SEPTEMBER 1984 90p

Amateur RADIO

For all two-way radio enthusiasts

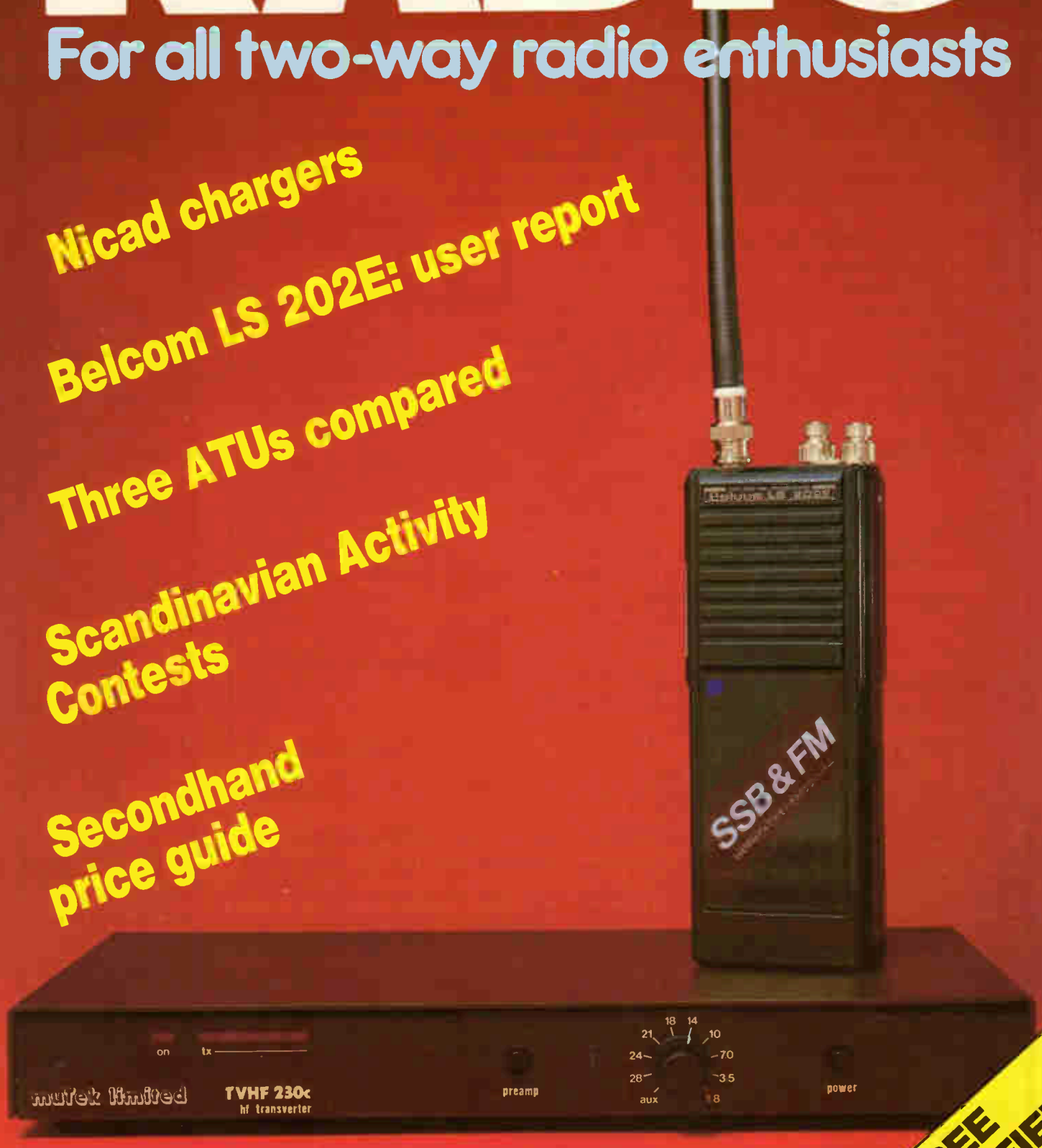
Nicad chargers

Belcom LS 202E: user report

Three ATUs compared

Scandinavian Activity Contests

Secondhand price guide



On test: muTek HF converter

FREE CLASSIFIED ADS

AMTRONICS (TONBRIDGE) G4 SYZ
THE AMATEUR RADIO SPECIALISTS IN KENT

CLOSED MONDAYS: 9 TO 5.30 TUES TO SAT

AUTHORISED YAESU

Access

VISA

FORTOP		B.N.O.S.		ADONIS	
Convertor	£26.95	1-100 Linear	£172.50	Safety Mic	£43.25
70cm TX	£149.00	3-100 Linear	£172.50	Safety Mic	£28.95
70cm TX/RX	£169.00	10-100 Linear	£149.50	503 Mic	£47.50
24cm TX	£199.00	25 amp PSU	£138.00	303 Mic	£36.50
TX Kit	£33.60	12 amp PSU	£95.45	FS3 C/W Speaker	£52.00

30FT LATTICE TOWER. Made by professionals for Amateurs. This is the latest product in our ever increasing range. Towers and mountings in stock (cash-n-carry) or delivered. Call in at the shop to inspect this quality tower or send SAE for full details.

CREDIT AVAILABLE THROUGH SHEPHERD FINANCE (INSTANT) WITH CALL SIGN. ASK FOR WRITTEN DETAILS OR CALL IN THE SHOP.

ALSO NEW FROM **MET ANTENNAS**
70cm 5 Element 9.5 db gain 0.7m long. Go anywhere antenna. Fantastic performance. End mounting, horizontal or vertical. Will fit in suitcase.
ONLY £16.95p
Coming soon:
2m + 70cm power splitters.
FULL RANGE IN STOCK

£299

Uniden CR2021 Receiver £160
Yamato Rotator (up to 8 Eli beam) only £40
Gamma Twin 2m Antenna £7.95p.
New-2 metre Preamps. Also inline 10 metre Preamps, ie 29MHz FM

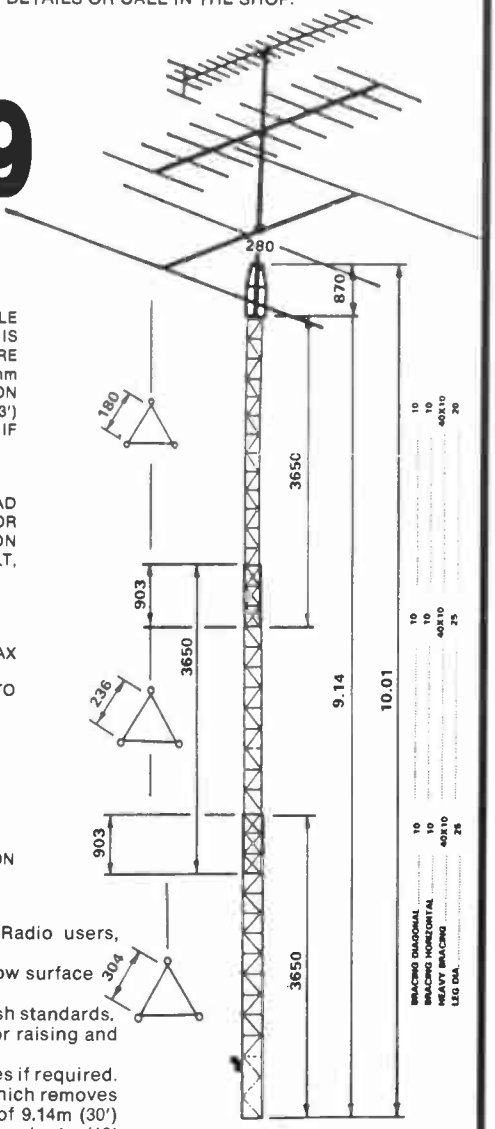
Full range Jaybeam Antennas.
Large stocks of pole, clamps, including the new 1 Eli.
Rotary Dipole and 1to2to3 Eli add on kits

FAST MAIL ORDER
Access, Visa, Postal Order, Cheque

GENERAL SPECIFICATIONS
WINCH (800lb)
ROPES 5mm LOWER 4.5mm TOP
540 Kg (1200lb) S.W.L.
A STANDARD HEAD UNIT IS AVAILABLE ALTHOUGH ONLY REQUIRED IF ROTATOR IS BASE MOUNTED AS ALL 10m (30') TOWERS ARE FITTED WITH MOUNTING FACILITIES FOR 51mm (2" Dia) STUB MAST AND DEPENDING UPON AERIAL CONFIGURATION CAN BE UP TO 4m (13') ALSO ALL HEAD UNITS WILL TAKE A BEARING IF REQUIRED.
FINISH MANUFACTURED TO B.S.I. STANDARDS HOT DIP GALVANISED
FIXINGS FOR ANY ALTERNATIVE HEAD ATTACHMENTS eg CCTV CAMERA MOUNT OR LIGHTING PAD SIMPLY SLOT INTO TOP SECTION OF TOWER AND IS LOCKED WITH SINGLE BOLT, AS IS SAME WITH HEAD UNIT.

LOADINGS
BASE ON C.P.3, CHP V. PART 2
AT WINDSPEEDS OF 160Km/h (100 m.p.h.) MAX WEIGHT OF HEADLOAD 125 Kgs (275lb)
THIS LOADING WOULD BE EQUIVALENT TO WINDSPEED SURFACE AREA OF: .84M (9.0 F^2)

UNIVERSAL MOUNTINGS
(a) WALL
(b) FIXED POST
(c) TILT POST
(d) FIXED BASE
(e) HINGED BASE
VARIATIONS CAN BE MADE TO CLIENTS ON REQUIREMENTS

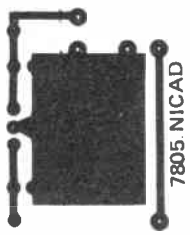


THE 30' (10m) TOWER RANGE
The 30' Tower is the result of a detailed design programme to study the needs of today's Radio users, particularly in an urban environment.
Our Towers are of the conventional triangular lattice construction which provides a low weight, low surface area but high strength combination.
For durability the complete tower, brackets and bell housing are hot dip galvanised to current British standards.
All Towers come complete with suitable winch cables, pulleys, bolts and accessories necessary for raising and lowering as standard. A safety latch is provided to lock the tower in its raised position.
The relatively low closed height of the towers make it practical and acceptable for planning purposes if required. Also the majority of owners find they are able to work on their aerial systems at this closed height which removes the necessity to purchase costly tilt over versions. The extended head height before head unit of 9.14m (30') provides a good operating platform at a most economic price. Bearing in mind depending on head load a 4m (13' stub mast can be fitted giving up to 13.7m (45').
The concept of our range is to provide the user with a basic tower unit and to allow him to choose from a selection of universal accessories to suit the precise needs of individual mounting requirements. If none of the standard items are suitable specific mounts may be manufactured to order.

WE ALSO SELL:
Jaybeam, Bnos, Drae, Fortop (ATV), Azden, Adonis, Met, Datong, Uniden Amateur, FDK, Yaesu, Oscar, Diamond, Sagant, Spectrum Software, RSGB Books and Maps. Also large selection of polls clamps, masts, cable-connectors, lashings etc.

8 TOLLGATE BUILDINGS, HADLOW RD, TONBRIDGE. TEL: (0732) 361850

Amateur RADIO



Editor: Jim Chalmers
Advertisement Manager: Nicola Dyer
Advertisement Executive: Anne Brady
Subscriptions: 01-684 3157
Accounts: Clare Brinkman
Publisher: Peter Williams
General Manager: Alan Golbourn
On sale: Fourth Thursday of the month preceding cover date
Next issue: Cover date October 1984 on sale 27 September 1984
Published by: Amateur Radio Magazines, Sovereign House, Brentwood, Essex CM14 4SE, England (0277 219876)
Printed: In England
ISSN: 0264-2557
News Trade Sales by: Argus Press Sales & Distribution Ltd, 12-18 Paul Street, London EC2A 4JS. 01-247 8233
Front cover: muTek HF transverter (page 18) and Belcom 2m multimode (p43). Photo by Jay Moss-Powell G6XIB

6 Current Comment
A look at the Woburn rally

8 Letters
Your opinions on topics of interest

10 Straight and Level
All the latest news, comment and developments on the amateur radio scene

13 Rally Calendar
When, where and how to get there

14 DX Diary
Don Field G3XTT with this month's DX news

18 Angus McKenzie tests
G3OSS checks out the muTek HF transverter and Icom IC271H 2m rig

30 The Eddystone Story
Ken Williams traces the tale from pins to pin diodes

33 On the beam
Glen Ross G8MWR with all the latest news from VHF, UHF and Microwaves

36 Antenna tuning units
A comparative review by Martyn Bolt G4SUI

38 Pirates ahoy!
John Heys G3BDQ does some detective work using old QSLs

43 Belcom LS202E
A user report by Julian V Moss G4ILO

45 Nicad chargers
Stephen Ibbs with some simple circuits

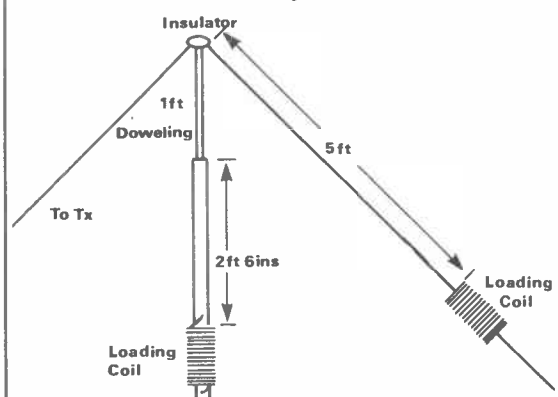
47 Getting started
Peter Dodson looks at what you need and what it costs

50 SWL
Trevor Morgan GW4OXB with some exciting news

54 A busy weekend. . .
Nigel Cawthorne G3TXF looks at the forthcoming Scandinavian Activity Contests

58 Applied negative resistance
'Old Ham' with some not-so-new ideas

60 Coming next month
What's in store for you



62 G8FR Hybrid
An aerial design from W Hazelden

64 Communications receivers
Bill Sparks G8FBX tells the story and picks out some favourites

67 Secondhand equipment guide
Hugh Allison G3XSE tells you what you should pay

69 Free Classified Ads
The market for buying and selling

SERVICES

56 Newsagents order form
61 Subscription order form
71 Free Classified Ad form
72 Small Ads
73 Radio and Electronics World subscription order form
74 Advertisers Index
74 Advertising rates and information

LOWE SHOPS,

Whenever you enter a LOWE ELECTRONIC'S shop, be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that along with a courteous welcome you will receive straightforward advice. Advice given, not with the intention of 'making' a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio after-sales service. The shops are open Tuesday to Saturday and close for lunch 12.30 till 1.30pm.

GLASGOW

In Glasgow the LOWE ELECTORNICS' shop (telephone 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...

DARLINGTON

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (telephone 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

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 (telephone 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1039, past the science park and turn left at the first roundabout. After passing a children's playground on your left turn left again into the High Street. Easy and free street parking is available outside the shop.

CARDIFF

Cardiff now has its own LOWE ELECTRONICS' shop. Managed by Richard GW4NAD, who hails from Penarth, the shop (our telephone number is 0222 464154) is located 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.

LONDON

MOVING... MOVING... MOVING... From the 13th September 1984 the LOWE ELECTRONICS' London shop will be located at 223/225 Field End Road, Eastcote, Middlesex (the new telephone number is 01-429 3256). The new shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings. 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.

MATLOCK

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.

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire DE4 5LE
Telephone 0629 2817, 2430, 4057, 4995
And don't forget from Matlock also

MAIL ORDER

SSB AND FM FOR £225, the **BELCOM** LS202E.

Until now, dual mode 2 metre transceivers have been designed for shack, car or shoulder operation. Mobile they may have been but convenient hand portables they were not. That situation has now changed. You will remember that I told you about the new BELCOM LS202E SSB/FM 2 meter transceiver in a previous edition of RADCOM; at the time I said the price would be around £1000. You will, therefore, be extremely pleased to learn that the transceiver is available for £225.00 inc VAT. Now for a few details; (if you want a colour leaflet to appreciate the full beauty of the LS202E transceiver then ring Beryl here at Matlock, alternatively you could always visit a LOWE shop).

● Full coverage of the 2 metre amateur band from 144 to 146 MHz in 5 MHz steps on both SSB (Upper and Lower) and FM, selection of frequency by means of rotary thumb wheel switches. In addition, a VXO control giving +/- 5 KHZ frequency shift and RIT with centre click stop are provided on the top panel. For night time operation the frequency readout and S meter can be illuminated by an internal LED.

● The use of hybrid IC's and a miniature SSB crystal filter has made the LS202E even smaller than some of the existing FM only handheld portables. The rig measures 62mm wide, 40mm deep and 165mm high, small enough for your jacket pocket and weighs only 520 grammes.

● RF power output SSB (PEP), FM 3.5 watts (at 10.8 volts)
2.5 watts (at 7.2 volts)
1.5 watts (at 6 volts)

● The LS202E is equipped for repeater operation having both frequency shift and 1750 Hz tone burst.

A comprehensive range of accessories is available...

NP6...Rechargeable battery pack (7.2 volts)	£22.65
NP9...Rechargeable battery pack (10.8 volts)	£31.40
CA910E...AC charger (for NP6)	£8.50
CA110E...AC charger (for NP9)	£8.50
CS912...Mobile charger (for N[illegible]	£6.90
CS112...Mobile charger (for [illegible]	£6.90
SH1...Speaker/microphone	£14.95
SFT207...Soft case	£4.80
LA207...Mobile console with 25 watt linear	£118.00
AN2...1/4 wave BNC rod aerial	£8.50

for £168 inc. vat not only a 32K COLOUR GENIE COMPUTER but £57 worth of RTTY receive/transmit hard and software

FREE!

plus 2 additional amateur radio programs, also FREE!

Many radio amateurs, very wisely, have not yet added a computer to their shack. Apart from the difficulty of which computer to choose, they consider it over expensive to purchase the necessary additonal soft and hardware to transmit and receive RTTY, create logging facilities or compute distances between themselves and other radio amateurs. Things have now changed. LOWE ELECTRONICS have put together a substantial package which includes FREE OF CHARGE with every COLOUR GENIE sold from Matlock the following.

A RADSOFT RTTY FULL RECEIVE/TRANSMIT SYSTEM (afsk) with the following features . . .

Split screen . . .enables incoming message to be displayed together with status of machine whilst you 'type ahead' your reply.

Status line . . .displays the current baud rate, a tuning aid and the callsign of the incoming signal if it has been captured.

Screen re-scroll . . .no need to scramble for a pen as details disappear of the top of the screen, more than 6000 characters are stored for reapraisal.

Memory buffers . . .10 x 255 characters enabling prepared messages to be stored, the pages can be pre written and saved to cassette for future use. They can also be edited at any time

Fixed buffers . . .incorporated into the program are a selection of messages often used by a RTTY operator. eg. RYRYRYRYRYRYR . . ., THE QUICK BROWN FOX . . ., QRZ DE (your call sign), DE (your call sign)

Callsign capture . . .on receive the incoming station's callsign can be automatically read from the screen and displayed on the status line. It can be transmitted at any time by the press of a key.

Baud rate . . .45, 50, 56 and 75 bauds transceive can be selected from the keyboard whilst in receive mode.

Normal and reverse shift is keyboard selectable, the selected shift and baud rate being displayed on the monitor screen. To simplify Operation an 'on screen' tuning aid is provided.

On transmit all the necessary carriage returns, line feeds, letter and figure shifts are built in making operation simple.

Connections could not be easier . . .a cassette lead is used between the computer and the 3.5 mm socket on the supplied terminal unit. To input an RTTY signal from the receiver requires a lead making up from the audio output of the rig to the 3.5 mm socket of the terminal unit. (one 3.5 mm jack plug is supplied) Transmit audio is generated inside the COLOUR GENIE, a lead from the computer audio out to the mic input completes the connections.

A comprehensive instruction manual is included with the package.

The list price of the RADSOFT package is £56.00 inc VAT. With the LOWE ELECTRONICS computer the system is FREE!

In addition purchases of the COLOUR GENIE will receive two other programs also FREE OF CHARGE. One is a log system enabling up to 700 stations together with their signal report and QRA locator to be stored, ideal for a contest. The second can be used to quickly tell you the distance between yourself and the station you are working. A map of the UK or, for the DX-er, Europe appears on the screen with flashing dots locating yourself and the other station.

Don't be carried away in your enthusiasm for RTTY, don't forget, you will own a COLOUR GENIE, a proven 32K home computer. This is a considerable advantage over the dedicated RTTY system. The COLOUR GENIE has a 'proper' keyboard just like todays electronic typewriters, not indefinite touch pads. It is not a games plaything but is capable of introducing the family to computing. That's if you'll ever let it out of the shack.

CURRENT COMMENT

THE 1984 RSGB NATIONAL MOBILE RALLY

This month sees ***Amateur Radio*** going to press immediately after the big RSGB Rally at Woburn, so it seems appropriate to pass on a few first impressions of the event in *Current Comment.*

Few rallies can rival those at Woburn for the headstart given in respect of location and facilities. Its central position makes it easily reached from large areas of the country, while the lovely Abbey with its park and other attractions offers diversions for the whole family, as well as providing a beautiful setting for the rally itself.

That ever-variable factor that can do so much to make or break a rally, the weather, was kind to us all this year, since after a chilly start the sun actually came out in the afternoon!

Bigger than ever

This year's rally was bigger than ever, with almost 100 exhibitors covering the full range of amateur radio interests.

Certainly these exhibitors could not be disappointed with the response: it is estimated that well over seven thousand people attended the rally.

Sales of new British and foreign made equipment were high, with many people taking advantage of special offer prices to purchase their new pride and joy.

Most of the major suppliers present can have done themselves no harm at all by providing information and advice for potential customers.

An interesting facet of the rally was that in the two big marquees that housed the major exhibitors one could find several smaller firms, many dealing with surplus or secondhand components and equipment. The great crowds around their stalls demonstrated just how much success such firms enjoyed.

The RSGB had their stalls near the main entrance to the marquees, and were kept busy selling books, maps and accessories and enrolling new members.

The BARTG stall, as always at a rally, was a constant centre of activity, with heavy sales of their books, PCBs and kits, as well as providing information for beginners and established enthusiasts in the field of data communication. Back issues of their excellent magazine Datacom were on sale, and without doubt their membership increased even more on the day.

AMSAT-UK were also represented, with information on the world of satellites. Their exhibit included a display of telemetry received from OSCAR-10.

Full talk-in facilities were provided by the Dunstable Downs Radio Club, with their station and aerials erected on site.

The Woburn rally was also a milestone for the magazine, it being the first such event we have attended as stand-holders.

The experiment proved to be a tremendous success, not merely in the selling of current and back issues of the magazine, but primarily on account of the opportunity which it gave us to meet you.

Thanks to all those who came along to have a chat: your comments and suggestions are of the greatest value.

Drawback

The one problem one could cite with the organisation of the rally, was the lack of space between stands in the marquees, due more to the unexpectedly large numbers than to bad planning. The fact is, however, that trying to fit too many stands into a marquee, with all the exhibitors trying to get a little bit more space for their displays, can lead to a less than pleasant atmosphere. This atmosphere could have been even worse had the day been hotter!

Despite this, one cannot really complain: the overabundance of activity amongst exhibitors, clubs, and in the bring-and-buy sale, ensured that no one need go away disappointed or, for that matter, empty-handed.

L·E·T·T·E·R·S

ALL AT SEA

I read with interest the letter from G2AIV in May ***Amateur Radio*** where he mentions the UK Amateur Maritime Mobile Licence. Surely it is time that something was done about this licence.

After many years of paying between three and four times the normal amateur licence fee to hold both my normal licence and my maritime mobile licence, the last straw came from the Home Office in October, 1982, when I was sailing on *SS Oriana* as 1st Radio Officer.

A group of American radio amateurs were given written permission by the Home Office to operate from the *Oriana*, a British ship, using their American licences. Apparently, permission had originally been granted by the Home Office for American amateurs to operate with their American licences from *MV Island Princess*, also a British ship, in 1980. Imagine my annoyance when I, as a British radio amateur and a Radio Officer employed by the company which owns both of these ships, had to go through all the procedure of letters of permission, forms filled in, DTI inspection arranged and passed and an extra licence fee of approximately three times the normal fee paid, to obtain my maritime mobile call.

Surely there can be no more worthy reason for an amateur radio station than when it is used on board ship where it could be employed as a safety of life at sea back-up for the ship's main radio installation.

In all of the ships I have sailed, which includes two of the world's largest passenger vessels each carrying more than 2,500 souls, all the radio equipment is installed in one Radio Office. Should this be put out of action by fire, collision, flood etc the vessel would lose all of its long range communication facilities. Apart from the Radio Office there is the bridge VHF, but its 40-50 mile range would not be of much use in the middle of the South Pacific. Passenger vessels also have one or two lifeboats fitted with radio, but usually it is virtually impossible to raise the masts and rig the aerial when the boat is in the stowed position. To lower the radio boat, raise its masts and rig the aerial is a lengthy, hazardous operation even in calm weather conditions – in inclement weather it becomes well nigh impossible.

An amateur radio station, set up away from the Radio Office and with its own aerial, could be an invaluable back-up on any ship. As most modern amateur transceivers will operate from 12V dc, the station could also be easily made independent of the ships mains in an emergency. For these reasons one would think that amateur radio at sea would be actively encouraged, but in fact quite the reverse is true.

The small handful of British/MM licences in existence bears witness to the tortuous path of red tape and heavy expense that has to be trodden by the intending seagoing radio amateur. Incidentally, while I was on *Oriana*, my annual MM licence fee was approximately three times as much as the ship's radio station licence fee, even though the ship's station included some £100,000 worth of equipment and had six R/Os to man it. Also, like any ship, a DTI surveyor has to spend at least one day on board every year examining the equipment in the annual radio survey.

Surely a simple letter of permission from the Master of the vessel would suffice, without any extra licence or fee being necessary. Most radio amateurs with MM licences are also the ship's Radio Officer. However, when this is not the case, perhaps there should be a ruling that the amateur installation be checked by the R/O to ensure no serious interference to the ship's radio communications.

It was following the frustration of the 1982 *SS Oriana* incident that I allowed both of my amateur licences to lapse. However, I am now in the process of renewing them. I have paid my £15 to BTI for the privilege of being able to take my Morse test again so that is the first step on the long road.

Maybe it would be a lot easier if I applied to the FCC for an American amateur licence which would allow me to operate on British ships.

Paul Barry, MV Sea Princess

I LIKE ANGUS...but

I must say how much I enjoy ***Amateur Radio.*** I like the mix of subjects and the style of the articles.

I am also very impressed with the reviews by Angus McKenzie, but he is making things difficult for me at the moment!

I have been intending to buy a linear for my 2m rig (the inevitable FT290) – nothing incredibly powerful, something in the range 25-50W was what I had in mind. The trouble is, Angus has now quite put me off the idea of buying a linear. His recent article convinced me that what I ought to do is build myself a valve linear.

Fine, I hear you say, another convert. There is only one problem – I can't find *anywhere* a design of a 2m linear in this range that I could build. I am not exactly a beginner on the construction front, but a project like this would be definitely pushing the frontiers forward as far as I am concerned.

I gave up on valves, I am ashamed to say, in 1967! That, of course, is what would make it fun; but I do feel the need of some information to work on. I am definitely not capable of making it up myself as I go along.

So, over to you. I am sure I am not the only reader in this predicament. You've been telling us in your magazine that we ought to use valves, build our own gear, and clean up our signals. How about taking us a bit nearer by publishing an article telling us how to build ourselves a 2m valve linear – not to run 1KW but for a middle-range power level with a really clean signal.

You could follow it up with an HF linear on similar lines. I may have passed the Morse test by then, with luck!

Frank Allen, G6WDB

GET IN TOUCH

Re your letter 'Young and Old' *(July)* from H Robson, Horncastle.

He is obviously an oldtimer and since I am myself 71, I decided to try and contact him.

However, despite spending some considerable time going through 'phone books and even electoral rolls I have met with no success.

I would still like to make contact. My address is 53 Stanley Street, Bourne, Lincs, PE10 9BJ.

I am G8GI, first licensed in 1936, always operative 160m-70cm nowadays, fixed and mobile. Well, here's hoping...

C B Raithby, Bourne

NO NOVICES

Re W Ellis's letter *(Current Comment, July)*, is it not about time the notion of a novice licence was knocked on the head?

I am a very new licensee. In the last twelve months, as well as studying for the RAE, I also managed to complete successfully the second year of my law degree. With no previous knowledge of radio or electronics I took a three-month RAE course and passed in December last. I then purchased a Datong D70 and key, practising every day until I passed the CW test in June.

In my view there is no need for a novice to be let loose on the air in order to get his CW up to the 12wpm test standard. Anyone who can read CW at 5wpm can learn to read and send at 12wpm through constant (off air) practice. All that is required is determination.

If Mr Ellis has not got time to study how will he find time to operate his shortwave equipment?

One point I feel has been overlooked – how many people would be interested in a novice licence when they realised it would allow the use of CW only?

The majority of CB operators I hear on FM and SSB state that it is a totally outmoded form of

L·E·T·T·E·R·S

communication that they would never bother with.

Other correspondents believe the entrance requirements for our hobby are set at the right level. I agree. The RAE is not difficult for someone with a genuine desire to become a radio amateur.

G4YOQ

BEAM NORTH

R G Wilson's observations '2m fixed station contest' *(August)* only confirms what we in the North have suspected – a great many stations south of the Midlands make no attempt to work the real DX to the north of them.

In 1983 I logged G1ACC at 4/1 convinced they would pick-up my signal and beam north. Had they, it would have been very good DX for them, as good as any they may have worked to the continent.

It is a great shame some very good contest stations can only work 100-200 stations over a 24hrs contest because they opt for the easy pickings to the south east.

Just recently I worked from home two stations in Eastbourne because they had heard me calling and bothered to swing their beams north. At a line of sight distance of 450 miles that is the sort of DX which can be worked by those in the know.

It is sad that contests judge quantity rather than the quality of the QSOs made!

Tom Waller, Aberdeen

A LOWE OPINION

I was somewhat surprised at the content of a recent article in your magazine, *('Short Wave Listener', August 1984)*, which quite frankly I find misleading and in some areas technically incorrect. I honestly think that the advice given, if aimed at the short wave listener who has a serious interest in listening, will result in disappointment and frustration for him in the long run.

Before going into details of my complaint, I should perhaps reassure you of my bona fides. As you may know, I am the technical director of Lowe Electronics, and have been associated with the company for almost twenty years. Prior to that, my career has always been in professional communications, with Pye Telecommunications, the Marconi Company (for whom I ran HF Communications training courses), and others. I have of course been licenced for some years as G3PCY and 5N2AAC, and I do feel qualified to comment on the article as published.

The first point at issue must be an unfortunate misprint or mistake. The article says 'call in at the local Trio dealer and he'll be pleased to tell you about the latest in stacked hi-fi systems, but he won't have a clue about receivers.' We have spent a long time establishing the name of Trio in this country, and whilst in charity I assume that Mr Morgan is referring to hi-fi dealers as distinct from communications radio specialist dealers, the distinction is not actually made, and I must ask for an explanation and rebuttal to be printed on this point. The budding listener will find that the Trio amateur radio dealer will give better advice on receivers than does Mr Morgan's article!

On the specific technical features listed, I assume that describing the BFO as a *'best frequency oscillator'* is a misprint, but a BFO does not simply resolve single sideband signals.

Notch filters? Mr Morgan has described the operation of a device which has precisely the opposite effect of a notch filter. A notch filter does not *'boost gain on the spot frequency.'*

The familiar quote of *'the £800 rig you saved hard for costs £200 less in the USA'* will certainly cause hardship if applied to a purchase, and is particularly bad advice if one looks at the facts. For the purpose of this exercise I have obtained USA prices from the current (July 1984) issue of 'Ham Radio' magazine, and included discounts offered by the USA dealers. I have added a basic carriage charge of £10 which is unrealistically low, and applied current duty and VAT rates into this country. As I write, the dollar exchange rate is 1.3/£, so I have used this rate in the calculation. The results are listed in the box.

Equipment	*USA price*	*Landed cost UK*	*Typical UK list price*
TS930S	$1800 less 10%	£1589	£1195
TS430S	$900 less 10%	£800	£779
R2000	$500 (special sale)	£503	£436
R600	$329 (special sale)	£335	£272

So one can see that there is actually a price penalty to pay when buying from the USA, and not the £800 down to £600 quoted by Mr Morgan. I know that someone will say 'I carried my purchase through Customs as hand baggage and didn't pay any duty', but that is not quite legal, and we can't make comparisons on that basis.

The main body of the article concerns itself with a short review of several receivers, and quite frankly most of them cannot be considered as equipment for the serious listener, as anyone who has tried to resolve signals on them should find. In my opinion, the receivers described are fine for the casual domestic listener, and possibly convenient for a regular world wide traveller, but they are just not up to the task of serious listening. In terms of value for money, the serious listener should be considering receivers from the secondhand market, as these are often made to fully professional standards and would satisfy the most demanding user. As examples from the 'for sale' column in the same issue of the magazine in which the article appears, let me quote 'Racal RA1217 at £320', 'Yaesu FRG-7 digital at £120', 'Trio R1000 with headphones and atu, at £135', and many more. Equally from the same columns, I note the following: 'Sony CRF320 professional communication receiver....Cost over £700, accept £300 ono', and this I feel shows the true worth of the so-called 'communications receivers' from the domestic radio market.

The fact is that we, in common with most of the specialist communications radio dealers, will not sell these glamorous pseudo-'communications receivers', nor will we accept them as secondhand trade-in items for resale, because we simply do not feel that they offer the facilities and performance which listening in today's conditions demand.

I must make comment on the description of the Satellit 600 Professional receiver as *'a sheep in wolf's clothing'* based on the observation that the *'clanger of clangers'* is the coverage stopping at 26.1MHz. As any specialist dealer will tell you, the receivers made in Germany or sold on the German market are prohibited in law from tuning above 26.1MHz, and whilst one may wonder at the logic behind this, it is certainly not a 'clanger of clangers'.

The penultimate paragraph states that *'short wave listeners are certainly not second class citizens, but are in fact dedicated people following a hobby that needs just as much patience.....as does amateur operating'*. I couldn't agree more, and this is precisely why I find this article, although well-meant, to be almost totally misleading in its content and conclusions.

I trust that you may find space in a forthcoming issue of ***Amateur Radio*** to correct some of the misleading advice in Mr Morgan's article.

John Wilson, Technical Director, Lowe Electronics

This letter arrived too late to enable Trevor Morgan to reply, and although I agree with much of what John Wilson says, I feel that in Trevor's defence it should be pointed out that he was dealing with high street general appliance shops, rather than respected amateur radio specialists such as Lowe's who, of course, do not sell hi-fi's – Ed.

STRAIGHT & LEVEL

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

ARROW AHOY

If evidence is needed of the importance of radio links to yachtsmen it came, surely, in the recent Observer single-handed transatlantic race.

Arrow Electronics tell us that they fitted a number of the competing boats with the FT757 transceiver. Just as well, too.

The equipment on board *Jemima Nicolas* enabled Alan Thomas to rescue John Mansell, of the trimaran *Double Brown,* which broke up in mid-Atlantic. Both arrived safely in Newport, Rhode Island.

Another installation, on the yacht *Race Against Poverty,* kept Chris Smith in touch with Portishead Radio and kept Race Control and his family informed when he had to return to Plymouth leaking badly. Chris also found the transceiver extremely useful for live BBC broadcasts.

All thanks to Yaesu 757.

ON TOP OF THE WORLD

David Rickwood, G6UDM, is about to combine his hobbies of amateur radio and mountain walking in a unique way. On 22-23 September, he is off with two friends to climb the 'three peaks' of England, Wales and Scotland. To the top of Scafell, Snowdon and Ben Nevis is the aim... and within 30 hours.

David will take with him a 2 metre SSB transceiver, beam (size yet to be determined but as big as possible), and probably a linear amplifier, if he can find a suitable portable power supply. He hopes to be able to make at least one contact from each of the peaks into each of G, GW and GM land.

He will use his own callsign with relevant changes for each country ie G6UDM/P, GW6UDM/P, GM6UDM/P. Due to the nature of the expedition, operation at each site will have to be restricted to about 30 minutes, unless time allows for longer. Similarly, exact times of operation cannot be given but he hopes to be active from about 0845 BST on the 22nd from the summit of Snowdon, 1600 BST on the 22nd from the summit of Scafell, and 1100 BST on the 23rd from the summit of Ben Nevis. Preferred frequencies will be 144.280 and 144.285MHz.

Local radio and press will cover the event, so a good response would go down really well. Local Raynet groups are also to be informed of the party's activities.

One of the party, we are told, was injured in a 100ft fall on a rock face in Devon but has now recovered, throwing away his leg irons to attempt this walk. Good luck to him!

David looks forward to contacting as many of our readers as possible, and he advises that all contacts will be confirmed by a special QSL card. An extra special card will go to any person able to contact him on all three peaks.

WELSH AR CONVENTION

Guest speaker at the Welsh Amateur Radio Convention on 30 September will be Dr Anthony W England, PhD, W0ORE.

Dr England will be a mission specialist on Space Shuttle 51F in April 1985, when he will operate on both HF and VHF. Astronaut England was a back-up crewman on the Apollo 13 and 16 flights.

Admission to Dr England's illustrated talk will be by ticket, which have been on sale since 1 August (see August issue of *Radio Communication.*)

The Convention, which will be opened by Mr R Barrett, GW8HEZ, President of the RSGB, will be held at Oakdale Community College, Blackwood, Gwent. In addition to the usual trade stands, there will be a tape/slide presentation on County Hunting and a video film of Dr Owen Garriott's (W5LFL) Space Shuttle mission. Admission will be £1 at the door and there will be talk-in on S22. Take exit 27 off the M4.

RMG OPEN MEETING

An open meeting of the RSGB's Repeater Management Group is to be held on Saturday, 6 October at the Crest Hotel, Ferriby High Road, North Ferriby, Hull, North Humberside HU14 3LG. Start time is 13.30.

There will be talk-in available on GB3HS (R2) and/or S22.

A buffet will be available at an approximate cost of £3 per head.

The meeting should be of particular interest to repeater builders and repeater users in Area E, Northern and Eastern England, including Norfolk, Midlands and the North West.

NATIONAL WIRELESS MUSEUM

The wireless museum at Arreton Manor, Isle of Wight, is to be known as the National Wireless and Communications Museum, thus considerably broadening its horizons. This was decided at a recent meeting in Portsmouth when it was also agreed to seek

'CLANDESTINE CONFIDENTIAL'

This is a new book on shortwave clandestine radio stations and is devoted exclusively to clandestine broadcasting on a largely current basis.

Clandestine broadcasting dates back virtually as far as does radio broadcasting itself, although the Second World War saw the technique come of age through extensive use of the medium by the Nazis, and the efforts on the part of the Allies.

There were anti-British stations in Palestine in the late 1940s, stations such as the Voice of the Hungarian Revolution in the 1950s, Radio Revolucion in Honduras during the same decade, the Voice of the Pathat Lao in the 1960s, Mother of Vietnam in the 1970s. Each was one of dozens on the air at any one time, positioned in all parts of the world.

Today's crop include anti-Iranians, anti-Iraquis, anti-El Salvadoran, anti-Cuban, anti-Angolan, anti-Chinese and many more.

The book deals, generally, with current or recently active shortwave clandestines, including a chapter on the Falklands crisis. Much detail is given about the stations and their frequencies. It makes compelling reading.

'Clandestine Confidential' is being marketed in the UK by *Interproduct Ltd, Lynton, Stanley, Perth. PH1 4QQ. Tel: 073882 575. The full price is £5.55 plus 50p p&p.*

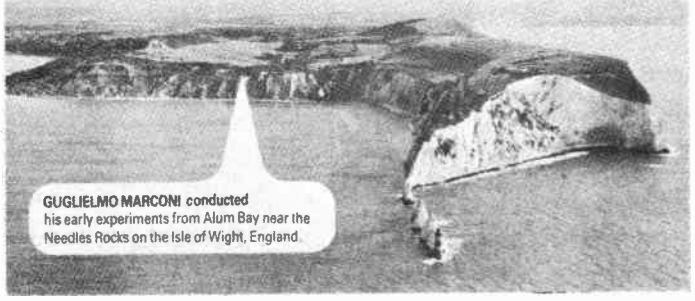
STRAIGHT AND LEVEL

73s from Douglas Byrne

G3KPO

(GB 3WM)

QRA:
34 Pellhurst Road
Ryde
Isle of Wight
PO33 3BW



GUGLIELMO MARCONI conducted his early experiments from Alum Bay near the Needles Rocks on the Isle of Wight, England.

charitable status for the Museum.

Trustees appointed were Dr Graham E Winbolt, Mr Bruce Jenkins (Managing Director, Radio Victory), Mr Tony Howarth (Director, Portsmouth City Museums) and Mr Douglas Byrne (Curator).

A new organising committee was also elected to replace the original committee of the former Wireless Preservation Society.

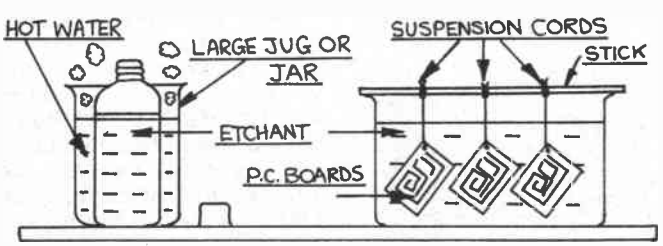
Arreton Manor is two miles from Newport, capital of the Isle of Wight, and is open to the public from 10am to 6pm on weekdays, and from 2pm to 6pm on Sundays.

CORRECTION

Due to a typographical error, the wrong price was given for the CWR-610E Telereader in the ARE (Amateur Radio Exchange) advertisement in our August issue.

The correct price is £179 inc VAT. Tel: 01-992 5765 for details.

