 is a basic receiver covering from 150KHz to 30MHz and having switched upper and lower sidebands, wide and narrow am and cw. It has a 20dB attenuator and a noise blanker fitted as standard. Operation is simple, select the mode of operation, turn the MHz dial to the correct band and, by using the VFO knob, tune to the desired frequency. The clear digital readout makes station selection simple. The TRIO R600, your passport to comfortable listening.
R600 general coverage receiver.....£299.52 inc VAT.

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

FREE FINANCE*

HAMPSHIRE, DERBYSHIRE, LOTHIAN, STAFFORDSHIRE

FULL DUPLEX!



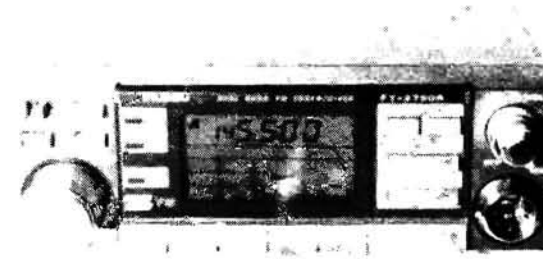
TWO-IN-ONE THE ULTIMATE FT2 700RH

Dual Band FM 2M and 70cms
Full Duplex Operation at the touch of a button
Aesthetically pleasing LCD Display/'S' Meter
25W power output both on VHF and UHF!
Optional Voice Synthesiser
1MHz/25KHz/12½KHz steps (12½ on UHF!)
'+' '−' Repeater shifts with reverse facility
10 Channel Memory
Priority Memory Scan/Programmable Memory Scan
One piece diecast centre chassis
50 (H) x 150 (W) x 168 (D) mm

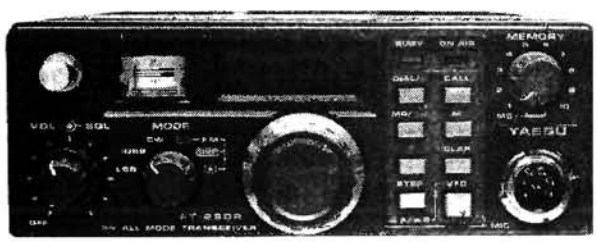
45W OUTPUT

Fully Synthesised 2M FM Transceiver
45W (RH), 25W (R) Power Output
Dual VFO's
Optional Voice Synthesiser
1MHz/25KHz/12½KHz Steps
10 Channel Memory
'+' '−' Repeater shifts with reverse facility
Memory Priority & Programmable Memory Scan
17 Function LCD Display, LED 'S' Meter
One piece diecast alloy chassis
(Fan assisted cooling on 45W model)
140mm W × 40mm H × 180mm D

SMALL ON SIZE-LARGE ON OUTPUT FT270R/RH



*BRITAINS BEST SELLER



2M MULTIMODE PORTABLE

Multimode 2M Transceiver
Dual VFO's
Microprocessor Control
Selectable Synthesiser Steps
Large LCD Display
Ten Memory Channels
'+' & '−' Repeater Function
Nicads for Portable Available
2.5W/0.5W RF Output
58(H) × 150(W) × 195(D) mm

LEEDS
SMC (Leeds)
257 Otley Road,
Leeds 16, Yorkshire
Leeds (0532) 782326
9-5.30 Mon-Sat

CHESTERFIELD
SMC (Jack Tweedy) Ltd
102 High Street
New Whittington,
Chesterfield
Chest. (0246) 453340
9-5.30 Tues-Sat

BUCKLEY
SMC (TMP)
Unit 27, Pinfold Lane
Buckley, Clwyd
Buckley (0244) 549563
10-5 Tues, Weds, Fri
10-4 Sat

STOKE
SMC (Stoke)
76 High Street
Talke Pits, Stoke
Kidsgrove (07816) 72644
9-5.30 Mon-Sat

GRIMSBY
(SMC) Grimsby
247A Freeman Street
Grimsby, Lincs
Grimsby (0472) 59388
9.30-5.30 Mon-Sat

JERSEY
SMC (Jersey)
1 Belmont Gardens
St. Helier, Jersey
Jersey (0534) 77067
9-5 pm Mon-Sat
Closed Wed

EDINBURGH
SMC Scotcomm
23 Morton Street
Edinburgh EH15 2HN
Tel: 031-657 2430
10-5 Tues-Fri, 9-4 Sat

N. IRELAND
SMC N. Ireland
10 Ward Avenue
Bangor
County Down
0247 464875.

Southampton Showroom open 9-5.30 pm Monday to Friday, 9-1 pm Saturday.

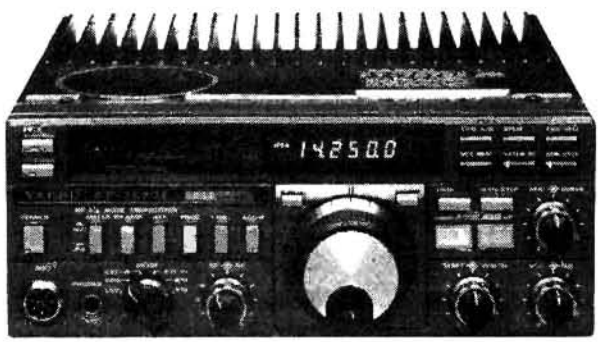
HQ & MAIL ORDER S.M. HOUSE, RUMBRIDGE ST, TOTTON, SOUTHAMPTON,

SMC South Midlands!

2 YEAR GUARANTEE

YORKSHIRE, HUMBERSIDE, CO.DOWN, CLWYD, JERSEY

HF AT ITS BEST



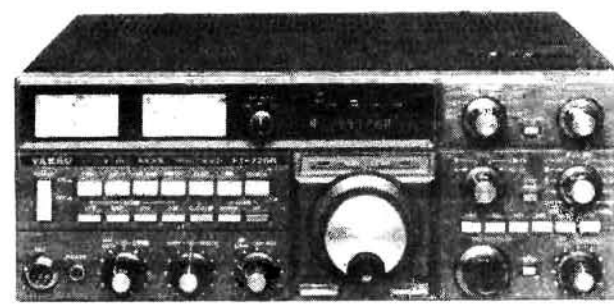
FT757GX

100W Multimode HF Transceiver
Fully Computer Compatible
Dual VFO's
100% Duty Cycle
General Coverage Rx
FM & CW Narrow as Standard
Programmable Memory Scanning
All Mode Squelch
Triple Microprocessor Control
Matching Automatic ATU (Opt)
Full Break-in CW
93(H) × 238(W) × 238(D) mm

FT77

100W Output Transceiver
LSB/USB CW Modes Standard
Large LED Display/'S' Meter
Optional CW Narrow Filter
Optional FM (or AM) Unit
2M or 70cms with matching Transverter
Matching Antenna Tuner Available
Matching Scanner VFO/Memories
95(H) × 240(W) × 300(D) mm

FT726R MULTIMODE VHF, UHF & HF



FRG8800 YAESU'S LATEST

★ COMING SOON ★
FT703R
70cms THUMBWHEEL HANDHELD
FT709R
70cms KEYBOARD HANDHELD

SEE US AT
N.E.C.
STAND NO.
A63 & A64

★ **FREE FINANCE**
On many regular priced items SMC offers Free Finance (on invoice balances over £120).
20% down and the balance over 6 months or
50% down and the balance over a year.
You pay no more than the cash price!
details on eligible items on request.

SMC SERVICE
Free Securicor delivery on major equipment.
Access and Barclaycard over the phone.
Biggest branch agent and dealer network.
Securicor 'B' Service contract at £5.00
Biggest stockist of amateur equipment.
Same day despatch possible.

GUARANTEE
Importer warranty on Yaesu Musen products.
Ably staffed and equipped Service Department.
Daily contact with the Yaesu Musen factory.
Tens of thousands of spares and test equipment.
Twenty-five years of professional experience.
● **2 Year warranty on regular priced Yaesu products.**

STOCK CARRYING AGENT. JOHN DOYLE, TRANSWORLD COMMS, NEATH (0639) 52374 DAY (0639) 2942 EVE

SO4 4DP, ENGLAND. Tel: (0703) 867333. Telex: 477351 SMCOMM G.

Communications Ltd.

AUTHORISED YAESU ®

ICOM AT 1

Come and hear the Icom range on stand A68-70 at the RSGB National Amateur Radio Exhibition

This year at the NEC, Thanet Electronics will have demonstration facilities only on our main stand, but the range and scope of these will enable you to appreciate fully the superb specifications and quality of all ICOM Amateur Radio Equipment.

You will be able to try out receivers and transceivers as base stations, mobiles and hand-portables in all the popular frequency ranges.

Buying ICOM equipment at the NEC. will not be a problem as it will be readily available at any of the authorised ICOM dealers exhibiting at the show.

A new exciting set will be seen at this years show, it is the ICOM IC-3200E FM Dual-band transceiver (144-430/440 MHz). This is the smallest transceiver available.

The IC-3200E employs a function key for low-priority operations to simplify the front panel. LCD display is easy to read in bright places, showing frequency, VFO A/B, memory channel duplex mode and S/RF meter information.

New! IC-3200E

Other features include a 10 channel memory able to store operating frequencies, Simplex or Duplex. A memory lock-out function allows the memory scan to skip programmed channels when not required. The IC-3200E has a built-in duplexer and can operate on one antenna for both VHF and UHF. Options include: IC-PS45 DC, power supply, HS-15 mobile mic, SM6 and SM8 desk mics, SP-10 external speaker and UT-23 speech synthesizer.

A great future is predicted for the IC-3200E against its rivals, due to the reasonable price of this model. For more details come and see us on stand A68-70. BCNU.

IC-290D/290E

290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

The squelch on SSB silently scans for signals, while 2 VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1 KHz or 100Hz tuning/CW sidetone, AGC slow or fast in SSB and CW, Noise blanker to suppress pulse type noises on SSB/CW.

You can scan the whole band between VFO's/scan memories and VFO's. Adjustable scan rate 144 to 146 MHz, remote tuning with optional IC-HM1 microphone. Digital frequency display, Hi/Low power switch. Optional Nicad battery system allows retention of memory.

Soon to be announced!

IC-735 New Compact HF and R7000 VHF/UHF Receiver.

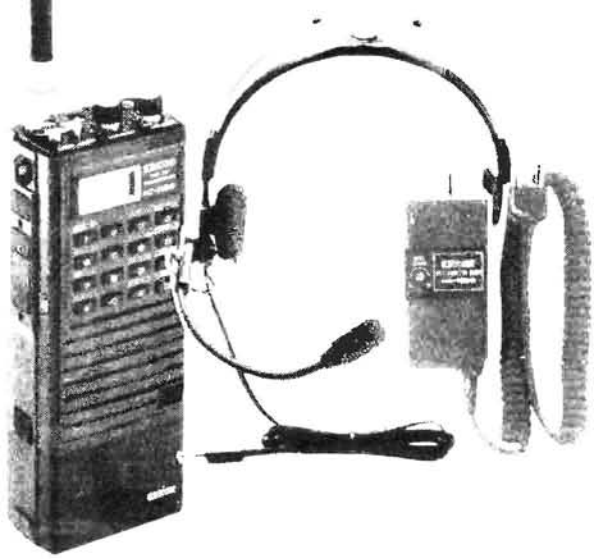
Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Tha

THE N.E.C.

IC-02E, IC-04E

The direct entry microprocessor controlled IC-02E is a 2 meter handheld features include: scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Internal Lithium battery backup and repeater tone are included. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority.

The IC-02E has an LCD readout indicating frequency, memory channel, signal strength, transmitter output and scanning functions. New HS-10 Headset, with earphone and boom microphone, which operates with either of the following:- HS 10 SB Switch box with pre-amplifier giving biased toggle on, off and continuous transmit. HS 10 SA Voice operated switch box, with pre-amplifier, mic gain, vox gain and delay. The IC-2E and 4E continue to be available.



Authorised Icom dealers in the UK

Alexian Electronics Ltd. Edinburgh, 031-554 2591.
Alyntronics, Newcastle, 0632 761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01 422 9585.
Arrow Electronics Ltd., Chelmsford Essex, 0245-381673/26.
Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444 400786.
Dressler (UK) Ltd., London (S. Harrow), 01-558 0854.
D W Electronics, Widnes Cheshire, 051-420 2559.
Hobbytronics, Knutsford Cheshire, 0565-4040.
Photo Acoustics Ltd , Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
Radio Shack Ltd , London NW6, 01 624 7174.
Scotcomms Edinburgh, 031-657 2430
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043
Reg Ward & Co Ltd., S W. England, 0297 34918.
Waters & Stanton Electronics, Hockley Essex, 0702 206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

Cue Dee Antennas Special Offer!

CUE DEE antennas are designed to last for decades – the best possible aluminium alloy for this purpose is used (SIS 4212-06).

The booms are made of 28mm tubing with 1.5mm wall, with colour marks clearly indicating where to fit the elements. By using tubular boom and a synthetic guy wire on the long yagis, the windload is reduced by a factor 0.66 compared to using square shaped material for boom and guying.

The driver element is made of 12mm tubing and features a PTFE (Teflon) insulated gamma match which is pre-tuned at the factory and made for 50 ohm feeder with a PL 259 type connector. No further adjustments or power consuming balun needed. This matching system ensures a clean radiation pattern and transfers the power without losses.

The parasitic elements are made of 6mm solid rod and mounted to the boom with the aid of a CUE DEE element washer, boom to element part and a screw. This, together with our intelligible assembly manual, makes an extremely easy and solid assembly which assures the long life of a CUE DEE antenna.

2 metre Yagis.
4144A – 4 element, 8dBd gain £19.00.
10144 – 10 element, 11.4dBd gain £37.00.
15144 – 15 element, 14dBd gain £49.00.
Order now while stocks last.

Tono Linear Amplifiers

2M – 100W, £79.00.
MR – 150W, £139.00.
Also available, new G-series with GaAs FET pre-amp.
2M – 130G, £159.00.
2M – 90G, £149.00.
2M – 40G, £ 89.00.
4M – 70G, £179.00.
all inc. VAT.

Carriage charge is free for Cue Dee and Tono special offers.

You can get what you want just by picking up the telephone. Our mail-order dept offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 369464. Give it a visit, BCNU.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet Electronics
Dept PW, 143 Reculver Road, Herne Bay, Kent. Tel: (0227) 363859/363850

GOING GOING G3RCQ GONE!

Selling your rig can be fast, easy and painless when you use the services of *G3RCQ ELECTRONICS*. We advertise in all the magazines, our turnover of equipment is fast, this means we can offer the *BEST PART EXCHANGE* deal and the *BEST CASH DEAL*. Our advertising is there to help you sell your used equipment without delay. *REMEMBER* if you are selling *USED EQUIPMENT* – Contact G3RCQ Tel: (040 24) 55733

★ **AUCTION** ★

Auction your surplus equipment from the comfort of your own home! *HOW?* Lets say you have an "XYZ" rig for disposal and you value it at £150 you send me 10% (£15) for inclusion into the auction, plus FREE entry into *LIST-A-RIG* your estimated price of £150 will not be quoted so you may even receive bids over and above what you expect. There are no further charges. If your rig does not sell within 2 months (that's two auctions) your 10% fee will be returned in full.

★ **NATIONAL ADVERTISING FREE** ★

I will advertise nationally lists of items to be auctioned. Potential purchasers will be invited to submit their bids by post to me before a specified date (auctions are monthly). All bids will be forwarded to you the seller. It is then up to you to contact the bidder of your choice and conduct the sale.

★ **LIST-A-RIG** ★

Imagine a data base which is constantly being updated and contains items for sale or wanted. The list encompasses Dealers' and Readers' adverts. LIST-A-RIG is sent *FREE* upon receipt of a S.A.E. To include your own advert the fee is £2 for *TWO MONTHS ADVERTISING*

★ **A FAIR DEAL IS MY POLICY** ★

When you deal with *G3RCQ* you get a straight deal. A full no quibble guarantee, coupled with free advice covering 25 years of Amateur Radio.

★ **BUY & TRY** ★

If you buy a rig from me you have one month to change your mind! If during the first month of purchase you decide that you have made a mistake or you simply cannot get on with the rig I will allow you 90% in part exchange for another rig of equal or greater value. If you want cash back without another rig I will give you 80% of your purchase price.

G3RCQ'S AUCTION (Equipment may be sold by private treaty).

ICOM 271 2M TRANSCEIVER	ICOM AT500 AUTO ATU	CCS 100MHZ FREQUENCY COUNTER	YAESU FT102/YAESU FT101E
EDDYSTONE 940 GEN/COV RX	HF TRAP DIPOLE WITH FEEDER	STANDARD C146 2M HANDIE	TRIO TS930S WITH CW FILTER
ICOM IC 740 HF TRANSCEIVER	YAESU FT757GX/ALSO AUTO ATU	ICOM BASE MIC, IC SM6	TRIO TS 700G 2M BASE/ICOM IC2E
TRIO 9000 2M MULTIMODE	FDK MULTI 2000 MULTIMODE BASE	QM70 2M LINEAR AMPLIFIER	YAESU FT720RU 70CMS FM
TV CAMERA & MONITOR	ADVANCE VALVE VOLTMETER	DATONG MORSE TUTOR	KW204 TRANSMITTER
TECH TE20D SIGNAL GENERATOR	YAESU FT 209/TRIO TH21E	ICOM 720A/PS15 GEN COV TRANS	CODEMASTER CW600/MBA-RO CW/RTTY
SX 200N SCANNER	DATONG PC 1 GEN/COV 2M CONV	NAGAI 2M BASE LINEAR	MM RECEIVE CON 28/144
ICOM IC2KL SOLID STATE LIN	TANDY TRS80, MONITOR, CASSETTE	KW 2000B HF TRANSCEIVER	TRIO SIG GENERATOR SG-402
YD148 BASE MICROPHONE	YAESU FT230R/KDK 2016 2FM	YAESU YM-38 SCANNING MIC	SOLATRON SCOPE DUAL CX1443

If you are interested in purchasing any of the above please send your bids to the address below.

Send S.A.E. today for current list and full information

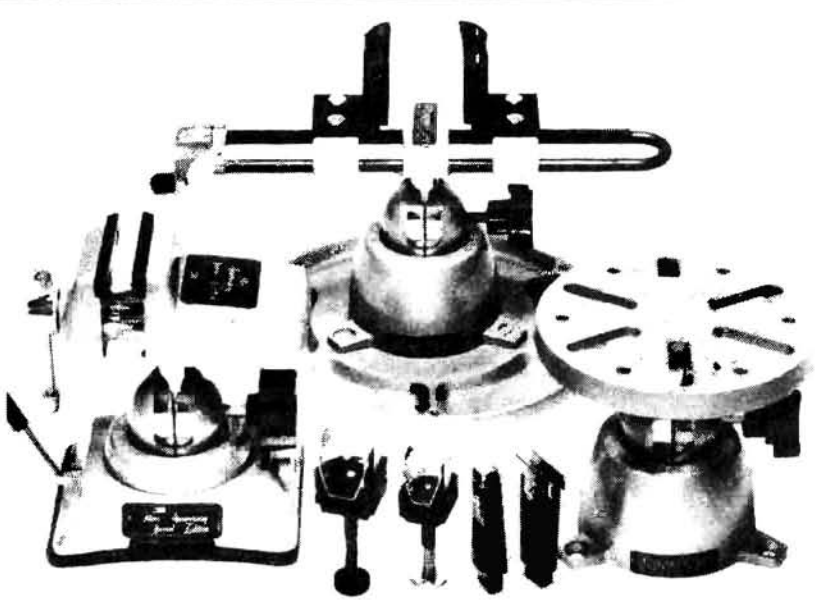
USED EQUIPMENT CENTRE, G3RCQ ELECTRONICS
65 CECIL AVENUE, HORNCHURCH, ESSEX.

Telephone: Hornchurch (040 24) 55733 Please leave a message on the answerphone. 73's de DAVE & CORAL G3RCQ & G4RCQ.

Oryx

clamp down on production problems

With PANAVISE you securely position your work exactly where you want it. PANAVISE tilts, turns and rotates and the range includes interchangeable heads and base mounts.
In this range of professional robust bench tools there is a unit to fit your every requirement.
Also illustrated is a small selection of Oryx Inserters and Extraction tools.



Oryx – advanced design at an ordinary price

GREENWOOD ELECTRONICS DISTRIBUTORS
Toolrange 0734 22245 **Reading.** S.T.C. Electronic Services 0279 26777 **Harlow.** Verospeed 0703 641111 **Eastleigh.** Electroplan 0763 41171 **Royston.** Hawnt Electronics 021 784 2485 **Birmingham.** Engineering and Electronic Supplies 0639 54162 **Wales.** Cobbies 01-699 2282 **London.** Buck & Hickman **U.K.** Anglia Components 0945 63281 **Cambridge.** E.I.C. Ltd. 0727 36311 **St. Albans.** Willowvale Electronics 0734 860158 **Reading.** Longs 09328 61241 **Surrey.**

Please telephone or write for further information to:

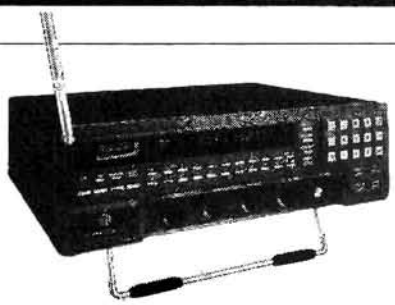
Greenwood Electronics Portman Road, Reading, Berkshire, RG3 1NE
Tel: Reading 0734 595844. Telex: 848659

PW

dressler (U.K.) LTD.,

EAST LONDON HAM STORE

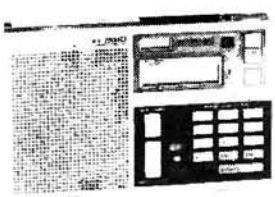
FREE DELIVERY ALL RIGS



SX400
26-520MHz

AOR 2001
25-550MHz

ICOM R71
General Coverage



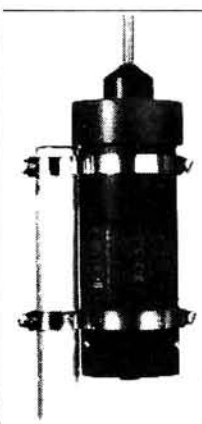
SONY 7600D
150-30MHz + FM Band II

TW4000
Dual Band 2+70

FT2700RH
DUAL BAND 2 + 70 + Full Duplex

dressler – ara 30 – active antenna
200 kHz . . . 40 MHz

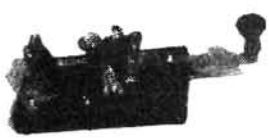
Professional electronic circuitry with very wide dynamic range. Meets professional demands both in electronics and mechanical ruggedness. 120 cm long glassfibre rod. Circuit is built into waterproof 2,5 mm thick aluminium tube. Ideal for commercial and swl-receiving systems.



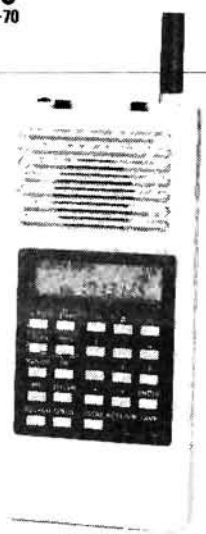
MET ANTENNAS

LONDONS ONLY STOCKIST

AM NFH WFM
60MHz-950MHz
IN 8 BANDS



Swedish Key £60.00



An excellent hand-held scanner
60- 80MHz
118-136MHz
138-174MHz
436-490MHz
490-525MHz
AM/FM
5-10-12½Kc steps

IC 3200
DUAL BAND 2 + 70 built in duplexer

VHF POWER AMPS.

D200 2MTR. 300w F.M. 550w SSB	£699
D200S 2MTR 400-500w 1Kw. D.C. in	£799
D70 70cms 325w F.M. 500w SSB	£799

NEW MODEL DUE SOON
1296 MHz. 1w-in-10w out.

★ ★ VISIT US AT THE N.

191 FRANCIS ROAD · LEYTON · E10

TEL. 01-558 0854 / 01-556 1415 TELEX 8953609 LEXTON G

. . . WHERE YOUR POCKET COUNTS

PHONE THE REST . . . THEN PHONE US FOR THE BEST 'PRICES'

HP FACILITIES AVAILABLE

PROMPT MAIL ORDER

OPEN: MON – SAT 9AM – 5.30PM

ICOM IC745

ICOM IC751

FT75GX+FC757+FP757HD

TS 711E

FT726 + 70cm ± SATELLITE INC. FREE 9XY + 19XY TONNA + SWEDISH MORSE KEY

KENWOOD TRIO-KENWOOD TRIO-KENWO

FULL RANGE OF TRIO/KENWOOD

AVAILABLE AT THE SHOW FROM LONDON'S LEADING

TRIO/KENWOOD DEALER

AT THE BEST POSSIBLE PRICES

OD TRIO-KENWOOD TRIO-KENWOOD TRIO

TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD TRIO-KENWOOD

TH21 ONE OF THE MOST POWERFUL, NEATEST AND SMALLEST 2M PORTABLES.

Also TH41 70cm model

TR2600 INCLUDING DIGITAL CODE SQUELCH

ICOM IC02E OR IC04E + FREE SPEAKER MIKE + ALL ICOM ACCESSORIES IN STOCK

FULL RANGE OF ACCESSORIES FOR ALL MAKES

MAST HEAD PRE-AMPS
GAAS FET
POWER HANDLING UP TO 1KW
·7 to ·9dB NOISE
15 to 19dB GAIN
0·2dB INSERTION LOSS

EVV200 GAAS 2MTR 750W SSB Through power	£80
EVV2000 GAAS 2MTR. 1KW SSB Through power	£90
EVRPS receive 2MTR. only	£50
EVRPS receive 70cm.	£50
EVV700 GAAS 70cm. 500W SSB	£90
EVV70 GAAS 70cm. 100W	£60
EVV2 GAAS 2MTR. 100W	£60
VV200VOX GAAS 2MTR. 250W SSB	£85
INTERFACE	£21
DRESSLER ASA12 Mast Head Coaxial 2 in 1 out Switch with 'N' Connector 1Hz-1GHz 1KW. PEP 0.15dB Insertion Loss	£45

*** NEW ***

DRESSLER

1296 Masthead Amps

EVV 1296

EVV 1296C

EVV 1296S

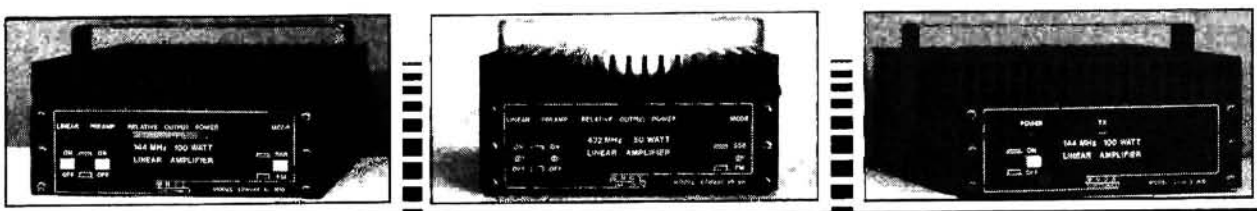
AVAILABLE AT THE SHOW

E.C. STAND NO. A21 & A22

STAND B59 AND B60.

WHAT NEXT FROM B.N.O.S. ?

...Find out at the N.E.C. !!



? T.B.A.

? T.B.A.

SOME EXCITING NEW PRODUCTS ARE TO BE REVEALED AT STANDS B59 AND B60 ON THE 13TH AND 14TH APRIL AT THE N.E.C. BIRMINGHAM

Come and find out why we have fast built up a reputation for manufacturing high performance products that don't just look good but have performance and reliability designed and built in.

All of our products will be on display and demonstration of any of our equipment will willingly be given either by Howard (G3PGN), Mike (G8VCP) or Andy (G8UYN).

WHY NOT COME AND HAVE A CHAT?

British Designed and Manufactured

B.N.O.S. ELECTRONICS LIMITED

British Technology and Innovation

B.N.O.S. ELECTRONICS, BIGODS HALL, GREAT DUNMOW, ESSEX CM6 3BE, ENGLAND. (0371) 4677

BI-PAK BARGAINS

HIGH QUALITY MODULES FOR STEREO, MONO & OTHER AUDIO EQUIPMENT

Audio Amplifiers

O/No.	POWER O/P R.M.S.	MAX SUP. VOLTAGE	PRICE
AL 30A	10 Watts	30V	£4.95
AL 60	25 Watts	30-50V	£5.92
AL 80	35 Watts	40-60V	£8.75
AL 120	50 Watts	50-70V	£15.22
AL 250	125 Watts	50-80V	£20.60

Stabilised Power Supplies —
Output current 2.5 Amps

O/No.	AC Input	Price
SPM 120/45	40 48V	£8.05
SPM 120/55	50-55V	£8.05
SPM 120/65	60-65V	£8.05

Mono Pre-Amplifiers – Operating Vtg. 40-65V

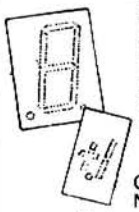
O/No.		Price
MM 100	Suitable for Disco Mixer	£14.75
MM 100G	Suitable for Guitar Pre-Amp Mixer	£14 75

Magnetic Cartridge Pre-Amplifier
O/No MPA30. Sup Vtg. 20-30V. Price **£4.29**

The **PA207** is a high quality pre-amplifier unit which features full range tone controls and an input switch. It is designed to drive power amplifiers ranging from the AL60 to the AL250. Order No. PA207. **£18.50**

Full Specifications and Data available on request. Please send self-addressed envelope.

HYBRID LED COLOUR DISPLAYS



Red, Green, Yellow – .3/.5/.6 inch Mixed types and colours NUMERIC & OVER-FLOW Common Anode/Cathode. GaAsP/GaP. Brand New. Full Data incl.

10 pieces (our mix) . . . £4.00
Normal Retail Value Over £10.00
Order No. VP58

BI-PAK'S OPTO SPECIAL

A selection of large and small sized LED's in various shapes, sizes & colours, together with 7 Segment Displays both anode & cathode plus photo transistors emitters and detectors. Cadmium Cell ORP12 and Germ. photo transistor OCP71 included In all a total of 25 Opto pieces valued over £12 Normal Price

Order No. VP57
Our Super Value Price Just £5.00

INTRUSION ALARM

The DOOR BIRD DB 2000 alerts you before your door is opened. Just hang on the inside door knob – alarm is activated as soon as the outside door knob is touched.
ONLY £3.95

MW398 NI-CAD CHARGER

Universal Ni-Cad battery charger. All plastic case with lift up lid Charge/Test switch. LED indicators at each of the five charging points.

Charges –	Power –
PP3 (9V)	220-240V AC
U12 (1·5V penlite)	Dims –
U11 (1·5V "C")	210 x 100 x 50mm
U2 (1·5V "D")	**£7.50**

VALUE PACKS

Pak No	Qty	Description	Price
VP1	300	Assorted Resistors Mixed Types	£1.00
VP2	300	Carbon Resistors ¼-½ Watt Pre-Formed	£1.00
VP3	200	⅛ Watt Min Carbon Resistors Mixed	£1.00
VP4	150	½ Watt Resistors 100 ohm-1M Mixed	£1.00
VP5	200	Assorted Capacitors All Types	£1.00
VP6	200	Ceramic Caps Miniature – Mixed	£1.00
VP7	100	Mixed Ceramics Disc. 1pf – 56pf	£1.00
VP8	100	Mixed Ceramic Disc. 68pf .015pf	£1.00
VP9	100	Assorted Polyester/Polystyrene Caps	£1.00
VP10	60	C280 Type Caps Metal Foil Mixed	£1.00
VP11	50	Electrolytics – All Sorts	£1.00
VP12	60	Bead Type Polystyrene Min Caps	£1.00
VP13	50	Silver Mica Caps Ass. 5.6pf – 150pf	£1.00
VP14	50	Silver Mica Caps Ass. 180pf 4700pf	£1.00
VP15	25	.01uF 250v Min. layer metallised Polyester Capacitors	£1.00
VP16	50	Wirewound Res. 9W (avg) Ass. 1 ohm – 12K	£1.00
VP17	50	Metres PVC Covered Single Strand Wire Mixed Colours	£1.00
VP18	30	Metres PVC Covered Multi Strand Wire Mixed Colours	£1.00
VP19	40	Metres PVC Single/Multi Strand Hook-Up Wire Mixed	£1.00
VP20	6	Rocker Switches 5 Amp 240v	£1.00
VP21	15	2in. high bright RED LEDs in plastic encapsulation–Large area light source	£1.00
VP22	200	Sq. Inches Total, Copper Clad Board Mixed Sizes	£1.00
VP23	20	Assorted Slider Pots. Mixed Values	£1.00
VP24	10	Slider Pots 40 mm 22K 5 × Log. 5 × Lin	£1.00
VP25	10	Slider Pots. 40 mm 47K 5 × Log. 5 × Lin	£1.00
VP26	15	Small .125" Red LED's	£1.00
VP27	15	Large .2" Red LED'S	£1.00
VP28	10	Rectangular .2" RED LED'S	£1.00
VP29	30	Ass. Zener Diodes 250mW – 2W Mixed Vlts. Coded	£1.00
VP30	10	Ass. 10W Zener Diodes Mixed Vlts. Coded	£1.00
VP31	10	5 Amp SCR's TO-66 50-400v Coded	£1.00
VP32	20	3 Amp SCR's TO-66 Up To 400v Uncoded	£1.00
VP33	200	Sil Diodes Switching Like IN4148 DO-35	£1.00
VP34	200	Sil. Diodes Gen. Purpose Like OA200/BAX13/16	£1.00
VP35	50	1 Amp IN4000 Series Sil. Diodes Uncoded All Good	£1.00
VP37	8	Black Instrument Type Knobs With Pointer ¼" Std	£1.00
VP42	10	Black Heatsinks To Fit TO-3, TO-220 Ready Drilled	£1.00
VP43	4	Power-Fin Heatsinks 2 × 10-3 2 × TO-66 Size	£1.00
VP45	50	BC107/8 Type NPN Transistors Good Gen. Purpose Uncoded	£1.00
VP46	50	BC177/8 Type PNP Transistors Good Gen. Purpose Uncoded	£1.00
VP47	10	Silicon Power Trans. Similar 2N3055 Uncoded	£1.00
VP140	50	Precision Resistors. 2-1% tol.	£1.00
VP141	40	1N4002 Sil. Rects. 1A 100v preformed pitch	£1.00
VP142	4	40A Power Rectifiers Silicon TO48 300PIV	£1.00
VP143	5	BY187 12KV Sil. Diodes in carriers 2.5mA	£1.00
VP144	4	100K 1in. Multi-turn pots ideal vari cap tuning	£1.00
VP145	10	Assorted pots. inc. Dual & Switched types	£1.00
VP146	25	Solid Tantalum Caps. Mixed Values	£1.00

OPTICALLY COUPLED MODULES

1 pair SD1/131 Consisting 1 × LS600 Silicon Light Sensor & 1× Matched Gallium Arsenide Light Source – Type TIL23, on ready mounted fibre glass board. Including Data. Ideal Alarm projects etc. O/No. VP147.

BI-PAK Price ONLY £0.60 pr.

LED DISPLAYS

VP130	6	RED 7 Seg. CC 14mm × 7.5mm RDP FND353	£2.00
VP131	4	GREEN 7 Seg. CA .6" LDP XAN6520	£2.00
VP132	5	RED 7 Seg. CC .6" LDP XAN6940	£2.00
VP133	6	RED Over-flow .6" 3 × CA 3 × CC 6630/50	£2.00
VP134	5	GREEN Over-flow .6" CA XAN6530	£2.00
VP135	5	RED 7 Seg. CA .3" XAN3061	£2.00
VP136	3	DUAL RED 7 Seg. .5" CA DL527 DPR	£2.00
VP137	3	DUAL RED 7 Seg .51" CA DL727 DPR	£2.00
VP138	20	Assorted LED Displays – Our mix with Data	£5.00

RDP = Right Hand Decimal Point CC = Common Cathode
LDP = Left Hand Decimal Point CA = Common Anode

DC-DC POWER SUPPLY

DC to DC adaptor. Plugs into car cigar lighter aperture. Output 3, 4.5, 6, 7.5, 9, 12V @ 800mA. Has universal output spider plug, also 9V battery snap and polarity reversing facility.
O/No. VP119/138 **£2.45**

HIGH PASS FILTER/SUPPRESSOR

CB/TV. High pass filter. Reduces unwanted signals picked up by antenna. Dims: 45 × 25 × 17mm. O/No. VP 115 **45p**

Designed to reduce harmonics on the VHS and TV band.
Cut-off frequency: 30MHz.
V.S.W.R.: Less than 1.2 to 1.
Insertion loss: –0.2dB @ 27MHz.
Impedance: 50 ohms.
Dims: 80 × 55 × 40mm.
O/No. VP 116 **£2.75**

LOW PASS FILTER

IC BARGAINS

40 Assorted TTL CMOS INTEGRATED CIRCUITS 74 Series & CD4000 Series – All new Gates. Flip-Flops – MSI etc. GREAT VALUE Data Book & Sheets included. 40 Pieces (Our Mix) **£4.00** O/No. VP40

TRANSISTOR PACKS

VP150	20	BC183B Sil. Trans. NPN 30v 200mA Hfe240+ TO92	£1.00
VP151	25	BC171B Sil. Trans. NPN 45v 100mA Hfe240+ TO92	£1.00
VP152	15	TIS90 Sil. Trans. NPN 40v 400mA Hfe100+ TO92	£1.00
VP153	15	TIS91 Sil. Trans. PNP 40v 400mA Hfe100+ TO92	£1.00
VP154	15	MPSA56 Sil. Trans PNP 80v 800mA Hfe50+ TO92	£1.00
VP155	20	BF595 Sil. Trans. NPN eqvt. BF184 H.F. TO92	£1.00
VP156	20	BF495 Sil. Trans. NPN eqvt. BF173 H.F. TO92	£1.00
VP157	15	ZTX500 Series Sil. Trans. PNP Plastic	£1.00
VP158	15	ZTX107 Sil. Trans. NPN eqvt. BC107 Plastic	£1.00
VP159	15	ZTX108 Sil. Trans. NPN eqvt. BC108 Plastic	£1.00
VP160	20	E5024 Sil. Trans. PNP eqvt. BC214L TO92	£1.00
VP161	25	BC183L Sil. Trans. NPN 30v 200mA TO92	£1.00
VP162	5	SJE5451 Sil. Power Trans. NPN 80v 4A Hfe20+	£1.00
VP163	2	NPN/PNP pairs Sil. Power Trans. like SJE5451	£1.00
VP164	4	2N6289 Sil. Power Trans. NPN 40v 40w 7A Hfe30+	£1.00
VP165	6	BFT33 NPN Sil. Trans. 80v 5A Hfe50-200 TO39	£1.00
VP166	5	BFT34 NPN Sil. Trans. 100v 5A Hfe50-200 TO39	£1.00
VP167	1	BUY69C NPN TO3 VCB 500 10A 100w Hfe15+	£1.00
VP168	10	BC478 eqvt. BCY71 PNP Sil. Trans. TO18	£1.00
VP169	10	BXS21 eqvt. BC394 NPN Sil. Trans. 80v 50mA TO18	£1.00
VP170	10	Assorted Power Trans. NPN/PNP Coded & Data	£1.00
VP171	10	BF355 NPN TO-39 Sil. Trans. eqvt. BF258 225v 100mA	£1.00
VP172	10	SM1502 PNP TO39 Sil. Trans. 100v 100mA Hfe100+	£1.00

TRANSISTORS

100 Silicon NPN Transistors. All Perfect. Coded Mixed. Types With Data And Eqvt. Sheet No Rejects. Fantasic Value. O/No. VP38 **£3.00**

The best known Power Transmitter in the world 2N3055 NPN 115W. Our Bi-Pak Special Offer Price.

10 off	50 off	100 off
£3.50	**£16.00**	**£30.00**

100 Silicon PNP Transistors. All Perfect Coded. Mixed. Types With Data and Eqvt. Sheet. No Rejects. Real Value. O/No. VP39 **£3.00**

BD312 COMPLIMENTARY PNP POWER TRANSISTORS TO 2N3055. Equivalent MJ2955 BD312 TO3. **Special Price £0.70** each. 10 off **£6.50**

SEMICONDUCTORS FROM AROUND THE WORLD

100 A collection of Transistors, Diodes, Rectifiers & Bridges, SCRs, Triacs, I.C.s & Opto's all of which are current every day useable devices. Guaranteed Value Over £10 Normal Retail Price. Data etc. in every pack. Order No. VP56
Our Price £4.00

TRANSISTOR CLEARANCE

100 All Sorts Transistors. A mixed bag NPN-PNP Silicon & Germ. Mainly Uncoded You To Sort Pack includes instructions for making Simple Transistor Tester, Super Value.
Order No. VP60. **£1.00**

150 De-soldered Silicon Transistors from boards 10mm leads all good. O/No. VP173 **£1.00**

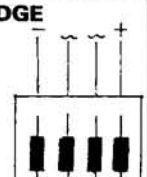
TECASBOTY

THE ELECTRONIC COMPONENTS AND SEMICONDUCTOR BARGAIN OF THE YEAR!

This collection of Components and Semiconductors for the hobbyist is probably the most value-packed selection ever offered, it consists of Resistors, carbon and wirewound of various values Capacitors: All types, sorts and sizes including electrolytics. Potentiometers – single, dual, slider and preset. Switches, Fuses, Heatsinks, Wire, P.C.B. Board, Plugs, Sockets etc., PLUS a selection of Semiconductors for everyday use in popular Hobby Projects. These include: SCR's, Diodes, Rectifiers, Triacs & Bridges as well as a first class mix of Transistors and I.C.'s. In all, we estimate the value of this in current retail catalogues to be over £25! So, help yourself to a great surprise and order a Box TODAY – ONLY at BI-PAK. Remember, stocks are limited so hurry! You can call us on 0920 3182/3442 and order with your Barclaycard or Access Card – 24hr Answerphone Service NOW. Order No. VP 85.

just £7.00

SILICON BRIDGE RECTIFIERS



Comprising 4 x 1½ amp rectifiers mounted on PCB.
VRM – 150 vlts
IFM – 1.5 Amps
Size: 1 inch square
10 off **£1.00**
50 off **£4.50**
100 off **£7.50**
Order No. As:4RI BRegl.

REGULATED VARIABLE *Stabilised* POWER SUPPLY

Variable from 2-30 volts and 0-2 amps Kit includes – 1 – VPS30 Module. 1 – 25 volt 2 amp transformer. 1 – 0-50v 2" Panel Meter. 1 – 0-2 amp 2" Panel Meter 1 – 470 ohm wirewound potentiometer. 1 – 4K7 ohm wirewound potentiometer. Wiring Diagram included Order No. VPS30 KIT **£20**

MINIATURE FM TRANSMITTER

Freq: 95-106MHz. Range: ¼ mile
Size: 45 x 20mm. Add: 9v batt.
Not licensed in U.K.
Ideal for: 007-MI5-FBI-CIA-KGB etc. VP 128
ONLY £5.50

SIREN ALARM MODULE

American Police type screamer powered from any 12 volt supply into 4 or 8 ohm speaker. Ideal for car burglar alarm, freezer breakdown and other security purposes. 5 watt, 12v max.
£3.85 Order No. BP124

POWER SUPPLY OUR PRICE £3.75

Power supply fits directly into 13 amp socket. Fused for safety. Polarity reversing socket. Voltage switch. Lead with multi plug input – 240v AC 50Hz Output –3 4.5 6 7.5 9 & 12v DC. Rating 300ma MW88/137

(LEARN A LINGO)
PILLOW SPEAKER

Slim under pillow unit. 80ohms 2" speaker. 1.5m lead with 3.5mm mono jack plug. Black. Dims: 65(dia) × 17mm. O/No. VP 88 **£1.25**

BI-PAK

Send your orders to Dept PW5 BI-PAK PO BOX 6 WARE, HERTS
SHOP AT 3 BALDOCK ST. WARE, HERTS
TERMS CASH WITH ORDER, SAME DAY DESPATCH, ACCESS, BARCLAYCARD ALSO ACCEPTED. TEL (0920) 3182, GIRO 388 7006
ADD 15% VAT AND £1.00 PER ORDER POSTAGE AND PACKING

Use your credit card. Ring us on Ware 3182 NOW and get your order even faster. Goods normally sent 2nd Class Mail.
Remember you must add VAT at 15% to your order. Total Postage add £1.00 per Total order.

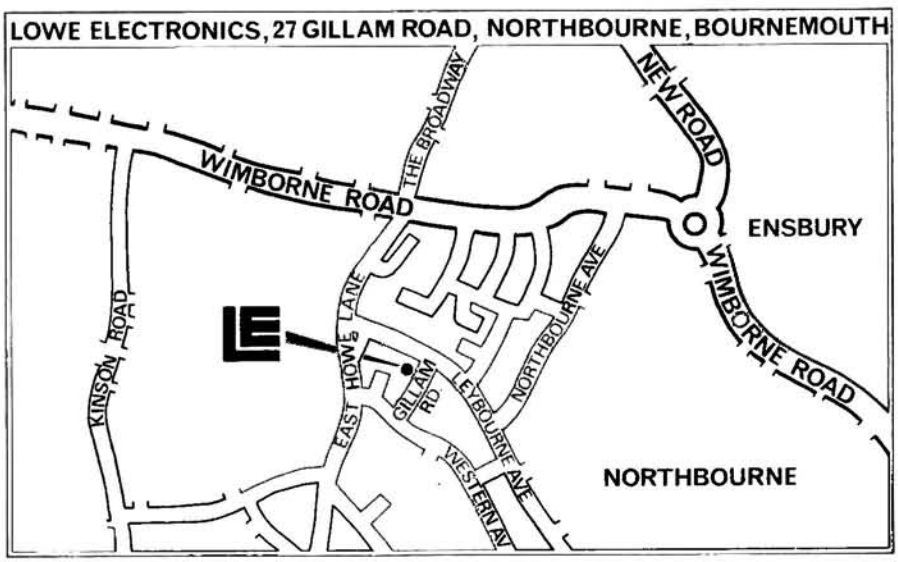
New South Coast Shop for Lowe's

Lowe Electronics are extending their network of shops throughout the UK with a new retail outlet in the South Coast town of Bournemouth.

Our map shows the location of the new shop, at *27 Gillam Road, Northbourne, Bournemouth,* where there will be stocks of the entire range of Trio products, along with a host of accessories, etc., in fact, just about everything the radio enthusiast could wish for.

The new shop will open on Saturday 4 May, however, to introduce themselves and their products locally, Lowe's have booked the Avon and Forest Rooms at the Avonmouth Hotel, Mudeford (near Christchurch), to hold a special pre-opening day reception for prospective customers and enthusiasts on Sunday 28 April from 2.00pm onwards.

The invitation is extended to all interested parties who can get to the venue and Lowe's confirm that early arrivals will be greeted with their, by now, traditional hospitality—wine and nibbles! We at *PW* will most certainly be there and look forward to meeting our readers as well.



Whilst on the subject of Lowe Electronics, readers in the Humberside area will be interested to learn that John Wilson, of Lowe Electronics, is giving a Technical Lecture on the design and construction of two of the latest pieces of Trio equipment at the Grimsby College of Technology on Thursday 2 May, at 7.30pm.

Further information from: *Mr. M. J. Wray, Department of Engineering, Grimsby College of Technology, Nuns Corner, Grimsby, South Humberside.*

For Your Diaries

Practical Wireless will be attending radio rallies and exhibitions, nationwide, throughout the year, and if the level of activity is anything like that at the 1984 Leicester Show at the Granby Halls (see photograph) we are in for a very busy time. The following list details the events we will be attending until the end of June:

RSGB National Convention at the NEC Birmingham on 13 and 14 April.

CAST '85—International Cable and Satellite Television Exhibition and Conference at the NEC Birmingham between 16 and 18 April.

Glasgow Amateur Radio Society Exhibition at Cardonald College, Mosspark, Glasgow, on Saturday 11 May.

Northern Mobile Rally at the Great Yorkshire Showground, Harrogate, on Sunday 19 May.

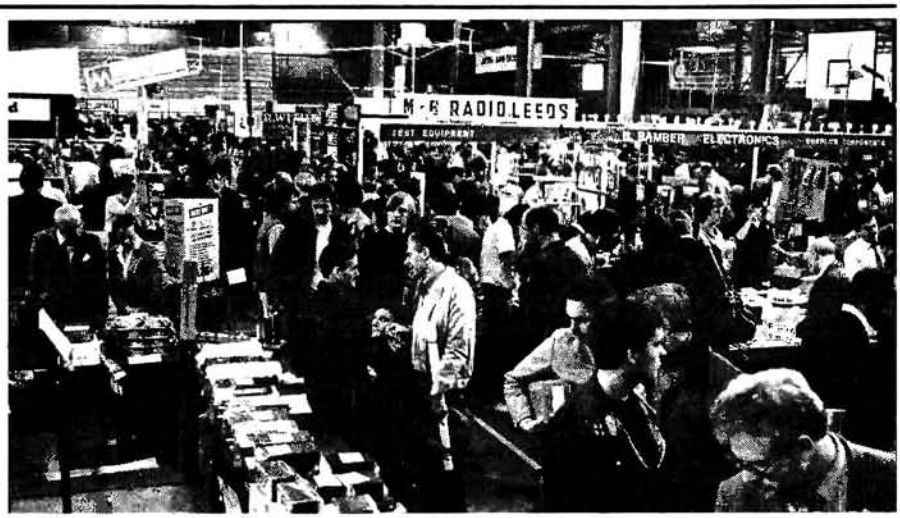
RNARS Mobile Rally at HMS Mercury, Near Petersfield, Hants., on Sunday 16 June.

Longleat Mobile Rally in the grounds of Longleat House, Wiltshire, on Sunday 30 June.

Buxton Amateur Radio Rally at the Pavilion Gardens, Buxton, Derbyshire, on Sunday 30 June.

For dates of further events—see the July issue.

Technical staff from *PW* will be manning our stands, where we look forward to meeting our readers, and we will be exhibiting past and future projects, plus we will have for sale recent copies of the magazine, the full range of *PW* publications, computer program tapes and *PW* parabolic dishes.



RAE Students Get Together

The North Trafford College of Further Education will be opening its doors to the general public, prospective and past students of the College's RAE and Morse Courses, on three days in April.

The College open days will be, Tuesday 23 (between 1400 and 2000), Wednesday 24 (between 1000 and 2000) and Thursday 25 April (between 1000 and 2000). The College station G4FXP will provide talk-in on S22.

Further details from: *The Course Tutor, J. T. Beaumont G3NGD, North Trafford CFE, Talbot Road, Stretford, Manchester M32 0XH. Tel: 061-872 3731 ext. 53.*

Insurance

Readers who are interested in applying to the *PW Radio Users Insurance Scheme* are advised to use the coupon published on page 18 of a previous issue.

News

PW 144MHz QRP Contest—1985

For the third year running, *Practical Wireless* is organising what has become the best supported v.h.f. contest in the UK, the *PW* 144MHz QRP Contest.

The Contest will take place on Sunday 16 June, between 0900 and 1700GMT (10am to 6pm local time).

Look out for final details in the June issue of *Practical Wireless*.

CAST '85

The International Cable and Satellite Television Exhibition and Conference, returns to a UK venue this year.

CAST '85 will run from Tuesday 16 April to Thursday 18 April (inclusive), at the National Exhibition Centre, Birmingham, and *Practical Wireless* will have a stand where we look forward to meeting our readers and friends.

IOM QRM

The "media" is often accused of generating erroneous rumours, matched—some would say—only by the comments to be heard over the air waves by radio amateurs!

However, in the hope of simultaneously redressing the balance, we publish here a letter received from Mike Dennison G3XDV, Chairman of the Repeater Management Group.

"GB3GD was recently reduced in power on the instructions of the Repeater Management Group who have responsibility for the co-ordination of the repeater networks.

The power reduction was necessary because the new repeater had caused severe interference to users of the co-channel Stoke-on-Trent repeater, 140 miles away.

The interference was the direct result of the IOM Repeater Group erecting an aerial (a 3dB 'white-stick' colinear) totally unsuited to the job of covering a small island from a site 2000ft asl.