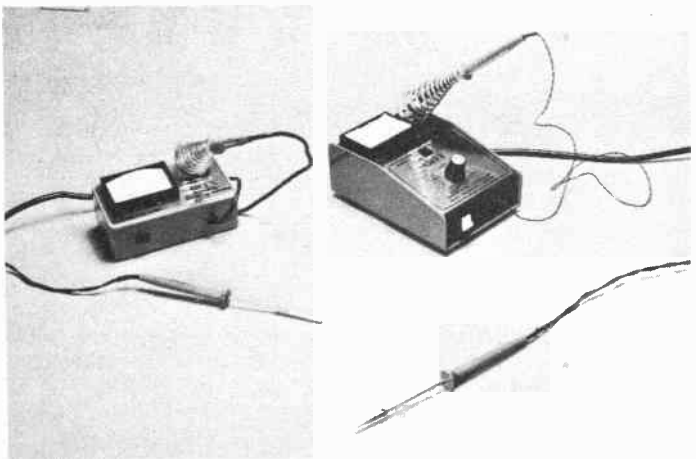
ANDY TIPPS by Deejay



ANDY SAYS:-

"FOR FASTER AND MORE EFFECTIVE ETCHING OF HOMEBREW P.C. BOARDS TRY THESE TWO IDEAS. PLACE A PLASTIC BOTTLE OF ETCHANT WITH THE STOPPER REMOVED INTO A HOT WATER 'JACKET' FOR ABOUT TEN MINUTES BEFORE USING. TRY SUS--PENDING THE BOARDS VERTICALLY WHEN ETCHING, THIS KEEPS THE ETCHING SURFACE CLEAR FROM DISSOLVED COPPER"

MINIATURE SOLDERING IRON

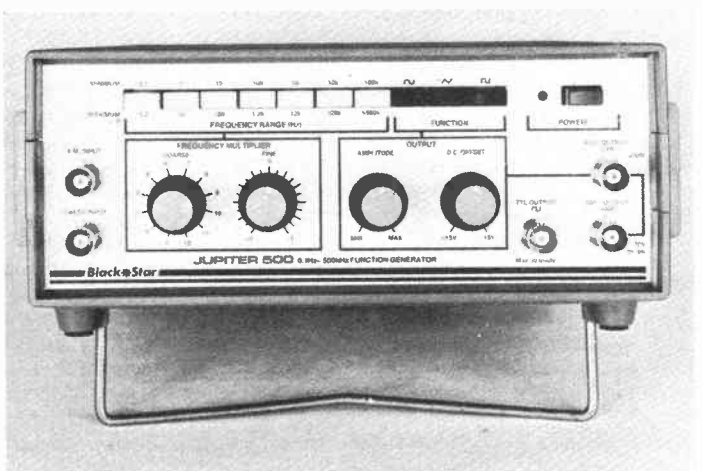


A new miniature soldering iron, the Oryx M3, has been introduced by Greenwood Electronics. Developed for light production applications, the M3 is rated at 17W and has a normal operating temperature of 380°C. It has been ergonomically designed and is perfectly balanced to give the correct 'feel' to experienced operators.

Supplied complete with a replaceable push-on tip and stainless steel storage hook, the M3 iron is available in 12V, 110V and 210/240V versions. The 12V iron is fitted with a cigar lighter plug for mobile work. Price is £5.95.

Greenwood Electronics, Portman Road, Reading, Berks. RG3 1NE. Tel: 0734 595844.

LOW COST FUNCTION GENERATOR



The new British-made Jupiter 500 Function Generator is a rugged mains operated instrument offering features unique in its price range, such as full programmability of both amplitude and frequency by external voltage and exceptionally high output voltage of up to 30V peak-to-peak. The frequency range is 0.1Hz to 500KHz in 7 switched decade ranges with fine frequency control.

Sine, square, triangle and TTL (30 loads) waveforms are selectable and an adjustable dc offset up to 15V can be applied to the output.

The Jupiter 500 is supplied with a comprehensive instruction manual and a spare fuse and sells in the UK at £110 + VAT.

Black Star Ltd, 9A Crown Street, St Ives, Huntingdon, Cambs. PE17 4EB. Tel: 0480 62440.

VHF CONVENTION

The Midlands VHF Convention will be held at the British Telecom Training College, Stone, Staffordshire, on October 13th, starting at 1030am. There will be usual attractions plus measurement facilities for visitors rigs, lectures on DX and Yagi aerial design, a VHF Forum and talk-in on S22 and SU8. Details from G3UBX.

STRAIGHT AND LEVEL

BARTG CONTEST NEWS

Peter Adams G6LZB, Contest Manager of the British Amateur Radio Teleprinter Group, has written with some details of past and future BARTG contests. He writes:

'The committee of BARTG wish to thank your readers for their past support of these annual events, which are organised in order to promote interest in the RTTY mode as used by radio amateurs, and they hope that the Group will continue to enjoy the participation of non-members in any future RTTY contests that the Group may organise. I look forward to receiving any of your logs or comments in connection with future RTTY contests.'

Looking ahead

Peter sends information regarding two forthcoming RTTY contests:

The 1984 BARTG Autumn VHF Contest will take place from 1800 GMT Saturday 13 October, until 1100 GMT Sunday 14 October 1984. A rest period of at least 4 hours must be taken during the contest period and be declared on the summary sheet.

The contest will take place on 144MHz, although repeater and satellite working is invalid, and is open to all stations in zones 14 and 15. Portable operation (from not more than 1Km from a particular location) is allowed, and there is an SWL section. The same station cannot be counted more than once in the contest.

The Winter 144/432MHz Cumulative RTTY Contest will be held from 2000-2200 GMT on November 5, 12, 19 and 26, and December 3, 1984. Only three of the five contest periods may be used in scoring and a station can only be contacted once per period.

In both contests, messages should carry the following information:

a) time of start of contact in GMT, to consist of a full four figure group. This information must be passed in both directions and logged. The use of 'same' or 'same as yours' is not permitted;

b)RST report, normal three figure group;

c)message number: this will consist of a three figure group, starting from 001 for the first contact made and numbers will continue in sequence throughout the duration of the contest;

d)QRA locator (normal five symbol locator) is preferred, or QTH given either as a town or as a bearing and distance in Km from a town (max 25Km). The town must be identifiable on a 1:500,000 tourist or road plan map.

Logs shall be entered on A4 size log sheets and be accompanied by a cover sheet similar to the RSGB form 427, giving address for correspondence, site and equipment details, comments and signature(s) of operator(s).

The log entry shall contain: date – time of start of contact – RST report sent – message number – time received – callsign of station worked – his RST and message number (these may be combined, eg 599001) – QRA and/or QTH received – estimated distance and points claimed.

It will be helpful to include your own QRA locator at the top of every log sheet.

Scoring

Scoring details are shown in the box below. Proof of contact may be required when no log is received from the station worked.

Certificates are awarded to top scorers and runners-up among single-operator stations, multi-operator stations and SWLs from the UK and Europe (separate sections for both bands in the Winter contest).

Closing dates for log entries are October 17 1984 and January 12 1985, for the Autumn and Winter contests respectively.

Peter has also sent some comments on the 1984 VHF/UHF Contest; and some tips on good RTTY contest operating:

'Once again conditions during the contest did us no favours, but even so a number of continentals managed to work well into the UK. Although RTTY activity has increased sharply on VHF of late, the number of entries was less than last year, and there was very little activity 70 and 23cm.

My current feeling is that until UHF RTTY becomes more popular, the contest should be restricted to 2 metres only. Comments required please.

Difficulty

All score claims were cross-checked by computer and this year they were more accurate than last, so maybe the rogue programs have been eliminated. Considerable difficulty was experienced when reading some reports and serial numbers, and in three cases a contact was eliminated from the score because of this.

Operating on the whole was good, but there was the perennial complaint from mechanical operators about the absence of the CR/LF sequence from some computer stations. When are they going to learn?

Many people also complained about long CQ calls and endless RYs, which seriously waste time.

Here is an amalgam of advice and comments received about this subject: call CQ in short one or two line bursts, repeating your callsign as often as possible. Wait five seconds, then do it again. The RY string is completely unnecessary as other stations will be able to tune you in on the CQ call. If they have not tuned you in by the time you drop carrier, they only have to wait five seconds for your next burst.

Similarly, when answering a CQ call, repeat callsigns an appropriate number of times as a tuning aid rather than send the information-less RYs.'

Winner

Incidentally, the winner of the contest in the single-operator section was G6CZV with 68 QSOs, including one over 441Km with a GM station.

If you want more details of RTTY contests, or if you wish to enter logs in one of those mentioned above, write to *Peter Adams at 464 Whippendell Road, Watford, Herts WD1 7PT.*

BARTG Contests: distance/scores

0 – 50 Km: 1 point	250 – 300 Km: 11 points
50 – 100 Km: 3 points	300 – 350 Km: 13 points
100 – 150 Km: 5 points	350 – 400 Km: 15 points
150 – 200 Km: 7 points	400 – 450 Km: 17 points
200 – 250 Km: 9 points	450 – 500 Km: 19 points

and pro rata in 50Km increments

WORTH A PACKET

ICS have introduced the first packet switching terminal node controllers to be commercially available on the UK amateur radio market.

The PKT-1 is a fully assembled, tested and cased unit which sells at £499.00 inc VAT plus £2.50 p&p.

Also available is the Tucson Amateur Packet Radio Group terminal unit in kit form, at £295.00 inc VAT plus £2.50 p&p.

Both units implement the TAPR AX.25 protocol, include a modem, and are designed to be driven by a dumb terminal unit or a personal computer equipped with terminal emulation. They interface directly to a standard VHF FM transceiver.

These units are suitable for high speed terrestrial or satellite error correcting data communication and multiple QSOs are permitted on one frequency. Each TNC can act as a digital repeater with the ability to 'digipeat' via up to eight TNCs. This means that VHF contacts will ultimately be possible from one end of England to the other, under flat band conditions – given suitably equipped and attended stations.

Packet radio represents the leading edge of amateur radio technology in the United States, and is now gaining in popularity in this country. For further information, contact: *ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX.*

STRAIGHT AND LEVEL

RADIO COURSES

We have been advised of the following RAE courses.

Brunel Technical College, Ashley Down, Bristol BS7 9BU, Tel: Bristol 41241

Monday evenings, Theory; Tuesday evenings, Morse. Enrolment 3-4 September. Courses commence 17-18 September. Tutor, Phil Brouder, G3ZJH. Further details from Department of Aerospace and Radiocommunications Engineering. Last year, students achieved 100% pass rate in the Morse examinaton .

Reddish Vale Evening Centre, Reddish Vale Road, Reddish, Stockport.

The RAE course leading to City and Guilds in May, 1985, will be on Monday nights starting 24th September, 7pm to 9pm.

Lessons in Morse will be on Thursday nights starting 27th September, 7pm to 9pm. The course is designed to teach sending and receiving of Morse up to speeds of 12-15 words per minute in preparation for the Morse test for amateurs.

Enrolment for both courses is on September 17th, 18th and 20th between 7pm and 9pm.

Further details are available from Dave Wood by 'phoning 061-477 3544 ext 10 between 9am and 4pm.

Brooklands Technical College, Department of Technology, Heath Road, Weybridge, Surrey. Tel: Weybridge 53300 ext 246.

The class meets on Wednesdays from 6.30 to 8pm commencing September 19th. The lecturer is Chris Roberts G4EVA.

No previous knowledge is assumed and the course is designed to prepare potential students for the RAE May examination.

Students should enrol on 10th, 11th or 12th September between 6 and 8pm.

Barking Radio & Electronics Society

Registration will be at 7.30pm, 13th September, at the Westbury Recreational Centre, Westbury School, Ripple Road, Barking, Essex. All welcome.

Wigan College of Technology

Morse classes for radio amateurs will commence at 7pm on Wedensday, 19th September.

The classes will be approximately £10 per 10 lessons with a substantial reduction for senior citizens and unemployed. For further information apply to Mr E J Fox, G3AVJ5 Belfield Crescent, Huyton, Mersyside, L36 5TR, Tel: 051-489-3325 or direct to the college.

CLUB NEWS

Barry College of Further Education Radio Society will be operational on HF, VHF, UHF bands from Flat Holm Island in the Bristol Channel. Callsign GB2FI, special QSL cards will be available. WAB ST26. Details from Glyn Jones, GW6PDG, 2 Castle Precinct, Llandough, Cowbridge.

Maltby Amateur Radio Society – the Worksop repeater GB3DS is operational and on the air giving good 70cm coverage into Maltby and surrounding districts. Anyone wishing to join the Repeater Group, or even just donate a small amount to ensure that the repeater is maintained, should contact Fred, G3XXN.

Glenrothes & District Amateur Radio Club: Claimed scores for our NFD entries were – Open Section, GM4GRC/P, 693 QSOs, 3048 points; Restricted Section, GM3ULG/P, 527 QSOs, 2148 points.

Bridgend & District Amateur Radio Club: All meetings are now at the YMCA, Angel Street, Bridgend. These will be twice monthly on the first and third Friday.Start time is 19.30.

Newark and District Amateur Radio Club are hoping to meet a number of new members, both newly licensed and old hands who have lost touch with their local club, at their social evening on 6th September at Elston Village Hall (near Newark).

Interested persons should contact Roger Hiscock, G4MDV, QTHR, Tel: East Stoke 539.

RALLY CALENDAR

August 26: **BARTG Rally,** Sandown Park Racecourse, Esher. Open 10.30-17.00. Talk-in on S22. BARTG TU kits, components, data sheets and publications. Live demonstrations, trade stands, car boot sale. Entrance £1, 25p for XYLs, children and OAPs.

September 9: **Telford Mobile Rally.** At Telford Shopping Centre. Free admission and parking. Over 80 stands plus club exhibits in fully enclosed venue. Open 11am (disabled from 10.30am). Details from G8DIR, G8UGL or G3UKV.

September 16: **Vange Mobile Rally,** St Nicholas School, Nicholas Lane, Basildon. Open 10am-5pm. Talk-in on 144MHz by GB4VMR. Details from G4IFD, QTHR.

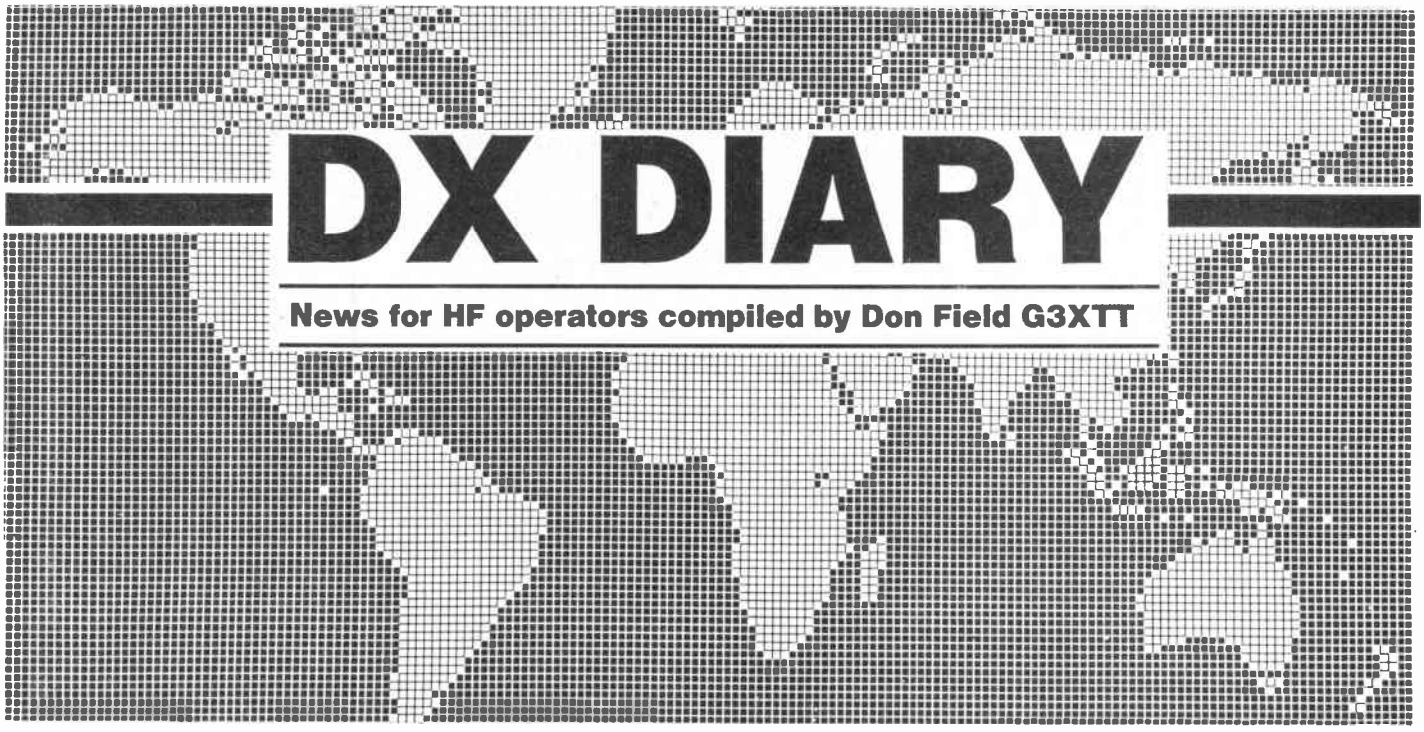
September 16: **Peterborough R&ES Mobile Rally,** Wirrena Sports Stadium, Bishops Road. Open 10.30am-5pm. Details from D Wilson. Tel: Peterborough 76238.

September 22: **Ballymena & District Annual Mobile Rally,** Ballee High School. Open 12 noon-5pm. Talk-in on S22. Trade stands, bring-and-buy, RSGB bookstall, QSL Bureau. Details from Jeffrey Clarke GI4 HCN

September 23: **Galashiels & District AR Society Open Day,** Focus Centre, Livingstone Place. From 12 noon-5pm. Usual trade stands, bring-and-buy stalls and an exhibition station will be in operation. Details from A Walker, GM3DAR.

September 23: **Lincoln Hamfest,** Lincolnshire Showground, (4 miles north of Lincoln City on the A15). Opens 11am-5.30pm. More trade stands than previous years.

September 30: **Harlow & District Annual Mobile Rally,** Harlow Sports Centre, Hammarskjold Rd. Open 10am. Talk-in on 144MHz (S22). Bring-and-buy plus usual features. Ample parking. Details from G4TLU, G6STB.



DX DIARY

News for HF operators compiled by Don Field G3XTT

The coming of autumn, with longer hours of darkness, signals the onset of a new LF DXing season. For many amateurs (including myself), LF DXing presents one of the greatest challenges that our hobby has to offer. It demands the most from our stations and antennae, it demands some of the greatest operating skills, it demands perseverance of a high order and the ability to manage on minimal sleep for nights on end. Not a recipe to everyone's taste, but one which appeals to an increasing number of amateurs bored or disiliusioned with the higher bands.

What is LF?

The LF bands are normally taken to include 40, 80 and 160 metres, the criterion being that these are the bands on which daytime signals are highly attenuated by absorption in the 'D' layer of the ionosphere, so that long distance propagation is achievable principally during the hours of darkness. Having said this, during the autumn and winter period 40 metres is often 'open' round the clock with Pacific stations workable from dawn through to midday and Japanese and West Coast US stations workable from early afternoon. These effects are less noticeable on 80 metres, and on 160 metres openings to specific parts of the world can be very short indeed – just a matter of minutes sometimes.

To get you in the mood for LF DXing I want to make some general observations about propagation, operating technique, band-plans, and station requirements. If space permits, in the future I may have more to say relating to specific bands. Having said this, whole books could be written about the particular demands of each band. In the case of 80 metres the definitive book has indeed been written by John Devoldere, ON4UN, the acknowledged 'king' of 80m with over 300 countries worked on the band! You may well be astonished at such an achievement, particularly if you think of 80m in the same light as a newly licensed station I heard the other evening who was amazed to be called by a Hungarian station on 80. For the record, John's book is called *80m DXing*, and is available from the RSGB.

As I said earlier, LF DXing takes place principally during the hours of darkness. However, there are special effects which take place at dawn and dusk which tend to enhance LF propagation and make the dawn and dusk twilight periods especially important to the LF DXer. One of these effects is that during the twilight period there is a tilting of the ionosphere which has the effect of lowering the angle of the radiated signal. Low angles of radiation are particularly important for the longest distances and are relatively easy to achieve at HF simply by getting the antenna at least a half wavelength into the air. At LF the antenna heights needed to achieve this are beyond the reach of most amateurs, so any help from nature is well worth having.

The length of the twilight period varies in winter from about 2 hours either side of sunrise/sunset at 65 degrees latitude to about 5 minutes either side at the equator. To get the most out of LF DXing it is essential, therefore, to know both your own sunrise and sunset times and also those of the station you wish to work. Computer programs have been developed to enable to work them out on your home computer. Alternatively, ON4UN publishes a book giving sunrise and sunset times at 15 day intervals for every DXCC country.

A third alternative, and one which I favour, is the so-called DX Edge, again available from the RSGB, which is a map of the world with overlays for each month of the year showing at a glance where the grey-line (border between daylight and night) lies at any given time of day, and exactly which areas of the world are in darkness.

Low angles of radiation

I said that low angles of radiation are important for long-distance working. This is especially true of east-west paths and of paths over the North Pole. It tends to be less true of paths to the south. Because horizontally-polarised antennae have to be at least a half-wave high to achieve significant low-angle radiation they are far from ideal for LF. If you can put up an 80m beam at 150 feet, fine. The night before writing this column I worked W2HCW on 160. His signals were S9 while other US stations were only just audible. Arnold is using a 160m quad at well over 200 feet above ground!

For most of us a more practical solution to the problem of low angles is to use a vertical antenna. A full size quarter-wave vertical for 80m is quite feasible for many operators, and even reduced height verticals with some form of capacitive and/or inductive loading can give excellent results. The shorter the vertical, compared with a full quarter-wave, the higher will be its angle of radiation and the lower will be its radiation resistance. This latter figure is important because it determines the amount of transmitter power which is lost.

A full size quarter-wave antenna has a radiation resistance of about 25ohms. If the earth resistance is also 25ohms, half your transmitter power will be lost as heat. If the antenna is significantly shorter than a quarter-wave its radiation resistance could be as low as, say, 5ohms when, with the same earth system, over 80% of the power would be lost. 25ohms isn't unreasonable for an average earth system, and this is why many amateurs fail to have much success with vertical antennae.

Always strive for the best earth possible by getting as much copper as possible under the ground. A hundred half-wavelength wires radiating from the antenna feedpoint is about what our broadcasting colleagues would aim for with a medium wave transmitter. For most of us 40 or 50 wires of random length (aim for 50ft or more if the garden allows) should do the trick. At the same time, ensure if possible that your antenna is at least two-thirds full-size, and capacitively rather than inductively load the antenna if at all possible (see the various antenna handbooks).

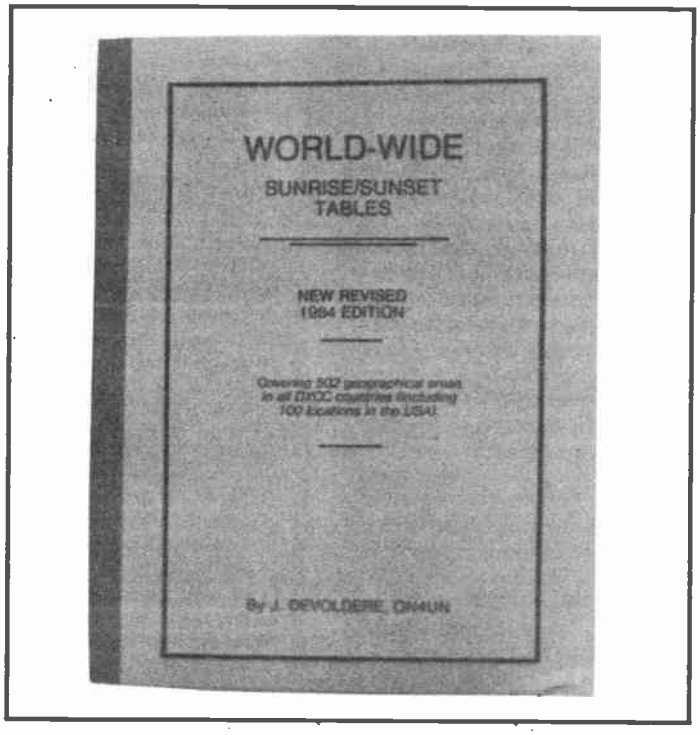
Equipment

Equipment for the LF bands need not be significantly different from that needed on the HF bands. Having said this, receiver performance is tested to the full on 40m when trying to find an amateur station amid the broadcast QRM, so a receiver with a high dynamic range is a must. To work the USA on 40 and 80 SSB or 160 CW also requires, at least in most cases, that you transmit on one frequency and receive on another. A separate receiver, or an external VFO for your transceiver, is therefore another essential item. The weak signals encountered on the LF bands also make add-on items such as audio filters particularly useful. Headphones are also a necessity to prevent you from waking the family during those late-night sessions. Finally, a linear amplifier is more important on LF than at HF in order to compensate for the higher signal attenuation and the lack of directional antennae.

Operating technique and band-plans

As in all aspects of DXing it is more important to spend time listening rather than transmitting. Get to know the band(s) which interest you; who are the regulars, when are different parts of the world to be heard, and so on. Remember to observe the DX segments of the band plans. At the recent IARU conference it was agreed that 3775-3800KHz should be reserved for intercontinental working, and 3500-3510KHz is similarly designated for CW operation.

On 160m band planning is complicated by the fact that



no two countries seem to have the same frequency allocations!

As a general rule, however, UK stations should transmit between 1820-1830KHz and listen between 1800-1810KHz when looking for transatlantic contacts although, having said this, more and more DX contacts on 160m are now taking place co-channel.

Talking about different allocations in different countries, US stations are limited to CW only operation below 7100KHz on 40m and below 3775KHz on 80m. However, their bands extend well above ours in each case.

On 80m the Russian allocation stops at 3650KHz, although a limited number of licences are issued each year for operation at the top end of the band.

As far as operating times are concerned, I have already talked about signal enhancement at dawn and dusk. Usually the optimum time for propagation to stations to the east of us is at their dawn; for stations to the west of us it is at our dawn. For stations to the south, signals tend to peak around midnight. On 80 and 160m the best propagation to New Zealand and the Pacific is around the equinoxes (September 21st and March 21st). Certainly the September equinox last year produced good propagation to New Zealand on 160 and to Hawaii on 80. Don't forget that some interesting contacts can be made during the summer.

During June of this year South American stations were workable almost nightly on 160 and stations from South Africa, Zimbabwe, Pakistan and other parts of Africa and Asia were regulars on 80. In just two hours one evening on 80 SSB I was able to work all continents, and I know others who were able to achieve the same feat in an even shorter time.

Another tip when you start to run out of new ones to work is to arrange LF schedules with stations you work on the HF bands. Many DX stations will be only too happy to co-operate in such a venture.

Over the next few years as we hit the depths of the sunspot cycle the LF bands will become much more important to us. Why not get started now?

Cocos Island

Earlier this year a group of Costa Rican amateurs undertook a very successful DXpedition to Cocos Island off the Costa Rican coast. I have recently received my QSL cards from the group and on the back of the card is the following information about the island.

Cocos Island is located 500Km from the Costa Rican coast, 650Km NNE of the Galapagos Islands, and has an area of 24Km². Known since the 16th century as 'Isle de Coques', it was a favourite haunt of pirates, corsairs and whalers who used the island as a source of fresh water, wood, meat and coconuts. At least 20 treasures are said to have been buried here, including the loot of Lima by William Thompson in 1820 and Bennett Graham (Benito Bonito) with his ship 'Lightning', who looted many cities and ships along the South American coast. During the 1800s, over 400 expeditions spent years looking for these fabulous treasures, including Gissler who lived 18 years on the so called 'Treasure Island', leaving an innumerable amount of caves all over the area. On the rocks at Chatham Bay one can find thousands of inscriptions of pirates and other visitors dating as far back as the 17th century. In 1874 the Costa Rican government used the island as a prison for a period of seven years.

Uninhabited for the past 90 years, the island was recently declared a National Primary Forest Reserve and is the subject of many biological studies. The island is primarily composed of volcanic lavae covered by very dense vegetation, with high humidity due to abundant rains which produce hundreds of waterfalls draining out into the Pacific Ocean through the high coral reefs. Landing is somewhat difficult and only possible at Chatham Bay in the north part and Wafer Bay on the west side, where in 1978 a complete amateur radio station and antenna tower system was installed by TI2CF and left there for future amateur visits. No permanent residents live on the island so that generators, fuel, some antennae and food have to be taken on each trip. Transportation is only feasible by chartered boats from Port Puntarenas and takes 4 days for the round trip.

News

In the July column I talked about the three 4U1 stations operating in Vienna, Geneva and New York. Late in June they were joined by a fourth, 4U1UP, operating from the University for Peace in Costa Rica. The University is administered along similar lines to those which I described for 4U1VIC. The ARRL has just decided overwhelmingly not to count 4U1VIC as a DXCC country, so the same will

DX DIARY

presumably be true for 4U1UP. Nevertheless it is an interesting one to work. If you've caught them, you can send the QSL to University for Peace, PO Box 199, 1250 Costa Rica.

K1RH, W1CCN and KC1CI were hoping to be operational from St Pierre & Miquelon for 5 weeks, commencing August 3rd. They will be operating as FP/K1RH, etc. as recommended by the ITU for reciprocal callsigns.

During June, Alan T30AT, made a last-minute trip to Kanton Island to operate as T31AT prior to returning to the UK at the end of his contract. He was able to work a number of UK stations on 20m SSB and his QSL manager G4GED was hoping to make a prompt start with the QSLing as soon as the logs arrived. Alan may return to Kiribati if his contract is renewed.

Another surprise arrival in June was 5X5GK, a Canadian doctor working in Uganda. He was worked in the UK on 20m and, at the time of writing, had even been heard on 80. He was asking for QSLs via JA1BK. It remains to be seen whether his licence is genuine as there have been several unauthorised operations from Uganda in the last couple of years. However, rumour has it that he will be in Uganda for 12-14 months.

Bull, 9U5JB, returns from his holiday in the United States at the end of August and is hoping to be active on the LF bands during the autumn. If you catch him on any band a quick QSL is guaranteed from his manager ON5NT.

DXCC news

On the DXCC front it looks as though the former Baker, Howland and American Phoenix Islands will become a deleted country now that Kanton Island is no longer under joint Kiribati/USA administration. In its place, a new country of Baker and Howland Islands will be created. This decision is subject to ratification by ARRL HQ. Incidentally, the newest DX Advisory Committee member is K1MM. Bill is a well-known DXer and DXpeditioner and should bring a breath of fresh air to the DXAC.

My DX News Sheet colleague G3ZAY was active in July as VK9LX from Lord Howe Island, along with Richard, G3CWI/VP8ANT/VK9LW. QSLs for both of them go to PO Box 146, Cambridge.

Another interesting piece of news is that the Taiwanese authorities are now prepared to issue licences to Taiwan nationals. Apparently there are a number of licence applications in the pipeline, so BV calls should no longer be the rarity they once were.

Dick NN6U, a keen LF DXer, is now in Malaya with the callsign 9M2RT. He will be there for a year and his QSLs will be handled by KB6UF. In 1983 I had the pleasure of travelling by car to the Visalia DX Convention with these two enthusiastic DXers.

Contests

The weekend of 8/9 September sees the Worked All Europe SSB contest organised by the German national society. European stations work non-Europeans and vice versa. The following weekend is the CW leg of the Scandinavian Activity Contest, an 80-10m event which is always a lot of fun because the Scandinavians are such good operators. Into October and the first weekend is the time for the VK-ZL SSB contest, the title of which should be self-explanatory.

I have not considered it desirable to reproduce in full in this column the rules for the various HF contests as they would take up so much space. If you need more information I can usually help or, at the very least, put you in touch with the organisers. Many of these contests require special logsheets and it is worth getting these well beforehand if you intend sending in an entry (there are usually both SWL and QRP sections as well as the main transmitting sections).

To encourage you to have a go I shall devote much of next month's column to the noble art of contest operating. Until then, good DXing to all of you.

DEWSBURY ELECTRONICS

G4CLX

APPROVED TRIO DEALER

NOW FROM THE ACKNOWLEDGED LEADERS IN THE FIELD OF AMATEUR TELETYPE, CODE READERS AND TRANSMITTERS

DEWSBURY ELECTRONICS
PRESENTS
"THE MICROPATCH"

The new low cost method of using your Vic 20 or Commodore CBM64 for the reception and transmission of RTTY, ASCII, and CW.
IS IT EVER EASY????

It certainly cannot be easier than with the 'Micropatch', simply plug in to the games port of your machine, supply 12-14 volts DC, connect transmitter and receiver, type in an 8 character command code. Thats it. So easy. Display features menu, status line receive portion of screen, transmit line (showing characters currently being transmitted) a transmit buffer which allows you to precompose your messages. There are 10 variable length memories, the contents of which can be edited with word processing style insertion and deletion. Receives morse up to 99 WPM with autotracking of the received morse, the receive speed is displayed. CW transmit presettable up to 99 WPM. Send/receive baudot 60,67,75,100,132 WPM, or 100 & 300 baud ASCII. European tones mark 1445hz space 1275hz. Many other features too numerous to list here, SAE for details. Price £129.00 £1.75 P&P.

For those who have the BBC computer we can offer the computer patch CPI, which has all the features listed above, & come here theres more, this CP-1 can also be used with the Vic 20 and CBM64. £169.00 plus software BBC 25.00 Vic & 64 £33.91. P&P £2.50
WANT AMTOR? again G4CLX can help, with the famous AMT-1 from ICS Electronics, software available for Vic, CBM64, BBC and IBM CP.
WANT RECEIVE ONLY?
Then perhaps the telereader can be of service, from the CWR610, CWR670, CWR675, we have them all.

For those who want just RTTY, ASCII, SITOR and AMTOR receive only. . . .coming soon from Switzerland THE PROCOMTOR AFR2000 – COME HERE, THERES MORE, fully yes fully AUTOMATIC, simply tune in the required station – Procomtor will AUTOMATICALLY select speed, shift, and phase. Process shifts from 50hz to 1000hz. Will receive 200 baud press services – also, but keep it quiet, FEC procedures used in secret services. Shhh

New opening hours 0930-1715 Monday thru Saturday. Engineering support on site.
SAE ENQUIRIES

ACCESS/BARCLAYCARD ACCEPTED
LICENCED CREDIT BROKER

Dewsbury Electronics offer a full range of **Trio Equipment** always in stock
We are also stockists of DAIWA – WELTZ – DAVTREND – TASCO TELEREADERS – MICROWAVE MODULES – ICs AMTOR – AEA PRODUCTS – DRAE

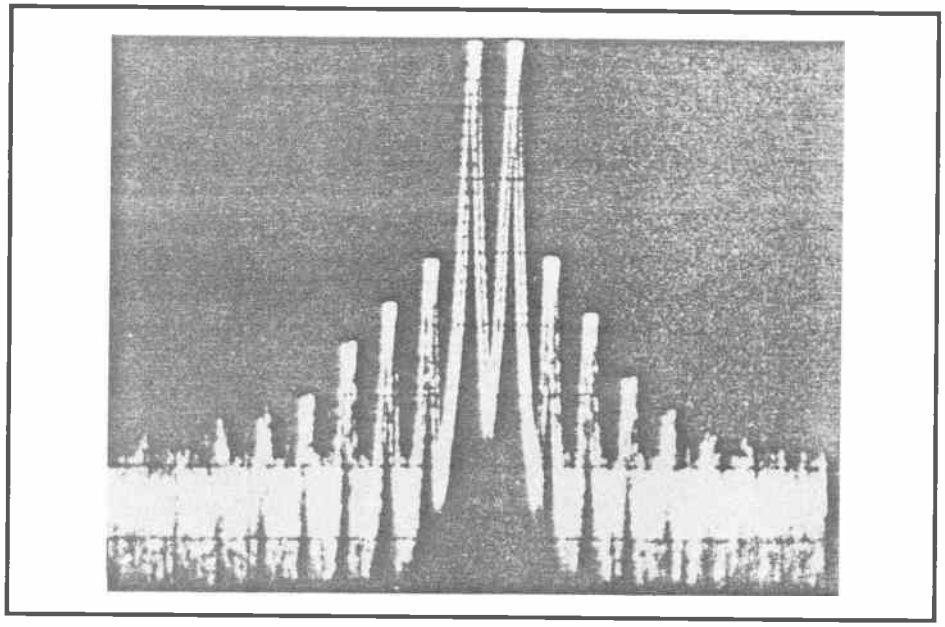
Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063

VISA Access

Instant finance available subject to status
Written details on request

THE ANGUS McKENZIE TESTS

THE muTek TVHF 230C HF TRANSVERTER



Many manufacturers have made transverters with HF inputs and transmitted outputs on VHF, UHF and even microwave, but very few indeed have ever attempted a transverter to work the other way round, for transverting a 2m rig down to the LF and HF bands. The design is far trickier, for the transverter has to have a local oscillator and output circuitry working on any of nine output bands, whilst keeping spurii and harmonics well down.

Chris Bartram of muTek has been working on this new design for quite a long time, for it was first rumoured nearly a year ago. The TVHF 230C delivers 10W PEP or carrier output on all bands from 160 to 10m, including the three new bands. It is intended that a 2m multimode rig be directly interconnected with it, the review version requiring between 1W and 5W input on 2m for full output at HF. muTek will shortly be making available an additional attenuator load for external connection which will cope with rigs delivering a higher power. The transverter is very simple to use, having on its front panel just an on/off switch and a band change switch with frequency bands labelled as 1.8, 3.5, 7, 10, 14, 18, 21, 24, 28 and aux which is 28.5MHz, in order to give an additional 500KHz upshift capability. Another pushbutton on the front panel switches in an Rx preamplifier, adding around 19dB gain, which is particularly useful for 10 and 15m. Earlier production samples had only around 10dB gain in this pre-amp, which was insufficient to allow the transverter to overcome the noise of the average 2m rig, but the design has been very carefully worked out so that the transverter has the minimum gain required on each of the bands for aerial noise to just overcome the noise of a reasonable 2m rig. This means that when the pre-amp is switched out, there is actually considerable attenuation in the transverter, so that on 160, 80 and 40m you are not likely to suffer 2m receiver overload and RFIM problems.

One very novel feature is the incorporation of ALC around the transmitting section from the PA output back to the input circuit. This allows quite a wide range of 2m input PEPs to give full output without the IM products getting out of hand, or indeed output PEP being considerably reduced if the drive level is lowered. The ALC time constants have been well designed, so that it is not obvious to a receiving station that there is any unusual ALC present.

Band pass filters have been incorporated both in the 2m input and output sections and in the LF/HF transmitter outputs and receiver input. Connections on the rear of the rig include an SO239 socket for the HF antenna interconnection, a BNC socket for the 2m rig connection and a 13V power socket which includes a PTT line which has to be shorted for Tx. An additional pin on the power connector provides 12V dc on Tx for operating a linear changeover relay etc, but I would have preferred this to have been a short circuit on Tx/open on Rx relay for easier use with most linears.

The transverter also employs an RF sensed transmit relay circuit so that it is indeed easy to drive it from any suitable rig, although a PTT interconnection is favoured. The PTT line is of fairly high impedance so that it can be interconnected directly to the PTT line on the FT290, for example, without any disasters occurring, although in some cases you might have to decouple the line with a capacitor to keep RF out of the main transceiver. The unit is housed in a brown metal case finished with a row of LEDs on the front to indicate output power levels and transverter on.

The 144MHz input signal is first attenuated by a 6dB power attenuator and then controlled by a preset which, in fact, allows an input power of only 100mW fully to drive the output PA to 10W. The input SWR is held at around 1.25:1 which is excellent. A pin diode ALC attenuator is provided at the 144MHz input. The mixer is an SL6440 which produces 1mW to drive the amplifier strip via the transmit image filter. Two stages of broad band amplification in Class A are provided before the signal reaches the PA section which uses a push/pull Class AB circuit, employing two 20W HF devices (SC1969s). The PA push/pull is coupled with 180 degree hybrids and baluns.

The output filters are switched appropriately and incorporate two-pole Butterworth bottom capacitor coupled band pass filters. muTek decided on these filters to reduce output losses, maintain good harmonic rejections and provide reasonable selectivity for the receive front end. A lumped component bi-directional coupler is provided to derive ALC, which is allowed to back down the RF power if a poor SWR is present, although muTek do recommend that SWR should be kept below 1.5:1 if possible, particularly when FM is used on 10m, or for a heavy duty cycle on RTTY.

The receive signals pass through the same filters up to the antenna changeover relay which then feeds the input signals to a noise figure equalisation network which introduces a progressive gain reduction as frequency is lowered. The RF switchable pre-amp comes in at this point, this being broad band and employing a bipolar transistor. A five element low pass Butterworth filter cuts out images before the mixing stage which is a high level integrated circuit, Plessey type SL6440. This is double balanced, which explains the excellent RF intercept point measurements. A two-pole band pass filter

follows the mixer to give a reduced band pass into the 2m receiver, and thus reduce far-out-of-band signals.

Subjective trials

The original prototype was loaned to me by muTek some months ago and much useful information was obtained as a result which helped contribute to muTek's design philosophy. It was soon learned that the original over gain was rather high for the FT290 handheld which I decided to use, for I had felt that if I could work round the world with a battery operated handheld as a driver, the transverter would work with almost anything else! For this reason, muTek designed in a receive loss dependent on the frequency band in use.

The review sample originally had just 10dB additional gain on all bands as compared with the pre-amp so that it reached an overall system gain of around 6dB on 10m, falling at LF.

On the HF band I found that I was able to work many DX stations on 14, 21 and 28MHz quite successfully, although there were a few ribald comments when I said that I was using a walkie-talkie on 2m as the drive source! On the LF bands, not only were many stations very surprised that the FT290 held its own quite remarkably, giving clean transmissions if I had remembered to charge it up, but that the signal was no worse than average from a normal LF rig.

It was quite clear that the muTek's transmitted quality was virtually entirely dependent on the quality of the 2m rig, so 'garbage in, garbage out' is basically the principle. My FT290 was modified a year ago so that its PA standing current was increased somewhat, which greatly improved its intermodulation performance. I dare say that some FT290s that have been dodgily fiddled with may well be appalling on Top Band, so this fact will require attention! The FT290 is not renowned for its RFIM performance, but despite this there were no real problems, even on the LF bands with the combination, provided that I did not use the pre-amp, which in any case was totally unnecessary below 14MHz. On 10m, the pre-amp was very necessary to obtain adequate sensitivity, and the system held its own on 10m FM, although the lack of 10KHz channels on the FT290 was aggravating.

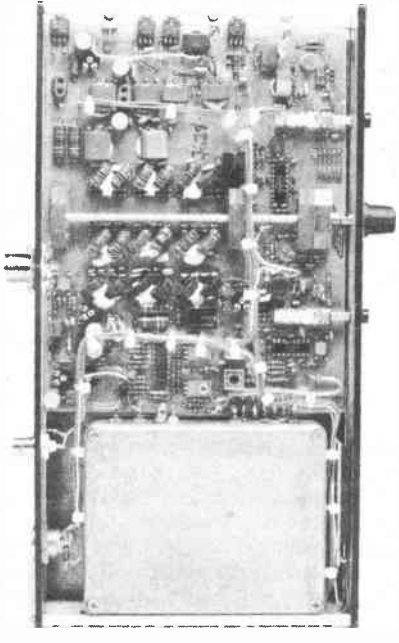
FM quality was, of course, entirely dependent on the 290 but I also tried my TW4000A Trio FM transceiver, running its output at around 4W into the transverter with excellent results. The Trio's excellent selectivity and ability to give 10KHz channels made the set-up most attractive.

In the subjective trials only one problem arose on an early production sample. After a very long (too long!) over on 10m FM, a station came back to me and said that my output power had decreased almost to inaudibility. The rig worked okay on all other bands though and muTek informed me that I had managed to burn out the 10m output filter. They then completely redesigned this with heavier duty components and challenged me to blow it up, which I have not yet succeeded in doing!

If you bear in mind that you have to use your 2m rig for 144.0 to 145.7MHz to cover all the bands included, and that you therefore have to hop around a bit from band to band, you will see that you may find it useful to have a driver with memory to VFO function, and quite a few memories, and you will be able to QSY rapidly from one band to another and commence tuning from the centre of each band. Unfortunately, you cannot do this on the 290, but rigs such as the IC271E will work admirably.

There are many class B licensees who have very good 2m set-ups and are perhaps discouraged from obtaining an A licence by the additional cost of an expensive HF transceiver, so muTek's philosophy is an absolutely fascinating way round the problem. They inform me that a British manufacturer has already set about designing a linear with full legal output for use with their transverter, which is an interesting further development.

There seems to be little more to say on the subjective performance for it is a credit to muTek that this is virtually dependent on the main rig's own parameters. Early samples, however, did have a rather soft heatsink internally and the screws which attach the lid soon turned round and round and thus became useless. muTek have now fixed this problem by using an improved cabinet and heatsink, thus allowing you to take the lid off and peep inside. I suggest though that the only preset that you should be concerned with is the input drive level which can be optimised for your rig. The equipment is very well built internally and the instruction manual is very good and well presented, although a circuit diagram is omitted for the time being to make it awkward for other manufacturers to try to find out how muTek have succeeded, whilst they might be having problems!



Laboratory tests

We first of all had a look to see how the receiver gains from input to output varied across the different bands, with and without the pre-amp. On 10m the gain loss was 13dB, increasing to 23dB loss on Top Band. Gain started rising from 7MHz upwards, finally to reach the 10m gain. The preamp gave 19dB gain throughout, and this seems about optimum taking intercept point and average 2m rig performances into account.

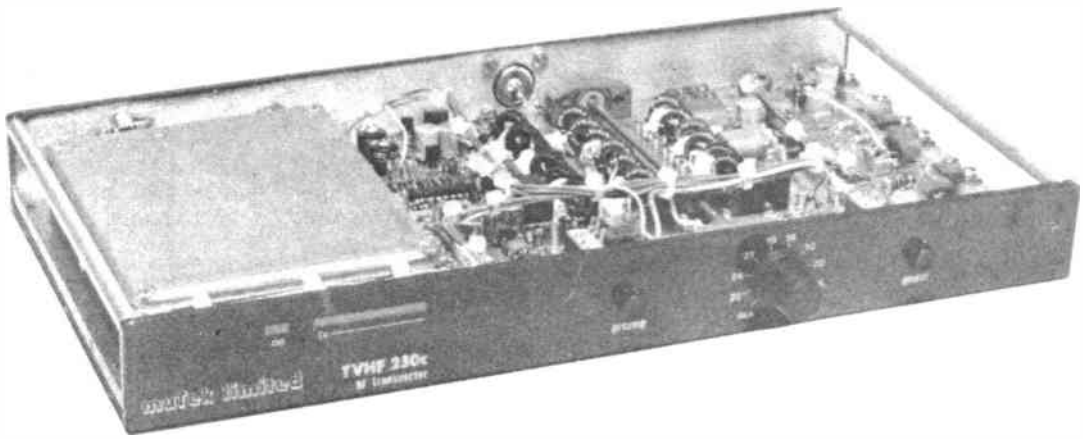
We decided to use the FT290 as the main rig to measure the overall system sensitivities, my 290 having been fitted with a muTek front end with around 2dB noise figure. On 10m, with preamp on, the system gave approximately 0.2μV for 12dB sinad, thus an approximate system noise figure of 8dB. I would have preferred it to be slightly better and you might get a 10m performance limitation if you are using a very deaf 2m rig that had perhaps a 9dB noise figure, this unfortunately being typical of unmodified FT290s!

We had a look at the RFIM performance on receive by putting the output at 145MHz into my HP spectrum analyser, and driving the system from two Marconi 2019 signal generators through a hybrid coupling transformer in the usual way, with carrier separated by 100KHz. Intercept points between +21dBm on 1.9MHz to +18dBm at 7.1MHz were noted, the points falling gradually up to 10m, precisely in accordance with the overall gain. With the pre-amplifier switched in, the worst intercept point was on 10m at -3.5dBm, which is itself an excellent figure, and comparable with most modern rigs, except for outstanding ones such as the latest Icom HF transceivers.

Having measured many 2m rigs, it is clear that almost all of them will be a lot worse on 2m than the transverter is, and only the IC271E with muTek front end is actually good enough to equal the performance of the transverter itself, which is excellent.

We had a look at the local oscillator and out-of-band signals generated by the transverter itself, especially on lower frequencies. The local oscillator runs between 143MHz for Top Band and 116MHz for the normal 28MHz band. The worst local oscillator breakthrough at the 2m output was with the rig on 160m, the breakthrough level being quite acceptable at -52dBm (550μV). This should not cause a problem to any decent rigs, but it is worth mentioning. On other bands the local oscillator breakthrough decreases down to almost immeasurable levels.

We tried a rather stiff test in which we noted the 1.9MHz input, 144.9MHz output to detect an output image at 141.1MHz. This was only 4dB down on the intended output in the 2m band, but again I cannot see that it should cause any problem. On 21.3MHz HF, the output image at 121.7MHz into the 2m receiver was 37dB



below the main signal, and thus totally harmless. Bearing in mind that at low frequencies where the output images are worst, attenuation is also at maximum, I do not think you should have any problems.

We looked at the received bandwidth from LF input on Top Band to VHF output, and 3dB points of 1.64 to 2.14MHz were achieved, with 10dB down at 1.46 and 2.33MHz. I have immense aggro on some rigs from medium wave transmitters locally, both Brookmans Park and Capital Radio etc, but even with the FT290 there did not seem to be a problem. Having discussed this with muTek though, they did agree to release, at a later date, a bomb-proof high-pass filter for use in the antenna circuitry externally with a very steep turnover below 1.8MHz for those who live close to medium wave aggro.

In order to check the transmitting section we had to adjust the input sensitivity preset so that 100mW gave full power output. We again used the two Marconi generators as a source, but amplified the coupled outputs with a Marconi TF2175 amplifier which has a very good two tone IM performance up to 250mW. At 100mW PEP output the third order intermodulation of the drive amplifier was around -53dB, and the fifth order product was in the noise. Since the worst IM of the transverter was at 28MHz we undertook all the IM tests here. Lower frequencies were checked and were substantially better. At 10W PEP output, and on the onset of ALC, third order distortion was at -29dB, with higher order products falling very rapidly to -55dB for 11th order, for example.

We then drove the rig harder, increasing drive by 4dB, and the Marconi amplifier's third order had increased to -46dB, with the transverter's measurement then being -25dB, higher orders again going down very rapidly. I consider this IM performance excellent, as good as most modern HF rigs, and better than some. At full output the rig drew an average current of 3amps.

We checked the linearity of drive requirement to achieve full power and found this varying from 95mW to a maximum of 150mW. The ALC action was fairly soft though so these figures are not too accurate. Low level gains were checked, and the power output noted for 10mW input drive on all bands. Minimum sensitivity was on 10m where the output was just below 1W, the sensitivity rising to 1.8W on 10MHz, 2.8W on 7MHz, and a surprising 6W on 3.7MHz, but just 1.2W on 1.9MHz. muTek agree that there is a gain hump on 80m but the ALC copes with this well, and thus there is no real problem.

Harmonic and spurious outputs were checked on all bands, and the worst were 2nd harmonic from Top Band of -52dB with 3rd at -56dB, whilst 3.7 to 10MHz bands were at -68dB for both harmonics. Other bands varied from -58dB at worst to below the noise floor at best. One spurious was detected on the 10m band in which sidebands at between -45 and -50dB were developed fairly close in. Frequencies well off-set from 145MHz drive produced sidebands at much lower levels than those stated for close in to 145MHz. This is acknowledged by muTek who explained that they were caused by harmonics of the output frequency beating with the local oscillator frequency for 10m. I do not think that these will cause any harm, for in any case most CB rigs cause us a darn sight more upset on 10m with their diabolical spurii than we ever cause them!

The transmit hold time when RF sensing is in use is around one second, and this is probably a reasonable compromise although I would have liked a pot to optimise it for a faster time for FM, and slower for SSB/CW. The RF sensing is very sensitive though so that if you speak at a reasonable distance from the mic you should be able to keep the Tx section up during phrases. The relays are fairly quiet in operation, so you should not be disturbed too much by them dropping in and out. It is better to use the PTT line though to avoid this.

Conclusions

We were all very impressed indeed with the superb performance of this innovative new transverter, and I have a feeling that it is going to become very popular. Its final version had no snags whatsoever, and even drift after the first few minutes warm up was not a problem. We noted a tranversion error shortly after switch on of around 400Hz, and in using the rig with the FT290 I occasionally found myself hopping up or down 100Hz, partly due to the fact that many LF band enthusiasts seemed to be almost incapable of netting properly, with possibly a minor contribution from the muTek.

I do not want to upset the LF band enthusiasts too much, but just try listening to a few of the nets on 80m and you will hear remarkable sex changes in voices with clockwork regularity! At least this is better than the situation 20 years ago where sex changes were frequent during one over, many stations drifting outside the passband in a remarkably short space of time. Their CW had to be heard to be believed in those days, being more like a chicken clucking than anything else, but fortunately, most of today's 2m rigs tend to prefer going up and down in amplitude, rather than sideways when on SSB or CW. If you do yearn for sideways movement, then at least the muTek can put out excellent FM on 10m, and there is an ever-increasing population around 29.6 who will welcome you, provided you have a class A licence!

I have had enormous fun with this rig, both in general operation and in carrying out a lot of leg pulling, and I really have worked Nigeria on 14MHz with a walkie-talkie! You should take this rig very seriously, and I hope muTek will not mind the odd leg pulls on the air. I would particularly like to thank them for lending me the early prototype sample, and for being extremely co-operative in helping me undertake this review. I would also like to thank my colleagues Jonathan Honeyball, as yet not licensed (I am working hard on him though) and Mike Hatch, G1DEW, who took most of the measurements, and who has been persuaded to start working for his class A licence! He does not know that I have written this yet, so that when he sees it in print it might well spur him on further!

The price of £330 including VAT seems a very fair one for such a complex box, and I heartily recommend this transverter to readers, and I guess that many will have a lot of fun with it if they purchase one. I hope muTek will introduce some VHF and UHF transverters in which their ALC system will be incorporated so that we can have a cracking good series of transverters for use with HF rigs. This would offset so many problems in this area which I have described probably all too frequently!

THE ICOM IC271H HIGH POWER MULTIMODE 2m TRANSCEIVER

Last winter I first had a look at the IC271E 2m multimode transceiver for *Ham Radio Today*, and the model reviewed was fitted with an early sample of the muTek front end, which did cause some troubles but which, I am happy to relate, has now been slightly redesigned to overcome all the problems. This receiver, with the muTek front end circuitry fitted, had a remarkable front end and is to be recommended.

Now follows the high power version of the same rig which looks almost identical, but with the addition of a 120W PA stage to give greatly increased power. Inside the rig there have had to be many changes in positioning of various circuit boards to accommodate room for the higher power dc supply and the new microphone input circuitry, which overcomes many of my earlier criticisms of the older rig. The 271H costs around £1000 including VAT if you purchase it with the internal power supply and speech synthesiser, the latter giving audio readout of frequency in exactly the same way as the one on the IC751.

Facilities

Let us have a look at what facilities are available on the 271H version. The rig provides FM, USB and LSB, and CW modes, although RTTY could be accommodated reasonably easily. The minimum hold time on tx, however, is not really short enough for direct use with AMTOR unless you dig inside the rig and modify the circuitry. Two VFOs are incorporated which can independently retain the stored mode, so you can use VFO A for SSB, and B for FM.

Small push buttons select VFO A-B, A or B, scan, VFO or memory operation (32 memories provided which also store mode), memory store and selected memory to VFO. This last provision is really fabulous since you can leave the machine on 144.300 memory 1, for example, and return to the calling frequency (if you really must use it in the inevitable pile up), if you are having a long session on SSB! I found myself putting 144.05 CW, 144.2 and 144.3 SSB, 144.925, and several FM channels in memories for rapid access to often-used frequencies. Calling up 144.925, for example, and then tuning down to 144.915 (GB3CTC, the Cornish Beacon) was very simple and useful. Searching is permitted between two of the memory frequencies, which is a useful asset.

RIT is incorporated with a button to select or de-select it, together with a clear button which removes the RIT offset in store. The RIT has a range of +/-9.9KHz. Two large buttons give shifts of +/-1MHz. With sensible use of the 2 VFOs, or memories, I really feel that these are redundant, and surely Icom would have been better to have made them jump 100KHz on SSB, and 12.5 or 25KHz on FM, dependent upon the step size button position. This button gives 10Hz or 100Hz resolution, the latter being engaged if the VFO is rotated rapidly.

The VFO thus gives 2KHz per rotation, or approximately 6KHz when rotated fast (NB not 20KHz per rev, despite several of us nearly getting dizzy trying to rotate it very fast, and suffering burnt fingers). In the larger step size, 1KHz steps are provided, with 50KHz per rotation. When FM is selected, the step sizes are 1 and 5KHz, and thus you cannot achieve a true 12.5KHz step unless you go to SSB, retune, and back to FM. You will have to offset the SSB by 1.5KHz LF though, ie 145.011, then switch to FM and hey presto, you are on 145.012.5MHz.

This phenomenal logic totally defies my understanding, but possibly seems wrapped up with Icom's strange habits in their frequency readout of USB and LSB which does not seem to coincide with any other manufacturer's logic. I have written much about this in earlier Icom reviews, and to discuss it further now would be boring, and the editor would accuse me of padding! Incidentally, if you switch to LSB the readout is then .014KHz and on CW it becomes .011.8, fantastic logic. I will not discuss the actual received frequencies in the different modes, as this is mind blowing.

Dial functions

Below the step size button is a button bearing the legend DFS, dial function select switch. This allows you to lock the VFD and preselect a memory channel by rotating the tuning dial and then pushing memory to VFO, obtaining a new memory frequency from which you can then VFO. DFS also works reciprocally, so if you are on a memory, you can tune the VFO in readiness to another frequency whilst remaining on memory whilst in QSO. A third large button allows you to transmit on one VFO and receive on the other for split operation.

Actual repeater splits are built in however, at +/-600KHz, but even these can be offset to new shifts if required. These are all controlled by push-buttons on the left side, additional facilities being reverse repeater, called 'check', offset write, selective calling (not used in UK), and 1750Hz tone access. Unfortunately, this button does not put on auto tone burst when repeater shift is selected, which is a nuisance.

A row of small pushbuttons which can be locked in or out select VOX control, noise blanker on/off, AGC fast or slow, meter FM centre tuning or S-meter, external pre-amp on/off (when switched on, 12V dc is supplied on the output inner ref ground to switch on a masthead preamp in Rx only) and, finally, mode S, which allows one to access only those memories with mode stored which is identical to the mode set before the switch is depressed. This also affects scanning, eg you can scan just FM.

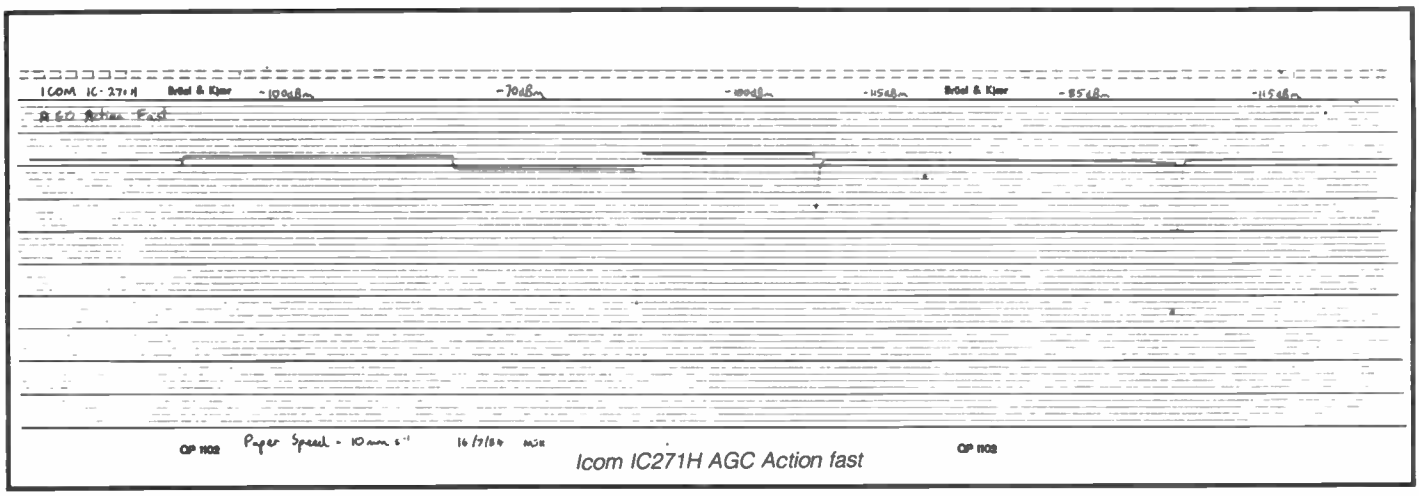
Rotaries

Three dual concentric rotaries vary RF and AF gain, audio tonal quality/squelch (active on all modes), and RF power output/mic gain. The power control allows one to set output power on all modes from 5W to over 100W, which is extremely useful. The frequency lock button when pushed also fires the interminably slow speech readout. This can be speeded up, however, by cutting a wire jumper on the board, which allows the charming Japanese female to speak faster, her speech injection level also being variable with a pot.

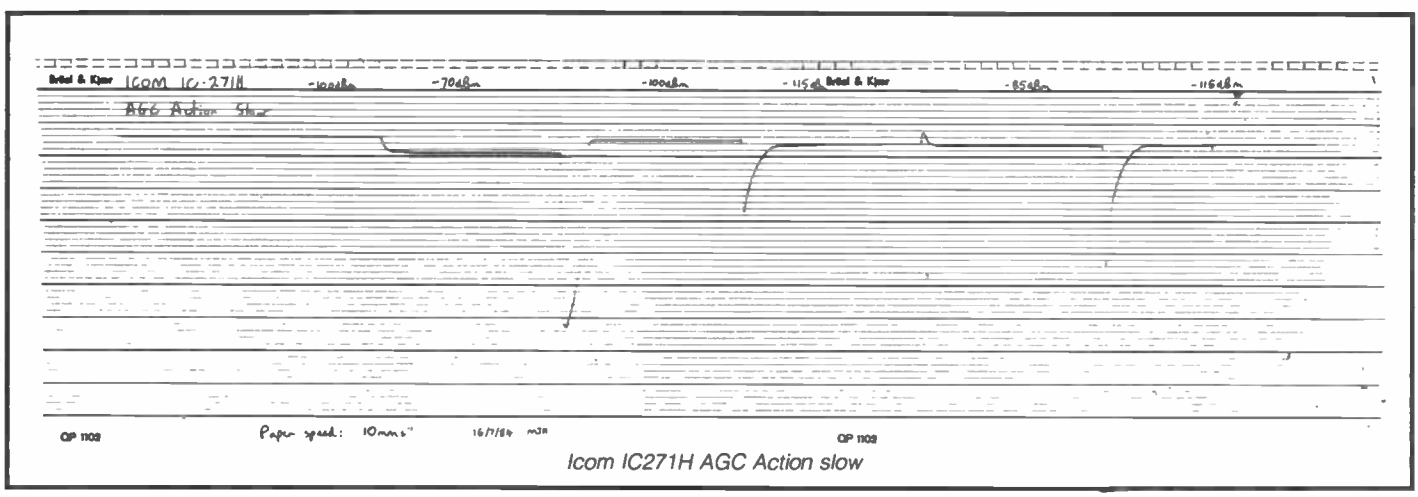
The frequency readout is to the nearest 100Hz and is very easy to read, having a light blue numbering against a black background. The status of VFOs, memories and other functions are also displayed as usual.

Under the front of the rig is a bar which when pulled down allows the front to come up around 3cms, thus allowing the speaker, which is underneath, to be more easily heard.

On the back are 13V dc and normal mains interconnections, the mains PSU being fitted on the review sample. The



Icom IC271H AGC Action fast



Icom IC271H AGC Action slow

PSU output plugs back into the 13V input in this case. Sockets are provided for CW key (3.5mm jack), external speaker (3.5mm jack) and antenna output on an SO239. I found this socket to be too close to the massive heat sink and the extension speaker socket underneath it is also awkwardly situated.

A multipin accessory socket provides for external interconnections, these being 8V dc output when squelch operation is present, 13.8V dc, external PTT input, audio output for feeding a tape recorder with fixed gain, output from mic amp/input to mic gain control, 8V dc on Tx (5mA only), ALC input, ground connection, metering voltage, input for external noise blanker control voltage, and input to control FM and SSB squelch. Note that despite the provision of many facilities that hardly anybody would ever want, there is no short on Tx relay for controlling external equipment, nor is there a lower power transverter output for allowing the rig to be used for microwave transverter driving etc.

On the metal top panel there is a bug hutch cover which exposes presets for CW delay, VOX delay, VOX gain, anti-VOX and CW side tone level. On the back panel, above the accessory socket, is a plate which can be removed, and a computer interconnection circuit installed, Icom supplying an optional interface unit for this (IC-EX309).

The rig is completely encased in metal and finished in Icom green. It measures 125mm high by 300mm wide by 324mm deep, including projections and weighs 6.9Kg.

Subjective tests

I have used this rig together with the Icom GaAsFET masthead pre-amp type AG25 for many weeks prior to writing this review. With the external pre-amp switched off, the sensitivity in all modes seemed only rather average, ie fairly poor in a state-of-the-art standard, and whilst selectivity on FM was very good, I noted something strange about SSB selectivity. The skirts seemed to be excellent down to a level of -40dB or so, but opened out quite badly at very low levels.

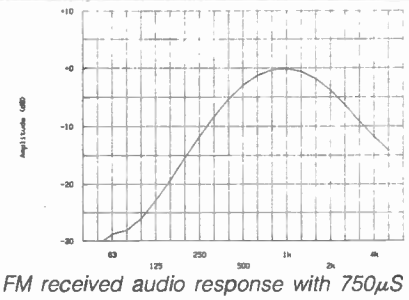
A typical example of this would be that when I was tuned to receive GB3CTC, I was still receiving very high frequency breakthrough pulses from GB3VHF. I also noted that very strong stations that were relatively clean still seemed to be breaking through well off channel with very high-pitched chattering. The RF intermodulation performance seemed reasonably good, but fell well short of the 271E with muTek front end.

The audio quality on all modes was rather muffled, even with the tone control fully clockwise, and this received considerable attention and analysis as a result. The built-in speaker was set rather a long way back on the underneath of the left side, which added to the muffled quality unless one lifted the rig right up. I strongly recommend the use of a reasonable extension speaker, which did improve matters quite a lot. The tone control gave a very wide range of adjustment from muffled to 'head inside a box surrounded by heaps of blankets' (but see lab test comments).

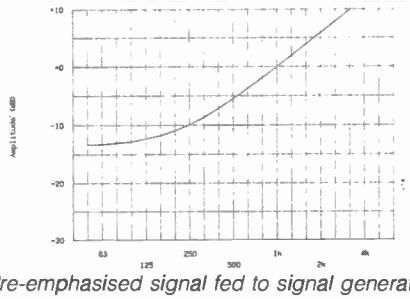
The AGC characteristics are a little strict seeming to like a form of hang circuit in which gain is held steady either for a short or long period and then full RF gain suddenly shoots up, so that hiss will almost blow you away unless you have RF gain backed off. This form of AGC has its advantages and if 'short' is selected you can easily hear a break-in station, even if it is very weak. I found the long AGC mode a little irritating though and would have preferred a more exponential and longer gain recovery.

I found the frequency readout jumping between modes very irritating, but the actual indication was around 300Hz in error, even after fighting Icom's strange logic. When tuning across the entire band I was most impressed with the lack of out-of-band breakthroughs and spurii, allowing stations to be received very clearly without, for example, the Euston Tower breakthrough problem which besets so many rigs when beaming across the Euston area.

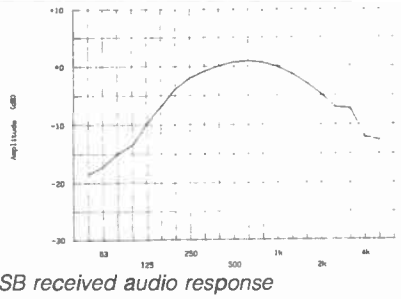
When the GaAsFET pre-amp was switched in, the front end sensitivity



FM received audio response with 750μS pre-emphasis



Pre-emphasised signal fed to signal generator (750μS)



SSB received audio response

improved greatly but the RF intercept point degraded badly, causing some interference across the band at various points, thus showing that the Icom pre-amp had rather excessive gain. VOX worked well, both on CW and SSB, and I liked the squelch operation. I rather regret the passing of rotary switches for mode control, but this is a consequence of micro-processor operation.

The transmit quality of the 271E has been criticised by many, and I had a good old grumble about it in my original review. I am pleased to see that Icom have taken note of the criticisms so that modulation quality is much better on the 271H, new circuitry having been developed for it.

I understand from Thanet Electronics that the very latest batch of 271Es also has improved mic circuitry. I found that the mic gain control was in its optimum position at about three-quarters up for both modes, and this saves a lot of hassle, as well as being easier to adjust (in the old model it had to be only a sniff off the bottom stop for SSB and almost flat out for FM).

Icom supply the HM12 mic with the rig which has a PTT lever and up and down step/scanning buttons. I obtained very good reports of the SSB transmission quality, and no one complained about any spreading, even when power was flat out and the mic gain nearly flat out. Everyone considered the quality far superior to that from many solid-state high power linears, so whilst you are paying a lot for the increased power, Icom have clearly designed the PA very well. CW operation was liked, and despite the fact that when receiving CW the SSB filter is used, the tone control comes into its own allowing the effective selectivity to be subjectively better. I am surprised that there is no optional CW filter available, and this is a strange oversight on such an expensive rig.

A rather noisy fan comes on if you are using full power which helps keep the heat sink cool. When on CW, it was maddening to hear the fan go on and off all the time if the VOX operation was being used, and the CW delay when set at maximum was not long enough to avoid this.

Laboratory tests

Almost all the lab tests were carried out before some modifications were inserted to the receive audio section with the importer's permission. Some parameters, therefore, look a little better than they are subjectively, eg apparent sensitivity. This is because the audio passband was much narrower than it should be and thus hiss was decreased which helped the sinad ratings. Without external pre-amp on, the SSB sensitivity measured well, as did FM sensitivity, but with pre-amp, the sensitivity improved by around 4dB average.

The improvement was subjectively more marked after modification, and an approximate input noise figure would be around 7dB with pre-amp off, and 2dB with pre-amp on. The pre-amp gain was around 24dB, and this is grossly excessive, for 14dB gain would have been far better in order to preserve an acceptable front end intermodulation performance.

With pre-amp out, the RFIM performance was reasonable, and the intercept point was around 16dB inferior to that given by the muTek front end in the 271E modified version. Unfortunately, the muTek front end will not fit into the 271H, so Icom have successfully foiled a British manufacturer's attempt to improve their rig, and thus increase sales potential! The reciprocal mixing performance is very good, but was, perhaps, slightly affected by an SSB selectivity problem which caused much puzzlement in the laboratory.

When we measured the selectivity by the normal method, using S5 indications for measuring bandwidth, the selectivity on SSB appeared to be phenomenal and about as good as that of the IC751. It had measured well on the 271E but since the prolonged subjective trials inferred that there was a problem, we decided to measure selectivity by another more elaborate method, using two generators, with one on frequency set to give 15dB sinad whilst the other was off-channel and XdB higher in level, where X was the relative dBs down bandwidth. We looked for a deterioration in sinad ratio of 3dB. The selectivities were identical down to -40dB, but the apparent -60dB selectivity was 8.3KHz rather than 3.6KHz, and -80dB selectivity a disastrous 26.8KHz instead of an apparently phenomenal 3.7KHz!

I was very puzzled by this but after examining the circuit it appears that the AGC and S-meter level feeds are derived directly from the RF level on the output of the SSB filter, whereas the product detector is driven from a buffered stage, itself driven from the filter output. It thus seems clear that there must be some IF breakthrough at 10.7MHz from before the filter into the product detector circuit, bypassing the feed to the AGC amp etc. Surely this is rather careless circuitry and I have the feeling that a suitably positioned 0.01μF capacitor could decouple the breakthrough line. Perhaps two circuit board tracks are too close together or there is insufficient separation in a wiring harness. The same problem was exhibited by the 271E, but at the time I did not tumble to the problem.

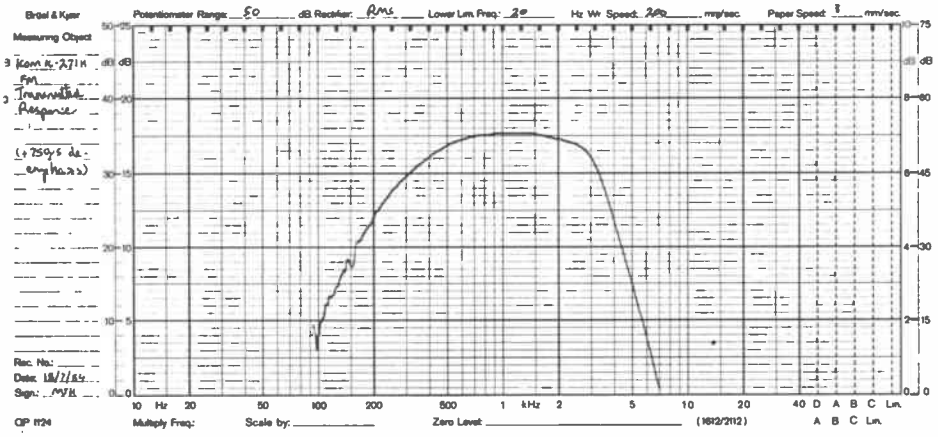
FM Selection

The FM selectivity is excellent even on 12.5KHz channelling, although it was lopsided close in. 25KHz selectivity was phenomenal. Looking at the AGC charts, it can be seen that short AGC is incredibly rapid in recovery, and even long AGC is too fast. Close examination of the latter shows a recovery in approximately one second, but the majority of the recovery is taking place in the final quarter second, with an amazing sharp edge at the full recovery point. This is characteristic of 'hang AGC', and I suggest you listen to SSB on the rig to see if you can go along with this before considering purchase. I must admit here that AGC characteristics are very much a personal preference, so give me a nice exponential recovery any day, with around 2 seconds for full recovery.

The S-meter on FM gives a range of only 15dB from S1 to S9, but on SSB the displayed range is nearly 40dB between the same points, which is excellent. '+20dB' is rather optimistic though, and '+40dB' represents +20dB, all very confusing, so is it not time for the manufacturers to invest in a new printing mask for their S-meter?

The FM capture ratio, which concerns a rig's capability to favour a slightly stronger FM station whilst apparently rejecting a weaker one, is excellent, showing quite a wide discriminator bandwidth despite the excellent selectivity. At the 12dB sinad sensitivity point on FM a surprising 18.5dB quieting was obtained, which shows that distortion at low RF levels is quite high, and noise crackling with modulation present being fairly noticeable.

Do not forget that quieting only tells you how quiet a carrier might be when the person the other end shuts up for a moment, whilst sinad sensitivity gives a far more realistic figure for readability of a weak signal. The difference between these two figures is exaggerated when IF selectivity is excellent, for a wider selectivity would have improved low level distortion, but actually degraded apparent sensitivity.



Icom IC271H FM transmitted response (750μS de-emphasis)

The squelch range was 11dB, and I would have preferred more range here. The best attainable signal-to-noise ratio on FM was very good indeed, most of the noise on a strong signal being at MF. Audio distortion at reasonable deviations measured very well indeed, but it has to be said that in the unmodified audio amp circuitry much of the distortion components measured were attenuated because of the muffled response. SSB product detector distortion was also very low, but was again affected by HF cut in the audio amp. Maximum audio output power into 8ohms was a little on the low side, but significantly more power is available into 4ohms.

Pen charts

We used up much pen chart paper in taking various responses on SSB and FM. The FM response seemed poor enough, but I was stunned to see considerable HF roll-off in the audio amp on SSB. Surely this should be controlled by the action of the IF filter, but even within the IF passband, there is 7dB difference between the output at 600Hz and that at 2.5KHz, the latter frequency being -7dB from the peak value. All the charts were taken with the tone control flat out.

We have had considerable discussions recently with the importers of Trio, Yaesu and Icom and no one could advise me as to which pre-emphasis time constant to apply to the audio modulation of the signal generator, so we tried the usual 750μS and 318μS. Looking at 750μS pre-emphasis curves, with the generator giving 6dB per octave boost above a low frequency all the way up, HF roll-off was noted. The response peak was at 1KHz, but by 2.5KHz the response was already 6dB down and 3KHz was -9dB. Many transmissions are not pre-emphasised as much as 750μS though. Looking at a 318μS curve, the attenuation at HF is even more marked.

At this point, it was decided that we should examine the audio circuitry in depth. There are separate lines coming from the product detector and FM discriminator outputs meeting at the base of an audio amplifying transistor. Across this base to deck is a 0.15μF capacitor in series with a 10Kohm variable resistor which acts as the tone control. When on SSB, the discriminator is shut off, and on FM the product detector is disabled.

The circuit struck me as being very odd and complicated so with the help of Mark Capstick, G4RCD, we put the entire pair of circuits into the BBC B computer, using a Systems 1 Linear AC Network Analysis Program on a floppy disc. After hours of analysis of the SSB and FM circuits from 50Hz to 5KHz it became apparent that each circuit back loaded the other, and that the time constants were, to use a favourite phrase of mine, 'bananas'. With steaming heads, cooled only by beer, we attacked the circuit within the computer and developed a fix which we then put into the rig.

For those with much patience, and who want to hear the difference clearly between 'G3OFF' and 'G3OSS', I advise changing R208 from 120Kohms to 22K ohms, and C165 from 0.047μF to 0.0047μF. On FM, these mods will create a reasonable 750μS de-emphasis with an additional roll-off above 3KHz, and take away what looks like three lots of de-emphasis within the audio passband! The same modifications reduce the FM circuit's capacitative loading on the SSB circuit, and thus improve the SSB response dramatically.

The tone control will thus allow a variation from a clear, good, HF response up to 3KHz, down to a head in a bag surrounded by sand response which some manufacturers seem to like. Other parts of the audio amplifier have a considerable effect on the response, and some bass cut is introduced elsewhere, for example. Time precluded any more analysis as we ran out of beer!

Previously, I recommended changing C159 to 0.01μF, but this should now be ignored. Incidentally, my modifications do allow for an additional bass roll-off below 350Hz to be more effective, but that is another story. Having done these modifications, Mark and I found that the best FM transmissions were a delight to listen to, being very clear and smooth, whilst SSB copy allowed consonant sounds to be much clearer, despite the narrow IF. For CW, with tone control at minimum, signals were as clear as a bell and hiss was well attenuated.

We looked at the transmitted output with a Marconi spectrum analyser, inserting into the mic input socket two audio tones within the audio passband. We were very impressed with the narrowness of the transmission and the fact that very high order products were well into the noise. Third order IM was -20dB, 11th order for example was -50dB and by the time we got to the 31st order, the output was -80dB. This is an 'at worst' situation, which assumes peak output continuously on both tones. Thus -80dB would be noted at worst for +/- around 15KHz, and -50dB at +/- around 5.5KHz. This is not as good as a properly adjusted valve linear, but it is very reasonable for a solid-state one. At 40W PEP output third order had fallen to -39dB, and 9th order was -51dB, so if you restrict the power by adjusting the power control you would be that much cleaner. I suspect that slightly more standing current would have reduced the higher orders, but the PA would have been rather hotter, and the fan would have been running nearly all the time.

Carrier rejection on SSB was remarkably good, and alternate sideband output for a modulation frequency of 1KHz was at -70dB, and nobody could possibly ever grumble at that, the measurement being taken with 3Hz resolution bandwidth! Maximum RF output power was around 120W PEP on SSB, and around 112W on FM and CW, plenty enough!

On FM, repeater shift accuracy was within 10Hz, tone burst deviation was just about right, and maximum speech deviation was very well controlled at just over 5KHz. Minimum RF output power was 5.5W on all modes. With the microphone gain set at an average level and the input terminated, residual noise within the transmitted passband was low. No harmonics above -65dB were detected on my HP analyser, and no spurii were noted. We noted a 320Hz error in output frequency accuracy which coincided with the Rx error, so probably the internal crystal needed a tweak.

The transmitted FM response from microphone input to carrier out, checked with the Marconi 2305 automatic deviation meter with 750μS de-emphasis, can be seen to be excellent, a reasonable degree of LF cut being included, whilst the HF end is reasonably preserved up to 3KHz. Above this the response is very rapidly curtailed.

If Icom can get the transmit response right, why can they not get their rig correct, even to itself, on Rx? The transmitted response on SSB seemed rather better controlled than it had been on the 271E. The rig's power output meter was very useful and helped in the setting of the power control, allowing you to see the power level quite reasonably, the meter under-reading by around 10%.

Conclusions

The reader may wonder if I am ever satisfied with any rig, for I seem to pick so many holes, even in good designs. The

IC271H and 271E are very nice rigs and since the audio can be improved with the change of the two components referred to, the receive side is good and perhaps the main criticism is of the strange SSB selectivity problem. If anyone has a fix for this please write in to the magazine and you will get a credit for it.

It is a terrible shame that the muTek front end just will not fit into the 271H, which may preclude this model from being used by the top end DX stations and the top portable contest operators. If the SSB selectivity problem can be rectified, then the IC271E with muTek front end will clearly be the rig to go for, but I must admit that it is very convenient indeed to have 120W PEP available at the push of a PTT button.

I liked the general feel of the rig, and soon got used to all its facilities. There is little point in making recommendations for mods on poor rigs, and my colleagues and I spent a lot of time fiddling with this one because it was worthwhile.

There are alternative mast head pre-amps that the 271H could energise in line with the antenna feed, and I would particularly recommend those by SSB Products and muTek, the latter requiring a small control unit with it, and both having a better RF performance and less gain, which is all to the good. The Icom mast head pre-amp is very easy to use and is mounted in a weatherproof box fitted with SO239 sockets, and clamps for fixing it to a mast. muTek and SSB Products are wiser in choosing N-type sockets which are more easily waterproofed and which are better anyway.

One has to take a final look at the enormous price asked for this rig and compare it with the cost of a good HF rig and transverter, together with the economy of a home built valve linear. I must admit that a transverter set up is more appealing to the specialist, but really good performance transverters are, as yet, extremely thin on the ground, although it is hoped that at least two will be forthcoming that might have bomb-proof front ends!

Assuming average cable losses, a rig does need to have a 2dB noise figure front end to be really hot on Rx, and if a mast head pre-amp is used, then the rig's intercept point has got to be a lot better than that of the 271H, and these may be final important considerations if you live in a city crammed full with 400W brigade stations, including myself when I am going flat out!

My final conclusion is that the 271E with muTek front end, and my suggested audio improvements in the receiver, gets a very strong recommendation indeed, but the 271H cannot be quite so strongly recommended, although it is a very nice rig.

I would like to acknowledge the help of Mike Hatch, G1DEW, in taking all the measurements and the considerable assistance given by Fraser Stuart of Thanet Electronics for his inexhaustible supply of patience when discussing the many findings and experiments.