The use of the aerial was directly contrary to:

1. The assurances on coverage made to the RMG when arguing against our initial decision to reject the proposal on the grounds that it would not fit in with the rest of the network.
2. The specific advice on suitable and unsuitable aerials given to the group by the RMG on a number of occassions.
3. The repeater group's Site Clearance Form on which the DTI based their acceptance of the licence application. This, too, referred to a dipole.

The RMG are continuing to advise on suitable aerials which are expected to give better coverage of the Island than the colinear did, but without the unnecessary interference to the rest of the network.

It has been the declared intention of the IOMRG, and is also RMG policy, that the GB3GD's primary purpose is to improve the extremely difficult VHF communication on the Island itself, rather than to facilitate inter-G/GW/GM/GI/EI working on FM.

Lundy Island Expedition

The Nene Valley Radio Club has organised an expedition to Lundy Island, in the middle of the Bristol Channel, between 11 and 18 May inclusive.

Utilising the Old Lighthouse on Lundy, the group has been issued with the special callsign GB4LI, and the operating team will be John Barwell G4ZPL, Pat Barwell G4ZCY, Lionel Parker G5LP, Roger Perkis G4XAO, Dave Rogers G4VID, Ian Wade G4VKX and Harry Williams G4MOP.

Activity will be on all h.f. bands, with special arrangements for WAB on 7, 3·5 and 1·8MHz, in addition to 144 and 430MHz. QSLs via the RSGB bureau or G4NWZ, QTHR.

Full details of times, frequencies, etc., and also if special arrangements are required, please write to: *G4NWZ, QTHR.*

Rallies and Events

The British Amateur Television Club will be holding their annual get-together at the Post House Hotel, Crick, Northamptonshire (at junction 18 of the M1, near Rugby).

Following an informal session on Saturday evening in the hotel bar, the rally itself will begin at 10.00am on Sunday 5 May, and there will be trade stands, lectures, ATV demonstrations using the club's outside broadcast van, plus good stocks of the club's publications and project p.c.b.s will be available.

Admission to the event is free, and non-members will be welcome, additionally, half-price accommodation may be available at the Post House Hotel (tel: 0788 822101 for details).

The North Wakefield Radio Club has organised an Amateur Radio & Computer Fair to be held at Bretton Hall College, Bretton, Nr. Wakefield, on Monday 8 April, starting at 11.00am.

Talk-in will be available on S22 and via GB3WU on RB15, and in addition to radio, computer and electronics attractions there will be many stalls and film shows, etc., to entertain the whole family.

Further details from: *Steven Thompson G4RCH, tel: (0532) 536633.*

Following the highly successful inaugural event in 1984, the joint organisers, Kelso, Borders and Galashiels Amateur Radio Societies, will be hosting the 2nd Anglo-Scottish Rally in Kelso's Tait Hall on Sunday 5 May, between 11.00am and 5.00pm.

For further information, including accommodation, contact: *André Saunders GM3VLB, Physics Department, Kelso High School, or Bruce Cavers GM4UIB, QTHR, tel: (0573) 24664 and 24654, evenings only.*

NAHBO Conference

The National Association of Hospital Broadcasting Organisations, NAHBO, will be holding its annual residential conference between 19 and 21 April 1985, at Newport, Gwent.

The conference, which will be open to non-members of NAHBO, will feature broadcast training sessions, equipment exhibition, seminars and debates, plus a major debate on the recent decision by the Government to allow community radio in this country, and its impact on hospital radio.

For further details, interested parties should send an sae to: *Alf Partridge, Conference Chairman, NAHBO, c/o 56 Fleet Road, Benfleet, Essex SS7 5JN.*

by S. Niewiadomski
Part 2

PW 'COLNE'

Direct Conversion Receiver

In this part of the *PW* Colne we will deal with the construction and operation of Board 3.

Product Detector and Audio Stages (Board 3)

Integrated circuit 3IC1 (an LM1496 or MC1496) is a double balanced modulator/demodulator biased for operation from a single 12V supply rail. This i.c. produces the sums and differences of various multiples of the two input frequencies applied to pins 1 and 10. In this case, the frequency we want is the difference between the fundamentals, namely the output from the r.f. amplifier and the output from the frequency converter buffer amplifier. We know that with a direct conversion receiver the required output of the detector stage is at audio frequencies and so the outputs of 3IC1 (pins 6 and 12) are decoupled to r.f. by 3C5 and 3C6. Both outputs of 3IC1 are used here, whose voltages are in antiphase making them ideal for driving the inverting and non-inverting inputs of an operational amplifier. This effectively doubles the audio output from the product detector.

The operational amplifier, 3IC2, is set to have a gain of 10 by its input and feedback resistors. Because 3IC2 is operating from a single rail, its inputs (and therefore its output) are biased to approximately mid-rail by 3R14 and Zener diode 3D2. It is surprising how often positive and negative supplies are generated solely for the operational amplifiers in a circuit, when the simple circuit shown here in Fig. 2.3 will suffice in most cases.

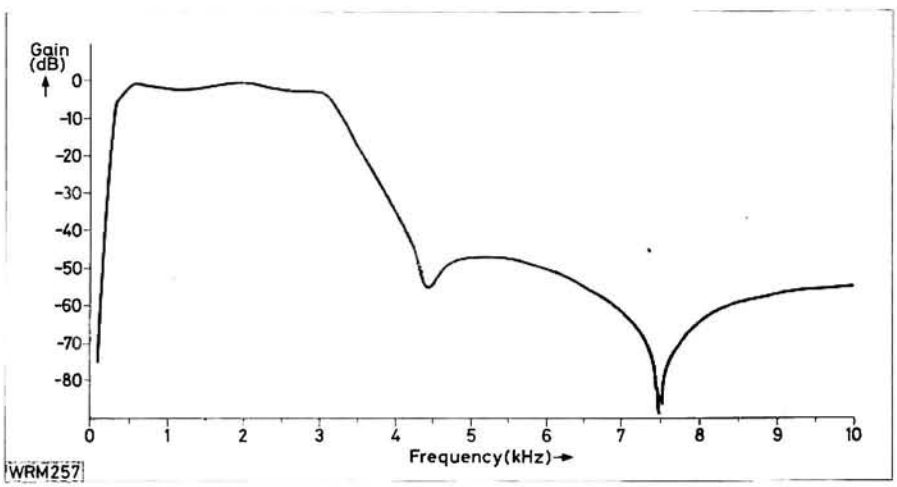
A low noise amplifier (TL071) was used for 3IC2, but it is debatable whether it is really merited. Other i.c.s. with the same pin-out (such as the 741) can be substituted if they are to hand without much degradation in performance.

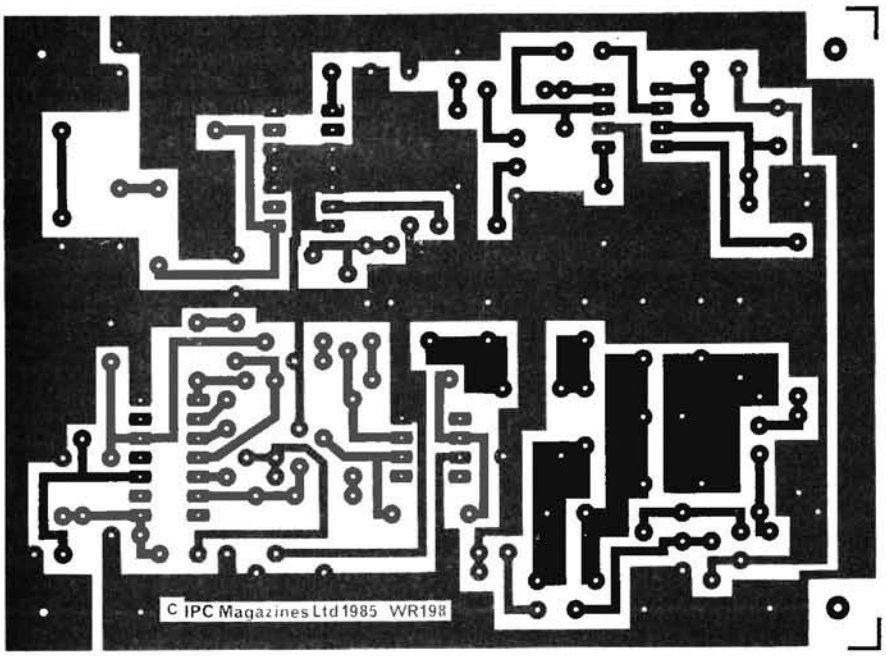
The output of the 3IC2 drives the audio filter via the 1kΩ resistor 3R17. One advantage of using an operational amplifier to drive an audio filter is that its output impedance is sufficiently low to be ignored, and so the drive impedance of the filter (in this case, 1kΩ) can be matched accurately by a series resistor. This drive impedance to filter is often ignored, and mismatching the input can result in poor performance from the filter.

A series combination of a highpass and a lowpass filter is used to give the desired audio bandpass response of approximately 500Hz–3kHz. The highpass filter consists of 3C10, 3C11, 3C12, 3L1 and 3L2 and was designed to have a cut-off frequency of approximately 500Hz and an attenuation of more than 70dB to mains frequency. Its passband ripple is approximately 1dB. An elliptic design was chosen for the lowpass filter which consists of 3C13, 3C14, 3C15, 3C16, 3C17, 3L3 and 3L4. You can see that it is an elliptic filter by the tuned circuits (3L3/3C14 and 3L4/3C16) which it contains. Elliptic filters give a very fast initial roll-off but the attenuation does not continue to rise in the stopband. It settles down to a more or less constant value, in this case approximately 50dB.

The response of the complete filter is shown in Fig. 2.1. This is an excellent response for a direct conversion receiver, whose main selectivity depends on the audio filter (and the ability of the human brain to concentrate on the desired signal, of course). Note that this performance has been

Fig. 2.1: The response of the complete filter





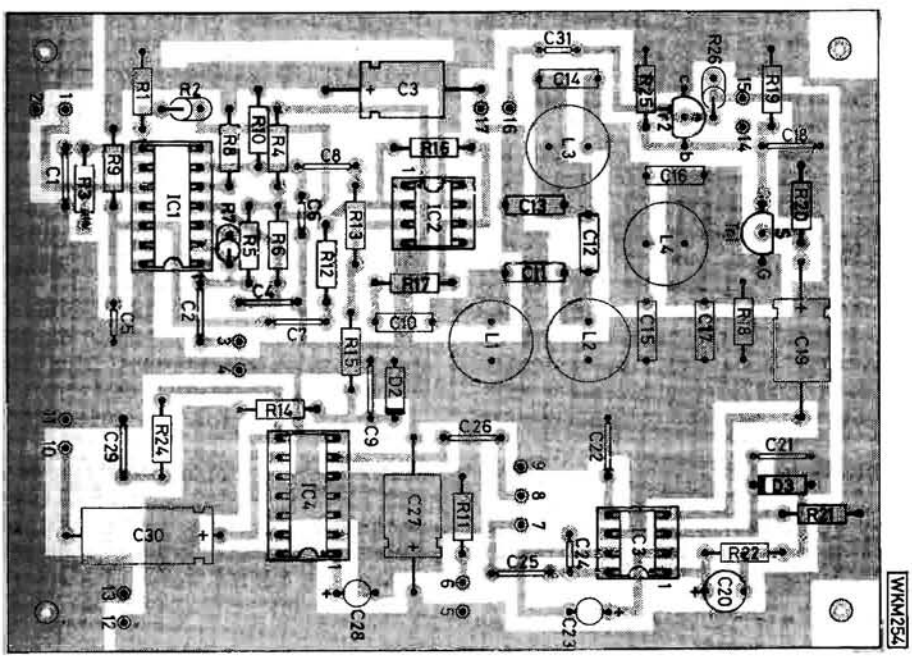


Fig. 2.2: The full size p.c.b. track pattern and component placement for Board 3 of the PW Colne

achieved by using preferred value capacitors and miniature, pre-wound inductors. In general, a passive filter using inductors will give far superior performance to active designs using operational amplifiers which seem to have become popular these days.

The output impedance (again 1kΩ) of the audio filter is matched by 3R18, which also provides the d.c. bias to the gate of j.f.e.t., 3Tr1. Because the input impedance of the gate of 3Tr1 is very high, it does not affect the matching of the audio filter. Transistor 3Tr1 is connected as a source follower, having a low output impedance to drive the low input impedance of 3IC3 via 3C19.

Integrated circuit 3IC3 is a Plessey SL6270C v.o.g.a.d. (voice operated gain adjusting device) audio amplifier which provides the a.g.c. characteristics of this receiver. This i.c. is normally used to regulate the audio input to the modulator stages of transmitters, but it gives excellent

★ components

Board 3 Product Detector & Audio Stage

Resistors

¼W 5% Carbon film

2·7Ω	1	R24
100Ω	2	R7,19
390Ω	1	R21
470Ω	1	R3
820Ω	1	R2
1kΩ	8	R4,5,6,14,17,18, 20,26
1·5kΩ	2	R1,11
2·7kΩ	2	R9,10
10kΩ	4	R8,12,13,25
100kΩ	2	R15,16
1MΩ	1	R22

Potentiometers

10kΩ log	1	R23

Capacitors

Disc ceramic

0·1µF	12	C1,2,4,7–9,18, 21,22,25,26,29

Sub miniature plate ceramic

4·7nF	4	C5,6,24,31

Polyester

10nF	1	C14
27nF	1	C16
0·1µF	1	C13
0·12µF	1	C15
0·18µF	1	C11
0·22µF	2	C10,12

Tantalum

2·2µF 35V	1	C23
4·7µF 16V	1	C28
47µF 6·3V	1	C20

Electrolytic 16V

100µF	4	C3,19,27.30

Semiconductors

Diodes

BZY88C6V2	2	D2,3
3mm l.e.d.	1	D1

Transistors

BF241	1	Tr2
BF245	1	Tr1

Integrated Circuits

LM380N	1	IC4
LM1496	1	IC1
SL6270C	1	IC3
TL071	1	IC2

Miscellaneous

Veropins, p.c.b.s, 8-pin i.c. socket (2), 14-pin i.c. socket (2), 6BA nuts and bolts.

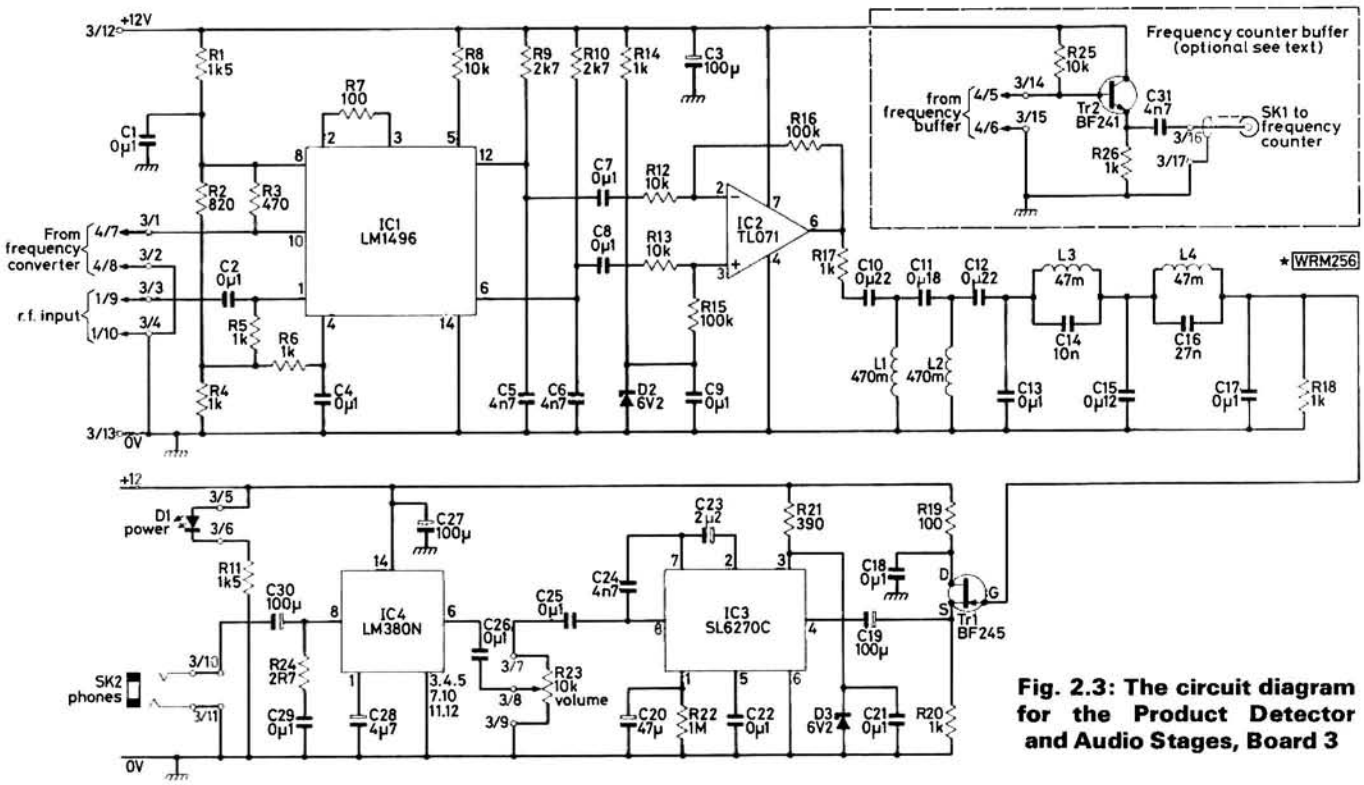


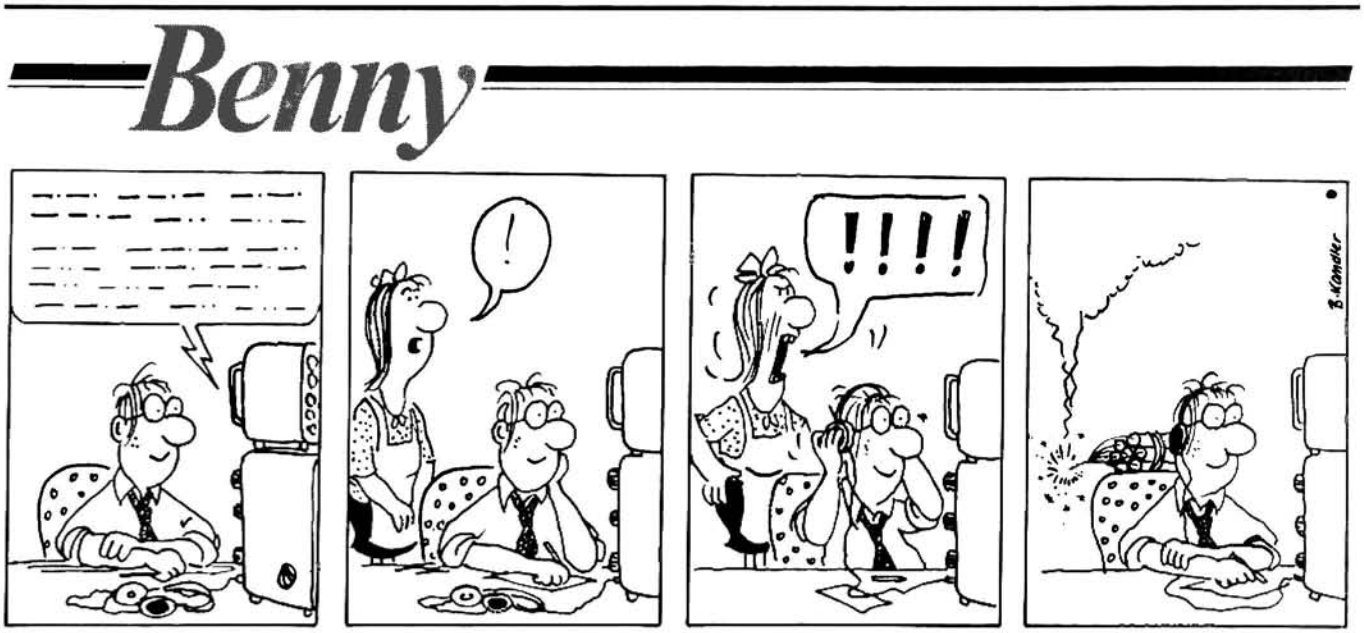
Fig. 2.3: The circuit diagram for the Product Detector and Audio Stages, Board 3

results in this application. As well as giving a high maximum voltage gain (52dB), the output of the i.c. remains essentially constant for a 60dB input voltage range. A full description of this i.c. is not given here and further details can be obtained from the Plessey data. The attack and delay times and frequency response of the circuit is set by the external components 3C20, 3R22, 3C23 and 3C24. The maximum operating voltage is 10V and so a supply rail is generated at 6·2V by 3R21 and Zener diode 3D3.

Control over the output volume level is provided by 3R23 and the final audio amplification is provided by 3IC4 (an LM380). A standard Zobel network (3R24, 3C29) is connected across the output to stabilise 3IC4 under all load conditions. A maximum power output of approximately 1 watt is available into an 8Ω load.

Also shown in Fig. 2.3 is the POWER l.e.d. with its series resistor and an optional emitter follower, 3Tr2, which buffers an output suitable for driving an external frequency counter.

In part 3 we will deal with the construction of the final p.c.b., the crystal oscillator and frequency converter.



Part 1 by Stephen J. Birkill* G8AKQ
The Satellites and Programmes

1985 will go down as the year in which satellite television came to the British Public. The government's DBS (Direct Broadcasting by Satellite) plans are way behind schedule and over budget and the ambitious scheme for cabling the country looks like an expensive flop. But perhaps now the politicians are finally taking notice of what the engineers have been saying—as I write (early February), new legislation is reported to be in preparation, enabling the licensing of wired distribution systems and perhaps even private homes to receive the existing cable TV channels distributed by satellite. Satellite Master Antenna Television (SMATV) is the term for a privately-cabled system carrying these programmes, while Quasi-DBS (QDBS) refers to direct reception in the home.

The distinction between SMATV, QDBS and true DBS is an important one. The European DBS plan was drawn up at a World Administrative Radio Conference in Geneva in 1977. With a handful of exceptions, each European nation (even Andorra, Liechtenstein and San Marino) was granted a block of five channel frequencies in the 12GHz band, a geostationary orbital location, a power level and a sense of polarisation, to establish a national satellite TV broadcasting system with the minimum of interference to adjacent countries. The proposed power levels were immense: peak equivalent isotropically radiated power (e.i.r.p.) levels as high as 67dBW (decibels relative to one watt)—the power per channel transmitted by the satellite's directional antenna towards the centre of the coverage zone was the same as would be produced by a five megawatt transmitter radiating omnidirectionally.

With a satellite antenna beamwidth (and hence gain) suitably scaled to cover an average-sized European country, this translated to an r.f. power requirement of between 150 and 250 watts per channel. A very heavy and costly spacecraft would be needed to carry all five allocated channels at this power level and that has been the major obstacle to the DBS plans—the cost of even a three-channel system (with reserve satellites) now having escalated well into its second half-billion pounds. There have been technical problems, too, over the reliability of the travelling-wave tube (t.w.t.) r.f. amplifiers developed for these high-power satellite transponders, which have delayed even the furthest-advanced DBS projects, those of France and Germany, into 1986/7.

*Mr Birkill is Technical Director, Satellite TV Antenna Systems Ltd.

The reason for these extravagant satellite power levels was the WARC requirement to keep home dishes down to 0·9 metre or less in diameter. The state of low-noise amplifier technology in 1977 suggested that affordable DBS receivers would need to employ simple mixer input stages and accordingly an 8dB noise figure was assumed in the WARC calculations. Today, noise figures of 2·5dB or better are readily obtainable using cheap Gallium Arsenide f.e.t.s, and in quantity production the cost of such performance is already within reach of the consumer. This and other advances made since 1977 have increased effective receive system sensitivity by a total of over 10dB (10 times power ratio). But DBS is saddled with the WARC plan and without a major revision the only option seen by the high power DBS advocates is to maintain satellite power and use the extra 10dB to reduce home antenna size, down to 0·45 or even 0·3 metre.

Naturally, the question asked by the critics of high power is whether such a costly system can be financially viable, bringing as it does a maximum of only five extra TV channels, which must somehow pay for themselves. Worse, DBS seems to be committed to an expensive and incompatible colour coding system (MAC) which even in ideal circumstances gives but a slight real improvement in picture quality. Alternatives have been proposed, including a Europe-wide 16-channel medium power system (Coronet) with DBS-like capabilities.

Low Power

The SMATV and QDBS proposals do not address directly the DBS issues. Indeed they must not prejudice the development of full DBS, whatever form that may

take. Instead they make the existing specialised satellite-delivered cable TV programmes available to the general public, outside the very limited cable franchise areas, and offer the programmers an enormously expanded (and urgently needed) market for their product. The satellites in question transmit in the 11GHz fixed-satellite service band, outside the sphere of the DBS plan, and they operate at rather more modest r.f. power levels, in the range of 10 to 20 watts per transponder to give peak e.i.r.p.s in the region of 47dBW (50kW). This means a larger receiving antenna is required than in the case of DBS, but not excessively so—with typical low-noise electronics a dish of 1·2 to 1·8 metres diameter (dependent upon location and satellite power) will give domestic users the kind of picture quality they have come to expect from the u.h.f. broadcast services.

US TVRO

There is a parallel to be drawn here with the situation in North America. Over there more than 100 different cable TV programme channels are distributed coast-to-coast by satellites in the 4GHz band. It is now eight years since the start of a revolution in American home entertainment. In 1977, a handful of enthusiasts began to build "small" satellite terminals for receiving these programmes in their own homes. In fact the antennas used were between 3 and 6 metres in diameter, on account of the low satellite power (e.i.r.p. of 35dBW) and the insistence of the experimenters on achieving the highest possible picture quality. From 1979 onwards the "hobby" grew into an industry, and home TVRO (Television Receive Only) terminals became the newest status symbol.

The industry's success was driven by the programming—the public was growing tired of pre-digested network fodder and wanted its movies to be recent, without commercial breaks or network censorship. Today, complete systems comprising a 2·5 to 3·5 metre motorised dish, low-noise amplifier and receiver (indoor unit) can be bought and installed for just two to three thousand dollars. The USA has had the same delays and doubts about DBS as we have, but home TVRO has stepped in and filled the void. Legislation enacted in 1984 clarified the individual's right of access to these satellite cable TV channels, creating a legal QDBS (albeit with rather large antennas by our standards) and establishing home TVRO as one of North America's fastest-growing industries.

In Europe too it was the amateurs, the TV DX-ers who first realised the possibility of small antenna satellite TV reception. We go back even further than the Americans, to India's SITE experiment at 860MHz via the ATS–6 satellite in 1975. The satellite television programmes were received in the UK by a number of enthusiasts on home-built equipment, and after the one-year experiment these experimenters went on to build receivers for the 4 and 11GHz bands. Dishes of all sizes from 1 to 6 metres were built, receiving TV from such satellite systems as Molniya, Raduga, INTELSAT, Gorizont, Sirio and OTS. While even the receiving terminals were experimental and few in number, the authorities were not too concerned about these activities. Had terminals been marketed to the public, problems would have arisen over their licensing. The broadcast television receiving licence covers broadcast and amateur services in their appropriate frequency bands. A special licence would have been required for reception of fixed service (point-to-point) satellite transmissions—the Home Office had no machinery for issuing such licences, other than for bona fide research, development or demonstration. Now all this is changing.

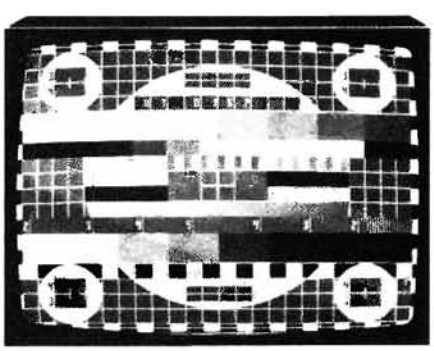
Satellites at 4GHz : Gorizont

The satellite most familiar to experimenters is called Gorizont, Russian for Horizon, and occupies a Clarke-orbit location called Statsionar–4, 36890km above the Atlantic equator and 14 degrees west of the Greenwich meridian. Four operational Gorizont satellites form part of the Soviet Union's internal telecommunications, radio and television distribution system and provide the eastern bloc nations with international links through the Intersputnik organisation. The current occupant of the Statsionar–4 slot is Gorizont–7, which is notable for having the world's highest-power downlink in (well, almost in) the 4GHz band. Gorizont's 3·675GHz channel 6 transponder runs a 40 watt t.w.t. to generate an e.i.r.p. of some 46dBW in a spot beam pattern spanning Europe, from the Atlantic coast almost to the Urals.

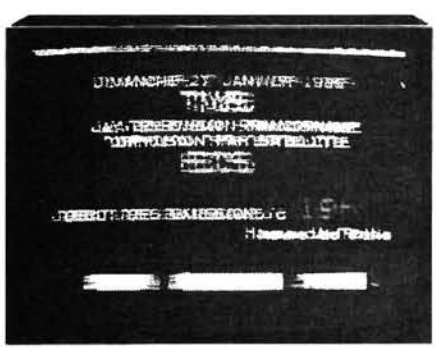
Gorizont's high power spot beam carries full time the Moscow edition of Soviet Central Television's *Channel One*. It is received by the Russians throughout European USSR and at certain locations in the Eastern European nations, using 2·5 metre TVRO terminals which feed cable systems or terrestrial rebroadcast transmitters. In the UK, its signals are so strong that with standard electronics a 1·2 metre antenna will provide quite viewable pictures—rebroadcast quality is obtainable with a 2·4 metre dish. The SECAM colour system is used.

Five other 4GHz transponders are carried by the Atlantic Gorizont, but utilisation changed during 1984 reducing TV traffic on these to one full time and one occasional channel, in a global beam pattern some 15dB (in the UK) below spot beam e.i.r.p. level.

Some curious mythologies have accompanied the Gori-



Soviet TV via the Gorizont Satellite at 3·675GHz



French language TV for Europe: The TV5 picture via EUTELSAT before and after descrambling

zont transmissions since they began in 1979 (the high power service turned on in 1980). It is **not** a propaganda channel—the programmes are in Russian, for Soviet viewers, and form a vital part of the Russian internal TV distribution network. Transmitted vision and sound quality are of the highest standard—some commercial and broadcast users achieve poor results due to receivers not fully optimised for the non-standard Russian vision and sound modulation. One such is the BBC, who at times of international tension have been seen to rebroadcast Soviet TV news received on their own Gorizont terminal.

INTELSAT

Away from the Soviet Statsionar locations, C–Band (4GHz) is dominated by the satellites of the International Telecommunications Satellite Organisation, INTELSAT. As well as providing global telecommunications services, INTELSAT leases out part of its otherwise spare capacity to provide domestic telecommunications services to various member nations. The bulk of these domestic leases are used for internal television distribution. Typically, an African or Middle-Eastern nation will lease a full (36MHz) transponder, use half of it for single channel per carrier telephony circuits and the other half to carry the national TV service out from the capital city to ten or twenty regional rebroadcasting centres, often over terrain which would prevent the use of conventional microwave links. These leases are usually maintained via east or west hemispheric beams, permitting the same transponder frequencies to be used simultaneously in, for instance, Africa and South America, without mutual interference.

C–Band domestic lease services receivable in the UK include those of Algeria, Argentina, Chile, Libya, Morocco, Niger, Nigeria, Oman, Portugal, Saudi Arabia, Spain, Sudan and Zaire. The Spanish and Portuguese leases are used for services from the mainland to the Canary Islands and the Azores, respectively. Certain full-time international leases are also of interest, in particular the INTELSAT relay of the US *Armed Forces Radio and Television Service* (AFRTS), a 24-hour per day news compilation. The bad news about all these services, however, is their low power. At present, the strongest has an e.i.r.p. towards the UK of 26dBW; the weakest is around 15dBW. Six metres is a minimum antenna size to achieve really good reception from any of these.

11GHz : INTELSAT

British Telecom International operates a domestic lease with a difference. This takes in the entire K–Band (11GHz) spot beam capacity on the Atlantic Reserve INTELSAT V, Flight 4, at 27·5 degrees west of Greenwich. There are six transponders in total, downlinking in two spot beams with opposite polarisations, to minimise interference. BTI has taken the unusual step of repointing the west spot beam, which normally serves the US eastern seaboard, and directing it towards the UK, along with the east spot beam. The transponder bandwidths of 72, 77 and 241MHz are large by television standards—most satellite f.m. TV transmissions occupy a bandwidth of between 27 and 36MHz. BTI has also chosen to use frequency-division multiplex with two channels per transponder in the higher power west spot. The effect of this is to share transponder power and in fact each half-transponder TV carrier operates about 4dB below the transponder's maximum (saturation) power level. The east spot has a rather wider beam and its beam centre saturation e.i.r.p. is some 3dB less, so in a full-transponder mode it will have a slight power advantage over the west spot. This partitioning of bandwidth and power makes a total of nine TV channels available on this satellite.

As I write, three of these channels are in use to relay four cable programme services, uplinked from the London Teleport, to all parts of the UK. *The Children's Channel* is exactly what it says, and operates from 7 a.m. to 3 p.m., when *Premiere* takes over until the early hours. *Premiere* is an American-style movie channel modelled on *Home Box Office*, one of the US TVRO operators' favourite channels. The very best of recent cinema releases are shown, from the motion picture industries of Great

Table 1

Programme	Transponder	Country of Origin	Type of Programming	Decoder Required?	Colour System
Music Box	12	UK	Pop "videos"	No	PAL
Sky Channel	6	UK	Entertainment	Yes	PAL
TV5	4	France	Entertainment	Yes	SECAM
RAI–Uno	1	Italy	Entertainment	No	PAL
Teleclub	7	Switzerland	Movies (German)	No	PAL
SAT1	10	Germany	Entertainment	Yes	PAL
3SAT*	2	Germany	Entertainment	Yes	PAL
New World	4	Norway	Evangelism	Yes	SECAM
FilmNet	9	Holland	Movies (Dutch)		PAL—operational spring/summer 1985
NOS/Olympus	3	Holland	News/Culture		
RTL–Plus*	8	Luxembourg	Entertainment (German)		

* The *3SAT* and *RTL–Plus* channels are directed towards Eastern Europe and demand a very large antenna for reception in the UK.

A 1·25m dish antenna is adequate for home reception of most European satellite "cable" TV

Saudi Arabian TV via INTELSAT at 4GHz

Sky Channel via ECS at 11GHz

RAI — Italian TV via ECS

Britain, Australia and Canada as well as from Hollywood. A full teletext service is also transmitted. *TEN—The Movie Channel* is the UK's other all-film service, with its own selection of high-class movie entertainment. The fourth INTELSAT programme service is *Screen Sport,* offering a full evening's viewing drawn from the most exciting sporting events world-wide.

The INTELSAT fare will be further enhanced come September of this year, when a 625-line PAL version of America's 24-hour Cable *News Network* will be birded direct from Atlanta, into our homes via 6 to 11GHz cross-strapping on board the same satellite. Also due for a September launch is Britain's own *Lifestyle* channel. The combination of programme services on INTELSAT V F4 (to be replaced in due course by F10) make the 27·5°W slot an exciting prospect for SMATV and QDBS development.

EUTELSAT

Europe's other "cable TV bird" is the European Com munications Satellite at 13°E. ECS F1 (also known as EUTELSAT–1 F1) took over from the pre-operational satellite OTS at the end of 1983, and since that time the number of European satellite-delivered cable TV services has grown from one to ten—the number is still increasing. EUTELSAT operates in exactly the same frequency band as INTELSAT V, but its Spot West beam takes in the whole of Western Europe. Each EUTELSAT has four beam patterns: Spots West, East and Atlantic, plus a wider, lower power Eurobeam. F1 has eight transponders switched to Spot West and two to Spot East. Spot West will deliver SMATV grade reception with a 1·8 metre antenna in the UK, or QDBS grade using a dish as small as 1·2 metres. For cable TV or rebroadcast quality reception a 3 or 3·7 metre antenna is required. We shall discuss antenna requirements in more detail in the next part of this series.

On Spot West are the two UK services distributed via the EUTELSAT system: Rupert Murdoch's *Sky Channel* is the one that started pan-European satellite cable TV. It continues to expand its transmission hours with "strip" programming of popular-appeal English-language material, much of which will look familiar to viewers of the UK, or indeed US networks. *Sky* has achieved considerable success in the ratings battle across Europe and even in the UK cable towns it has claimed third place behind BBC–1 and ITV. The other English channel is *Music Box*, whose 20-hour per day programming consists almost entirely of pop promotional "videos", transmitted with compatible stereo sound. With pop music's international appeal, *Music Box* is already a firm favourite with young people throughout the EUTELSAT footprint and is tailor-made for an SMATV audience.

Another notable EUTELSAT service is *TV5,* transmitting each evening a selection of French-language material from France's *Antenne–2,* Belgium's *RTB* and Switzerland's *Suisse-Romande* channel. Like *Sky,* the *TV5* service is scrambled (but not with the same system) and an appropriate decoder must be obtained from the programme provider. *Sky* and *TV5* are free, not subscription services, and scrambling would seem to be an obstacle to their offering QDBS access, although the decoder would no doubt be a worthwhile expense for an SMATV system.

The Spot East beam is at a 15dB (average) disadvantage in the UK and so requires a considerably larger dish. Two programme services use this beam: *3SAT* is a German-language entertainment channel specially compiled for satellite, with material drawn from Germany's *ZDF,* Austria's *ORF* and the German service of Switzerland's *SRG. RTL–Plus* is Luxembourg's terrestrial German-language service, now available to a very much wider audience via satellite.

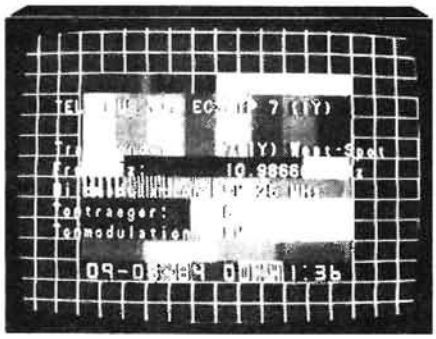
These, and other EUTELSAT–1 F1 programmes, are summarised in Table 1.

ECS–1 F2 is operational at 7°E as the EUTELSAT primary telecommunications satellite, but does include four Eurobeam transponders dedicated to EBU (Eurovision) programme exchange. One Spot West transponder (6) is also in use for television, carrying a C–MAC feed of *NRK* (Norwegian Television) to Spitzbergen, well beyond the Arctic Circle and close to the northern limit of geostationary orbit visibility. F1 is the reserve for F2, and so its transponder leases are classed as pre-emptible—a failure on the Primary F2 satellite could result in F1 having to drop one or more cable TV services to handle EUTELSAT's higher priority digital telecommunications traffic.

The next EUTELSAT satellite, F3, will be dedicated entirely to TV transmission, and should be in operation from 10°E before the end of the year with nine new cable/SMATV channels, from Spain, Italy, Turkey, Scandinavia and two from the UK.

Steerable Antennas

The continuing demand for transponder space is thus spreading out Europe's channels among more and more satellites. None of the currently used spacecraft was designed for this application—their transponders are too wide and too few for efficient TV distribution. France's



Teleclub — Swiss pay TV via ECS

TEN, one of the UK's two movie channels via INTELSAT

SAT1 German cable TV via ECS

Telecom–1 will be the next to carry cable TV programming, and that will be followed by Germany's Kopernikus. Meanwhile the DBP (West Germany's telecommunications authority) has leased transponders on an Indian Ocean INTELSAT (57°E) for TV relay, and the first high-power DBS satellites are not so far away, with power enough to cover most of Europe. Operational and planned geostationary communications satellites stretch in an arc from eastern to western horizon, right across our southern sky.

In cable or SMATV applications, it is customary to have one antenna per satellite. To cope with frequency re-use on opposite polarisations, the antenna feed can be equipped with an orthomode coupler to separate the two polarisations for amplification, conversion and demodulation. A two-antenna system could well have three or four separate signal cables entering the equipment room, each of which is then further split to feed a bank of receivers (tuner/demodulators), one for each channel required by the system. With a QDBS installation such duplication is unnecessary, and the home viewer will be demanding, like his American counterpart, a fully-steerable dish with electronic selection of polarisation. The American steering and polarisation systems, designed for 4GHz use, are not suitable for Europe and new products are in preparation to meet the QDBS requirement.

Equipment Availability

Satellite television receiving hardware is available now from a number of suppliers. My own company manufactures professional and consumer satellite receivers. Complete 11GHz home systems can be bought for prices between £1200 and £3500, depending upon the particular facilities required. With the establishment of an SMATV and QDBS market the costs will begin to fall and no doubt we shall soon see satellite TV on sale in the High Street.

There is still scope for the hobbyist to build his own system—GaAs-f.e.t.s are already part of the microwave radio amateur's kit and the waveguide techniques common in the 10GHz amateur band can be adapted for 11GHz satellite reception. Even a simple mixer front-end with no r.f. amplification is capable of delivering quite surprising results from the existing satellite transmissions. The thrill of receiving one's first TV picture from space must rank among the great inspirational moments of our hobby.

In the next part of this series we shall look at satellite transponder frequencies and "footprint" coverage and examine the type of electronics needed for satellite reception.

Further Reading

The following publication may be of interest to those wanting to know more about satellite systems and technology:

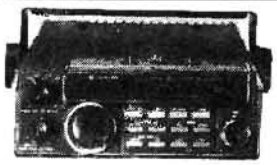
The Word of Satellite Television by Mark Long and Jeffrey Keating. An excellent introduction to TVRO, American style. Includes information on international as well as domestic systems. £8.00 (inclusive of UK P&P) from Satellite TV Antenna Systems Ltd., 10 Market Square, Staines, Middx. TW18 4RH.

TO BE CONTINUED

North London Communications Ltd

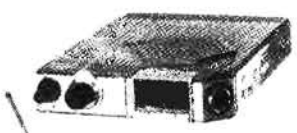
211 The Broadway, West Hendon, London NW9 7DE Tel. No. 01-202 3638

SPECIAL EXHIBITION OFFER:- INTEREST FREE H.P.



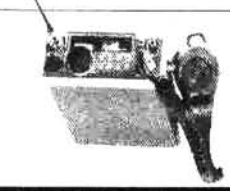
C5800
CASH PRICE £399.00
INC V.A.T.

H.P. OVER 6 MONTHS		H.P. OVER 12 MONTHS	
DEPOSIT	£81.00	DEPOSIT	£201.00
REPAYMENTS	£53.00	REPAYMENTS	£16.50
TOTAL	£399.00	TOTAL	£399.00



C8900
CASH PRICE £239.00
INC V.A.T.

H.P. OVER 6 MONTHS		H.P. OVER 12 MONTHS	
DEPOSIT	£47.00	DEPOSIT	£119.00
REPAYMENTS	£32.00	REPAYMENTS	£10.00
TOTAL	£239.00	TOTAL	£239.00



C58
CASH PRICE £289.00
INC V.A.T.

H.P. OVER 6 MONTHS		H.P. OVER 12 MONTHS	
DEPOSIT	£58.00	DEPOSIT	£145.00
REPAYMENTS	£38.50	REPAYMENTS	£12.00
TOTAL	£289.00	TOTAL	£289.00

COME AND SEE US AT THE N.E.C. 13/14 APRIL STAND No. A69

FORMERLY: LEE ELECTRONICS
NOW OPEN AT BOTH ADDRESSES

400 EDGWARE ROAD,
LONDON W2
01-723 5521 Tlx 298765

Please allow up to 14 days for delivery

NORTHERN AGENTS:
Joe Bell G4PMY,
Unit 3, Thomas Street,
Crewe. Tel: 0270 582849

R. WITHERS COMMUNICATIONS

584 Hagley Road West, Oldbury
Warley B68 0BS
Tel: 021-421 8201/2 (24 hr Answerphone)

"THE FASTEST GROWING AMATEUR RADIO DEALERS IN THE UK"
Full range of Yaesu, Icom, Trio, etc. Some at pre-increase prices—phone for latest stock levels

NEW PRODUCTS EXCLUSIVE TO R.W.C.

10 Mtr MOD BOARD

PRICE **£22.50** + £1.00 post and packing

This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of synthesizer chip, the unit comprises of a small pcb with six microchips and **fits almost all current legal (CB 27/81) radios,** the unit is supplied with **full fitting instructions** and can be **fitted easily by most enthusiasts,** with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10 mtr amateur band.

RAYCOM MODULAR RF AMPLIFIERS

PRICE from **£39.50** for the 15W vhf model + £2.00 post

A complete range of linear and fm amplifiers for use with both VHF and UHF hand portables and multimode potables such as the YAESU FT290R and FT790R. Power output from 15W to 45W depending on model (eight are available). All units feature Mitsubushi or Toshiba power modules as used in the majority of mobile and base radio transceivers. Two versions are also available for business radio applications.

PLEASE SEND SAE FOR FULL SPECS, DETAILS AND PRICES

A.R.M MULTI P6 ANTENNA

PRICE **£34.50** + £2.50 carriage

This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon. The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and **is capable of being used on both vhf and uhf** in both **horizontal and vertical polorization** modes, both portable and mobile. The antenna has the facility of being used as both omni-directional or directional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna **can** therefore **be used in a variety of applications on frequencies between 140-450 mhz.**

Collinear Extension Element **£4.75**

ANNOUNCING THE SUPER YAESU FT757GX

- **The modification serves two major purposes**
- **(1) To improve VFO tuning and eliminate "VCO GLITCH"**
- **(2) to increase tuning speed from 5khz per dial revolution to 50khz per dial revolution (selectable on the 500khz step switch)**
- **UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. Delivery 7-10 days.**

ALL PRODUCTS ON SHOW AND AVAILABLE AT THE N.E.C. CONVENTION STAND B57

New Receiver from Yaesu

White hot news from SMC, describes the Yaesu FRG-9600, an all-mode v.h.f./u.h.f. scanning communications receiver that covers 60MHz to 905MHz, with 100 keypad-programmable memory channels.

Six modes are available, f.m. wide, f.m. narrow, a.m. wide, a.m. narrow and the new experimental a.s.c.b. mode. A front panel tuning knob is provided to simplify tuning of s.s.b. and narrowband a.m. Seven tuning/scanning rates between 100Hz and 100kHz ensure fast and efficient scanning while still permitting easy tuning of narrowband signals.

The scanning system allows either full or limited (via keypad) band scanning as well as memory channel scanning, with auto-resume. In addition to carrier sensing scan stop, audio scan stop sensing is also selectable to avoid stopping on inactive "carrier-only" channels. Scanning steps are selectable, with the wide steps indicated on the front panel display.

Signal strength is displayed on a 2-colour graphic S-meter and a 24-hour clock/timer is included, along with a recorder output, for automatic power on/off switching and recording.

Additional jacks provide c.p.u. band selection outputs, multiplexed (f.m. wide) output, a.f. and r.f. mute plus other control signals for maximum expansion potential with future options for those who wish to provide their own add-on hardware for special applications.

Operators with personal computers are able, via the Yaesu CAT system, to add virtually unlimited customised control functions in software; such as multiple, organised memory banks; automatic tuning; and customised scanning systems; using almost any personal computer and a Yaesu FIF CAT Interface Unit.

The FRG-9600 requires a 12V d.c. power source, and a number of optional accessories are available, including a Video IF Unit for reception of TV pictures (NTSC format on a video monitor).

By the time this is published details of price etc. should be available from: *South Midlands Communications Ltd., SM House, Rumbridge Street, Totton, Southampton SO4 4DP. Tel: (0703) 867333.*

New Transceiver

Eddystone Radio, well known to radio enthusiasts for a long line of communications receivers, recently announced their Orion 5000 h.f. transceiver, which has a 150W output, and is crystal-controlled over the range 2–16MHz. It is aimed at Third World countries where existing telecommunications facilities are poor, and has already attracted orders for 50 sets. Simplicity of operation and maintenance were major considerations in the design of the Orion 5000, a compact unit suitable for 13·6V d.c. operation in vehicles or 115/230V a.c. operation as a base station. A marine version, suitable for small-craft installation is expected to be available later in 1985.

Complete with ancillary units, cables and an antenna, the Orion 5000 costs £800-£1000, depending upon options chosen.

Following the success of their professional grade Model 1650 l.f./h.f. communications receiver, Eddystone have announced that they expect to launch the Model 1995 v.h.f./u.h.f. range of microprocessor-controlled receivers in late 1985. These, they claim, will rival the performance of receivers from Rohde and Schwarz and Hewlett Packard. Further details from: *Eddystone Radio Ltd., Eddystone Works, Alvechurch Road, Birmingham B31 3PP. Tel: 021-475 2231.*

RTTY Receive Demodulator

With many radio amateurs and s.w.l.s employing home computers in their hobby activities, readers may be interested in the introduction of the RDU 847 RTTY Receive Demodulator Unit by B & J Telecommunications, which provides an economical method of resolving RTTY transmissions when interfaced with most types of home computer.

continued on page 49 ▶

Valved Communications Receivers

by Chas. E. Miller

Part 3—THE R1155 continued

Modifications for Domestic Use

The very least that will have to be done is the provision of a suitable power pack for l.t. and h.t. supplies, since, as mentioned earlier, no internal power supply was fitted. It would be perfectly possible to use a standard receiver domestically as long as earphone-only reception was acceptable, in which case the heater requirement would be 2·1A at 6·3V, and the h.t. between 50 and 65mA (according to setting of volume control in OMNI mode) at approximately 200V. However, there must be very few receivers which have not, by now, been modified to drive a loudspeaker, and the extra valve required for this task may be expected to consume up to 1A more heater current and around 50mA more h.t. current. To be on the safe side a power pack rated at 3·5A and 125mA respectively should be employed. This should give an ample margin of error.

At this juncture new owners of receivers are urged to examine carefully all modifications that have been made in the past, as the complexity of the circuit and the actual wiring makes it all too easy for mistakes to have crept in.

The output valve may be conveniently plugged into the holder vacated by the redundant V9. This is immediately adjacent to the demodulator/output valve V8, which will now have its triode section adapted to form a resistance-capacity coupled amplifier to drive the new output stage. All connections should be removed from the V9 holder with the exception of the heater wiring. As for the actual valve to be employed, the choice is very wide, but in the interests of preserving uniformity with the rest of the line-up another Marconi/Osram type is indicated. Their KT63 is eminently suitable since it provides ample output (just over 3W) with an h.t. supply of 200V, without demanding a great deal of current—approximately 35mA I_a and 8mA I_{g2}; the heater draws 0·7A a 6·3V. The nearest standard value of bias resistor for the KT63 is 390Ω at 0·75W. Whatever valve is used however, and whatever the value of its bias resistor, care must be taken to ensure that the "bottom end" goes directly to h.t. negative and **not** to chassis, as is usual. The reason for this is connected with the bias supply system. Were the extra anode current of the output valve to flow through the latter the operating voltages would be seriously affected and some of the smaller resistors might well burn out. It is equally essential that the grid resistor for the new valve also be taken to h.t. negative and not chassis, since the familiar arrangement would cause a positive bias to be applied to the valve with consequent serious over-running.

No difficulty should be experienced in finding space for the necessary loudspeaker matching transformer. Its primary should be connected across the anode and g_2 pins of the output valve and the latter connected directly to the h.t.+ input. The secondary should be connected to chassis and pin 6 of Jones plug P1;L30 is disconnected from the anode of V8 and the cable insulated. A 47kΩ resistor is connected from anode to h.t.+, and a coupling capacitor of around 10nF taken from anode to g_1 of the output valve. It may be advantageous to interpose a "stopper" resistor of about 1kΩ between the capacitor and the grid, in which case the grid return resistor should be connected to the junction of the two components. The coupling capacitor should have a rating of at least 400V. A further capacitor should be shunted across the output transformer primary; this will prevent high-frequency oscillations from taking place under certain conditions. The value should be around 5nF; since it will introduce a measure of "top cut" the value may be selected to suit the owner's personal feelings regarding treble response. The peak voltages occurring across the primary of an output transformer are surprisingly large, calling for a capacitor rated at 1kV or better.