ICOM IC-271H – LABORATORY RESULTS

Receiver Measurements

Sensitivity for 12dB Sinad (3KHz deviation, 1KHz modulation), FM

	(without pre-amp)	(with pre-amp)
144.025MHz	-123dBm (0.16μV)	-126.5dBm (0.1μV)
144.950MHz	-123dBm (0.16μV)	-126.5dBm (0.1μV)
145.975MHz	-123.5dBm (0.15μV)	-126.5dBm (0.1μV)

Sensitivity for 12dB Sinad (1KHz beat), SSB

144.35MHz	-126.5dBm (0.1μV)	-131dBm (0.065μV)

Selectivity, FM
blank carriers off channel to degrade Sinad by 3dB (ref 12dB Sinad pt)

+/– 12.5KHz spacing	54/41dB
+/– 25KHz spacing	77/79dB

Selectivity, FM
carriers off channel modulated with filtered white noise (ref 12dB Sinad pt)

+/– 12.5KHz spacing	28/19dB
+/– 25KHz spacing	76/77dB
+/– 50KHz spacing	82/82dB

Selectivity, SSB (* see text)

3dB bandwidth	2.3KHz
6dB bandwidth	2.4KHz
20dB bandwidth	2.7KHz
40db bandwidth	3.4KHz
60dB bandwidth	8.3KHz
80db bandwidth	26.8KHz

RFIM Performance, FM
carriers off channel to produce 12dB Sinad product (ref 12dB Sinad pt)

	(pre-amp off)	(pre-amp on)
50/100KHz spacing	71dB	56dB
100/200KHz spacing	71dB	56dB

RFIM Performance, SSB
carriers off channel for 1KHz 12dB Sinad beat note

20/40KHz spacing	75.5dB	64dB
100/200KHz spacing	74dB	63dB

Calculated RF intercept point	–15dBm	–36dBm

Reciprocal Mixing Ratios at 144.05MHz
RF Levels required off channel to degrade Sinad 3dB (ref noise floor)

20KHz spacing	97.5dB
50KHz spacing	102dB
100KHz spacing	108.5dB
200KHz spacing	110.5dB

S-Meter; RF Levels required to give the following readings

	FM	SSB
S1	–109dBm (0.8μV)	–117dBm (0.3μV)
S3	–102.5dBm (1.7μV)	–111dBm (0.6μV)
S5	–99dBm (2.5μV)	–102dBm (1.8μV)
S7	–96dBm (3.5μV)	–89dBm (7.9μV)
S9	–94dBm (4.7μV)	–78dBm (28.2μV)
S9+20dB	–90.5dBm (6.6μV)	–67dBm (100μV)
S9+40dB	–88.5dBm (8.5μV)	–58dBm (281μV)
S9+60dB	–75.5dBm (38μV)	–46dBm (1.1mV)

Capture ratio, FM		3.5dB
Audio quieting, FM (at 12dB Sinad pt)		18.5dB
Squelch sensitivity	(minimum)	–116.5dBm (.33μV)
	(maximum)	–127.5dBm (.09μV)

Best obtainable signal/noise ratio, FM	
Unweighted	61dB
CCIR/ARM weighted	55dB
Received frequency error, SSB	+300Hz
Audio Distortion (125mW into 8ohms) FM	
1KHz deviation	1.3%
3KHz deviation	1.7%
Product detector distortion (–80dBm) SSB	1.3%
Maximum audio output power (10% THD into 8ohms)	2.1 watts
Maximum audio output power (10% THD into 4ohms)	3.4 watts
Pre-amp gain (at 144.5MHz)	24dB

Transmitter Measurements

RF output power

	FM	SSB (PEP)	CW
144.025MHz	110.5W		112W
144.925MHz	111W	125W	112W
145.500MHz	111.5W		110W
145.975MHz	112W		110W

Carrier frequency accuracy	–320Hz
Carrier frequency stability	v. good
Repeater shift accuracy	±10Hz
Tone burst deviation	3.2KHz
Peak deviation (typical speech)	5.3KHz
(loud shout)	5.6KHz
Minimum RF output power	5.5W
SSB residual carrier and noise	–49dB (ref full o/p)
Harmonic output	<–65dB (all orders)
SSB unwanted sideband rejection	–70dB (ref wanted sideband)
Carrier rejection, SSB	–57dB

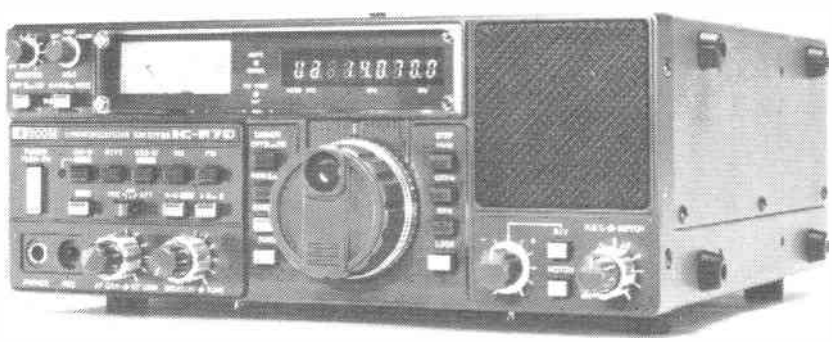
Transmitted two tone intermod products (40W PEP)	
3rd order	–39dB
5th order	–40dB
7th order	–47dB
9th order	–51dB

Transmitted two tone intermod products (120W PEP)	
3rd order	–20dB
5th order	–38dB
7th order	–45dB
9th order	–47dB
11th order	–50dB
13th order	–54dB
15th order	–58dB
17th order	–61dB
19th order	–64dB
21st order	–66dB

ICOM

FOR THE SWL...

IC-R70, £565.



The R70 covers all modes (when the FM option is included), and uses 2CPU-driven VFOs for split frequency working, and has 3 IF frequencies. 70MHz, 9MHz and 455KHz, and a 100dB dynamic range. It has a built-in mains supply. Other features include input switchability through a pre-amplifier, direct or via an attenuator, selectable tuning steps of 1KHz, 100Hz or 10Hz, adjustable IF bandwidth in 3 steps (455KHz). Noise limiter, switchable AGC, tunable notch filter, squelch on all modes, RIT, tone control. Tuning LED for FM (discriminator centre indicator). Recorder output, dimmer control.

The R-70 also has separate antenna sockets for LW-MW with automatic switching, and a large, front-mounted loudspeaker with 5.8W output. The frequency stability for the 1st hour is ± 50Hz, sensitivity – SSB/CW/RTTY better than 0.32 uv for 12dB (S + N) ÷ N, Am – 0.5 uv. FM better than 0.32 for 12dB Sinad. DC is optional.

Ever since its introduction the IC-R70 has proved to be a popular and reliable HF receiver making your listening hours a pleasure. Please contact us for further details on this excellent set.

IC-R71E, £649.

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz, 9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100db dynamic range. Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation. Auto squelch tape record function.

OPTIONS:- Synthesized voice readout, infra-red remote controller, 12 V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Than

ICOM

FOR THE DX'er...

IC-751, £1099.

The IC-751 could be called the flagship of the ICOM range as it features 32 memory channels, full HF receive capability, digital speech synthesizer, computer control and power-supply options. The 751 is fully compatible with ICOM auto units such as the AT-500 and IC-2KL. The IC-751 now has a remote push-button frequency selector pad

Standard features include: a speech processor, switchable choice of J-FET pre-amp or 20dB pin diode attenuator and two VFO's, marker, 4 variable tuning rates, pass band tuning, notch, variable noise blanker, monitor switch, direct feed mixer in the front end, full break-in on CW and AMTOR compatibility.

The first IF is 70.045 MHz. Any XIT and RIT adjustment is shown on the display. The transmitter features high reliability 2SC2904 transistors in a low IMD (-32dB@ 100W) full 100% duty cycle. For more detailed information on this excellent set, please get in touch with us.

IC-271H, £819.

The IC-271H is the most advanced 2 meter transceiver available today, it covers the spectrum from 144-146 MHz with FM, SSB, or CW using the most advanced 10Hz PLL system. The IC-271H is suitable for simplex, repeater operation, moonbouce or satellite work, and has features found on no other transceiver.

Some standard features include 32 tunable memories, a high visibility fluorescent display, RIT readout, scanning, 12V DC operation with optional AC power supply.

The 271H has a speech synthesizer that announces the displayed frequency, ideal for blind operators, this is an optional extra along with the SM6 desk microphone and 22 channel memory extension with scan facilities.

As you can see from this brief description the IC-271H, (and its 430-440MHz brother the IC-471H) are very versatile sets indeed. More detailed literature can be easily obtained from Thanet Electronics Limited.

ICOM

ON THE MOVE...

IC-27E, £319.

This must be the smallest, 2M, FM mobile available today, measuring only 38mm H x 144mm W x 177mm D. It has all the features that you probably require included in this microprocessor controlled unit. In addition, if you feel lonely and can't find anybody on the band, just press "speech" and the optional built in speech synthesizer will tell you the frequency you are tuned to. This is a boon to the blind operator or to those that tuck their rigs out of sight.

Brief features:- 25/1 Watt output, green LED readout, scanning (memories and programmable limit band scan), priority scan, programmable duplex splits, 25 and 5Khz tuning steps, 10 memory channels with lithium back up cell, normal and reverse repeater switch, dual VFO, internal speaker and optional speech synthesizer. Just ask for a leaflet and we'll be glad to send you one. Price £319 and £25 for the optional speech synthesizer.

IC-02E, £239.

The new direct entry microprocessor controlled IC-02E is a 2 meter handheld jam packed with excellent features.

Some of these 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 of course 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 continues to be available.

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

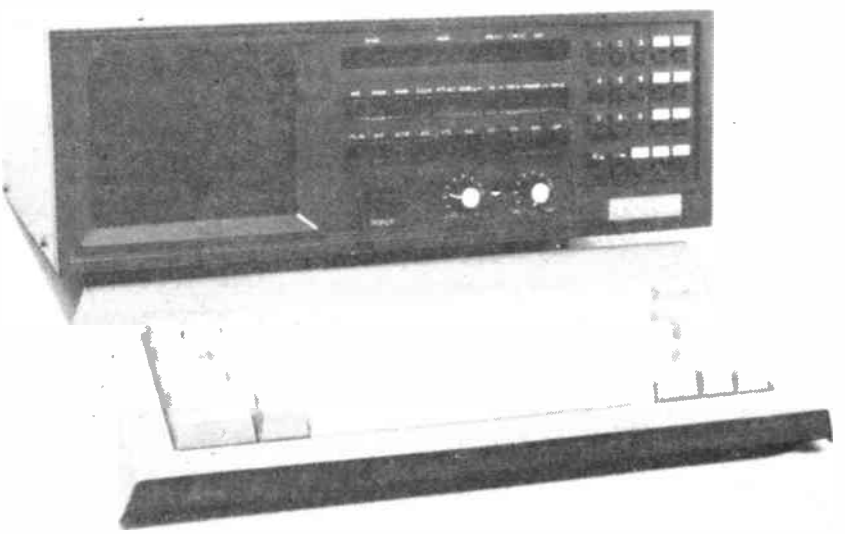
Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM

ICOM FOR COMPUTERS

Tono 5000E, £799.

From the famous TONO stable comes the new THETA – 5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASCII.

Features include:- 5" high resolution monitor displaying 400chr. x 16 lines x 2 pages, ARQ/FEC, time clock, Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTL level); 3 shifts (170,425 and 850 Hz) and two tones (2125 and 1275 Hz); manual or automatic Tx/Rx; Battery back-up memory (72 chars x 7 channels and 24 chars x 5 channels); type ahead correctable buffer memory; Morse code 5 – 100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A, B and L – the list goes on and on..... Power requirements by the way are AC mains or 13.8v DC



Tono 9100E, £699.

The famous TONO THETA 9000E has had AMTOR modes A, B and L added to its functions providing transmit and receive facilities with selective calling on AMTOR, RTTY (with 3 selective shifts and 2 tone pairs), CW with built in practice function and random generator, and ASCII with full Duplex facility The 9000E requires an external VDU. The battery backed memory covers 256 characters x 7 channels with Channel 6 which is divided into 16 subsections of 16 characters each and Channel 7 into 8 subsections of 32 characters. Any of the subsections may be used individually and messages can be repeated 1 – 9 times from a keyboard command.

Agent. Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900 – 2200 hrs.

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

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet Electronics

Dept AR, 143 Reculver Road, Herne Bay, Kent. Tel:(02273) 63859/63850

THE Eddystone STORY

FROM PINS TO PIN DIODES

by Ken Williams

Although radio equipment has only been produced under the Eddystone trademark since 1923, to say that the story started there would be wrong, for the history of the Stratton organisation goes back many years – to 1860, when a Gloucestershire pin maker called Stephen Jarrett, and a Birmingham merchant, Charles Rainford, became partners. The firm which they founded was known as 'Jarrett and Rainsford' and they manufactured steel pins at premises in Islington, Birmingham.

Thirty-eight years were to pass before the next significant event took place. Then a fifteen-year-old boy, George A Laughton (GAL) joined the firm as an office boy. Six years later, the company's activities expanded to manufacture hairpins, with young George appointed assistant manager for the operation.

By 1911, GAL was running a section manufacturing coronation flags and badges. Certain parts of these were supplied by a near-bankrupt, drunken manufacturer. Alive to the inherent dangers of such a source of supply, GAL purchased the concern and for the princely sum of £50 became the owner of a firm possessing a few tools and benches and a staff of two girls and a drunken toolmaker. This he named 'Stratton & Co'.

Within a short period, Stratton & Co was thriving, manufacturing gentlemen's jewellery; ladies' compacts; a variety of small metal products and a range of DIY kits including ships, aircraft, seagrass stools and wooden bead mats.

In 1920, GAL sold the major part of his interest in Strattons to Jarrett & Rainsford, at the same time acquiring a substantial shareholding, the firm thus becoming 'Jarrett, Rainsford and Laughton Ltd', with Stratton as the parent company.

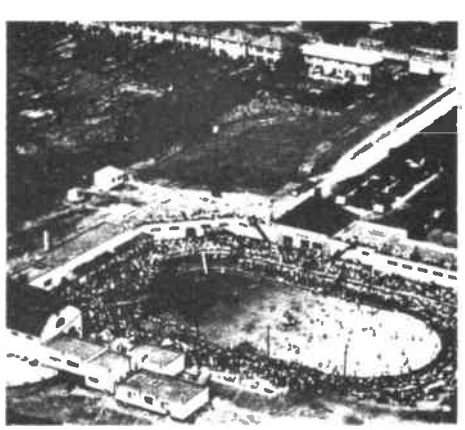
Only a few years later, however, occurred one of those events which shook society and could have been the death knell of the business – there was a change in ladies fashions. Hemlines rose to unprecedented heights, hair was cropped, shingled and bobbed; and the plant at JR & L, which had been manufacturing six tons of hairpins a week, came to a standstill almost overnight. Diversification was obviously necessary and the solution was provided by George Stratton Laughton, GAL's eldest son, who suggested the manufacture of wireless components.

This proved a wise choice, for at the time not only was the hobby of amateur radio rapidly gaining popularity, but radio was also an official communications medium and the recently formed British Broadcasting Company had commenced transmitting mass entertainment. The new wireless business was concentrated at the Balmoral Works in Bromsgrove Street, Birmingham, under the trade name of 'Eddystone', whilst the manufacture of fancy goods was taken over by the parent company.

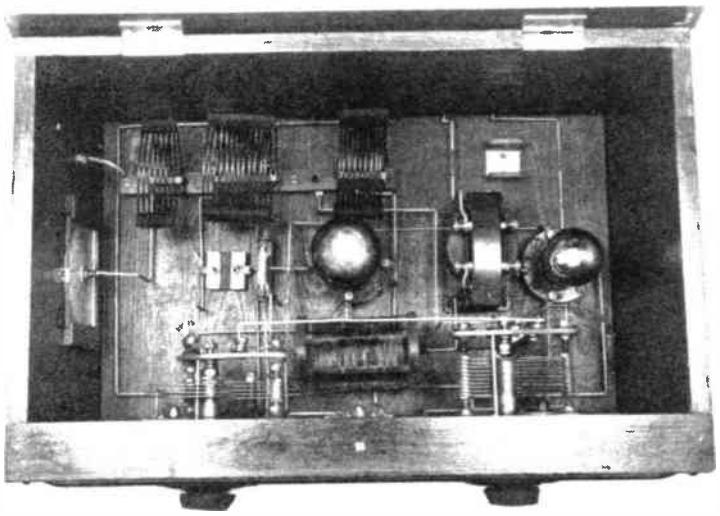
The first four years saw the company establish itself, not only in components but also as a manufacturer of receivers, the first being the 'Eddystone Twin', a two valve equipment mounted in an oak cabinet with a plate-glass front panel.

In 1924, Strattons opened Webbs Radio, which was intended to be the first of a chain of retail radio shops. In the event, however, only five were opened and the last closed its doors in the mid-1960s.

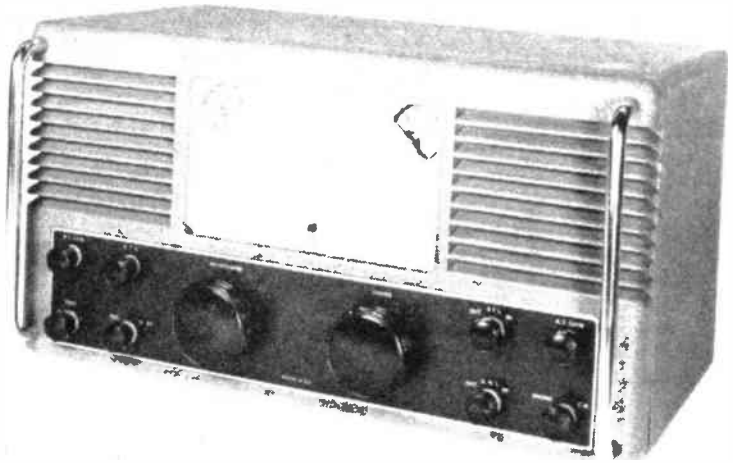
All that was left of the Eddystone works after the November, 1948, bombing - the event which caused the move to 'The Bath Tub'



An aerial view of West Heath Lido (The Bath Tub) before the war and before it became the home of Eddystone Radio



Top view of an Eddystone two valve receiver of 1928. In this, the right hand capacitor is the 'reaction' control, whilst the tuning is on the left. Between these, on the panel is the filament voltage rheostat and behind it is the RF choke in the selector plate circuit. The three plug-in coils towards the rear of the cabinet are: (l. to r.) aerial, grid and reaction



The Eddystone 504

Short Wave Two

By 1927, GAL had realised that the future lay in the development of equipment for the higher frequencies which were, at that time, almost unused. This led to the first Eddystone HF receiver – the 'Short Wave Two'.

Using plug-in coils, this covered the waveband from 15 to 85 metres and was the only commercially available equipment capable of receiving the recently introduced BBC Short Wave Service. In consequence, this found immediate success with both short wave listeners and Britons living overseas. It was also used by commercial concerns, principally public works constructors and overseas administrations.

The 'Short Wave Two' was followed by the 'Scientific Three' and the 'Scientific Four', these being among the first to use the newly developed screen grid valve.

During the thirties a host of new models was introduced – the 'Kilodyne Four', the 'Sphinx' and the 'ERA Seven', to name but a few. In particular, the 'All Wave' and 'All World' series gained an excellent reputation for ruggedness and reliability. It is on record that one 'All Wave Two' fell overboard during an Arctic expedition, yet needed only drying out before being returned to service, apparently none the worse for its dousing.

During the 1930s, Eddystone developed a work pattern which would make a modern efficiency expert blanche – each receiver was built from start to finish by the same man. This gave a degree of job satisfaction almost unknown today.

Another notable project of the 1930s was the development of transmitters and receivers working on the then almost unimaginable frequency of 60MHz. The first walkie-talkies in the world, developed for the Oxford University Everest Expedition, operated on this frequency and gave a range of 5-6 miles.

During this period, much effort was expended on the development of 60MHz two-way vehicle equipment which culminated, in 1938, with a contract to supply the Metropolitan Police Authority with equipment for communicating with all their stations. The installation was completed just before the outbreak of war and this order was followed by others from several other police authorities.

The war years

At the outbreak of war, many of the Eddystone engineers left to serve in HM Forces; however, the full impact of hostilities was not felt until the 24th October 1940 when, during an air raid, an oil bomb fell on the Eddystone Works. The building quickly caught alight, but staff on fire-watching duty managed to save almost all the technical equipment. This was transferred to Globe Works, another section of the JR & L Organisation some two hundred yards away, and production was gradually resumed. Only a few weeks later, a combination of high explosive and oil bombs fell on and totally destroyed Globe Works, the only equipment saved being two signal generators, a beat frequency oscillator and a 'Q'-meter.

The products of both Stratton and its parent company were important to the war effort and consequently no time was lost in searching for new premises. The very next day they took over the Lido at West Heath on the outskirts of Birmingham.

Pre-war, this had been an entertainment complex containing a fun fair, dance hall, swimming pool and chalets and was known to the local population as 'The Bath Tub'. In these premises, Stratton was allocated the ladies changing rooms and the ballroom. The latter was still as it had been left from the last pre-war dance, with ashtrays full and dirty coffee cups still on the tables, but to make up for this – a bar with drinks!

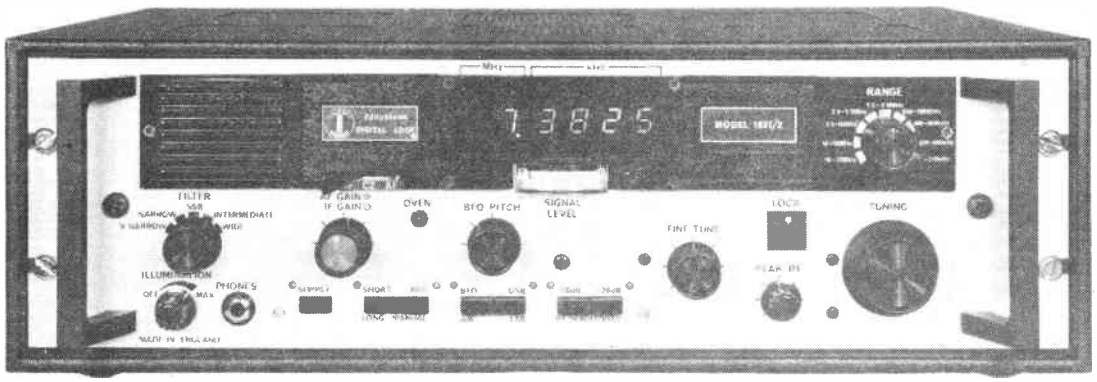
Stupendous efforts were made by staff and within three months 358X receivers were again rolling off the production line. These receivers were important on two counts: first because they were the first Eddystone professional receivers and second, because the only comparable equipment was manufactured in the United States and, due to U-Boat activities, supplies were unpredictable.

By the end of the war, Strattons had supplied to the Police and Armed Services over 4,500 transmitters, 7,250 receivers, 45,000 supplementary pieces of equipment and over 4.5 million components.

Post-war

In the years succeeding the end of hostilities, markets were at a low ebb. The armed services were placing very few orders and the availability of high quality, ex-service equipment at give-away prices seriously depressed both the home and export markets. Despite this situation, policies had to be decided

The Model 1590 of the late 1970s



Introduced in 1979, the 1837/2 communications receiver which covered from LF to 30MHz

The latest state-of-the-art receiver from Eddystone – the 1650

for the future. Among these was the decision to withdraw from the two-way communication field and concentrate on high quality professional receiving equipment.

This policy has been extremely successful and many of the products are also well known to the radio amateur fraternity. Starting from the model 504 of 1948, quickly followed by the 640, a steady stream of new models, each greatly prized by amateur and professional alike, came from the Eddystone production lines. Only in the late 1960s did this dwindle in the face of the strong competition from the Orient.

The mark that these receivers made in the professional field is evidenced by the fact that even quite recently the author has seen Eddystone 750s and 880s still in daily professional use as far apart as Sarawak, Singapore, the Caribbean and Central Africa.

The company also developed the 770R and 770U, which for many years were the only professional, continuously-tuned VHF receivers available and which, in consequence, captured a worldwide market. Other models were designed for shipborne use, both as cabin receivers and in the radio room.

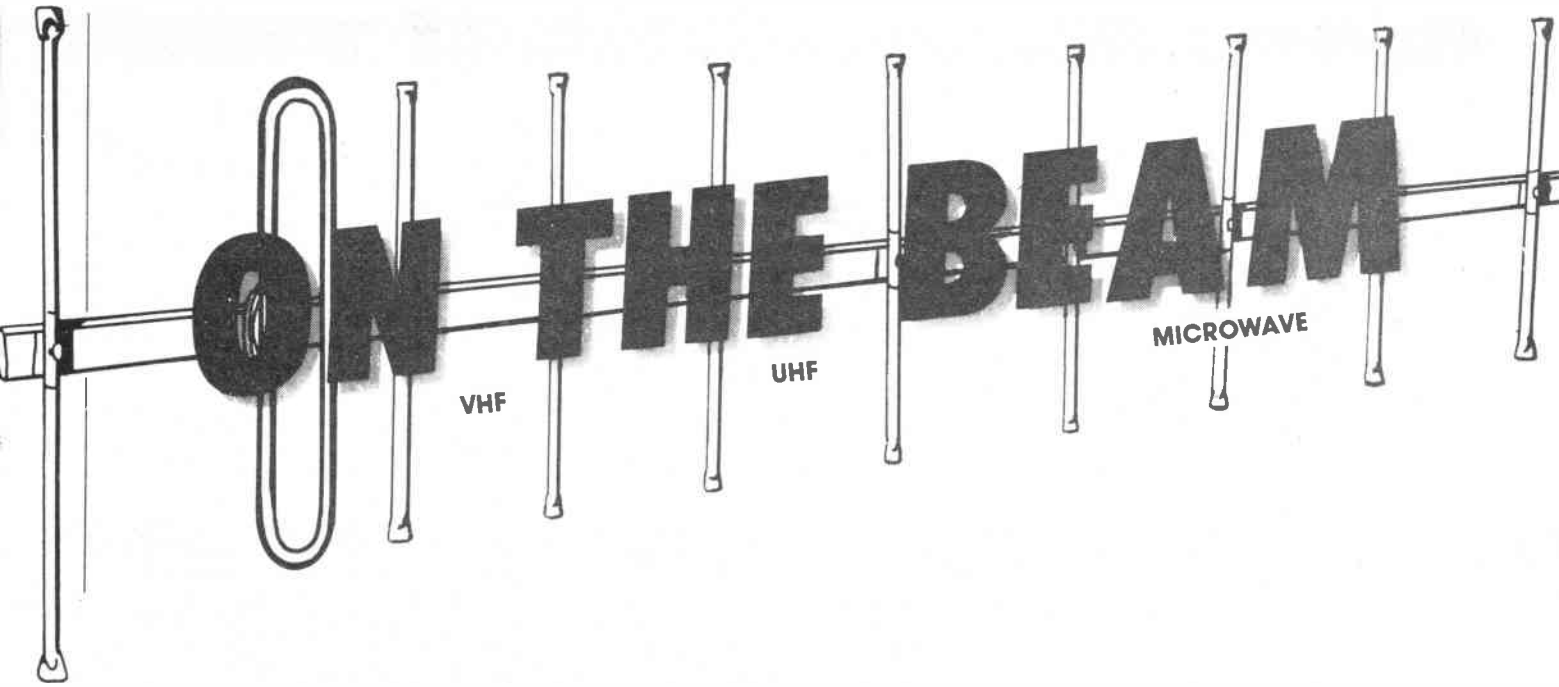
In 1965 the long association between Strattons and its parent company (now called Laughton & Sons Ltd with GAL himself in the chair) came to an end. Strattons was sold to the Marconi Company and at the same time it also seemed appropriate to rename the company 'Eddystone Radio Ltd'.

The last major milestone was in 1973 when the company manufactured its last valve receiver. This was not for lack of demand, but because it was no longer possible to obtain many of the necessary components.

Although rarely seen now on the amateur market, Eddystone still produce a range of high quality communications receivers, the most recent being the Model 1650 which is a high grade professional equipment covering a frequency range of 10KHz to 30MHz and the Model 1995, a VHF/UHF receiver which comes in two versions: one covering 20-470MHz and the other 20-1000MHz.

The techniques and technologies used have changed many times since 1923, but the devotion and sense of involvement of those who work at Eddystone are as evident today as they were sixty years ago.

The author wishes to express his sincere appreciation of the assistance given by Eddystone Radio Ltd in the preparation of this article.



News and topics of interest for the bands above 50MHz

by Glen Ross G8MWR

The sporadics

Now the newcomers to the band have had a taste of what Sporadic-E operating at its best really amounts to. We have said in the past that it was something really special, but this one... *wow!* The odd point about it was that so many of the newcomers to the band just were not aware of how tremendous the opening was.

I have been on two metres in one form or another since 1949 and I had never heard anything like it in all that time. Those of you who missed it really lost out, and those of you who did get in on the act may never see the like again. For the record, stations were worked in squares as far away as OJ, PO and QL, at distances of up to 2400Km.

Excellent

The event started in the afternoon with many Italian stations being worked. The path then veered round towards the East, and Greek stations started to appear. This phase of the opening finished by about 1400 GMT, but at the same time there was an excellent tropo opening into Scandinavia. The Sporadic-E was in full swing again by 1800 GMT, both on CW and SSB, and by this time the path had moved around into Russia, giving many people their first taste of super DX.

As is often the case in these events the stations worked depended to a large extent on where you were located, operators in the north of England were working Polish stations that were not audible in the south. There is also an unconfirmed report of a Hungarian station working into Iceland.

For the really well-equipped stations the opening continued for some time after the rest of us had given up. G3POI, with a massive aerial system, was heard working into YU and HG. The stations worked at this time were very weak and there is a suspicion that these could have been propagated by 'field aligned irregularities', a system about which very little is yet known. This is also borne out by the fact that when the beams were turned to the right bearing the signals went into the noise.

No equal

Many stations were using very low power. I managed to get 5 and 9 reports from UC2AAB in NN square while running 5watts to a five-element yagi at 25 feet, (most operating was done with 120watts to an 8-element Swiss quad at 35 feet). I felt this was a fair achievement until I heard that G1ARU worked RB5AO, in QL30c square, while running a barefoot FT290 to an eight-element at 25 feet, a report of 5 and 9 being received.

There have been one or two small events into Italy and Malta since the big one but we are now rather late in the season for another really big E opening. You may never see another to equal it.

Roundtable

The annual Sheffield 'roundtable' was again organised by Barry, G8AGN, and was a great success. These events provide the microwave enthusiast with the opportunity to meet like-minded souls, to listen to some interesting talks, and to make use of some very nice test gear to set the gear up. One of the main topics this year was the forthcoming move of the FM section to around 10.4GHz. This met with universal approval, the reasons for it being very obvious. There was also a call for people to make use of a lot more sites rather than just the tried and trusted ones. This is the only way that new paths will be broken, and a suggestion was made that perhaps bonus points should be awarded to those using new sites.

Questionable

The whole being of the RSGB microwave cumulative contests was called into question; the general feeling was that now there is so much activity on the band they are no longer required, and that the obtaining of points has taken too much importance. There was also a feeling that the reduction of operating hours and the reduced number of days was a retrograde step, and seemed to show that the RSGB was out of touch with the current microwave scene. This view has been reinforced by the number of letters received bearing on the same subject.

To balance things up the Microwave Society (no connection with the RSGB) are running an additional activity day on Sunday the 7th October.

The contest will start at 1000 and finish at 1900 GMT and will coincide with the IARU UHF contest. Scoring will be on the usual basis with a bonus of 20% of the score added if you are aperating from less then 600 feet asl. Entries to the Microwave Society at 81 Ringwood Highway, Coventry, to arrive by the end of October. The prize will be a year's

membership of the society.

Ultimate repeater DX?

Those of you who like operating long distances through the repeaters might like to try beating this one. Adrian, G4ROA, was working into California through Oscar 10 and the station he was in contact with had the facility to patch through the local two metre repeater. This was done and brought joy to the hearts of many Californians who found themselves talking into England while using no more than a handheld and a rubber duck aerial. At the time the satellite was over 20,000 miles away, making the round trip in excess of 40,000 miles. If you beat that distance please let us know. We think it will be a long time before we get another claimant, but Adrian is working on it.

Illegal operating

Since it became common knowledge that it was illegal for a class B operator to work cross band, say 144 to 50MHz, due to the fact that it was not permitted to operate to bands that you were not licenced to use, many people have queried the fact that class A operators seem to be doing this regularly by working cross band between 28 and 50MHz.

There seemed to be something wrong here and on checking with the authorities I am informed that *this operating is illegal*. I stated that there seemed to be a 'grey' area in the regulations, but I was told that this is not so and that *any* working into bands that you are not licenced to use is a contravention of your licence terms and will be dealt with as such. This seems to be perfectly reasonable and simply adjusts what has seemed to be an unfair restriction on the class B person.

I suggest that any person who intends to operate in this way bears in mind the possible consequences. The rule is quite clear; if the band is not included on your licence then you must not work cross band to it whether class A or B. To cover the use of Oscar there is a special dispensation and no infringement is caused by using these machines.

Scotland the brave

Operating from the north of Scotland is rather a different scene to what we know around the great cities in the south. Bill GM6MGS, writes from Aberdeen to give us an idea of what goes on up there. The notes refer mainly to the group's experiences on VHF field day. On 1296 they used a barefoot MM transverter giving 1.5watts to a two foot dish, and made 19 QSOs, the best being with ON7WR at a distance of 833Km.

On 70 they had ten watts to a 21-element aerial which provided contacts into Norway and Holland as well as the more usual stuff. On two metres the best DX was F1KBF at a distance of 815Km.

The interesting point about this is that the best DX on 1296 is actually further than that on two metres, although this will come as no surprise to 23cm operators. They then continue with a plea for more operators to beam to the north. They also make the interesting point that it seems to be easier to work into the Midlands and southern England than into the north of the country. Operators in the southwest also make regular pleas for people to beam in their direction. Having lived for many years in that area I know what a dearth of calls are put out that way.

The obvious path in Great Britain is, of course, the north-south one, but please remember there are other directions and the distance from say Kent to Cornwall is not to be sneezed at. Give it a try sometime.

A good thing

Last month we said that the amount of space devoted to CW on 144MHz was far too much, and that some of this space could be used to provide talkback or other facilities for all sorts of minority interests. There has been a lot of feedback from you on this subject and, without exception, all of it has been in favour of the idea. If you really feel strongly enough about it please get together with your specialist society and start an effective lobby. Unless you do

something the situation will continue as it is.

There can be no argument in favour of so large a CW segment when so many other people are looking for some space where they can operate in a civilised way. We are not saying that the existing calling frequency for special interests should be moved. If there are only a couple of, say, RTTY people on at one time the present system works well enough.

The problem arises when a special or minority interest group has a contest, particularly if that clashes with a major event. You may say that it should not clash, but there are only so many weekends in a year and there is a problem fitting all the activities in. The ball is now in your court.

Overheard on two metres: 'sorry that there is noise on my signal. Is it any better now that I have switched the noise blanker in?'; also this gem: 'your signal is end-stopping through the repeater but there is a lot of noise on it'; or even: 'is my signal better now that I have turned the squelch up'. Then they say that we need a novice licence!

50MHz news

There has still been no information on who the latest series of 50MHz permits are being issued to. When these are available it will bring the total number of operators on the band to around 100 which should certainly make a difference to activity.

The RSGB beacon has been installed at Potters Bar and has undergone two short periods of test transmission. This beacon not only sends its callsign but also the new 'Maidenhead' locator for the site which must make it about the first station to use the new system.

The Sporadic-E has been very prevalent on this band and it has been very interesting to hear many continental broadcast stations really booming in, providing a real foretaste of what operating on this band will be like when, or if, we all get permission to use it. The signs at the moment look reasonably good as the 'Green Paper' speaks of a possible amateur allocation from 50 to 52MHz. Remember though that aerial systems for this band are on the large side. Have a look at an old Band 1 TV aerial and imagine, say, a five element version swinging above your roof. Just cross your fingers and hope for the best.

Contests

The next microwave contest takes place on the 26th August. This is the 5th of the 10GHz cumulatives. Talkback, as always, is on 144.175MHz.

The weekend of the 1st and 2nd of September sees the 144MHz trophy contest, which also has an SWL section. This is followed on the 16th by the 70MHz trophy contest, again with an SWL section. The start and finish times for this one are 0900 and 1600 GMT.

On the weekend of the 8th and 9th there is the International ATV contest. This runs from 1800 GMT on the Saturday to 1200 GMT on Sunday. The bands involved are 432, 1296MHz and also 10GHz. The TV boys are moving up in frequency. More details on this one from BATC.

As a comment on band activity the results of the last SHF contest are now available. There were 123 entries in the 1296MHz section, 80 entries on 10GHz, and 12 for 24GHz.

Looking forward into October there will be the start of the 432 and 1296MHz cumulative contests and the Microwave Society 10GHz contest on October 7th.

The final

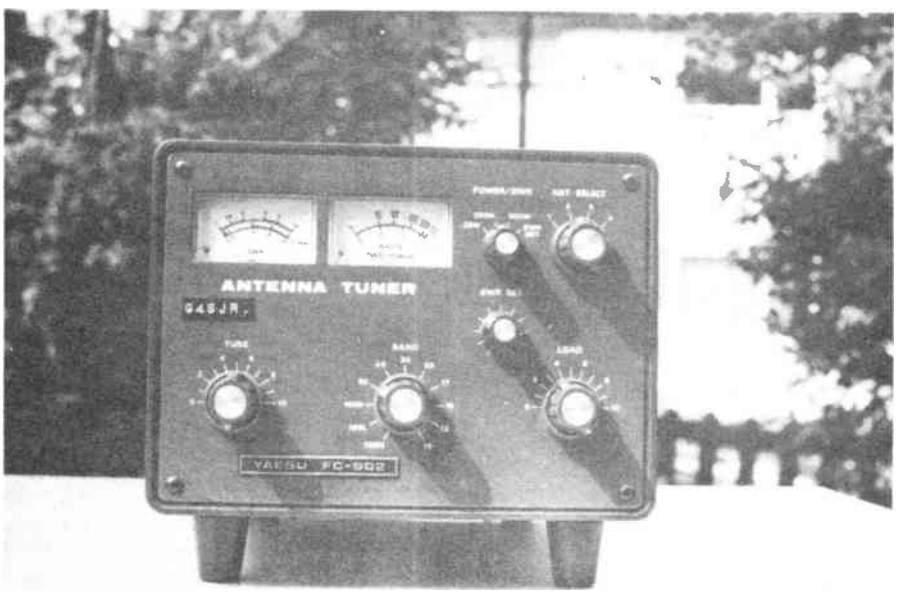
We have probably come to the end of the sporadic season for this year, but get ready for the big tropo openings that normally arrive around October to November. Nice to get so many letters from you, as you know we do not run a who-worked-what-when-type column, but we are always interested to hear of anything a bit out-of the ordinary and your views on the current scene are always welcome.

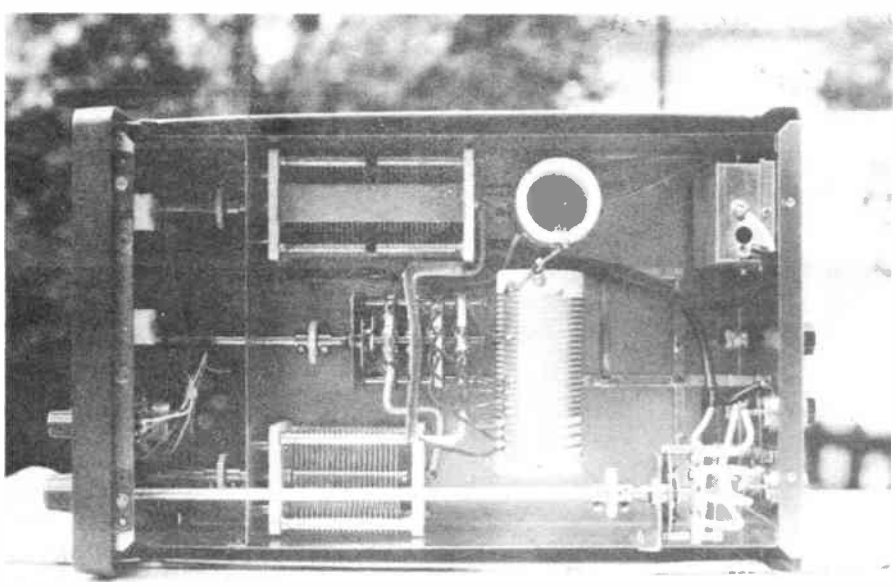
The address for all correspondence is *81 Ringwood Highway, Coventry.* Take care and enjoy your amateur radio. All the best till next month.

ANTENNA TUNING UNITS

A comparative review by Martyn Bolt, G4SUI

In the last two years, since buying an HF rig (the Yaesu FT902dm), I have had the good fortune to be able to use three of the most popular ATUs currently on the market. Here then are my views on the relative performances of the Yaesu FC902, SEM TranZmatch and the KW109, which I hope will be of use to anyone thinking of buying an ATU. It should be borne in mind that the Yaesu and SEM were bought new, whereas the KW was secondhand.





Yaesu FC902

This was the first unit to be bought: it matches the FT902 and other Yaesu rigs. Currently priced at around £138 and available from major retailers, the ATU has a useful front panel with twin SWR/PWR metering measuring forward power of up to 500W, which should be adequate in the majority of cases. The meters are in 3 scales, up to 25W, 250W and 500W, whilst a 4-position antenna switch allows selection of three coaxial and one random wire input. Tuning controls are two rotary capacitors (Tune & Load), and a switched inductor. The rear panel has the Tx input, the antenna outputs previously mentioned and an earth connection. Inside, there is lots of room and all components are easily accessible for any necessary maintenance. The unit measures 152 x 208 x 324mm.

The FC902 covers all HF bands 160-10, with the inductor having two tappings from a separate coil for Top Band. The manufacturer's quoted specifications, which I am not in a position to question, include: tuning capabilities of 10-250ohms for 50ohm input and 18-300ohms for 75ohm input; maximum insertion loss of 0.5dB; and SWR measurements of up to 4:1.

Comments

My first impression was that it should have featured some form of meter lighting, and that with the room inside a 'dummy load' could also have been included for the price (as in the FC707). The antenna inputs are OK for the operator who uses, for example, a beam trapped antenna, plus one other (eg 10m?), and a long wire for Top Band; but for myself with a new licence, wanting to try my hand at aerial construction, I missed the ability to feed direct with twin feeder or open line. The impedance matching range was also a limiting factor: one operator had trouble loading his G5RV on 14MHz with the FC902.

I like the facility to bypass the tuning network and read the SWR of the antenna. The cap tuning knobs, whilst working well, needed careful handling, or else the SWR dip could be easily missed. Some form of slow-motion drive would have helped cure this. One amateur was told that a common fault was the destruction of the rectifying diodes, which suggests that this could have been cured at the manufacturer's end. The few times I tried to tune random

wires I found it a difficult task, and for this reason I disposed of this unit.

The TranZmatch

The second ATU at G4SUI was the SEM TranZmatch, available from many retailers or direct from the manufacturers on the Isle of Man. The unit I used cost £112.50, which was for the 160-10m tuner with the 'Ezitune' noise bridge built in. The makers say 90% of their ATUs now have the noise bridge, which hopefully means quieter HF bands with no on-air aerial tuning necessary.

Of the 3 ATUs, this had the least reading matter on the unit which, as it has the noise bridge, was a bit disappointing. Presumably this was a sign of their confidence that you will not need to go inside! Directions for use were on a duplicated, double-sided A4 sheet with a basic diagram (no component values). This design of ATU has been featured in many manuals and magazines over the years. The magazine adverts mention an 'air-coupled balun', but the full implication of this escapes me!

The Ezitune is set at 50ohm which matches the output of the majority of commercial rigs, so all antennae will be tuned to this impedance. It will tune from 15-5000ohms accepting balanced or unbalanced feeders into the coaxial or wire inputs. An earth lug is also featured, and a link wire should be attached to this when using a coaxial feeder onto the required output socket.

The Top Band coil is selected by a switch on the front, which brings in a rather small coil fixed to the 40/80m tuning coils. In relation to the Yaesu, this coil is considerably smaller, although adequate for the power limits on this band.

As the induction is selected by positioning the aerial feeders, the only tuning controls on the front are two vernier dials for the capacitance, and the 160 and Ezitune switches. The dials allow accurate tuning, and the figures can be noted for each frequency to facilitate quick band changes.

Internally, this again is a roomy cabinet measuring 100 x 220 x 180mm. The input/output line is via link-coupled coils mounted on a PCB, which helps to prevent TVI. With no on-board meters there are a minimum of components in this unit, the difficulty for any would-be constructor being the noise bridge mounted below the coils. This compact circuit surprised me and I found myself using it more than my SWR bridge (which was as well, when the bridge got broken).

The Ezitune needs 12V dc into a phono socket on the rear panel (plug supplied – make your own lead!) When switched on, it gave an S9+ noise into the receiver, and the controls were tuned for lowest noise (which takes a bit of practice). I expected the 'noise' to be rather different from the 'scratching': something like a constant tone similar to my sidetone.

As many people will also want some form of power metering, with possibly an antenna switch in-line (dummy load, H & V ants), this type of unit can get to be both expensive and take up a lot of room with the additions. Also, by-passing the tuning circuits in the event of a pre-matched aerial, is not easily possible.

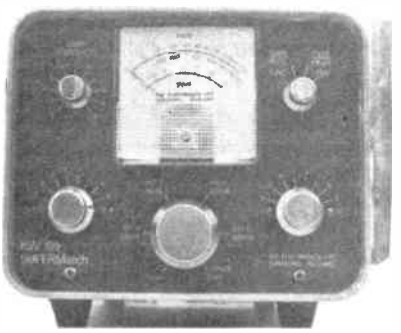
The KW109

The final ATU I have used is the KW109, this being the only unit bought second hand. Approaches to the manufacturers for current details have so far proved unsuccessful. Although a rare and sought after commodity, this ATU can be expected to cost around £85+ on the secondhand market (based on recent examples seen). Of similar size to the FC902, this matches my Yaesu station nicely, and its 1KW rating should satisfy my needs for the present (hi!). A comprehensive booklet comes with this one, and describes the KW109 as a combination of four KW products, housing an ATU, SWR/PWR meter, 100 or 1000W FSD Versatile antenna switch and dummy load all in one cabinet.

The front panel features an 80mm² meter, with SWR sensitivity dial on the left and meter function on the right. Below are the capacitor controls on reduction drives, and the aerial selection switch. The latter also gives access to the dummy load. The frequency tuning range is only 10-80m – which is a sad drawback – with impedance matching of 30-2500ohms for 10/15/20m, and 30-1000ohms for 80/40m. Ceramic wafer switches are used for selection.

The rear panel is similar to the SEM with 2 coaxial and 2 open-wire inputs, and a ground. Again, the ground should be connected to the earthy side of the wire input when using coax. There is also a spare hole, should you want to add an extra coaxial socket.

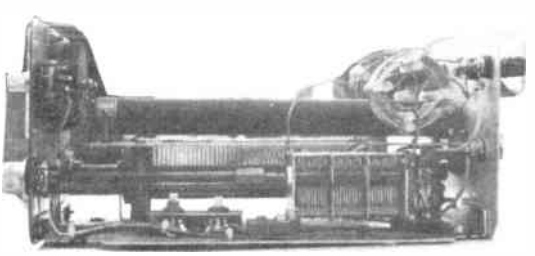
Inside are the wide-spaced tuning caps (3x180pF and a 300+300pF ganged). The coils are also link coupled, but are wound on insulated formers. Although rated at 1KW, this is only for about five seconds maximum at one time, with the duration increasing as the power level is dropped. The lower end of the scale shows approximately 40W for one hour.



As the resistor is 'in air', these limits should be heeded.

Again, comprehensive instructions tell how to connect various feeders on the output, using DPST knife switches to disconnect or earth the unused feeders. Also, in contrast to the SEM, KW advise the use of a balun (a topic guaranteed to stimulate controversy on any net), when using 75ohm twin feeder. The tuning circuit can again be by-passed for direct antenna measurements of the aerial.

Whilst this is the most comprehensive unit I have used, which deserves its much sought-after status, the one drawback has to be the lack of Top Band, although I think a similar idea as in the SEM may be possible, and I would be interested to hear from anyone who has done a mod such as this.



Summary

In summary, each ATU has its good and bad points, and I hope my thoughts will help any prospective buyers.

The Yaesu matches the rig nicely and requires no access to the rear after setting up.

The SEM was useful with its noise bridge, choice of feeders, and 160m facility.

The 'old faithful' KW, with its compact all-inclusive unit, lacks only Top Band to secure its shelf space, and will, no doubt, suit many.

In the future, I should like to compare one of the new auto ATUs with these models, but as the pocket prohibits that will have to wait (any offers?). My thanks to Andy G4SJR for letting me loose with a screwdriver and camera on his FC902.

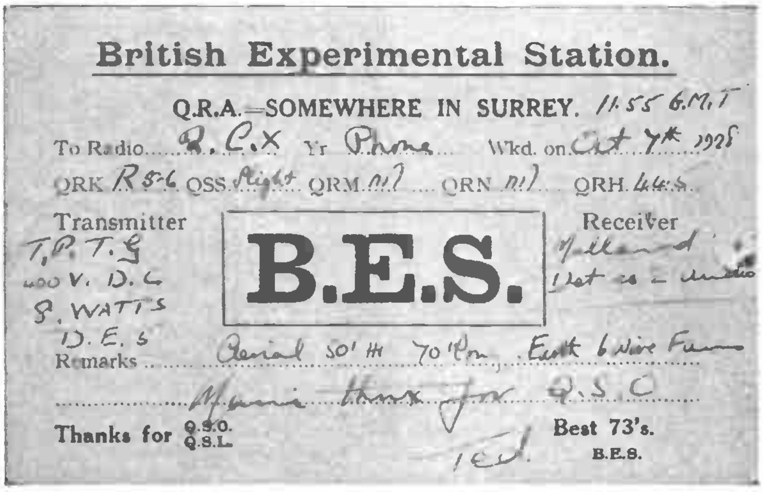
SOME DETECTIVE WORK

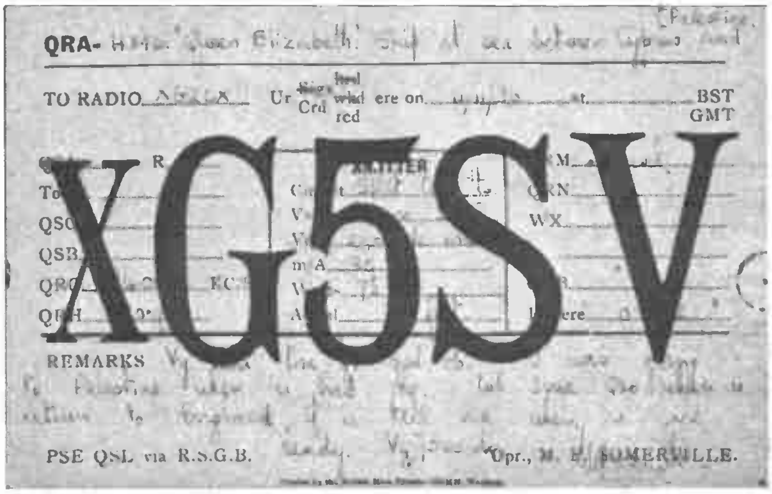
PIRATES

In the simplest terms a pirate radio station is one that is unlicensed and that is being operated without permission from the government administering the territory from which operating is taking place. Illegal transmitting includes what we know as 'broadcasting' with a strong entertainment content, but in this article I shall only be dealing with amateur band piracy.

Undercover or bootleg operating has a long history, and indeed the first 'amateurs' were technically all pirates! Licences were only required in this country after the passing of the Wireless Telegraphy Act of 1904, and by June 1906 some sixty eight people held permits to carry out receiving and transmitting experiments. Britain was the first country to pass Wireless Telegraphy laws and it was not until August 9th 1912 that amateur licences became obligatory in the United States, by which time that country had more than five thousand amateur operators.

Switzerland and Holland, both having been strictly neutral during the 1914-18 war, were very slow to legislate for amateur radio operation. It seems likely that both countries had retained the 'spy mania' induced by the considerable and clandestine intelligence operations of the Allies and their enemies during the war, and that this influenced their attitudes towards any likely 'spying' communications by amateurs. Switzerland issued regulations concerning amateur transmitting in 1925, but these were so stringent and the fees demanded were so high that a year later not one single Swiss amateur could afford a licence! This however did not stop the Swiss from operating 'under cover' and they happily continued to work DX stations all over the world. The Swiss operators sent out QSL cards and did not seem to be too worried about being discovered by the authorities.





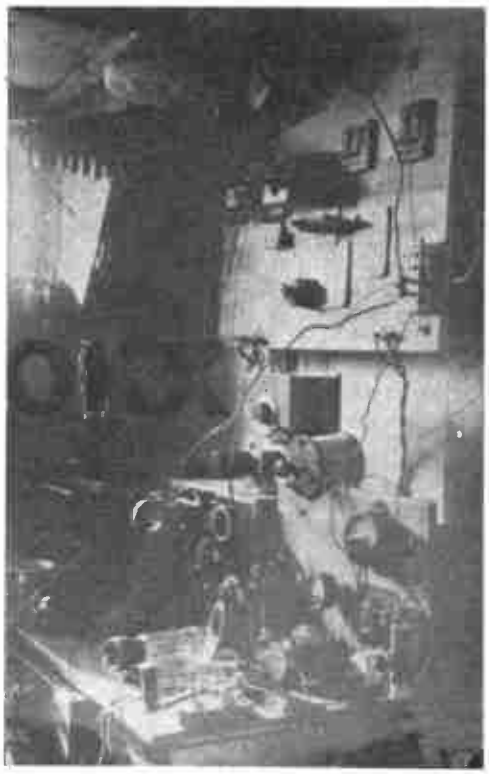
Dutch 'mass piracy'

Holland did not have amateur licensing until 1929 and a 'spin-off' from this was the proliferation of strange call signs. Examples include OPV, OTH, OKX, PB2, PB3, PCII, OCTT, NPCG2 and EN0QF, and I am fortunate in having in my collection many QSL cards from these and other Dutch pirate stations. The cards date between 1923 and 1929 when at last things were regularised and the first PA0 calls were officially issued.

Most of the Dutch amateurs had incoming QSL cards routed via 'IARU, Hoogduin, Noordwijk aan Zee.' This was the accommodation address chosen by Mr RVW Tappenbeck who acted as both QSL Manager and 'Callsign Issuer' for many Dutch operators. Tappenbeck's call was PCTT and so secretive was he that few Dutch amateurs realised this! In 1926 the operator of P0XX (soon to be changed to N4PX and formerly N0PX) wrote on the back of a card to the late G2UV:

'. . . *I will explain u the question. I am not R Tappenbeck but R Tappenbeck is our traffic manager. His home is Villa Hoogduin, Noordwijk aan Zee. I've never heard of 'Villa Margaretha'* (actually this was Tappenbecks real home address). *The Dutch amateurs are very careful with their addresses and names. Now R Tappenbeck has made the foundation for a Dutch Section IARU and most of the Dutch transmitter amateurs are members. Because Xmitting is forbidden in Holland, R Tappenbeck who has the list of all Dutch amateurs doesn't give the calls and names and addresses of each*

USING OLD QSLs



Top right *Photo QSL from the 'Dutch pirate' OKX, 1924*

Below right Card from BRS80 proving that SMD was really A J E Forsyth

Top left *QSL card from BES 'somewhere in Surrey'. Operator was later G6LK*

Mid left *Card from RN Cadet Somerville for contact when operating on board HMS Queen Elizabeth in 1930*

Bottom left *QSL from SMD*

by John D Heys G3BDQ

AHOY!

other to us so I don't know who is N0GM, N0ZM, N2PZ etc. From you I know now that PCTT is R Tapp. himself . . .'

I do not know if the energetic and brave Mr Tappenbeck was ever picked up by the Dutch authorities, but he certainly did a good job in organising amateur radio activity in his country at a time when most of the civilised world was licensing and for the most part encouraging amateur operation. I have a QSL card which was originally sent to G5BV in 1923 from Tappenbeck which bears the logo of the Noordwijk Radio Club, gives his call as PCTT and also shows that indeed his home address was the Villa Margaretha!

In recent years we have witnessed long delays in the issuing of licences in this country. This was in part caused by the sheer volume of applications and an administration not geared to handle or process them. This delay tempted a few to 'chance their arm' and to go on one of the VHF bands illegally. The frustration induced when a complete station had been paid for and assembled, the RAE passed and all the necessary cash and documents sent on was just too much for some characters and most of us have heard their forays on the bands (and recognising them as pirates refused to contact them I hope!).

A very similar situation existed some fifty years ago when there was no RAE to worry about; instead just a Morse test to pass and a submission of full details with circuits of the equipment to be used and the experiments which were planned! It appears that there was a quite rigorous look into the backgrounds of applicants for licences. For a start one had to be a British-born national and there was to be no indication or even suspicion that the applicant might be a security risk. We too had some of the 'spy-mania' as a hangover from the war and it is understood that each British amateur had his or her own file which was updated regularly in the offices of an Intelligence Department (was it MI5 or MI6?). This interest in amateurs by the cloak-and-dagger folk seems to have carried on well into the 1950s and 60s.

Primitive devices

Fifty and more years ago many unlicensed stations came up on the amateur bands and not many were discovered or dealt with. Detection devices were primitive before 1939 and the Post Office did not have the gear or the manpower to track down pirates. Key clicks and BCI were usually the pointers to illegal operation and such unwitting interference could lead the Interference Squad right to the offender's door. On the other hand a QRP pirate working on 40 metres had a very limited ground wave and could not be heard between about 25 to 30 miles away and the first 'skip' distance.

Amongst my many thousands of ancient QSL cards there are a few from rather special pirate operators; chaps who later became 'legit' and well respected members of the amateur community! There is a card emblazoned with the callsign SMD and dated October 13th 1928 for a 45 metre QSO on CW with G5UF. The QTH of SMD is shown as M/C 'Leonie', lying in Newport River, South Wales. The card carries full details of the Rx and Tx and is signed 'DA Forsyth'. G5UF was asked to send his card via a Monomark address; BM/GJGJ, London WC1.

The SMD card meant little for a time but a few months after its discovery I

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 £19.95 Built and tested module £24.95

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 £9.95 Tested Module £14.95 P&P £1.00 (VAT inc.)
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 £14.00 Tested Module £19.00 p&p £1.00 (VAT inc.)

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 x 9mm x 15mm (same as Mk1) Noise figure 1.0db Gain 26db **Kit Price £4.95** (inc VAT & P&P).

TRANSISTOR BARGAINS

	mHz	PoutW	Pin W	Volts	Price
2 N6456	30	60	1.25	13.8	£5 (inc)

Not 3SK88 but BF981 Better 2M noise figure -0.6db £1.40 (inc) ZTX 501 Gen. purpose PNP 0.5A, 20 for £1.25 (inc)

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 most short wave receivers using common IFs. Similar to the FC177 but cheaper! Supply voltage 5-15V dc. Will operate on 26 different IF offsets. If this counter range won't do what you want probably nothing will. Works with all of Tony Bailey G3WPO designs, ask for conversion data.

DFC40 0-4MHz £14.95 built DFC41 0-32 MHz £18.50 kit DFC42 0-200MHz £21.95 kit

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 £14.95. Built and tested module £24.95.

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 £6.50

70cm POWER AMPLIFIER At last a cheap and easy UHF power module by TRW the world leaders in RF modules. Only 150mW input for a full 15 watt output all the way from 430 to 440 MHz. Use with an attenuator for your handheld or build a simple TV Transmitter with the circuit provided. **TRW MX15 £12.75**

TOP BAND CONVERTER Listen to the other local nets and DX on 160m with any 2m SSB receiver. Does not need a large aerial and will comfortably out perform most commercial receivers.

UC160 Kit £9.95 UC160 built and tested £16.50

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 £19.95 Built and tested module £29.95.** For professional use on 18-200mHz built and tested module **£38.50** including crystal.

WHO IS TIMOTHY EDWARDS? He's 32, licenced for 14 years, was a senior design engineer at Pye Telecomm and now works full-time for Timestep. He's also responsible at Timestep for designing the synthesizers and down convertors for British Telecom used on the current ECS satellite system. He also specified and uses our new Spectrum analiser and signal generators costing over £40,000. Now you can see why our amateur modules always work properly and have full meaningful specifications..

GAS FILLED RF RELAY

New Japanese 50 ohm low loss gas filled RF relay. Only 0.3dB loss at 430 MHz with 35 watts input. Ideal for switching pre-amps and the TRW MX15. BSWR 1.5:1 at 1gHz. 12 volt coil. **DR12V £4.75**

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 TELEX 817015 TIMST G

Access

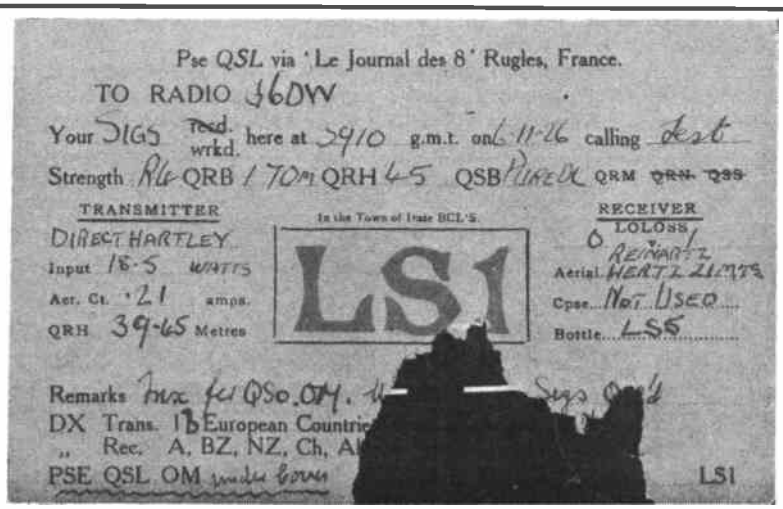
came across several QSL cards sent out by the late Austin Forsyth OBE, G6FO to various amateurs between October 1927 and August 1938. In 1927 'Angus' (as he liked to be called) was unlicensed but was a registered listener as BRS80. There is another BRS card from him to G2CX for March 1928 and yet another to G6DW dated February 1929. The first card which bears the call G6FO was one sent to G2KO for a contact on October 10th 1930. All the cards are signed 'AJE Forsyth' (his full name was actually Austin James Esslemont Forsyth) and they are written in the same hand as the one from SMD. The receiver used remained the same too between 1927 and 1929; a O-V-1 Reinartz.

First station

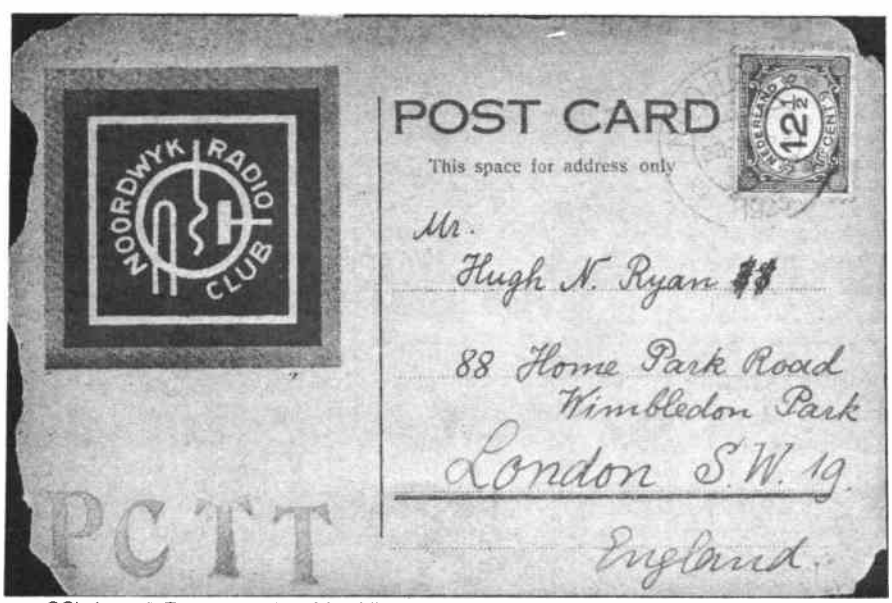
He is most remembered as the proprietor and Editor of *Short Wave Magazine*, which he took over in March 1938 and published until his death in January 1977. G6FO was licensed some time after February 1929 and soon in 1930 became the first G station to work across the Atlantic on Top Band. His obituary in the March 1977 issue of the *SWM* states that Angus was first licensed in 1928 but the QSL evidence shows this to be incorrect. It was usual for applicants for amateur licences to be at least 21 years of age in those days, and this fact could have led Angus to a little bootlegging! He was born on May 11th, 1907 so was not 'of age' until May 1928.

Big names

A top DX man, especially on the higher frequencies before WW2 and just after was EJ (Ted) Laker, G6LK. On page 207 of John Clarricoat's book *World at their Fingertips* is a reference to G6LK as being the second British station to work Ken Ellis, G5KW who was operating on 50MHz in 1947 from the Suez Canal Zone as MD5KW. This contact was made during the brief period in late 1947 when the Post Office gave official permission for operation on 50MHz to just a few 'big names' who were specially equipped to work on that frequency. Laker was also one of the 'early birds' on 28MHz and a QSL card dated March 2nd, 1930 and sent to G2CX for a QSO on ten metres has written on it: 'First time ever hrd a G stn after weeks of listening'.



Badly damaged QSL card from pirate station LS1



QSL from R Tappenbeck, 1923. His correct address was given on the reverse side

Another QSL card, co-incidentally also to G2CX and from a station with the unlikely call sign BES, headed 'British Experimental Station' with a QRA 'Somewhere in Surrey' dated October 7th, 1928 comes obviously from a pirate operator. This card marks a telephony QSO on 44.5 metres using an 8watt transmitter and on its front is signed 'Ted'. On the other side is a handwritten comment, 'Veri sorri u could not understand me OM. Should veri much have liked to have had a chat via radio after our personal contact. Will look out for you next Sunday morning'. This comment is signed 'EJ Laker' and is in the same hand as the writing on the later G6LK card. Perhaps Ted Laker had not yet mastered CW in 1928 and so was unable to get his 'ticket'? His QTH when becoming G6LK by the way was Cranleigh in Surrey!

A damaged card dated November 6th, 1926 with the call LS1, showing a location 'In the Town of Irate BCLs' and received by G6DW to confirm a contact with the odd station's phone on 170 metres is yet another example of British pirate operations. On the card the transmitter is said to be a 'Direct Hartley' with 18.5 watts input, also for 39 to 45 metres, with a Reinartz O-V-1 receiver. Station LS1 brazenly boasted of having worked 13 European countries and wanted incoming cards to be sent 'under cover'. His address for QSL purposes was via 'Le Journal des 8', the early French radio magazine which often operated as a QSL bureau for subscribers and no questions asked!

On the back of the card in manuscript is written, 'Pse do not disclose my address, Tnx'. The bootlegger then signs his name, and surprise, surprise it reveals the 'handle' of a well-known and much respected old timer still living in the east Midlands. Should he get to read this article (his eyesight was not too good when the writer last communicated with him) I feel sure he will have a chuckle as he recalls his exploits as an unlicensed youngster.

All aboard!

Amateur operation from HM Ships was not approved in the early days for obvious reasons; the most important one being the possibility of interference with the ship's receiving equipment. In 1930 however a Royal Navy Cadet, Mr MF Somerville, was transmitting when aboard HMS 'Queen Elizabeth' on 14MHz with a 7.5watt transmitter. A contact with G2CX was made when the ship was at sea between Cyprus and Palestine. The card was written out when 'Queen Elizabeth' put into Malta on the way home and it bears the callsign XG5SV. Oddly the early callbooks show this call to be then held by SD Mason of Forest Gate. 5SV is of course an obvious choice for a pirate station operated by someone named Somerville! Perhaps G5SV was a re-issued call, for at the foot of the card, which was a commercially produced effort by G6MN it states, 'Pse QSL via RSGB'. The RSGB would not worry as to

whether operation was from one of HM Ships or not but it is not likely that it would handle cards from someone masquerading as the real G5SV.

A moral dilemma?

In the affairs of Men there are often no clearcut distinctions between good and evil or right and wrong. It is always unwise to strike moral positions condemning *all* radio pirates as the minions of evil! When we hear a weak signal from an undercover station in some remote territory where the government has strictly clamped down upon amateur operation, most of us feel some twinge of sympathy for the brave or foolhardy operator who may be risking imprisonment, or even worse, if caught.

Fortunately many of the territories where all amateur working is banned are rather primitive societies having little in the way of sophisticated detection equipment, so it becomes essential that the operator's wishes concerning the routing of QSL cards are followed to the letter. Often such contacts made with pirates in far away places do not count towards DX awards, but nevertheless the sense of achievement felt by actually working them outweighs such considerations.

The terms of our Licence state that we are not allowed to communicate with unlicensed stations, but again there are many 'grey' areas and circumstances when things are not clearcut as to whether the station in question really is a pirate or not. Often the station does not say that he is operating illegally so how are we to know? The United States has a kind of 'blacklist' of countries which are taboo to American amateurs. There seems to be a political basis for the drawing up of this list of countries, for they are territories which sometimes issue licences and may be worked by amateurs outside the USA.

No excuse

Obvious pirate operation in this country, whether it is inside or out of our amateur bands, is to be deprecated. It is quite possible to obtain legitimate amateur licences here so there is no excuse for illegal transmitting. If you knowingly contact any such station you are putting your own licence at risk, for 'Big Ears' is always listening!

Some pirate operation is both cunning and malicious. On Top Band last winter some of the choice DX heard and worked was not genuine. Just why anyone having a considerable knowledge of the band and its propagation characteristics should want to come on at exactly the right time and with just the right sounding signal strength to impersonate distant CW stations will remain a mystery. The only likely explanation is that the satisfaction gained by the pirate is akin to that derived by the 'Yobboes' who indulge in mindless vandalism or desecrate our towns and cities with sickening graffiti. Psychologists are needed, not the Radio Interference Department!

Last year the writer had the dubious pleasure of hearing CQ calls from a lunatic who had 'borrowed' his callsign. He knew that I was still on the band for I had just been operating only a few KHz from his frequency. If that pirate can raise a few rarities and get me the QSL's, so be it, but I am not prepared to 'carry the can' for his poor operating, duff signal, bad manners or any interference with other stations!

A privilege

Every month we read of stations whose call is being used on bands where they themselves never operate and who get heaps of QSLs for unlogged and unknown QSOs. If at any time a station is worked and it seems obvious that he is not strictly 'kosher', it is our duty to send full details to the station who has been pirated and also to the licensing authority. Holding an amateur licence is a privilege and we must do all possible to counter illegal operating. Gone are those days when the amateur bands were relatively empty and when 'blind eyes' were often turned when unlicensed stations were heard and worked.

THE BELCOM LS202E 144MHz MULTIMODE HANDHELD

A user report

by Julian V Moss G4ILO

Handheld 2metre transceivers have been available for a number of years. Probably the first of these was the six channel KP202 which was introduced in 1975. Although a true handheld, this rig was rather large to be carried in a pocket. Increasing use of LSI circuitry, however, has enabled smaller and smaller transceivers to be produced, so that pocket-sized rigs capable of covering the whole 2m (or 70cm) band, with multiple memories and scanning facilities, are now taken for granted.

Until now, these handheld transceivers have been FM-only devices. However, the recently announced Belcom LS202E claimed to offer both FM and SSB in a package smaller than many current FM-only transceivers. As a keen SSB operator, the writer decided that one of these rigs was just what he needed to keep in touch with 2m activity while away from the home QTH, and so an order was placed with the importers, Lowe Electronics. Eventually, a rig arrived at the London branch of the emporium, just in time for the May Day Bank Holiday.

Features

The LS202E stands slightly taller than the familiar Icom IC2E, and is very attractively finished in a green, metallic-look plastic case, with silver finish knobs and switches. The case feels less solid than an AR240 or IC2E, but the general impression is that it is a well-made piece of equipment.

On the top face are the On/Off Volume and Squelch controls, concentrically mounted, and RIT and VXO, also concentric. Below these are the noise blanker and +5KHz shift switches, and below these the mode switch, which offers FM, USB and LSB. To the left of the top panel are a BNC antenna socket, a small S-meter, calibrated 1 to 9, which indicates battery condition on transmit, jacks for external microphone and speaker, and the thumbwheel frequency selectors.

On the left-hand side panel at the top, is a push switch to operate a green LED lamp which illuminates the S-meter and thumbwheel switches. On transmit a red LED comes on. Below the lamp switch is the PTT lever, alongside which are small, semi-recessed switches for toneburst on/off, high/low power, and simplex/repeater shift. This latter switch was very fiddly to operate, as there is not a very positive 'click' in the centre (simplex) position, making it difficult to switch from repeater to simplex operation, particularly when mobile. At the bottom of this panel is a 2.1mm socket for charging the nicads.

Underneath the transceiver are three recessed terminals intended for use with the LA207 mobile mount and linear amplifier. These provide access for an external power source, a control voltage for the linear amplifier, and a terminal marked Lamp which, when grounded, causes the LED lamp to be illuminated.

The transceiver is supplied with a helical antenna, belt clip, wrist strap, and a good instruction manual containing a description of the circuit, a clearly printed circuit diagram, and printed circuit board layouts. No batteries or charger are provided.

The empty battery pack supplied takes six AA size nicads, giving a nominal voltage of 7.2V. With this pack the LS202E will run about 1.5W output on high power. An NP6 battery pack containing six AA nicads is available from Belcom at £22.65. At nearly £4 a cell this seems rather expensive, although in fairness, the price does compare favourably with accessories for other handhelds. An NP9 high power battery pack is also available giving a nominal 10.8V, or 3.5W output, for £31.40. Separate chargers, costing £8.50 each, are needed for each battery pack.

Other accessories available include a speaker/microphone, a soft case which will accommodate the rig with either battery pack fitted, and a ¼ wave telescopic rod antenna.

Ergonomics

Ergonomically, the LS202E was convenient to use, although some users might find the top panel controls a little cramped. Apart from the simplex/repeater switch already mentioned, the main grumble was the frequency selector thumbwheels, which were not as positive as on some other handhelds. This meant that it was necessary to pay more attention when changing frequency than might otherwise be required, and this was a bit of a nuisance, particularly when using the rig mobile.

The RIT and VXO controls operate only in the SSB mode. The VXO control allows continuous tuning between 10KHz steps and covers +/-7KHz or so, thus making the +5KHz switch unnecessary for SSB use. The RIT control has a centre detent rather than a separate on/off switch.

The receiver performance was assessed with the transceiver connected into the main station antennae. Sensitivity was found to be excellent and compared well with full-sized equipment, although the lower volume from the small speaker made copy of weak SSB stations more

difficult. Strong SSB stations sounded a little distorted and also required the volume to be turned right down, so the AGC performance could be better, and an RF gain control would be nice, if perhaps too much to expect on a handheld!

Selectivity

Selectivity was found to be adequate for 25KHz channelling on FM, while SSB selectivity was surprisingly good considering how small the crystal filter must be, though it was obviously wider at the – 60dB points than the filters in larger equipment.

It was possible to receive 10KHz away from a strong local station without too much 'splash' being evident.

In very severe conditions, during a contest, with the local club station radiating several kilowatts ERP from a couple of miles away, the receiver held up better than some older and cheaper equipment. Noise could be detected more than 100KHz from the strong station, although it was still possible to copy many signals. I suspect that the local oscillator is rather noisy, and that this was the main reason for the 'hash' which was experienced. Nevertheless, the receiver performs very well for this type of equipment.

Squelch

Squelch action was excellent, with very little 'squelch tail' (the burst of noise heard briefly after a transmission, before the squelch takes effect) and none at all when the rig itself goes from transmit to receive.

This had the unfortunate side-effect that there was no audible warning if one inadvertently released the very short travel PTT switch. The squelch also works on SSB, though at a different setting of the control.

Current consumption with the receiver squelched was a little over 30mA, which is quite good and should ensure reasonable battery life between charges.

Spurii on receive were noted on the following frequencies: 144.270, 144.410 and 144.725. None of these was strong enough to move the S-meter, the first one being the strongest of the three.

Problems

On transmit, very good reports were received on the audio quality on FM using both the internal microphone and the external speaker/mic. After a while, however, it became obvious that the FM deviation was set too high. This was most noticeable when working through repeaters, and transmissions through GB3PI, which has a 5KHz overdeviation 'pip', were virtually unreadable.

Using SSB, however, difficulty was experienced in making contacts. On investigation it was found that the average power output on normal speech was rather lower than would be expected for a peak power of 1.5W PEP. Stations who had difficulty in copying the signal on SSB were able to obtain readability 5 on switching to FM. It was felt that this could be due to a fault, and so the LS202E was returned to the shop for investigation.

After checking by Lowe's, the FM deviation was set correctly to 5KHz. It was possible to work through repeaters without complaints, and reports on the transmitted audio were still complimentary.

Good reports were also obtained on the SSB audio quality, although signal strengths still seemed low. Using a power meter, the average power reading on normal speech was generally below 0.2W, only rising above this level on an enthusiastic 'aallo', although it was possible to whistle up the output to the full rated power.

Disadvantage

Reference to the circuit diagram showed that there appears to be no ALC circuitry in the transmitter which, if present, would have provided some speech compression and so improved the 'talk power' of the rig. The effect of this in practice means that even with the high power battery pack, the LS202E will be at a distinct disadvantage on SSB compared with, for example, an FT290R which will run nominally the same power.

The big question then is whether or not the LS202E is a good buy. A large number of British amateurs, particularly the younger ones, do not have a great deal of money to spend on the hobby. Many people use handheld or portable equipment as their main station, perhaps with an external amplifier.

One of the reasons for the phenomenal success of the FT290R is, I am sure, that it is capable of good enough performance for base-station use, but is small enough to be used in the car and out on the hilltops as well. Because of its poorer performance on SSB, the LS202E does not look a good choice for an all-purpose rig for base-station as well as portable use.

Advantage

The great advantage of the LS202E is its small size. It is probably the smallest transceiver currently available with an SSB facility. It looks very attractive, it is well made and its performance on FM, which is no doubt where it will most frequently be used, is comparable with anything in its price range. It is a rig which is capable of giving its owner a lot of fun, and I am sure the LS202E will find a place in many shacks or, more likely, briefcases, jacket pockets and rucksacks!

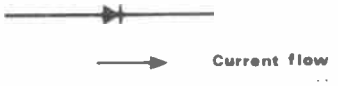
NICAD CHARGERS

Stephen Ibbs G4LBW describes an easy way to avoid paying manufacturers for their simple but expensive battery chargers – build your own

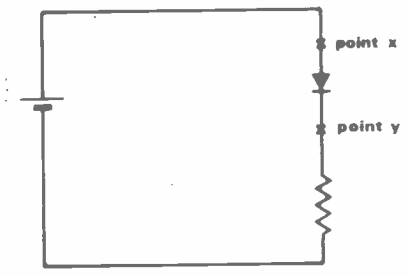
Unless you have access to normal batteries cheaply, sooner or later you will feel drawn to rechargeable nicad batteries. The problem is that unlike lead-acid types, eg car batteries, they have to be charged with a constant current, otherwise excessive current will flow through them and they will blow up. . .loudly. Consequently some firms make a killing by selling very simple circuits, packaged nicely and priced exorbitantly. Below are two circuits for you to experiment with. They are both standard so no claims for originality are made, but PCB designs are included so you can actually build and get them going.

Circuit 'A'

Most readers will know that a diode will allow current to flow in one direction only:



The diode has a resistance of its own, and needs a small current flowing through it to 'kick' it into action. Consequently a silicon diode drops a small voltage, approx 0.6 volts, across it. Thus if you measure the voltage at point 'x' below:



it will be 0.6V greater than the voltage at point 'y'. If two diodes are placed in series, 1.2V will be dropped, and so in circuit 'A' the base of the transistor is being held at 1.2V above the emitter. This allows current to flow from the +ve line, through the collector and emitter and variable resistor, down to 0ve. Because V=IR, and we have made V constant, then the current flowing will be primarily dependant on the resistance of R2 and RV1, and once this is set, the current will be fairly stable.

Circuit 'B'

The 7805 is a fixed 5ve regulator and operates by ensuring that the 'OUT' pin is 5 volts above the 'COMMON' pin. (Thus, incidentally, if you want a 6 volt regulator, put two silicon diodes in the common lead – running down from the IC1 in the diagram – raising its voltage by 1.2V, so the output will be 6.2V). If, therefore, you place a resistor between the 'OUT' and 'COMMON' pins, a current will flow, the amount depending on the value of the resistor, to maintain a potential difference of 5 volts. If this resistor is replaced by a preset resistor, then a variable current generator will be produced (as in circuit 'B'). For those interested, the actual formula for working out this resistance is:

$$I_{OUT} = \frac{VR}{R} + I_a$$

where Iout is the current required, VR the regulator voltage, R the resistance set by VR1, and Ia approximately 4.5mA for the 78 series of regulators. . .but the easiest method is to insert a variable resistor, and adjust until the required current is flowing.

Construction

PCBs have been designed as shown, and the components should be mounted carefully to ensure the polarised components are inserted the correct way round. With the symbol for polarised capacitors, the open block is the positive side, marked with a '+'.

The transistor in circuit 'A' should be bolted down to the PCB with two 6BA nuts and bolts to make the collector connections (the case being the collector), before the base, and emitter pins are soldered, to avoid strain. The 7805 in circuit 'B' should also be bolted down to the small PCB heatsink. A bigger heatsink of the finned variety may be necessary if large currents are being drawn.

After checking, set the variable resistance to maximum (anticlockwise), connect the batteries with a current meter in series, and turn on the supply. Within reason the supply voltage doesn't matter very much, as long as it's greater (eg 10V) than the nicad battery voltage. Thus you would use approx 25-28V dc to power a charging circuit for 15V nicads. Adjust the preset to give the desired charging current (this alignment procedure is the same for both circuits).

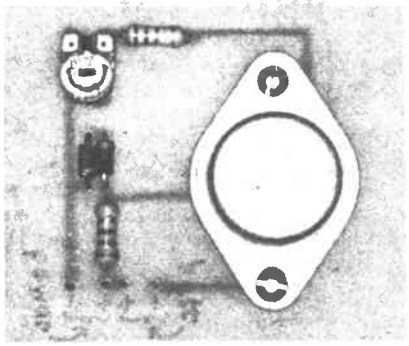
Before adjusting, check that the current meter is *in series*, as it measures the current flowing through a component. On the other hand, a voltmeter measures the potential difference across a component, so must be placed *in parallel*.

Higher currents

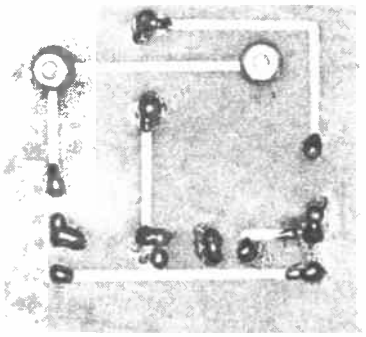
The absolute maximum current that circuit 'B' can deliver in its presented form is 20mA. This is because of the equation: amps times volts = watts. Thus 20mA times 5 volts = 0.1 watts, the limit of the variable resistor. If you want to use the circuit for higher currents, use the formula mentioned earlier to calculate what resistor value is needed, and then use the A x V = W formula to work out what type of resistor is needed, eg if 500mA current is required, the formula reveals that the nearest value is 10 ohms, and 500mA times 5 volts = 2.5 watts, therefore to be safe a 4 watt resistor would be installed. If you still want the circuit to be variable, then replace the preset by, for example, a 3 watt variable potentiometer.

As a rule of thumb, the charging current can be calculated by dividing the capacity of the battery (usually given in mAh, 'milliamp hours') by 10, then charging for 14 hours. In a perfect world the charging time would of course be 10 hours, but there is never 100% efficiency, so a PP3 9V nicad battery (100mAh), would be charged at a rate of 10mA. Please note that nicad batteries should *not* be connected in parallel, and they do not like being overcharged. . .I suppose the same could be said of us!!

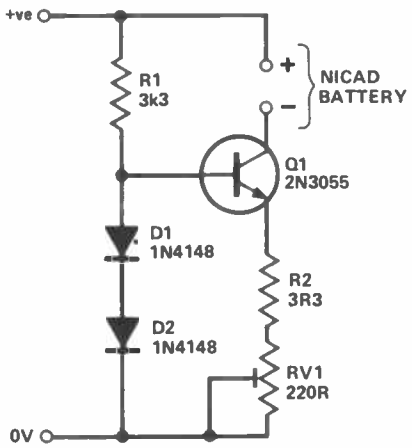
CIRCUIT 'A'



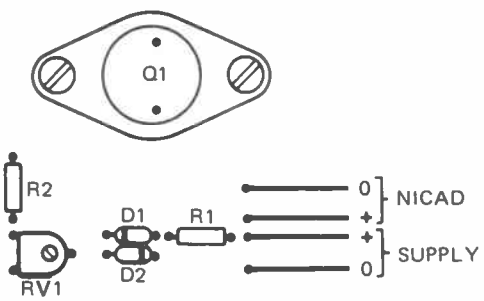
Top view



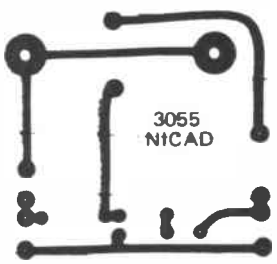
Bottom view



Circuit diagram

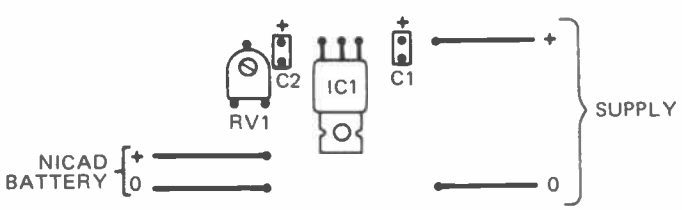


Component overlay

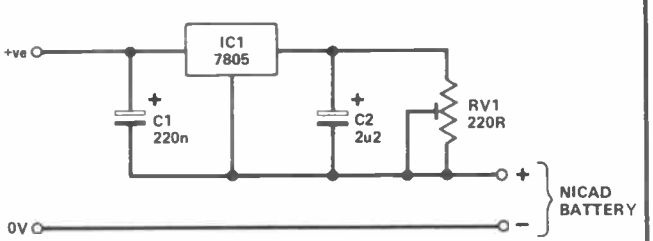


PCB design (actual size)

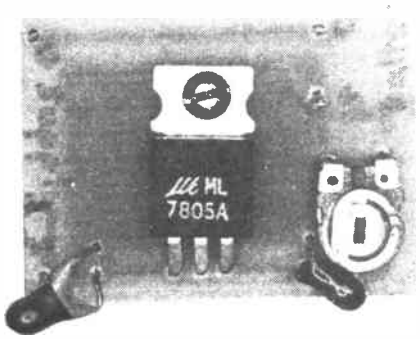
CIRCUIT 'B'



Component layout

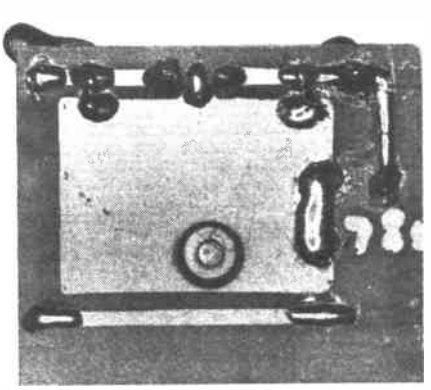


Circuit diagram



Top view

PCB design (actual size)



Bottom view

DODSON AT RANDOM

GETTING STARTED:

a look at what is entailed in becoming a radio amateur

A typical set-up belonging to John, G4FMN

In many respects, joining the ranks of radio amateurs is like taking up round-the-world, single-handed sailing – it is not a leisure activity calculated to attract the whole-hearted participation or enthusiasm of the family! No, for those who want to enjoy the garrulous and usually light-hearted aspects of communications-for-the-masses, there is CB. But having said that, it is surprising the number of 'breakers' who have become frustrated with the inadequacies of a limited facility and have since transferred their allegiance to amateur radio.