Power Supply Requirements

The h.t. and l.t. voltage and current ratings suggested above are relatively modest and in themselves unlikely to pose any great problem. However, the way in which they are fed into the receiver will call for modifications to virtually all p.s.u.s not expressly designed for this particular

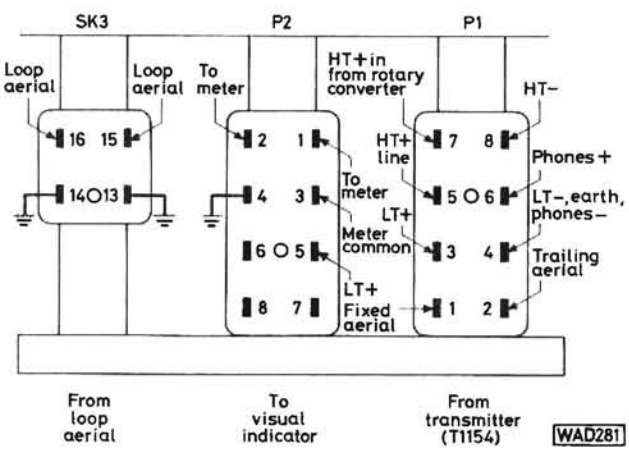


Fig. 3: Connectors as seen looking at the front panel of the R1155

job. The reason for this is the negative bias line used in the R1155. Normal practice in p.s.u.s is to have the h.t.– connected to chassis along with one side of the heater supply voltage, with a single common connection to the associated receiver. This cannot be used in the R1155 since the h.t.– is not taken directly to chassis. The heater supply need not be altered, but all h.t.– points must be isolated from chassis in the p.s.u. and taken to an insulated terminal or solder tag which eventually connects to pin 8 of P1.

The first connection to be removed from chassis is that coming from the centre tap of the mains transformer h.t. winding. Some p.s.u.s have a fuse in this lead, making it easier to be identified and modified. In such cases the new connection should be made on the previously earthed side of the fuse, thus leaving it in circuit. The next items to re quire attention are the smoothing capacitors which are commonly metal can types with the can forming the negative connector. Even when a negative solder tag is provided on the base of the capacitor it is not safe to assume that the can will be isolated; in some cases a warn ing to this effect will be found printed on the device body. Because capacitors are usually retained, and thus earthed, by metal clips they will have to be removed and insulated with a few turns of plastic tape. Where the can forms the only negative connection a narrow strip of tinplate should be bound against the body of the capacitor for use as a solder tag.

When the power pack is wired as above there will be no p.d. between its chassis and that of the receiver, obviating any threat to the bias line which might otherwise occur should a radio earth on the set and a safety earth on the p.s.u. form another d.c. path.

Care should be taken to ensure that the h.t. output of the p.s.u. does not exceed 200V to any appreciable extent, as measured across the h.t.– and h.t.+ (pins 8 and 5 of P1). The R1155 was designed to operate with this voltage and there is nothing to be gained by raising it. Indeed, an excess might cause trouble in the various potential dividing networks employed to feed valve electrodes. (To say nothing of that bias line!) An extra dropping resistor should be fitted in the p.s.u. to reduce its output when necessary—not placed inside the receiver. Insert the resistor between the smoothing capacitor and the h.t.+ terminal, decoupling the latter to chassis with another capacitor of 16–63μF 300V working. This arrangement will provide a little additional smoothing of the h.t. line and ward off instability. Reduction of the d.c. output by inserting resistors in the a.c. supply to the rectifier anodes is **not** recommended.

Preventative Medicine

Reference has been made previously to the potential dividers in the receiver. These are comprehensively decoupled by paper capacitors, most of which consist of small aluminium cans screwed to the chassis, each containing three separate 0·1μF units. It has to be said that these devices have an unhappy reputation for breaking down and it is strongly recommended that they be replaced en masse. (If this has been done by a previous owner, play safe and check the new components as well!) Some of the capacitors are well hidden and have to be searched for, but it is a task that must not be shirked. The associated resistors should also be tested for correct value if they appear to be discoloured by overheating. (The author recently worked on an R1155 which had a very mediocre performance. It transpired that a shorted capacitor in the r.f. amplifier had burned out R42, thus robbing V3 of its anode voltage. Instead of tracing the fault the previous owner had simply transferred the antenna input to the grid of the frequency changer, omitting the r.f. amplifier altogether!)

It is not only capacitors that have to work at fairly high voltages that need to be investigated; those used to decouple the a.g.c. line, for instance, must be above reproach, since even a high resistance leak here will badly affect the action of the a.g.c. The same applies to capacitors used for filtering and coupling the a.f. from the demodulator, where the diode concerned must have its anode maintained at the same potential as its cathode. Any leak which upsets this will bring about an unwanted "squelch" effect which could

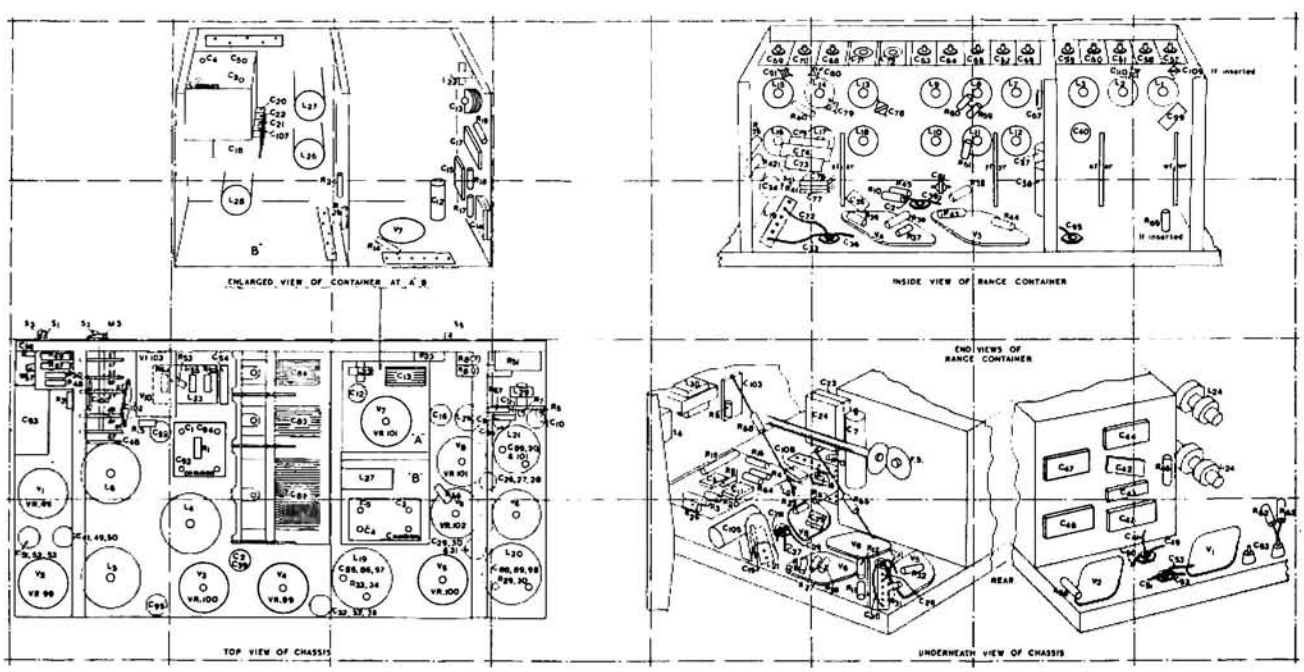


Fig. 4: Principle component locations and general internal layout

cut off weak stations completely. If, when the receiver is tuned up and down the bands only strong stations are received, with silence between them, it is the demodulator circuit that must be checked out.

An hour or two spent in locating and replacing leaky capacitors will be handsomely repaid in terms of increased receiver performance, as the writer can testify from personal experience. The latter also suggests that open circuit components are not so commonly found, but "Murphy's Law" means that one is bound to crop up at some time! If this occurs on the r.f. or i.f. decoupling circuits the result will be instability and reduced performance; on the decoupling of V8 cathode it may make it impossible for the volume to be reduced to zero on the AVC setting of the master switch. C1, which decouples the bias line, is part of a triple unit of squarish shape mounted on the top deck of the chassis. (R1, the principle bias resistor is soldered across terminals of this unit.) An open-circuit here would almost certainly introduce a.f. instability.

Some quick checks for HT currents and valves: Although there are too many variables concerned to quote a precise h.t. current overall, much may be learned from the bias line, which should be 30V at OMNI and the volume control at minimum. Any variation of more than a volt or so must be investigated. It will be seen from Fig. 2 that the voltage dropped across the resistors R1 and the R3/R4/R64/R69 arrangement is partly due to the current drawn by V3, V4, V5, V6 and V7, and partly to the current flow through the potential dividers R15/16 and R14; R27/28; R31/32; R36/37; and R43/44. Any serious change of value occurring to any of these resistors is bound to affect the current flow and thus the bias voltage. As a guide, the d.c. resistance as measured between pins 5 and 8 of P1 should be 9·5kΩ. This will account for an h.t. current flow of 21mA at the rated input voltage, apart from that due to the valves. Clearly, any variation in the performance of the latter will also have an effect on the h.t. current. As regards V3, V5 and V6 a quick check can be made by measuring the voltage drop across the anode decoupling resistors R42, R30 and R58 respectively. Whilst an exact value cannot be quoted, applicable to every receiver, it should at least be sensibly uniform for the three resistors in a particular set. Wide variations pointing to an "odd man out" can be cross-checked by changing the valves around in their positions. A similar comparison may be made between the two VR101/MHLD6 valves by alternating them in the V7 position and measuring the voltage across R17—with, of course, the b.f.o. switched on. A p.d. of around 5V across R34 will show that the hexode section of V4 is at least doing something, but the triode section cannot be checked in this manner since the voltage drop across the anode resistor will be affected by whether the valve is oscillating properly—and the mere application of test prods can upset this. A good rule of thumb test is to measure the voltage on the grid of the triode—if it is oscillating a negative reading will be obtained. If this is absent, try the anode voltage; should it be high, near to the h.t. supply voltage, the chances are that the valve itself is at fault. A very low reading indicates that a component failure or other fault in the local oscillator circuit is preventing the valve from working normally, thereby causing it to draw excessive anode current.

It need hardly be said that a selection of spare valves of known "goodness" is a tremendous help in fault-finding!

Special notes on V7: In early receivers it was impossible to withdraw V7 without first rotating the b.f.o. tuning capacitor for maximum capacity. Later sets had a different capacitor which gave more clearance. It is as well to check this point before removing V7. The early sets also suffered from frequency drifting of the b.f.o., attributed to overheating of small capacitors in the b.f.o. compartment and to the presence of sulphur emanating from a sorbo-rubber pad used to steady the valve. The cure is to remove the lid, discard the sorbo pad, and drill a ventilation hole, approximately 32mm in diameter.

Replacement of V4—Danger! The VR99/X66 originally specified for this position is non-metallised, which left pin 1 of the holder free for use as an anchoring tag—in this case for the h.t. line. The potential danger of inserting a metallised valve (such as ECH35) having the metallising connected to pin 1 hardly needs elaboration! Quite apart from the risk of electric shock, the fitting of the original metal shield over the valve will almost certainly bring about a dead short on the h.t. line.

Alignment—Checks and Adjustments: Apart from the actual calibration of the dial, the physical appearance of the r.f. oscillator and i.f. trimmers, etc., should be examined. If there are signs of someone having been "screwdriver happy" complete realignment may be on the programme. Otherwise, the good old principle of "leave well alone" applies, especially with regard to the i.f. transformers. The band-pass design of these makes it highly desirable that alignment should be carried out visually with wobbulator and oscilloscope. As regards r.f. calibration the officially suggested tolerances are these: Band 1, ± 100kHz; Band 2, ± 50kHz; Band 3 ± 6kHz; Band 4, ± 3kHz; Band 5, ± 1·5kHz. By interpolation, Band 2A ± approx. 20kHz.

When re-alignment is essential it is suggested that as a precaution the i.f. should be checked, even if only by ear against an ordinary signal generator, since if it is wildly off all else will be upset. The location of the trimmers is shown on Fig. 4. It will be seen that there are three groups of five, numbered respectively C57–C61; C62–C66; C68–C72—but not, n.b., in numerical order. In all cases the highest C number corresponds with the highest fre-

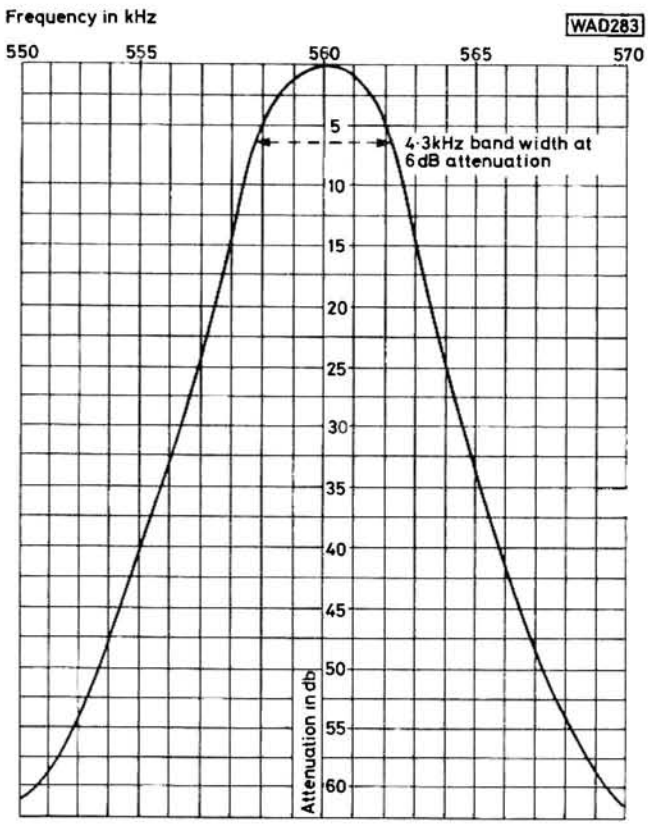


Fig. 5: The R1155 i.f. response curve

quency range. The first group (numerically) are the antenna coil trimmers, the second group for the intervalve r.f. transformers, and the third group for the local oscillator coils. Thus, commencing with the lowest frequency band C68, C62 and C57 should be adjusted in that order, followed on the next band by C69, C63 and C58, and so on. This holds good for all marks of receiver but the appropriate frequency ranges for the bands must be observed. (For instance, the lowest band in R1155A is 75kHz—200kHz, but in R1155L is 200kHz–500kHz. Reference should be made to the specifications given in the first part of this article.) Alignment frequencies are:

Band 5 185kHz. Band 4 500kHz. Band 3 1430kHz. Band 2A 2·8MHz. Band 2 7MHz. Band 1 16MHz.

Adjust trimmers for maximum output (preferably with meter) with receiver switched to OMNI and with volume control at maximum. Chronic inability to obtain correct dial readings points, in the first instance, to changes of values among the fixed padder capacitors C73, C74, C75, C76, C77 and C116 (L and M models). The correct values of these are, respectively, 93pF, 255pF, 537pF, 1670pF, 6170pF and 1320pF. It is virtually certain that replacements will have to be made up of two or three capacitors in parallel, in each case. Close tolerance components must be used. Another possibility is to use a combination of fixed and variable devices, e.g. for C75 a 50pF preset shunted across a 500pF fixed. If this course is adopted it will be possible to check the dial settings and adjust if need be at the low frequency end of each band, suggested points being:

Band 1, 8MHz. Band 2, 3·5MHz. Band 2A, 1·7MHz. Band 3, 500kHz. Band 4, 230kHz. Band 5, 80kHz.

It is suggested that final checking should take place using actual radio stations of known frequency, especially those of MSF Rugby, on 60kHz, 2·5MHz, 5MHz and 10MHz. It is also highly desirable that signal generators be checked against such frequency standards by the zero beat method.

Additional Modification—Aerial Input: The original method of taking the inputs from the fixed and trailing antennas via pins 1 and 2 of P1 may not be very convenient for the home user, as this plug also handles the power supplies. A good alternative is to use the redundant loop connector SK3, or twin antenna/earth terminals mounted in its place. The wires from pins 1 and 2 of P1 may be shorted together to provide a single input for all bands.

Valved Communications Receivers

by Chas. E. Miller

THE NATIONAL HRO

A POSTSCRIPT

During my research for the article on the HRO I made many attempts to discover just what the three letters stood for, but without success. It was even suggested to me that they were completely meaningless, like the "S" in Harry S. Truman's name. At last, however, the investigative patience of one of my spies has paid off and I am able to bring you the truth of the matter . . . or at least, a very plausible explanation!

Since the HRO is considered to be very much the province of the amateur, it may come as a shock to find that it was developed to meet a purely commercial need in the American aviation industry. At the beginning of the 1930s civil airlines in the USA were confined largely to daylight flying, since navigational aids were at a minimum. What few night flights were made depended on light beacons set on high ground to keep them on the straight and narrow, since the primitive radio equipment then available simply was not reliable enough for consistent communications. The US Department of Commerce was anxious to remedy this situation, proposing a nationwide network of radio beacons and ground/air speech facilities. Contracts were let to several noted radio and electrical firms for the supply of the necessary transmitters and receivers. General Electric (America) made the ground-based transmitters, Aircraft Radio Corp. the airborne equipment, and what was then a minor radio manufacturer was asked to develop a ground-based receiver; the National Company of New Malden, Mass.

The director of the project for National was James Millen, a licensed ham whose callsign was originally 2BYP, later changed to W1HRX. The first result was a receiver known as the AGS (Aviation Ground Station), this being a fairly simple superhet employing plug-in coils. Many of the airlines adopted the AGS, but others felt that something more sophisticated was called for. Transcontinental & Western Airlines engaged Herbert Hoover jnr., W6ZH (some-time president of the ARRL), to work in conjunction with Jim Millen on a "State of the Art" receiver.

Hoover set up a small laboratory directed by Howard Morgan of the Western Electric Co, in which the purely electrical design of the new receiver was to be carried out, whilst the mechanical work was in the hands of Millen, three thousand miles away on the East Coast. This involved much overtime on the part of toolmakers working on the various dies and jigs used to build the chassis, screening cans, and other metal components. These men had to complete time sheets for the work they put in, the forms normally being allocated a serial number or letters to indicate what particular job was involved. No official serial having been given to the new receiver, the workmen created one of their own; because the job had to be carried out at top speed they called it HOR, for "hell of a rush".

The initials stuck, and it was as the HOR that Millen took the completed prototype chassis to Hoover's laboratory for the wiring job and subsequent testing. Naturally enough there were a few unexpected snags that had to be corrected, but all in all the set was a great success. Arrangements were made to announce it in the December 1934 issue of the magazine *QST*. Just in time someone realised that the letters HOR might be susceptible to another interpretation (or pronunciation!) and they were reshuffled to make HRO.

So there you have it. I can only say that if it isn't true it ought to be, recalling the words of a famous editor who once said, "if the legend outstrips the truth, print the legend!"

(With grateful thanks to Ray Williams of Hitchin who made the above possible.)

PW REVIEW

TRIO TH-21E 144MHz f.m. Transceiver

There can be little doubt that in most "amateur" populated parts of the world the 144MHz band has become a focal point of operations, accommodating both serious in-band communications and "talk-back" functions for higher frequencies. The later part of 1984 saw the arrival of many different handheld portable transceivers amongst which the Trio TH-21E is without doubt the most compact.

When considering the purchase of a portable transceiver several questions have to be answered—do you need multimode options—will you be operating for extended periods—are scanning facilities/multi-channel memories essential and perhaps of more basic consideration is the size/weight important? If, after careful consideration, the choice has been narrowed down to exclude the portable "base station/mobile" options and a true lightweight "handheld" remains then the TH-21E will be hard to better.

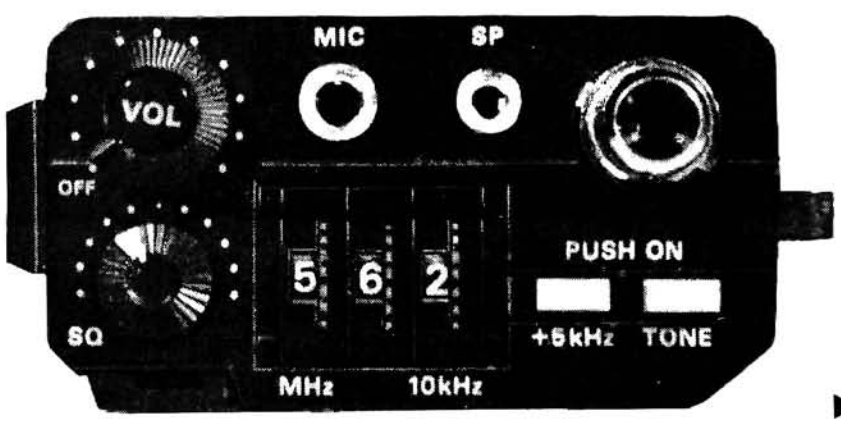
Weighing in at 280g, including the supplied rubber clad flexible antenna and Nicad pack, the transceiver's overall external dimensions amount to 128 × 66 × 32mm—allowing it to slide into a top pocket, handbag, or vanish into the depths of a rucksack. Such diminutive proportions do not however dictate any sacrifice in r.f. performance, which remains typical of the traditional "full size" Trio equipment, even though the active elements of the rig actually occupy less than half of the overall volume! (The US version comes fitted with a full DTMF key pad).

Design emphasis has obviously been centred on a straightforward "no frills" operation technique. Top deck controls feature serrated-face volume and squelch knobs (these can also be operated with the finger tip), three section thumbwheel/+5kHz (latching pushbutton) synthesiser frequency programming, together with selectable auto toneburst, external microphone/speaker sockets and screw locked "phono" type antenna socket. A BNC adaptor is available as an optional accessory. Amongst these features the thumbwheels are the least accessible, but no more so than other switches of this format—again a finger tip/nail operation. The MHz switch inhibits all functions when indicating out of band.

Rear apron controls consists of two miniature toggle switches to enable simplex, normal and reverse repeater operation and HI (1W) or LO (150mW) output power levels. The only other control is the side mounted p.t.t. pressel—a forward facing red l.e.d confirms TX status. I strongly suspect that a sizeable proportion of people using handheld "talking brick" transceivers probably confine their portable operations to the local repeater or a nominated simplex frequency. This said, the fact that a short course in computing science, fast becoming mandatory to fully realise the potential of some of the multi-MPU equipment, is not needed. This is not to decry the efforts of the designers of such equipment, but the *essential* aspect of hand portable equipment must be simplicity of operation in all operating conditions, ideally without frequent study of the "operating/programming manual"—end of moans!

In operation the TH-21E will be found to have a more than adequate receiver performance, featuring a conventional double superhet arrangement using 16·3MHz and 455kHz i.f.s. The first r.f. stage is formed by a 2SC2671 bi-polar device with a subsequent r.f. stage feeding, via band-pass filtering, into an f.e.t. mixer. Ceramic i.f. filtering centred on 16·3MHz follows the mixer and feeds an MC3359P i.f. amplifier/demodulator. The resulting audio is amplified up to approximately 250mW to feed the internal 8Ω speaker.

Reproduced audio was found to be both clear and of sufficient level for most locations, the squelch action being particularly positive. As an optional extra, a matching headset/boom mic combination, which includes VOX

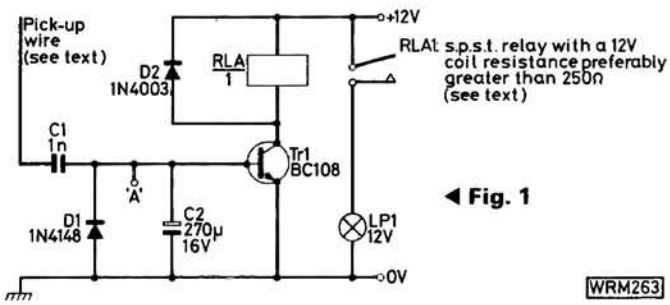


On the Air Indicator

From an idea by Chris Loftus G6AFJ

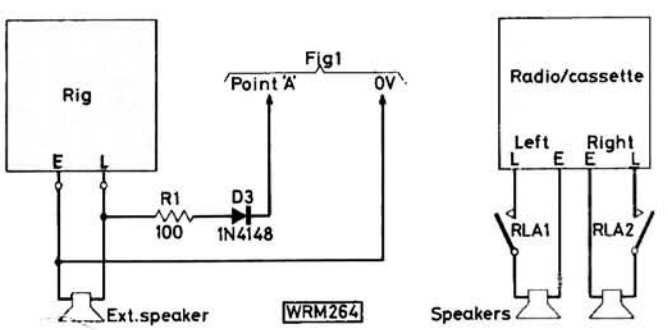
Having been interrupted from time to time by members of the family bursting into the shack or shouting to me oblivious of a QSO in progress, I decided that some sort of transmission indicator would help to solve the problem.

The circuit shown in Fig. 1 is a simple r.f.-actuated switch which will respond to any strong field in the region of the pick-up wire. The length of the wire will depend on how much coupling is needed, but a 250mm length wrapped around the outside of the coaxial cable feeding the antenna should suffice for most power levels. If only one band is used, the wire can be made a resonant length—495mm for 144MHz band operation, for example. The indicator lamp can be a red light fixed above the shack entrance, or whatever suits the constructor's own situation.



◀ **Fig. 1**

▼ **Fig. 2**



When r.f. energy is picked up by the device, diode D1 will conduct on the negative half-cycles, but will be cut off on the positive half-cycles. The result will be a net positive voltage at the base of transistor Tr1, forward biasing it into conduction. On s.s.b. and c.w. transmissions, where the transmission is not continuous, that bias would be constantly varying and the relay RLA would chatter if it were not for capacitor C2, which holds the bias voltage steady until a long gap in transmissions occurs.

The relay can be any small 12 volt coil type, though the higher the coil resistance the better. This is more important for the real rag-chewer, who would otherwise find transistor Tr1 running rather hot. Diode D2 protects the transistor by dissipating the inductive backswing voltage which is generated by the relay coil each time the circuit switches off.

There are several other uses for an r.f.-actuated switch. A useful idea for mobile operators who like to have music on-the-move whilst keeping an ear open for calls on the bands, is an automatic muting device. A simple addition to the circuit of Fig. 1 will give a unit which shuts off the sound from the loudspeaker(s) of your radio or cassette player whenever you transmit (so keeping you "Legal", see your Licence conditions), or whenever a signal is received on your mobile transceiver. The extra circuitry and the connections to other units are shown in Fig. 2.

There are two ways of getting a "signal being received" or "busy" indication from your rig. The best way is to tap into the squelch line, but this does involve getting inside the rig and possibly adding a d.c. amplifier or a polarity inverter to produce an output capable of operating Tr1 in Fig. 1. The circuit of Fig. 2 shows the simple way out, which only needs a tapping off the feed to your rig's external loudspeaker. You do use an external 'speaker, don't you? A proper "communications" type designed to give clear punchy speech signals and fixed to the door-pillar just behind your ear—it certainly makes mobile operating a lot easier.

Diode D3 rectifies the rig audio output to produce a positive voltage across C2 and also blocks that d.c. from being fed back into the rig's speaker circuit. Resistor R1 reduces the loading effect of the rectifier circuitry.

If your radio/cassette is a stereo one, you'll need to use a double pole relay for RLA, with the contacts connected up as shown in Fig. 2. The transmit indicator lamp is no longer required, of course.

No layout is shown for the unit. It is so simple that it can easily be put together on a piece of Veroboard or perforated board, or even on a tagstrip, housed in a small plastics box. For the mobile muting version, it's probably a good idea to add an on/off switch and a fuse (around 1 amp) in the +12V supply line from the car electrical system. ●

operation, is available. The quoted sensitivity (under 0·25µV for 12dB SINAD) and selectivity (6dB at 12kHz/40dB at 28kHz) were easily obtained on the review sample with good audio reports received when using the internal electret microphone.

Whilst the TH-21E comes complete with the PB-21 7·2V 180 mAh Ni-Cad pack and mains charger, there will be obvious limits to the duration of transmissions. If frequent sustained overs at the high power level are envisaged the availability of a spare AAA pack would be well worth the extra investment—replacement takes less than 30 seconds with the transverse slidelock offering positive location.

For those who prefer higher frequency operations Trio also produce the matching TH-41E which provides identical facilities over the range 430–440MHz. I have not had the chance to fully evaluate the TH-41E in the lab, but it certainly performed well, when I finally prised one out of the hands of G8GIY, during his visit to the *PW* offices here in Poole.

Thanks for the loan of the review sample TH-21E go to **Lowe Electronics, Chesterfield Road, Matlock, Derbyshire DE4 5LE or Tel: 0629 2817**. The current price of the 144MHz transceiver, including Nicad pack and charger is £186.48 inc. VAT and carriage. *John M. Fell*

Radio Wave

Part 4 by F. C. Judd G2BCX

There are several aspects of so-called sky-wave propagation that offer considerable interest from the point of view of amateur radio operating in general. Recognition and appraisal of unusual effects can often help to explain certain inconsistencies in ionospheric propagation, the results of which are all too often blamed on one's transmitter, receiver or antenna.

Lowest Usable Frequency

The previous article dealt with m.u.f. (maximum usable frequency) and its relationship to the critical frequency for given times of the day during winter and summer seasons. If the frequency of operation is decreased **below** the m.u.f., the signal level of transmissions at a distance receiving point will also decrease owing to greater absorption of the wave and with a still further decrease in frequency a point is reached where signals will disappear into the general noise level. There is however, a lower frequency limit, below the m.u.f., known as the **lowest usable frequency** (l.u.f.) and which, if ionospheric conditions are favourable, will still allow propagation over considerable distances. The transmitted power may need to be higher than usual, perhaps even higher than allowed by the amateur radio licence.

When the frequency in use is nearer the m.u.f., or not more than about 15 per cent below it, variations in ionospheric conditions generally are not quite so critical. Frequencies a little lower than the m.u.f. are usually referred to as **optimum working frequencies** or o.w.f. Radio amateurs are of course confined to specific bands so it may not alway be possible to choose a suitable m.u.f. or o.w.f. Optimum working frequency is sometimes called f.o.t. or **frequence optimum de travail.**

Electron Concentration of Layers

In Part 1 we dealt with the general characteristics of the three main ionospheric layers, i.e. D, E and F, the formation of which are due to the combination of a mixture of gases in the atmosphere and the various ionising radiations from the sun. The D layer, or region, forms at heights between 60 and 90km and because of the low altitude the gas density is high and recombination between electrons and positive ions becomes very rapid as soon as the sun sets. The result is that the D region forms only during daylight hours and because the electron concentration is not high the layer does not reflect radio waves in the medium and high frequency band. On the other hand a strongly ionised D region will absorb upward travelling high frequency waves.

The E layer, at heights between 100 and 125km, largely disappears at night, although not completely and it is this layer that reflects medium frequency waves when the D region absorption ceases at nightfall.

In the remaining region, or F layer, which varies in height between 200 and 400km depending on time of day and season, the electron concentration decreases at night but still remains high enough for the propagation of high frequency waves. The electron concentration in each of the layers, D, E and F, is subject to day and night changes as shown in Fig. 4.1. Electron concentration also changes with the seasons of the year and with the so-called eleven year cycle.

The Eleven Year Sunspot Cycle

The usually quoted period of eleven years between the peaks of sunspot activity is average because it may in fact vary a year or so either way. What is known as the smoothed sunspot number (s.s.n.) may also vary with the peaks. For example, in 1968 the count was not much over 100 but by contrast the 1957-58 peak produced a smoothed sunspot number of well over 200 and at the time this was the highest ever recorded. During this period there were occasions when the F region m.u.f. reached the v.h.f. part of the radio frequency spectrum, see Fig. 4.2.

Sunspot numbers are not those actually counted. The figure quoted is a "weighted number" which takes various other factors into account, including the number of groups of sunspots. From this a smoothed sunspot number is obtained and used as an index of solar activity. It is during

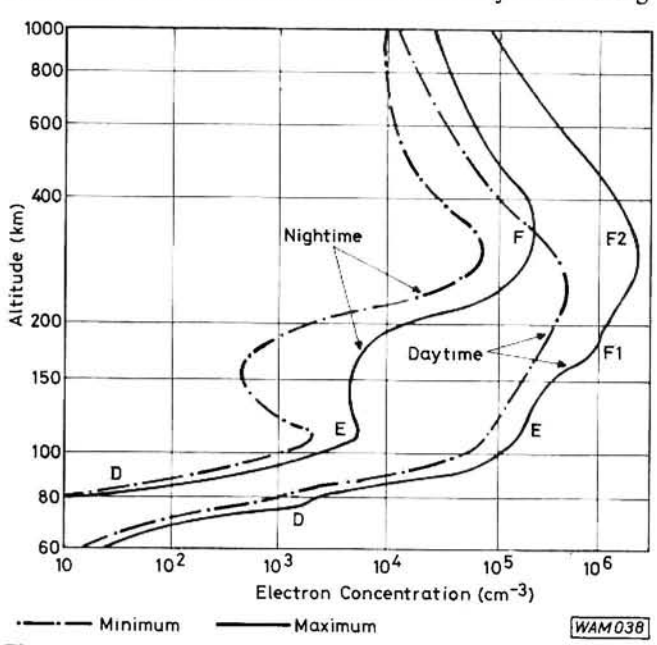


Fig. 4.1: Maximum and minimum electron concentrations versus altitude for D, E, F1 and F2 regions (see text)

Courtesy of Airforce Cambridge Systems Laboratory, USA

Propagation

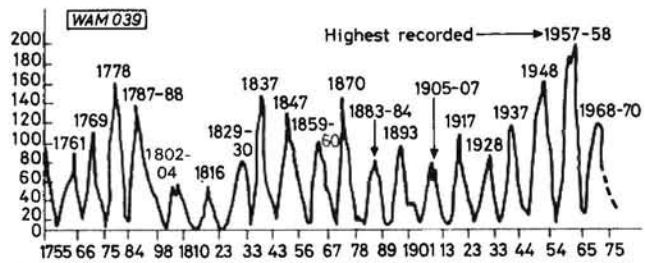


Fig. 4.2: Relative sunspot numbers and "11 year cycle peaks" for the years 1775 to 1975. Note highest peak ever recorded 1957–58

the peak period of the eleven year cycle that the 28MHz amateur radio band frequently becomes open for DX working to virtually anywhere in the world. There is another index used for predictions and this is the 10·7cm solar noise flux which is, or has been, considered a more accurate measure of solar activity. However, since the two indices are closely correlated either may be used.

Trans-equatorial Openings

There is a period of a year or so around the eleven year sunspot minimum when the F layer m.u.f. does not reach 28MHz in temperate latitudes and which mainly affects East-West propagation. However, trans-equatorial (North-South) openings are frequently possible even when the sunspot counts are less than 5. There is also a small but fairly regular variation in sunspot activity over a period of 27 to 28 days, the time taken for the sun to make a single axial rotation. This results in a rise and fall in m.u.f. causing changes in propagation conditions from about 14 to 28MHz.

Ionospheric Storms

Ionospheric storms are due to disturbances in the ionosphere co-incident with eruptions on the surface of the sun which are usually accompanied by disturbances in the earth's magnetic field known as magnetic storms. These storms occur most frequently during a sunspot cycle peak and can have undesirable effects on radio wave propagation, such as a reduction in the F region critical frequencies and an increase in absorption of waves within the D region. The m.u.f. is reduced and the l.u.f. is increased, resulting in a narrower usable frequency spectrum. Significant indications of ionospheric storms are "radio blackouts" in the h.f. bands. Such storms may last for as little as a day, or continue for several days and vary in intensity as well. There is also a tendency for ionospheric storms to occur every 28 days (rotation time of the sun) as they usually coincide with a group of sunspots at a fixed position on the surface of the sun. Ionospheric storms can last for several days.

Sudden Ionospheric Disturbances

There are times when h.f. communications may be disrupted quite suddenly by the event of solar flares from which the levels of radiation (ultra violets and X-rays) are high enough to cause a marked increase in D region ionisation. Signals in the higher frequency bands may suddenly disappear completely but return in minutes, or even hours later. Solar flares are often followed by ionospheric storms which may begin sometime after the event of the solar flare itself, often as much as 36 hours later, bringing about conditions similar to those already described for ionospheric storms.

Complex Ionograms

Whilst on the subject of particular ionospheric features, we can take a look at some real ionograms which serve to illustrate other aspects of ionospheric propagation. These are as follows and as shown in Fig. 4.3.

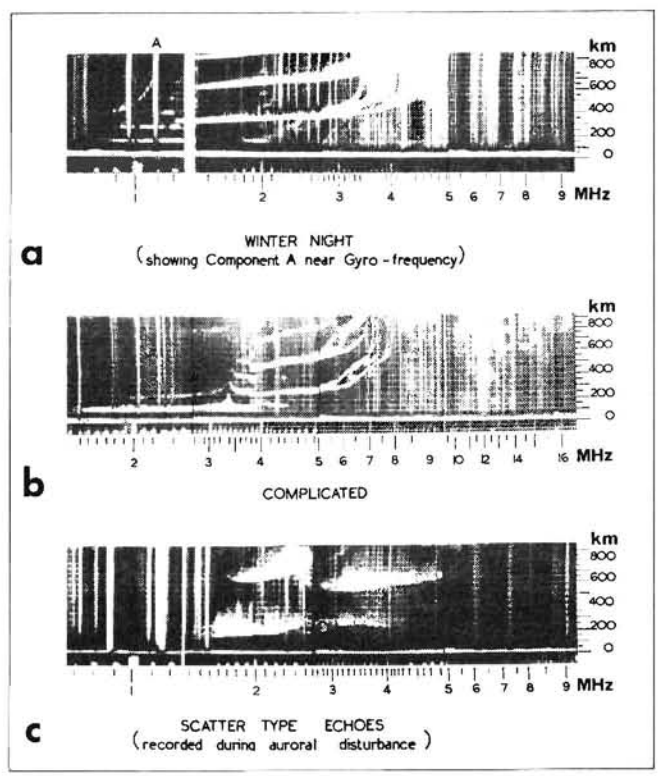


Fig. 4.3: Ionograms showing other aspects of ionospheric sounding as explained in text

Photographic recordings and explanations in text by courtesy of the Rutherford Appleton Laboratory, Chilton, Oxfordshire

a) The extraordinary component is heavily absorbed and retarded around the "gyro" frequency and is rarely seen at the Slough Ionospheric Observatory below 1·6MHz. Here it is present at between 0·8 and 1·1MHz on a night-time ionogram when both absorption and interference are extremely low. The frequency spread of the echoes from the F layer is often recorded during a winter night.
b) The complex pattern above 6MHz is produced by tilts in the electronic density contours giving rise to off-vertical returns.
c) During a severe magnetic storm the auroral ionosphere moves toward the equator. The echo traces become spread and complex with a combination of vertical and oblique returns. Auroral type sporadic-E is present from 100 to 400km although overhead F layer is penetrated at 2·5MHz, with oblique reflections continuing up to 5MHz.

Note, the gyro frequency is the frequency of rotation of the electrons about the direction of the earth's magnetic field in the ionosphere. It is directly proportional to the magnitude of the field and for the Slough Ionospheric Observatory the value is 1·2MHz. The separation of the critical frequencies of the ordinary and extraordinary components is half the gyro frequency.

Glossary

Ionospheric Layer Height: The reflected frequency is proportional to the square root of the electron density ($f_{oc}\sqrt{N}$). As the electron density increases with height (up to a maximum) and varies with the time of day, from day to day and seasons of the year, recorded echo heights will vary. The whole layer moves up at night and the thickness varies, often from hour to hour. A pulsed radio wave transmitted vertically will be reflected from the height at which the electron density N satisfies the $f_{oc}\sqrt{N}$ relationship. The electron density increases with height up to a maximum and then decreases at a slower rate.

Fading (of echoes): During ionospheric sounding, echoes will often fade completely and return with great rapidity. This is due to movement of irregularities in the ionosphere. Weak echoes result from absorption either in the D region, or in the vicinity of the height of maximum electron concentration in the F layer. Lower electron density produces a low critical frequency but not weak echoes.

The F layer is a total reflector up to the critical frequency. It moves bodily but there are no holes in the layer although areas of reduced electron density occur at high latitudes. From time to time a solar flare will produce a large increase in the electron density of the D layer which would totally absorb radio waves and therefore, prevent them from reaching either the E or F layer.

A sporadic-E layer can be a partial reflector, i.e. waves can penetrate the layer and then be reflected back to earth from the F layer. Observations therefore, sometimes reveal Es echoes from 100km and F region echoes from heights determined by the electron density in that region.

Layer Thickness: The F layer has a thickness of around 100 to 200km but this varies with time of day, or from day to day and with the seasons of the year. Sporadic-E clouds and normal E layer both have a thickness of the order of 1 to 2km and form at a height of 100km.

Effect of Earth Weather Conditions: So far as is known normal earth weather conditions do not affect the behaviour of the ionospheric layers although some investigators have claimed that certain ionospheric conditions coincide with particular kinds of weather.

Scatter Propagation: There are several forms of scatter propagation which include back-scatter and side-scatter, troposheric and ionospheric scatter and trans-equatorial scatter. Tropospheric and trans-equatorial scatter are considered to be forward scatter propagation. However, these forms of propagation may require higher than normal transmitting power, are not reliable and hardly worth considering for normal amateur radio DX working. Signals propagated by scatter are usually very weak and may flutter rapidly.

One Way Skip: With DX communication on the h.f. bands via the ionosphere, it sometimes happens that the path is not reciprocal as is usually the case. The reason for this is thought to be due to one or other of the following. Tilting of the ionospheric layer, different m.u.f. conditions at each end of the path, the presence of E layer, or sporadic-E at one end of the path and not at the other, or high D region absorption at either end of the path. One way skip generally occurs when one end of the path is in darkness and the other is in daylight. In other words you may hear a choice DX station at 5/9+ but he doesn't hear you, or vice versa.

Polarisation: Owing to the nature of refraction in the ionosphere the polarisation of a reflected wave is often changed from what it was on leaving the transmitting antenna. It is not generally considered necessary to use a common mode of polarisation, e.g. either horizontal or vertical, although horizontal polarisation is more commonly used for amateur radio communications. Horizontal antennas for 3·5 and 7MHz even at relatively low heights above ground will normally produce better and more reliable communication at distances up to 800km or more, when ionospheric conditions are at their best for these bands, i.e. when the critical frequency is above 3·8 or 7·1MHz respectively. Ionospheric radio wave propagation from low height antennas for the 1·8, 3·5 and 7MHz amateur bands will be dealt with in Part 5 of this series.

'85 SPRING

computing in radio

contents

comment

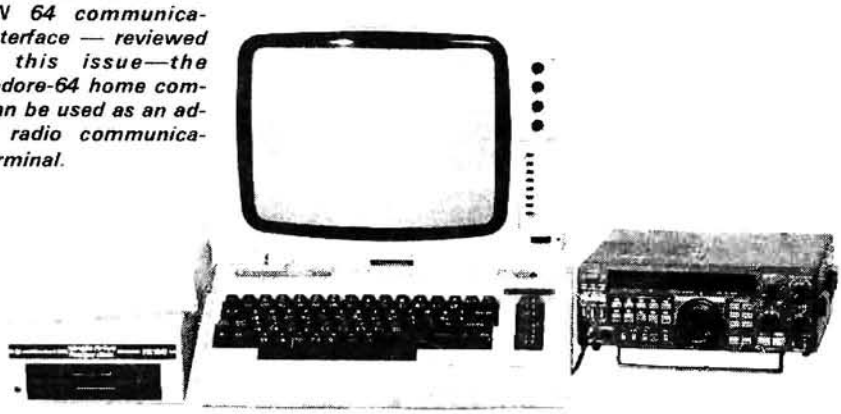
In this issue of *CiR* you will find several interesting items. The Transmission Line program suite for the Dragon-32 will enable you to calculate the parameters of a variety of transmission line configurations from conventional round coaxial cables to strip lines and trough lines. Although written for the Dragon-32 computer the suite will be available on cassette for both the Dragon-32 and the BBC–B. The full listing is too long to print in these pages so only the GOSUB routines, title page and the program dealing with round coaxial cable are printed. You can obtain a full listing for either machine by sending £1 to the editorial offices. Don't forget to state which machine you have.

From the beginning of this year the powers-that-be in the contest world have been insisting on the use of the new Universal Locator System instead of the previous QTH Locator System. To enable you to calculate your new UL with the least hassle we are listing a program, specially written for the BBC–B micro-computer. This program will calculate your UL from your Latitude and Longitude—for any position on the earth— and will also calculate the distance and contest score for any other UL being worked—also for anywhere in the world.

Both the Transmission Line and the Universal Locator programs can be easily translated to run on other machines as no machine code is involved. Why not try it for yourself?

G8VFH

With the addition of the COM-IN 64 communications interface — reviewed inside this issue—the Commodore-64 home computer can be used as an advanced radio communications terminal.



products

RTTY systems

If you have either a ZX81 or a Spectrum computer and are interested in RTTY then Morsen Electronics can supply your hardware and software needs from their range.

The hardware comprises a terminal unit and an interface unit, the latter being different for the ZX81 or Spectrum. The t.u. is a single board which carries the tone decoder—a 4 stage active filter design, the a.f.s.k. generator and the regulated power supplies and mains transformer. The t.u. is the same for both ZX81 or Spectrum and can be supplied ready built and tested, as a complete kit of parts or just the p.c.b. and instructions.

The interfaces are also available in the same form as the t.u. to suit your needs. The Spectrum version uses a single-sided p.c.b. which fits into a plastics box and plugs directly into the userport at the rear of the Spectrum. The ZX81 interface is more complex and uses a double-sided board which holds the USART, EPROM and associated components including the variable baudrate oscillator. The board can also take the Z80PIO and a 555 sidetone oscillator for use with the G4IDE c.w. EPROM. This board is intended to be fitted into the same case as the t.u. and is connected to the ZX81 by a ribbon cable which Morsen can supply.

The software is taken care of by the G4IDE RITTY series of programs written by Roger Barker, G4IDE. The programs for the

ZX81—RITTY-2 and 3 are supplied in EPROM form with your callsign programmed into the CQ call routine. Both have full transmit and receive capability but RITTY-3 is more advanced than RITTY-2 with 26 programmable stores plus 2 pre-programmed stores. It also uses a split screen, type ahead and can output to a ZX Printer.

RITTY-4 and 6 are for the Spectrum and are supplied on cassette. They can be written onto Microdrives. RITTY-4 is for the 16K version and is similar to RITTY-3 in facilities. RITTY-6 is for the 48K machine, or Spectrum+, and has a real-time clock which can be transmitted as required. It can capture the callsign of the station being worked and has a review facility. All received text is held in a circulating 40 screen buffer and any screen can be displayed and output onto the ZX Printer while in receive mode.

Further details and prices are available from **Morsen Electronics, 1 Crunden Road, Eastbourne, BN20 8LW. Tel: 0323 22295.**

books

PROGRAMMING LANGUAGES FOR MICROS
by Garry Marshall
Published by Newnes Technical Books
136 pages, 216 × 136mm. Price £5.95
ISBN 0 408 01185 8

This book deals with the common programming languages that are available for microcomputers—BASIC, PASCAL, LISP, COBOL, FORTH, COMAL, FORTRAN, PILOT, C as well as some more specialised ones such as PROLOG and LOGO.

SOME USEFUL BASIC SUBROUTINES
by Ian R. Sinclair
Published by Newnes Technical Books
96 pages, 216 × 138mm. Price £4.95
ISBN 0 408 01163 7

A collection of program listings of useful BASIC subroutines including flashing a title, printing in columns, box display, walking title, underlining, sorting etc.

Although most of the subroutines are usable on most machines or are annotated so that you can adapt them for your own machine, a few examples have been included of routines which are intended to overcome limitations or take advantage of features of particular machines.

All the subroutines are annotated with respect to local and global variable so that they can be adopted as procedures for the BBC Microcomputer.

INTRODUCING Z-80 ASSEMBLY LANGUAGE PROGRAMMING
by Ian R. Sinclair
Published by Newnes Technical Books
144 pages, 216 × 135mm. Price £5.50
ISBN 0 408 01338 9

This book has been written for newcomers to assembly language programming. The reader is likely to have some experience in programming in BASIC, but will have come to realise its shortcomings, many of which can be overcome by use of assembly language.

Practical methods of designing and entering code are emphasised rather than detailed study of each command, and the interaction between machine code and hardware is stressed.

The book should be of interest to all users of Z-80 based micros, including the ZX81, ZX Spectrum, TRS80, Video Genie etc.

QUESTIONS AND ANSWERS ON BASIC PROGRAMMING
by Peter Lafferty
Published by Newnes Technical Books
112 pages, 165 × 111mm. Price £2.50
ISBN 0 408 01300 1

Using the easy-to-follow "Q & A" format, this book describes how to program a computer using the most popular and widely used computer language, BASIC.

A simple version of BASIC is described which should be applicable to all commonly available microcomputers. More advanced features of the language are treated briefly with advice on how to learn more.

Many program examples, including educational and games programs, are given to bring the subject alive.

Transmission Lines: Dragon-32

by D. R. Coomber G8UYZ

The program consists of several blocks: the most often used sub-routines at the front deal with the screen layout and message support, as well as cleaning up before the next page.

Pages are identified, but if you type in the program in one go, and it took me 5 hours when my backup tape failed, test each routine before going forward. The GOSUB suite will only confuse you because it is used so often—be warned!!

The first page seen on the screen is the MENU and selection of the appropriate routine, lines 510-575. After a test for validity of a numeric input, (F), the required sub-routine is then called. The screen is cleared, the headings and page numbers written, and input details requested. The various calculations are performed, and the opportunity to repeat, (Y), or return to menu (N), given.

In all cases, the setting of the Dielectric Constant (K) is possible, and the ROUND COAX subroutine gives the Velocity Propagation Constant as well as capacitance and, of course, the impedance. Other sub-routines provide impedance. The DIY COAX routine, which enables the calculation of the "missing" variable for round coaxial cable, has not been linked back, since the program has been written so that local variations or requirements may be met.

A full listing is available from the Editorial Offices price £1 inclusive. The program will be available for both Dragon-32 and BBC-B in cassette format—details will be published shortly.

The routines listed have lots of REMs to show what is where, and it is strongly recommended that they be included by all but the most experienced hacker.