Becoming an amateur automatically imposes certain restrictions: the isolated luxury of a real 'shack' in the garden might ease the televiewing arrangements of the family but tends to make the father-figure somewhat remote. Similarly, as enthusiasm is a prerequisite of radio amateurism, the temptation to constantly up-rate equipment, with attendant demands on the family budget, is considerable.

But having come to terms with the environmental constraints, the next priority is to equate available space with technical intent: there isn't much point in buying radio gear that occupies 50 square feet if you live in a bed-sit in Bayswater with a wife and six children! Ideally, the 'spare bedroom' (if the 6 x 6 glorified cupboard in modern homes deserves the term) is the place for the radio amateur to practice his art. There, free from interruption, he can lay out his equipment and leave books and documents without fear of re-arrangement in the interests of domestic order! Unfortunately, there often isn't a spare bedroom, so radio gear has to be part of the living-room area and, as such, must be cosmetically acceptable. This problem can be overcome by mounting equipment in a cabinet, as with stereo tower units, or by fitting it into a desk behind doors. Using either of these methods, incidentally, is in compliance with regulations which state that amateur radio equipment must be locked away when not in use to prevent access by unauthorized persons. In the interests of both neatness and safety, all wiring should be concealed.

As far as buying equipment is concerned, amateur radio is a bit like Topsy – it just grows, and the sky's the limit. The more fortunate will be able to pay cash for radio gear – others will have to take advantage of the many credit facilities which abound these days. But be warned, credit arrangements with some suppliers and many loan companies can prove very costly. First, go and have a quiet word with your bank manager.

The good news is that as the amateur progresses from novice to veteran, so his basic equipment will be traded in for more sophisticated gear. As a result, perfectly sound equipment is freely available through the technical press and amateur radio dealers.

Having progressed from the so-called 'good old days' when enthusiasts built their own gear, amateurs of the 80s are more 'systems orientated', buying ready-made equipment: this, of course, does not take into account those who take advantage of 'kits'. Supplied complete with full instructions, assembly requires no previous experience but does not necessarily mean a vast saving by comparison to the purchase of assembled units.

The essentials

Nevertheless, self-assembly buff or not, a small tool-kit is essential to every amateur, and a soldering iron must head the list. Now soldering is an art. The novice will find that his initial attempts at gluing two bits together will result in the rapid disappearance of a foot of solder, a great blob of the stuff on and in the immediate vicinity of the required point – and a dry joint! Ninety per cent of equipment faults on self-assembled units are caused by bad soldering. The secret lies in a clean iron, the prior heating of the surfaces to be soldered, and the minimal deposit of solder.

Similarly, a selection of screwdrivers is a must: nothing is calculated to ruin the head of a screw quicker than the use of the wrong sized tool. For that matter the same applies to nuts, in that the use of the wrong spanner (or a pair of pliers) can cause severe damage. Pliers, of

Newcomers to amateur radio frequently find the conversion from wavelength to frequency a source of confusion.

As far as amateur bands are concerned the following are relevant and should be of assistance.

Band				CW only		CW/Phone	
10 metres =	28	to 29.7	MHz	28 – 28.2	MHz	28.2 – 29.7	MHz
15 metres =	21	to 21.45	MHz	21 – 21.15	MHz	21.15 – 21.45	MHz
20 metres =	14	to 14.35	MHz	14 – 14.1	MHz	14.1 – 14.35	MHz
40 metres =	7	to 7.1	MHz	7 – 7.04	MHz	7.04 – 7.10	MHz
80 metres =	3.5	to 3.8	MHz	3.5 – 3.6	MHz	3.6 – 3.8	MHz
160 metres =	1.8	to 2	MHz				

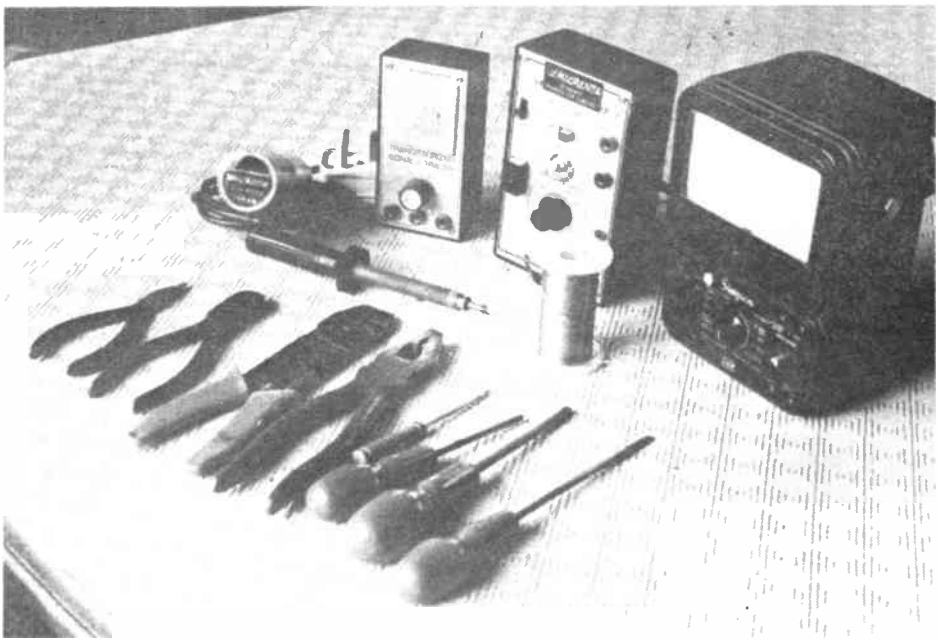
course, of the long-nosed variety should be part of the kit, along with the wire-strippers, and no radio amateur worth his salt would be without his 'nips' (or wirecutters) any more than he would his volt/amp meter. Useful, too, is an RF probe in tracing RF through a circuit, and it is assumed that most aspiring amateurs carry the usual domestic tools such as hammers, electric drills and the odd JCB!

The logical place to start when setting up an amateur radio station is at the aerial. For the beginner, simplicity is essential – the sophistication of beam antennae and other complicated systems will come in time. And there is nothing simpler than the 'long wire' of random length or the halfwave dipole to give reasonable reception on all HF amateur bands. The 'long wire' means exactly what it says and should, if possible, be erected away from large objects such as trees and heavy metal.

A half-wave dipole on the other hand can be supported at one end by the house, and at the other by a pole or tree – suitably insulated from the supports of course. The two 'legs' of the aerial, totalling 66ft 6in in length, fed via a matching 72ohm twin-feed will give acceptable gain on all HF bands. Having said that, there remains a need for fine tuning of the aerial to extract maximum efficiency.

This can be achieved in two ways. Firstly, by using an SWR meter the ratio of transmitted power output to reflected wave can be measured: a high SWR reading indicates lack of radiation, whilst a reading as near as possible to 1:1 indicates the maximum transference of power.

Adjustment of the aerial to achieve the idealistic 1:1 situation is usually by physically shortening the antenna a fraction of an inch at a time. Additionally, tting the antenna to resonate exactly as required is the job of an Aerial Tuning Unit. This relatively simple and inexpensive piece of equipment is designed to adjust the electrical wavelength of the antenna through a system of coils and variable capacitors. Available through most amateur radio suppliers, an ATU can cost around £70, but is a simple and straightforward piece of gear that the novice could build for himself, if only by way of practice.



Basic tool kit and meters

Next choice

A receiving system, either as a stand-alone unit or part of a transceiver, must be the next choice if only to give the aspiring amateur an opportunity to get the 'feel' of radio operating before actually going 'on the air': a chance to understand the jargon, the procedure and even the etiquette associated with amateur operations: all are very important.

But first a decision on what mode of communications will be used – CW (for Morse) or side-band reception will require the facility of a beat frequency oscillator.

The wise will go for a set that will accommodate all modes, including AM and FM, as personal preferences may well change over the years. There are plenty of the older valve receivers about, like HROs, AR88s and B40s, varying in second-hand price from £25 to £50 – or even a more up-to-date Racal at £300. The problem is often the availability of spares for sets which do not have the reliability of modern transistorized gear – not to mention the technical ability to make repairs!

Conversely, modern receivers are available such as the Trio 9R59DS with a secondhand value of around £60, the Yaesu FRG7 at about £120, the Lafayette HA380 at £50 or even the Realistic (Tandy) DX200 that sells between £60 to £85 on the used market.

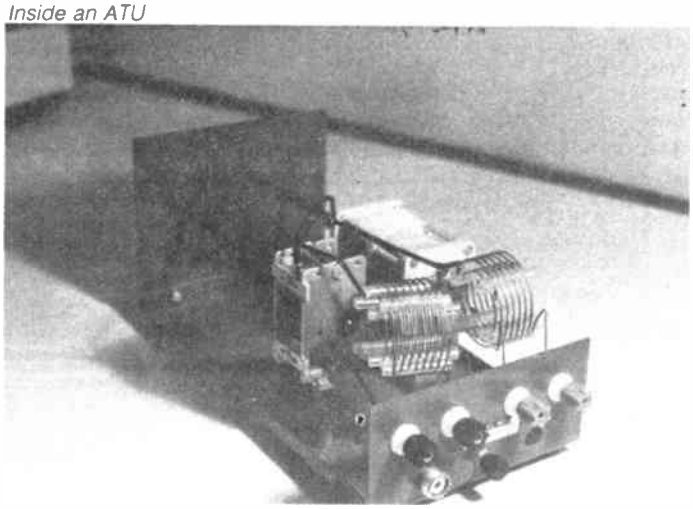
But really, the wisdom of buying a receiver as an interim measure before becoming fully operational as an amateur is doubtful. The modern trend in equipment is for the use of transceivers, with the availability of a receiver only as a back-up facility.

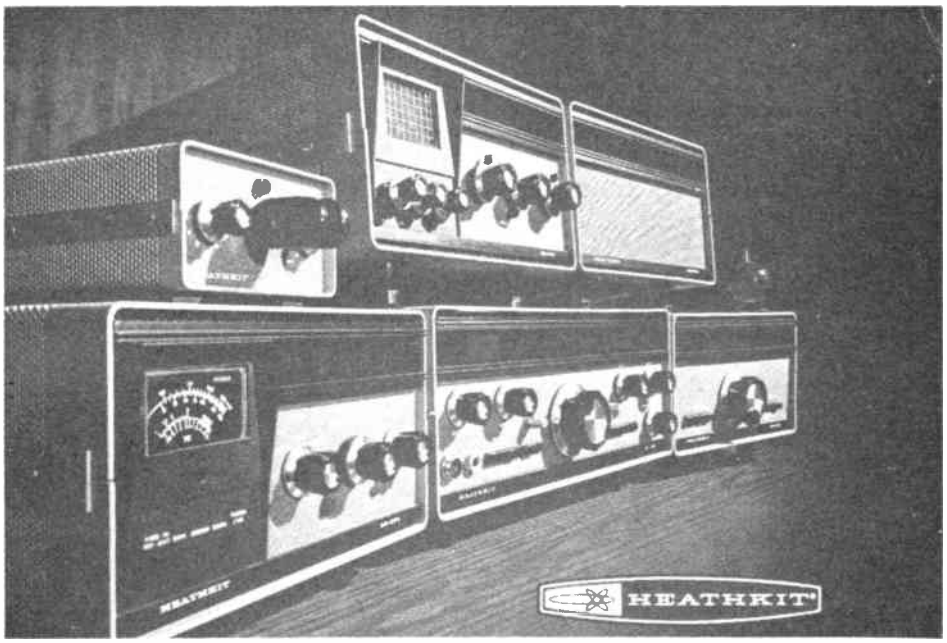
On the strictest understanding that no transmitting would be attempted until the issue of a licence, perhaps the purchase of a transceiver in the first instance would be more economically viable.

For that matter it *is* possible to build a QRP (low-power) transceiver for under

Wavemeters

Inside an ATU





A comprehensive 'one-brand' set-up

£49. The firm, WPO Communications, do a basic kit from £37.45 which is truly 'idiot-proof'. Fully illustrated at every stage of assembly, complete with full instructions, even wire-stripping is explained at some length.

Heathkit, on the other hand, are due to bring out their HW9 (suitable for 15, 20, 40 and 80metres, with options for 12, 19 and 30m) which sells at 250 dollars: the money-market being in its current state of chaos, the equivalent price in Sterling is somewhat uncertain!

The licence

But it must be stressed again, that under existing legislation, no telegraphic equipment must be used by unlicenced persons: those requiring this facility must first pass the Radio Amateur Examination.

Preparation for this is by way of home-study, the local college of technology or amateur radio club or by correspondence course. Examinations are held twice a year at local 'techs' and are in two parts – the regulations and limitations pertaining to amateur radio operation, and the technical aspects. The answers to the examination questions are in 'tick' form, and failure of one part of the exam requires the re-taking of that part *only*, and not both (as it used to be). But beware, failure to renew an amateur radio licence (cost £12) requires the re-taking of the entire examination! 'A' licence examinations, authorising amateurs to use the Morse code, require minimum send/receive speed of 12 words per minute for a fee of £18.

Having, hopefully, passed his examination, the new amateur is free to transmit. For those who haven't yet bought the gear, the choice is staggering with prices ranging from £199 for a reasonable QRP rig to over £3000 for an all-singing-all-dancing all-band-all-mode job. Having said that, a new transceiver capable of providing the facilities required by the average amateur costs between £700 and £1000.

On the second-hand market, a typical example of the slightly older variety would be between £200 and £250 for a Yaesu FT101: a transmitter on its own would cost £200.

However, it will be necessary for the new amateur to dig even deeper into his resources to provide equipment to ensure that his transmitted signal is not radiating out of the authorised amateur radio bands – where they would cause interference. Most of the bigger transceivers have a built-in calibration system which ensures adhesion to correct bands, but if not, a calibrated crystal-controlled oscillator is necessary. As for checking the presence of harmonics, small all-band receivers are available at around £30, such as the Lowe FX-1.

So, having attended to all the legal and technical obligations of becoming a radio amateur, it is time to enjoy this new-found leisure activity. Although microphones are often included in the deal with transceivers (or thrown in by dealers in a fit of apparent abandoned generosity to encourage the customers' return!), Morse keys are not. They vary in terms of sophistication, from the straight 'bar' key to the iambic – an electronic wizard that not only generates dots and dashes electronically, but will alternate them by squeezing together the twin 'paddles': they do, however, require a back-up black-box of tricks to make them work!

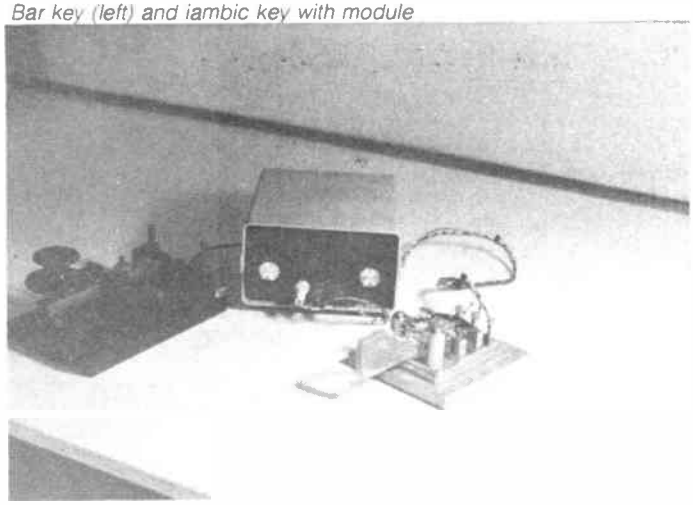
Simplest

Less complicated (not to say less expensive) is the mechanical 'bug' key which depends for its motivation on an end-weighted sprung arm, vibrating against an electrical contact to make the dots, whilst the dashes are all down to the muscle-power of the operator. But by far the simplest is the paddle or side-swiper key. Although available in manufactured form, it is a device well within the creative capabilities of the average amateur. It is comprised of a tempered steel blade, anchored at one end, with a handle at the other, which is moved by the operator alternately left and right to make electrical contacts.

All you need is a hacksaw blade: and by the time you have got through the financial hassle of equipping your station with the basic necessities required for amateur operation, *that* is about all you can afford!

The popular Yaesu FT101 transceiver

Bar key (left) and iambic key with module



SHORT WAVE LISTENER

by Trevor Morgan, GW40XB

Hello again! When receiving letters from readers, it is sometimes difficult to come up with an answer to a particular problem quickly, especially if I have had no personal experience with a certain receiver or other piece of equipment. It seems to me that what is needed is a free exchange of ideas or experiences between listeners, to enable them to swap information. To this end, I would like to put forward the idea of a mailing list of listeners with details of the type of equipment used, so that those with similar equipment or interests can make contact and exchange ideas to mutual advantage.

If you are interested, drop me a postcard or letter giving details of your set-up and any queries you may have and, once we have a reasonable number, I will issue a list to the participating listeners so that they can make contact.

Awards

Some of you may already be on the trail towards getting an award of some sort, but I'm sure there are many who have not yet tried award hunting.

Many short wave listeners are loners (in fact I could say the majority are). This is not to say that they are an unsociable bunch by any means and, in fact, many are also members of local radio clubs. However, like many hobbies such as photography, model making or even stamp collecting, short wave listening is one of those interests which can be undertaken by anyone with the will to do so and can be thoroughly enjoyed without any third party contact.

The unfortunate, but nevertheless true, point that listeners are sometimes treated as second class citizens gets right up my nose, as there are many shortwave listeners who are not only enthusiastic but also extremely knowledgable in the technical side of the radio hobby. Such people may have spent years studying propagation, antenna construction and behaviour, theoretical and practical use of receivers, filters and sundry other matters allied to the hobby. In reality, there are many listeners who could teach the licensed fraternity a thing or two!

Whether you have an introverted personality, three heads or you just prefer to work on your own, the fact remains that shortwave listening is an absorbing hobby that is open to anyone regardless of age, sex or anything else.

There is also a competitive spirit to be found if you take up award hunting as part of your listening hobby, and there are an ever-increasing number of awards to be gained by using your equipment to its best, and learning how to listen carefully for little-heard stations amongst the general babble of the busy frequencies.

One of the aspects of award hunting is that there are often no time limits set for gaining the necessary points for the award, so it is ideal for the listener who has only limited time to spend on his hobby. An hour or so 'on the air' can be sufficient to give a daily intake of 'contacts' that will build up to a particular award.

Some of the awards are extremely simple in concept but still require a reasonable amount of listening skill to obtain. One such award is the Russian 'Work 100 Oblasts' award. An oblast is a district and each has a number. There are about 200 oblasts but some of these are infrequently on the air, so it does take a bit of careful listening to get the required 100. The claim must be accompanied by the QSL cards and 1 rouble or 14 IRCs. If you want to try for it send the cards, etc to *Central Radio Club, PO Box 88, Moscow.*

Another similar award is the 'H22 Award' from Switzerland. The districts in this case are called cantons and there are 22 of these. To gain the award you must have a QSL card from each of the cantons. The award is free but send a couple of IRCs to help defray costs to *Walter Blattner, HB9ALF, PO Box 450, CH 6601, Locarno, Switzerland.*

There are many other similar awards up to the superb 'CQ CA Award' which is for hearing American counties. If you work really hard at it you could gain not only the colourful award but also a special engraved plaque. . .and you only need to have 3,079 counties confirmed!

Prefixes

Another way of 'competitive' listening is the working of *prefixes.* An annual prefix 'score' has been published by *Short Wave Magazine* for many years and it is a lot of fun trying to get your name up there amongst the 'champs' in shortwave listening.

In the shortwave listening fraternity there are names that are mentioned frequently in conversation as easily as McEnroe in tennis or Lillee in cricket circles. Listeners who follow the prefix working world mention Hughes and Yerganian in the same way, as these gentlemen were always to be found at the top of the 'ladder' when the scores for the year's prefix hunting were announced!

The prefix is the group of letters and number to be found at the start of a callsign such as GW4, WB7, VE3 etc. There are anomalies as in any list, such as Y33, 5N4 and so on, but a complete list of

Short Wave Listener Report To .....

Your LSB/USB/CW/RTTY transmissions of ..... at ..... GMT

on a frequency of ..... were heard at this QTH at R..... S ..... T.....

QRM .....

QRN .....

QSB .....

You were heard in QSO with ..... whose signals were R..... S ..... T.....

Comparative signals from your region .....

Equipment used at this QTH; Receiver.....Aerial .....

Filters .....

current prefixes is published in the Geoff Watts *Radio Amateur Prefix, Country, Zone List* which is a must for any serious listener.

Prefix working has had devoted enthusiasts for as far back as I can remember and is a simple way of bringing a competitive spirit into your listening. You don't have to be a member of any club, although if you want to use the RSGB bureau it is advantageous to be a member! But it is not necessary to exchange QSL cards for prefix working, just necessary for you to keep an accurate record of the stations you hear.

The standard log book can be used but a better way is to list your stations under an alphabetical system for quick and easy reference. A simple card index system with each card listing a particular group of prefixes is ideal and fairly cheap, but if you have a computer you can make up a programme or buy one ready made to do the job.

The whole idea is to simply (?) hear as many prefixes as possible and keep a record of them. Whether you enter them into the *SWM* 'HPX' lists is up to you, and as they have operated their ladder for many years I'm not going to start a rival list here. However, as you will gather from this page, ***Amateur Radio*** is considering a prefix award, on which your comments are invited. Please send your suggestions to the Editor so that we can get this exciting idea off the ground.

Reporting

During May I had the pleasure of being one of the operators of GB4SMM on board the Helwick lightship which is based at the Swansea Maritime and Industrial Museum.

The reason I mention this is that we received a number of short wave listener reports direct to the club premises which included some from listeners who had never reported before and so didn't know the facts. Although their reports will be verified in due course, the method of reporting needs clarifying for newcomers to the hobby. So, for those who have never reported before and wish to do so, we reproduce the information which a good report should contain (see box).

A station receiving this amount of information is pretty certain to respond. The actual layout is, of course, up to you. There are many companies advertising ready made up cards but you may like the personal touch of your own individual design. You can use 'instant lettering' and, if you are artistic, do your own artwork which means you can present the printer with camera-ready copy. . .a lot cheaper than letting them do the artwork!

Well, there we are for another month. Once again I thank all of you who wrote in to me. Good listening.

A SPECIAL PREFIX AWARD?

Amateur RADIO Magazine

Prefix Award

Presented To

For the outstanding achievement made in receiving a total of amateur radio Prefixes

Dated _____ *Verified by* _____

Your comments are invited on the idea of a prefix award sponsored by ***AMATEUR RADIO.*** Write with any suggestions to:
Sovereign House, Brentwood, Essex CM14 4SE.

INTEGRATED CIRCUITS

AN124	2.50	MC1358	1.58	STK439	7.95	TBA560Q	1.45	TDA2530	1.95
AN214Q	2.50	MC1495	3.00	TA7061AP	3.95	TBA570	1.00	TDA2532	1.95
AN240P	2.80	MC1496	1.25	TA7108P	1.00	TBA641A12		TDA2540	1.25
AN612	2.15	MC145106P		TA7120P	1.65		2.50	TDA2541	2.15
AN7140	3.50		7.95	TA7130P	1.50	TBA651R	2.50	TDA2560	2.15
AN7145	3.50	MC1723	0.50	TA7146	3.95	TBA720A	2.45	TDA2571	2.95
AN7150	2.95	MC3357	2.75	TA7176AP	2.95	TBA750Q	2.65	TDA2581	2.25
BA521	3.35	ML231B	1.75	TA7203	2.95	TBA800	0.89	TDA2593	2.95
CA1352E	1.75	ML232B	2.50	TA7204P	2.15	TBA810AS	1.65	TDA2600	5.50
CA3086	0.46	MSM5807	8.75	TA7205AP	1.15	TBA810P	1.65	TDA2610	2.50
ETT6016	2.50	PLL02A	5.75	TA7222AP	1.80	TBA820M	0.75	TDA2611A	1.95
HA1339A	2.95	SAA500A	3.50	TA7227P	4.25	TBA820Q	1.45	TDA2640	2.60
HA1377	3.50	SAA1025	7.25	TA7310P	1.80	TBA890	2.50	TDA2680A	2.75
HA1156W	1.50	SAA5010	6.35	TA7313AP	2.95	TBA920	1.65	TDA2690	2.45
HA1551	2.95	SAS560S	1.75	TA7321P	2.25	TBA950/2X		TDA3560	3.95
LA1230	1.15	SAS570S	1.75	TA7609P	3.15		2.35	UPC566H	5.50
LA4102	2.95	SAS580	2.85	TA7611AP	2.95	TBA970	2.95	UPC575C2	
LA4250	2.95	SL901B	4.85	TAA550	0.25	TBA990	1.49		2.75
LA4420	1.95	SL917B	6.65	TAA570	1.95	TBA1441	2.15	UPC1025H	
LA4430	2.50	SL1310	1.80	TAA621AX		TCA270	1.10		1.95
LA4400	4.15	SL1327	1.10		3.50	TCA270SQ		UPC1028H	
LA4422	2.50	SL1327Q	1.10	TAA661B	1.20		1.10		1.95
LC7120	3.25	SN76003N	1.95	TAA700	1.70	TCA650	2.50	UPC1032H	
LC7130	3.50	SN76013N	1.95	TBA120B	0.95	TCA800	2.95		1.50
LLC7131	5.50	SN76023N	1.95	TBA120C	1.15	TCA940	1.65	UPC1156H	
LC7137	5.50	SN76033N	1.95	TBA120T	1.05	TDA440	2.20		2.75
LM324N	0.45	SN76110N	0.89	TBA120U	1.00	TDA1001	1.95	UPC1158H	
LM380N	0.95	SN76115N	1.25	TBA231	1.25	TDA1004A	3.25		0.75
LM383T	2.95	SN76131N	1.30	TBA395	1.50	TDA1006A	2.50	UPC1167C2	
M51513L	2.30	SN76226DN		TBA396	0.75	TDA1010	2.15		1.15
M5155L	2.95		2.95	TBA440N	2.55	TDA1035	2.50	UPC1181H	
M51521L	1.50	SN76227N	1.05	TBA480Q	1.25	TDA1037	1.95		1.25
MB3712	2.00	SN76533N	1.65	TBA510	2.50	TDA1170	1.95	UPC1182H	
MC1307P	1.00	SN76544N	1.95	TBA510Q	2.50	TDA1190	2.15		2.95
MC1310P	1.95	SN76570N	1.00	TBA520	1.10	TDA1270Q	3.95	JPC1185H	
MC1327	0.95	SN76650N	1.15	TBA520Q	1.10	TDA1327	1.70		3.95
MC1327Q	0.95	SN76660N	0.90	TBA530	1.10	TDA2002	1.95	UPC1191V	1.50
MC1330P	1.10	STK014	7.95	TBA530Q	1.10	TDA2020	2.95	UPC1350C	
MC1349P	1.20	STK015	7.95	TBA540	1.25	TDA2030	2.80		2.95
MC1350P	0.95	STK415	7.95	TBA540Q	1.35	TDA2522	1.95	7805	0.65
MC1351P	1.50	STK433	7.95	TBA550Q	1.95	TDA2523	2.95	7815	0.65
MC1357	2.35	STK437	7.95	TBA560C	1.45	TDA2524	1.95		

SEMICONDUCTORS

AAY12	0.25	BC172C	0.10	BD179	0.72	BF355	0.37	R2010B	1.70
AC126	0.45	BC173B	0.10	BD182	0.70	BF362	0.38	R2322	0.58
AC127	0.20	BC174	0.09	BD201	0.83	BF363	0.38	R2323	0.66
AC128	0.28	BC174A	0.09	BD202	0.65	BF371	0.20	R2540	2.48
AC128K	0.32	BC177	0.15	BD203	0.78	BF394	0.19	RCA16334	0.90
AC141	0.28	BC178	0.15	BD204	0.70	BF422	0.32	RCA16335	0.80
AC141K	0.34	BC182	0.10	BD222	0.46	BF457	0.32	SKE5F	1.45
AC142K	0.30	BC182LB	0.10	BD223	0.48	BF458	0.36	TIP29	0.40
AC176	0.22	BC183	0.10	BD225	0.48	BF467	0.68	TIP29C	0.42
AC176K	0.31	BC183L	0.09	BC232	0.35	BF595	0.23	TIP30C	0.43
AC187	0.25	BC184LB	0.09	BD233	0.35	BF597	0.25	TIP31C	0.42
AC187K	0.28	BC204	0.10	BD234	0.35	BFR39	0.23	TIP32C	0.42
AC188	0.25	BC207B	0.13	BD236	0.45	BFR40	0.23	TIP33B	0.75
AC188K	0.37	BC208B	0.13	BD237	0.40	BFR41	0.28	TIP34B	0.75
AD142	0.79	BC212	0.09	BD238	0.40	BFR81	0.25	TIP41A	0.45
AD143	0.82	BC212L	0.09	BD241	0.40	BFR88	0.30	TIP41C	0.45
AD149	0.70	BC212LA	0.09	BD242	0.50	BFR90	1.50	TIP42C	0.47
AD161	0.39	BC213	0.09	BD246	0.60	BFR91	1.75	TIP47	0.65
AD162	0.39	BC213L	0.09	BD376	0.32	BFT42	0.28	TIP120	0.60
AD161/2	0.90	BC214	0.09	BD410	0.55	BFT43	0.28	TIP125	0.65
AF106	0.50	BC214C	0.09	BD434	0.55	BFW92	0.85	TIP142	1.75
AF114	1.95	BC214L	0.09	BD437	0.50	BFX29	0.30	TIP146	2.75
AF121	0.60	BC237B	0.09	BD438	0.60	BFX84	0.26	TIP161	2.95
AF124	0.65	BC238	0.09	BD520	0.65	BFX85	0.32	TIP2955	0.80
AF125	0.35	BC239	0.12	BD538	0.65	BFX86	0.30	TIP3055	0.55
AF126	0.32	BC251A	0.12	BD597	0.75	BFX88	0.25	TIS91	0.20
AF127	0.40	BC252A	0.15	BD701	1.25	BFY50	0.21	TV106/2	1.50
AF139	0.40	BC258	0.25	BD702	1.25	BFY51	0.21	2N2110	4.50
AF178	1.95	BC258A	0.39	BD707	0.80	BFY52	0.25	2N2219	0.28
AF239	0.42	BC284	0.30	BDX32	1.50	BFY90	0.77	2N2905	0.40
AU106	4.50	BC300	0.30	BDY57	1.65	BLY48	1.75	2N3053	0.40
AU107	3.50	BC301	0.30	BF115	0.35	BR100	0.28	2N3054	0.59
AU110	2.00	BC303	0.26	BF119	0.65	BR101	0.49	2N3055	0.52
BC107A	0.11	BC307B	0.09	BF127	0.24	BR103	0.55	2N3702	0.12
BC107B	0.11	BC327	0.10	BF154	0.12	BRC4443	0.85	2N3703	0.12
BC108	0.10	BC328	0.10	BF158	0.22	BT100A/02	0.75	2N3704	0.12
BC108A	0.11	BC337	0.10	BF160	0.27	BT106	1.49	2N3705	0.12
BC108B	0.12	BC338	0.09	BF167	0.24	BT116	1.20	2N3706	0.12
BC109	0.10	BC347A	0.13	BF173	0.22	BT119	2.35	2N3708	0.12
BC109B	0.12	BC461	0.35	BF177	0.38	BT120	1.65	2N3773	2.75
BC109C	0.12	BC478	0.20	BF178	0.26	BU105	1.22	2N3792	1.35
BC114	0.11	BC527	0.20	BF179	0.34	BU108	1.69	2N4280	3.50
BC116A	0.15	BC547	0.10	BF180	0.29	BU124	1.25	2N4427	1.50
BC117	0.19	BC548	0.10	BF181	0.29	BU125	1.25	2N4444	1.15
BC119	0.24	BC549A	0.08	BF182	0.29	BU126	1.60	2N5294	0.42
BC125	0.25	BC550	0.08	BF183	0.29	BU204	1.55	2N5296	0.48
BC139	0.20	BC557	0.08	BF184	0.28	BU205	1.30	2N5298	0.60
BC140	0.31	BC557B	0.08	BF185	0.28	BU208	1.39	2N5496	0.65
BC141	0.25	BC558	0.10	BF194	0.11	BU208A	1.52	2SA715	0.60
BC142	0.21	BCY33A	1.60	BF195	0.11	BU208D	1.85	2SC495	0.80
BC143	0.24	BD115	0.30	BF196	0.11	BU326	1.20	2SC496	0.80
BC147	0.09	BD116	0.60	BF197	0.11	BU407	1.24	2SC1096	0.80
BC147B	0.09	BD124P	0.59	BF198	0.16	BU500	2.25	2SC1106	2.50
BC148A	0.09	BD131	0.42	BF199	0.14	BU526	1.90	2SC1172Y	2.20
BC148B	0.09	BD132	0.42	BF200	0.40	BU807	2.25	2SC1173	1.15
BC149	0.09	BD133	0.40	BF241	0.15	BUY69B	1.70	2SC1306	1.00
BC157	0.12	BD135	0.30	BF245	0.30	MJ3000	1.98	2SC1307	1.50
BC158	0.09	BD136	0.30	BF256 LC	0.28	MJE340	0.40	2SC1364	0.50
BC159	0.09	BD137	0.32	BF257	0.28	MJE520	0.48	2SC1449	0.50
BC160	0.28	BD138	0.30	BF258	0.28	MPSA13	0.29	2SC1678	1.25
BC161	0.26	BD139	0.32	BF259	0.28	MPSA92	0.30	2SC1909	1.45
BC170B	0.15	BD140	0.30	BF271	0.26	MRF237	3.45	2SC1945	2.65
BC171	0.09	BD144	1.10	BF273	0.13	MRF450A		2SC1953	0.95
BC171A	0.10	BD159	0.65	BF336	0.34		12.50	2SC1957	0.80
BC171B	0.10	BD160	1.50	BF337	0.29	MRF453	17.50	2SC1969	1.95
BC172	0.10	BD166	0.55	BF338	0.32	MRF454	23.50	2SC2028	1.15
BC172B	0.10			1N23C	2.95	MRF475	2.50	2SC2029	1.95
		BY206	0.14	1N23ER	2.95	MRF477	10.00	2SC2078	1.45
		BY208-800	0.33	1N23WE	2.95	OC23	1.50	2SC2091	0.85
		BY210-800	0.33	IN4001	0.04	OC42	0.55	2SC2098	2.50
		BY223	0.90	IN4003	0.04	OC44	0.75	2SC2166	1.95
		BY298-400	0.22	IN4004	0.05	OC45	0.55	2SC2314	0.80
		BY299-800	0.22	IN4005	0.05	OC70	0.45	2SC2371	0.36
		BYX10	0.20	IN4007	0.06	OC71	0.55	1SD234	0.50
		BYX36-150R		IN4148	0.02	OC81	0.50	3N211	1.95
			0.20	IN4448	0.10	OC16W	2.50	3SK45	0.70
		BYX38-600R		IN5401	0.12	R2008B	1.70	3SK88	0.55
			0.60	IN5402	0.14				
		BYX55-600	0.30	IN5403	0.12				
		BYX71-600	1.10	IN5406	0.13				
		BZY95C30	0.35	IN5407	0.16				
		CS4B	4.50	IN5408	0.16				
		CS10B	8.45	ITT44	0.04				
		OA47	0.09	ITT923	0.15				
		OA90	0.05	ITT2002	0.10				
		OA91	0.06						
		OA95	0.06						
		OA202	0.10						
		1N21DR	2.95						
		1N23B	2.95						

DIODES

AA119	0.08		
BA115	0.13		
BA145	0.16		
BA148	0.17		
BA154	0.06		
BA156	0.15		
BA157	0.30		
BAX13	0.04		
BAX16	0.06		
BB105B	0.30		
BT151	0.79		
BY126	0.10		
BY127	0.11		
BY133	0.15		
BY164	0.45		
BY176	1.20		
BY179	0.53		
BY182	0.55		
BY184	0.35		
BY199	0.40		

CV ITEMS

We have available a large range of British & US Government specification valves, semiconductors, diodes etc and will be pleased to offer a quotation against customers enquiries.

74LS SERIES

Prices available on request

NEW BRANDED CATHODE RAY TUBES

A1865/20	65.00	DG13 2	45.00	M38-120W	65.00
A44 120	25.00	DH3 91	45.00	M38-120WA	65.00
AW36 11	25.00	DH7 11	95.00	M38-121GR	65.00
CME822W	19.00	DH7 91	45.00	M38-121GHR	65.00
CME822GH	25.00	DP7 5	35.00	M38-121LA	65.00
CME1428GH	45.00	DP7 6	35.00	M38-121WA	65.00
CME1428W	39.00	DP7 11	45.00	M38-122GH	65.00
CME1523GA	39.00	DN13 78	35.00	M38-122GW	65.00
CME1523W	39.00	F15-101LC	49.00	M38-140LA	65.00
CME1431GH	39.00	F16-101GM	55.00	M38-141LA	65.00
CME1431W	39.00	F16-101LD	55.00	M38-142GR	65.00
CME202GH	45.00	F21-130GR	55.00	M38-142LA	65.00
CME2024W	45.00	F21-130LC	55.00	M38-340P31	65.00
CME2325W	45.00	F21-131GR	79.00	M38-341GR	65.00
CME3126GH	45.00	F22-11LD	53.00	M38-341P31	65.00
CME3128GH	45.00	F31-10GM	65.00	M38-344P39	65.00
CME3128W	45.00	F31-10GR	65.00	M40-120W	59.00
CME3132GH	45.00	F31-10LC	65.00	M43-12GM/01	65.00
CME3155W	45.00	F31-10LD	65.00	M43-12LG/01	65.00
CRE1400	25.00	F31-12LC	65.00	M44-120LC	65.00
CV429	89.00	F31-12LD	65.00	M44-120GR	65.00
CV1450	35.00	F31-13GR	65.00	M47-25GR/22	65.00
CV1526	19.00	F31-13LD	65.00	M50-120GH	65.00
CV2185	15.00	F31-13LG	65.00	M50-120GR	65.00
CV2191	19.00	F41-123LC	160.00	M50-120GV	65.00
CV2193	15.00	F41-141LG	160.00	M50-120LC	65.00
CV2328	85.00	F41-142LC	185.00	M61-120LC	75.00
CV5119	85.00	M7-120W	19.00	M61-120W	75.00
CV5320	85.00	M14-100GM	45.00	S6AB	45.00
CVX389	55.00	M14-100KA	55.00	SE4/D-P7	45.00
D9-110GH	39.50	M14 100LC	45.00	SE42BP31AL	55.00
D9-120	45.00	M17-151GVR	175.00	SE42BP31	55.00
D10-210GH	45.00	M17-151GR	175.00	SE52AP31AL	55.00
D10-210GH68B	65.00	M19-100GY	55.00	SE5Fp31	55.00
D10-210GH72	65.00	M19-100W	45.00	T937	65.00
D10-230GH	35.00	M19-101GR	55.00	T948N	65.00
D10-230GM	35.00	M19-103W	55.00	T948H	65.00
D10/293GY/90	55.00	M23-110GH	55.00	V3191	59.00
D13-27GH	49.50	M23-111W	55.00	V4150LC	55.00
D13-30GH	49.50	M23-111GH	55.00	V4254B	65.00
D13-33GM	49.00	M23-111LD	55.00	V4274GH	65.00
D13-47GH/26	55.00	M23-112GM	55.00	V4283W	65.00
D13-47GH/34	55.00	M23-112GV	55.00	V5002LD	65.00
D13-47GH	55.00	M23-112GW	55.00	V5004GR	59.00
D13-51GH/34	85.00	M23-112KA	55.00	V5004LD	59.00
D13-51GL/26	85.00	M23-112LD	55.00	V6001GH	65.00
D13-51GM/26	85.00	M23-112W	55.00	V6006GH	65.00
D13-450GH/01	55.00	M24-120GM	59.00	V6007DP31	59.00
D13-471GH/26	55.00	M24-120GR	59.00	V6007GW	65.00
D13-550GH	65.00	M24-120LC	59.00	V6008GH	59.00
D13-600GM	59.00	M24-120WAR	59.00	V6008W	65.00
D13-610GH	59.00	M24-121GH	55.00	V6034WA	59.00
D13-610GM	59.00	M24-121LC	59.00	V604CLA	59.00
D13-611GH	59.00	M24-121WA	59.00	V6048F	65.00
D13-611GM	59.00	M28-11LA	49.00	V6048J	49.00
D13-630GH	59.00	M28-12GH	55.00	V6052GH	65.00
D14-120GH08	65.00	M28-12LC	55.00	V6052GR	65.00
D14-121GH09	65.00	M28-13LC	49.00	V6064BLA	65.00
D14-150GH	75.00	M28-13LG	49.00	V6064BP31	55.00
D14-150GM	75.00	M28-13GR	49.00	V6064CLA	55.00
D14-172GH/84	59.00	M28-13WA	49.00	V6069GH	55.00
D14-172GR	55.00	M28-131GR	55.00	V6070P31	49.00
D14-172GV	55.00	M28-132GM	55.00	V7016A	65.00
D14-173GH	55.00	M28-133GH	55.00	V7030	59.00
D14-173GM	53.00	M31-100GH	55.00	V7031GH	59.00
D14-173GR	55.00	M31-101GH	55.00	V7031/67A	59.00
D14-181GH/62	65.00	M31-182GR	55.00	V7035A	49.00
D14-181GH/98	65.00	M31-182GV	53.00	V7037GH	45.00
D14-181GJ	55.00	M31-183W	55.00	V8004GR	65.00
D14-181GM	53.00	M31-184W	65.00	V8006GH	65.00
D14-181GM50	59.00	M31-184GH	65.00	V8010A	65.00
D14-181W	55.00	M31-184P31	65.00	1CP1	15.00
D14-182GH	59.00	M31-185GH/VR	69.00	1CPB1	15.00
D14-182GM/98	65.00	M31-186W	69.00	2BP1	15.00
D14-200BE	89.00	M31-190GH	55.00	3BP1	13.50
D14-200GA/50	85.00	M31-190GR	55.00	4EP1	30.00
D14-200GM	75.00	M31-190LA	55.00	3HOBM	55.00
D14-210GH	75.00	M31-190W	59.00	5BP1	9.00
D14-270GH/50	75.00	M31-191GH	59.00	5BHP1	30.00
D14-310W	110.00	M31-191GR	59.00	5BHP1FF	30.00
D14-320GH	85.00	M31-191GV	55.00	5BHP31	30.00
D14-320GH/82	85.00	M31-191W	59.00	5CP1	10.00
D14-340GH/KM	45.00	M31-192W	59.00	6EP7S	39.00
D14-340KA	45.00	M31-195GH	59.00	13BP1	13.50
D16-100GH	65.00	M31-210GH	59.00	13BP4	17.50
D16-100GH/65	69.00	M31-220W	59.00	17DWP4	25.00
D16-100GH/67	65.00	M31-270GY	65.00	32J 1085	69.00
D16-100GH67A	75.00	M31-271P31	65.00	88D	15.00
D16-100GH/79	69.00	M31-271GW	65.00	89B	15.00
D16-100GH79A	75.00	M31-271W	65.00	89D	15.00
D16-100GH97	65.00	M36-12W	75.00	89L	15.00
D18-130GH	65.00	M36-141LA	75.00	1273	39.00
D18-130GH/70	69.00	M36-141LG	75.00	1564	39.00
D18-160GH	69.00	M36-141W	75.00	1844	45.00
D21-10GH	65.00	M36-170LG	75.00	55451GM	75.00
D21-10GJ	69.00	M38-100GR	65.00	9442E1	80.00
D21-10LD	69.00	M38-101GH	65.00	95447GM	75.00
D21-102GH	65.00	M38-103GR	65.00	95449GM	75.00
DB7 6	35.00	M38-113GH	65.00	7709631	79.50
DG7 32	45.00				

LINE OUTPUT TRANSFORMERS

DECCA 100	7.95
DECCA 1700 MONO	9.95
DECCA 1730	8.95
DECCA 2230	8.25
GEC 2040	8.95
GRUNDIG 1500	15.45
GRUNDIG 5010-6010 2222 5011-6011	13.45
ITT CVC20	8.20
ITT CVC30	8.25
PHILIPS G8	8.50
PHILIPS C9	8.99
PHILIPS G11	13.39
PYE 725	10.95
RBM T20A	12.40
TANDBERG 90	11.15
TELEFUNKEN 711A	11.15
THORN 1590	9.50
THORN 8000	9.20
THORN 9000	9.95
THORN 9800	22.40
THORN MAINS TRANSFORMER 3000/3500	9.70

SOLDERING EQUIPMENT

25W Antex Iron	4.59
Weller Instant Heat Gun	11.30
240V Weller Marsman	4.74
½ Kilo Solder 60/40	6.95

EHT MULTIPLIERS

ITT CVC20	6.35
ITT CVC30	6.35
PHILIPS G8 550	6.96
RANK T20A	6.91
THORN 3000/3500	7.57
THORN 8500	5.50
THORN 9000	8.00
UNIVERSAL TRIPLER	5.45

REPLACEMENT ELECTROLYTIC CAPACITORS

DECCA 30 (400-400-350V)	2.85
DECCA 80/100 (400-350V)	2.99
DECCA 1700 (200-200-400-350V)	3.55
GEC 2110 (600/300V)	2.25
ITT CVC20 (220/400V)	1.80
PHILIPS G8 (600/300V)	2.25
PHILIPS G9 (2200/63V)	1.19
PHILIPS G11 (470/250V)	2.35

POTENTIOMETERS

STANDARD VERTICAL POTS	0.12
MIN VERTICAL POTS	0.12
STANDARD HORIZONTAL POTS	0.12
MIN HORIZONTAL POTS	0.12
CONVERGENCE PRE-SETS	0.30
SLIDERS LOG	0.48
SLIDER LINEAR	0.48

SPARES & AIDS

FOAM CLEANSER	0.79
FREZE IT	0.82
SOLDA MOP	0.64
SWITCH CLEANER	0.79
WD40	1.25
PUSH PUSH MAINS SWITCH (DECCA GEC RANK THORN ETC)	1.02
PYE IF GAIN MODULE	6.99
ANODE CAP (27KV)	0.69

PUSH BUTTON UNITS

DECCA ITT CVC20 6 WAY	7.95
ITT CVC5 7 WAY	10.19
PHILIPS G8 (550) 6 WAY	14.49

VARICAP TUNERS

ELC1043/05 MULLARD	8.65
ELC1043/06 MULLARD	8.65
U321	8.25
U322	8.25

20MM ANTI SURGE FUSES

100MA-800MA	15p each
1A-5AMP	12p each

20MM QUICK BLOW FUSES

100MA	8p each
200MA-5AMP	5p each

PHONE 0474 813225 3 LINES

P.M. COMPONENTS LTD

DEPT REW SELECTRON HOUSE, WROTHAM ROAD MEOPHAM GREEN, MEOPHAM, KENT DA13 OQY

VISA

TELEX 966371 PM COMP

A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714	18.50
A1998	11.50
A2087	11.50
A2134	14.95
A2293	6.50
A2599	37.50
A2900	11.50
A3042	24.00
A3283	24.00
AC/HL/DD	4.00
AC/THI	4.00
ACT22	59.75
AC/S2PEN	8.50
AH221	39.00
AH238	39.00
AL60	6.00
AN1	14.00
ARP12	0.70
ARP34	1.25
ARP35	2.00
BL63	2.00
BS450	67.00
BS810	55.00
BS814	55.00
CIK	19.00
C3JA	21.00
C1112G	70.00
C1108	54.95
C1134	32.00
C1148A	115.00
C1149/1	130.00
C1150/1	135.00
C1534	32.00
CCA	2.60
CC3L	0.90
CL33	2.00
CV Nos Prices on request	
D63	1.20
DA41	22.50
DA42	17.50
DA100	125.00
DAF91	0.45
DAF91	0.70
DC70	1.75
DC90	1.20
DCX4-1000	12.00
DCX4-5000	25.00
DET16	28.50
DET18	28.50
DET23	35.00
DET24	39.00
DET25	22.00
DF91	0.70
DF92	0.60
DF96	0.65
DF97	1.00
DH63	1.20
DH77	0.90
DH79	0.56
DH149	2.00
DK91	0.90
DK92	1.20
DK96	2.50
DL35	2.50
DL63	4.00
DL70	2.50
DL73	2.50
DL91	1.50
DL92	0.95
DL93	1.10
DL94	2.50
DL96	2.50
DLS10	13.50
DLS16	10.00
DM70	1.95
DM160	2.75
DY51	1.50
DY86/87	0.65
DY802	0.72
E80CC	9.95
E80CF	11.00
E80F	13.50
E80L	11.50
E81CC	3.15
E81L	12.00
E82CC	3.50
E83CC	3.50
E83F	5.50
E86C	9.50
E88C	7.95
E88CC	3.50
E90CC	7.95
E90F	7.95
E91H	4.50
E92CC	3.95
E99F	6.99
E130L	19.95
E180CC	6.50
E182CC	9.00
E180F	6.50
E186F	8.50
E188CC	7.50
E280F	19.50

E283CC	10.00
E288CC	13.50
EB10F	18.50
E1148	1.00
E1524	6.95
EA50	1.00
EA76	1.95
EA79	1.95
EAA91	0.60
EABC80	0.70
EAC91	2.50
EAF42	1.20
EAF801	3.50
EB34	1.50
EB41	3.95
EB91	0.52
EBC33	2.50
EBC41	1.95
EBC81	1.50
EBC90	0.90
EBC91	0.90
EB91	0.60
EBF33	2.50
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	5.50
EC92	1.25
EC93	1.50
EC95	7.00
EC97	1.10
EC8010	12.00
ECC32	3.50
ECC33	3.50
ECC35	3.50
ECC81	1.15
ECC82	0.55
ECC82 Philips Mullard	1.35
ECC82 Philips	1.10
ECC83	0.65
ECC83 Philips	1.95
ECC84	0.50
ECC85	0.60
ECC86	2.75
ECC88	0.85
ECC91	2.00
ECC180	0.72
ECC189	0.78
ECC801S	3.50
ECC803S	3.50
ECC804	0.60
ECC807	2.50
ECC2000	12.00
ECF80	0.85
ECF82	0.85
ECF86	1.70
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF804	6.00
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	2.15
ECH42	1.00
ECH81	0.65
ECH83	0.78
ECH84	0.69
ECH2000	1.50
ECL80	0.60
ECL82	0.65
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.80
ECL805	0.69
EF37A	2.00
EF39	1.10
EF41	3.50
EF42	3.50
EF50	2.50
EF55	4.95
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.50
EF85	0.50
EF86	1.25
EF86 Special quality	2.50
EF89	0.85
EF91	1.50
EF92	2.15
EF93	0.95
EF94	0.95

EF95	1.00
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
EF732	3.50
EB800	11.00
EF805S	13.50
EF806S	14.50
EF812	0.65
EFL200	1.50
EH90	0.72
EK90	0.72
EL32	0.95
EL33	4.00
EL34	2.25
EL34 Mullard	3.95
EL36	1.50
EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL84	0.75
EL85	4.50
EL86	0.85
EL90	1.50
EL91	6.00
EL95	0.70
EL153	12.15
EL183E	3.50
EL183P	3.50
EL360	6.75
EL500	1.40
EL504	1.40
EL509	5.25
EL519	6.95
EL802	3.65
EL821	8.50
EL822	12.95
EM1	9.00
EM4	9.00
EM80	0.70
EM81	0.70
EM84	1.65
EM85	3.95
EM87	2.50
EN10	8.00
EN32	13.50
EN91	1.10
EN92	4.50
ESU872	25.00
EY51	0.80
EY81	1.50
EY83	1.50
EY84	5.95
EY86/87	0.50
EY88	0.55
EY91	5.50
EY500A	1.50
EY802	0.70
EZ35	0.75
EZ40	2.75
EZ41	2.15
EZ80	0.75
EZ81	0.75
EZ90	1.50
F6064	2.95
FW4/800	2.95
G1/371K	30.00
G55/1K	9.00
G180/2M	9.00
G240/2D	9.00
G400/1K	14.00
GC10B	17.50
GC10D	17.50
GC10/4B	17.50
GC10/4E	17.50
GC12/4B	17.50
GD86W	6.00
GDT120M	5.00
GE10	9.00
GN4	6.00
GN10	15.00
GR10G	4.00
GR10J	4.00
GS10C	16.50
GS10H	12.00
GS12D	12.00
GT1C	14.00
GT1C S/S	13.00
GTE175M	8.00
GTR150W	1.00
GU20	35.00
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.20
GY802	1.00
GZ30	1.00
GZ31	1.00
GZ32	1.00
GZ33	4.50
GZ34	2.15
GZ37	4.50

HAA91	1.00
HABC80	0.90
HBC90	0.75
HBC91	0.80
HF93	0.75
HF94	1.50
HK90	1.06
HL2K	3.50
HL23DD	4.00
HL41	3.50
HL42DD	3.50
HL90	0.70
HL92	1.50
H133/DD	3.50
HR2	4.00
HY90	1.00
HVR2	3.00
K391A	95.00
K3118	86.00
KR6/3	45.00
KT8C	7.00
KT33C	3.50
KT36	2.00
KT44	4.00
KT45	4.00
KT61	4.00
KT63	2.00
KT66 OSRAM	10.50
KT66 USA	6.90
KT66 GEC	14.95
KT77 Gold Lion	9.50
KT81	7.00
KT88 USA	9.00
KT88 Gold Lion	15.95
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
L63	1.50
L102/2K	6.95
L120/2K	12.00
LB7-20	95.00
LS9B	6.95
M502A	60.00
M537A	60.00
M5143	155.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	5.50
M8161	6.50
M8162	5.50
M8163	5.50
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.50
ME1401	29.50
ME1402	29.50
ME1501	14.00
MH4	3.50
MHLD6	4.00
ML4	4.50
MS4B	5.50
MU14	1.50
N37	12.50
N78	9.85
OA2	0.85
OA2WA	1.50
OA3	2.50
OB2	0.85
OB2WA	1.25
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65

PCF82	0.60
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL200	1.60
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN4DD	2.00
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PFL200	0.95
PL21	2.50
PL36	0.95
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802	5.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
Q13-110BA	47.50
QB3-300	30.50
QEO3-10	3.50
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEO3-12	6.50
QQEO3-20	27.00
QQEO6-40	39.50
QQVO2-6	16.50
QQVO3-10 Mullard	9.50
QQV03-10	5.50
QQVO3-20A	18.50
QQVO3-20B	32.00
QQVO6-40A	19.50
OQVO7-50	63.50
QQZO3-20	42.50
QQZO6-40A	45.25
QS72/20	1.50
QS75/40	3.00
QS92/1D	6.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	2.00
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50

QU37	11.50
QVO3-12	4.95
QVO5-25	1.75
QVO6-20	29.50
QV2-250C	45.00
QVQ8-100	145.00
QY3-125	49.50
QY4-250	65.00
QY4-400	71.95
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RG4-1000	10.00
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	33.50
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30 2K	12.00
S104 1K	10.00
S109 1K	15.00
S130	5.95
S130 P	5.95
SC1 800	5.00
SC1 1200	5.00
SC1 2000	9.00
SD6000M	45.00
SP2	1.50
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2 5/300	85.00
TB2-300	45.00
TBL-2-300	275.00
TD1-100A	25.00
TD03-10D	35.00
TD03-10F	28.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TT21	29.00
TT22	29.00
TT100	57.00
TY2-1254A	60.00
TY4-400	70.00
TY7-6000A	365.00
TY8-600W	365.00
TYS2 250	375.00
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	2.95
UBC81	1.50
UBF89	0.60
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20

UCH41	1.20
UCH42	1.35
UCH81	0.65
UCL82	1.75
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.50
UL41	3.50
UL84	0.85
UU5	3.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XP1002	29.00
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y65	6.95
Y602	12.00
YD1100	75.00
YJ1060	265.00
YL1020	29.00
YL1070	115.00
YL1071	109.00
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.60
Z759	19.95
Z800U	3.00
Z803U	18.95
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1AC6	1.20
1B3GT	1.95
1B22	10.00
1B24	14.95
1B35A	29.50
1C1	2.50
1C5GT	2.50
1D5	2.50
1FD1	2.50
1G3GT	2.50
1L4	0.60
1LA6	1.00
1N5GT	2.50
1S2	0.55
1T4	0.70
1U5	1.00
1X2B	1.40
2C21	1.00
2C39A	23.50
2C39BA	39.50
2C40	37.00
2C40A	55.00
2C42	29.50
2C51	0.75
2C53	32.00
2CY5	1.50
2B7	1.50

2D21	0.95
2D21W	2.50
2E26	7.95
2J42	93.00
2K25	24.95
2K25 Ray	75.00
2K26	95.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3AW2	3.35
3B2	3.00
3B7	4.50
3B26	24.00
3B28	12.00
3C4	1.00
3C45	24.00
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3W4GT	2.50
4B32	19.50
4B551B	115.00
4BQ7A	1.75
4-65A	59.00
4-250A	65.00
4C27	25.00
4C28	25.00
4CX250B ITT	37.50
4CX250B EIMAC	49.00
4CX250B surplus ex-government	12.50
4CX250B tested ex-equipment	6.00
4CX250BM EIMAC	75.00
4CX250K EIMAC	95.00
4CX350A	71.50
4D26	75.00
4GS7	2.25
4GV7	2.25
4JC6A	2.95
4J52	75.00
4X150A	25.00
5A 102D	9.50
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-206K	10.00
5A-180M	9.00
4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
5B 110M	10.00
5B 254M	14.50
5B-255M	14.50
5B255M	19.50
5B 256M	9.00
5B-257M	9.00
5B-258M	14.50
5C22	69.00
5R4GB	2.80
5R4GY	2.80
5T4	5.95
5U4G	1.95
5U4GB	2.50
5V4G	1.25
5Y3GT	1.95
5Z4GT	0.85
6 30L2	0.70
6A 203K	9.00
6A8G	1.50
6AB8	0.66
6AC7	2.00
6AF4A	2.50
6AF9	4.15
6AG5	1.50
6AG7	1.95
6AH6	1.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.00
6AK6	2.00
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.50
6AN5	2.65
6AN8A	2.65
6AQ5	1.50
6AQ8	0.85
6AR8	3.95
6AS5	1.50
6AS6	1.50
6AS7G	4.50

6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BD4	1.50
6BD6	1.00
6BE6	0.72
6BF5	1.60
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.20
6BK4	4.00
6BK7A	1.95
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	2.35
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	0.65
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BS8	2.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6BZ6	2.50
6BZ7	2.95
6C4	1.10
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C15	2.50
6C18	2.50
6CA4	3.50
6CA7	3.50
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CH6	6.95
6CL6	3.25
6CL8A	2.00
6CM5	1.60
6CS6	0.75
6CW4	6.50
6CY5	1.00
6DC6	2.35
6DK6	1.15
6DQ5	3.35
6DQ6B	2.50
6EA8	2.50
6EB8	1.75
6EU8	1.75
6EW6	1.50
6F1	2.00
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F22	0.70
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	17.00
6FG5	1.95
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GV7	2.50
6GW6	2.50
6H3N	1.10
6H6	1.95
6H6GT	1.95
6J4	1.10
6J4WA	3.15
6J5	2.50
6J6	0.65
6JB6A	3.95
6JE6C	4.95
6JS6C	4.95
6J7	4.15
6K7G	0.70
6K8Y	3.95
6KD6	5.50
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC(GE)	3.95
6L6GT	1.15
6L7G	0.75
6LD20	0.60
6LF6	4.50
6LO6	4.95
6N7	2.50

6N7GT	2.50
6P15	1.50
6P25	4.00
6P28	2.00
6Q7	1.20
6Q7GT	1.20
6S4A	1.50
6S7	1.10
6SA7GT	1.00
6SC7	1.50
6SG7	1.20
6SH7	1.20
6SJ7GT	1.20
6SK7	0.80
6SK7GT	1.20
6SL7GT	0.85
6SN7GT	0.65
6SQ7	0.80
6SS7	1.95
6U4GT	1.75
6U5G	1.50
6U8	0.85
6U8A	1.50
6V6GT	0.85
6X2N	1.00
6X4	1.50
6X5GT	0.55
6X5GTY	1.00
6X8A	2.25
7A7	2.00
7AD7	1.75
7B7	2.50
7C6	2.50
7E7	2.50
7V7	4.15
7Y4	1.95
8B8	2.50
8EQ7	1.95
85A8	1.50
10D2	1.25
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD11	1.00
10LD12	0.65
11E2	16.50
11E3	55.00
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	0.95
12AT7	1.15
12AT7WA	2.50
12AU6	1.50
12AU7	0.55
12AV6	0.80
12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	3.50
12BA6	1.50
12BE6	1.05
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CX6	1.20
12E1	17.95
12E14	28.00
12GN7	4.50
12HG7A	4.50
12JGT	0.70
12K5	1.00
12K7GT	0.60
12K8	1.10
12Q7GT	0.50
12SA7GT	1.00
12SG7	4.75
12SH7	1.00
12SK7	1.00
12SJ7	0.60
12SN7GT	1.85
12SO7GT	1.50
13D3	3.20
13D7	3.20
13DR7	2.95
13E1	115.00
14S7	1.00
17EW8	0.95
17JZ8	2.75
18D3	1.60
19G3	17.00
19H4	23.95
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
20P5	1.15
21LU8	2.50
24B1	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95

30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
31JS6A	5.50
33A/158M	19.50
44A/158M	19.50
35A5	4.50
35L6GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
47	6.00
60B5	1.60
50C5	0.95
50CD6G	1.15
60JY6	2.96
52KU	2.00
61SPT	4.50
75B1	2.50
75C1	2.50
84	3.00
85A1	6.50
85A2	1.50
90AV	10.00
90CG	13.50
91AG	9.00
92AG	19.50
92AV	12.50
95A1	6.50
108C1	1.50
150B2	6.95
150C2	1.50
150C	2.15
155UG	26.00
274A	15.00
1858T	1.50
307	5.00
328A	15.00
388A	17.50
425A5	8.00
431U	2.00
572B	35.00
705A	8.00
708A	8.00
715A	6.00
715C	45.00
725A	275.00
803	14.95
805	39.00
807	1.60
810	45.00
811A	12.95
813	18.50
813 USA	45.00
829B	14.50
833A	60.00
866A	3.50
872A	19.00
873	60.00
884	5.50
930	9.95
931A	13.95
954	1.00
955	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
2050W	4.50
2050	2.75
3545	4.00
4313C	4.00
4328D	9.00
5642	9.50
5651	2.50
5654	1.95
5663	1.95
5670	3.25
5672	4.50
5687	4.50
5692	3.50
5696	2.75
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
5751	2.95
5763	4.95
5814A	3.25
5840	3.50
5842	11.00
5894	39.50
5899	4.50
5963	2.00
5965	2.25
6005	1.85
6012	10.00
6021	3.65
6057	2.50
6059	3.75
6060	2.25
6062	4.50
6063	2.00
6094	3.25
6067	1.95
6072	4.20
6080	4.75
6080WA	8.50
6096	2.85
6132	10.00
6136	2.50
6146B	7.50
6157	2.50
6201	6.45
6211	2.50
6267	1.50
6350	2.00
7025	2.50
7189A	2.95
7247	2.00
7360	8.95

WIREWOUND RESISTORS PREFERRED VALUES

4 Watt	4R7-1K8	0.16
	2K2-6K8	0.18
7 Watt	R47-4K7	0.18
	5K6-12K	0.19
	15K-22K	0.20
11 Watt	1R-10K	0.20
	15K-22K	0.24
17 Watt	1R-10K	0.26
	15K-22K	0.28

BASES ETC.

B7G	0.15
B7G Skirted	0.30
B8G	0.70
B9A	0.20
B9A Skirted	0.30
B108	0.16
B13B	0.50
8 Pin DIL	0.14
14 Pin DIL	0.15
14 Pin DIL Q	0.30
16 Pin DIL	0.17
OCTAL	0.35
CANS	0.27
B9A PCB	0.15
B5	0.75
B9G	0.38

ZENER DIODES

BZX61 0.15

6V2 7V5 8V2 9V1 10V 11V 12V 13V 15V 16V 18V 20V 22V 24V 27V 30V 33V 36V 39V 47V 51V 56V 68V 75V

BZY88 0.07

2V7 3V 3V3 3V6 3V9 4V3 4V7 5V1 5V6 6V2 6V8 7V5 8V2 9V1 10V 11V 12V 13V 15V 18V 20V 24V 27V 30V

THERMISTORS

VA1040	0.23
VA1056S	0.23
VA1104	0.70
VAT8650	0.46
VA1097	0.25

BATTERIES

7V Power Mike batteries TR175 £2 25 ea other prices on request

CALLERS WELCOME

★ ENTRANCE ON A227

50 YDS SOUTH OF MEOPHAM GREEN

CAR PARKING AVAILABLE

Open Monday-Friday 9am-5.30pm

★ 24 HOUR ANSWERPHONE SERVICE ★

ACCESS AND BARCLAYCARD ORDERS WELCOME

★ MANY OTHER ITEMS AVAILABLE ★

UK ORDERS P&P 50p PLEASE ADD VAT AT 15%

EXPORT ORDERS WELCOME CARRIAGE/POST AT COST

A BUSY WEEKEND IN SCANDINAVIA

. . . an introduction to the SAC contest

by Nigel Cawthorne G3TXF

Working into Scandinavia on the HF bands from the UK does not demand large antennae nor very high power – it can be done with simple HF antennae and low power. Every year in September there are two Scandinavian Activity Contests, one on SSB and one on CW. For UK HF operators these two contests are an ideal opportunity to make a large number of easy QSOs with Scandinavia.

Scandinavia for the purposes of the SAC is made up of Sweden, Norway, Denmark, Finland, Iceland, the Faeroe Islands, and Greenland. The DXCC countries of the Aaland Islands (OH0), Market Island (OJ0:OH0M), Svalbard and Bear Island (JW) and Jan Mayen (JX) are also in Scandinavia.

Dates and times

The CW SAC and the SSB SAC are held on consecutive weekends. The CW SAC is on the second full weekend in September and the SSB SAC is just one week later, on the third full weekend of September of each year. The SAC is one of the longer running international contests: the 1984 SAC will be the 26th in the series.

For European and UK HF operators the timing of the SAC contests are convenient. Unlike many of the international contests which run for 48 hours, the SACs are only 27 hours in duration. They start at 1500GMT on the Saturday afternoon and go through to 1800GMT on the Sunday. To enjoy the SAC it is not necessary to operate the whole length of the contest: a part-time entry will produce a lot of interesting QSOs.

Making a few QSOs

A UK station can come on the bands for a few hours at any time during the contest and will probably be able to work a good number of Scandinavian stations. From the UK to Scandinavia, one or other of the HF bands is usually open at any time of the day or night.

Where only a few hours of operating is feasible, then 20 metres is probably a good band to try. The Sunday morning of the contest is usually a good time to work a lot of loud and easily workable Scandinavian stations on 20m. Alternatively if operation on the LF bands is preferred, then a few hours in the early evening on 40m and 80m will provide many easy contacts.

High activity levels

As its name implies, the SAC is all about activity! There is always a very high turnout of Scandinavian stations for both the SSB and the CW sections. The 1983 SAC results showed a total entry of nearly 500 logs from Scandinavia alone. There is never a shortage of stations to work.

A great attraction of the SACs is the very high operating standard. The Scandinavian operators employ excellent technique, and this increases the enjoyment of the event. QSOs are quick and easy.

The scoring system

For stations outside Scandinavia it is contacts with Scandinavian stations only that count for points. One point is earned for each complete Scandinavian QSO on any band. Scandinavian stations work the rest of the world and they do not work each other within Scandinavia.

The multiplier is based on the 'call-areas', and these are listed in *Table 1*. As stations are being worked it is worthwhile keeping a running check of the different call-areas that have been worked on each of the bands. *Table 2* gives the layout of a typical five-band multiplier check sheet. As contacts are made and the different multipliers are logged it is easy to keep a check sheet going of the call-areas.

Table 1 *The multipliers used in the SAC. The 'call areas' worked within each of the Scandinavian countries on each band counts as a 'multiplier' when computing the contest score*

JW1	JX1	LA1	OH1	OX3	OY1	OZ1	SM1	TF1
JW2	JX2	LA2	OH2	OX4	OY2	OZ2	SM2	TF2
JW3	JX3	LA3	OH3	OX5	OY3	OZ3	SM3	TF3
JW4	JX4	LA4	OH4	OX0	OY4	OZ4	SM4	TF4
JW5	JX5	LA5	OH5		OY5	OZ5	SM5	TF5
JW6	JX6	LA6	OH6		OY6	OZ6	SM6	TF6
JW7	JX7	LA7	OH7		OY7	OZ7	SM7	TF7
JW8	JX8	LA8	OH8		OY8	OZ8	SM0	TF8
JW9	JX9	LA9	OH9		OY9	OZ9	SJ9	TF9
JW0	JX0	LA0	OH0		OY0	OZ0		TF0
			OJ0/OH0M					

Prefix	80m	40m	20m	15m	10m
OH1					
OH2					
OH3					
OH4					
OH5					
OH6					
OH7					
OH8					
OH9					
OH0					
SM1					
SM2					
SM3					
SM4					
SM5					
SM6					
SM7					
SM0					
LA1					
LA2					
LA3					
LA4					
LA5					
LA6					
LA7					
LA8					
LA9					
LA0					
OZ1					
OZ2					
OZ3					
OZ4					
OZ5					
OZ6					
OZ7					
OZ8					
OZ9					
OZ0					
Others:					
OX3					
OY2					
OY5					
Totals :					

Table 2 *Typical multiplier check sheet layout*

The full list of possible multipliers is shown in *Table 1.* In practice many of these prefixes are very rare and are not likely to be active during the SAC, eg TF6, TF7, TF8, TF9 or TF0. Hence the multiplier check sheet shown in *Table 2* lists firstly all the prefixes that are very likely to be contacted during the contest, such as all the OH, SM, LA and OZ call-areas, and then at the bottom of the check sheet there is room for other rarer call-areas that might be active during the SAC.

OY1, OY2, OY5, TF3, JW5, JW0 and JX5 or many other of the rarer call-areas may appear on the bands during the contest, and these are best given space on the multiplier checksheet as and when they appear, rather than trying to cater on the check sheet for a lot of very unlikely call-areas.

A special point to note on the call-area multipliers is that all the special, club or novice prefixes such as LB2, LG5, OF2, OG4, SK6 or SL7 count according to the call-area. Thus the six examples given would count as LA2, LA5, OH2, OH4, SM6 and SM7 respectively.

Portable stations that are not using an area number in their callsign suffix count as if they were in the 10th call-area, eg: GW3WVG/LA would count as LA0, or DJ6SI/OZ would count as OZ0.

The special station at Morokulien on the Sweden-Norway border, that signs either LG5LG or SJ9WL counts as LA5 or SM9. There are no other 9th call-area Swedish stations. There are no 8th call-area Swedish stations at all.

The little island called Marketrees, that lies between the Aaland Islands and Sweden and which counts as a separate DXCC country, also counts as a separate call-area multiplier in the SAC. Occasionally we are lucky enough to have this relatively rare DXCC country on the air during SAC. OJ0 has been the prefix used, but future operations from Marketrees may be using calls with OH0M instead. Whichever callsign is used it counts as a separate multiplier from the 10th call area multiplier in Finland (OH0), as shown in *Table 1.*

Tactics and propagation

Searching for and calling Scandinavian stations during the contest is usually more productive than calling CQ. Most of the Scandinavian stations are either calling CQ themselves and working the strings of stations calling them or they are looking for DX multipliers. As a UK station the best tactic is to continually sweep the bands looking for Scandinavian stations calling CQ Contest and to reply to them.

When calling CQ, non-Scandinavian stations would call CQ SAC. Searching and calling stations is probably the best bet unless you have a particularly

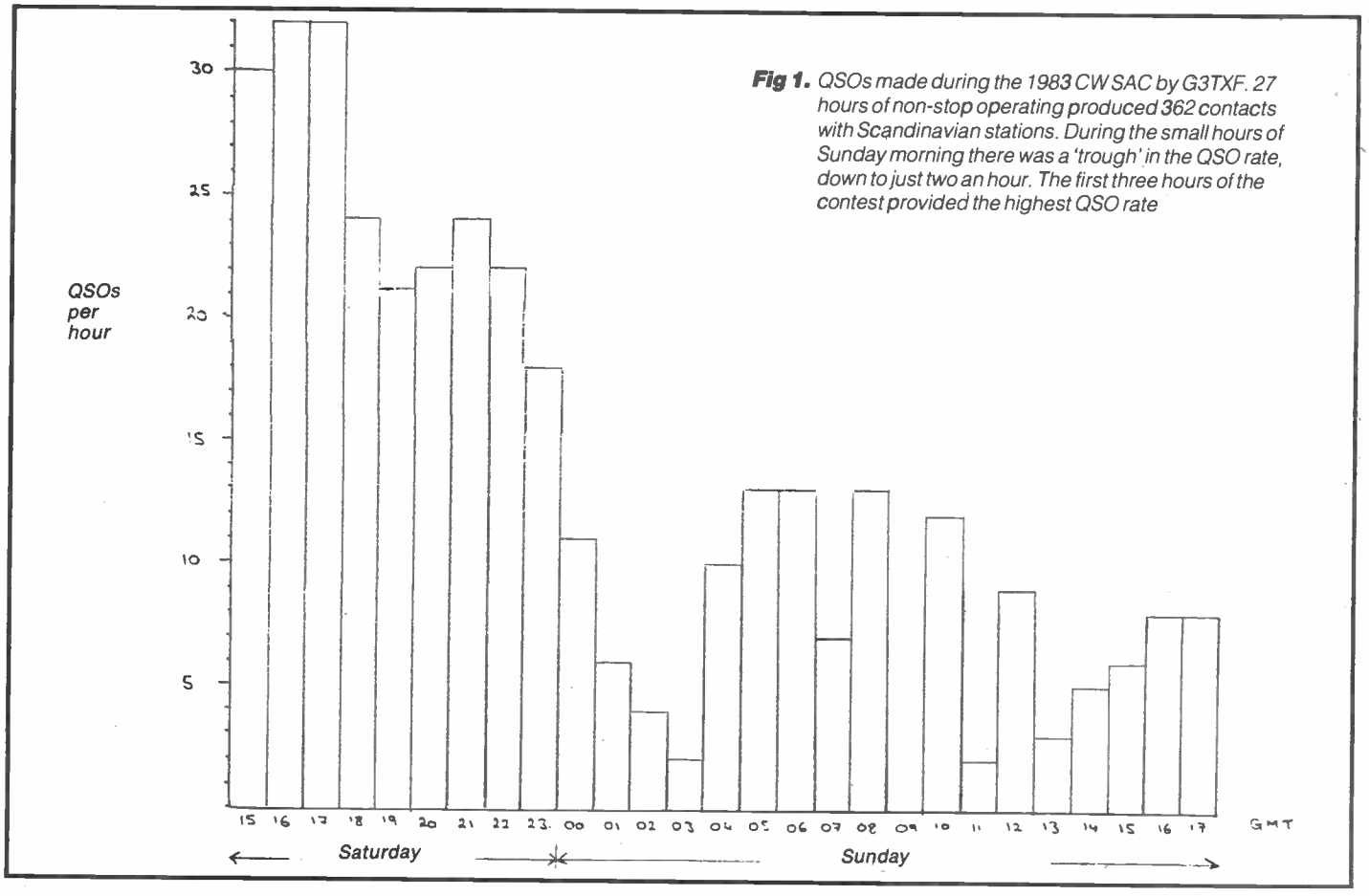


Fig 1. *QSOs made during the 1983 CW SAC by G3TXF. 27 hours of non-stop operating produced 362 contacts with Scandinavian stations. During the small hours of Sunday morning there was a 'trough' in the QSO rate, down to just two an hour. The first three hours of the contest provided the highest QSO rate*

outstanding signal.

As the propagation from the UK to Scandinavia is often very good on the HF bands, it usually does not take long to get through to the Scandinavian stations calling. The type of conditions to be expected on each of the bands during the SAC is summarised as follows:

160m: Not used in SAC. As the regulations governing the use of this band vary from country to country, 160m is not included in the SAC.

80m: Scandinavian stations can be worked easily during the hours of darkness. For stations in the northern parts of the UK, Scandinavian stations can probably be worked during much of the day as well.

40m: During the early evening on the Saturday and during the morning hours on the Sunday, this band usually provides many Scandinavian contacts during SAC. During the middle of the night propagation will usually fade out leaving 80m as the night-time band. 40m springs to life with SAC stations at around 0600 on Sunday.

20m: Usually the main band. During most of the daylight hours Scandinavian stations can be worked in abundance. Sunday morning from about 0800 onwards is often a good time for SAC QSOs on this band.

15m: Conditions usually very patchy. The serious entrant cannot afford to miss any multipliers on this band, but the band can be very erratic and selective. This band might produce a whole string of OH6s all at S9 + 40, and absolutely nothing else.

10m: Even more erratic than 15m. Only the odd multiplier can usually be worked on this band, unless very lucky with the conditions.

In summary, 20m, 40m and 80m are the main traffic carriers for UK stations during SAC, with 15m and 10m being the sources of the possible odd multiplier only.

Propagation will always vary. The above observations are based on experience gained operating the SAC in recent years. With the decline of the current sunspot cycle, 15m and 10m are likely to be even less productive in the coming years. SAC traffic will then be even more concentrated on the three lower HF bands: 20m, 40m and 80m.

Entries and results

The responsibility for the organisation and adjudication of the SAC rotates between the main Scandinavian countries: LA, OH, OZ and SM. The 1984 SAC is being run by the Swedes. Logs should be sent to: *SSA Contest Manager, Goran Granberg, SM6EWB, Rosengatan 76, S-43400 Kungsbacka, Sweden.*

Each entrant to SAC receives a very well produced results booklet from the organisers. This makes very interesting reading as it lists in full all the scores from the other entrants. The results booklet is also a souvenir of the contest itself.

This year – have a go!

This year's SAC contests are on the 15/16 September 1984 (CW) and 22/23 September 1984 (SSB). Whether you prefer CW or SSB, the SAC contests are an excellent operating event for UK stations. Simple HF antennae and low power are all that are needed to make a good number of contacts in SAC. This year, for the first time, a new QRP section is being introduced for stations with a maximum output of 10 watts.

However many contacts you make, it is always worthwhile sending in a log. Contest adjudicators are always pleased to receive logs no matter how many QSOs are made.

The Scandinavian Activity Contest is one of the best 'regional' HF contests. UK stations are particularly well placed geographically to be able to make many contacts in this contest. Make a note of the dates of this year's Scandinavian Activity Contests, come on the bands, work as many or as few as you like, and send in a log. The SACs are fun!

REGULATORS
LM317T Plastic TO220 variable £1.00
LM317 Metal £2.20
7812 Metal 12v 1A £1.00
LO36 TO3 Metal 12v LO37 15v ea..... 50p
7805/12/15/24 plastic..... 50p
7905/12/15/24 plastic..... 50p
CA3085 TO99 Variable regulator..... 50p
LM723 14 dil 50p

EPROMS/MEMORIES
2764 INTEL/FUJITSU 300ns £7 450ns . £6.50
2732A-3 NEW £3.50 ea. ..... 100+/£3.00
2102 500ns AMD 80p..... 10/£6.00
MC6810P.....£1.05

POWER TRANSISTORS
TIP141, 142, 147 £1 ea. TIP112, 125, 42B.....2/£1.00
TIP35B £1.30, TIP35C £1.50
2N3055 Motorola 50p ..... 5/£2.00
2N3055 Ex eqpt tested..... 4/£1.00
MJE3055, MJE2955 equiv ea..... 50p

DISPLAYS
Futaba 4 digit clock fluorescent display FLT-02-8 also 5-LT ..... 16/£1.50
Futaba 8 digit calculator fluorescent display 9CT-01-3L £1.50
LCD Clock display 0.7" digits..... £3.00
Large Clock display 1" digits £3.00
7 seg 0.3" display comm cathode 50p

MISCELLANEOUS
QUARTZ HALOGEN LAMPS
A1/216 24v 150w..... £2.25
H1 12v 55w (car spot) £1.25

WOUND POT CORES
with adjuster unused
RM7 LA4245 ..... 3/£1.00
RM8 LA4344 ..... 2/£1.00

TOK KEY SWITCH 2 POLE 3 KEYS
ideal for car/home alarms £3.... 100+/£2.00
12v 1.2w small wire ended lamps fit AUDI/VW TR7 VOLVO SAAB ..... 10/£1.00
14v 0.75w MES lamps..... 8/£1.00
Heat shrink sleeving pack £1.00
PTFE sleeving pack asstd colours £1.00
250 mixed res diodes, zeners..... £1.00
Mixed electrolytic caps..... 100/£2.00
ITT CASS RECORD/PLAY AMP +cct..... £2.00
Stereo cassette deck..... £5.00
Stereo cass R/P head.....£2.50
Mono head £1 Erase head..... 50p
Thermal cut-out 50°C, 77°C or 85°C..... 70p
Thermal fuse 121°C 240v 15A..... 5/£1.00
Vero pins fit 0.1" Vero 100/50p
Double sided PCB pins 100/50p
TO220 Micas + bushes 10/50p ..... 100/£2.00
TO3 Micas + bushes..... 10/50p
RELAYS 240v AC coil PCB mounting 2 pole changeover £1 3 pole c/o..... £1.00
Varley 24v dc 4p c/o relay 80p
Fig 8 mains cassette leads..... 3/£1.00
KYNAR wire wrapping wire 2oz reel..... £1.00
PTFE min screened cable 10m..... £1.00
TOKIN MAINS RFI FILTER 250v 15A...£3.00
TDK MAINS RFI FILTER 115v 15A £1.00
Epoxy potting compound 500g £2.00
Mercury tilt switch small £1.00
Min rotary sw 4p c/o 1/8" shaft ..... 2/£1.00
Thorn 9000 TV audio o/p stage ..... 2/£1.00

10m7 CERAMIC FILTER 50p..... 100/£20
6m CERAMIC FILTER..... 50p
240v AC FAN 4.6" SQUARE NEW £5.50
240/115v AC FAN 4.6" SQ NEW..... £7.00
12v DC Brushless fan reversible 2.5"sq 2" deep QUIET £9.00
KLIPPON terminal block EKS 12/4 12 way 20A term block..... 3/£1.00
BELLING-LEE 12 way block L1469.. 4/£1.00
POTENTIOMETERS short spindle
2K5 10K 2m5 Lin ..... 5/£1.00
500K 1in 500K log long spindle..... 4/£1.00
40KHZ ULTRASONIC TRANSDUCERS EX-EQPT. NO DATA PAIR £1.00
STICK-ON CABINET FEET..... 20/£1.00
TO3 TRANSISTOR COVERS..... 10/£1.00
TRANSISTOR MOUNTING PADS TO5/ TO18 £3/1K

RECTIFIERS
120v 35A stud..... 50p
12FR400 12A 400v small stud..... 4/£1.50
BY127 1200V 1.2A..... 10/£1.00
1N5401 100v 3A..... 10/£1.00
BY254 800v 3A ..... 8/£1.00
BY255 1300v 3A ..... 6/£1.00
1A 800v bridge rectifier..... 4/£1.00
6A 100v bridge 50p
10A 600v bridge £1.50
15A 100v bridge £1.50
25A 200v bridge £2.00ea..... 10/£18.00
25A 400v bridge £2.50 ..... 10/£22.00

SCRs
MCR72-6 400v.....£1.00
BTX95 800v 15A.....£1.50
35A 800v stud.....£2.00
70A 500v large stud £3.00
MCR106 equiv 4A 400v 40p ea..... 100/£20.00
2N5061 800mA 60V TO92 ..... 4/£1.00
TICV106D .8A 400v TO92 3 £1, ... 100/£15.00
MEU21 Prog unijunction.....3/£1.00

TRIACS diacs.....25p
TXAL228 8A 400v isol. tab ..... 2/£1.00
25A 800v ex eqpt, tested.....£1.50

CONNECTORS (EX EQPT price per pair)
'D' 9 way £1, 15 way £1.25, 25 way £2, 37 way £2, 50 way £3.50 covers .....50p ea
NEW 25 way PCB SKT £1.00
0.1" double sided edge connector 32 way ideal ZX81/SPECTRUM.....£1.50
0.1" d/sided pcb plug 24+25 way.....£1.50
2 pole sub min connectors ideal radio control RS 466/472/488/343 5 pairs £2.00

IDC CONNECTORS
25 WAY 'D' SOCKET 37 'D' PLUG ea..£2.00
20 WAY SOCKET (BBC USER PORT) £1.00
26 WAY SOCKET (BBC PRINTER) £1.50
34 WAY SOCKET (BBC DISC DRIVE) £2.00
40 WAY SOCKET £2.00

IDC CARD EDGE CONNECTORS D/S EX-EQPT
34 WAY (FITS DISC DRIVE PCB) £3.00
40 WAY (FITS CENTRONICS 739 PCB) ..£3.00
50 WAY £3.50

WIRE WOUND RESISTORS
W21 or sim 2.5W 10 OF ONE VALUE FOR.....£1.00
1R0, 2R0, 2R7, 3R9, 5R0, 10R, 12R, 15R, 18R, 20R, 27R, 33R, 36R, 47R, 120R, 180R, 200R, 330R, 390R, 470R, 560R, 680R, 820R, 910R, 1K, 1K15, 1K2, 1K3, 1K5, 1K8, 2K7, 3K3, 10K
W22 or sim 6 watt 7 OF ONE VALUE for £1
R22, 1R5, 9R1, 10R, 12R, 20R, 33R, 51R, 56R, 62R, 120R, 180, 270R, 390R, 560R, 620R, 1K, 1K2, 2K2, 3K3, 3K9, 10K.
W23 or sim 9 watt 6 OF ONE VALUE for £1.
R22, 1R0, 3R0, 6R8, 56R, 62R, 100R, 220R, 270R, 390R, 680R, 1K, 1K8, 10K.
W24/sim 12 watt 4 OF ONE VALUE for £1.
R50, 2R0, 10R, 18R, 47R, 68R, 75R, 82R, 150R, 200R, 270R, 400R, 620R, 820R, 1K.