The formulae are as up to date as the author can find, and in this regard, acknowledgement is due to G6AXO, G4TXN, G4FUN, G6JP, W6SAI, G2JT, as well as various locals.

```
10 GOTO 290
20 ' AMATEUR UTILITY PROGRAM,G8UYZ
30 ' COAXIAL TRANSMISSION LINFS
40 ' COPYRIGHT 1985 IPC MAGAZINES LTD
50 ' GOSUB SUITE
60 ' DELAY
70 FOR I=1 TO 1000: NEXT
80 FOR I=1 TO 500: NEXT
90 RETURN
100 ' SPACEBAR
110 A$=INKEY$:IF A$="  THEN 110
120 IF A$=CHR$(32) THEN RETURN ELSE 110
130 ' ANYKEY
140 Q$=INKEY$:IF Q$="" THEN 140 ELSE RET
URN
150 ' PAGES
160 FOR L=96 TO 127:PRINT@L,"=":NEXT
170 FOR L-384 TO 415:PRINT@L,'- :NEXT
180 RETURN
190 ' LINEWIPE
200 FOR L=128 TO 383:PRINT@L,  ";:NEXT:R
ETURN:REM TEXTWIPE
210 ' ENTRY LINK
220 FOR L=416 TO 510:PRINT@L,' '; NEXT:R
ETURN:REM LINEWIPE
230 ' CLEANUP TEST FOR NUMERIC INPUT
240 F=VAL(K$):IF F<1 OR F>19 THEN  30 EL
SE RETURN
250 N=S/D.M=276/SQR(K):J=(N+(SQR(N^2)-1)
):J2=LOG(J)*0.4343
270 ' ***************.......
280 C[illegible] PR.NT@128,          T          HOLD
ING PAGE,":STOP
290 CLS:GOSUB 150.PRINT@1,'TRANSMISSION
LINE SUITE.":PRINT@28, (01)':PRINT@65, M
ENU
300 PRINT@128. CIRCULAR COAX      (1)"
310 PRINT@160,"INFINITE PLANE     (2)"
320 PRINT@192,"SLAB LINES         (3)'
330 PRINT@224, TWIN WIRES         (4)'
340 PRINT@256, RECTANGULAR TROUGH (5)'
350 PRINT@288. SQUARE COAX        (6)'
360 PRINT@320, 'RECTANGULAR LINE  (7)"
370 PRINT@352, D.I.Y. COAX        (8)"
380 PRINT@495, PLEASE SELE T.   , GOSUB 1
30
390 F=VAL(Q$)
400 ON F GOTO 420,770,950,1140,1330,1560
.1760,2000
410 ' ##########################
420 ' ROUND COAX
430 CLS:GOSUB 150:PRINT@1,"TRANSMISSION
LINES':PRINT@28,"(1)":PRINT@64,"CIRCULAR
 COAX.
440 PRINT@128,'THE 3 PARAMETERS ARE:-":P
RINT@193,'OUTER DIAMETER' PRINT@225,"INN
ER DIAMETER':PRINT@257, DIELECTRIC CONST
ANT, K":PRINT@352, PLEASE INPUT WHEN ASK
ED."
450 PRINT@480, PRESS ANY KEY.  ';:GOSUB
130
470 CLS:GOSUB 150:PRINT@1. TRANSMISSION
LINES":PRINT@28, (2)":PRINT@64,''CIRCULA
R COAX.
490 PRINT@160, IS THE DIELECTRIC AIR ??"
:PRINT@320,"PLEASE TYPE (Y) OR (N)"
500 PRINT@495, PLEASE SELECT..";:GOSUB 1
30
510 IF Q$= Y  THEN K$-'1":GOTO 540
520 IF Q$="N" THEN 530 ELSE 500
530 GOSUB 190.PRINT@160, ENTER DIELECTRI
C CONSTANT, K":PRINT@192,'K=";:INPUTK$:G
OSUB 240
540 CLS:GOSUB 150.PRINT@1,'TRANSMISSION
LINES :PRINT@28,'(3)":PRINT@64,"CIRCULAR
 COAX :F-VAL(K$)
550 PRINT@142,"K=";F
560 PRINT@160,'OUTER DIAMETER";:INPUT DL
570 PRINT@192, INNER DIAMETER'.:INPUT DS
580 IF DS DL OR DS>DL THEN PRINT@224,"IM
POSSIBLE ??':PRINT@288,"PRESS ANY KEY TO
 CONTINUE.":GOSUB 130:GOTO 590
590 Z-(60/SQR(F))*(LOG(DL/DS))
600 PRINT@224, IMPEDANCE =';INT(Z+0.5);"
 OHMS.'
610 PI=4*ARN(1 0)
620 RJ=0.4343*(LOG(DL DS))
640 K=VAL(K$)
650 C=24.137*K/RJ
670 PRINT@256,'CAPACITY =";INT(C+0.5);"P
F PER METRE
680 V=INT(100  QR(K))
690 PRINT@288, VELOCITY PROPAGATION CONS
TANT =';V;' % LIGHT.
700 GOSUB 220:PRINT@416, ANOTHER ?:(Y) O
R (N)":PRINT@495,'PLEASE SELECT..";:GOSU
B 130
710 IF Q$='Y' THEN 470
720 IF Q$-"N' THEN 290
730 GOTO 700
```

Feature

Universal Locator and Contest Scoring Program for the BBC-B

By M. J. Richards G4WNC

This program, written for the BBC-B in BBC BASIC, enables you to calculate your Universal (Maidenhead) Locator directly from your latitude and longitude. This will enable you to keep up with the latest directives to use the new system for contest workings.

The program has two options—1. Calculate a Universal Locator from latitude and longitude. 2. Calculate the radial distance and points scored in a contest from the UL of the other station. As the new system is worldwide the program is arranged to deal with any position on the earth's surface. For the radial distance calculations the mean earth radius has been taken to be 6367km. Just in case the contest organisers decide to use a different mean earth radius you can opt to change the constant to whatever value is specified.

The program does not contain a section to convert from the old QTH Locator system to the Universal Locator system. The correlation of the smaller squares in the two systems is so poor that any such conversion is doomed to failure. Even using your QTH Locator to find your latitude and longitude will only give you the figures for the centre of your small square. Don't try it—get out a large OS map and do the job properly.

```
   10 REM PW UNIVERSAL LOCATOR/CONTEST SCORE
   15 REM COPYRIGHT 1985 IPC MAGAZINES LTD
   20 DEF FNA(A)=ASC(MID$(MH$,A,1))
   30 MODE1
   40 DIM L$(6):NS$="":EW$=""
   50 GOSUB10000
   60 GOSUB12000
   70 ON (K-48)GOTO6000,1000
 1000 REM CONTEST SCORING
 1010 MH$="":AF=0:TS=0:S=0
 1020 GOSUB13000:REM TITLE
 1030 PRINT:PRINT:PRINT
 1040 INPUT"Enter your OWN STATION LOCATOR ";MH$
 1045 IF MH$="XXXXXX"THEN60
 1050 GOSUB 4000
 1060 IF AF=1THEN 1040
 1070 GOSUB 3000
 1080 Y=RAD(A4):Z1=RAD(D4)
 1090 PRINT:PRINT
 1100 INPUT"Enter distant locator ";MH$
 1105 IF MH$="XXXXXX"THEN60
 1110 GOSUB 4000
 1120 IF AF=1THEN 1100
 1130 GOSUB 3000
 1140 X=RAD(A4):Z=Z1-(RAD(D4))
 1150 GOSUB 5000
 1160 PRINT:PRINT"Distance = ";R;" Km  Score = ";S
;" Points"
 1170 PRINT:PRINT:TS=TS+S
 1180 PRINTTAB(12)" Total score = ";TS;" Points"
 1190 GOTO1090
 3000 REM MAIDENHEAD TO LAT/LON
 3010 O1=180-((ASC(MID$(MH$,1,1))-65)*20)
 3020 O2=((ASC(MID$(MH$,5,1))-65)*5+2.5)/60
 3030 O3=(VAL(MID$(MH$,3,1))*2+O2)
 3040 IFO1>0 THEN O3=20-O3:O4=01-20+O3:GOTO3060
 3050 O4=01-O3
 3060 A1=((ASC(MID$(MH$,2,1))-74)*10)
 3070 A2=((ASC(MID$(MH$,6,1))-65)*2.5+1.25)/60
 3080 A3=(VAL(MID$(MH$,4,1))+A2)
 3090 A4=A1+A3
 3100 RETURN
 4000 REM CHECK LOCATOR
 4005 IF LEN(MH$)<>6THEN4100
 4010 IF FNA(1)>82OR FNA(1)<65THEN4100
 4030 IF FNA(2)>82OR FNA(1)<65THEN4100
 4040 IF FNA(3)>57OR FNA(3)<48THEN4100
 4050 IF FNA(4)>57OR FNA(4)<48THEN4100
 4060 IF FNA(5)>88OR FNA(5)<65THEN4100
 4070 IF FNA(6)>88OR FNA(6)<65THEN4100
 4080 AF=0:RETURN
 4100 PRINT"******* INVALID LOCATOR *******"
 4110 AF=1:RETURN
 5000 REM RANGE & SCORE
 5010 R=ER*ACS(COSX*COSY*COSZ+SINY*SINX)
 5020 S = 1+2*INT(R/50) : R=INT(R)
 5030 RETURN
 6000 REM LAT/LON TO MAIDENHEAD
 6010 ML$="":GOSUB11000
 6020 PRINT:PRINT
 6030 PRINTTAB(2)"Enter Longitude (Deg,Min,Sec,E o
r W) "
 6035 PRINT:INPUTTAB(13)" ";D,M,S,EW$
 6040 GOSUB8000:IFLF=1THEN6020
 6045 IF EW$="E" AND D>180 OR D>180 THEN PRINT:PRI
NT:PRINT"INVALID LONGITUDE..":GOTO6020
 6050 IF EW$="W"THENGOSUB7000
 6060 L$(1)=CHR$(INT(D/20)+74)
 6070 L$(3)=STR$(INT((D-(INT(D/20))*20)/2)
 6075 L$(5)=CHR$(INT((ABS(D*60-INT(D/2)*120)+M+S/6
0)/5)+65)
 6080 PRINT:PRINT
 6090 PRINTTAB(2)"Enter Latitude (Deg,Min,Sec,N or
 S)"
 6092 PRINT:INPUTTAB(13)" ";D,M,S,NS$
 6095 GOSUB8000:IFLF=1THEN6090
 6096 IF NS$="S" THEN D=90-(D+(M+(S/60))/60)
 6097 IF NS$="N" THEN D=90+(D+(M+(S/60))/60)
 6098 IF NS$="N" AND D>180 OR D=180 THEN PRINT:PRI
NT:PRINTTAB(4)"YOU CANNOT BE FURTHER NORTH THAN
                THE NORTH POLE!":PRINT:PRINT:GOTO 609
 6100 L$(2)=CHR$(INT(D/10)+65)
 6110 L$(4)=STR$(INT(D-(INT(D/10))*10))
 6120 L$(6)=CHR$(INT((M+S/60)*2/5)+65)
 6130 PRINT:PRINT
 6140 FORXX=1TO6:ML$=ML$+L$(XX):NEXT
 6150 PRINTTAB(4)"Universal (Maidenhead) Locator"
 6155 PRINT:PRINTTAB(17)ML$
 6160 PRINT:PRINT"Another (Y/N) ?";K=GET
 6170 IFK=89THEN6000
 6180 GOTO60
 7000 REM
 7010 D=-1-D:M=59-M:S=60-S
 7020 IFS<60 THEN 7040
 7030 S=0:M=M+1
 7040 IF M<60 THEN 7060
 7050 M=M-60:D=D+1
 7060 RETURN
 8000 REM LON VALIDATION
 8010 IFD<0OR D>180 THEN8100
 8020 IFM<0OR M>60 THEN8100
 8030 IFS<0OR S>60 THEN8100
 8040 IFEW$="E"OREW$="W"THEN8060
 8045 IFNS$="N"ORNS$="S"THEN8060
 8050 GOTO8100
 8060 LF=0:RETURN
 8100 PRINT:PRINT"INVALID ENTRY ":LF=1:RETURN
10000 CLS:PRINT:PRINT:PRINT:PRINT:PRINT
10005 PRINTTAB(6)"***** PRACTICAL WIRELESS *****"
10007 PRINT:PRINT:PRINT
10010 PRINTTAB(12)"UNIVERSAL  LOCATOR"
10020 PRINT:PRINT:PRINT
10030 PRINTTAB(19)"BY"
10040 PRINT:PRINT:PRINT
10050 PRINTTAB(11)"M.J.RICHARDS G4WNC"
10060 PRINT:PRINT:PRINT:PRINT
10070 PRINTTAB(5)"COPYRIGHT IPC MAGAZINES LTD 1985"
10080 PRINT:PRINT:PRINT:PRINT
10090 PRINTTAB(7)"PRESS ANY KEY TO CONTINUE"
10100 XX=GET
10110 RETURN
11000 CLS:PRINT:PRINT:PRINT
11010 PRINTTAB(8)"*** UNIVERSAL LOCATOR ***"
11020 PRINT:PRINT:
11030 PRINTTAB(4)"This program will calculate your"
11040 PRINTTAB(3)"Universal (Maidenhead) Locator f
rom"
11050 PRINTTAB(7)"your Latitude and Longitude."
11060 RETURN
12000 CLS:PRINT:PRINT:PRINT
12010 PRINTTAB(11)"*** M E N U ***"
12020 PRINT:PRINT:PRINT
12030 PRINTTAB(2)"Lat/Lon to Universal Loc .....
 1"
12040 PRINT:PRINT:PRINT
12050 PRINTTAB(2)"Contest scorer ..............
 2"
12060 PRINT:PRINT:PRINT:PRINT:PRINT
12070 PRINTTAB(5)"Please enter your option "
12080 K=GET
12090 IFk<49ORk>50THEN12080
12100 RETURN
13000 CLS:PRINT:PRINT:PRINT
13010 PRINTTAB(8)"*** CONTEST SCORING ***"
13020 PRINT:PRINT
13030 PRINTTAB(6)"This program will convert a"
13040 PRINT"       Universal Locator to radial"
13050 PRINT"          distance and points."
13060 PRINT:PRINT"The calculations use 6367km as t
he Earth Radius Constant.Do you wish to change
        this, (Y) or (N) ?"
13070 X=GET:IF X=78 THEN ER=6367:GOTO 13100
13080 IF X=89 THEN PRINT:PRINT:INPUT"Enter Earth R
adius (km)";ER:GOTO 13100
13090 IF X=32 THEN PRINTTAB(3)"Please select (Y) o
r (N).":GOTO 13070
13100 PRINT:PRINTTAB(4)"Enter XXXXXX to return to
menu."
13110 RETURN
```

FORTH for the Radio Amateur

By David Husband G8HJT

In the last article, I promised some Morse Code routines and this time I will present a Morse decoding program written in Microsoft BASIC which should be readily adaptable to work on most computers with at least one bit of I/O.

Even though the program looks simple, it has some unusual surprises, such as self-adaptive adjustment for changes in code speed. In addition, the influence of changes in dash or dot length is weighted so that they must occur five or six times in succession before the computer decides that there has been a *bona fide* speed change. As a result, an occasional "bad" character will not mess up your copy. The program also detects the end of the word and prints out a space, if required.

The program is very short—just over 1K—and is written in Microsoft BASIC, so it should work on any computer. It will follow Morse transmissions to well over 30 words per minute. Type in the program exactly as shown, even though some of the instructions may seem redundant. It is written this way to save execution time, which is very important when you are dealing with fast-acting dots and dashes.

Lines 1Ø, 2Ø, 6Ø, 11Ø and 15Ø instruct a PEEK to location 5888 (Decimal). This is a memory-mapped I/O Port address at 17ØØ hex and will need changing to suit the I/O Port in use on your machine. This location reads a total of eight input ports as an eight-bit value.

The AND 1 on lines 1Ø, 2Ø, 6Ø, 11Ø and 15Ø forces the computer to consider the state of one bit only, the line receiving the incoming Morse. Obviously, this must be changed to fit your particular system.

In addition, the program assumes that when a dot or a dash occurs, a logic Ø ap-

pears on the input port. This is in agreement with a "key-down" shorting the input port to ground, and also in agreement with the hardware interface circuit described later. If your hook-up provides a logic 1 during a dot and dash, then lines 11, 30, 70, 120 and 160 must be changed so that all IF A = 1 statements should read IF A= Ø, and vice versa.

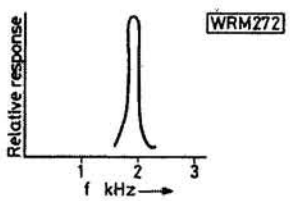
How it works

The initialisation routine (lines 1 to 6) sets the look-up table that will permit the printout of the proper character. The program then waits for a key-down to occur (lines 10 to 11). The first part of the operating program (lines 20 to 80) measures the length of time that the key is down and compares this with the stored value for the length of a dash.

If the key is raised in less than one-half of the stored dash time, the computer writes a dot into the dot register (line 30) and goes to the second part of the decoding program.

If the key remains down longer than one-half of the dash time, a dash is stored in the dash register (line 50), and the value of the dash time is updated with a one-to-four weighting (line 80). This is accomplished by multiplying the old value of the dash time by four, adding the new value, and then dividing by five. As a result, the stored value of the dash time cannot change drastically from character to character, and the copy is not susceptible to errors from erratic sending habits.

The second part of the program (lines 100 to 190) measures the length of time the key is up. If it's up less than one-half of the dash length, the program assumes that the character is not complete and no printout is provided (see lines 100 to 130). If the key is up longer, the program jumps to line 300, the print character subroutine. If the key is up longer than twice the dash length, the program assumes that a word is complete and a "space" is printed (lines 170 and 180).



The Algorithm

The heart of the program is the algorithm that counts the dots and dashes and develops a number used to look-up the actual character to be printed. In other words, each combination of dots and dashes in Morse code has a discrete number that commands a given character to be printed. This algorithm has three conditions as listed in Table 1.

Table 1

1. If the input signal is a dash
- a. Double the values in the dot and dash registers.
- b. Add 1 to the dash register (line 50).

2. If the input signal is a dot
- a. Double the values in the dot and dash registers.
- b. Add 1 to the dot register (line 30).

3. If the character is complete
- a. Double the value in the dash register.
- b. Add the dash and dot registers to obtain the look-up number.
- c. Clear the dot and dash registers.

Steps 1 and 2 keep repeating until the character is complete. When the program detects a key-up period longer than one-half of a dash length, it is assumed that the character is complete and step 3 is carried out (lines 300 to 430). The manner in which the look-up number for the letter D is formed is shown in the example.

Interface

The drawing shows a typical circuit for connecting your radio receiver to the computer. The *npn* transistor is an R-C coupled audio amplifier connected to a 567 phase-locked loop circuit. The free-running frequency of the p.l.l. is set by the values of the capacitor and resistor connected to pins 5 and 6 of the 567, and is roughly 2kHz. The capacitors on pins 1 and 2 of the p.l.l. adjust the bandwidth to about 100Hz, and the l.e.d. serves as a tuning indicator, blinking when the signal is in the centre of the narrow bandpass. The circuit is compatible with the program, as written, in that the output signal goes to a logic Ø when a dot or a dash occurs.

The computation constants in the program can be changed quite easily if you wish to experiment with different algorithms to detect whether a key-down signal is a dot or dash, or to take care of "swing-fisters". Try changing the factor in line 40 from Ø·5*C to Ø·25*C or to Ø·75*C. By the same method the constants in lines 111 and 151 can be changed to provide more leeway for the formation of characters and spaces.

73's de G8HJT

Example: D = -.. (dash dot dot)

Initial conditions: Dot register = Ø, dash register = Ø

First period: Input a dash.
2 times dash register = 2 × Ø = Ø
2 times dot register = 2 × Ø = Ø
Add 1 to dash register = 1 + Ø = 1

Summary: dash register = 1, dot register = Ø

Second period: Input a dot.
2 times dash register = 2 × 1 = 2
2 times dot register = 2 × Ø = Ø
Add 1 to dot register = 1 + Ø = 1

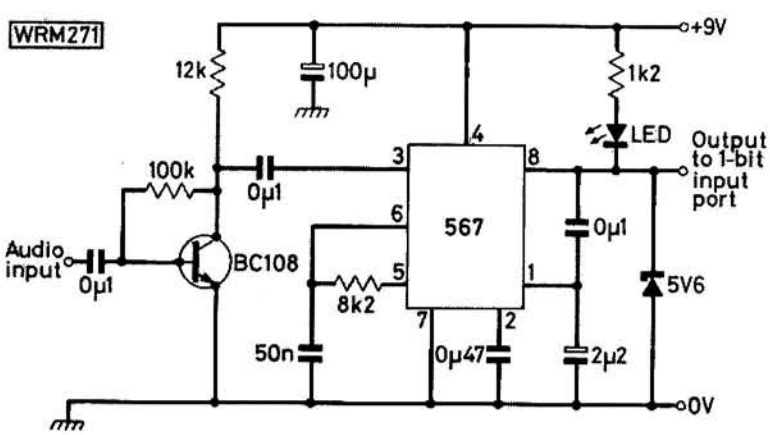
Summary: dash register = 2, dot register = 1

Third period: Input a dot.
2 times dash register = 2 × 2 = 4
2 times dot register = 2 × 1 = 2
Add 1 to dot register = 1 + 2 = 3

Summary: dash register = 4, dot register = 3

End of character—determine look-up number for "D".
2 times dash register = 2 × 4 = 8
Add dot register to dash register = 8 + 3 = 11

Answer: D = 11




```
2     RESTORE
5     DIM A$(100)
6     FOR N=1 TO 100:READ A$(N):NEXT N
10    A=PEEK(5888) AND 1
11    IF A=1 THEN 10
15    B=0
20    A=PEEK(5888) AND 1:B=B+10
30    IF A=1 THEN C=((5*C)+(2*B))/6:
      DO=2*DO:DA=2*DA:DO+1:GOTO 100
40    IF B<(.5*C) THEN 20
50    DO=2*DO:DA=2*DA:DA=DA+1
60    A=PEEK(5888) AND 1:B=B+10
70    IF A=0 THEN GOTO 60
80    C=((4*C)+B)/5
100   B=0
110   A=PEEK(5888) AND 1
111   B=B+10
120   IF A=0 THEN GOTO 15
130   IF B<(.5*C) THEN GOTO 110
140   GOSUB 300
150   A=PEEK(5888) AND 1
151   B=B+10
160   IF A=0 THEN GOTO 15
170   IF B<(2*C) THEN GOTO 150
180   PRINT " ";
190   GOTO 10
300   DA=DA*2
310   D=DA+DO
330   IF D>100 THEN D=100
340   PRINT A$(D);
400   DATA E,T,I,A,N,M,S,U,R,W,D,K,G,
      O,H,V,F,-,L,-,P,J,B,X,C
410   DATA Y,Z,Q,-,-,5,4,-,3,-,-,-,2,
      -,-,-,-,-,-,-,1,6,-,/,-
420   DATA -,-,-,-,7,-,-,-,8,-,9,0,-,
      -,-,-,-,-,-,-,-,-,-,?
430   DATA -,-,-,-,-,-,-,-,-,.,-,-,-,
      -,-,-,-,-,-,-,-,-,-,-
```

Software

Morse Decoder
CATRA Software, 3 Pedmore Close, Redditch, Worcs B98 7XB. Tel: 24759
ZX81+16K
Black and White **Cassette**

This is the first of a series of programs promised for the radio amateur. (CATRA actually stands for Computers and the Radio Amateur.) It is a Morse decoder which, it is claimed, will decode c.w. over a wide range of speeds.

The program self-runs and the first few screens give the instructions needed on how to connect the computer to the receiver and how to operate the keyboard during receive.

On a short test using a cassette recorder to provide the Morse the program worked perfectly.

SSTV System G6GCM
T. Collings G6GCM, 1 Goldsmith Drive, Newport Pagnell, Bucks MK16 8ED
BBC–B
Colour **EPROM or Disk**

This program, which is available either in an EPROM which is permanently fitted into the BBC-B ROM socket, or on a 5 inch Minidisk for sideways RAM users, is used in conjunction with the simple interface described in *CiR*, Winter 84/85. This program has been improved since we published the original one in *CiR* and it is now possible to adjust the sync. frequency from the keyboard to match the incoming signals. This makes alignment much easier.

The disk version also has some digitised pictures for demonstration purposes as well as an RTTY program.

For the details of the interface and its operation please refer to *CiR* Winter 84/85.

Morse Tutor 5
G6LTR J. L. Warner, 39 Cradock Road, Leicester LE2 1TD
Spectrum 48K, Spectrum+
Colour **Cassette**

The program is divided into six blocks designed to help you practise and learn the Morse Code. The speed of the code sent can be varied but only the inter character spacing changes to preserve the "rhythm" of each character. The normal speed is about 12 w.p.m.

One section allows you to compile a message which can then be "transmitted" either with or without visual confirmation. The first two blocks are intended for raw beginners and assumes no previous knowledge of Morse.

The main block of the program is a random test section which can be set for different block lengths ranging from a single character up to seven characters per block. The block lengths can also be random if required, simulating plain text.

The instruction sheet recommends wearing headphones and these can be plugged into the EAR socket at the rear of the computer.

CBM 64 RTTY

Technical Software have told us that they are experiencing a little bit of trouble with some Commodore 64 computers and their very successful RTTY and c.w. transceive programs.

The problem, which seems to be very much a computer problem, shows up as an inability to transmit properly. CBM are aware of the difficulties and have a machine on test which exhibits the fault. It seems that only a small percentage of CBM64s have the fault but how Commodore will get round the problem remains to be seen. Perhaps by the time this appears they will have solved it.

Meanwhile, Richard Wilmot, GW3RRI at **Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd, LL54 7RF. Tel: 0286 881886** will let you have details of his range of software for the CBM64 as well as other machines.

QUESTIONS AND ANSWERS ON MICROPROCESSORS
by Steve A. Money
Published by Newnes Technical Books
128 pages, 165 × 111mm. Price £2.50
ISBN 0 408 01211 0

This explains simply the principles of microprocessor devices and associated support chips, assuming no prior knowledge and dealing with microprocessors in terms of hardware and applications. Aimed at students and hobbyists interested in the basic principles.

AN INTRODUCTION TO PROGRAMMING THE ORIC-1
By R. A. & J. W. Penfold
Published by Bernard Babani (publishing) Ltd.
92 pages, 110 × 179mm. Price £1.95
ISBN: 0-85934-104-6

This book is for those who wish to learn more about programming and making the best use of the ORIC-1 microcomputer. Most aspects of the ORIC-1 are covered.

Starting with simple commands and programs the more complex topics such as animated graphics and sound commands are introduced and illustrated by longer and more sophisticated programs.

COM-IN 64 Communications Package

The COM-IN package for the Commodore 64 is a plug-in unit consisting of two boards joined by a length of ribbon cable. One board plugs into the memory expansion port and contains the filters, tone decoder and the program EPROM. The second board plugs into the user port and it is used to interface to the rest of the world. It is supplied with a well presented manual which has to be studied carefully before venturing to plug the unit in, or trying to make any connections to it!

Functions

It is only when you sit down to read the manual that you begin to appreciate the number of functions that this package offers you. It is obvious that a great deal of thought has gone into the software in making it flexible enough to cater for the needs of the curious amateur or listener (see list). This flexibility has its drawbacks in that the manual has a lot of explaining to do, and I'm afraid that in translating from Dutch to English, some of the essential information seems to have got lost.

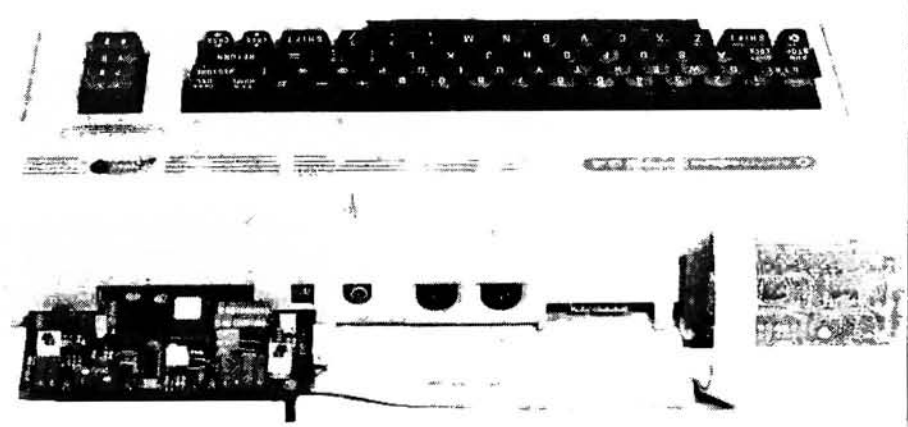
There are only four connections to make to the rig, signal in, signal out, p.t.t. and ground. I made the connections through a DIN socket so that I could swap the leads over from another unit. The signal into the unit is made through a 3mm jack plug but the p.t.t. has to be soldered to a pin on one of the p.c.b.s. There is no method of strain relieving the joint and so this will be very prone to dropping off from time to time. The signal output is a triangular wave form taken from the SID chip in the CBM64 via the DIN socket on the back. A simple resistor capacitor network has to be used to reduce the signal level and to round it off to a more acceptable sine wave, the details of which are given in the manual. It is important to note that it is very easy to make several earth loops in connecting up the rig to the computer, there are no clues in the manuals, but it can be disastrous if r.f. gets picked up in the loop so beware. Remember, if you need to break any loops, to make sure that the screens should normally be earthed at the lower impedance end i.e. at the signal source.

At last it was time to plug it in and switch on! The first problem was the fact that while going through initialisation, the p.t.t. line is held low and the transmitter is on. Remove microphone lead and try again. You are requested to enter your callsign and it then automatically detects whether or not you are using a disk drive (more of which later on). The screen splits to give a receive screen at the top, and a transmit buffer at the bottom with a multitude of information about the mode that you are in, e.g. baudrate, data type (ASCII, Baudot, Morse), time, TX tones selected, etc.

It was around now that I ventured to replace the microphone socket only to find that the p.t.t. line was still held low. After much contemplating, I traced out the p.c.b. to discover that the board was different to that described in the manual. The correct pins were found and at last it operated the p.t.t. correctly. Even if the manual had described the correct board there was not enough information on how to connect it up. Another case of designing in flexibility without the backup of good documentation. (I understand that the review unit was a prototype model.)

Filters

The first thing to do is to set up the first of two pairs of filters. The output frequency has to be plugged into the signal input socket with a specially made lead (again the details are in the manual) and by pressing the CBM key and J, any one of 15 tones is available. The relevant pot is twiddled until an l.e.d. lights to show that the next frequency is set up. The tones are also heard from the TV which is a great help when you are trying to determine the tones being used on the air. The frequencies set up were 1275Hz and 1445Hz (normal RTTY) and a station was tuned in until the two l.e.d.s flickered at their brightest and the message appeared on the screen.



The Morse was tried next but here I found that the c.w. filter was too broad. Although it is easy to tune in, if there are any other c.w. stations nearby the Morse decoder just gives rubbish. However, if a clear signal can be found, the Morse decoder works very well.

Word Processor

The purpose of the word processor in the package is to create a file on disk which can be called up at any time but which would more likely be called up when in the mailbox mode. This looks like a very nice feature — pity about the U.K. licence conditions. If an incoming message matches the script in one of the buffers, a message stored on the disk (or tape) is transmitted. and the incoming message is stored on disk (or tape) with the time of the message. The facility of loading files from disk is extended to being able to transmit programs in any of the operating modes, although I don't fancy the idea of sending a few Kbytes of program via Morse! It should also manage files written in Easyscript etc.

The only drawback to this mode of operation is that it only sends the data as a string of four-bit nibbles which have to be stored and recombined into eight-bit bytes with another program. A program for this is given in the manual, but it has to run on its own at a later time.

There is a facility to use up to 3K of your own software. Perhaps it might be possible to squeeze AMTOR in here. What a shame that it has been omitted from this package especially as on the first night that I tried Com-In, there was more AMTOR activity than RTTY on the 3·5MHz band.

SSTV

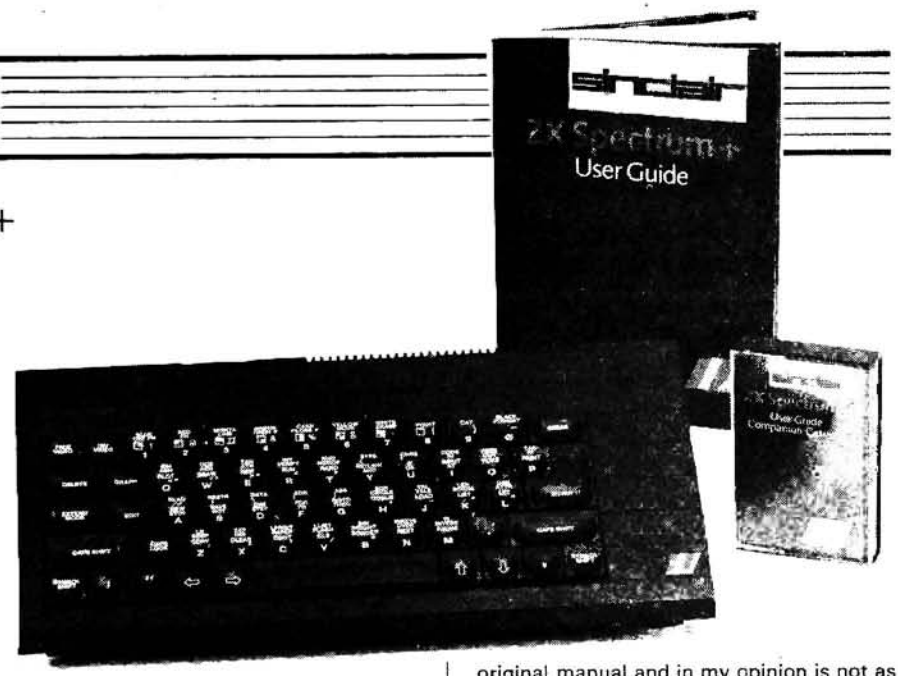
It was unfortunate that during the brief test period, I could not find any SSTV on the air, but I sent a CQ message to a cassette recorder, played it back into the COM-IN and displayed it on the screen. It appeared to work perfectly. However, I borrowed a cassette with some other SSTV signals recorded on it, but the recorded frequencies were not compatible with the COM-IN.

Had the signal come off-air, I assume that I would have been able to tune it correctly but as there is no adjustment available in this mode it is obviously not possible to use the technique of recording the signal for later decoding to avoid computer QRM. Also, in this mode, the p.t.t. line is not operated by the computer so it has to be done manually.

The COM-IN 64 costs £127 inc. VAT and postage from **Zero Electronics, Nash House, 149 King Street, Gt. Yarmouth NR30 2PQ. Tel: 0493 2023** to whom we extend our thanks for the loan of the review unit.

G4JET

Sinclair ZX Spectrum+



When Sinclair introduced the QL last year many people wondered if the keyboard would find its way onto a version of the Spectrum. The Spectrum+ would seem to be the outcome of such a marriage. *CiR* has been looking at a Spectrum+ to see whether it really is a step in the right direction for the radio user.

As far as the electronics inside the computer are concerned the Spectrum+ is identical to a standard 48K Spectrum. The p.c.b. in the review model was in fact a 1983 issue 4A which compares with our own 48K Spectrum which is over 12 months older and has a 1983 issue 3 board. This does mean that to all intents and purposes a Spectrum+ can be regarded as identical to a standard 48K model and will run and use any programs and hardware already available.

So, the real difference lies in the totally new case and keyboard. The case, still in black plastics, is quite a bit larger than the standard model and is totally different in style. The keys follow the style set by the QL and are larger and easier to use than the standard Spectrum keys. To further improve the keyboard for the user Sinclair have provided extra keys and this removes the frustrating double or triple-key functions of the standard Spectrum.

The changes should make the Spectrum+ even more popular in the radio shack—but what a pity that it is still in an unscreened plastics case.

When it was first launched the Spectrum+ was priced at £50 above the standard model but with a pack of six programs. Recently the price was slashed to £129 without the programs.

The rewritten manual, together with a demonstration cassette replaces the original manual and in my opinion is not as good or comprehensive as the original manual. No details are given of the edge connector allocations for instance—vital information for our kind of use. The strange button concealed under the lefthand edge of the keyboard is also not mentioned in the instructions—in fact it turned out to be a very useful RESET button.

The Spectrum+ is an improvement in most respects on the Spectrum—now Sir Clive, how about some r.f. screening!?

G8VFH

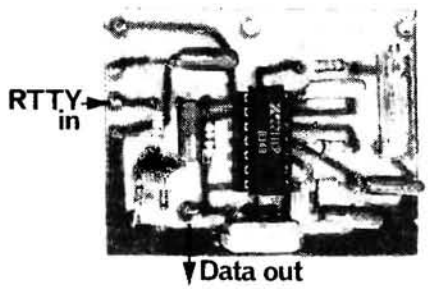
Products

▶ *continued from page 31*

The unit is designed to operate from low audio input levels and is optimised for narrow shift transmissions, but will accommodate wide shifts on s.s.b. by detuning the receiver or by adjusting the receiver's b.f.o.

At the heart of the unit is the XR2211 Data f.s.k. demodulator i.c., which provides superior performance over conventional p.l.l. (phase-locked loop) chips. An additional advantage with using the XR2211 is the production of a simple demodulator that does not require L/C tuned circuits, plus the i.c. has an on-board v.c.o. that provides the unit with an elementary form of filtering.

Connections to both the radio receiver and computer are simple, with the +5V d.c. power required being picked up, in most instances, from the printer port.



An add-on filter unit is soon to be available, and overall performance can be expanded to full transmit/receive capability when used in conjunction with the B & J RTTY Tone Unit. Further details from the manufacturers.

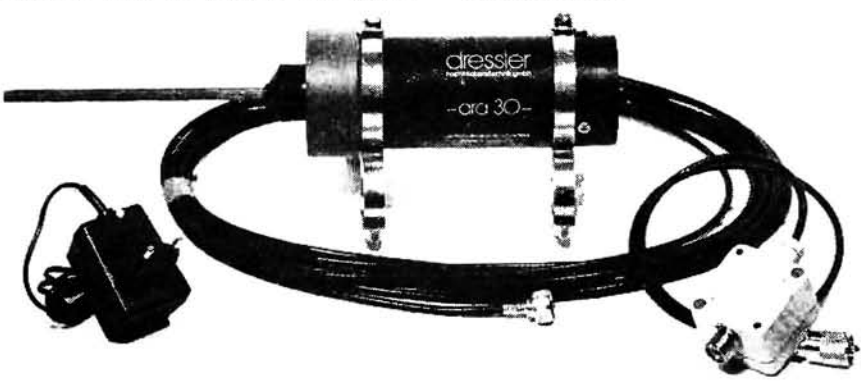
The RD 847 RTTY Receive Demodulator Unit is supplied complete as a built and tested printed circuit board, and costs £13.50 plus 50p p&p from: *B & J Telecommunications, 9 Queen's Walk, Thornbury, Near Bristol BS12 1SR. Tel: (0454) 416381.*

Active Antenna

The Dressler ara30 Active Receiving Antenna System is designed to meet the needs of the s.w.l. enthusiast with very limited space for antenna erection

The masthead unit comprises a short whip antenna mounted on top of an aluminium tube which houses the amplifier necessary to match the high impedance of the whip to the 50–75Ω coaxial cable feeding the receiver. The amplifier uses a low-noise f.e.t./CATV transistor/push-pull amplifier line-up to achieve 10dB gain with good intermodulation performance and a low noise figure. The overall length of the antenna unit is 1·45m. The ara30 covers the frequency range 200kHz–30MHz, with limited performance up to 100MHz.

The antenna comes with 8m of coaxial cable fitted with a PL259 connector at each end. At the receiver end, this plugs into an interface unit which allows the power supply required by the amplifier to be fed up the coaxial cable. The nominal requirements are 11–15V d.c. at 100–140mA, and a suitable wall-plug adaptor unit is provided. The complete system as described costs £90.00 including VAT. Further details from: *Dressler (UK) Ltd., 191 Francis Road, Leyton E10. Tel: 01-558 0854.*



Autoranging Digital Multimeters

Two fully autoranging 3½ digit multimeters have been added to the Beckman Industrial Circuitmate series, the handheld DM77 and the DM73 probe meter, the latter being a really compact pocket meter.

The DM77 has five d.c. and four a.c. voltage ranges (to 1000V and 600V respectively), two a.c. and d.c. current ranges of 200mA and 10A, plus five resistance ranges of 200Ω and 2MΩ. Resistance can be measured with low power for use inside electronic circuits, or high power for measurements out-of-circuit or inside electrical circuits. Additionally, a buzzer is incorporated for continuity testing and circuit tracing. The price of the DM77 is £46.00.

The versatile DM73 is ideal for voltage and resistance measurements in hard-to-reach locations. It has four a.c and d.c. voltage ranges from 2V to 500V, four resistance ranges from 2kΩ to 2MΩ, plus a buzzer for continuity testing and circuit tracing. Also, a "display-hold" button facilitates measurements to be held on the display after the probes have been removed from the circuit. The DM73 is priced at £39.75.

Both units are available through Beckman Industrial's network of UK distributors. Further details from: *Beckman Industrial Ltd., Electronic Technologies Division, Mylen House, 11 Wagon Lane, Sheldon, Birmingham B26 3DU. Tel: 021-742 7761.*

PRACTICAL ATV TECHNIQUES

Part 3 by Allan Latham G8CMQ

Having now considered reception techniques at 1·3GHz it's time to look at f.m.—but first an explanation of picture grades and reception.

Picture Grades

In amateur television just as in the world of amateur telephony and telegraphy there is a code for describing the quality of signals received. It is not an exact measure (no-one reports their s.s.b. contacts giving the received field strength and signal/noise ratio!) but it gives a good guide to the transmitting station.

There are six grades from P0 to P5.

P0: Some sign of the picture is present, for example sync pulses can be seen but they will not lock. If lock is obtained no visual content can be detected in the picture.

P1: Some visual information can be seen, for example a large single letter occupying the whole screen can be read.

P2: More visual information can be made out than P1. For instance, a callsign occupying the whole width of the screen can be read. The type of test card in use can be identified, but it is not possible to distinguish individual lines in the frequency gratings or adequately see the steps in a grey scale.

P3: The most coarse frequency bars can be made out and steps in a grey scale may be apparent. If the program content was specially interesting you might watch this sort of picture, but it would be a strain on your eyes. If the transmission is in colour it may appear intermittently and is very noisy when it does.

P4: The noise is much reduced. Colour will be present if slightly noisy. This level of picture is what you might be prepared to accept for domestic purposes if you live in a poor reception area or if you are watching an out of area IBA broadcast. Fine detail is present in the picture—on a test card all the frequency bars up to 4MHz are clear, if a little noisy.

P5: This is as good as broadcast reception. Usually it will be limited by the source of the amateur video. Single tube domestic colour cameras cannot compete with the latest broadcast ones.

As a guide the output of a domestic VCR would probably rate P5 for most people but the more discerning might rate it between P4 and P5 due to lack of definition.

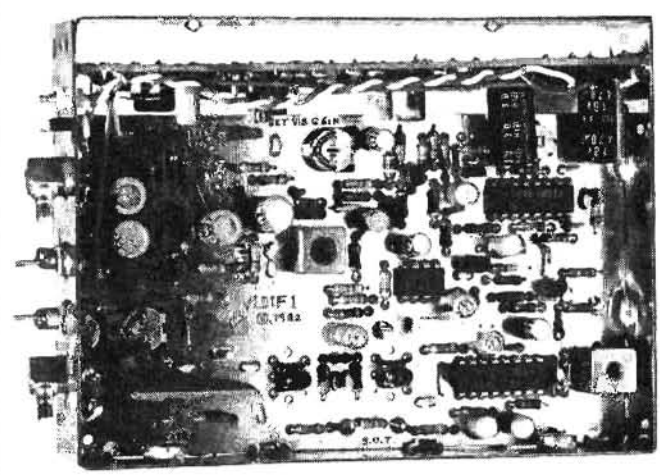
Frequency Modulation

A dozen or so years ago use of f.m. for telephony on the amateur bands was just beginning. Before that it was regarded as something quite odd that would never catch on. Just look at todays situation on 144 and 430MHz! The reasons for the change from a.m. to f.m. on phone are very similar to those which are now forcing the same change on ATV.

My first 144MHz band transmitter used a QQV06-40 valve in the r.f. output stage and this was modulated by about 50W of audio from a pair of 813's. It is hard now to imagine the weight and size of the transformers involved—modulation transformer as well as p.s.u. transformers. The 6-40 was very tolerant and providing overs were kept short the glass envelope didn't collapse with the heat! Maximum h.t. could be established by winding the volts up until the valve flashed over on modulation peaks and blew the fuse, then backing things off a bit. This is of course nothing to do with f.m. but serves to remind those readers who are not familiar with valves about a few simple facts: at these frequencies valves were needed for high power; valves are very forgiving; valves need high voltages and non-portable p.s.u.s.

When power transistors began to appear on 144MHz a few nasty surprises were in store for those used to valves. Transistor ratings had to be treated with great respect. Excess voltage or current was likely to destroy the device before the fuse. Over-running on power for more than a few seconds was often fatal for that very expensive transistor. As much as any other reason this provided the spur to the development of f.m. Why? Simply the ratings for the transistor p.a. must not be exceeded at *any* point in the modulating cycle. If you wanted to modulate the collector using a modulation transformer (similar to anode modulation) the peak collector voltage went up to twice its resting value on the peaks and the transistor needed to be rated accordingly. Alternatively you could modulate at a lower level and use a linear amplifier afterwards.

To achieve satisfactory linearity meant running the transistor in class AB, at inherently lower collector efficiency than class C. Usually it needed further derating still to get a clean signal—all very bad news for the a.m. people. If you wanted to go to all the trouble of linear amplifiers etc then s.s.b. was the route to go. If you wanted to make the most of the transistors available then f.m. had much to commend it. Transistors could be run in class C with collector voltages close to the maximum ratings. Once more and more amateur stations equipped themselves with proper f.m. detectors the real advantages of f.m. began to be felt. Meanwhile new converts to f.m. on



The Wood & Douglas VIDIF f.m. video demodulator

144MHz were finding that their TVI problems had vanished along with the a.m.

FM and TV

Let's now look at a.m. and f.m. in relation to a TV transmission. The vast majority of ATV stations on 430MHz amplitude modulate the carrier by controlling the collector voltage of the final p.a. transistor. The transmitter is usually rated by its power output at sync tips (p.s.p.). This is exactly equivalent to p.e.p. (i.e. it is the r.f. power of a continuous carrier whose amplitude is the same as that at the crest of the modulation cycle—the sync tips) and that is broadly the same as four times the carrier power for a conventional amplitude modulated transmitter. Therefore a 20W p.s.p. TV transmitter relates approximately to a 5W sustained carrier power. Because the video signal is far from average this is not an exact relationship. The sidebands carry some power as well as the carrier and this explains why a 20W p.s.p. ATV transmitter power meter reads about 7W average, when correctly modulated.

In an f.m. transmitter the carrier power is constant and equal to the p.e.p. (strictly speaking it is the total power in the carrier plus sidebands which is constant). In our previous example the full 20W is available from the same transmitter for f.m. A word of caution about heatsinks would not be out of place. In our a.m. case the dissipation of the final p.a. transistor will be much less than the f.m. case because the collector voltage will on average be much less. If you convert a 430MHz TX to be the driver for a tripler on 1·3GHz you may well need more heatsinking.

On 1·3GHz power transistors are still expensive. In order to make the most of them f.m. is the obvious choice. Using class C often results in low gain but it is still possible to bias just into the class AB region and drive more power into and out of the device using f.m. than can be done with a.m. where linearity is a severe problem. Powers in the order of 10W are possible at reasonable prices—above this level valves are needed.

FM Theory

At this stage it may interest you to read some of the many accounts of f.m. as relating to audio transmission. The RSGB *Radio Communication Handbook* and the *VHF UHF Manual* give reasonable accounts. A few words of caution to avoid confusion.

1. Audio people refer to peak-to-peak and r.m.s. in various contexts. Video people refer to peak-to-peak for the video signal.
2. Signal/noise ratios are often weighted but this is not always clear from the texts.
3. Remember that a video signal contains frequencies from 25Hz to about 5MHz. For a really good picture a signal to noise ratio of about 40dB is needed. For comparison hi-fi sound (wide band f.m. as used on Band II) uses 25Hz to 15kHz at signal to noise ratios of approximately 60 to 70dB. On the amateur bands n.b.f.m. uses 250Hz to 3·5kHz and signal to noise ratios of 10 to 20dB are acceptable.

Bearing all this in mind will help the mathematically inclined to related audio experience to the application of f.m. to TV. The following explanation is a simplification of a fairly complex subject. It is my hope that it provides the reader with enough background to appreciate what is happening and to see what effect changing various transmission and reception parameters will have.

Bandwidth

In theory the bandwidth of an f.m. transmission is infinite but in practice the vast majority of the energy is in the frequencies near the carrier frequency. For small modulation indices (see later) as used in ATV and n.b.f.m. telephony (but not for wideband audio f.m.) the effective bandwidth (B) is:

$$B=2D + 2M$$

where D is the deviation and M is the highest modulating frequency. Note that this refers to deviation in the audio sense i.e. the carrier is shifted by $\pm D$ at the modulation peaks. If we use the normal television meaning of deviation i.e. the shift from sync tips to peak white, then:

$$B=D + 2M$$

M is fixed by the nature of the TV signal. If no sound subcarrier is used M will be about 5MHz, with sound M will be 6MHz. Table 3.1 gives the bandwidths of typical ATV colour transmissions.

Table 3.1

Without Sound			With Sound	
D	B	I	B	I
3	13	0·3	15	0.25
6	16	0·6	18	0·5
9	19	0·9	21	0·75

I is the modulation index which is the ratio between the deviation and the highest modulating frequency. Again there is a difference between audio and TV usage because of the different meaning of deviation. I=D/M (audio) and I=D/2M (TV). Many properties of the total transmission/reception system depend on I.

Before leaving this introduction to bandwidth and modulation index it is useful to look at the actual energy distribution in the r.f. spectrum, Figs. 3.1. and 3.2. It is interesting to note that there is no discrete frequency in the spectrum which corresponds to the colour sub-carrier or the sound sub-carrier.

FM Detection Threshold

It is a characteristic of f.m. reception that once the carrier-to-noise ratio (C/N) is above a certain value further increases in carrier strength produce little (if any) improvement in the signal-to-noise ratio (S/N). It is important here

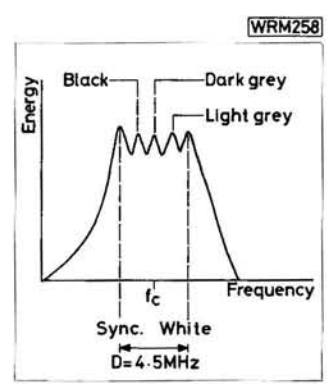


Fig. 3.1: Energy distribution of a simple grey scale

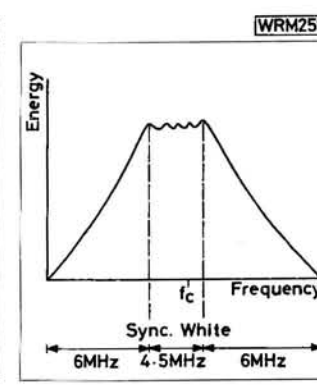


Fig. 3.2: The effect of adding colour and sound

to distinguish clearly between carrier/noise ratio and signal/noise ratio. Carrier/noise ratio is measured at r.f. The signal/noise ratio is measured in the demodulated signal. If you are trying to work out the maths you will also need to be clear whether you mean signal/noise or signal + noise/noise.

Unfortunately f.m. has the complementary characteristic that below a certain carrier/noise ratio a small decrease in carrier strength produces a very much worse signal/noise ratio.

The turning point is called the threshold: it is defined as the C/N ratio when the S/N is 1dB worse than the extrapolation of the large C/N ratio curve, Fig. 3.3.

Practical experience of amateur signals and amateur picture grades indicates that the slope of the curve below threshold is about 4dB C/N per picture grade. Each picture grade is about a 10dB improvement in signal/noise ratio. A picture of approximately P4 is achieved at the threshold; a further 10dB or so of C/N is needed for a P5.

The standards used by professional users of f.m. TV e.g. satellite links are aimed at P5+ pictures at threshold and use much higher deviations and bandwidths. The result of this is that threshold is at a lower C/N ratio (about 11dB) but the curve drops very quickly below that. This is fine if you are working over a reproducible path but is unsuitable for amateur use. In a sense we are making it easier for people to see P2 or P3 pictures while making it a little harder for people to get P5.

In case you are wondering why a lower C/N ratio is needed for a wider deviation; you must remember that the bandwidth has increased and therefore so has the noise. For the same strength of carrier the C/N ratio is better the narrower the bandwidth. So in the case of the wide deviation of satellite TV you will actually need more carrier to be present to achieve a given C/N ratio simply because of the bandwidth increase.

Detection of FM TV

The simple way to detect f.m. is to use what has become known as "slope detection". The main advantage of this is that it allows a picture to be viewed on an unmodified TV set. Those with long memories will remember the same technique being used on 144MHz for the reception of f.m. audio on conventional a.m. receivers.

A typical TV set will have an i.f. response approximately as in Fig. 3.4. If an f.m. signal is being received the receiver can be off-tuned to either point Y or X and the result is that the slope of the i.f. response causes the amplitude of the f.m. signal to vary as the frequency varies. The a.m. detector operates on this as it would with a conventional a.m. signal. Note that at point X the slope is opposite to that at point Y—the result is that when tuning through an f.m. signal on an a.m. set you see a positive picture, then a blank screen (in the centre of the passband), then a negative picture. Because the slope is steeper one side than the other the contrast of the two pictures is going to be different. Although this system will let you see strong signals quite well—and hear them too via the TV sets audio system—it is not as good as using a purpose designed detector. The difference is about two picture grades, so a proper f.m. detector is well worth making.

All the classical methods of f.m. demodulation can be applied to TV signals. Component values will need changing to allow for the TV signal bandwidth and usually an i.f. of 35MHz or above will be used, so that the deviation is not excessive in comparison to the i.f. It is worth reading up on f.m. demodulators and looking at some of the characteristics: ease of alignment; cost of components; behaviour below threshold; distortion characteristics. For TV we do not need to seek extremely low distortion or even superb S/N ratio (40dB+ will do).

For amateur use, behaviour below threshold is very important. One of the simplest demodulators to build and align is the pulse counting discriminator—it gives excellent results above threshold but below this point it produces nasty spikes in the signal, with amplitudes much larger than the recovered video. These can be limited to some extent but the result is not very good.

The phase locked loop type of detector behaves very well for a little way below threshold but after that produces noise which is generally called "sparklies". Normal noise consists of random variations in the signal level; the chance of the signal at any instant being at a particular level is less if that level is a long way from the actual signal level. In the case of sparklies the detector gets it completely wrong and a pure white noise dot appears where black was intended, or a pure black dot occurs where white was intended. The visual result is a picture where the mid grey tones are almost noise free but the whites contain black sparklies and the blacks contain white sparklies. If there are enough sparklies in the syncs the picture will not lock well. Ultimately all f.m. detectors produce sparklies if the C/N is too low.

The phase locked loop detector however has an advantage compared with most others. Besides being simple to align and build in i.c. form, it is possible to have control over the detection bandwidth by varying a few simple components or even make it adjustable by varying the signal level into the p.l.l. i.c. With other circuits major realignment is needed to do this.

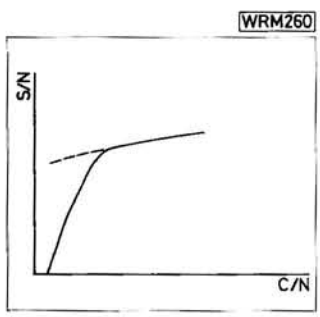


Fig. 3.3: The detection threshold characteristic of an f.m. system

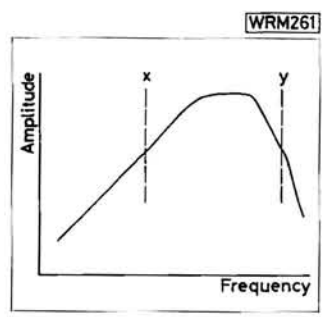


Fig. 3.4: Typical i.f. response of a conventional TV receiver

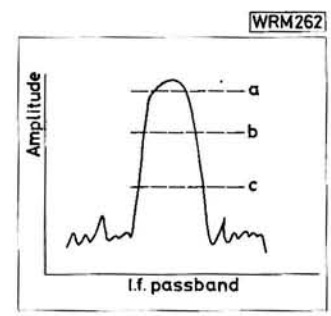


Fig. 3.5: (a) bandwidth is narrow; (b) wider; (c) out of band responses are significant

For these reasons almost all amateur f.m. TV receivers use the NE564 p.l.l. i.c. It is not strictly necessary to provide limiting before a p.l.l. circuit but some form of gain control is needed so that a known level of signal is presented to the loop phase detector. Results have been achieved with simple amplifiers where limiting occurs in an uncontrolled way, but control over the i.f. bandwidth (as opposed to detection bandwidth) is impossible; this is because the shape of the i.f. passband will depend on the degree of limiting (i.e. signal level), Fig. 3.5. A purpose designed i.c. which does this is the CA3089, which was developed for 10·7MHz but works well up to 50MHz. As well as a controlled limiting i.f. amp it also offers an S-meter facility which is immensely useful above signal strengths that give P5 pictures—no visible change in picture occurs as the signal level changes and this makes lining up beam antennas difficult.

Before leaving f.m. detectors it is worth mentioning the professional approach. This favours quadrature detectors in the 100 to 200MHz range and s.a.w. filters for passband shaping. This can be expected to work better than a p.l.l. above threshold and I expect it to produce superb video. For amateur purposes however it is more useful to concentrate on making the most of weaker signals.

Sound

This is a good point to explain how the sound is carried along with the vision. In conventional a.m. TV which we see every day on the u.h.f. broadcast bands the sound is carried on a separate f.m. modulated carrier, 6MHz from the vision carrier in the UK. Although it is possible to receive this sound carrier independently of the vision (in much the same way as f.m. radio on Band II) this is seldom done. Instead the vision and sound carriers are demodulated together in the same detector. The result is that the video contains a 6MHz f.m. modulated component. This is filtered out of the video to avoid spoiling the picture and is fed to a 6MHz f.m. i.f. and detector. This is often called "intercarrier" sound because it relies on the difference between the two carriers to generate the 6MHz. The main advantage in doing it this way is that drift in the tuning affects both vision and sound carriers together but the difference still remains 6MHz.

In amateur f.m. TV we use a similar technique. An oscillator running an 6MHz is frequency modulated by the audio signal. The 6MHz f.m. signal is then mixed with the video at about 100mV of 6MHz in a 1V p-p video signal. The resulting video then modulates the 1·3GHz carrier. There is an important difference between this and the u.h.f. TV case; the sound carrier has no separate existence and cannot be demodulated except as part of the video signal. In the receiver the same technique is employed on 1·3GHz f.m. TV as u.h.f. a.m. The recovered video from the demodulator is filtered to remove the 6MHz, which goes on its own f.m. demodulator to recover the audio.

Pre-Emphasis/De-Emphasis

In order to improve the signal-to-noise ratio of the demodulated f.m. signal it is normal practice to increase the high frequency components in the transmitter and reduce them in the receiver. This is known as pre-emphasis and de-emphasis respectively. This technique is applied to f.m. audio and on f.m. video. The choice of the amount of pre/de-emphasis is important to achieve best results. The increased deviation of the pre-emphasised high frequency components must be accommodated within the system bandwidth, so the low frequency components must deviate the carrier less than in the non pre-emphasised case. There is a commercial specification from the CCIR but this is a little too much for amateur use. Nevertheless modest amounts of pre-emphasis from simple *RC* networks or the full CCIR spec result in much better signal/noise ratios—worth about a picture grade. Interestingly when a pre-emphasised signal is received much below threshold the result is "edge sparklies" i.e. the sharp edges of the picture break up into sparklies. This is not surprising since these contain high frequency components and suffer most pre-emphasis.

I am well aware that f.m. theory is very complicated and applying it to video produces new complications. I hope this article has helped your understanding. In any case you do not have to be an expert to build a suitable demodulator for f.m. TV. There are several designs on the market as kits or ready built units. FM TV is definitely the mode of the future and you have an opportunity now to increase your practical knowledge of it.

Next month I will deal with the mechanics of the TV waveform and start to consider the equipment and techniques needed to generate r.f.

Did You Know...

That in 1907 Marconi's mighty Clifden station was powered by steam engines totalling 1100 horsepower?

To establish a wireless telegraphy link across the Atlantic with his station at Glace Bay, Canada, Marconi in 1907 built an unprecedentedly powerful 300 kilowatt transmitter at Clifden, in the west of Ireland. He used steam engines developing a total of 1100 horsepower to drive high-voltage direct-current generators which operated in conjunction with his newly invented high-speed "disc discharger". His 1·16μF capacitor consisted of 1800 sheets of galvanised steel 9m × 3·8m suspended from insulators and separated by a wide air space. It operated reliably at 80 000 volts and occupied a huge building over 100m long. The directionally aligned antenna stood 62m high and, utilising over 18km of wire, covered an area of one-twentieth of a square kilometre. Owing to the remoteness of the site—the only access was by means of its own light railway—the steam engines had at certain seasons to be fired by peat dug from the surrounding bog. The station operated successfully until 1921, when it was blown up by Irish rebels.

Eric Westman

Introducing Short-wave Listening

Part 4 by Charles Molloy

The Hobby of DXing

At one time everyone who had a wireless set was a DXer. Broadcasting started on the medium waves, receivers were nearly all home-made and the reception of anything, other than the local station if there was one, could be regarded as an achievement. Today, international broadcasting is well established, but there are those whose interest in the short waves goes beyond information and entertainment. These DXers, as they are called, regard the short waves as a challenge. They listen for weak signals not really intended for their ears. They will probably be members of a DX club, which provides a framework for the exchange of information and ideas. They will almost certainly want to write to their quarry to obtain a verification of reception, known as a QSL.

What do the letters DX stand for? They make up the telegraphic abbreviation for DISTANCE, where the X replaces the last sevens letters of the word. At one time "Distance" and "DX" were synonymous. Not so today. Tune round the 9MHz band (31m) at breakfast time. A portable with whip antenna will suffice. It can hardly fail to pick up Radio Australia on 9·760MHz. This transmission is coming direct from Australia, it is not a relay station. A high power transmitter feeds a directional antenna that beams the signal to us. It is intended for reception in Europe so it cannot be regarded as DX.

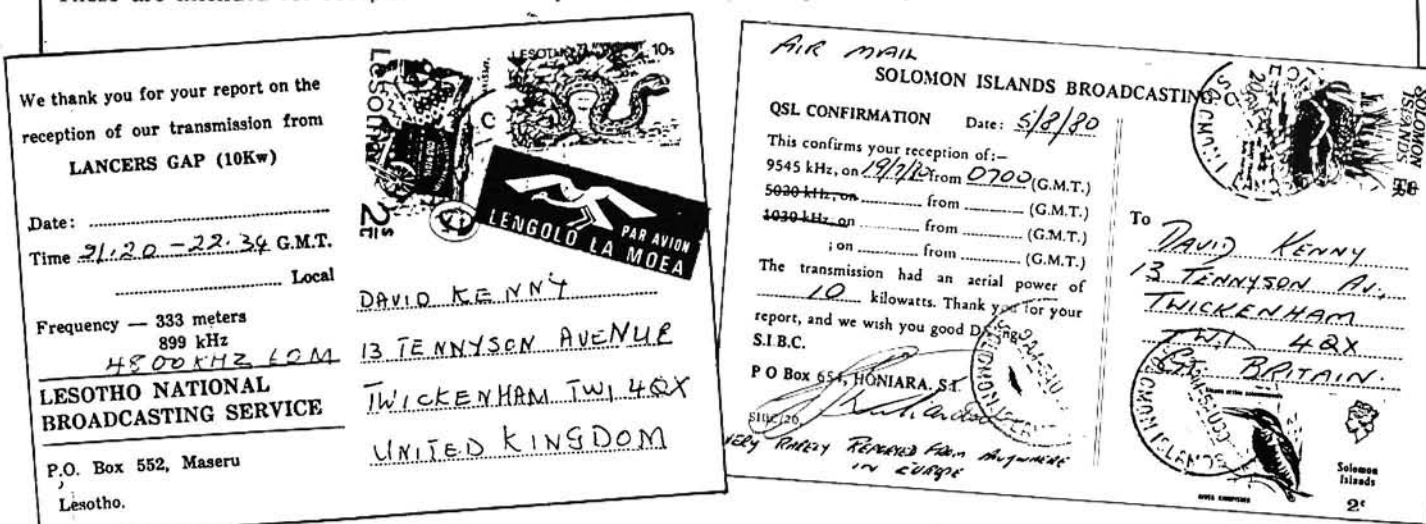
What is DX then? Perhaps the key is "listen-in". We are not listening-in, eavesdropping if you like, to a signal beamed to Europe, but we would be if we managed to pick up one of the domestic short wave stations in Australia. These are intended for reception in remote parts of that country, not adequately served by the medium waves. Try 9·660MHz during the morning for VLQ9 located at Brisbane. Stations belonging to the Australian Domestic Short Wave Service use callsigns beginning with the letter V. If you do manage to hear VLQ9, and it is receivable in the UK, then you will certainly be listening to DX.

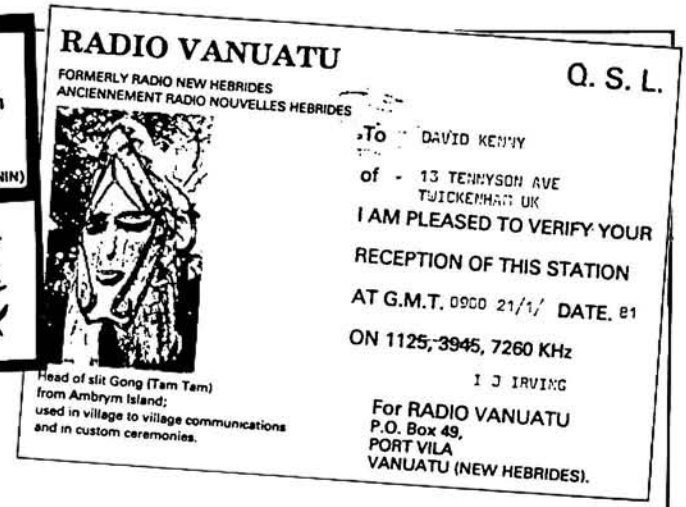
The Tropical Bands

Frequencies in the range 2·2MHz to 5·1MHz have been allocated to broadcasting in tropical parts of the world and in some remote parts of Asia as well. The high level of static caused by local thunderstorms makes the medium waves less attractive in the tropics, while it is feasible to cover quite a large sparsely populated area with a low power transmitter operating in one of the tropical bands, at any rate during the hours of darkness.

The three tropical bands are 2·4MHz (120m) which stretches from 2·2MHz to 2·4MHz, 3·3MHz (90m) from 3·2 to 3·4MHz, and 5MHz (60m) from 4·750 to 5·060MHz. The principal DX band is 5MHz, some DX ing is done on 3·3MHz, few DXers have ever heard anything on 2·4MHz. These bands are shared bands—shared between broadcasting in some parts of the world and commercial users elsewhere. We live outside the broadcasting zones so it is only after dark, when long distance propagation is possible, that we can hear our DX, usually mixed with non-broadcasting QRM.

Broadly speaking, we can hear DX from Latin America throughout the year from about 2300 hrs to sunrise. Many would say that summer is the best season. Africa can also be picked up throughout the year during the evening,





QSL Cards supplied by David Kenny of the British DX Club Solomon Islands, Ghana, Lesotho, Venezuela, Vanuata, Tchad, Benin

though a number of stations only transmit on the tropical bands after local sunset and before local sunrise. The Far East comes in best during the afternoon in winter, before many of the stations "sign-off for the night" around 1600 UTC. They are sometimes audible around midnight for a short time, during the summer. The path to Australia and the Pacific is open for a period round 2000 hrs winter and summer and also in the morning in winter.

Newcomers to the tropical bands often fail to hear anything, quite a contrast to listening on the international bands! DX on the tropical bands is usually weak, interference (QRM) sometimes severe and there is no DX at all to be heard during the daytime. Ideally, a communications receiver with outdoor antenna should be used to deal with weak signals and QRM. In practice, DX can be picked up with one of the better type portables using its whip antenna, but only during the night after TV hours. Interference from TV sets can be troublesome—another reason for using an outdoor antenna.

International Bands

Although DXers have traditionally turned away from the international bands, presumably because of the amount of high power broadcasting, jamming, etc., there is none the less quite a lot of DX to be found there. One could argue that over crowding is part of the problem and is merely another obstacle to be overcome!

Some DXers are interested in international broadcasts intended for other parts of the world. The Voice of the Andes HCJB in Ecuador, for example, transmits to S.E. Asia at 0930 on 6·130MHz in the 6MHz band. It comes in as a poorish signal in the UK during the winter but is loud enough for one to follow their DX Party Line programme, at a time of year when the late evening transmission on the 15MHz and 17MHz, which is intended for reception in Europe, is often poor or even inaudible. This is not the sort of DX I have in mind, though.

Those bands lying between 5·9MHz and 16MHz, i.e., 6MHz (49m), 7MHz (41m), 9MHz (31m), 11MHz (25m), 15MHz (19m) are used for domestic broadcasting in many parts of the world, often to add to the range of a medium wave transmitter. Tune round 6MHz during the day and you'll pick up relays of domestic service in West Germany and Luxemburg. Not DX from our location, but could be from other parts of the world.

Latin American DX can be found in the 49m bands from late evening until sunrise. Listen for La Voz de Nicaragua on 6·015MHz, Caracas in Venezuela on 6·100MHz, Radio Impacto in Costa Rica on 6·150, Radio Globo Brasil 6·035, Radio Bandeirantes Brasil 6·185, Radio Jornal de Comercio Brasil 6·085, Radio Rivadavia Argentina on 5·880, Radio Panamericana Bolivia 6·105. Africa, too, can be found on the lower frequencies. Sometimes a domestic service, for propagation reasons, divides its time between the tropical bands in the morning and evening and a higher frequency during the day. Bamako in Mali, for example, can be found on 7·285MHz from 0800 to 1800. Listen for Malabo in Equatorial Guinea on 6·250, Mogadishu in Somalia on 7·200, Sokoto, Nigeria, on 6·195, Nairobi, Kenya, 7·140, Capital Radio Transkei 7·165. From Asia there is Aden on 6·005MHz, Singapore 6·120, Jeddah in Saudi Arabia on 7·290, Taiwan 7·250, Noumea in New Caledonia on 7·170. There is also Radio Nacional San Gabriel in Antarctica, which can occasionally be heard during the night on 6·030MHz.

The 9MHz (31m) band is another good hunting ground for the DXer. As well as the Australian domestics VLH9 in Perth on 9·610, VLQ Brisbane on 9·660 and VLR9 Lyndhurst on 9·680 to be heard in the morning, there are a number of Latin American domestics to be heard in the late evening and at night. Rio de Janeiro on 9·705MHz and Radio Rumbos in Venezuela on 9·660 for example. As we move up in frequency the bands become less useful for domestic broadcasting but it is always worth investigating weak signals, even on 15MHz in the late evening for stations such as Radio Globo in Brasil on 11·805 or Radio Nacional de Chile on 15·140. Radio New Zealand still uses its vintage 7·5kW transmitters for a service to the Pacific Area. Try 15·485MHz between 0600 and 0800, it comes in well at times in the UK, in spite of the low power and the distance.

Some Real DX

We have already referred to domestic broadcasting in Australia. There is a slightly different arrangement in Canada where a number of low power relays in the 6MHz band are used to increase the service area of a medium wave station. CKZN (the callsign) in St John's, Newfoundland, with 300 watts on 6·160MHz relays CBN on 640kHz, CFCX with 500 watts on 6·005 relays CFCF Montreal on 600kHz, CFVP with 100 watts on 6·030 relays CFCN Calgary on 1060, CHNX with 500 watts on 6·130 carries the programme of CHNS located at Halifax, Nova Scotia. CKZN and CHNX are sometimes heard late at night in the UK.

Perhaps the ultimate in broadcast band DXing is the 10 watt CKFX on 6·080MHz, which relays the 50kW CKWX in Vancouver on 1130kHz. Evidently this midget reaches pockets screened from the medium wave transmitter. CKFX has been logged right round the world but if you really do think you have picked it up then be sure to have a tape recorder at the ready, otherwise no-one will believe you.

Keep a Logbook

There are several reasons why the DXer keeps a logbook. When preparing a reception report it will help him to have a record of the exact time of reception and an outline of the programme heard, to know whether there was interference from other broadcasters and if there was any fading. The log can be a useful source of reference in the future, when checking propagation for example. Most of all, the log will enable the DXer at some future date, to return and enjoy again, interesting and important DX from the past.

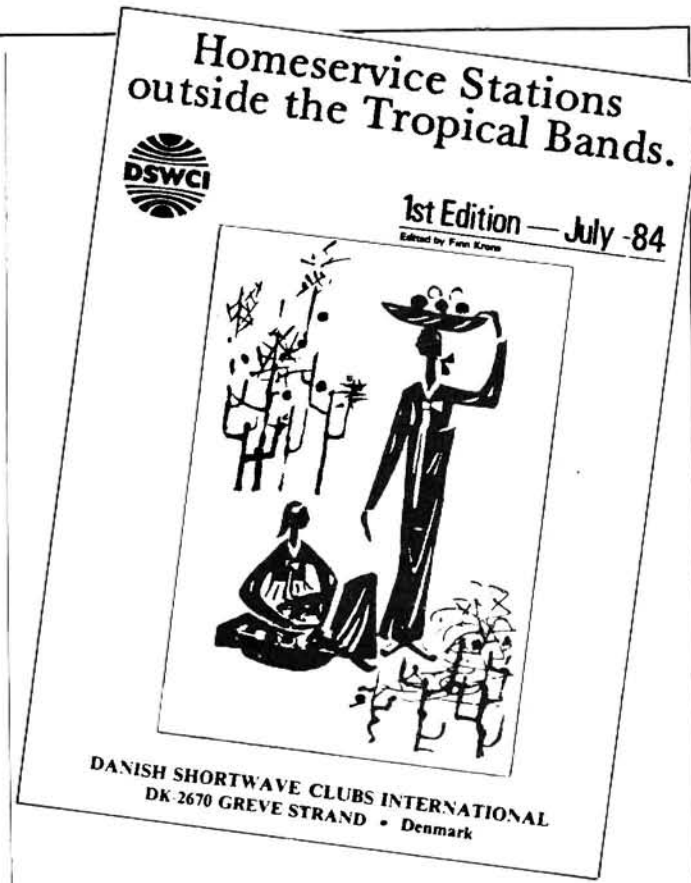
I'm sorry now that I didn't keep a log when I started DXing. At the time it just did not occur to me but it would be more than interesting now to relive pre-war reception with my one-valver.

You please yourself what you keep in the log. There are no rules. Using a stiff-covered notebook with feint horizontal lines printed on each page, I pencil in vertical lines to provide the columns for the information I want to record. The date and time in UTC are essential. Do not use summertime, it only leads to confusion. Record the frequency if you know it, or an approximation or even the band, if you don't. I make a few notes, using abbreviations of my own such as Nx for news, Wx for woman announcer, EE for English, etc., of what is actually heard, just in case the station remains unidentified. A column for the name of the station, if known, a remarks column for anything relevant, another for the antenna in use if there is more than one available and finally one for the SIO reporting code which I use.

Station Lists

Two lists published by the Danish Short Wave Clubs International (DSWCI) are just about essential for serious DXing. The *Tropical Band Survey* (TBS) comes out annually in the summer. It lists all active broadcasting stations in the range 2·2MHz to 5·9MHz giving the times of broadcasts and how often or seldom a station has been heard. The list is compiled mainly from information supplied by a world wide membership. It is in English and is available to non-members for 7 IRCs from the DSWCI, Tavleager 31, DK–2670 Greve Strand, Denmark.

The second publication, a 30 page A4 size booklet called *Homeservice Stations outside the Tropical Bands* starts from where the TBS leaves off. "We have printed this issue in order to list DX stations of the world in the frequency range 5·9MHz to 17·0MHz" writes compiler



Finn Krone who continues "The list includes Home Service programmes of International Broacasters as well as entirely domestic stations". The first edition of this booklet came out in July 1984. No doubt much of the information in it can be found elsewhere, but it is handy to have it highlighted and reading through could well stimulate interest in DXing the international bands. Send 7 IRCs to the DSWCI if you would like a copy.

It is hoped this introduction to the hobby of DXing will throw light on an interesting and rewarding activity. Some would regard it merely as a training ground for future radio amateurs and certainly non-technical DXers can hold their own with anyone when it comes to handling a receiver. The hobby does exist in its own right though, and DXers are in any event usually s.w. programme listeners as well, members of a world wide audience recently estimated to have reached 500 million.

the things people say

"If people can't take it seriously they shouldn't be allowed on the air."

. . . heard on 27MHz by A. F. Woodward

"I forget SWR and tune for maximum forward power so I'll get the best front to back radio."

. . . heard on 27MHz by G4GSJ

"No, radio amateurs do not die—they only evaporate gradually through their aerials."

. . . heard by H.H.C. Graepel

"Can't seem to be able to peak up the signals at all on this 'ground plane', no matter which way I turn the rotator."

. . . heard by G4KKJ

"Of course you're a solid 5/9 here, I'm beaming the colinear right at you."

. . . heard simplex by RS44984

Have you heard any (printable) comments, funny peculiar or funny ha-ha? If so, why not send them in to our Editorial offices at Poole. We will pay for every one published.

The Cost Cutters

SOME OF OUR PRICES ARE SO LOW WE DARE NOT QUOTE THEM - CALL IN NOW!

OR PHONE

"I give you much more than just the lowest price . . .

PETER (G3LST) SAYS

When you buy that exciting new rig from my Company you know you are going to be completely happy. I see to it personally that you get the fastest possible, insured, delivery, a pre-delivery test by qualified engineers, the best Part Exchange allowances, the keenest low cost finance, in fact my personal service in every way. Ask any of the thousands who have bought from my companies in the last 20 years (Yes 20 years in Electronics & Radio this year!)

*** SEE US**
At all major shows & rallies or visit one of our well stocked showrooms for a very warm welcome where you can sit & have a proper demonstration

ARROW CAN OFFER YOU A GREAT DEAL ON ALL MAJOR MAKES – PLEASE CONTACT US FOR ANY ITEM NOT LISTED

ARROW *HAS THEM ALL!*

APPROVED TRIO DEALER

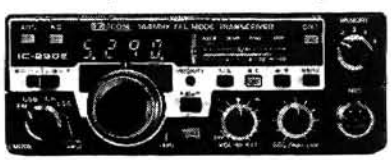
AUTHORISED YAESU

AUTHORISED ICOM DEALER

THIS MONTH'S SPECIALS

FT290R YAESU ALLMODE PORTABLE
£339.00 including FREE nicads & charger
(RRP Value £382.85!!)
Or FT290R fitted with famous Mutek front end **£339.00** (RRP Value £376.40!!)

IC290E ICOM MULTIMODE with scan mic
£379.00 (RRP Value £399.00)



FT209R + FBA5 YAESU 2M FM HANDTRANSCEIVER
£219.00 (RRP Value £239)

SPREADING THE LOAD?
Yes ARROW can still help you with interest free credit over 6, 9 or 12 months & can accept Creditcharge, Visa and Access cards against most regular price (RRP) items. Please enquire.

FT757GX HF TRANSCEIVER with FM, CW Filter, Keyer
£759.00 (RRP Value £829.00)

FRG8800 NEW YAESU GENERAL COVERAGE RECEIVER £511.00
(RRP Value £559.00)

or fitted with new VHF Converter 118-175 MHz
£589.00
(RRP Value £649.00!!)

FT726R YAESU 2M SYSTEM TRANSCEIVER
£835.00 with FREE Mutek front end & fist mic.
(RRP Value £908.90!!)

IC271E ICOM 2M ALLMODE BASE STATION £699.00
with FREE P825 Internal PSU (RRP Value £795.00)

NEW RELEASES

TS-711E/TS-811E

THIS MONTH'S SUPERBUY

LOW PRICE

FT2700R YAESU's NEW FM DUAL-BANDER WITH FULL DUPLEX
(CROSS BAND WORKING) **£511.00**
(RRP Value £559.00)

ARROW ELECTRONICS LIMITED

5 The Street, Hatfield Peverel, Essex
Tel: Chelmsford (0245) 381626/381673
Telex: 995801 (Ref A5)

The importance of exchanging speakers and lecturers between clubs cannot be over-emphasised. It makes for a much greater variety of topics for discussion and can only assist clubs in increasing their memberships. Specialist speakers like Chris Page G4BUE and Jim Bacon G3YLA spend a lot of their spare time travelling around the country, enlivening many a club meeting, for, as far as I know, nothing more than their out-of-pocket expenses.

I have noted that some clubs have their own member speaker time and time again but, no matter how good he might be, a change now and again would not be a bad thing. Most big towns have several clubs so it is not a hardship for a club speaker to do a tour of the others in his area. It just needs secretaries to send out a few invitations to get things going. Then there would not be any excuse for the dearth of advance programming suffered by many clubs.

CLUB NEWS

Compiled by Eric Dowdeswell G4AR
Reports to Eric Dowdeswell,
57 The Kingsway, Ewell Village,
Epsom, Surrey KT17 1NA
PLEASE MARK "CLUB NEWS"

Acton, Brentford & Chiswick ARC G3IIU George Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3. Next monthly meeting is on Tuesday April 16 at the Chiswick Town Hall, High Street, Chiswick, London W4, when G4HMC deals with QRP operation at locations where the antenna space is restricted.

Bangor & District ARS Stewart Mackay GI4OCK on Bangor 454049. Change of venue, now at the Royal Hotel, Bangor, normally on the first Friday of the month except for April when it will be the second Friday April 12 with a talk by the local coastguard, at 8pm.

Barry College of FE RS GW4BRS GW3VKL P. Beckett GW4YCU, 9 St Fagans Road, Fairwater, Cardiff. Thursday evenings at 7.30, in the annex at Weycoch Cross, Barry. April 11 has GW4PCJ talking on WWII clandestine radio followed, on the 25th, with a trip to the radio room of the Bridgend Police HQ.

Biggin Hill ARC G4RQT G6TBH Ian Mitchell G4NSD on (09598) 376. Third Tuesdays at St Marks Church Hall, Biggin Hill, Kent, 8.30pm. Members slides, photographs and the like are invited for April 16.

Border ARS Mrs S. P. Jones G1IUK on (0289) 305465. Another new club for the feature! Meets first and third Fridays of the month at 8pm, the Tweed View Hotel, Berwick-on-Tweed. The lecture on April 19 will deal with measurements and test instruments. On May 3 there will be a demonstration of antennas.

Bridgend, Mid-Glam. The YMCA Bridgend at 7.30pm, first and third Fridays.

Bristol ARC G3TAD D. Gully G4YOC on Bitton 4116, is the new sec of this club which gathers at the YMCA, 6 Park Street, Kingswood, Bristol, every Tuesday with RAE and Morse code classes. On April 9 it's a chat on club management with a night on the air on the 16th. On the 23rd computers will be the popular subject.

North Bristol ARC G4GCT Ted Bidmead G4EUV, 4 Pine Grove, Northville, Bristol. Club meets on Fridays at the SHE, 7 Braemar Crescent, Northville, Bristol, with a visit to the club by the local RSGB Area Rep on April 26.

South Bristol ARC G4WAW Len Baker G4RZY on (0272) 834282. At 7.30 every Wednesday at the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol, with a crystal calibrator among the club projects under way. On April 17 it's computer night with microwave workshop having the limelight on the 24th. Note the lecture on SSTV on May 1.

Cambridge & District ARC G2XV David Leary G8JKV, The Farmhouse, Blackers Hill Farm, Lowndes Drove, Needingworth, Cambs. Good to hear from this club again, it meets in the Visual Aids Room of the Coleridge Community Centre, Radegund Road, Cambridge, starting around 7.15pm every Friday during school terms. There are slow Morse classes and a "problem corner" for members. There is no meeting on April 5 but on the 12th there is a 144MHz band d.f. fox hunt, with a quiz on the 26th.

Cheltenham ARA G5BK Tim Kirby G4VXE on (0242) 36723. New sec says the club meets first and third Fridays at the Stanton Room, Charlton Kings Library, C'ham, BUT in April it will be second and fourth Fridays 12th and 26th because of holiday at Easter. April 29 will be a quiz at the Worcester club.

Cheshunt & District ARC G4ECT G6CRC Roger Frisby G4OAA on (0992) 464795. The Church Rooms, Church Lane, Wormley, Wednesdays at 8pm. The chairman G3OJI will deliver a lecture on BBC OB communications on April 17 other nights being devoted to RAE revision and nattering. On May 1 G3VPK, RSGB's Zone C rep, will visit the club.

Chester & District RS Alan Warne G4EZO on Chester 40055. Tuesdays at 8, the Chester RU Football Club, Hare Lane, Vicars Cross, Chester, with h.f. antennas and a.t.u.s the subject by G3EWZ on April 9. Installation of p.m.r. equipment will be dealt with by GW1ATZ on the 16th while entertainment electronics by GW8ICT forms the lecture on the 23rd. Code classes before meetings by G4MOU.

Chichester & District ARC C. Bryan G4EHG on Chichester 789587. It's the Fernleigh Centre, 40 North Street, Chichester, first Tuesday and third Thursday at 7.30, with a club net on S11 Wednesdays at 7pm. April 18 has a talk on Xerography by G4TSQ.

Cornish RAC N. Pascoe G4USB on Falmouth 40367. Meetings at the Church Hall, Treleigh, on the old Redruth by-pass, at 7.30. May 2 has G3VWK on the intricacies of tuning transmitters. Earlier the computer section has a gathering on April 8 when G3VWK, again, talks on Micronet.

North Cornwall RC John West G6ICW on Bude 4976. Get along to the RAOB Club, Camelford, Cornwall, on the first Wednesday of the month at 7.30pm. Subjects to be dealt with on May 1 include d.f. antennas, plus satellite communication by G8EWV.

Coulsdon ATS G4FUR Alan Bartle G6HC on 01-684 0610. SSB projects and theory by G6HC on April 15 (third Monday) and Morse code classes on the 25th, but normally make it the second Monday and last Thursday of the month at St Swithuns Hall, Grovelands Road, Purley, Surrey, at 8pm.

Coventry ARS Robin Tew G4JDO on Coventry 73999. April 12 is a night on the air, 19th a chat on p.c.b.s with demonstration, and on the 26th a project using p.c.b.s. Morse code tuition and classes most times. All this at Baden Powell House, 121 St Nicholas Street, Radford, Coventry, at 8pm.

Dunstable Downs RC G4DDC G8DDC G4ARD Phil Morris G6EES on Dunstable 607623. Solar factual data will be discussed by G8AFN on Friday April 12 and on the 26th it's "The best of QSLs", all at Chews House, High Street South, Dunstable, every Friday.

Ealing & District ARS G3UUP Anton Berg G4SCR on 01-997 1416. Meets at the Northfields CC, 71a Northcroft Road, London W13, at 8pm. Subject of the talk on Tuesday April 16 is DXing by G3GIQ. A future demo will deal with the Apple computer.

Echelford ARS Bob Crane G4PHS on 01-977 4157. Second Monday and last Thursday of the month at 7.30pm, The Hall, St Martins Court, Kingston Crescent, Ashford, Middx. Nets on Sundays at 10am on 1·92MHz, and on the 144MHz band. Wednesdays at 8pm on 144·575MHz. April 8 is an Easter natter night with the club's AGM on the 25th.

Edgware & District RS G3ASR John Cobley G4RMD on Hatfield 64342. Subject for G3SJE on April 25 is operating techniques. Get ready for the constructional contest to be judged on May 23. Otherwise second and fourth Thursdays at 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx.

Exeter ARS Roger Tipper G4KXR, 11 Chancel Court, Chancel Lane, Pinhoe,

Exeter. Starting at 7.30 there will be a talk on fault finding and circuit testing on Monday April 15, at the Community Centre, St Davids Hill, Exeter. This date is a week later than normal due to Easter.

Farnborough & District RS Peter Taylor G4MBZ on F'boro 837581. It's a bring-and-buy sale on Wednesday April 10, plus G4CJO and G4EMR dealing with AMTOR on the 24th. Meet at the Railway Enthusiasts Club, Access Road, off Hawley Lane, F'boro, Hants, at 7.30pm with talk-in on 144·775 f.m.

Fylde ARS H. Fenton G8GG on (0253) 725717. First and third Tuesdays of the month at the Kite Club, Blackpool Airport, at 7.45pm. G8GG holds the floor on April 16 with a talk on modifying BC sets for d.f. work on 1·8MHz and the techniques of d.f. hunting.

Grimsby ARS G3CNX George Smith G4EBK on Grimsby 887720. The venue is the Cromwell Social Club, Grimsby, at 8pm. On April 4 it's "Communication with Aliens" and back to earth on the 18th with a talk on c.w. contest operating.

Radio Society of Harrow G3EFX Dave Atkins G8XBZ on (0923) 779942. Every Friday night at 8.15pm, the Harrow Arts Centre, High Road, Harrow Weald, Middx, with talk-in on RB14. No meeting on April 5 but on the 12th it's a junk sale and an activity night on the 19th. "Listening in" will be explained by G3WCB on the 26th. Code classes are held regularly. The club will again be taking part in the Capital Venture Day, Sunday June 23, with a special event station.

Home Counties TV Group Paul Hancock, The Flat, 5a The Broadway, Southall, Middx. Gathers at the Beaconsfield Arms, West End Road, Southall, on the fourth Wednesday of the month. A new entry, more details would be appreciated.

Ipswich RC G1IRC G4IRC Jack Tootill G4IFF on (0473) 44047. Second and last Wednesdays at 8pm, the Rose & Crown, 77 Norwich Road, Ipswich It's AGM time again, on April 24 to be precise. Keep Sunday May 26 open as it is the East Suffolk Wireless Revival at the Hollies. Regular meetings also carry code classes.

West Kent ARS Brian Guinnessy G4MXL on (0892) 32877. No meeting on April 5 but to make up there is the AGM on Friday April 19, all at the club premises in Quarry Road, Tunbridge Wells, Kent.

Leighton Linslade RC G4LLR G6LRC Ian Jardine G1ACQ on (0525) 376741. On April 15 G8GIK and G4OCP will talk on "Simply the Transputer" and "A little logic". There is no meeting on May 6 being a Bank holiday. Otherwise meet in Room A64, Vandyke Community College, Vandyke Road, Leighton Buzzard, Beds, at 7.30pm, on first and third Mondays.

Loughborough ARC G3RAL Jim Smith G4DZL, Top Floor, Brush Sports & Social Club, 18 Fennel Street, L'boro, Leics., which is the club meeting spot, open every day of the week. On Fridays there is an organised programme and on Tuesdays it's the turn of the constructor group. Main item on April 12 is a junk sale, with a d.f. hunt starting at 8pm on the 19th.

Lough Erne ARC Cliff Corderoy GI4CZW on (0365) 24500. Mobile Rally at the Killyhevlin Hotel near Enniskillen with full hotel facilities, bring-and-buy, scenic trips plus talk-in on both the 144 and 430MHz bands, on Sunday April 21.

Maidstone ARS G3YSC G3TRF G8TRF Alan Judge G6FZD on (0622) 50709. Every Friday from 7.30pm at the YMCA Sportscentre, Melrose Close, Cripple Street, Maidstone, Kent. The club will be running a rally on Sunday May 26 starting at 11am with usual entertainments and adequate parking.

Maltby ARS Ian Abel G3ZHI on Rotherham 914911. Fridays at 7pm, Church Building, Church Lane, Maltby, with code classes to start with. On April 5 there is a d.f. hunt, with a Q & A session on licensing matters on the 12th. G8NVS talks on s w. listening on the 19th and take along your computers on the 26th A chat on 1·296GHz operation will be given on May 3.

Mansfield ARS Keith Lawson G4AAH, 233 Southwell Road West, Mansfield, Notts. The Victoria Social Club, Princess Street, Mansfield, first Fridays and third Tuesdays. Well-known speaker Jack Hum G5UM will talk on "v.h.f. Then and Now" and will judge the construction competition on April 5. AGM takes place on May 3.

Midland ARS Norman Gutteridge G8BHE on 021-422 9787. HQ is at 294a Broad Street, Birmingham, and the club meets every night including Saturday and Sunday if there are any competitions on! On Tuesday April 23 there is a surplus equipment sale. Other activities include code classes and RAE tuition.

ARC of Nottingham G3EKW G6CW G8IUT Jim Towle G4PJZ on (0602) 624764. Thursdays at 7.30, Sherwood Community Centre, Mansfield Road, Nottingham. AGM on April 4, a chat by G3YUT on transistor testing on the 11th, activity night on the 18th and G3KDQ talks on antenna experiments on the 25th. A Forum Q & A session is scheduled for May 2. Get ready, too, for the d.f. hunt on the 144MHz band on May 9.

Oldham ARC John Midgely G3SAO on 061-652 6529. This is a change of secretary, so welcome to the column John. The club meets Mondays at 8.30pm at the Wheatsheaf Hotel, Derker Street, Oldham.

Greater Peterborough ARC G4EHW Frank Brisley G4NRJ on (0733) 231848. Subject for April 25 is v.h.f., Then and Now, by Jack Hum G5UM. So, fourth Thursday at Southfields Junior School, Stanground, P'boro, at 7.30pm.

Plymouth ARC R. B. Weston, POB 46, Plymouth. The annual Mobile Rally is being held on Sunday May 26 starting at 10am at the Devonport Secondary School, Park Avenue, Devonport, Plymouth. Wide variety of attractions including a secondhand stall. Talk-in on S22 and RB2 by G3PRC. Licensed bar and other refreshments.

Rhyl & District ARC GW4ARC Melfyn Allington GW1AKT on Nantglyn 469. Note new venue of the club at the Mona Hotel, Market Street, Rhyl, with gatherings on the first and third Mondays starting at 7.30pm. April 15 is an activity night-on-the-air and keep May 6 open for the ATV demo by GW8XLL.

Salop ARS G3SRT J. T. Orrells G6DQY, Perry Willows, Yeaton, Baschurch, Shrewsbury. There is a construction competition on April 11, the club meeting every Thursday at 8pm, the Olde Bucks Head, Frankwell, Shrewsbury. Get your old stuff together for the junk sale on May 9.

Skelmersdale Radio, Electronic and Computer Club. Joe Singleton G4WJR, 3 Willow Drive, Skelmersdale, Lancs. Help still wanted with lectures and the like for the club which meets every Wednesday at 8pm, the Royal British Legion, Liverpool Road, Sk'dale.

Southdown ARS G1KAR G3WQK R. Wilson G1BAB on (0323) 890234. This seems to be a new secretary now that our previous correspondent George North G2LL has been elected to be president of the club. First Monday of the month at the Chaseley Home, Southcliffe, Eastbourne, at 7.30pm, and at the clubrooms at the Wealden DC Offices, Vicarage Fields, Hailsham, on Tuesdays and Fridays at 7.30pm. This takes in items like RAE and code classes.

Southend & District RS Brian Wood G4RDS on (03745) 50494. A grand rally on Sunday April 28 at the Rocheway Centre, Rochford, Essex, with road signs for direction plus talk-in on S22 and ample parking. Special provision for disabled visitors. Bring-and-buy, refreshments and bar and many other facilities.

Southgate ARC R.F. Snary G4OBE, 12 Borden Avenue, Enfield, Middx. It's the second Thursday of the month at the St Thomas's Church Hall, Prince George Avenue, Oakwood, London N14, starting at 7.30pm. There will be a surplus equipment sale on April 11.

Spen Valley ARS G3SVC Tim Clough G4PHR on Mirfield 499397. Thursdays at 8pm, the Old Bank WMC, Mirfield. Special note of the club's AGM on April 11. There seems to be a visit from an SMC rep on the 25th.

North Staffs ARC G4BEM David Morgan G6MLI on (0782) 332657. Demos of RTTY, OSCAR 10 and SSTV coming up at the club which meets every Monday at 8pm at the Harold Clowes CC, Dawlish Drive, Bentilee, Stoke-on-Trent.

Stanley ARC Ron Piper G6XCO on (0207) 235930. Still very new the group meets every Tuesday at 7pm in the Kings Head Hotel, Stanley, Co Durham. Activities include RAE courses and constructional work.

Stourbridge & District ARS G6OI G6SRS Malcolm Walker G8JTL on Lye 4019. Get along on the first or third Monday at 8pm to the Robin Hood Centre, School Street, off Enville Street, St'bridge.

Stratford upon Avon & District ARC David Boocock G8OVC on S-u-A 750584. The Control Tower, Bearley Radio Station, Bearley, near Stratford, at 7.30pm second and fourth Mondays. No meeting on April 8 but on the 22nd members will be visiting the Rugby radio station. Make a note of May 13 when Tom Douglas G3BA will be describing his experiences in a Jap POW camp.

Mid-Sussex ARS G3ZMS C. R. Cook G1FRF on (07918) 2937, is the new

secretary who would appreciate enquiries. School term meetings at Marle Place, Burgess Hill, with a full programme of events. Tell me more!

Sutton & Cheam RS Alan Keech G4BOX, 26 St Albans Road, Cheam, Surrey. On April 19 Malcolm Cummings will be holding forth on tape recording at the Downs LT Club, Holland Avenue, Cheam. Meetings third Friday of the month at 7.30pm. Diary note for May 17 when the AGM comes round again.

Swindon & District ARC Dave Ineson G4ZAZ on (0793) 37489. Every Thursday at 7.30pm, Oakfield School, Marlowe Avenue, Swindon, with RAE courses available plus usual lectures and the like. On April 18 a talk on RTTY by G3LLZ.

Thornton Cleveleys ARS Jack Duddington G4BFH on (0253) 853554. No meeting on April 8 but on the 15th it's Crime Prevention time by a member of the Lancashire Constabulary, followed by an auction of gear on the 22nd. An advanced Morse code class will be held by G3ZRZ on the 29th. So, Mondays at 7.45pm, 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool.

Torbay ARS G3NJA G8NJA Brian Wall G1EUA, 48 Pennyacre Road, Teignmouth. New venue for the club is the ECC Social Club, Ringslade Road, Highweek, Newton Abbot. Meeting times remain the same, every Friday plus last Saturday of the month being the formal night with lectures etc, but it will be the AGM on April 27.

Verulam ARC Brian Pickford G4DUS on (0923) 720616. Second and fourth Tuesdays of the month at RAF HQ, New Kent Road, off Marlborough Road, St Albans, Herts, at 7.30pm. The subject for G3NRW on April 23 is AMTOR.

Wakefield & District RS G3WRS W. Parkin G8PBE on Wakefield 378727. Meetings during April include a natter night-cum-night-on-the air on the 16th and a talk on amateur radio in SE Asia on the 30th. The venue is the Community Centre, Prospect Road, Ossett, near Wakefield, at 7.30 with code classes to hand.

North Wakefield RC G4NOK G6WRS Steve Thompson G4RCH on (0532) 536633. On the air activity with club stations on April 4, lecture and visit on the 11th and, unusually, a doubles pool competition on the 18th. There will be an Amateur Radio & Computer Fair at Bretton Hall College, Bretton, near Wakefield, on Easter Monday April 8 starting at 11am. Usual attractions like bring-and-buy, good ale bar, bookstalls, and handicraft stalls. Talk-in on S22 and RB15. To help visitors, the site is one mile from exit 38 on the M1 and four miles from exit 39, and 10 miles from the M1/2 interchange. Otherwise club meetings at the Carr Gate WMC every Thursday at 8pm.

Walsall ARC G4HLL Linda Price G6HZI on (0922) 32607. Another new one for the column I believe. Gatherings at the Forest Comprehensive School, Hawbush Road, Bloxwich, Walsall, every Wednesday starting at 8pm. Regular code classes, junk sales, talks and visits, 144MHz band net at 8.15 on S15 Fridays and same day at 8pm on 28·025MHz c.w. changing to s.s.b. on or about 3·7MHz at 9pm.

Welwyn Hatfield ARC Dave Fairbanks G0AII on Welwyn Garden 26138. This recently-formed club welcomes new members and gathers on the first and third Mondays at the Knightsfield Scout HQ, Welwyn Garden City, at 8pm, I think. Club net is on S15 other Mondays at 8pm.

Westmorland RS Gordon Chapman G1IIE on (0539) 28491. A while since hearing from this club. Meets second Tuesdays starting at 8pm at the Strickland Arms, Sizergh, near Kendal. Subject for April 9 is Oldham Batteries and the use of sealed-for-life batteries for the radio amateur.

Wimbledon & District ARS G3WIM G8WIM George Cripps G3DWW on 01-540 2180. Second and last Friday of the month at 8pm and a cup of tea during the evening, all taking place at the St John Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19. General activity is planned for April 12 including Morse code tuition.

Wirral ARS G3NWR Cedric Cawthorne G4KPY on 051-625 7311. Venue is the Parish Hall, Heswall, behind the church, first and third Wednesdays at 7.45. Planning has begun for the society's golden jubilee next year. Highlight for April is the lecture on QRP operation by George Dobbs G3RJV on the 17th. Don't miss it! On May 1 it's d.f. techniques, at the start of the d.f. season. Special note, a dinner dance will be held at the Heatherland on Friday May 3.

Wirral & District ARC G4MGR G8WDC Gerry Scott G8TRY on 051-630 1393. April 10 talk is on v.h.f. in small boats by G4ZKF and on the 24th there is a mobile treasure hunt. Sunday 14 is the first of a series of five d.f. hunts starting at 2pm on the Heswall lay-by. Second and fourth Wednesdays at Irby Cricket Club, Irby, Wirral. The late Spring Bank holiday sees a special event station at the International Waterways Festival at Ellesmere Port Boat Museum.

Wisbech & District AR & Electronics Club G4PQL G8NED David Wilkinson G4KHF, "Leon", Lutton Gowts, Long Sutton, Spalding, Lincs. The club gathers at the Five Bells, Parsons Drove "every two weeks", the April meetings being 11th and 25th it seems.

Wolverhampton ARS Keith Jenkinson BRS84269 on (0902) 24870. Every Tuesday at 8pm, W'hampton Electricity Sports & Social Club, St Marks Road, Chapel Ash, W'hampton. No meeting on April 9 because of Easter, but on Sunday April 12 there will be a 144MHz band d.f. hunt. On the 16th the W'hampton repeater group will talk on its repeaters, and on the 30th members will be vying for the home-brew competition award.

Worcester & District ARC Derek Batchelor G4RBD on (0905) 641733. Venues are the Oddfellows Club, New Street, Worcester, for formal gatherings and the Old Pheasant, in the same street, for informal "do's". Both start at 8pm. April 15 will be informal and the 29th formal but lecture subject unknown.

Worthing & District ARC Roy Jones G4SWH on (0903) 208752. First entry for this club I believe. Every Wednesday from 7.30pm, the Parish Hall, South Street, Lancing, W. Sussex. High activity on local nets with the 3·5MHz band on c.w. and s.s.b., 7MHz s.s.b., plus 144 and 430MHz f.m. as well as slow Morse on the 144MHz band.

Yeovil ARC G3CMH G8YEO Eric Godfrey G3GC on (0935) 75533. Thursday evenings at 7.30pm, the Recreation Centre, Chilton Grove, Yeovil. Main item for April is the all-important AGM on the 11th. G3MYM talks on mutual coupling between antennas on the 18th and on the Yagi antenna on May 2.

Cover Date	Deadline	For events from early
July	April 15	June
August	May 15	July
September	June 15	August

ON THE AIR

AMATEUR BANDS

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey KT17 1NA.
Logs by bands in alphabetical order

by Eric Dowdeswell G4AR

With the nosedive in the maximum usable frequencies as we approach the minimum of the present sunspot cycle attention is becoming focused more and more on the low frequency amateur bands. The latest information is that the minimum will occur around June 1987. This means that the 3·5MHz (80m) and 1·8MHz (160m) bands are coming into prominence very rapidly for DXing.

Many s.w.l.s do not bother with the 1·8MHz band (Top Band) because a good antenna is a prerequisite for the l.f. bands and a half wave on the 1·8MHz band is something around 80m or 284ft long which is more than the average amateur can manage. However, the classical trapped dipole covering the bands from 3·5 to 28MHz is generally about 32m (108ft) long and much more manageable in a small garden even if it has to be bent round to fit, Fig. 1(a).

Some time ago, in my old QTH in Ashtead, I experimented with extending my trapped dipole by adding additional traps for 3·5MHz band plus a length of wire at each end, Fig. 1(b). This extra wire amounted to something like 30m (100ft) which was rather excessive for the space available, but it did work very well on Top Band.

I recently came across an article in the Bury RS magazine *Feedback* by Chris Marcroft G4JAG who has been experimenting along the same lines. He mentioned an article in an old copy of *QST* where the loading coils were 420 microhenries plus a short "pigtail" at each end. This does work but the antenna is then very sharply tuned indeed and needs to be adjusted an inch or so at a time for a specific frequency. Not very practical!

Chris increased the value of the loading coils until he was able to increase the end wires to around 1·75m. The effect on the 3·5MHz band was to move the resonant frequency from 3·68MHz to 3·765MHz and on 7MHz it remained the same, 7·100kHz. On the 1·8MHz band the resonant frequency was 1·92MHz. Such an antenna would be very effective for the s.w.l. while the transmitting amateur could adjust the pigtail for the c.w. end of the band if necessary. The loading coil comprised 28 s.w.g. enamelled copper wire close wound to a length of 66mm on a 37mm former made from plastic pipe as used for plumbing and easily obtainable at DIY shops. After installation the traps were waterproofed with bitumen mastic, from the same source.

The resultant antenna now covers from Top Band to 28MHz without any a.t.u. The value of the loading coils for those able to measure inductance is about 530 microhenries. The extended antenna is shown in Fig. 1(c). Previously Chris has been shorting the bottom end of the feeder to the old trapped dipole and resonating it on Top Band with an a.t.u. This is a compromise at best and puts the maximum current in the antenna close to the ground. The modified antenna has maximum current at the centre of the antenna, up in the air, where it should be!

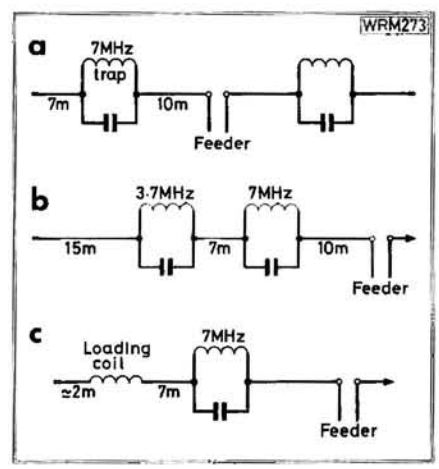


Fig. 1: (a) Approximate dimensions of trapped dipole covering 3·5 to 28MHz, fed with low impedance coaxial cable. (b) Same as (a) but with additional traps at 3·7MHz and end wires but now extending coverage to 1·8MHz. (c) The use of a loading coil instead of a trap considerably reduces length of end wires for coverage of the h.f. and l.f. bands

From **David Wilkinson** G4KHF comes information on a rather special award. To celebrate St George's Day (April 23) the Wisbech & District ARC will be running a special event station GB0SGD from 0001 April 21 to 2359Z on May 18, mostly on h.f. bands with s.s.b. and, hopefully, on the 144MHz band. Awards are several in number and open to both licensed amateurs for QSOs made with the station and to s.w.l.s. Details from David at "Leon", Lutton Gowts, Long Sutton, Spalding, Lincs. A photo of the award is shown elsewhere in this feature.

Another new award open to s.w.l.s and licensed amateurs is the TARS-30-Award offered by the Torbay ARS. Basically one has to hear/work at least 30 members of the society, with endorsements available for different modes, bands, and QRP working. Club stations G3NJA and G8NJA count as five contacts. More from Awards Manager, D. Hind G3VNQ, 4 Thoryville Villas, Oreston, Plymstock, Plymouth, Devon.

The Hastings Electronics & Radio Club is sponsoring a new award, the 1066 Award, for working eight club members or six plus the club station G6HH. Endorsements will be issued for different modes, bands, and QRP, with a special sticker for qualifying on Hastings Day, October 14 each year. More from Ken Homewood G3UBP, 73 Hughenden Road, Hastings, E. Sussex.

DX Bands

It's welcome back to the fold for **Norman Henbrey** BRS28198 of Northiam, Rye, E.Sx, who last reported in some 15 years ago although he started DXing way back in 1946, with a domestic superhet. Nowadays Norman has a KW77, FR-DX400, FRG-7700 plus converters for the 430, 144 and 50MHz bands with a Telereader CWR-670E for RTTY work. Antennas include a 48-element for the 430MHz band, 8-over-8 slot for 144MHz band, TA31JR for the 14, 21 and 28MHz bands, 18AVT with buried radials for the 3·5–28MHz bands not to mention a 40m-long wire with a.t.u. Sounds like a pretty comprehensive set-up to me! Results on 1·8MHz s.s.b. include EA6VQ, HK0HEU, KC9BC, T77V, TG9NX, UA9CZZ, UA2EC, VE1LK, 4X6DK, 6Y5IC and 7X5AB.

Up to 3·5MHz where Norman entrapped CE3EEO, CO2AL, D44BC, HC6XE, HH2MC, HK4GGK, that HK0HEU again, J39BS, J73LC, TI2KD, UM8NAW, V3ZZ, VK2AVA, VP2MPB, XE1VIC, YB0JH, ZD8LA, ZP5MJO, 3X4EX, 6W1CK, 6Y6IC, 8R1RBF, and 9Y4AT, all of which must make the 3·5MHz band the band of the month. Not too bad on 7MHz either where Norman logged A71AD, CE4EBJ, FM7CL, JH3TKM, KL7U, LU2FN, V3ZZ, VK4VC, ZL1AIA, ZP5JCY, ZS3E and 5N3RTF. Nice to hear from you again OM, and keep the logs coming.

Paul Price (Merthyr Tydfil) was content to stay mainly on the 14MHz band with his Panasonic DR29 receiver and 5M of wire in the loft space. He latched on to CT2BC, ER3A (QSL to UZ3AZO), JY5CI, OH0NJ on Aaland Is, TU2CJ, VK6LC, ZS6ODZ, 3B8FP, 5B4OP, 5N8GRI, 7X2EB (QSL POB 160, Bousaada), VQ9CK (QSL WB3CQN), VU2RX, ZS4PB and TF5EP with just EA6BC and YC0CN of note on 7MHz, and HH2MC around 3·8MHz. Paul plans an outside antenna very soon which ought to help quite considerably, plus a replacement for the DR29. On 21MHz in

the afternoons he heard A92EB, EC9HR (QSL EA9IB). J73LC (QSL KF4IL) and 6W1NQ. Down on 7MHz were FM4CL and ZL4BO. Around 3·8MHz Paul logged CN2AQ, EA9JV and NP4QC on Puerto Rico.

In Basingstoke, Hants, **Matthew Probert** uses an FRG-7 receiver and, as far as I can make out, four sloping wire antennas from the top of a 9m-high metal mast. Usually the close proximity of a metal mast will interfere with the characteristics of the antennas. Matthew says he has an a.t.u. but seldom uses it as signals tend to be quite strong anyway. Well, I think you should always use it OM, not only to enhance the strength of weak signals which need all the help they can get, but also to reduce the magnitude of out-of-band signals which can frequently be very powerful BC stations which can cause cross modulation on amateur signals. Anyway Matthew logged a couple of VK6's on 14MHz plus 5N8AMA. On 7MHz it was just ZL1FV of any note but on his seemingly favourite band around 3·8MHz he logged D44BC, VK2AVA, CE8ABF, HK3ODD, TI2CCC, C31LD.

A DX-pedition to Clipperton Island, normally FO8, is expected to be active between April 3 and 11 so keep your ears open for a rare one. It is said that some 16 operators from seven countries will keep several rigs on the air the whole time, so no excuses!

Melvyn Dunn of Grimsby was very upset at the way a certain DL station was apparently deliberately QRMing 4S7DA on the 3·5MHz band recently. I'm afraid OM that this sounds just like any other pile-up! Perhaps he was trying to organise a "list" not much one can do about it I'm afraid. Melvyn's DX160 fed from 40m of copper wire brought in 6W1CK, SU1ER, 4S7DA, 7X2LS, JA0RA, JA1FR, JA1DLP, VP2MDB, 9Y4NP, J88AX (QSL to KF4IL), VP5DM, JY5CI, TL8CK and 3A2EE all on or around 3·8MHz on s.s.b. Of interest on 7MHz were CM7KR, CM8CTK and YC5NDU.

From Swindon, Wilts, **Andy Durrant** writes to say that owing to promotion at work he will be moving QTH to the Aldershot area. Congrats OM. He has stuck to 14Mhz with his AR88 and an inverted-V designed for the 3·5MHz band. Pity you could not get on during the wee hours on the 3·5MHz band as it is full of DX nowadays. So, on 14MHz Andy caught A6AQS, BJ1HP, EL2BA, EA9IB (QSL Box 2139 Melilla), AP2MQ, J3KAN, VE3KF/4U, TU1BS, VQ9YR and ZS1AAQ. More yet with ZF1FP, ZL1BTP, SW2RE (QSL POB 10483 Thessaloniki), 8P6IB, ZL2PT, 6W1LL.

My apologies to **Bob Parsey** (New Malden Sy) whom I gently chided for not having an a.t.u. on the end of his 60m-long antenna. In fact he always uses one and reckons he wouldn't hear half of what he does without it. He also mentions using headphones to eliminate all the usual household noises, very wise, too. It's the only way to sort out those weak DX signals. Anyway, Bob has an FRG-7700 with that long wire and found D44BC on the Cape Verde Islands, EA9KF and WB3GCG as a representative of many Yanks heard on 1·8MHz. That D44BC is certainly a rare one for Top Band. Down to around 3·8MHz and A71AD, CN2AQ, D44BC, DH1AAE/C53 (QSL to home call), FM4CL, J73LC, TZ2XN (QSL DK3HL), YN4RC, VK6LK, ZL1BT and 5N8HEM. Only station worthy of note on 21MHz was 5H3QM who said to QSL via POB 6306 Dar-Es-Salaam.

Bill Williams of Gloucester has increased his antenna to 20m long feeding his FRG-7700 receiver and FRT-7700 matching a.t.u. and logged C6AI in the Bahamas, C31SD, D44BC and a "funny" in EV6AX said to be in Ethiopia. Normal prefix is ET which could sound like EV and with the international activity there at the moment the odd amateur could pop up. All this was heard on the 3·5MHz band. On 14MHz Bill found KA1GHM/KP2 (US Virgin Is), KL7LF, RZ1WO in Franz Josef Land, VQ9YR on Diego Garcia and ZK1LW, with just 4X4VX and CX5CQ on 21MHz.

Chris Burger ZS6BCR of Pretoria says he is having fun on the 3·5MHz band with a vertical quarter wave in his "city lot" and lists a number of G stations worked. I have asked Chris to note some of the G's he hears down there but not worked as this is likely to be more interesting. His ground system comprises 25 radials each 21m long and several more 42m long. Best openings are around 1700Z when it is around sunset down there. Chris hopes to be active on the 1·8MHz band very soon so look out for him.

Certificate issued by the Torbay ARS for contacts/reports with club stations

The Ealing Shield, left, and Southall Shield, presented to the winners of the BARTG Spring Event, portable and fixed sections, by the Ealing & District ARS and the Southall Constructors Group respectively, to encourage RTTY activity ▶

QRP Corner

Brian Fields G4XDJ of Billingham, Cleveland, has been having fun with his *PW Severn* QRP transceiver which was described in *PW* for May and June 1983 and designed by G3RJV. Input is 1W feeding a dipole about 7m above ground, fed with coaxial cable, firing more or less east and west. During 1984 he QSOd the following countries: G, GM, GU, GJ, GI, EI, F, DL, EA, LA, LZ, YU, Y2, OE, HB, HA, I, LX, YO, SP, OK, ON, PA, UB OZ, OH, SM **and** IT. Very good going OM, all on the key of course. Bill would like to see reports from other readers using such rigs. So would I!

For those interested in the G-QRP Club and its activities the club, founded in 1975, has over 2000 members in 48 countries, is open to anyone interested in QRP work, including s.w.l.s. The power is generally limited to 5W input. The quarterly journal *SPRAT* is crammed full of ideas, circuits for QRP gear, technical hints together with contest details and award information for QRPers. Annual subscription is £4.50. Subs to Fred Garrett G4HOM, 47 Tilshead Close, Druids Heath, Birmingham, or for general info to, QRP Club, Rev G. C. Dobbs G3RJV, St Aidans Vicarage, 498 Manchester Road, Rochdale, Lancs.

St George's Day Award from the Wisbech & District Radio & Electronics Club

MW BROADCAST BAND DX

Reports to: Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG.

by Charles Molloy G8BUS

"It may interest your readers to learn how frequently St John's Radio (in Newfoundland) CJYQ on 930kHz can be received in the UK," writes **Eric Duncan** of St Andrews in Fife. He uses a WPO Communications Omega receiver with a 20 metre-long wire antenna. "I monitored CJYQ nightly from 30 November 1984 to 31 January 1985. Monitoring generally stopped at midnight, exceptionally I continued until 12.30am," says our reader. He goes on to say that apart from December 24 and 31 when the Belgian station on 927kHz was on extended schedule, making reception on 930kHz difficult, CJYQ was heard on 41 of the remaining 61 nights. "The longest gap in reception was 5 consecutive nights in November—other stations recorded occasionally included CBGY in Bonavista Bay (Newfoundland) on 750kHz and CHER in Sydney, Nova Scotia on 950kHz." Many thanks for sending the report Eric.

This report doesn't surprise me. The location in Scotland is favourable from an interference point of view. QRM from continental stations should be less severe than farther south. The 20 metre antenna in a semi-rural location should help, too. If it were not for the high level of band occupancy in Europe then I am sure that CJYQ would have a regular audience in the UK, especially at this part of the sunspot cycle which is favourable to the propagation of lower frequencies. In case newcomers may wonder what the letters CJYQ, CHER etc stand for, they are callsigns, just like those issued to radio amateurs. All broadcasting stations in North America are issued with callsigns which they are obliged to use over the air. There are so many stations, 4500 in the United States alone, that this system has to be used to keep track of them all.

More Transatlantic DX

"Two loggings of real interest found their way into my logbook this month," reports **Graham Powell** of Pontypridd. "The first using the internal antenna of my Grundig Satellit 1400SL was Radio Globo in Rio de Janeiro, Brazil, on 1220kHz with identification at 0052. The second, using the receiver's SW1 band which covers 1·575 to 3·5MHz was, using a 10 metre-long wire antenna, Caribbean Beacon in Anguilla 1610kHz with English programmes, station identification, location and a time announcement of GMT–4 hours."

Many DXers believe that transatlantic reception is only possible during the winter. From our location at the western extremity of Europe, this is not so. Reception actually becomes easier as the days get longer owing to a reduction in QRM from continental Europe. It reaches a minimum in June when it is possible to pick out DX from the Atlantic seaboard of North and South America and the Caribbean relatively clear of the usual QRM, for a short time before sunrise in the UK. More about that next month. In Spring and Autumn listen for CJYQ about 4 hours after sunset and for WMRE in Boston on 1510kHz an hour later. They should be audible until sunrise in the UK.

"I enclose a photocopy of the letter received from WMRE—it gave me much pleasure as it is my first QSL from a new station from across the Atlantic," continues Graham. The letter which is from Elizabeth A. Schulenberg, Program Co-ordinator, says, "I am pleased to inform you that your reception report on WMRE has been confirmed. You are one of the many in your area who has reported receiving our signal, so welcome to the WMRE Fan Club. We are always happy to hear from our DX friends." The station address is WMRE AM1510, 74 Landsdowne Street, Boston MA02215, USA. Be sure to send sufficient programme details so that the station is able to verify your report. Enclose a couple of International Reply Coupons, obtainable from main post offices. It is a gesture of goodwill which may benefit other DXers in the future.

"I am writing to compliment you on your medium wave column," writes thirteen-year-old **Paul Logan** from Lisnaskea in Co. Fermanagh in Northern Ireland. Carry on Paul, you are doing very well! "I use a Silver XF900 receiver with a 13 metre-long wire and I enclose a list of DX tips." One item in Paul's list caught my eye immediately—our old friend CJYQ on 930kHz. You are favourably placed for reception of North America Paul. If you are able to check the band before sunrise, at weekends or during the holidays, you may get a surprise. Hope to hear from you again and good DXing.

DX Slots

A couple of items from my own log may be of interest. Radio Visión in Caracas, Venezuela, on 950kHz is a consistent signal and fades in about the same time as WMRE. The language is Spanish but the identification Radio Visión is used frequently. On the same frequency you will hear "DT" in slow Morse. It is a strong signal at my QTH and comes, presumably, from a radio navigation beacon. There are a number of these intruders scattered across the medium waves, "SW" on 930 for example, which can be heard as QRM on CJYQ. Search for 940kHz between CJYQ and Radio Visión. If you hear Portuguese, then it will be coming from Radio Jornal do Brasil in Rio de Janeiro. These two frequencies, 940kHz and 950kHz are two of the DX slots I mentioned in the February issue. The relationship between European and Region 2 (Americas) channels is interesting—936kHz (EU), 940kHz (DX), 945 (EU), 950 (DX), 954 (EU). Although QRM may still be severe, especially early on in the night, there is a definite advantage in DXing in these DX holes in the Geneva Plan.

Radio Algiers is on 800kHz. QSL sent in by David Kenny

Local Radio Scene

"I use an FRG–7 receiver with just a dipole cut for 14MHz facing north-south and managed to pull in a surprising number of local stations over the UK at very good signal strength during the day," reports **Alastair Ross** GM4PMT, Buckie, in Banffshire. Stations heard regularly include Manx Radio 1368kHz, Radio Ulster 1341kHz, Radio London/Radio Manchester on 1458kHz. Radio Newcastle has been identified once or twice also on 1458. Scottish local radio heard included Northsand (Aberdeen) on 1035, Radio Clyde 1152, Radio Tay in Dundee 1161.

"I have always been surprised to pick up so many stations with strong signals here as my antenna is far from ideal for m.w. DXing of any sort. I might also add that often during the hours of darkness I find the stations previously mentioned difficult or even impossible to receive due to increased QRM from foreign stations." Yes, daytime DX is by ground wave which travels a lot farther than many would imagine. Signal-to-noise ratio is the main criteria for DX and a good outdoor antenna will help. It might be worth searching the band for distant local radio in the UK at the same time as we look for North American DX around sunrise in summer. Incidentally, what has happened to all the FRG-7 receivers. I rarely hear of them these days.

Back to Paul Logan who reports hearing Viking Radio on 1161kHz, Saxon Radio 1251, Hereward Radio 1557, Pennine Radio 1278, Manx Radio 1368. Good DX from a QTH in Co. Fermanagh.

Radio Sahara, Aaiun, one time Spanish Sahara, sent in by David Kenny

Paul also lists a number of interesting local radios which I am at a loss to classify. They are unlicensed I think, but operate with the approval of the Eire government who have issued guidelines or terms under which they operate. Perhaps someone would correct me if I am mistaken.

Medium Wave Circle

This club for medium wave DXers, which went into suspense last year with the passing of Ken Brownless, is being re-launched by Ed Baker, Harold Emblem, Bill Shaw and Charles Molloy. Information about membership is available from secretary Ed Baker at 69 Alderley Way, Cramlington, Northumberland. *Medium Wave News* will reappear in April and editorial material for future issues should go to Charles Molloy, 132 Segars Lane, Southport, PR8 3JG.

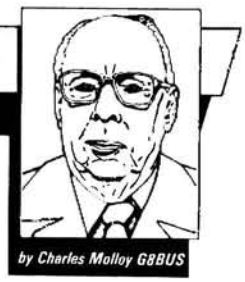
North American Radio-TV Station Guide

Reader **Bill Kelly,** Belfast, has sent me a copy of the latest (15th) edition of this 226-page book, usually known as the Vane Jones list. Bill received it from his nephew who lives in Mesa in Arizona. "Television, f.m., a.m. (medium wave) stations in the United States, Canada, Cuba, Mexico and the West Indies are indexed by geographic location, frequency and call letters. All stations currently on the air plus those that have temporarily ceased operation and those that hold construction permits are listed.

The book is published by Howard Sams under ISB 0–672–22296–5 and should be available on order in the UK. The price, which is $9.95 in the US may be prohibitive at the current exchange rate but the book certainly is a complete guide to broadcasting in North America and the Caribbean and is a useful reference for the DXer.

SW BROADCAST BANDS

Reports... as for Medium Wave DX, but please keep separate.



by Charles Molloy G8BUS

It is easy when using a receiver with digital readout to forget that many, perhaps a majority of sets in use, do not have this facility. My listening today, started a few minutes before 9 o'clock when I tuned the receiver exactly to 7·170MHz. I turned up the a.f. gain to hear a strong carrier, then the Blue Danube interval signal and finally at 0900, the Austrian *SW Panorama* programme, the one I was looking for. A few years ago I would have located 7·150MHz and 7·200MHz with the aid of a crystal calibrator. Then I would have tuned between the two looking for the Austrian interval signal, which is put out to help listeners to home-in on the transmission.

Add-On Digital Readout

Although there is a steady stream of new receivers at the top end of the market we are still struggling away with a tuning scale, pointer and dial cord at the low priced end. Unfortunately these are the sets that a newcomer to the short waves is likely to be using. After a while the advantage of digital readout becomes apparent. "Can I get a gadget to plug-in or add-on, that will show me what frequency I am on?" asks reader **A. H. C. Trickey** who uses a Vega 206 portable.

Regrettably, the answer must be No. A commercially made digital readout (d.f.m) would cost more than the receiver. Then there is the problem of connecting the d.f.m to the portable. "Modern portables are remarkably immune to the addition of add-on accessories," as someone aptly put it. Even the older, more accessible sets can present a problem. I've tried to modify four receivers so that I can plug in an external d.f.m. The easiest was my BRT400 valved communications receiver, but I had by trial and error to find a suitable value for the coupling capacitor. The Realistic DX150A and DX160 had to be re-aligned on the highest frequency band (see *PW* April 1984). On this band the oscillator is tuned to a frequency lower than the incoming signal while on the others it is higher. There was a real problem with an Eddystone EB36 which is a marine version of the EC10. The oscillator is rich in harmonics which give false and erratic readings on the d.f.m.

It is possible to connect a d.f.m to almost any receiver but it can be a task for an experimenter who is able to purchase a kit of parts at moderate cost and who can do the job himself. Some sets are easy. There is a marked point inside the FRG–7 where you can tap on a suitable d.f.m but this is exceptional.

Logging Scales

Some receivers have a logging scale. The DX160, for example, has one marked 0–10–20–––100. There are five additional marks between each main one giving a total of 50 marks in all, on the scale (Fig. 1). It is possible to estimate, using the width of the pointer as a guide, a further 5 positions between each scale marking. We now have 50 times 5 = 250 marker points that can be read off with the pointer. On band D covering 4·5 to 13MHz which is a range of (13 – 4·5 = 8·5MHz) 8500kHz, each of our 250 markers represents (8500 ÷ 250) 34kHz. The logging scale is slightly longer than the others so allowing for this and for errors, we should be able to "measure" where we are to an accuracy of 50kHz. We have to calibrate the scale of course. We do this using known stations and we record the "log scale reading" in a separate column in our receiving logbook. There is little backlash, slackness, in the tuning system of modern sets so we can make full use of the logging scale. Accuracy on Band E, 13 to 30MHz is less at about 75kHz. Band C, 1·5 to 4·5MHz is better at 15kHz while on the medium waves we should be able to identify individual channels, except perhaps at the h.f. end.

What if our receiver does not have a logging scale? We can make one out of a piece of paper and stick it on the glass cover. Alternatively, we can put one round the tuning knob. Set the scale pointer to the extreme left-hand side of its travel and put a mark on top of the knob. With my Vega it takes almost 4 turns of the knob to make the pointer travel the length of the scale. Put a mark on the scale or glass cover every time the mark on the knob is on top. Mark out a circular piece of paper with 10 equidistant points on its rim. Use a protractor if you like for 36 degree spacing. We now have 10 times 4 = 40 marks, not much different than with the DX160 and we can estimate in between points.

A home-made logging scale is no substitute for digital readout but it is an im-

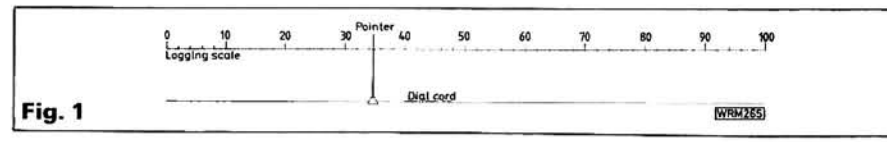


Fig. 1

provement over a normal tuning scale. There is nothing new about fitting a scale round a tuning knob. Some versions of the famous wartime receiver the R1155 had an engraved scale round the main tuner, see illustration on page 51 of the March *PW*, so there must be something in it.

International Programme Guide

"The Complete Directory of Programmes by External Services in English," is how this guide, written in English, describes itself. In 52 pages it lists the English programmes and regular features of some 100 international broadcasting stations that are on the air daily. Times quoted are in UTC, target areas are indicated and adjustments are made for summertime where appropriate.

Since this sister publication of the *International Listening Guide* does not quote frequencies, it is independent of seasonal changes and should remain valid for some time. The previous edition came out in 1982. The *ILG* and the *IPG* should be read together where one gives up-to-date seasonal information and the other longer term programme details. The price for a single copy of the *IPG* is $3 US, $4 Canadian, DM6, £2 or 8 IRCs from the DX Listeners Service, c/o Bernt Friedewald, Merianstr 2, D–3588 Homberg, West Germany (FRG).

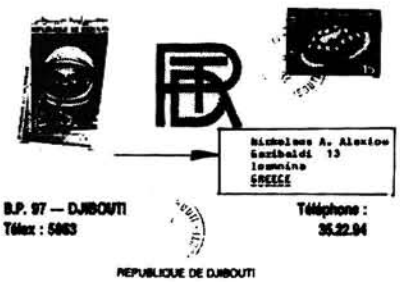
DX Heard

The Grundig Satellit receiver is becoming popular with broadcast band DXers. Reader **Michael Phillips,** Liverpool, used his model 1400 with telescopic antenna to pull in Radio Cameroon on 4·750MHz at 1810, Trans World Radio Swaziland on 9·785MHz at 1830, the Voice of Namibia on 9·595MHz at 1117, WINB on 17·730 at 1917, all with programming in English.

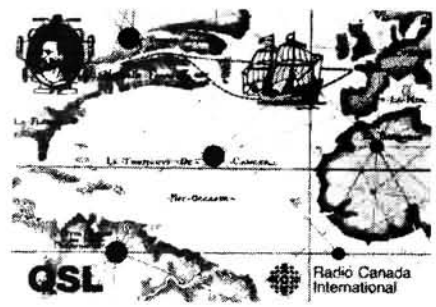
A model 1400SL with 10 metre long-wire antenna produced Hubei in China on 3·940MHz (75m band), Abu Dhabi testing in English on 4·800MHz at 2233, Radio Nepal on 5·005MHz at 1700, Voice of Lebanon on 6·550MHz with news in English at 1700, Radio Tanzania External Service with identification in English, national anthem and sign-off at 1914, for DXer **Graham Powell,** Pontypridd.

"Radio RSA comes through very well from 0300 to 0425 on 3·230MHz (90m band), 4·990MHz (60m) and 5·990 (49m)," writes **Bill Kelly,** Belfast, who describes himself as an insomniac. The receiver is a NRD 515 with 20 metre long-wire antenna.

"I was heartened to read in the January issue the letter from fellow Scot John Masterton, about DX with cheaper type of equipment," observes **David Middlemiss,** Duns, in Berwickshire. His EC10 Mk2 produced the Voice of Greece on 15·345MHz at 1240 with news in English and Dubai in the UAR on 21·8MHz in English at 1330. DX is related to the receiver, antenna and location. A listener with a communications receiver and good outdoor antenna in a country area will obviously do better than a DXer who has to use a portable with whip in a densely populated area full of electrical noise and TV buzz. Please give details of receiver and antenna when sending reports, it will help readers to assess what they are likely to hear.



QSL card from Djibouti sent in by Nickolas Alexiou, Greece



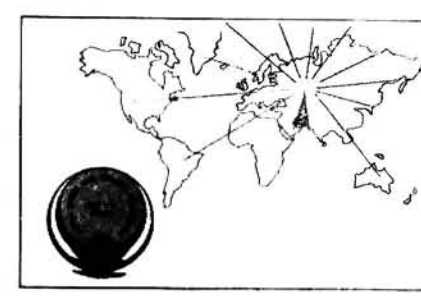
Radio Canada International QSL card sent in by Ron Steadman

Readers' Letters

"At the present time I use a Trio 9R59DX general coverage receiver with a 20 metre-long wire," writes **Mark McVeigh,** Belfast, who is looking for information on short wave antennas. Your 20m random wire should do well with a general coverage receiver. Try using an antenna tuning unit (a.t.u.). Cambridge Kits, who advertise in *PW*, can supply one. It is inserted between antenna and receiver and will ensure maximum transfer of signal from antenna to receiver.

"I am a regular reader of *PW*—I write to ask if any reader could help me with some information plus a circuit diagram on an ex-army valved receiver, a Hallicrafter SX42," writes **Emmanual Achiome** of 55 Chisokrone Flats, Nchanga North, Chingola, Zambia. Try using a shorter antenna and alter its position if you can. This might help with your electrical interference problem. Glad to hear from you Emmanual hope you will write again.

"Recently I had a small tin box touching the back of my receiver (a Grundig Satellit 1400). When I moved the box along the back of the radio the frequency changed. Why is this?" asks **Michael Phillips.** The metal in the box is interfering with the local oscillator and detuning it. You get a similar effect when aligning a receiver if you use an ordinary screwdriver to adjust the dust cores. "My QSL returns for January are Radio RSA 12 days, All India Radio 84 days, KTWR Guam 43 days," reports **Graham Powell.** "I cannot see how one report a year can be of much use to any radio station," says **Ron Steadman** (G1EIW) who is referring to Radio Canada International's complicated do-it-yourself QSL card which is issued once a year. Probably they are only issuing a card to satisfy a demand from listeners!



QSL card from Dubai sent in by Raymond Crowe

VHF BANDS

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.


by Ron Ham BRS15744

Although we all prefer plenty of DX, a quiet period does give us chance to take notice of those infrequent and minor atmospheric events which are often hidden when the bands are wide open and/or the sun is very active. It is always worth making a note in your log about anything unusual, such as a higher than normal background noise, echoing or watery incoming signals, meteor pings, static cracks and exceptional local weather. They may not mean much at the time, but months later you could read about something similar, or hear about it at a club meeting and then you will be in a position to confirm the event.

Solar

The January issue of *Solar News* (published by the London Solar Committee £3 p.a. inc. p&p), reports that committee member, **Bert Wooller** G3GYZ, Hastings, leads a regular net for radio amateurs interested in solar activity. It is held on 3·650MHz, at 0900 clock time on Thursdays. Further details of membership and the observational programmes of the LSC are available from **Bert Chapman,** Brindles, Mill Lane, Hooe, Battle, E. Sussex, TN33 9HT. "The committee feel that there is a great opportunity here to build up a

PHOTO ACOUSTICS LTD. TEL: 0908 610625

58 HIGH STREET, NEWPORT PAGNELL, BUCKS, MK16 8AQ

HF TRANSCEIVERS

NEW	TRIO	TS940S
	TRIO	TS430S
	TRIO	TS830S
	YAESU	FT757GX
	TRIO	TS530SP
	TRIO	TS130S
	YAESU	FT77

ANTENNA TUNER UNITS

TRIO	AT250 auto
YAESU	FC757 auto
TRIO	AT230
YAESU	FC700
WELZ	AC38
YAESU	FRT7700 Short Wave Listening
GLOBAL	AT1000 Short Wave Listening

HF RECEIVERS

ICOM	R70
ICOM	R71
TRIO	R2000
TRIO	VC10 VHF Converter for R2000
YAESU	FRG9600 60-900MHz
TRIO	R600
YAESU	FRG8800 Gen Cov Rx

VHF RECEIVERS

JIL	SX200N
AOR	AR2001 25-500MHz
JIL	SX400N 26-520MHz
REGENCY	HX2000E Handheld

2M FM TRANSCEIVERS

TRIO	TM201A 25W Mobile
TRIO	TM211E 25W Mobile (DCS)
YAESU	FT270R 25W Mobile
YAESU	FT270RN 45W Mobile
TRIO	TR2600E Handheld (DCS)
TRIO	TH21E Miniature Handheld
YAESU	FT209R Handheld

2M FM TRANSCEIVERS (cont.)

YAESU	FT203R Handheld
ICOM	IC02E Handheld

2M MULTIMODE TRANSCEIVERS

TRIO	TS780 2M and 70cm base
YAESU	FT726R 2M fitted (70cm optional) base
TRIO	TS711E 2M base station (DCS)
TRIO	TR9130 25W Mobile
YAESU	FT290R Portable
ICOM	IC290E 10W Mobile
BELCOM	LS202E Handheld

70cm TRANSCEIVERS

TRIO	TW4000A Mobile 2M/70cm
TRIO	TW401A 12W Mobile
TRIO	TM411E 25W Mobile (DCS)
TRIO	TR3600E Handheld (DCS)
TRIO	TH41E Miniature Handheld
ICOM	IC04E Handheld
TRIO	TS-811E Base Station (DCS)
ICOM	IC490E Multimode Mobile
YAESU	FT2700R Mobile 2M/70cms
YAESU	FT709R Handheld
YAESU	FT703R Handheld

SPEAKERS

TRIO	SP230 (TS830, 530)
TRIO	SP430 (TS430)
TRIO	SP120 (TS130, 120)
TRIO	SP40 Mobile speaker
YAESU	SP55 Mobile speaker

WELZ SWR-POWER METER

SP15M	SWR-Power HF/2M 200W
SP45M	SWR-Power 2M/70cm 100W
SP250M	SWR-Power HF 2kW
SP350M	SWR-Power HF/2M/70cm 200W

ANTENNA BITS

Self Amalgamating Tape 10m x 25mm
T-piece polyprop Dipole centre
Polyprop Strain Insulators
Small ceramic Egg Insulators
Large ceramic Egg Insulators
75 ohm Twin Feeder-light duty
300 ohm Twin Feeder
UR67 Low loss coax – 50 ohm
UR43 50 ohm coax – dia 5mm
HS50B 1:1 Balun 1KW
SMC HPT 7MHz TRAPS 1KW

COAXIAL SWITCHES

SA450	2 Way Diecast SO239 (500MHz)
SA450N	2 Way Diecast N plug (500MHz)
CH20A	2 Way Welz S0239 (900MHz)
CH20N	2 Way Welz N plugs (900MHz)
DRAE	3 way SO239 sockets
DRAE	3 way N sockets

MORSE EQUIPMENT

HK708	Straight Key
HK702	Straight Key Marble Base
MK704	Squeeze Paddle
BY1	Bencher
CW3	Practice Oscillator
D70	Datong Morse Tutor
DRAE	Morse Tutor

AMTOR/RTTY EQUIPMENT

AMT2	Terminal Unit
CBM64	Software
BBC	Software
VIC20	Software
PKT1	Packet Switching
RM1	Radio Modem
The Micropatch	
TI-1	Tuning Indicator
CWR	610E RTTY/CW Decoder

ANTENNAS

JAYBEAM	16 ele (2M)
JAYBEAM	10 ele (2M)
JAYBEAM	8 ele (2M)
JAYBEAM	10 XY (2M)
JAYBEAM	8 XY (2M)
JAYBEAM	88 ele (70cms)
JAYBEAM	48 ele (70cms)
JAYBEAM	28 ele (70cms)
JAYBEAM	24 ele parabeam (70cms)
JAYBEAM	18 ele parabeam (70cms)
JAYBEAM	TB3 HF 3 ele beam
JAYBEAM	TB2 HF 2 ele beam
JAYBEAM	TB1 HF rotary dipole
JAYBEAM	VR3 HF Vertical
JAYBEAM	LR1 2M colinear
TONNA	17 ele (2M)
TONNA	9 ele (2M)
TONNA	9 XY (2M)
TONNA	13 ele port. (2M)
TONNA	9 ele port. (2M)
TONNA	21 ele (70cms)
TONNA	21 ele ATV
TONNA	19 ele (70cms)
TONNA	19 XY (70cms)
TONNA	23 ele (23cms)
TONNA	23 ele (ATV)
TONNA	2-way splitter (2M)

WE ALSO STOCK A FULL RANGE OF WPO KITS. RING FOR FURTHER INFORMATION.

CRICKLEWOOD ELECTRONICS LTD

It's no secret!

. . . that there is a *real difference* at *Cricklewood Electronics*. That's why you should never be without the *FREE* CRICKLEWOOD ELECTRONICS COMPONENTS CATALOGUE, for sheer variety, *competitive prices* and *service* from the U.K.'s number one 100% component shop. No gimmicks, no gadgets or computers, just components, millions of them, all easily available by mail order, calling or credit card telephone orders. Just pick up the phone (or a pen) to get your FREE copy now (no SAE required). You have nothing to lose.

CRICKLEWOOD ELECTRONICS LTD.
40 Cricklewood Broadway NW2 3ET
01-450 0995/01-452 0161
Telex 914577
ALL MAJOR CREDIT CARDS ACCEPTED
Phone or write today

TV-DX

EQUIPMENT – PROFESSIONAL ADVICE . . .

Our 1985 catalogue includes everything you need to start an exciting new hobby from a suitable television to aerials, rotators, converters, amplifiers and accessories.

Examples from range: (With the forthcoming Sporadic E season in mind)
(Band 1 VHF Aerials 47-68MHz)

WB1 – Wideband dipole, 24" stub mast (incl. clamp) **£24.80**
WB3 – Wideband 3 element, 72" long (incl. clamp) **£31.80**
WB5 – Wideband Omni directional crossed dipoles, 24" stub mast **£34.60**
Band 1 'in line' Double Notch Filter **£15.45**
WALTHAM 416 6" screen VHF/UHF B&W Television, System B/G operation (5.5MHz sound); covers Bands 1, 3 & UHF with continuous **varicap** tuning for ease of operation. 12 volt and mains operated, all plugs & leads supplied **£73.70**
(adjustment to 6MHz sound for additional cost of £2.50)

We are **THE DXing** Specialists, advice given on ALL reception problems (SAE please)

All prices inclusive of VAT and Carriage
Delivery 7-10 days *Access & Visa welcome*

SOUTH WEST AERIALS (PW)
11 Kent Road, Parkstone, Poole, Dorset BH12 2EH
Tel: 0202 738232

BARCLAYCARD VISA

FREQUENCY COUNTERS

HIGH PERFORMANCE
HIGH RELIABILITY
LOW COST

EX-STOCK DELIVERY

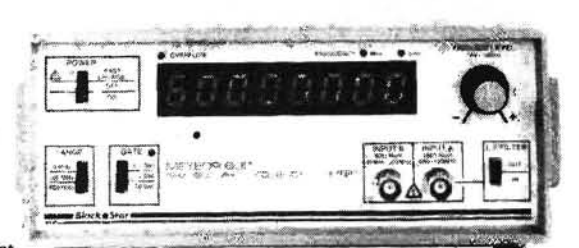
The brand new Meteor series of 8-digit Frequency Counters offer the lowest cost professional performance available anywhere.

- ★ Measuring typically 2Hz 1.2GHz
- ★ Sensitivity < 50mV at 1GHz
- ★ Setability 0.5ppm
- ★ High Accuracy
- ★ 3 Gate Times
- ★ Low Pass Filter
- ★ Battery or Mains
- ★ Factory Calibrated
- ★ 1-Year Guarantee
- ★ 0.5" easy to read L.E.D. Display

PRICES (Inc. adaptor/charger, P & P and VAT)

METEOR 100	(100MHz)	£116.72
METEOR 600	(600MHz)	£147.77
METEOR 1000	(1GHz)	£204 12

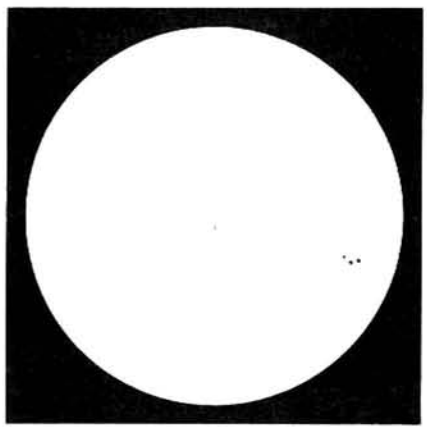
NOW AVAILABE WITH T.C.X.O. OPTION
Illustrated colour brochure with technical specification and prices available on request.



Designed and manufactured in Britain.

Black★Star

BLACK STAR LTD (DEPT. P.W.), 4 Stephenson Road, St. Ives, Huntingdon, Cambs. PE17 4EB, England.
Tel: (0480) 62440 Telex: 32339



◀ Fig. 1

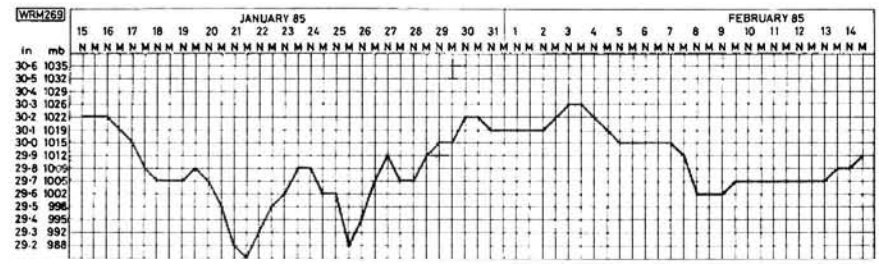


Fig. 2

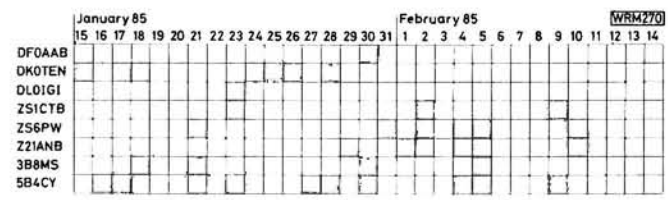


Fig. 3

really outstanding radio section," writes Bert. He says that later in the year the LSC hope to have their own solar radio telescope working.

Although the sun is still generally quiet and behaving typically for this period of the sunspot cycle, the combined efforts of readers have shown some of the less important solar events which otherwise may have gone by unconfirmed. 'Auroral glows and arcs were reported from Glasgow on January 8 and 23," writes **Ron Livesey**, the auroral co-ordinator of the British Astronomical Association.

The magnetic instruments at the Boulder observatory were unsettled on the 15th and active between the 21st and 23rd. There is little doubt in my mind that this was caused by a group of sunspots, Fig. 1, near the west limb, observed and drawn by **Patrick Moore**, Selsey, at 1000 on the 22nd. The following day, **Cmdr Henry Hatfield**, Sevenoaks, using his spectrohelioscope counted about 6 spots, 3 filaments and noted several small flares. These were no doubt responsible for the bursts of radio noise I recorded at 143MHz, during my midday observations on January 20, 21 and 22. As a matter of interest. the last severe noise storm that I recorded was between April 1–5 and 13–18, 1984, sending my recording pen to full scale on the 5th and 17th. Apart from a milder storm from May 12 to 14, there has been nothing like it since. Down in Bristol, **Ted Waring** observed two medium sized sunspots on February 2.

28MHz (10m) Band

Following the visit of VK4BRC and VK4VMB to the home of **John Muzyka** G4RCG, Fig. 4, he and his XYL plan to spend May and June this year in Australia, with the Chalmers. John will be using the call VK4FFB during his stay and he hopes to be active on all bands including 28MHz if it is open. As he is also the awards manager for the North Wakefield RC he says that while abroad, his VK callsign is worth double points in the club award (Fig. 6). Details of this are available by sending an s.a.e. to him QTHR.

Between 1100 and 1130 on January 13, **Gordon Pheasant** G4BPY, Walsall, worked DA2ER, DF6AT and DL2FAG, giving the German stations reports of 42 and receiving 52 from them. "Apparently they had a contest going on and quite a few were audible with weak and watery sounding signals," said Gordon.

During a brief sporadic-E on January 27, Gordon worked EA1MO on s.s.b. and EA1BK on c.w. Later, presumably by F2, he exchanged signals with 5B4DN and at 1616 on the 28th, Gordon had a QSO with SM2GCQ.

In Belfast, **Bill Kelly**, who logged a few Europeans on 28MHz c.w. between 1500 and 1600 on the 27th, reckons that January 1985, "holds the record for inactivity". For his h.f. listening, Bill uses Panasonic DR49 and NRD 515 receivers, Fig. 5, fed by a 7m trapped vertical and/or a 22m-long wire installed on his room.

At 2340 on the 29th **Dave Coggins**, Knutsford, heard his friend and near neighbour, **Tony Usher** make contact, possibly via sporadic-E, with SM5NWX and SM5POS. "Band conditions on 28MHz were quiet as usual, only real activity was in the morning of January 21, when I heard RT5UO in Kiev as well as several other Russian stations," writes **John Desmond**, Cork City. He also managed to log stations from Greece and East Germany on the 23rd and 30th respectively.

Propagation Beacons

"Conditions really terrible on h.f. especially on 28MHz", "Almost a blank sheet", "Nothing at all heard except for January 23rd when DL0IGI and 5B4CY were logged", "A very thin one I am afraid". These quotations from letters show a general theme about the conditions which prevailed on the 28MHz band during the period of this report. However with efforts from Dave Coggins, **John Coulter**, Henry Hatfield, **Ted Owen,** John Desmond, **Chris van den Berg,** the Hague, and **Norman Hyde** G2AIH, Epsom, I was able to compile the monthly 28MHz beacon chart, Fig. 3.

John Coulter chalked up the beacons indicated on February 5 and also reports receiving signals from the 14MHz beacons

Fig. 4

Fig. 5

in Finland OH2B, Madeira CT3B, New York 4U1UN/B and South Africa ZS6DN/B on 14·100MHz. These beacons were listed on the HF Band Plans chart given away with the March issue and I would like to include reports of their signals in future issues. I am sure this will help the RTTY and SSTV enthusiasts who use the 14MHz band a great deal.

At 0937 on January 27, Gordon Pheasant logged the signals from the 50MHz beacon in Gibraltar ZB2VHF and at 1555 on the 28th he received signals with auroral tones, 55A, from the UK beacon GB3SIX.


North Wakefield Radio Club
G4NOK GB2NWR G6WRS
CLUB AWARD
Date..... No..... Endorsed.....
Chairman..... Awards Manager.....

Fig. 6

Roland Jeffery G6DSA, Winsford, using a Kenwood TS660 and half wave dipole at 10m a.g.l., logged the RSGB headquarters beacon GB3NHQ 50·050MHz, on 11 days in January around 519 and GB3SIX on 13 days. GB3NHQ was subject to meteor pings on the 30th and GB3SIX on days 2, 10, 16 and 22. As the TS660 is all mode on 21, 24, 28 and 50MHz, he plans to install a 5-element Tonna for 50MHz, ready for the coming sporadic-E season and a long wire antenna, with a a.t.u. so that he can contribute to the 28MHz beacon chart.

Over in Holland, Chris van den Berg received signals from the 144MHz beacons in Belgium ON4VHF, on January 17, 18, 19 and 20 and February 7 and 9 and Wrotham GB3VHF, on 15 days between January 17 and February 10.

Between January 15 and February 14, I received signals from the RSGB 144MHz beacon at Wrotham GB3VHF (144·925MHz) each day at an average of 539, except for February 4 when it was 569. Such a beacon is a good propagation indicator, it is about 70km in a direct, but undulating, path from my QTH and with a dipole antenna I normally hear a consistent daily signal, so any change in strength is immediately noticed.

Tropospheric

Although the atmospheric pressure, measured at my QTH, began this period on January 15 at 30·2in (1022mb), the high pressure was not to last because it fluctuated in the 29 region, as can be seen in Fig. 2, which is not good for v.h.f. DX. However, a gradual rise from 30·0 at midday on the 29th to 30·3 (1026) on February 3 and back to 30·0 by the 6th. This coincided with a temperature inversion and produced a mild tropospheric opening on the 4th and 5th which put some life into the v.h.f. and u.h.f. bands.

At this QTH in Maldon, Ted Owen's barometer readings were similar with lows of 29·2 (988) on January 21 and 22 and highs around 30·4 (1029) on the 15th and 16th and February 3 and 4. Down south in St. Leonards-on-Sea, **Harold Brodribb** watches the movements of the pressure systems on the weather maps in his daily newspaper, which can provide a ready made set of records.

From Belfast, Bill Kelly reports hearing signals from the new 144MHz repeater in the Isle of Man GB3GD on R1 and writes, "It's putting in a fine signal, giving easy access to northern UK from Yorkshire to Scotland and south Wales". Bill monitors the repeater channels with a SX200 scanner receiver, seen on the right of Fig. 3, fed by a chimney mounted discone antenna.

During the opening on February 4 and 5 **Simon Hamer** heard stations working through the 144MHz repeaters in Aylesbury GB3VA on R4, Buxton GB3HH R4, Leamington-Spa GB3YJ R7 and Stoke on-Trent GB3VT R1, from his QTH in New Radnor.

With all the v.h.f. and u.h.f. contests coming up in the future I look forward to receiving all reports from readers taking part.

Band II

There was little real DX in the Band to talk about this time, until the tropospheric opening early in February. Then, from 0030 on the 4th and throughout the rest of the day, I received strong f.m. signals from several Dutch and French stations and many inter-station "warbles" between 87 and 104MHz. "Excellent opening on February 4," writes Harold Brodribb, who noted that strong French signals were drowning out the local radio stations in Kent and Sussex. Among the strong Frenchmen in the Band that Harold could identify were France Cultur, Frequence Nord and Musique.

During the evening of the 5th, Simon Hamer received transmissions from BBC Radio Leeds and ILR, Radio Broadlands and County Sound, between 92 and 97MHz. On the 3rd, **Andrew Guy,** Newport, using a Crown 6300 music centre and a Band II antenna, logged BBC Radios London and Sussex and ILRs Mercury and Southern Sound and on the 4th, BBC Radio 3 from the Channel Islands and ILR Chiltern.

TELEVISION

Reports. as for VHF Bands, but please keep separate.


by Ron Ham BRS15744

Listening around on the v.h.f. and u.h.f. bands can work hand in glove with DX TV. If you find that conditions are good on v.h.f., you should also find continental and Scandinavian pictures in Band III and if the prevailing opening extends to the u.h.f. amateur bands, then look for DX among the u.h.f. TV channels, 21 to 69 and for amateur television stations between 434 and 440MHz.

Amateur (Fast Scan) Television

The Home Counties TV Group (details in Club News), submitted its application for a TV repeater to serve the area and hopes to site it at a superb location above High Wycombe. Field tests have been conducted, with extremely low power, and P4 pictures have been received by G8LES in Thames Ditton. Further details about the group and its activities are available from **Paul Hancock** G8UAV, QTHR.

Like slow scan television, amateur fast scan television is a fascinating subject and with summer just around the corner, outside activity in this field will increase, so don't forget readers, let me have your reports because it makes interesting reading for people not familiar with the art.

Band I

During his routine lunchtime checks through the television bands, **Simon Hamer,** New Radnor, found some sporadic-E activity. He received pictures from Austria ORF on Ch. E2 48·25MHz, on January 14, the USSR, a programme with Cyrillic captions on Ch. R1 49·75MHz on the 17th, test cards from Sweden, marked TV1 Sverige, on Ch. E3 55·25MHz on the 19th and Norway NRK on Ch. E2 on the 20th. After logging the Icelandic test card RUV Island on Ch. E4 62·25MHz on the 21st and Czechoslovakia CST, with different test patterns on Chs. R1 and R2 on the 23rd Simon called them "a real exotic catch". In addition he received pictures from Italy RAI on their Chs. A 53·75MHz and B 62·25MHz, during the evening of the 30th. That lot should give encouragement to new DXers.

At midday on February 3, Simon decided to take his receiver to Penyfforst Hill and tune through Bands I and III. At 1300, he found Radio Telefis Eireann RTE 1, showing *Bilko,* on their Chs. F and H 191·25 and 207·25MHz, respectively, and a test card from RTE 2 on Ch. J 215·25MHz.

At 2200 on January 28, **Dave Coggins,** Knutsford, Fig. 1, detected auroral reflected signals on Chs. E2 and R1, using his Waltham Mini Star receiver. This can be seen at the middle left of his equipment in Fig. 1, below the Philips ART20, used by Dave for monitoring the u.h.f. channels.

TIMESTEP ELECTRONICS LTD

FRG7 OWNERS ARE GOING — DIGITAL AND SIDEWAYS

And you can join them by using our custom designed DFC70 digital frequency counter. The DFC70 is specifically designed for the FRG7 and gives rock steady read out on all bands with 100Hz resolution. Signal frequency is computed and displayed unambiguously on a state of art LCD display specially made for us in Japan. It is not necessary to drill any holes and only one wire has to be connected to a well marked test point in the receiver.

DFC70 Kit £29.50 Built and tested module £34.50

Will also work with the Lowe SRX30 and Drake SSR/1.

With our new FM7 adaptor module, you will be able to receive sideways modulation (FM as it is otherwise known). Our superb state of art FM detector uses the very latest 3359 chip from Motorola, and has a built in IF filter and a variable squelch control for noise free monitoring. Although specially designed with the FRG7 in mind, it will happily work with other receivers or transceivers with a 455KHz IF amplifier. The FM7 will add a whole new dimension to your listening activities. You will of course be able to follow legal CB contacts but you will also hear the exciting DX being worked by amateurs on 10 metre FM. Used in conjunction with our DFC7 counter, you can accurately tune to a specific CB or amateur channel and so be sure that you will not miss whatever goes on. **Kit Price £12.95. Tested Module £15.95** For FM reception on receivers with any IF up to 50MHz, the FM 42 is the answer to all your problems. *Please state frequency required when ordering.* **Kit Price £16.95. Tested Module £21.95. 10.7MHz version FM107 £13.95. Built and tested module £16.95.**

TIMOTHY EDWARDS MK2 144 MHz PRE-AMP
HEAR IT LIKE YOU NEVER HEARD IT BEFORE

We are proud to announce that the well known RF consultant Timothy Edwards has given us the exclusive marketing rights to his new 2 metre pre-amp. Timothy Edwards RF designs are used by British Telecom amongst others and so you can be sure that this pre-amp will perform to perfection. It employs the incomparable BF981 which has a better noise figure at 2M than the often used 3SK88. Spec. Size (tiny) 34mm × 9mm × 15mm (same as Mk1) Noise figure 1.0db Gain 26db. 2M PRE kit **£4.95.** Built and tested module **£9.95.** For Commercial use on 60 to 200MHz Built only **£14.95** (state frequency required). Versions for 156 or 137MHz kit **£4.95** Built and tested module **£10.95.**

AR2001 MODS. SAE for all data.

NEW LCD COUNTERS

At last a new range of 5 digit LCD counters that will cover up to 200MHz and give 1KHz resolution to 39MHz. Ideal for upgrading short wave receivers with common IFs. This module is the industry standard FC177 counter as supplied by all other major component distributors, only the price is different!

DFC40 0·4MHz £22.50 built DFC41 0·32MHz £28.95 kit DFC42 0·200MHz £32.95 kit DFC43 30-200MHz £28.95

LNA144. OUR ace RF designer Timothy Edwards has done it again! In line 144MHz RF switched pre amp which needs no modification to any rig. Just put it in the co-ax feed, supply 12V and your deaf rx will have ear ache. Uses the BF981 with a total of 4 tuned circuits for the best out of band rejection. The relays are 50ohm gas filled with earthed metal cans and are good to over 800MHz. This was originally designed for 'British Telecom Satellite Division' hence the provision for gold 14GHz SMC connectors. 1dB noise figure and 18dB gain is guaranteed to improve all standard rigs on 144-146MHz. Will fit in standard diecast box (not supplied). Try one in the car under a wing mounted aerial and be surprised. LNA144 kit **£16.95.** Built and tested module **£26.95.**

TONE BURST. Probably the smallest crystal controlled unit available. 1750Hz ±0.1Hz. Supply 5-15V. Will fit in the tiniest of rigs or even microphones.

TBI Kit £8.50.

Built and tested module £12.95.

2M CONVERTER. At last a cheap design to allow you to listen to the fascinating world of two metres. Use with any HF receiver that covers 2–4MHz (the FRG7 is ideal) to cover the complete band including SSB-DX, FM simplex and, of course, the love them or hate them Repeaters. The sensitivity is 0.5uV and can be upgraded later to the ultimate of 0.1uV by the use of either of our Pre-Amps.

DCC144 kit £9.95 Built and tested module £16.95

GAS FILLED RF RELAY. New Japanese 50 ohm low loss gas filled RF relay. Only 0.3dB loss at 433MHz with up to 35 watts input. Ideal for switching pre-amps and aerials. VSWR 1.5:1 at 1GHz. 12 volt coil.

DR12V £4.95.

2M MONITOR RECEIVER. A superb design featuring crystal and ceramic filters coupled with the MC3359 and BF981 results in an almost bomb proof monitor. Single channel with squelch and 500mW audio amplifier. No coils to wind and little alignment required. Uses standard crystals from 'PM Electronics'. **MON2M Kit £28.50.** Built and tested module **£37.50.** Versions for 4 Metres (70MHz) or Marine (156MHz), or on any single frequency in the 40-200MHz range, **kit £29.95.** Built and tested module **£39.95.** (State frequency required). Crystals for all versions **£4.60.** Quote frequency or channel number.

WEATHER SATELLITE RECEIVER. The hard work taken out of a Weather Satellite Station. Based on the enormously successful 2M monitor but specially designed to allow satellite reception with only a small aerial. Supplied with a crystal for 137.5MHz for immediate use. Be ahead of everybody with weather reports, already in use by progressive farmers.

WSAT Kit £29.95.

Built and tested module £39.95

BBC software and interface together with aerials available.

934MHz PERSONAL COMMUNICATION TRANSCEIVER

We now have the incomparable Cybernet Delta 1 934MHz transceiver in stock now. After a few false starts we now can supply this transceiver completely modified for us by Cybernet to the full UK specification. The RX squelch will open at 0.12uV and gives 12dB SINAD at an incredible 0.25uV. We used our £5500.00 Marconi 2019 signal generator for these results and every set is checked by us before delivery. We know of no other supplier that has our level of technical support on their premises. This is the most sensitive receiver of them all. This set has full scan facilities that work properly. If you want the best write and ask us why we were one of the first suppliers to BRITISH TELECOM of 941MHz equipment.

Delta 1 £355.00. Aerials and accessories available.

All prices include postage and VAT. Send 35p for individual data on any of the above.
Mail order only. Please allow up to 28 days for delivery.
TIMESTEP ELECTRONICS LTD, WICKHAMBROOK, NEWMARKET, SUFFOLK.
TELEPHONE NO. 0440 820040 (TECHNICAL ENQUIRIES 3.00 TO 4.00 PM ONLY) TELEX 817015 TIMEST G

Access

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fig. 5

Fig. 6

Fig. 7

Fig. 8

Fig. 9

Fig. 10

Tropospheric

"There was a daytime tropo on February 5 when signals were quite weak, but with some strong stable peaks," writes **Tony Palfreyman,** Sheffield. He received pictures from East and West Germany DDR on Ch. 34 and NDR III, WDR and ZDF on Chs. 43, 40 and 53 and 35 respectively, Holland PTT NED 1 and 2 on Chs. 39 and 45 and a first for Tony, Granada on Ch. 59. Another first for him was a test card enscribed hr 3 FFTM, with a clock, on Chs. 42 and 55. Samples of the German test cards mentioned earlier are shown in Figs. 2 and 3 which Tony received during one of the openings in 1984.

At 0930 on the 3rd, **Harold Brodribb** received strong pictures from Canal Plus around Ch. E5 and negative pictures from French stations on Chs. 51 and 54. At 1020 on the 4th, he added the Belgian test card RTBF1 on Ch. E8 to his score. During that evening he logged negative pictures from French stations on Chs. 21, 23, 34, 46, 48 and 51 and carefully through the u.h.f. band, he found some sort of interference on 23 of the channels between 26 and 68. By rotating a Yagi antenna above his head he located stations in Lille on Ch. E5, Paris on Chs. E6 and 10, Rouen on Ch. E7 and saw the test card scribed "FR3 et Specialise".

During that period, I received weak pictures on Chs. E8, 9 and 10, and also a strong signal from Canal Plus. I see that there is an article about this station and one entitled, TV in the Far East, in issue No. 15 of *Teleradio News* published by HS Publications, 7 Epping Close, Derby, DE3 4HR.

SSTV

In Bude, **Lester Curno** uses an FRG-7 receiver with a long wire antenna and the Spectrum/Scarab combination for SSTV. He logged pictures, on 14MHz, in the latter half of December and in January from DK5AL, DL1SAP, DL7MAI. I1CEL, I1HJP, LA4R, OH6ZS, SM3GOM and found I3FWY and I3XQW both very active.

Between 1000 and 1200 on January 20, around 14·230MHz, I copied SSTV pictures from IC8POF, in Capri, while he was in QSO with an OZ and later, possibly a YU. Although the interference level from other stations using this frequency was high, I did see the complete captions, "QRZ PSE AGN", "MY QTH CAPRI ISLAND" and "PSE UR NAME BTU". At 1020 on the 27th, I received a "CQ" from I4LRH, Fig. 4, followed by a variety of captions such as, "QTH CESENA", "NAME ALLAN" and "I HAVE QRM OVER YOU", which was also the same with me for much of the time on the 14MHz band. Later in the morning I copied a caption from I3XQW, engraved with the callsign G2BAR, who no doubt he was working Fig. 5. Whilst Peter I3XQW was in QSO with OZ1DOZ, I saw him show pictures of a signal strength scale and his quad antenna.

Despite heavy QRM during the early afternoon, I logged captions from IC8POF and signals, not easy to identify, from stations in Italy, Portugal and Sweden. I again received pictures from I3XQW at 0920 on February 3, when he transmitted his "CQ SSTV" captions on photographs of various animals, Figs. 6, 7, 8 and 9, followed by a person's face, Fig. 10. Also on the 3rd, I logged calls from stations in Austria, Finland and Poland, all incomplete callsigns because of QRM and QSB. However, at 1504, I received a strong signal from SM3GOM while he was working G4UFV and a fair signal at 1519 from IC8POF.

My SSTV signals are received, mainly on the 14MHz band, with a long wire antenna feeding a Trio 2000 communications receiver which, in turn, feeds its audio signal into the EAR socket of a ZX Spectrum computer, loaded with the Scarab Systems software. The pictures are monitored on a television screen and for hard copy, like Figs. 6 to 10, I use an Alphacom 32 printer.

During the 3rd, Lester received pictures from SM3GOM and I1CEL, while in QSO and from I5HOR who was working a KP4. Despite much QRM again on February 10, I logged signals from IC8POF and, I am almost sure, that the caption "SSTV TEST", which I received at 1118 came from a YU2. On January 15, **George Ross** G4IEI, using a TS120S, Commodore 64 computer and a JVC CX610GB TV receiver for this mode, exchanged pictures for about 30 minutes with IC8POF.

SPACE & SATELLITES

Reports to: Pat Gowen G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

by Pat Gowen G3IOR

More on Phase IV

Jan King W3GEY, AMSAT Vice President of Engineering, has produced a long-term planning proposal that would involve the joint resources of all current and future AMSAT building groups, and bring numerous financial and technical advantages. Feasibility studies indicate that a global communication system using intercommunicating transponders could be established on board a constellation of six (yes—6!) spacecraft, carried into geostationary orbit by a common carrier as seen in Fig 1, and then ferried through the drift phase of the mission to be deposited individually at points to form a hexagonal pattern around earth (see Fig. 2) rather like the intended yet ill-fated Firewheel mission that sank with Phase IIIa.

Though much of the required technology is currently available, still needed are mechanically despun antenna or platform, drive electronics for this, reaction control system, RCS electronics, Mode 'L' transponder and antennas, sub-satellite separation system, and a synchronous orbit ranging and determination system. (Any offers ?).

To give the bandwidth desirable, Mode 'L' is proposed, split between the pair of satellites at each geostationary point, with the lower spacecraft uplink from 1267·950 to 1268·500MHz giving a downlink from 435·950 to 436·500MHz, whilst the upper s/c accepts an uplink from 1268·500 to 1269·050MHz to supply a 436·500 to 437·050MHz downlink inclusive of beacons. This would permit some 500 simultaneous users, or, allowing for frequency time sharing, a total user community of 75 000. In comparison to the 14MHz band, even allowing a 6-station employment per 3kHz because of skip-differential, giving a world occupancy of around 29 000 amateurs, the Phase IV total system capacity is two and a half times greater!

To the user, access offers no problems, as a 10 watt transmitter to an 18dB uplink antenna (e.g. a pair of 12-turn helixes only 600mm long) would give the 28dBW required (630W e.i.r.p), whilst a 13dB gain antenna, such as a 0·85m boom (6XY Yagi via a low-loss (—1·0dB) cable to a 2dB n.f. pre-amplifier or front end would satisfy the downlink demand.

Whilst technically ideal and quite feasible, it has to be recognised that comparatively few of the amateurs in the Third World, where the exotic callsigns that constitute a DX band abound, will have either the technology or finance to permit them to equip a suitable ground station. In many countries amateur licences do not permit the use of these bands, so in the socio-economic sense the Phase IV concept may only be available to nationals of the more affluent Western European and North American continents.

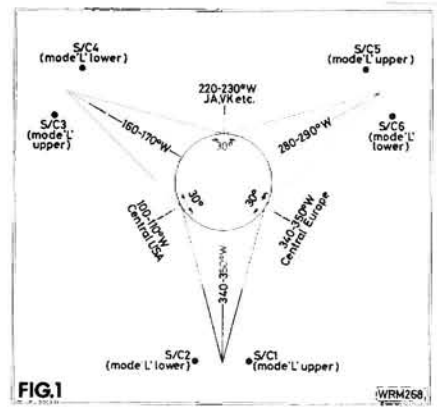


FIG.1

The technical details listed above are a mere precis, as the whole proposal consists of 38 pages of a well documented complex feasibility study, which can be supplied by your scribe in return for photocopying and postage coverage.

To put the proposal into practice, a considerable amount of phasing, international co-operation, good-will, tolerance, effort, sheer hard work and lots of financial support will be needed, and this tends to be in rather short supply in the world of today. We have the technology—do we have the support?

Satellite Reports

Harold Meerza follows the UOSAT pair with great expertise and interest, and has sent in some good copy of the Digital Communications Experiment run to provide a demonstration of the forward and load PACKET on OSCAR-11 in January (Fig. 3). Harold found that there was little difference between receiving this data and the normal 1200 baud text except that it was 80 characters wide (as distinct from the 64 for UOSAT-1) and had no right-hand justification. Harold's copy of the Channel 2 Navigational Magnetometer. Axis whole-orbit-telemetry is also shown in Fig. 4.

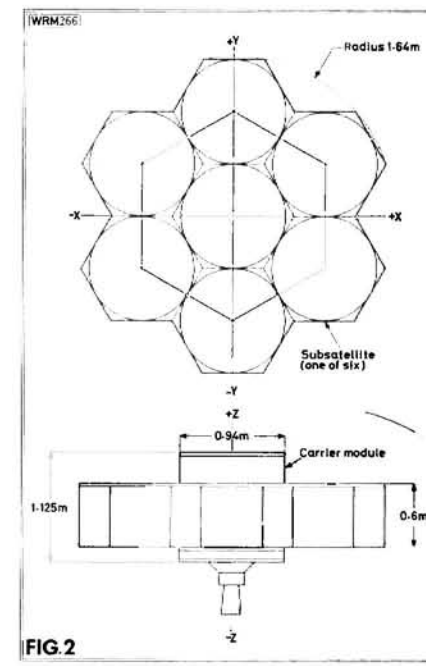


FIG.2

Leo Labutin, UA3CR, reports that apart from a few minor technicalities, both RS-9 and RS-10 are performing up to expectation on both Mode 'A' (144-29MHz bands) and Mode 'K' (21 to 29MHz bands), with a launch confidently expected at the end of the year. Both satellites are now in Kaluga, some 200km south-west of Moscow, undergoing final frequency determination, sensitivity tests, and final checking prior to integration before launch.

Visual observation from HAMSAT enthusiasts has shown that it is the larger satellite of the RS 1 and RS 2 pair that is giving the "5" telemetry, e.g. RS-1, so the RC2CA command is now attempting to command this long-lived spacecraft in order to try to bring it back to full operational status.

On January 25, at 1328UTC, on 29·400MHz, **John Coulter** heard the following frames:

55
5265 5995 5515 5985 5305 5985 5995 5725
5665 5355 5025 5645 5015 5145 5515
55

Leo (UA3CR) states that another way of determining between the satellite pair is to note the c.w. speed, as RS-2 sends 60-65 letters per minute, whilst RS-1 normally sends 80 l.p.m.

```
"LL   UOSAT These messages are u test of the embryonic store and forward packet
radio service on UoSAT-Oscar-11."
"LL   NK6K  DCE message system TEST message; from Redondo Beach; CA."
".JO NK6K  Do you plan to switch beucons .6....?"
"ALL   UOSAT The tests are running on the Digital Communication s Experiment NSC
-800 computer; assisted by the RCA 1802."
"LL   UOSAT They form part of a proof-of-concept demonstration of PACSAT techniq
ues by AMSAT; VITA; and INTER-PARES at the Pacific Telecommunications Council an
nual conference in Honolulu; Hawaii this weekend."
"LL   UOSAT The demonstaration has been organised by Larry Kaylor WA3ZIA; DCE so
ftware and support by Hugh Pett VE3FLL and Harold Price NK6K; UoSAT support and
groundstation activities by Roger Peel G8NEF and Neville Bean G8NOB."
"LL   UOSAT Thanks are also due to radio amateurs in Hawaii; the Los Angeles are
a and the Ottawa area for their assistance."
```

Fig. 3

Alex Kushnirov UI8ABF demonstrating one of his handheld 144–28MHz RS transceivers

A New North Pole expedition using hand-held transceivers to the RS-7 and 8 satellites will provide communications between UK3KP/9, UA3AOC/9 and UZ9KWW en route, with /0 cells or a special at the actual pole point itself. Regular reports will occur on the Sputnik net (Saturday, 1500MSK on 14·292MHz). Topical input and information is always present on this net, which is at 1100UTC in the winter-time, and 1200UTC in the summer. In the main, the net is conducted in the Russian language, but most of the stations present can both speak and understand English, and your participation is welcomed.

Bill Kelly of Belfast has been avidly listening to the 29MHz downlinks, and has heard no re-appearance of the older OSCAR satellites, but noted the '55' suffix of RS-1, plus lots of c.w. activity from both Eastern and Western Europe on RS-5 and 8 around 29·420 and 29·475MHz respectively. It indicates Bill's enthusiasm when his logs commence at 0435UTC in January!

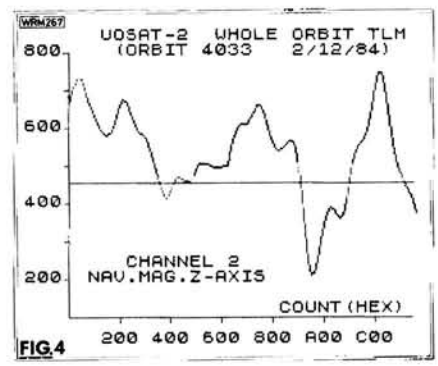


FIG.4

AMPTE

If any reader DID see the artificial aurora planned late on Christmas day last, it probably WAS due to over-indulgence, as the first Barium release was postponed in fact to two days later! Our first report came from Alex, UB5MGW, who first observed the phenomena at 1300UTC on 27 December 1984. At an azimuth of 90 degrees, and at 45 degrees elevation, Alex first saw a bright white spot in the dark sky, from which came rapidly rotating green beams. "They rotated once every two seconds" said Alex "and this effect lasted for about seven minutes. then the bright white spot disappeared after enlargment, being replaced by a large green cloud. A yellow ring then separated from this cloud increasing rapidly in diameter, disappearing at horizon, leaving the sky yellow in colour. The green cloud grew larger and larger, eventually covering the whole sky". Alex saw a repeat performance during the night of January 9, and on both occasions beamed at the effect to call CQ, but without response. **John Branegan** GM4IHJ reports that it would appear, going on Alex's report, that the release missed the magnetopause and the timing and position of the dump underestimated the Solar Wind compression, thus placing the experiment outside the bow-wave. Further experiments are planned, so follow the AMSAT nets for topical updates.

SSTV on STS

Those participating will recall the trauma of the W5LFL STS-9 shuttle mission, when a combination of a super high tropo opening, a reversal of calling and listening times as well as the calling and listening frequencies publicised by the media, and the incredible popularity of the event caused what must have been the world's biggest pile-up. The number of stations making QSOs was inversely proportional to the number calling!

Before the end of next year, a number of similar Spacelab missions may take place, with the list of shuttle astronauts holding amateur radio callsigns growing all the time. Dr. Owen Garriot W5LFL may fly again, as should Dr. Tony England W0ORE, and John Bartoe W4NYZ. A Dutch astronaut candidate should soon have his PA0 callsign also! The 144MHz band (f.m.) will be used again, with a similar hand-held transceiver, though probably modified with controllable squelch circuit to aid discrimination under overload conditions, and with an antenna mounted externally in the payload bay so that spacecraft manoeuvres permit more visibility.

Additionally, it is hoped to fly an auto-manual 14 to 29MHz transponder handling both voice and slow-scan TV. The voice transponder will scan the 145MHz band for f.m. signals in steps of time and channels, giving re-transmission of the uplink as a downlink in the 29MHz f.m. band. On SSTV, the international 8-second monochrome and 12-second colour frame options will be available, used either as a re-transmission on 29MHz of any single frame stored from the stations-on-earth 145MHz uplink transmission, or, can be fed from cameras aboard the shuttle to give images of internal scenes, pictures of earth from space, etc.

What will be essential is some equally dedicated planning by operators back on earth, who will have to stick by the rules to have any hope of a QSO. If you thought that the last space-mobile attempt was chaotic here on earth, then you should have heard it on the shuttle! Your author was fortunate in receiving a complete set of tape recordings of the W5LFL mission, and careful analysis demonstrated that on any one f.m. channel up to 1000 stations were calling continuously when the pass was over the highly populated Western European area, producing merely noise, from which some six UK stations emerged briefly! Over California, it was an entirely different case, as each W6 called for five seconds only, in serial order, giving his callsign once as letters, and once phonetically, and each and every one was perfectly readable. Area groups, via their local repeater, could organise alphabetical order serialisation on each of the dispersed uplink frequencies so that all within a community could effect QSOs by mutual co-operation instead of maximum competitive white-noise production as evidenced for 95 per cent of the pass time on the tapes of the last attempt.

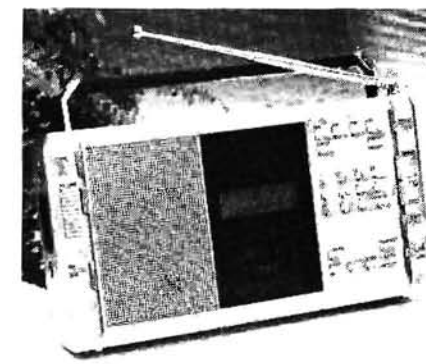
Products

Broadcast Receiver

The ITT Touroport 220 is a sophisticated synthesiser-tuned mains/battery receiver for the traveller or the broadcast bands enthusiast, offering coverage of f.m. Band II, long and medium waves, and each of the short-wave broadcast bands from 120m to 11m (2·3–25·5MHz). The synthesiser is inhibited outside the broadcast bands, and so the receiver is not suitable for reception of the amateur bands.

The keypad is used for frequency entry, plus control of automatic or manual scanning, the ten-station memory and the quartz clock with alarm and sleep-timer facilities, The clock and memories are maintained by an independent set of batteries. Additional features are a three-way tone control, l.e.d. indicators for battery condition and tuning, connections for headphones, external 6V d.c. supply, and an external s.w. antenna. Built-in antennas are a ferrite rod for l.w./m.w. and a telescopic whip for s.w. and f.m.

The Touroport 220 measures approximately 150 × 280 × 60mm,



comes in a stylish crystal silver metallic finish and costs £139.00 including VAT from ITT Consumer Products (UK) Ltd stockists.

A review of this receiver will appear in *PW* in the near future.

RTTY

Reports: as for VHF Bands, but please keep separate.

by Ron Ham BRS15744

The British Amateur Radio Teleprinter Group have announced the inauguration of a Sunday morning s.s.b. phone net on 3·660MHz, to give people interested in the communications modes of AMTOR, Packet Radio and RTTY a chance to chat informally about the subjects. The net is open to all licensed amateurs who should simply call "CQ DATANET", at 1000GMT and join in. When possible, BARTG committee members will participate in the discussions. Listener's reports and comments are also welcome and should be sent to BARTG's chairman, Stuart Dodson G3PPD, 63 Malvern Ave, South Harrow, Middx, HA2 9EU. During the middle of January, **Jack Wingrove,** London, received AMTOR signals from G stations on the 3·5MHz band and Italian and Spanish stations on the 14MHz band using his AFR2000 AMTOR unit. Around the same time Jack logged RTTY signals on the 14MHz band from stations in Australia, Japan and the USA.

During the tropospheric opening on February 4, I copied RTTY signals on the 144MHz band from G4CUS, G4VPM and an exceptionally strong signal from FE6FLB.

Richard Everitt G4ZFE, Huntingdon, is active on AMTOR and RTTY with a Yaesu FT-200 fed with an HF5 vertical antenna for the 7MHz band and an inverted V for the 14MHz band. Richard generates AMTOR and RTTY from a Dragon 32 computer with G4BMK software. "AMTOR is becoming my favourite mode of operation", said Richard who has heard VE3PZ/MM in the Mediterranean, YB0RA and K1RR so far on 14MHz. "My favourite band is 7MHz and I often call CQ with no takers", says Richard and he tells me that he would like to hear from other amateurs using an FT-200 for AMTOR. "B licensees should think about RTTY because it almost equals c.w.," writes **Ron Daly** G8VJY, Newbury. During the December lift he could just read a French signal on s.s.b. at strength 31, but had perfect copy on RTTY at 519.

Between January 15 and February 14, I checked the h.f. bands at random times each day and logged 112 RTTY signals on the 14MHz band, 25 on the 7MHz band and 29 on the 3·5MHz band. An end of period analysis showed that the 14MHz band was dominated by Italians, with Finland, Spain and Sweden joint seconds, over half the stations on 3·5MHz were Gs and Germany and Italy shared the honours on 7MHz.

There was an interesting opening on the 14MHz band during the evening of January 26, when in 30 minutes, I copied strong RTTY signals from stations in Brazil, Canada, Japan and the USA which are included in the monthly list of countries heard or worked, Fig. 1.

Country	Prefix	Band (MHz) 3·5	7	14	21
Andorra	C3			X	
Austria	OE		X	X	
Belgium	ON	X			
Brazil	PY			X	
Canada	VE			X	
Canary Is	EA8			X	X
Ceuta & Melilla	EA9			X	
Denmark	OZ	X	X		
England	G	X	X	X	
Finland	OH			X	
France	F		X		
Germany	DF/DJ/DL	X	X	X	
Greece	SV			X	
Holland	PA	X	X		
Israel	4X4			X	
Italy	I		X	X	
Japan	KA/JA			X	
Malta	9H1			X	
Morocco	CN			X	
Norway	LA/LG			X	
Portugal	CT1			X	
Sardinia	IS0			X	
Sicilly	IT9			X	
South Africa	ZS			X	
Spain	EA		X	X	
Switzerland	HB9	X	X		
Sweden	SM	X	X	X	
USA	K/W1-9			X	
USSR	UA/UB/UT			X	
Wales	GW	X			
Yugoslavia	YU			X	

Fig. 1

Ted Double G8CDW, Enfield, writes that he operates f.s.k. RTTY around 144·6MHz or a.f.s.k. on or around 145·3MHz and always QSLs first time RTTY QSOs 100 per cent.

WATERS & STANTON ELECTRONICS

18-20 MAIN ROAD, HOCKLEY, ESSEX. TEL: SOUTHEND (0702) 206835 - 204965
12 NORTH STREET, HORNCHURCH, ESSEX. TEL: HORNCHURCH (040 24) 44765
MON – SAT 9 AM – 5.30 PM E.C. WEDNESDAY 1 PM
ALL MAIL ORDER ENQUIRIES TO MAIN SHOP AT HOCKLEY

WE'LL GIVE YOU *SPOT CASH*
FOR YOUR GOOD CLEAN UNWANTED GEAR!
TEL: (0702) 204965

NO NEED TO VISIT US AT NEC BIRMINGHAM

FOR THE BEST DEALS ..... WE WILL OFFER THE SAME

SUPER DEALS TO CALLERS OR MAIL ORDER! – TEL: (0702) 206835

All prices are correct at time of going to press but subject to change without notice.

INSTANT CREDIT – BARCLAYCARD – ACCESS – PART EXCHANGE

SPECIAL: VHF/UHF AIRCRAFT LISTINGS

This unique frequency manual contains a complete list of all the VHF civil aircraft frequencies in use throughout the UK plus all the RAF-USAF and MOD airfield frequencies in both the VHF and UHF bands. No other publication offered at anywhere near this price has offered so much new information. Supplies are limited! **£2.95**

SPECIALS!

Communication Headphones low impedance **£5.95**
Deluxe G5RV 80-10m dipoles. Airspaced feeder **£17.95**
SWL Wideband dipole 3-30mHz 50' long **£8.95**

AOR 2001 RECEIVER

£359 + FREE FREQUENCY LIST
WHILST EXISTING STOCKS LAST

A firm favourite amongst listeners. The AOR2001 covers 25-550mHz without gaps. It provides AM/FM and WFM reception and has programmable search 12v DC or 230v AC and specially tweeked by us for best reception.

NEW WELZ PEP METER

1.8mHz – 200mHz
2w/20w/200w
£59!

At last a meter that reads true PEP on both HF and VHF. This unique product now enables you to read average power, pep and VSWR. Surely an essential item in any SSB station. So now you don't have to wonder what your pep output is, you can actually measure it!

ICOM R70 RECEIVER

£579 + FREE H'phones – dipole antenna – prefix maps and SWL book worth £21!

The Icom R70 is the ROLLS ROYCE of receivers. Covering 150kHz to 30mHz it has features far too numerous to list here Suffice to say no other receiver at anywhere near this price can match its performance. As usual, each one is carefully tested by us before sale to make sure it meets its specification.

TRIO R2000 RECEIVER

£479 + FREE H'phones – dipole antenna prefix maps and SWL book worth £21!

The Trio R2000 receiver covers the entire spectrum from 150kHz to 30mHz with no gaps. Its programmable scanning and memories combine to make this SSB/AM/FM receiver a firm favourite. The optional VC10 VHF converter at £128 adds to range 118-174mHz.

YAESU FRG8800 RECEIVER

£509 + FREE H'phones – dipole antenna – prefix maps and SWL book worth £21!

Covering 150kHz to 30mHz this latest offering from Yaesu provides a really high performance receiver. Now with built-in memory and optional VHF module (118-174mHz) it can be thoroughly recommended.

SONY ICF7600DX

AM SSB
£178 + FREE AC PSU & Aerial

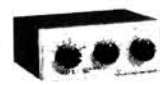
The Sony ICF7600 is a truly remarkable receiver covering 150kHz to 30mHz SSB/AM plus FM broadcast. Despite its size it gives superb performance even from its built-in telescopic aerial. The LCD readout, built-in clock and memories all go to make what is probably the World's smallest communications receiver.

FDK M750XX TRANSCEIVER 2M SSB/CW/FM

£389

A full 20watts SSB/CW/FM at less than £400! Ideal as a mobile or base station this rig will give you plenty of DX and its good sensitivity means you'll hear plenty of DX as well. Complete with DC lead and mobile mounting bracket.

BEST PRICES ON ALL BRANDS INCLUDING:



WELZ AC38 ATU **£85**

3.5 – 30mHz

WELZ SP15M **£49**

1.8 – 160mHz

WELZ SP200 **£87**

1.8 – 160mHz

TRIO, YAESU, ICOM, WELZ, FDK, DIAMOND, JAYBEAM, TONNA, MICROWAVE, MUTEK, SONY, PANASONIC, MINI-PRODUCTS, SAGANT, GLOBAL, BNOS, SAFETY MICS, ROTATORS, DATONG

24 HOUR DELIVERY £6 EXTRA (Recommended for larger items)

WE STOCK VIRTUALLY EVERY MAKE OF HAM GEAR

LARGE STOCKS OF GOOD SECOND HAND GEAR

USE YOUR CREDIT CARD FOR SAMEDAY DESPATCH

FDK SYNTHESIZED MONITORS

ATC720 118 – 138mHz AM £189
RX40 141 – 180mHz FM £159

These professional quality synthesized monitors are ideal for a wide range of monitoring purposes. A number of these units have been supplied to government departments, civil and military airfield use, etc Each receiver incorporates a thumbwheel switch for rock steady frequency selection The units are powered by self-contained, rechargeable batteries and each unit is supplied with AC mains charger and helical whip. The auto tracking front-end tuning means high sensitivity. Other controls include AF and squelch and each receiver has its own built in speaker with provision for an external aerial.

YAESU FT290

£339 INCLUDES FREE NICADS & CHARGER

The FT290 is a legend in its own lifetime. What other rig can offer so much at such a price? Ideal as a portable, fixed or mobile unit the FT290 provides 2½ watts of SSB-CW-FM from 144-146mHz.

FASTEST MAIL ORDER SERVICE – BEST DEALS AROUND – PART EXCHANGE SPECIALISTS

QUARTZ CRYSTALS

STOCK CRYSTALS

CRYSTALS FOR 2 METRES
HC25 £2.15 **FOR ONE CRYSTAL**, £1.96 **WHEN 2 OR MORE PURCHASED**
HC6 £2.15 **FOR ONE CRYSTAL**, £2.05 **WHEN 2 OR MORE PURCHASED**

TX CRYSTALS

HC6/U	4 & 8MHz 30PF	44MHz SERIES RES	RO TO R7	S11, S20 TO S23
HC25/U	12MHz 30 & 40PF	44MHz SERIES RES	RO TO R7	S8, TO S23 & S32
HC25/U	18MHz 25 & 20PF	14/15MHz 20 & 30PF	RO TO R7	S8, TO S23 & S32
HC25		SCANNER XTLS (NOT SR9)	RO TO R7	S8, TO S23 & S32

Full list available on request, please send SAE

4 METRE CRYSTALS FOR 70.26 IN HC6/U AT £2.40 each
TX 8.78250 RX 29.7800
70CM CRYSTALS £5.00/pr or £2.50 each
For Pye PF1 PF2 & PF70 series Wood & Douglas and FDK MULTI U11
SUB(433.2) SU20 RB0 RB2 RB4 RB6 RB10 RB11 RB13 RB14 RB15
ALSO FOR MULTI U11 ONLY SU16 SU18
CONVERTER CRYSTALS IN HC18/U AT £2.85 each
22.000, 38.666, 42.000, 96.000. 101.000, 101.500, 105.666, 116.000
FREQUENCY STANDARDS £2.75 each
HC6/U 1000kHz 3.50MHz 5.00MHz 10.000MHz 10.700MHz
HC18/U 1000kHZ 7.00MHz 10.70MHz 48.00MHz 100.00MHz
Also HC6/U 455kHz £3.25 each
TONEBURST, I.F. & MPU CRYSTALS IN HC18 £2.25 each
7.168MHz (For 1750 HZ Tone), 10.245 (for 10.7 I F.)
3.2768 4.000 5.0688 10.2400 14 3180 15.00000
YAESU CRYSTALS for FT101's FT901 & etc £4.00 each
Many available ex stock (A list is available on request please send S.A E)

MADE TO ORDER CRYSTALS

FUNDAMENTALS

FREQUENCY RANGE	PRICE
5 TO 50kHz	£21.00
50 TO 150kHz	£11.00
150 TO 500kHz	£7.80
160 TO 999kHz	£11.90
1 TO 1.5MHz	£10.75
1.5 TO 2.0MHz	£5.10
2.0 TO 6.0MHz	£4.75
6 TO 21MHz	£4.55
21 TO 25MHz	£8.50
25 TO 30MHz	£8.50

OVERTONES

	FREQUENCY RANGE	PRICE
3rd OVT	21.00 TO 65.00MHz	£4.55
5th OVT	60.00 TO 110.0MHz	£5.10
5th OVT	110.00 TO 125.0MHz	£7.40
7th OVT	125.00 TO 175.0MHz	£10.00

DELIVERY 2 0 TO 175.0MHz 2 to 3 weeks
5 TO 999.9kHz 6 to 8 weeks
1 TO 1 499MHz 3 to 4 weeks

Unless otherwise requested fundamentals will be supplied for 30pf load capacitance and overtones for series resonant operation.
HOLDERS:– PLEASE SPECIFY WHEN ORDERING – else HC25/U supplied for XTLS above 3MHz
HC13/U 6-200kHz HC6/U & HC33/U 170kHz-175MHz HC18/U & HC25/U2 175MHz
DISCOUNTS: Price on application for 10 + units to same frequency/spec. or bulk purchases of mixed frequencies. We supply FREE xtals for use in UK repeaters.
COMMERCIAL CRYSTALS: available on fast delivery and at competitive prices.
Please send for list stating interests.
EMERGENCY SERVICE: for XTALS 1 to 125MHz. Add the surcharge for each XTAL.
Days refer to working days 4 days +£12, 6 days +£7, 8 days +£5, 13 days +£3.
CRYSTAL SOCKETS HC25 £0.20 ea. HC6 £0.25 ea. MINIMUM ORDER CHARGE £1.50 unless ordered with crystals.
TERMS: Cash with order post inc. to UK & Ireland. Cheques & PO's to QSL LTD.
A stamped addressed envelope with ALL enquiries please.

QSL — QuartSLab MARKETING LTD

ALL PRICES ARE EX VAT PLEASE ADD 15%

P.O. Box 19
Erith Kent DA8 1LH

Telephone: 01-318 4419 24 Hr Ansafone: Erith (03224) 30830
Telex: 8813271 GECOMS-G (Attention QUARTSLAB)

S.E.M.

UNION MILLS, ISLE OF MAN
Tel: MAROWN (0624) 851277

SEMFACT – Our Twin Paddle key is often mistaken for imported ones costing over £50.

S.E.M. TRANZMATCH. The most VERSATILE Aerial Matching (Tuning) Unit available. Matches 15-5,000 ohms BALANCED or UNBALANCED feeders up to 1 KW. Air coupled BALUN (no toroids) means no connection to equipment, which can cure TV1 both ways. An SO239 and screw terminals for CO-AX, END FED or TWIN FEEDERS. Size 8¾" × 4" × 7¼". 3.5-30MHz **£80.** 1.8-30MHz **£90.** The highly acclaimed EZITUNE built in (see below) **£29.50** extra. 90% we sell have the EZITUNE option. All Ex-stock.

NEW S.E.M. WAVEMETER. Have you read your licence? Have you got a wavemeter? Produced following so many requests. 1.5-30MHz in 3 switched bands with a very nice meter. Only **£29.50.**

S.E.M. IMABIC KEYER. No better fully auto keyer anywhere. Uses Curtis chip. R.F. proof. Sidetone etc **£38.** A first class twin paddle key **£17.50 Ex stock.**

BRAID BREAKER/HI PASS FILTER. Stop TVI at TV. **£6.50 Ex stock.**

RF NOISE BRIDGE. Adjustable 0-infinity ohms, 3" × 1½" × 2" only. S0239s, 1-170MHz. Neat, accurate & economical. **£34.50 Ex Stock.**

3 WAY ANTENNA SWITCH 1Kw SO239s. Good to 2 metres. **£17.50 Ex stock. Or 4th position to earth** output **£19.80 Ex stock.**

S.E.M. 2 METRE TRANZMATCH. 5½" × 2", 3" deep. SO239s. **£24.90 Ex stock.**

S.E.M. EZITUNE. New circuit. Gives MORE noise & bomb proof operation.

Because no similar unit is made, it's usefulness is not appreciated until you have used one. Eliminates need for S.W.R. bridge.

Clean up the bands, increase your P.A. life by many times, by tuning up without transmitting.

Connects in aerial lead, produces S9 + (1 – 170MHz) noise in receiver. Adjust A.T.U. or aerial for minimum noise. You have now put an exact 50 Ohms into your transceiver. Fully protected, you can transmit through it, save your P.A. and stop QRM. SO239s. 3" × 1½" × 2". **£34.50 Ex stock.** P.c.b. + fixing + instructions to fit in TRANZMATCH or any ATU **£29.50 Ex Stock.**

NEW RANGE

SENTINEL 2M LINEAR POWER/PRE-AMPLIFIERS
Feature either POWER AMP alone or PRE-AMP alone or both POWER AND PRE-AMP or STRAIGHT THROU when OFF. Plus a gain control on the PRE-AMP from 0 to 20dB. N.F. around 1dB with a neutralised strip line BF981.

Ultra LINEAR for all modes and R.F. or P.T.T. switched. 13.8V. SO239s.

Five Models: Ex. Stock
3/36. 12 times power gain, e.g. 3W in, 36W out. **£70**
1/36. 36 times gain, 1W in, 36W out. **£80.**
10/50. 10W in, 50W out. **£86.**
10/100. 10 to 100W. **£135.**
1/100. 1 to 100W. **£148.**

POWER SUPPLIES for our linears 6 amp **£34.** 12 amp **£49.**

SENTINEL AUTO 2 METRE or 4 METRE PRE-AMPLIFIER (R.F. Switched) 1dB N.F. and 20dB gain, (gain control adjusts down to unity) 400W P.E.P. power rating. Use on any mode. 12V 25mA. Sizes: 1½" × 2¼" × 4". **£29.50* Ex stock.**

PA5 Same specification as the Auto including 240V P.S.U. **£33.00* Ex stock.**
SENTINEL 2 METRE PRE-AMPLIFIER. No R.F. switch. **£15.00* Ex stock.**

S.E.M. AUDIO MULTIFILTER (A very good filter at a very good price). The most versatile filter available. Gives "passband" tuning, "variable selectivity" and one or two notches. Switched Hi-pass, Lo-pass, peak or notch. Selectivity from 2.5KHz to **20Hz.** Tunable from 2.5KHz to 250Hz. PLUS another notch available in any of the four switch positions which covers 10KHz to 100Hz. 12V supply. Sizes: 6" × 2½" front panel, 3½" deep, all for only **£65.00 Ex stock.**

SENTINEL AUTO H.F. WIDEBAND PRE-AMPLIFIER 2-40MHz, 15dB gain. Straight through when OFF, 9-12V. 2¼" × 1½" × 3". 200W **£19.55* Ex stock.**

SENTINEL STANDARD H.F. PRE-AMP. No R.F. switching. **£12.62* Ex stock.**

12 MONTHS COMPLETE GUARANTEE INCLUDING ALL TRANSISTORS.

Prices include VAT and delivery. C.W.O. or phone your credit card number for same day service. *Means Belling Lee sockets, add £1.90 for S0239s or BNC sockets. Ring or write for more information. Place orders or request information on our Ansaphone at cheap rate times.

Goods normally by return.

1W AMPLIFIER

Z914 – Audio amp panel 95×65mm with TBA820 chip. Gives 1W output with 9V supply. Switch and vol control. Just connect batt. and speaker. Full details supplied. Only **£1.50**; 10 for **£12**; 25 for **£25**; 100 **£75.**

Z915 – Stereo version of above 115×65mm featuring 2 × TBA820M and dual vol. control. **£3.50**; 10 for **£30**; 25 for **£65**; 100 **£200.**

AM TUNER PANEL

Z916 – For use with mono amp above. Neat panel 60×45mm. Only **£1.50**; 10 for **£12.00.**

NI-CAD CHARGER PANEL

177×114mm PCB with one massive Varta Deac 57×50mm Ø rated 7.2v 1000mAH and another smaller Deac 32×35mm Ø rated 3.6v 600mA. The price of these Ni-cad stacks new is over £20. Also on the panel is a mains input charger transformer with two separate secondaries wired via bridge rectifiers, smoothing capacitors and a relay to the output tags. The panel weighs 1kgm. All this for just **£6.00.**

FIBRE OPTICS

Scoop purchase of single and twin cable. For use with visible light or infra-red. Core 1mm dia, overall 2.25mm dia. Single **50p/m**; 20m coil **£5.30.** Twin **90p/m**; 20m coil **£11.00.**

PCB MOUNTING NI-CADS

Much sought after 4.8V 150mA batts with PCB mntg tags on 25mm pitch. Batt size 25×16 Ø. Ideal for paralleling. **99p ea**; 10+ **85p**; 25+ **70p**; 100+ **60p.**

FM TUNING MODULE. This neat unit 75×40×19mm as used in car radios etc. Standard 10.7MHz IF output. 9-12V DC supply. Full connexion data supplied **£2.40.**

LEADS AT SILLY PRICES!!

PL616 DC adaptor lead for Walkman, 1.8m long **30p.**

PL528 2 pin DIN line skt to phono plug 0.2m long **20p.**

PL508 5 pin DIN to 3 pin DIN audio lead 1.2m long **40p.**

PL541 Intercom extn lead. 3.5mm line skt to 3.5mm plug. 6m long **40p.**

PL708 Video lead. PL259 plug to F type plug. 3m low coax **85p.**

1984/85 CATALOGUE

84 page A4 size – Bigger, Brighter, Better – more components than ever before! With each copy there's discount vouchers, Bargain List, Wholesale Discount List, Bulk Buyers List, Order Form and Reply Paid Envelope. All for just **£1.00!!** Winter Supplement out Now. – Send large SAE for your free copy.

RADIO/AUDIO PANELS

Z908 – Panel 147×38mm with 2 × TDA1004 6W audio amp. IC's *not soldered in!* so they can easily be removed. Also 1000/16, 1000/10 × 2, 470/16 elecs, ceramic discs, R's, also choke. (All easily removed). Stereo Amp? Only **£3.00** (IC's cost **£4 ea**).

Z909 – Another board which escaped the clutches of the flow solder machine – 103×39mm, this is an RF panel with a TDA1200 FM/IF chip & uPC1176C noise canceller + R's & C's inc. tants. Chips cost around £8 together. Price for panel **£2.50.**

Z910 – 139×39mm, this panel has soldered in components – TCA4500A and TBA651R, AM radio with IF amp. Probably complete RF section of radio as IF's and trimmers are on board, + R's, C's etc. **£2.50.**

Z911 – L shaped board 125 × 35mm. Looks like RF section of radio – BF194-5 etc + trimmers & IFs, but tuner is absent **£1.00.**

Z912 – Same as Z909, only components have been soldered **£2.50.**

Z913 – Another L shaped panel 135 × 40mm with non-soldered components including: BC549C × 2, BC208 × 3, BF241 × 2, BF194, coils, trimmers, Rs, Cs, etc. **£1.00.**

POWER/VU METER

Neat unit 40×40mm scaled 0-25 200uA movement. Only **£1.00**; 10 for **£8**; 25 **£17**; 100 **£58.**

Official orders welcome – minimum invoice charge **£10.** No. min. on CWO. Goods normally despatched by return of post

Our store has enormous stock of components and is open from 9-5.30 Mon-Sat. Come & see us!! Minimum Access order £5.00

GREENWELD
443B Millbrook Road Southampton
SO1 0HX Tel (0703) 772501/783740
ALL PRICES INCLUDE VAT: JUST ADD 80p P&P

RST

MAIL ORDER CO.
Langrex Supplies Ltd.,
Climax House,
159 Fallsbrook Road, Streatham, SW16 6ED.

SPECIAL EXPRESS MAIL ORDER SERVICE

	£p
AZ31	2.75
CL33	4.00
DY86/7	1.50
DY802	1.50
E88CC	8.42
E180F	10.20
E810F	35.48
EABC80	1.25
EB91	1.50
EBF80	1.50
EBF89	1 50
EC91	8.00
ECC33	4.50
ECC35	4.50
ECC81	1.75
ECC82	1.75
ECC83	1.75
ECC85	1.75
ECC88	3.50
ECC91	8.93
ECF80	1.50
ECH35	3.00
ECH42	3 50
ECH81	3.00
ECL80	1.50
ECL82	1.50
ECL83	3.00
ECL86	1.75
EF37A	5.00
EF39	2.75
EF41	3.50
EF42	4.50
EF50	2.50
EF54	5.00
EF55	3.50
EF80	1.75
EF86	3.50
EF91	2.95
EF92	6.37
EF183	2.00
EF184	2.00
EH90	1.75
EL32	2.50
EL33	4.00
EL34	4.00
EL36	2.50
EL81	5.25
EL84	2.25
EL86	2.75
EL91	9.68
EL95	2.00
EL360	8.50
ELL80	19.00
EM81	2.50
EM87	2.50
EN91	6.50
EY51	2.75
EY86	1.75
EY88	1.75
EY500A	3.00
EZ80	1.50
EZ81	1.50
GY501	300
GZ32	4.00
GZ33	4.75
GZ34	3.00
GZ37	4.75
KT61	5.00
KT66	15.00
KT77	12.00
KT88	20.00
N78	15.00
OA2	3.25
OB2	4.35
OC3	2.50
OD3	2.50
PC86	2.50
PC88	2.50
PC92	1.75
PC97	1.75
PC900	1.75
PCF80	2.00
PCF82	1.50
PCF86	2.50
PCF801	2.50
PCF802	2.50
PCF805	1.70
PCF808	1.70
PCH200	3.00
PCL82	2.00
PCL83	3.00
PCL84	2.00
PCL85	2.50
PCL86	2.50
PCL805	2.50
PD500	6.00
PFL200	2.50
PL36	2.50
PL81	1.75
PL82	1.50
PL83	2.50
PL84	2.00
PL504	2.50
PL508	2.50
PL509	6.00
PL519	6.00
PL802	6.00
PY33	2.50
PY81	1.50
PY82	1.50
PY83	1.25
PY88	2.00
PY500A	4.00
PY800	1.50
PY801	1.50
QQV02-6	31.80
QQV03-10	23.50
QQV03-20A	48.38
QQV06-40A	75.00
QV03-12	6.80
R18	3.00
R19	9.24
SP41	6.00
SP61	4.00
U19	13.75
U25	2.50
U26	2.50
U37	12.00
UABC80	1.25
UBF89	1.50
UCH42	2.50
UCH81	2.50
UCL82	1.75
UCL83	2.75
UF89	2.00
UL41	5.00
UL84	1 75
UY41	2.25
UY85	2.25
VR105/30	2.50
VR150/30	2.50
Z759	25.00
Z803U	25.00
2D21	3.25
3B28	40.00
4CX250B	45.00
5R4GY	3.50
5U4G	3.00
5V4G	2.50
5Y3GT	2.50
5Z3	4.00
5Z4GT	2.50
6/30L2	1.75
6AB7	3.00
6AH6	5.00
6AK5	5.99
6AL5	1.50
6AM6	6.02
6AN5	4.75
6AN8A	3.50
6AQ5	2.25
6AR5	25.00
6AS6	8.86
6AS7G	8.75
6AT6	1.25
6AU5GT	5.00
6AU6	2.50
6AW8A	3.75
6B7	3.25
6B8	3.25
6BA6	1.50
6BA7	5.00
6BE6	1.50
6BH6	2.50
6BJ6	2.25
6BN6	2.00
6BQ7A	3.50
6BR7	6.00
6BR8A	3.50
6BS7	6.00
6BW6	6.00
6BW7	1.50
6BZ6	2.75
6C4	1.25
6C6	3.50
6CB6A	2.50
6CD6GA	5.00
6CL6	3.75
6CH6	13.00
6CW4	8.00
6D6	3.50
6DQ5	6.00
6EA8	3.00
6EH5	1.85
6F6	3.00
6Gk6	2.75
6H6	3.00
6HS6	3.77
6J5	4.50
6J6	8.93
6J7	4.75
6JB6A	5.00
6JS6C	6.00
6K4N	2.50
6K6GT	2.75
6K7	3.00
6K8	3.00
8KD6	7.00
6L6G	3.00
6L6GC	3.50
6L7	2.50
6LQ6	7.50
6Q7	3.75
6SA7	3.00
6SC7	2.75
6SJ7	3.25
6SK7	3.50
6SL7GT	3.00
6SN7GT	3.00
6SS7	2.75
6SG7M	2.50
6U8A	2.25
6V6GT	2.25
6X4	2.00
6X5GT	1.75
12AX7	1.75
12BA6	2.50
12BE6	2.50
12BY7A	3.00
12HG7	4.50
30FL1/2	1.38
30P4	2.50
30P19	2.50
30PL13	1.80
30PL14	1.80
572B	40.00
805	45.00
807	3.75
811A	18.33
812A	29.50
813	65.00
866A	20.03
872A	20.00
931A	18.50
2050	7.00
5763	4.50
5814A	4.00
5842	12.00
6080	14.00
6146A	8.25
6146B	12.00
6883B	8.25
6973	4.00
7360	10.00
7586	15.00
7587	23.00

Open daily to callers: Mon-Fri 9 a.m.-5p.m.
Valves, Tubes and Transistors – Closed Saturday
Terms C.W.O. only, allow 7 days for delivery. Tel. 01-677 2424/7.
Prices excluding VAT add 15% Quotations for any types not listed S.A.E. **Post and packing 50p per order** **Telex 946708**

Prices correct when going to press

PRACTICAL WIRELESS P.C.Bs

We have in stock PCBs for every Practical Wireless project from 1978, so delve into those back issues of Practical Wireless and find that project you promised yourself you would build, then give us a call and we will be pleased to quote you for the PCBs.

E.G. January 1980 AF Speech Processor WR068 £2.98

This is just one of the many exciting projects you can build from Practical Wireless.

June 1983	PW RTTY	WR167	£4.50
July 1983	Marchwood Power Unit	WR161	£3.00
July 1983	PW Seven	WR169	£2.75
July 1983	PW Seven	WR168	£2.00
July 1983	PW Prescaler	WR172A	£3.00
July 1983	PW Prescaler	WR171	£1.75
Oct 1983	PW Capacitance meter	WR174	£2.75
Oct 1983	PW Digital calibrator	WR173	£3.50
	PW Dart	WR176/177/178	£3.75
	Bridport	WR182 (each)	£2.75
	Transceiver Box Unit	WR179	£4.00
	PW IF Signal Generator	WR175	£5.00
May 1984	Top Direction Receiver	WR183	£4.00
May 1984	Top Band Receiver	WR184	£4.30
June 1984	Auto Notch Filter	WR185	£3.25
		WR187	£2 50
		WR188	£2.50
	Bug Key with memory	WR189	£4.45
	Modifying FRG7	WR190	£3.25
	Remote MF Loop	WR191	£2.50
	Remote MF Loop	WR192	£3.00
	Bug Key with memory	WR192/A/B	£6.50
	Battery State Indicator	WR193	£3.50
	Modifying FRG7	WR194	£3.50
	Stable Tone Burst	WR195/A/B	£3.50
	PW Teme	WR196	£5.00

Please send Cash with Order Barclaycard Visa

C. BOWES & COMPANY LTD,
Unit 7, Kenwood Road, Reddish, Stockport, Cheshire SK5 6PH.
Tel: 061 432 9434
Goods by Return

WPO COMMUNICATIONS

HOME CONSTRUCTORS –

Why not join the ranks of satisfied customers building our products? We supply kits with copious instructions, all parts and specialise in HF Projects which really work!

MICRON – 6 BAND HF CW QRP TRANSCEIVER. Our latest kit for the QRP enthusiast covering 80, 40, 30, 20, 15 & 10 metres CW. 6-10W o/p fully filtered and variable. Sensitive Rx with AGC, S Meter, RIT, Attenuator, switchable filtering etc. Screened, solder masked pcbs and detailed instructions. Custom case/Digital display/Internal ATU/SWR metering available. Prices start at **£99.50** for 2 band basic pcb kit (state bands) or **£145** for 6 band basic kit. Case and Hardware @ **£46.20,** Display Kit @ **£38.50** and ATU at **£37.00.** All the above for **£241.00.** Optional Preamp @ **£15.00.**

DSB80 – over 1,000 sold since its introduction. A QRP Rx/Tx (VFO controlled) for 80 or 160m, 2W+ output with a very sensitive Rx. Complete pcb Kit for either band **£39.95,** or with a punched (plain finish) aluminium case/hardware & digital display for **£85.00.** Kit and Case @ **£62.00.**

ALPHA – our 50W full specification SSB Transceiver for either 20 or 160 metres. 90dB + Dynamic Range all on a single pcb. Complete with custom case/hardware/ digital display and mobile mounting bracket for **£179.95.** Variable RF output down to 4W, Sidetone and lots of other features. Optional CW filtering available.

UNIVERSAL MORSE MEMORY – our unique digital storage device which can be used with any type of key, including HAND keys. Totally variable message time from 10 seconds to 2 minutes at any input/output speed. Ideal for Contests, CQ Calling etc. Special MS version (1–15 seconds). 9v battery or external 12v supply needed. Ready Built @ **£52.45.** Works just like a variable speed tape recorder!

PARAMETRIC EQUALISER – tired of poor microphone response? Or is your voice lacking punch? Then you need this – the professional method suitable for SSB or FM/AM. Not like Standard Audio processors, this has variable frequency LOW and HIGH band controls, 12dB BOOST/CUT controls, and variable SHELVING. VOGAD controlled Hi-Lo Z input, and output Gain control. ALSO, it has an internal 2W AF amplifier and can be used to improve your receiver frequency response if you prefer! Please state 4 or 8 pin MIC input. PPE-1 – **£53.45** as a Kit or **£72.45** Ready Built. Kit & Built versions both come with low profile Custom Case. Need +12v supply.

SPEECH PROCESSOR – popular AF Processor with VOGAD and lots of filtering for low distortion and suitable for any mode. Uses SL6270. Pcb Kit **only £14.65.**

ALL PRICES INCLUDE VAT AND POST. DELIVERY 7-28 DAYS OR QUICKER IF POSSIBLE.
Export a pleasure – Europe use UK prices, rest of world UK + 5%.
Full Catalogue 50p in stamps please

ACCESS/VISA – USE OUR 24 HOUR ANSWERING SERVICE ON 07918 6149

MAIL ORDER ONLY or via our Agents, Photo Acoustics. ORDER YOUR WPO KIT NOW!

20 FARNHAM AVENUE HASSOCKS WEST SUSSEX BN6 8NS

The New 1985 Catalogues from Telecomms

934 Mhz Personal Radio Edition

For the first time in the UK a fully comprehensive catalogue of equipment for this exciting new band, together with many pages of vital technical information. Send £1 now for your copy and receive a £2 Telecomms Voucher.

27 Mhz CB & Amateur Radio Edition

Over 40 pages crammed full of CB products for the UK together with useful technical information. This catalogue is a must for any 27 Mhz CB or amateur radio enthusiast. Send £1 today for your copy and receive a £2 Telecomms Voucher.

TELECOMMS THE UK's LEADING PERSONAL RADIO DISTRIBUTOR

189 London Road, North End,
Portsmouth, Hants. PO2 9AE.
Tel: (0705) 662145. Telex: 869107. Telcom G.

J. BIRKETT

25 THE STRAIT, LINCOLN LN2 1JF. TEL 20767

TELEPHONE DIALER CHIP with re-dial feature. Brand New with data and circuit for use @ **85p.**
50 ASSORTED BC 107-8-9 TRANSISTORS untested for **60p.**
30 ASSORTED SILVER MICA CAPACITORS for **50p.**
NUT FIXING FEED THRU's 3000 Volt insulation @ 6 for **50p.**
SMALL 0.1uf 50 v.w. DISC CERAMICS @ 5p, SUB-MIN 0 01uf 63 v.w. @ **25p** doz.
UHF POWER TRANSISTORS BFR 64 470MHz, 24 Volt 4 Watt @ **£4**, BLY 53A 470MHz 7.5 Watt 12 Volt @ **£6.95,** PT 4642 470MHz 2 Watt 12 Volt @ **£1.95,** MRF 511 2.1GHz 3 Watt 12 Volt @ **£4.30.**
BRIDGE RECTIFIERS 100 PIV 20 Amp @ **£1.30,** 100 PIV 10 Amp @ **95p.**
TAG ENDED ELECTROLYTICS 16+16uf 450 v.w. @ **45p,** 32+32uf 350 v.w. @ **45p.**
FETS J304 @ 6 for **£1,** E304 @ 7 for **£1,** J230 @ 5 for **60p.**
100 ASSORTED RESISTORS ½ Watt for **40p, 25 ASSORTED VARI-CAP DIODES @ 50p.**
20 ASSORTED TANTALUM CAPACITORS @ 85p.
50 METAL SPACERS ASSORTED @ 35p, 50 INSULATED STAND-OFFS ASSORTED @ 45p
VMOS POWER FETS VN1 0KM **50p,** VN90AA @ **80p,** WM211 @ **40p.**
TTL I.C's SN 7400 @ 6 for **75p,** SN 74L00, SN 7410, 7430. All @ 4 for **60p.**
FETS TIS14 @ **20p,** MFE 131 @ **20p,** 2N 3819 @ **20p,** J177 @ **25p.**
TRIACS 400 PIV 1 Amp @ 6 for **£1, PUSH FIT TRIACS** 400 PIV 8 Amp @ 5 for **£1.**
MORSE OSCILLATOR KIT with instructions @ **£1.95.**
144MHz WAVEMETER KIT as in PW Oct 1983 with instructions @ **£4.65**
20 ASSORTED HC6U CRYSTALS @ £1, 20 ASSORTED FT 241 CRYSTALS @ £1.
20 FT 243 Metal Type @ **£1, 20 ASSORTED 10XAJ CRYSTAL @ £1.**

WOOD AND DOUGLAS KITS AVAILABLE BY POST AND FOR CALLERS.
ACCESS AND BARCLAY CARDS ACCEPTED P&P 50p, Under £5, over free. *Goods normally by return.*

BATC TELEVISION RALLY/SHOW

The **BRITISH AMATEUR TELEVISION CLUB** annual rally will be held on Sunday May 5th at the **POST HOUSE HOTEL,** Crick, Nr. Rugby (just off exit 18 on the M1). Everything concerned with TV will be there: **FAST SCAN, SLOW SCAN, NBTV, COMPUTERS, TRADERS, BRING-AND-BUY, LIVE DEMONSTRATIONS, EXHIBITS, LECTURES** etc . . .
Excellent hotel facilities , plenty of room for the family. For latest information dial the **BATC HOTLINE** on 0533 600108 or page **PRESTEL** No. 8008 20020.

ADMISSION FREE

RSGB National Amateur Radio Convention

National Exhibition Centre, Birmingham

Saturday 13th April 10am to 6pm Sunday 14th April 10am to 5pm

FEATURING

- **Lectures on HF, VHF and Microwaves**
- **Introduction to Amateur Radio for Beginners**
- **Special session on Packet Radio**
- **Major Exhibition of Amateur Equipment & Components**
- **Forum each day for Repeater Enthusiasts**
- **RSGB stand with book sales and representation by many of the Society's committees**
- **Bigger Flea market as a result of last year's success**

Entrance Fee £2.50 (Children ½ price) Car Parking Free

Organised by the Radio Society of Great Britain

When replying to Classified Advertisements please ensure:

(A) That you have clearly stated your requirements.
(B) That you have enclosed the right remittance.
(C) That your name and address is written in block capitals, and
(D) That your letter is correctly addressed to the adviser.

This will assist advertisers in processing and despatching orders with the minimum of delay.

SMALL ADS

The prepaid rate for classified advertisements is 38 pence per work (minimum 12 words), box number 60p extra. Semi-display setting £12.60 per single column centimetre (minimum 2.5 cms). All cheques, postal orders etc., to be made payable to Practical Wireless and crossed "Lloyds Bank Ltd". Treasury notes should always be sent registered post. Advertisements, together with remittance should be sent to the Classified Advertisement Dept., Practical Wireless, Room 2612, IPC Magazines Limited, King's Reach Tower, Stamford St, London. SE1 9LS. (Telephone 01-261 5785).

NOTICE TO READERS

Whilst prices of goods shown in advertisements are correct at the time of closing for press, readers are advised to check with the advertiser both prices and availability of goods before ordering from non-current issues of the magazine.

Receivers and Components

VINTAGE WIRELESS SPARES. Valves, radios, amplifiers, service data. Antique wireless newsheet sample upon request. Mail order. VINTAGE WIRELESS COMPANY, Cossham Street, Mangotsfield, Bristol BS17 3EN. Tel. 0272-565472.

RADIO CANADA, Peking, Australia, Voice of America. A Vega 206 (6× SW/MW/LW) pulls these and dozens more. £23.95. Year's guarantee. Return despatch. CORRIGAN-RADIOWATCH, Building 109, Prestwick Airport, KA9 2RT.

RESISTORS 1,000 mixed ⅛w, ¼w, ½w, 2%, 5%, 10%, C.Film £3.45 inc p&p D. J. HOOKER, Romney Marsh Electronics, Pennywood, Clark Road, Greatstone, Romney Marsh, Kent TN28 8PB.

AVCOMM LTD.
171 NORTH STREET, BEDMINISTER, BRISTOL
TEL. (0272) 633869

HP 5082-2396 unpasivated Schotky diodes (matched ring quad encapsulated) with info **£3.00.** BF981 @ **£1.** 1N4148 @ **2p.** 0.5pf-6pf Glass piston trimmers @ **45p.** 5pf-28pf Piston trimmers @ **35p.** 25pf Beehive trimmers @ **5/40p.** 250pf Min var. caps ¼" spindle @ **50p.** Yellow L.E.D.s @ **10/£1.** 500pf & 1000pf 500v Bolt in feed thru's. @ **35p.** 1000pf 10KV caps. @ **50p.** 1000pf 100v Disc ceramic caps. **10/35p.** LITTON MICRO DIAL multi turn counter with lamp @ **£1.50.** BZY93 C51 51v 20w diodes & BZY93 C13 13v 20w diodes @ **50p.** Ex-equip. 75pf + 75pf var caps @ **£2.00.** 33000 40v can electrolytics **£2.00.** 9v 20a s.p.c.o. relay @ **£1.75.** Mains 25v 40va transformer @ **50p.**

POST & PACKING 50p
LATEST LIST CONTAINING MANY BARGAINS 25p

CRYSTALS Made to order for any purpose and large stocks of standard frequencies for computers, modems, etc. Amateur CW (QRP) freqs *£4.00* and CB conversion crystals at *£4.50.*
PROGRAMMABLE OSCILLATORS (PXO) for baud rates, MPU, and freq markers *£12.50.*
FILTERS Crystal, monolithic, mechanical and ceramic for all standard IF's. Special 10.695MHz for big improvement to most CB rigs at *£4.50 each.*
S.A.E. FOR LISTS. PRICES INCLUDE VAT AND POST

P. R. GOLLEDGE ELECTRONICS
G3EDW, Merriott, Somerset, TA16 5NS
Tel. 0460 73718

REALISTIC PRO-30 Hand held scanning receiver. Covers Air, Ham, Public Services etc. Brand new, in box. Includes Batteries, instructions. £200. Phone Weybridge 40966.

HUNT ELECTRONICS 1985 Components catalogue. Send 50p in stamps. Refunded with first order, to P O. Box 57, Derby, DE6 6SN. (0283) 703071.

METRO ELECTRONICS
STOCK CLEARANCE

WIREWOUND RESISTORS (pc mtg)
500 mixed GWPCH, 3W to 9W **£5.00.**
LOW VALUE W/WOUND (axial leads)
400 mixed TW, 1W (12R.Max) **£5.00.**
METAL FILM (Hi-stab)
400 mixed PMF, 1% 50PPM **£5.00.**
POTENTIOMETERS PR16 (Cond. plastic)
Dual/single, bush mtg, plastic shaft.
Lin 1K, 2K2, 4K7, 10K, 22K 100K, 220K, 470K, 1MO.
Log. 10K, 22K, 47K, 100K, 220K, 470K, 1MO.
Prices, quality per single value/law.
Dual **£1 50/10;** Single **£2.00/10;** Bulk **£75.00/500.**
MOULDED CARBON POTS
ES, Lin, 10K + SW **£0.50,** E, 25K Log **£1 00 each.**
Pot. Packs, Grade 1 – **£5 00/25.** Grade 2 – **£6.00/50.**
TRIMMERS VN15, 330R, 470R, 1KO, 4K7, 100K, 220K.
Prices, quantity per single value.
330R to 100K **£8.50/100; £2.50/10.**
220K, **£5.00/100; £2.00/10.**
SWITCHES (SP, DP, 4 pole; 2/3 posn, biased)
Bargain pack (10 miniature toggles) – **£3.75.**
Rocker switches, 2Amp 240V – **£2.00/pack 3.**
R.F. CHOKES (Plessey type C miniature)
Mixed packs 25 – **£4.00;** 50 – **£7.50;** 100 – **£12.00.**
Minimum Order £5.00 plus p/p £0.75
Cheques/P.O. to:

H. Clark, Metro Electronics,
6 Pembury Road, Westcliff, Essex SS0 8DS.

VALVES CV6060 £20/100, EF80 & 81 £10/Doz, 6CH6 £12/Doz, 6V6GT EF80 & 81 EL82 £6/Doz. Tel. 0795 872133.

Books and Publications

RADIO & RTTY BOOKS

CONFIDENTIAL FREQUENCY LIST – New 6th edition listing thousands of Aero, CW, Coastal, etc. stations worldwide **£11.90 + 80p p&p**
CLANDESTINE CONFIDENTIAL – New guide to Rebel & Secret SW stations **£6.20 + 60p p&p**
GUIDE TO RTTY FREQUENCIES – Lists 4,500 commercial, Aero, UN, Coastal. etc frequencies **£3.85 + 60p p&p**
WORLD PRESS SERVICES FREQUENCIES – News RTTY Services listings by Frequencies, GMT & country, plus more **£6.20 + 60p p&p**
RTTY TODAY – Beginners Guide to RTTY decoding **£6.20 + 60p p&p**

2+ BOOKS P&P FREE

INTERPRODUCT LTD
PW15, Stanley, Perth PH1 4QQ. Tel: 073882-575

Educational

COURSE FOR CITY & GUILDS. Radio Amateurs Examination. Pass this important examination and obtain your licence, with an RRC Home Study Course. For details of this and other courses (GCE, Career and professional examinations, etc.,) write or phone: THE RAPID RESULTS COLLEGE, Dept JX15, Tuition House, London. SW19 4DS. Tel. 01-947 7272 (9am-5pm) or use our 24hr Recordacall Service: 01-946 1102 quoting Dept JX15.

For Sale

USED AMATEUR EQUIPMENT?
I BUY, SELL & EXCHANGE
My low overheads mean the best possible deal for YOU!
Whether buying or selling Phone Dave on
HORNCHURCH (040 24) 57722 ANYTIME
or send SAE for latest list to:
G4TNY ELECTRONICS
132 Albany Road, Hornchurch, Essex RM12 4AQ.
NEW EQUIPMENT SUPPLIED AT COMPETITIVE PRICES!

AERIAL ACCESSORIES. G5RV TYPE AERIALS. Half-size £13.50, Full-size £15.50. NEW HARD DRAWN COPPER AERIAL WIRE, 140ft 14swg £7.90; 50 metres 16swg £6.90. Enamelled soft copper wire 10 metres 12swg £3.50, 50 metres PVC covered aerial wire, £4.20. Ceramic Egg Insulators 40p. Guy Rope 4mm Polypropylene 50 metres £3.95. 4mm Nylon 50 metres £6.90. 1 KW 1: 1 Baluns £13.00. All items post paid. S.M. TATHAM G3RSY, 1 Orchard Way, Fontwell, Arundel, West Sussex.

ORDER FORM PLEASE WRITE IN BLOCK CAPITALS

Please insert the advertisement below in the next available issue of Practical Wireless for .....
insertions. I enclose Cheque/P.O. for £ ..... CAT. heading .....
(Cheques and Postal Orders should be crossed Lloyds Bank Ltd. and made payable to Practical Wireless)

NAME .....

ADDRESS .....

.....

PRACTICAL WIRELESS
Classified Advertisement Dept., Room 2612,
King's Reach Tower, Stamford Street,
London SE1 9LS Telephone 01-261 5785
Rate **38p** per word, minimum 12 words.
Box No. **60p** extra.

Company registered in England. Registered No. 53626. Registered Office: King's Reach Tower, Stamford Street, London SE1 9LS. 5/85

Veteran & Vintage

WANTED. Service sheets for radios of 20s, 30s and 40s. Small or large quantities purchased. 5 Holcombe Avenue, Bury, Lancs. Tel. 061-797 5653.

VINTAGE RADIOS over 200 stocked, 1920-1950s. Valve radios, amps, etc. Repaired/restored. RADIO VINTAGE, 250 Seabrook Road, Seabrook, Hythe, Kent. Phone anytime (0303) 30693.

Aerials

G2YF D.I.Y. H.F. long and medium wave frame antennas S.A.E. for details: F RYLANDS, 39 Parkside Avenue, Millbrook, Southampton.

ANTI-TVI AERIALS
Data Sheets, Large 24p
SAE Aerial Guide £1.00
G2DYM, UPLOWMAN, TIVERTON, DEVON
Callers Welcome by Appointment ONLY Tel: 03986 215

Service Sheets

SERVICE MANUALS. Any amateur radio, vintage wireless, audio, television, video test etc. Large SAE enquiries, MAURITRON (PW), 8 Cherrytree Road, Chinnor, Oxon.

BELL'S TELEVISION SERVICES for service sheets on Radio, TV, etc. £1.50 plus SAE. Service Manuals on Colour TV and Video Recorders, prices on request. SAE with enquiries to B.T.S., 190 Kings Road, Harrogate, N. Yorkshire. Tel. (0423) 55885.

TECHNICAL INFO SERVICES
76 Church St – Larkhall – Lanarks

FULL SIZE SERVICE SHEETS
Any radio, audio £2.50 + l.s.a.e.
CTVs/MusC £3.50 + l.s.a.e. complete set

Worlds largest collection
service manuals 30's – date
from £4.50-£35 each.

Comprehensive T.V. Repair Course
Complete Radio Service & Repair Course
ONLY £9.50 EACH

Repair data/circuits almost
any named TV/Video for £10.50

S.a.e. brings any quotation
FREE 50p mag. inc. service sheet!
Pricelists unique elect. publications

FOR FAST QUOTES
RING 0698 883334

Software

CQ CQ. Commodore 64 owners. "CONTACT-64" lets you record your radio contacts as they happen, gives you screen or printer listings for QSL purposes, and automatically sorts your entries into a master file which can be displayed, searched or altered, and saved or loaded from tape or disk. Can you be without it? £6.50 inc. p&p from: GALAXY SOFTWARE, 22 Mountfield Gardens, Kenton, Newcastle upon Tyne NE3 3DB.

Software – Cont.

SSTV FOR BBC MICRO. RX/TX Rom and sideways ram versions. Software and demonstrations £20. SAE for full details G6GCM, 1 Goldsmith Drive, Newport Pagnell, Bucks.

VIC 20 PROGRAMS World Locator, Morse tutors and transceive CW on 3.5K. SAE for details. G4SDJ. 2 Merriefield Close, Broadstone, Dorset.

MORSE READER PROGRAMMES. Off air onto screen Programmes for BBC B, Spectrum ZX81 16K, Dragon, Amstrad 464, Commodore 64 and any Vic 20. Sinclair computers need no interface, others use simple one transistor (BC107) interface. Programmes self tracking 8/30 w.p.m. All connections to existing sockets. Cassette with full instructions and circuit £6.00. J. E. PRICE, 4 Housman Walk, Offmore, Kidderminster.

Miscellaneous

SUPERB INSTRUMENT CASES by BAZELLI, manufactured from PVC, Faced steel. Vast range. Competitive prices start at a low £1.50. Punching facilities at very competitive prices. Suppliers only to Industry and the Trade. BAZELLI, (Dept No. 25), St. Wilfrid's, Foundary Lane, Halton, Lancaster LA2 6LT.

HEATHKIT U.K. Spares and service centre, CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. (0684) 73127.

QSL CARDS, printed to your own design on white or coloured gloss card. S.A.E. for samples to: THE NUTLEY PRESS, 21 Holmethorpe Avenue, Redhill, Surrey RH1 2NB.

BURGLAR ALARM EQUIPMENT. Ring Bradford (0274) 308920 for our catalogue or call at our large showrooms opposite Odsal Stadium.

FREE! Parcel of Components worth £10. Send only 80p postage!. D. HORSLEY, 113 Clare Road, Braintree, Essex.

WAVEGUIDE, FLANGES & DISHES. All standard sizes & Alloys (new material only) from stock. Special sizes to order. Call EARTH STATIONS 01-228 7876. 22 Howie Street, London SW11 4AR.

QSL CARDS. Gloss or tinted cards. SAE for samples to: TWROG PRESS, Dept PW, Penybont, Gellilydan, Blaenau Ffestiniog, Gwynedd.

THE SCIENTIFIC WIRE COMPANY
811 Forest Road, London E17. Telephone 01-531 1568

ENAMELLED COPPER WIRE

SWG	1lb	8 oz	4 oz	2 oz
8 to 34	3.63	2.09	1.10	0.88
35 to 39	3.82	2.31	1.27	0.93
40 to 43	6.00	3.20	2.25	1.61
44 to 47	8.67	5.80	3.49	2.75
48	15.96	9.58	6.38	3.69
SILVER PLATED COPPER WIRE				
14 to 30	9.09	5.20	2.93	1.97
TINNED COPPER WIRE				
14 to 30	3.97	2.41	1.39	0.94
Fluxcore Solder	5.90	3.25	1.82	0.94

Prices include P&P VAT. Orders under £2 add 20p.
SAE for list of copper and resistance wire.
Dealer enquiries welcome.

SHORTWAVE 40FT AERIAL, lightning arrestor, insulated fitments, coax cable. Complete £20. Tel. 01-876 5163.

WORLD WIDE COUNTRIES CHECK LIST. Keep an easy record of countries worked, includes full countries, prefix and continent index. £2.50 + 50p p&p. A. GOODIER, 35 Rose Lane, Marple, Stockport, Ches. SK6 6DS. Or from good Amateur Radio Shops.

NI-CAD BATTERIES. AA, 500, MAH, £1.00. C, 1200 MAH, £2.00. D, 1200. MAH, £2.20. PP3, 110 MAH, £4.80 P&P 40p. Free price list. SPECTRUM RADIO & ELECTRONICS, 36 Slater Street, Liverpool L1 4BX. Tel. 051 709 4628.

HAM RADIO COURSE VIDEO £24. 1 Grice Close, Kessingland, Lowestoft.

★ BAKER ★
GROUP P.A. DISCO
AMPLIFIERS post £2

150 watt Output, 4 input Mixer pre-amp. Illustrated £99
150 watt Output, Slave 500 mv. Input 3 Speaker Outputs £80
150+150 watt Stereo, 300 watt Mono Slave 500 mv. Inputs £125
150 watt P.A. Vocal, 8 inputs. High/Low Mixer Echo Socket £129
100 watt Valve Model, 4 inputs, 5 Outputs. No Cabinet £99
60 watt Mobile 240v AC and 12v DC. 4-8-16 ohm+100v line £89
Reverb Unit for Microphone or Musical Instruments £35 PP £1.
Electronic Echo Machine for mic/etc £85 PP £1. Deluxe £95.

FAMOUS LOUDSPEAKERS **FULLY GUARANTEED**

Make	Model	Size	Watts	Ohms	Price	Post
AUDAX	WOOFER	5½in	25	8	£10.50	£1
GOODMANS	HIFAX	7½x4¼in	100	8	£24	£2
GOODMANS	HB WOOFER	8in.	60	8	£13.50	£1
WHARFEDALE	WOOFER	8in.	30	8	£9.50	£2
BAKER	WOOFER	12in.	80	8	£25	£2
GOODMANS	HPG/GROUP	12in.	120	8/15	£35	£2
GOODMANS	HPD/DISCO	12in.	120	8/15	£33	£2
H+H	DISCO/GROUP	15in.	100	4/8/16	£44	£4
GOODMANS	HP/BASS	15in.	250	8	£74	£4
GOODMANS	HPD/BASS	18in.	230	8	£87	£4

DISCO CONSOLE Twin Decks, mixer pre amp **£145.** Carr £10.
Ditto Powered 120 watt **£199;** or Complete Disco **£300.** Carr £30.

MAINS TRANSFORMERS Price Post
250-0-250V 80mA. 6.3V 3.5A. 6.3V 1A. **£7.00** £2
350-0-350V 250mA 6.3V 6A CT **£12.00** Shrouded **£14.00** £2
220V 25mA. 6V 1 Amp **£3.00** 220V 45mA. 6V 2 Amp **£4.00** £1
Low voltage tapped outputs available
1 amp 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 **£6.00** £2
ditto 2 amp **£10.50** 3 amp **£12.50** 5 amp **£16.00** £2
31-26-0-26-31 volt 6 amp **£14.00** £2
LOW VOLTAGE MAINS TRANSFORMERS £5.50 each post paid
9V, 3A; 12V, 3A, 16V, 2A; 20V, 1A; 30V, 1½A; 30V, 5A+ 17-0-17V, 2A; 35V, 2A; 20-40-60V, 1A; 12-0-12V, 2A; 20-0-20V, 1A; 50V 2A.

PANEL METERS 50µA, 100µA, 500µA, 1mA, 5mA, 100mA, 500mA, 1 amp, 2 amp, 5 amp, 25 volt, VU 2¼×2×1¼in. **£5.50** post 50p

EQUIPMENT CASES. Black Vinyl Covered Top, All Base
4 × 2½ × 2¼in. **£2.50;** 6 × 4 × 1½in. **£3.60;** 8 × 5 × 2in. **£4.00;** 11 × 6 × 3in **£5.50;** 11¾ × 6 × 5in. **£8.00;** 15 × 8 × 4in. **£12.00.**
ALUMINIUM PANELS 18 s.w.g. 12 × 12in. **£1.80;** 14 × 9in. **£1.75;** 6 × 4in. **55p;** 12 × 8in. **£1.30;** 10 × 7in. **96p;** 8 × 6in. **90p;** 14 × 3in. **72p;** 12 × 5in. **90p;** 16 × 10in **£2.10;** 16 × 6in. **£1.30.**
ALUMINIUM BOXES. MANY OTHER SIZES IN STOCK.
4 × 2½ × 2in. **£1.20;** 3 × 2 × 1in. **£1;** 6 × 4 × 2in. **£1.90;** 8 × 6 × 3 **£3.00;** 12 × 5 × 3in. **£3.60;** 6 × 4 × 3in. **£2.20;** 10 × 7 × **£3.60.**

HIGH VOLTAGE ELECTROLYTICS

16/450V	50p	220/400V	£2	20+20/350V	75p
20/500V	75p	8+8/500V	£1	32+32/500V	£2
32/350V	45p	8+16/450V ..	75p	32+32/350V	50p
32/500V	95p	16+16/350V ..	75p	32+32+32/450V..	£1.50
				16+32+32/500V	£2

GEARED TWIN GANGS 365 + 365 + 25 + 25pf **£2.00.**
SLOW MOTION DRIVE 6·1 **£1.50;** Reverse Vernier **90p.**
VERNIER DIALS, 0.100, 36mm. **£2.50,** 50mm. **£3.00.**

RADIO COMPONENT SPECIALISTS
Dept 4, 337, WHITEHORSE ROAD, CROYDON
ACCESS SURREY, U.K. Tel: 01-684 1665 VISA
Post 65p Minimum. Callers Welcome
Full Lists 34p Stamps Same day despatch Closed Wednesday

INDEX TO ADVERTISERS

MAIL ORDER ADVERTISING

British Code of Advertising Practice

Advertisements in this publication are required to conform to the British Code of Advertising Practice. In respect of mail order advertisements where money is paid in advance, the code requires advertisers to fulfil orders within 28 days, unless a longer delivery period is stated. Where goods are returned undamaged within seven days, the purchaser's money must be refunded. Please retain proof of postage/despatch, as this may be needed.

Mail Order Protection Scheme

If you order goods from Mail Order advertisements in this magazine and pay by post in advance of delivery, PRACTICAL WIRELESS will consider you for compensation if the Advertiser should become insolvent or bankrupt, provided:

(1) You have not received the goods or had your money returned; and

(2) You write to the Publisher of PRACTICAL WIRELESS summarising the situation not earlier than 28 days from the day you sent your order and not later than two months from that day.

Please do not wait until the last moment to inform us. When you write, we will tell you how to make your claim and what evidence of payment is required.

We guarantee to meet claims from readers made in accordance with the above procedure as soon as possible after the Advertiser has been declared bankrupt or insolvent.

This guarantee covers only advance payment sent in direct response to an advertisement in this magazine not, for example payment made in response to catalogues etc, received as a result of answering such advertisements. Classified advertisements are excluded.

Published on approximately the 7th of each month by IPC Magazines Limited, Westover House, West Quay Road, Poole, Dorset BH15 1JG. Printed in England by McCorquodale Magazines Ltd., Andover, Hants. sole Agents for Australia and New Zealand – Gordon and Gotch (Asia) Ltd.; South Africa – Central News Agency Ltd. Subscriptions INLAND £13 and OVERSEAS £15 payable to IPC Magazines Ltd., "Practical Wireless" Subscription Department, Room 2816, King's Reach Tower, Stamford Street, London SE1 9LS. PRACTICAL WIRELESS is sold subject to the following conditions, namely that it shall not, without the written consent of the Publishers first having been given, be lent, resold, hired out or otherwise disposed of by way of Trade at more than the recommended selling price shown on the cover, and that it shall not be lent, resold, hired out or otherwise disposed of in a mutilated condition or in any unauthorised cover by way of Trade

REG. WARD & CO. LTD.

1 WESTERN PARADE, WEST STREET, AXMINSTER, DEVON, EX13 5NY.

THE SOUTH-WEST'S LARGEST AMATEUR RADIO STOCKIST

Trio

TS930S	9 Band TX General Cov RX	1350.00	(—)
TS830S	160-10m Transceiver 9 Bands	832.75	(—)
AT230	All Band ATU/Power Meter	157.99	(2.00)
SP230	External Speaker Unit	47.73	(1.50)
TS530S	160m-10m Transceiver	735.11	(—)
TS430S	160m-10m Transceiver	769.50	(—)
PS430	Matching Power Supply	145.00	(3.00)
SP430	Matching Speaker	39.50	(1.50)
MB430	Mobile Mounting Bracket	13.17	(1.50)
FM430	FM Board for TS430	45.00	(1.50)
TS130S	8 Band 200W Pep Transceiver	633.06	(—)
SP120	Base Station External Speaker	30.74	(1.50)
AT130	100W Antenna Tuner	108.62	(1.50)
MC50	Dual Impedance Desk Microphone	36.19	(1.50)
MC35S	Fist Microphone 50K ohm IMP	17.01	(1.00)
LF30A	HF Low Pass Filter 1kW	24.68	(1.00)
TR7930	2M FM Mobile	354.92	(—)
TR9130	2M Multimode	499.00	(—)
TW4000A	2M/70cm mobile	536.51	(—)
TM201A	2M 25W mobile	309.95	(—)
TM401A	7cms FM 12W	340.68	(—)
TR2500	2M FM Synthesised Handheld	270.47	(—)
TR3500	70cm Handheld	291.85	(—)
TR2600	New 2M FM Synthesised Handheld	295.69	(—)
ST2	Base Stand	60.36	(1.50)
SC4	Soft Case	15.92	(1.00)
SMC25	Speaker Mike	18.66	(1.00)
PB25	Spare Battery Pack	29.10	(1.00)
MS1	Mobile Stand	37.31	(1.00)
R600	Gen. Cov. Receiver	299.52	(—)
R2000	Synthesiser 200KHz-30MHz Receiver	479.47	(—)
HC10	Digital Station World Time Clock	78.99	(1.50)
HS5	Deluxe Headphones	26.88	(1.00)
SP40	Mobile External Speaker	16.46	(1.00)
NEW MODELS			
TH21E/41E	2M/70cm Mini-Handhelds	188.56/214.50	
TM211E/411E	2M/70cm FM Mobiles	396.08/452.58	
TS711E/811E	2M/70cm base stations	831.77/964.97	
TR3600	70CM Handheld	298.89	

Linear Amps

TONO (G series)			
2M40G	2m, 1-3W in, 20-35W out, preamp	89.00	(2.00)
2M90G	2m, 10-15W in, 70-90W out, preamp	149.00	(2.00)
2M130G	2m, 10-15W in, 110 130W out, preamp	159.00	(2.50)
4M70G	70cms, 3-15W in, 40-60W out, preamp	179.00	(2.00)
MICROWAVE MODULES			
MML144/30-LS	inc preamp (1/3 w i/p)	82.90	(2.00)
MML144/50-S	inc preamp, switchable	92.00	(2.00)
ML144/100-S	inc preamp (10w i/p)	149.95	(2.50)
MML144/100-HS	inc preamp (25w i/p)	149.95	(2.50)
MML144/100-LS	inc preamp (1/3w i/p)	169.95	(2.50)
MML144/200S	inc preamp (3/10/25 i/p)	299.00	(2.50)
MML432/30L	inc preamp (1/3w i/p)	145.00	(2.00)
MML432/50	inc preamp (10w i/p)	129.95	(2.00)
MML432/100	linear (10w i/p)	299.00	(2.50)
B.N.O.S.			
LPM 144-1-100	2m, 1W in, 100W out, preamp	172.50	(2.50)
LPM 144-3-100	2m, 3W in, 100W out, preamp	172.50	(2.50)
LPM 144-10-100	2m, 10W in, 100W out, preamp	149.50	(2.50)
LPM 144-25-160	2m, 25W in, 160W out, preamp	207.00	(2.50)
LPM 144-3-180	2m, 3W in, 180W out, preamp	235.75	(2.50)
LPM 144-10-180	2m, 10W in, 180W out, preamp	235.75	(2.50)
LPM 432-1-50	70cm, 1W in, 50W out, preamp	184.00	(2.50)
LPM 432-3-50	70cm, 3W in, 50W out, preamp	184.00	(2.50)
LPM 432-10-50	70cm, 10W in, 50W out, preamp	155.25	(2.50)

SWR/PWR Meters

HANSEN			
FS50VP	50-150MHz 20/200 Interval PEP/SWR	106.70	(1.50)
FS300V	50-150MHz 20/200 PWR/SWR	53.50	(1.50)
FS300H	1.8-60MHz 20/200/10W	53.50	(1.50)
FS210	1.8-150MHz 20/200 Auto SWR	63.50	(1.50)
W720	30-430MHz 20/200W	41.50	(1.50)
WELZ			
SP15	1.8-160MHz PWR/SWR	45.00	(1.50)
SP45	130-470MHz PWR/SWR	65.00	(1.50)
SP10X	1.8-150MHz PWR/SWR	31.00	(1.50)
SP200	1.8-160MHz PWR/SWR	87.00	(1.50)
SP250	1.8-60MHz PWR/SWR	59.95	(1.50)
SP300	1.8-500MHz PWR/SWR	121.00	(1.50)
SP350	1.8-500MHz PWR/SWR	75.50	(1.50)
SP400	130-500MHz PWR/SWR	87.00	(1.50)
SP600	1.8-500MHz PWR/SWR	106.00	(1.50)
TOYO			
T430	144/432 120 W	44.65	(1.00)
T435	144/432 200 W	49.35	(1.00)

Scanning Receivers

SMC8400	VHF/UHF Scanner	249.00	(2.50)
SX200	VHF/UHF Scanner	299.00	(2.50)
SX400	VHF/UHF Continuous Coverage	598.00	(2.50)
AOR2001	VHF/UHF Continuous Coverage	365.00	(2.50)
FDK RX40	141.00-180.000 MHz	142.00	(2.00)

Icom Products

IC751	HF Transceiver	1239.00	(—)
IC745	HF Transceiver	898.00	(—)
IC730	Mobile HF Transceiver	P.O.A.	(—)
PS15	P.S. Unit	135.00	(4.00)
PS30	Systems p.s.u. 25A	259.00	(—)
SM6	Base microphone for 751/745	36.50	(1.00)
IC290D	2m 25w M/Mode	469.00	(—)
IC290E	Low Multi-Mode Mobile	399.00	(—)
IC271E	2m 25w M/Mode Base Stn.	699.00	(—)
IC271H	100W version of above	889.00	(—)
IC25H	2m 45w FM	359.00	(—)
IC27E	25W FM mobile	359.00	(—)
IC45E	70c 10w FM	345.00	(—)
IC47E	25w 70cm FM mobile	449.00	(—)
ICBU1	B/U Supply for 25/45/290	24.50	(1.00)
ICR70	General Coverage Receiver	599.00	(—)
ICR71	General Coverage Receiver	699.00	(—)
IC02E	2m H/Held	259.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	69.00	(2.00)
IC4E	70cm H/Held	259.00	(—)
IC04E	70cm handheld	269.00	(—)
BC30	Base Charger	56.35	(—)
HM9	Speaker mic	18.95	(1.00)
IC3	Carry Case	5.50	(1.00)
ICBP3	Std Battery Pack	27.50	(1.00)
BP5	High Power Battery Pack	52.90	(1.00)
CP1	Car Charging Lead	5.50	(1.00)
DC1	12v Adaptor	13.75	(1.00)

Mutek Products

SLNA 50	50MHz Switched preamp	44.90	(1.50)
SLNA 144s	144MHz Low noise switched preamp	39.90	(1.50)
SLNA 145sb	Preamp intended for 290	27.40	(1.50)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	74.90	(1.50)
RPCB 251ub	Front end IC251/211	79.90	(1.50)
BBA 500u	20-500MHz Preamp	32.90	(1.50)
GFBA 144e	2m Mast head preamp	139.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	89.90	(1.50)
TVHF 230c	2M-FM Transverter	334.90	(5.00)
LBPF 144v	Bandpass Filter	19.95	(1.50)
LBPF 432u	Bandpass Filter	19.95	(1.50)
TVVF 50c	6M Converter	189.89	(2.50)
GLNA 433e	70cm Pre-amp	79.90	(2.50)

Datong Products

PC1	Gen. Cov. Con.	137.60	(1.50)
VLF	Very low frequency conv	29.90	(1.50)
FL2	Multi-mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	33.90	(1.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
DC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

Tono 9000E	Reader/Sender	P.O.A.	(—)
Tono 550	Reader	299.00	(2.50)
MICROWAVE MODULES			
MM2001	RTTY to TV converter	189.00	(2.00)
MM4001	RTTY terminal	269.00	(2.00)
MM4001KB	RTTY term with keyboard	299.00	(2.00)
BENCHER			
BY1	Squeeze Key, Black base	53.95	(1.50)
BY2	Squeeze Key, Chrome base	69.95	(1.50)
HI-MOUND MORSE KEYS			
HK702	Up down keyer marble base	30.95	(1.50)
HK703	Up down keyer	29.35	(1.50)
HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	15.49	(1.50)
HK706	Up down keyer	16.96	(1.50)
HK708	Up down keyer	14.95	(1.50)
HK802	Up down solid brass	86.30	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)
KENPRO			
KP100	Squeeze CMOS 230/13.8v	82.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1475.00	(—)
SP980	Speaker	64.40	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	145.00	(5.00)
FC700	Tuner	105.00	(2.00)
FT77s	10w. version	449.00	(—)
FMU77	FM Board for FT77	28.35	(1.00)
FT757	HF Transceiver	759.00	(—)
FC757	Auto A.T.U.	245.00	(2.00)
FP757HD	Heavy Duty PSU	179.00	(2.00)
FP757GX	Switched Mode PSU	140.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	309.00	(—)
FT290	With Mutek front end fitted	339.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
MMB11	Mobile Bracket	28.75	(1.00)
NC11	Charger	10.75	(1.00)
CSC1	Carrying Case	4.60	(1.00)
YHA15	2m Helical	5.75	(1.00)
YHA44D	70cm ½wave	9.95	(1.00)
YM49	Speaker Mike	20.30	(1.00)
FT230	2m 25w FM	269.00	(—)
FT730	70cm 10w. FM	239.00	(—)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	185.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	239.00	(—)
FT208	2m H/Held	209.00	(—)
FT708	70cm H/Held	189.00	(—)
MMB10	Mobile Bracket	8.80	(0.75)
NC9C	Charger	9.60	(0.75)
NC8	Base/station Charger	56.75	(2.00)
PA3	Car Adaptor/Charger	16.85	(1.00)
FNB2	Spare Battery Pack	23.00	(1.00)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	839.00	(—)
430/726	70cm Module for above	270.00	(2.50)
FRT7700RX	A.T.U	48.30	(1.50)
MH1B8	Hand 600 8pin mic	16.85	(1.00)
MD1B8	Desk 600 8pin mic	64.40	(1.00)
MF1A3B	Boom mobile mic	19.95	(1.00)
YH77	Lightweight phones	14.95	(1.00)
YH55	Padded phones	14.95	(1.00)
YH1	Uweight Mobile Headset-Boom mic	14.95	(1.00)
SB1	PTT Switch Box 208/708	17.25	(1.00)
SB2	PTT Switch Box 290/790	14.55	(1.00)
QTR24D	World Time Clock	34.50	(1.00)
FF501DX	Low Pass Filter	29.90	(1.00)
NEW MODELS			
FRG8800	HF Receiver	525.00	(—)
FRV8800	Convertor 118-175 for above	95.00	(—)
FT703	70cm H/Held	P.O.A.	(—)
FT709	70cm H/Held	P.O.A.	(—)
FT270R	2m 25W F.M.	325.00	(—)
FT270RH	2m 45W F.M.	380.00	(—)
FT2700R	2m/70cm/25W/25W	520.00	(—)

Power Supplies

DRAE			**BNOS**		
4 amp	34.00	(2.00)	6 amp	52.90	(2.50)
6 amp	53.50	(2.50)	12 amp	95.45	(3.00)
12 amp	79.50	(3.00)	25 amp	138.00	(4.00)
24 amp	110.00	(4.00)	40 amp	276.00	(4.00)

Aerial Rotators

9502B	3 core Lighter Duty	69.50	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	13.00	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	21.95	(1.00)
Welz	2 way 'n' Skts	38.75	(1.00)
Drae	3 way SO239	15.40	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(1.00)
T100	100W Dummy load	30.48	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	58.00	(2.00)
DRAE	2m Pre-set A.T.U.	11.80	(1.50)
ALTAI	KDM6 Dip Meter	57.00	(1.50)
TAU	SPC3000 HF Tuner	349.95	(5.00)

AERIALS BY:- JAYBEAM – HYGAIN – G. WHIP – TET – TONNA – MINIBEAM

COMPLETE RANGE OF WOOD & DOUGLAS KITS
NEW TAU TUNERS
★ Send SAE for up to date second hand lists ★

AUTHORISED YAESU

ICOM (Tel: 0297-34918) FDK

APPROVED TRIO

CLOSED MONDAY/OPEN TUES-SAT 9:00-5:30
(closed for lunch 1:00-2:00)
STOCK ITEMS NORMALLY DESPATCHED WITHIN 48 HOURS

RODNEY G6LUJ

REG G2BSW

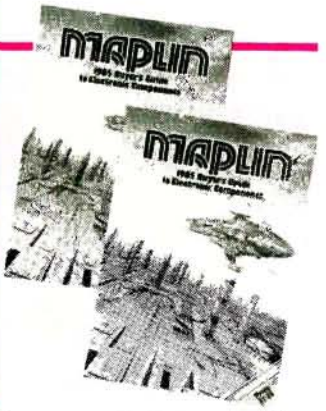
Instant credit also available

Mail/Telephone order by Cheque or Credit Card. Cheques cleared before goods despatched.

Delivery prices shown in brackets

All new in the 1985 Catalogue

From a gentle purr to a mighty roar, the tightly controlled power of the beast is yours to command!



PROFESSIONAL QUALITY HIGH POWER LOUDSPEAKERS

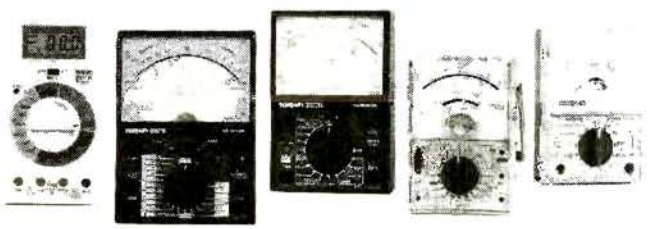
A new range of superb quality loudspeakers.

- ***Virtually indestructible high temperature voice-coil reinforced with glass-fibre***
- ***100% heat overload tolerance***
- ***Advanced technology magnet system***
- ***Rigid cast alloy chassis***
- ***Linen or Plastiflex elastomer surrounds***
- ***5-year guarantee (in addition to statutory rights)***

Available in 5, 8, 10, 12, 15 and 18 inch models with 8Ω and some 16Ω impedances and with input powers ranging from 50W to 300W e.g.

5in. 50W 95dB 8Ω: XG39N / 16Ω: XG40T £17.95§
8in. 100W 98dB 8Ω: XG43W £29.95§
10in. 100W 100dB 8Ω: XG46A £29.95§
12in. 100W 101dB 8Ω: XG49D £29.95§
12in. Twin Cone 100W 100dB 8Ω: XG50E / 16Ω: XG51F £31.95§
Note - the output power doubles for each 3dB increase (ref 1W @ 1m).

PRECISION GOLD MULTIMETERS



A new range of very high quality multimeters offering truly amazing quality at the price.

Pocket Multimeter, 16 ranges, 2000Ω/V DC/AC £6.95§ (YJ06G)
M-102BZ with Continuity buzzer, battery tester and 10A DC range, 23 ranges, 20,000Ω/V DC £14.95§ (YJ07H)
M-2020S with Transistor, Diode & LED tester and 10A DC range, 27 ranges 20,000Ω/V DC £19.95§ (YJ08J)
M-5050E Electronic Multimeter with very high impedance, FET input, 53 ranges including peak-to-peak AC, centre-zero and 12A AC/DC ranges £34.95§ (YJ09K)
M-5010 Digital Multimeter with 31 ranges including 20Ω and 20μA DC/AC FSD ranges, continuity buzzer, diode test, and gold-plated PCB for long-term reliability and consistent high accuracy (0.25% +1 digit DCV) £42.50§ (YJ10L)

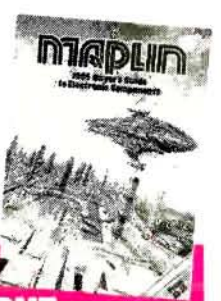
Our huge range of top quality electronic components at very competitive prices are all detailed in our catalogue, and with well over 600 new lines in our 1985 edition and many design improvements, it's well worth getting a copy. Here are just a few examples from the catalogue. (The items below are NOT kits).

★ Most phono and jack plugs now with integral strain relief sleeve - gold-plated types also available from 14p (gold from 70p)
★ Stereo Disco Mixer with cross-fade, talk-over, cue monitoring, aux input, slide controls. Only £58.95 (AF99H)

★ 10-Channel Stereo Graphic Equalisers - 3 models - basic; with peak level meter; and with spectrum analyser - from £77.95

★ Digital Delay Line permits Slap-back, Doubling, Flanging, Chorus and Echo. 11 controls. Only £195.00 (AF98G)
★ Video Enhancer improves picture quality when recording from one VTR to another, and with TV's with monitor input. Only 28.95 (XG59P)
★ Detailed descriptions of the exciting new 74HC range of IC's which combine the advantages of CMOS and TTL. From 46p
★ Keyboards: sloping keys, two-tone grey, mounted in steel frame, very smart cases (extra) available. 61 keys, only £33.95 (YJ12N)
79 keys, only £37.95 (YJ13P)
★ 1% Resistors now 50ppm/°C, 0.4W, only 2p each!
★ Auto transformers 120/240V 50VA, £10.75§ (YJ56L). 100VA £14.95§ (YJ57M). 150VA £16.95§ (YJ58N). 250VA £21.95§ (YJ59P).
★ Digital Clinical Thermometer. Only £13.95 (FK51F)

Check our 1985 Catalogue for all our other fascinating new lines.



AMERICAN EXPRESS · map · VISA

☎ ***Phone before 2pm for same day despatch.***

1985 CATALOGUE

Pick up a copy now at any branch of W.H. Smith or in one of our shops. The price is still just £1.35, or £1.75 by post from our Rayleigh address (quote CA02C).

N.B. All our prices include VAT and Carriage. A 50p handling charge must be added if your total order is less than £5 on mail order (except catalogue).

MAPLIN ELECTRONIC SUPPLIES LTD.

Mail Order: P.O. Box 3, Rayleigh, Essex SS6 8LR. Tel: Southend (0702) 552911
SHOPS
- BIRMINGHAM Lynton Square, Perry Barr, Tel: 021-356 7292.
- LONDON 159-161 King Street, Hammersmith, W6. Tel: 01-748 0926.
- MANCHESTER 8 Oxford Road, Tel: 061-236 0281.
- SOUTHAMPTON 46-48 Bevois Valley Road, Tel: 0703 25831.
- SOUTHEND 282-284 London Rd. Westcliff-on-Sea, Essex. Tel. 0702-554000

Shops closed all day Monday.

Post this coupon now for your copy of the 1985 catalogue.
Price £1.35 + 40p post and packing. If you live outside the U.K. send £2.40 or 11 International Reply Coupons. I enclose £1.75.

Name .....
Address .....
.....
.....

PW/5/85

§ Indicates that a lower price is available in our shops. ***All offers subject to availability.*** ***Prices firm until May 11th 1985.***