PHOTO DEVICES
Slotted opto-switch OPCOA OPB815 ..... £1.30
2N5777 50p.....100/£26.00
TIL81, TO18 Photo transistor £1.00
TIL38 Infra red LED 2/50p
OPI2252 Opto isolator 50p
Photo diode 50p,.....6/£2.00
MEL12 (Photo darlington base o/c) 50p
TO18 LDR 50p, RPY58A LDR 50p
LEDs RED 3mm or 5mm 12/£1, ...100/£6.00
GREEN + YELLOW 3/5mm 10/£1,..... 100/£6.50
FLASHING RED 5mm 50p,.....100/£30.00

DIODES
1N4151 sim 1N4148.....100/£1.25
1N4148.....100/£1.50
1S3740 Germanium.....100/£2.00
1N4004 or SD4 1A 300v .....100/£3.00
1N5401 3A 100V.....10/£1.00
BA157 1A 400V Fast recovery .....100/£2.50
BA159 1A 1000V Fast recovery.....100/£3.50

MULTI TURN PRESETS
10R, 20R, 100R, 200R, 500R, 2K, 5K, 22K, 50K, 100K, 200K.....40p

IC SOCKETS
8 pin 12/£1, 14 pin .....10/£1.00
18/20 pin 7/£1, 100/£12, 1k £80.00
22/28 pin 25p, 24 pin 25p, 100/£20, 1k £100.00
40 pin 30p, 16 pin 12/£1,.....100/£6.00

TRIMMER CAPACITORS small
GREY 1.5-6.4pF GREEN 2-22pF.....5/50p
YELLOW 2-16pF GREY larger type 2-25pF 5/50p

SOLID STATE RELAYS NEW 10A 250v AC zero voltage switching control voltage 8-28v DC £2.50
VARIAC 0 to 130v 6A new uncased £6.00

POLYESTER/POLYCARB CAPS
10n ax 100/£2, 22n radial .....100/£2.50
47n rad .....100/£2.50
1u 250v Polyester C280 5/£1,.....100/£10.00
1u5 p/carb 15mm rad .....100/£5.00
2u2 160v rad 22mm .....100/£10.00
470n 250v AC X rated rad ..... 4/£1.00
100N 250V AC X rated rad 20mm.....4/£1.00
33n 250v AC X rated rad 15mm.....10/£1.00
10n 250v AC X rated rad 10mm.....10/£1.00

BEAD THERMISTORS
GLASS BEAD NTC Res @ 20°C..... 80p
250R 1K2, 50K, 220K, 1M4

BEAD TANTALUM CAPS
47u, 3V, 10v, 6V3, 68u, 6V 12/£1,.....100/£6.00
2u2 20V 8/£1,..... 100/£8.00

SMALL AXIAL CERAMIC CAPS 50V
15p, 18p, 22p, 27p, 33p, 47p, 68p, 82p, 470p, 1n, 10n (25V) .....100/£3.00

STEPPER MOTOR 4 PHASE 2 9v WINDINGS £3.50,.....10/£35.00

KEYTRONICS

332 LEY STREET, ILFORD, ESSEX
Shop open Mon-Sat 10am-2pm
TELEPHONE: 01-553 1863

MIN ORDER £2.50 OFFICIAL ORDERS WELCOME
UNIVERSITIES COLLEGES SCHOOLS GOVT DEPARTMENTS
P&P AS SHOWN IN BRACKETS (HEAVY ITEMS)
50p OTHERWISE (LIGHT ITEMS)

ADD 15% VAT TO TOTAL

ELECTRONIC COMPONENTS BOUGHT FOR CASH

APPLIED NEGATIVE RESISTANCE

by 'OLD HAM'

During the mid-twenties Lossev, a Russian engineer, published a work derived from his experiments on the properties and behaviour of certain crystaline substances when used under current-passing conditions. His discoveries, with others of the period, were undoubtedly responsible for the perfection of more modern crystal devices, such as diodes and some semi-conductors.

Only a minority of enthusiasts took the newly-released information seriously as valves, although not cheap, were rapidly improving and were readily available. England, of course, had its own experimenters who were working independently of others and making considerable headway into the more stable applications of crystals, used not only as detectors but as oscillators and amplifiers, the latter application being not so stable and beset with difficulty.

Notable among these engineers were Dr Eccles, Captain H J Round and N M Rust who, like Lossev, based their work upon the negative resistance principle which was exhibited in various substances, but in differing degrees. Mainly, the materials at their disposal were natural crystaline and therefore radio-sensitive, resistive and comparatively conductive. However, other crystals like lead sulphide which could be easily made were subject to investigation.

Detection or rectification of RF signals was of course well known and therefore a common application, but the experiments in applied crystal technology proved to be an innovative measure. Many held out high hopes that certain oscillating and amplifying devices would soon be available for everyday use and marketable at a lower price than valves, the disadvantages of which were numerous. Their bulk and powering alone were major drawbacks. The amateur fraternity watched with interest but little information, even about the more stable specimens, was released after the initial report.

Principle

Figure 1(a) shows the forward-reverse characteristics of a modern crystal diode with negative resistance occuring at 'x'. *Figure 1(b)* illustrates a typical diode reverse voltage characteristic with the negative resistance area shown. The

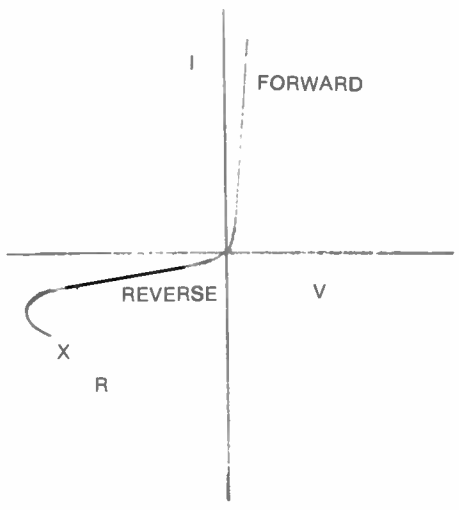


Fig 1(a) *The forward-reverse characteristics of a modern crystal diode*

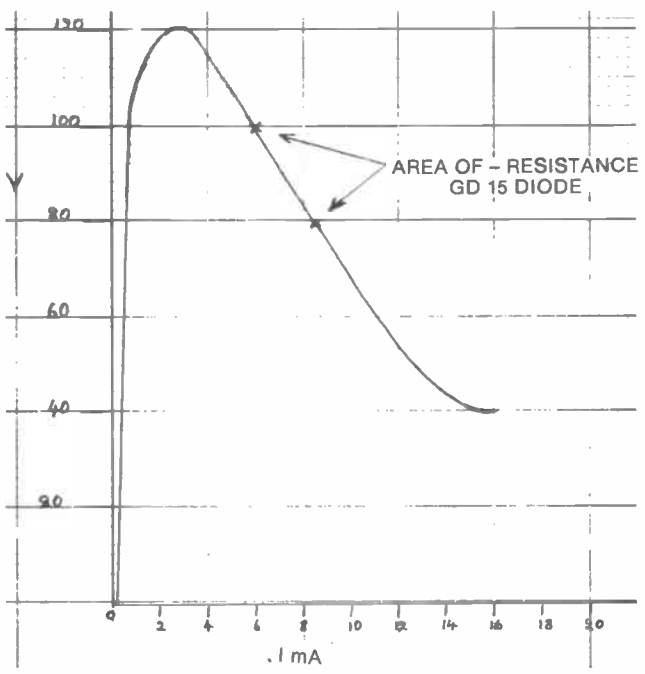


Fig 1(b) *A typical diode reverse voltage characteristic*

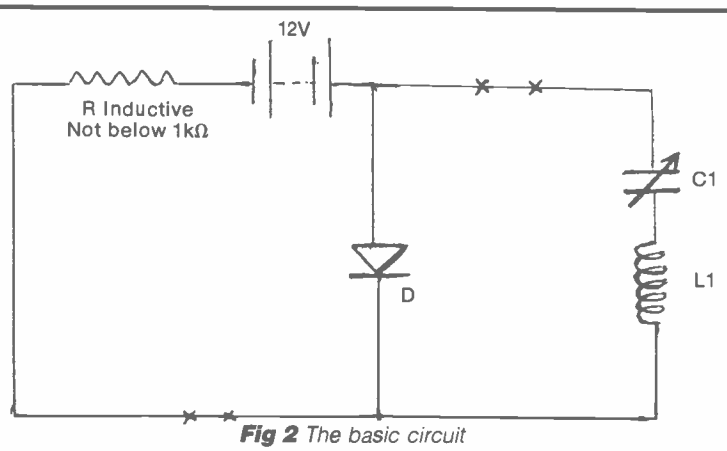


Fig 2 *The basic circuit*

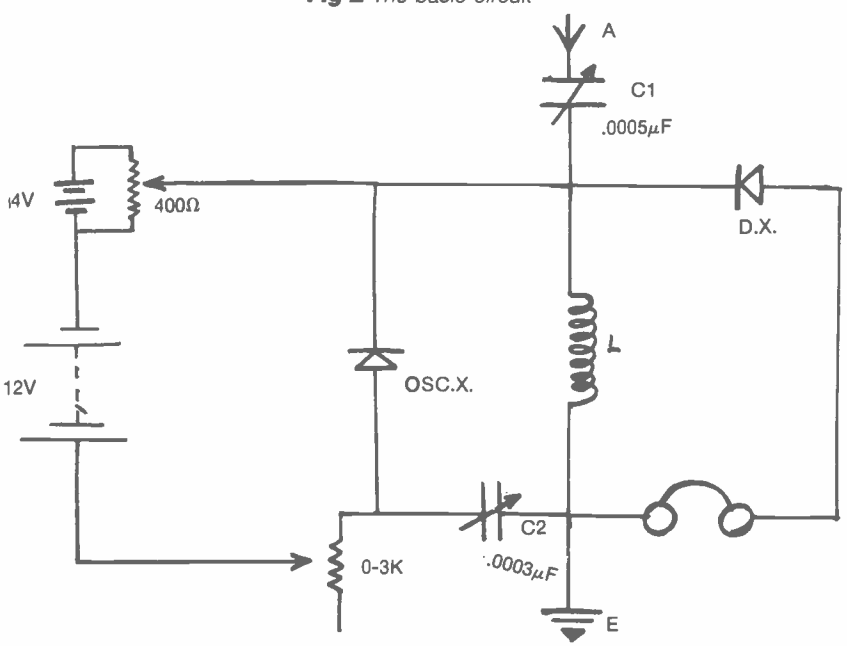


Fig 3 *The principle applied to an orthodox crystal receiver*

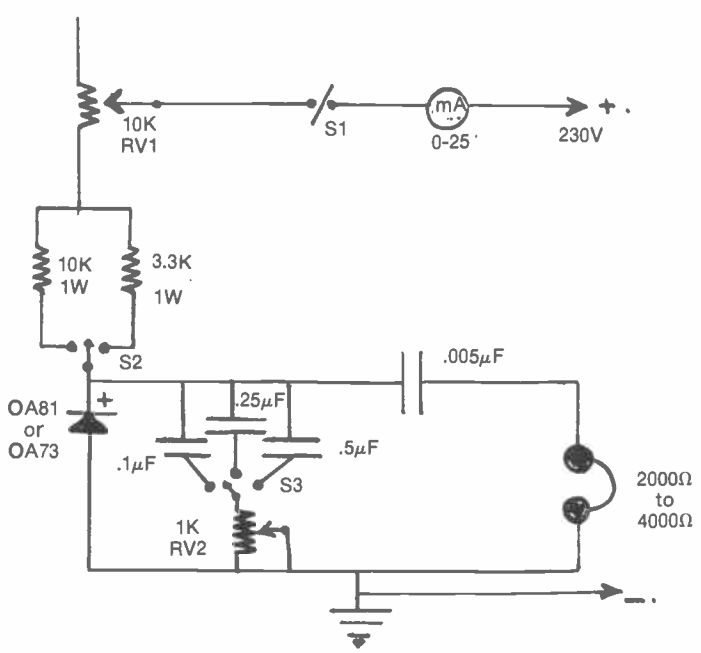


Fig 4 *Audio oscillator circuit*

now well-known crystal diode had yet to make its appearance but basic detectors, both permanent and semi-permanent, proliferated. Although their relative efficiency bore no comparison with modern diodes, the underlying operative principles were the same; even the characteristics were not entirely dissimilar.

Figure 2 shows the basic circuit accredited to Lossev where the device is made to oscillate by an initial charge across C1 and which then discharges via L1. D, which offers a negative resistance to the oscillatory current, ensures that no damping occurs but that some amplification takes place which, having reached a maximum amplitude, remains constant. Resistance R prevents oscillatory motion from passing through the battery circuit, R being higher in value than the negative resistance of D. Resistance of R should be at least 1K, and also of the inductive type to act as a choke.

For more practical purposes, the principle is applied in *Figure 3* to an orthodox crystal receiver, the detector DX having a perikon crystal combination. The crystals should exhibit high resistance characteristics as stability is essential. Fine wire-wound variable resistances should be employed to control the voltages.

High impedance headphones of the order of 4000ohms should be used, but those of half the impedance were found functional.

Zincite, with a steel wire point contact, or cat's-whisker, forms the oscillating crystal.

Modus operandi is as follows. The steel point should not be in contact with the Zincite, but a signal must be detected by the normal detector and tuned to maximum. Then C2 should be set at full capacity and followed by the location of a suitable spot on the oscillating crystal. The potentiometers should be set in the midway position. When oscillations have commenced C2 should be rotated until a carrier is heard, then both C1 and C2 should be adjusted for optimum results. If oscillation is fierce adjust the potentiometers.

Up-to-date

While RF circuitry can be entertaining, not everyone will have access to the older components which I used, although some jewellers can obtain large pieces of radio-sensitive crystal of various types.

Under the right conditions, oscillations of the order of 10KHz are possible using crystal diodes. *Figure 4* shows the circuit of an audio oscillator. Two of the OA series were chosen, the OA73 and the OA81. RV1 and RV2 are of the wire-wound type and again high impedance headphones are used. Loads and capacitors are switched, frequencies of the order of 500KHz and above being possible. It is emphasised that an effective heat shunt should clamp the diode to the chassis as heat may damage any diode when subject to a non-specific use. A GD15

gave good results.

Reference to *Figure 5* shows how capacitor C charges via R. This charge is dependant upon the values of C, R and the applied voltage. Diode D presents an effective parallel resistance being typically 65K in value. The diode will conduct heavily upon reaching turnover point, causing C to discharge until the voltage across D is low, which in turn causes a return to high resistance. C will once again charge via R, the cycle being repeated as in waveform 'XX' in *Figure 5.*

Effective

Some germanium diodes will oscillate quite effectively within the spectrum of 10KHz, possibly above. The experimenter has a wide selection of diodes from which to chose. When diodes with a low peak inverse voltage are utilised, the HT can be reduced by some fifty per cent. Operational frequency depends upon the type of diode and the CR network across it.

Oscillator

When using the oscillator, a slow reduction in RV1 will eventually cause a fast rise of current in the meter to about 8mA and this should be maintained for a while to allow the diode to reach its working temperature. RV1 should then be adjusted for as low a current reading as possible, this being consistent with a pure audio note. Something approaching a sine wave is obtainable from the instrument, and an output of 30 to 35V rms may be possible. This simple notion, having its basic roots in so distant a past, should provide several interesting hours for the enthusiast. It also lends support to the saying 'nothing's new under the sun . . .', especially oscillating rocks: now known, as transistors and tunnel diodes.

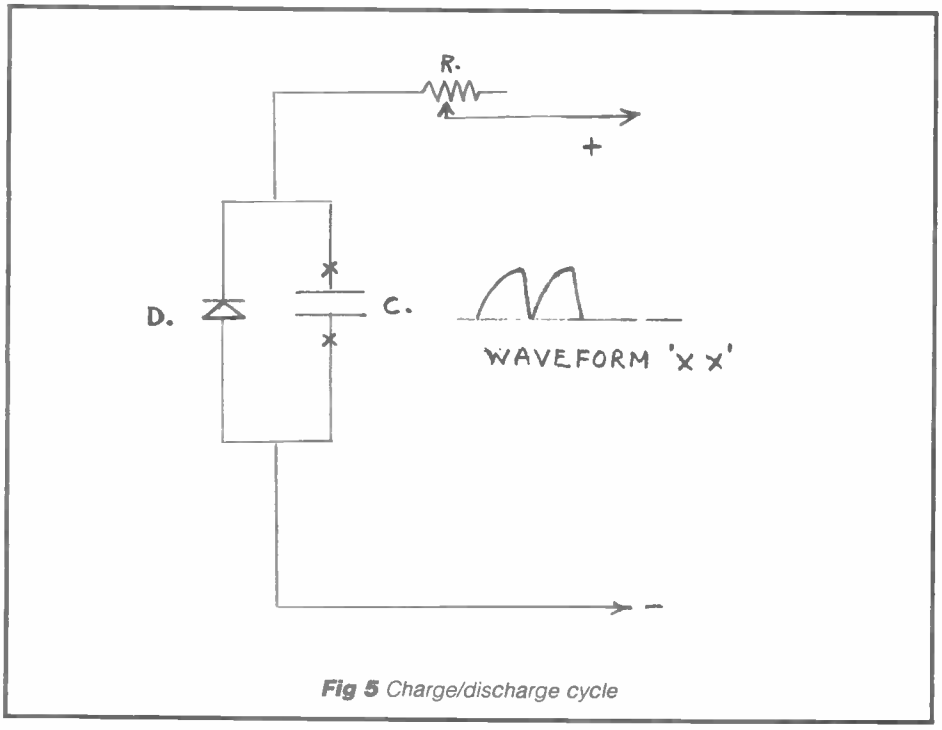


Fig 5 *Charge/discharge cycle*

Amateur RADIO

For all two-way radio enthusiasts

DON'T MISS YOUR COPY

With regular features like Current Comment, DX Diary, Straight and Level, Angus McKenzie's equipment review, SWL, Rally Calendar and Free Classified Ads, and a host of special features in each issue, make sure you place a regular order for ***Amateur Radio*** with your newsagent or take out a post free subscription now, while the offer lasts

SUBSCRIPTION BENEFITS

...delivery to your door by publication date each month

...inflation proof – price guaranteed for 12 months

On sale NOW at your newsagent

AMATEUR RADIO SUBSCRIPTION ORDER FORM

To: Subscription Department • Amateur Radio • 513 London Road • Thornton Heath • Surrey • CR4 6AR. Tel: 01-684 3157

NAME .....

ADDRESS .....

.....

..... Postcode .....

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P

Inland	World-Surface	Europe-Air	World-Air
£10.80 ☐	£11.65 ☐	£16.30 ☐	£24.40 ☐

PAYMENT ENCLOSED: £ —

Cheques should be made payable to Amateur Radio. Overseas payment by International Money Order, or credit card.

CREDIT CARD PAYMENT VISA ☐ Access ☐

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Signature AR0984

THE G8FR HYBRID

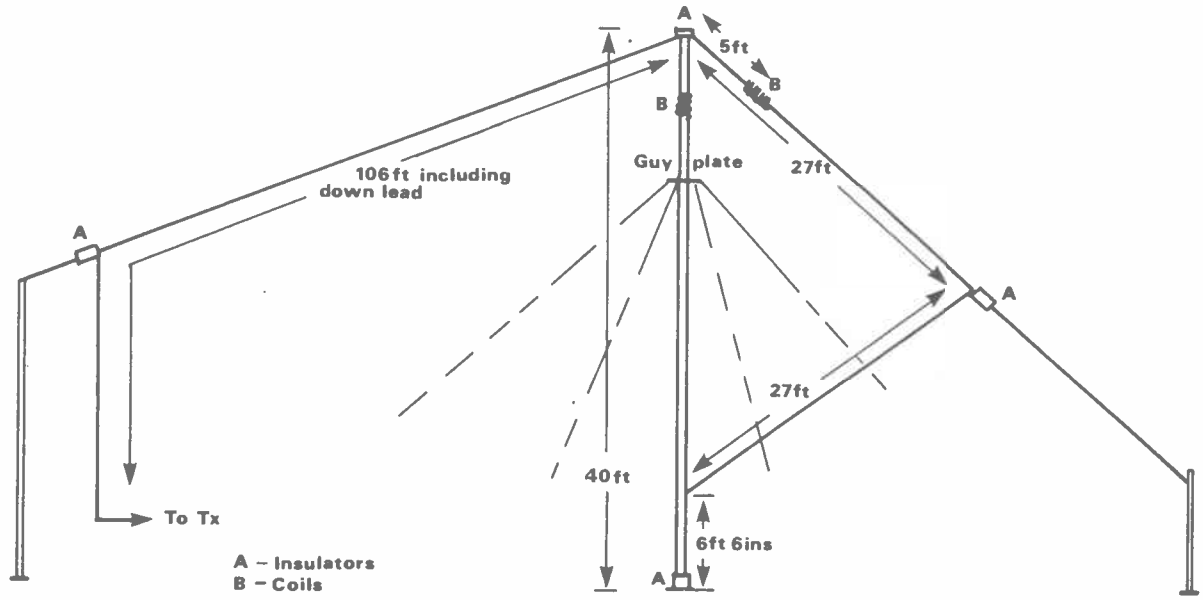


Fig 1 *The layout*

Among the many changes in the amateur radio scene over the last decade or so, perhaps the one that has occurred on 160 metres is the most pronounced. In the past, although DX had been worked on it for many years, it was mainly a band for local contacts, coming to life in the late evenings and over the weekend period with phone and CW. It is still used in this way of course, but the emphasis has considerably changed with the opening up of our lowest frequency band to many other countries, and with improved techniques in equipment and antenna systems.

After moving to a location where a half-wave 160 metre dipole at a good height was not possible and with a garden of only half this length, thoughts were turned to the loaded vertical. Because of the decline in the sun spot cycle and the decrease in activity on the HF bands with a corresponding increase on the LF bands, a fresh approach was thought necessary to find an antenna to cover the latter. An 80 metre inverted vee had been tried on 160 metres, but it was concluded after many fruitless calls that the radiated signal was plainly not at a low enough angle to achieve anything but local contacts.

by W HAZELDEN

Therefore a vertical radiator was erected using a telescopic mast with a length of 38ft 6ins. Ground mounted, it was suitably insulated at the base with a short length of heavy duty plastic pipe. A loading coil was inserted near the top of this radiator using a 1¼in former with 70 turns of close wound 16g enamelled wire. New and good quality wire was used for this coil. The completed radiator after erection was then tuned to 3.9MHz using a GDO at the base. Some adjustment of turns will always be necessary according to surroundings and the type of vertical radiator used.

As it was not intended to operate solely on 160 metres, a coil and a variable capacitor were fitted into a waterproof box and coax taken from this to the transceiver. A 4ft copper rod and two buried radials completed the installation. Good results were obtained on 80 metres and other bands but unfortunately the required results were missing on Top Band. The practical disadvantages of this arrangement, with retuning required for each change of band, led to the idea of the vertical being discarded.

The inverted vee was re-installed, keeping the vertical in situ and using this as a mast, but with the length increased and with a further loading coil inserted. The inverted vee had to be insulated from the mast *(see Figure 2)*. An 18in long piece of dowelling was force fitted into the top section of the vertical leaving a separation of 1ft between the vertical and the wire. Part of the wire was doubled back onto the base of the vertical and the other end brought down to bring the now end-fed antenna into the operating position. This was connected to an 'L' match tuner with a roller-

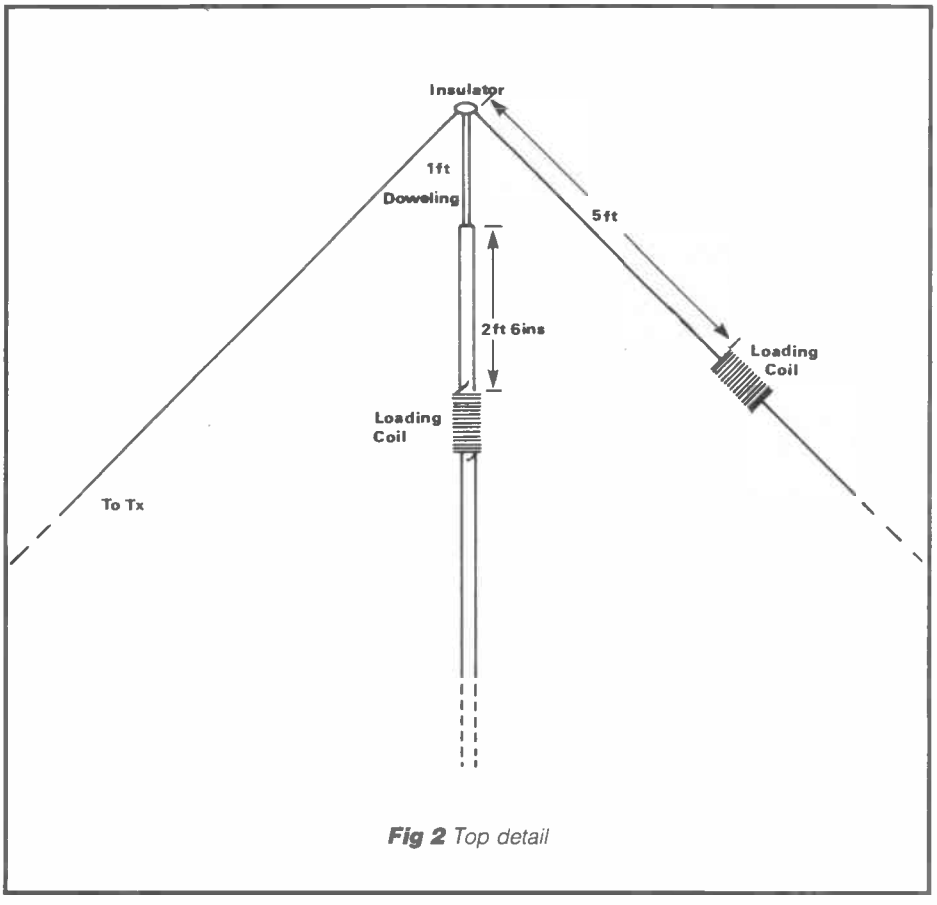


Fig 2 *Top detail*

coaster and variable capacitor, which had been transferred from the base of the vertical. A tapped coil will serve equally well here but the infinitely variable inductance is more convenient.

The transceiver was connected to the usual earth rod and also a buried radial of about 120ft. The extended antenna wire and the vertical connected in this way now resulted in a total length of nearly 200ft. Reference to *Figure 1* should make this clear.

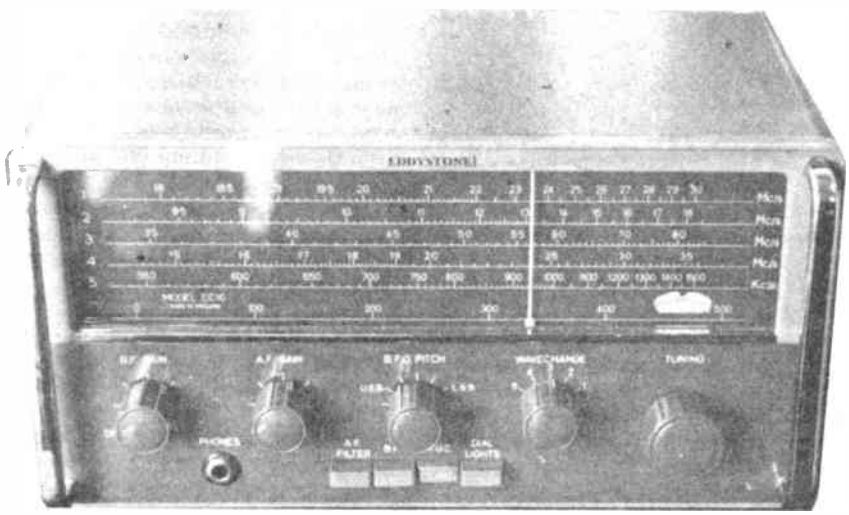
On test the improvement in performance was immediate and very marked, contacts with East Coast USA stations being made whenever conditions were suitable. It was found that the doubled back portion of the wire could be attached to the vertical at 6ft 6in above ground: very necessary for practical reasons, and with no difference in results.

On 80 metres reports were also satisfactory with good contacts with the USA and ZL, etc. Reports on the other bands indicated that the combination of inverted vee and vertical was not inferior to results that would be expected using a normal wire antenna at this medium height.

No two situations are quite the same and if this design could not be fitted into your particular space, it is hoped that there may be ideas in this short article which might generate variations on the hybrid theme and prove of use to others.

THE STORY OF THE AMATEUR COMMUNICATIONS RECEIVER

by
Bill Sparks
G8FBX



The Eddystone EC10

This year is a significant moment in time for amateurs since 1984 sees the 50th anniversary of the birth of the amateur communications receiver. It all started in 1932 when James Lamb wrote his classic article in *QST*, the monthly magazine of the American Radio Relay League, which is the equivalent of our RSGB.

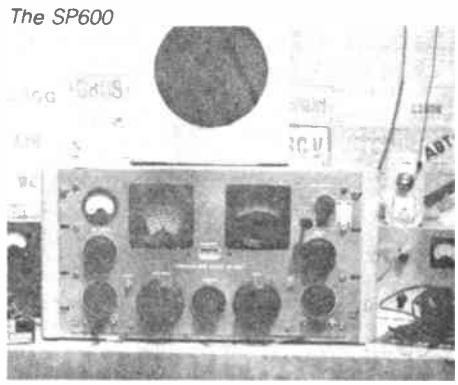
The June 1932 edition of the magazine carried his article entitled 'What's Wrong with our Receivers?' Prior to this date nearly all amateurs used straight receivers of the 1V1 or RF, Detector, audio type. The detector stage was made regenerative to improve gain and also, when sufficient feedback was obtained, to create an oscillating detector to receive CW. The selectivity and general stability of these receivers did not keep pace with the requirements of the age and Lamb's article advanced many revolutionary ideas. Together with a later article he suggested methods of obtaining selectivity and stability that are in common use even today.

The real problem involved in taking advantage of these ideas was component cost and the superheterodyne receiver suggested by Lamb replaced the standard concept of a receiver of that day as used commercially, occupying a six foot rack with standard 29in wide panels and weighing several hundredweight.

Lamb's condensed version in a cabinet some 19in x 8in x 12in certainly created interest among the amateur fraternity and by 1934 many amateurs had built versions of this 'Single Signal Superhet' as it was known.

Around this time the domestic market was changing from straight receivers to superhet versions and the so-called 'All Wave' receivers appeared on the market. This meant that cheap components capable of a certain degree of performance on the short wave bands became available and Bill Halligan started to produce receivers specially made for the amateur market using such components.

The SP600



Halligan started up in a back street garage in Chicago and soon established one of the best known names in the history of amateur radio – Hallicrafters. Bill's first receiver appeared on the market in October 1934 as the Skyrider and was closely followed before the end of the year by the RCA 136, the Paterson PR12 and the fantastic National HRO which set new standards in receiver performances. Another company entering the field was RME with the RME9 receiver.

The market settled into three groups, cheap and cheerful dominated by Hallicrafters, the middle level receivers basically RME and top class by National. This was the situation in early 1935, but more was to come.

Lamb in the meantime had developed superior designs for RF amplifiers and oscillators and vastly improved filters using quartz crystals. The advances in design meant that stability was of paramount importance and around this time Hammarlund produced the Comet Pro. This was the forerunner of the Super Pro series of receivers which came to be acknowledged as the Rolls Royce of receivers in the late 30's. The final Super Pro was the SP600, produced up to the

The SX28

1960s and still a popular receiver today.

The mechanical ingenuity shown in the varied models of tuning dials was amazing. The finest dials of all were produced by National with the superb HRO drive and the Velvet Vernier dial. The HRO drive was copied during WWII by many countries for use on precision instruments, and the writer possesses a British version made by GEC which is a masterpiece.

The HRO used plug-in coils and was a nine valve receiver. It kept the plug-in coil arrangements right through to the 1950s.

During the late thirties receiver development galloped ahead, and the HRO was changed to octal base glass valves around 1936 and to metal valves around 1938.

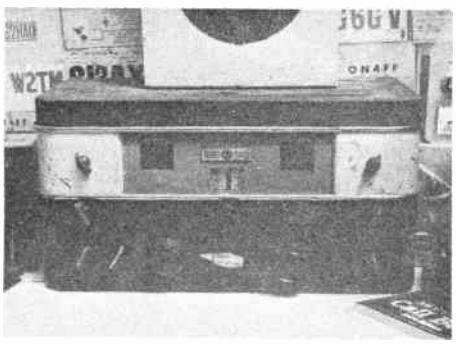
The cheapness of the coils available in the early days meant that bandswitched ranges were the vogue. The losses entailed, however, caused the better class manufacturers to use other techniques, which will be discussed shortly.

As mentioned, Bill Halligan created a revolution in amateur radio with his approach. Prior to his day, all communication receivers had been carefully assembled using specially designed and expensively produced components. Halligan used ordinary run of the mill components as produced in their thousands for the domestic 'All Wave' receivers and brought production costs down dramatically. His orginal Skyrider was a seven valve receiver.

With the prospect of war many receivers were rebuilt in military fashion, especially the HRO, Super Pro and SX 28. The SX 28 of Hallicrafters was produced in tens of thousands for the SCR 399 communications vehicles which were standard equipment in the US forces. The HRO was used by the Royal Navy as a monitor receiver in large quanitites. The main stations for monitoring Japanese traffic in the Far East consisted of banks of up to forty HROs. They were also used in large numbers by the RAF as HF receivers in Bomber Command ground control. Many other receivers were adopted for military use and it says a lot for the original designs that very few variations were required to meet military standards.

A rather interesting development took place during this period. The RAF produced the 1084 receiver for long distance communication purposes. This receiver was a battery operated unit and had separate plug in coils for each stage and each band. The IFs used were varied from band to band, so they were also plug-in coils. One factor of interest is that the IF coils had adjustable bandwidth so that varying degrees of selectivity were available. This technique was copied by the American army in the highly successful Command Set receivers. The 1084 was in current use early in the war period as a monitoring receiver used by spy surveillance sections of the RAF, especially on the Irish border, and gave an excellent performance.

Eddystone in the UK brought out the 358X during the late thirties and this



The AR77

receiver had an excellent peformance in its day. The letter 'X' in the type numbers of the Eddystone and Hallicrafter series indicated that the particular receiver was fitted with a crystal filter.

James Millen left the National company at the turn of the decade and started his own business as a component supplier to the amateur market, producing very high quality components at reasonable prices together with ancillary test gear to enable the amateur to get the best out of his home constructed equipment. This in itself was a revolutionary move since the amateur now had professional quality components in an amateur price range.

One of the most popular receivers in service use was the AR77. This receiver had a very good coverage and excellent bandspread. During the early part of the war an improved version of the Navy CR100 Marconi receiver was developed. Due to wartime limitations this set could not be built in the UK so RCA in Canada were given the job. Based upon the concept of the CR100 and SX28 the superb AR88 was developed. This receiver is in use in many shacks today, at least forty years after its original design date, and still gives excellent results.

Hallicrafters designed VHF Superhet receivers which came on to the market in 1938/39. A typical model was the S27 (16/140MHz range). This receiver was originally used by the RAF to identify the German navigation beams used by their bombers in the Blitz and a licensed amateur, Corporal Mackie from the RAF, was given the job of operating it. The RAF thought that being an amateur receiver, special skill was necessary to operate it.

The modern-day receiver bears little resemblance to its predecessors, but with all its sophistication does not hold the glamour of these old clunkers. The writer has a National HRO with all coils dating back to 1935, which is still working with its original valves and which gives excellent performance. Using it brings back many happy memories.

One intersting feature was that, in common with some National receivers, waveband switching was brought about by sliding a die cast tray along runners. The coils were fixed in this tray and wipers made contact with their opposite numbers fixed to the main chassis and directly adjacent to the corresponding valves. This technique eliminated long leads at RF and was basically an automated form of a plug-in coil idea. Later versions used coil turrets and this idea was copied in certain British military receivers.

Bill Halligan has sold out his interests in Hallicrafters and lived in Florida until recently. At one time he ran four large plants in the Chicago area, all starting from a back street garage only fifty years ago. He was still on the bands up to a few years ago. Many of the old original names are no longer around due to the Japanese attack.Hallicrafters and Johnson are in commercial radio. National

The S27

went bust but were re-started. Hammarlund are still operating in the commercial market, as are RCA. RME have vanished, leaving some very pretty relics of their period in the RME 69 and its companions. James Millen still supplies components specially made for amateurs, as do Johnson.

The receivers that have established happy memories in the writer's mind include the Hallicrafters series, especially the SX28 and the original Sky Buddy, the National HRO of course, Super Pro although it was an enormous set up, RME 69 with the DB 20 preselector and the fabulous AR77.

The whole picture changed in post war years when Art Collins produced the 75A receiver with a tuneable IF and fixed front end, thus signalling the arrival of the receiver as we know it today. After over fifty years association with amateur radio the writer looks back with fond memories to the days of the old receivers and the special skills required in extracting the last ounce of performance from them.

R WITHERS COMMUNICATIONS

AUTHORISED YAESU

VHF • COMMUNICATIONS • UHF

584 HAGLEY ROAD WEST, OLDBURY, WARLEY
B68 0BS (QUINTON, BIRMINGHAM) W. MIDS.
Tel: 021-421 8201/2 (24 HR ANSWERPHONE)

Access VISA

RWC SPECIAL OFFERS
DEALERS OF ICOM, FDK, TRIO, KENWOOD

INSTANT FINANCE AVAILABLE TO ALL LICENCED AMATEURS SUBJECT TO STATUS. VIA LOMBARD TRICITY + NORTH-WALES TRUST

NEW TRANSCEIVERS & RECEIVERS – BEST BUYS

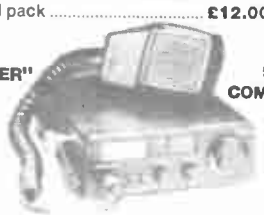
		P & P
Yaesu FT203R Handheld from	£149.00	£2.00
Yaesu FT290R World Best Seller. Free listen on input mod	£279	£2.50
Mutek front end fitted instantly at	£35.00 or with 290 £309.00	£2.50
Hamaster FM 2025–25w 2mtr mobile	£179.00	£4.00
FDK Palm II–Ex Demo 6CH 2mtr H/H	£119.00	£2.50
FDK Palm II–Ex Demo 6CH 70cm H/H	£119.00	£2.50
Blazetone FM200–15w 2mtr PRT Shift	£129.00	£3.00
Century 210–AM–FM–SSB Digital PLL SW Receiver 0–30mhz	£199.00	£5.00
Kenpro KT 200 140 -150MHz – HH	£159.00	£2.50
Kenpro KT 200 spare ni-cad pack	£12.00	£1.00

ACCESSORIES — PART OF OUR EXTENSIVE RANGE ON OFFER

			P & P
500mhz 7 Digit Mini Frequency Counter	JUST A FEW LEFT – HURRY!	£59.98	£2.00
40mhz 7 Digit version of above		£39.98	£2.00
Our best selling 50kg loading – Kopek Straight Through Rotator		£38.95	£2.00
Oskerblock SWR 200 maximum power 2kw. Normal price £59.95 –3.5–144MHz only		£39.95	£2.50

SPECIAL

"RWC BEST SELLER"



£47.50 COMPLETE

TRIED 10-FM?

10 METRE FM

UNMODIFIED £33.00 with RPT shift £58.00. All parts available seperately HURRY ONLY 30 left! Some seconds available. please phone Linears – aerials also available + all spares

Complete mod kit for LCL 2740 DNT M40 inc 2 × XTALS, 2 x c's XTAL filter full instructions @ £12.95 inc post.

Phone for special 70cm packages

FT708R 1W/200mw FM portable **£189**

10 memories
Keyboard entry
Best features

STOP PRESS
Come and see the FT726 – fantastic!

70CMS

FT-790R 1W/200mw multimode
All the features of the FT-290R on 70 cms
Incredible value at **£259**

JOIN THE INTEREST ON 70!

Free 70cms HB9CV with every 70cm rig purchased

Excellent range of mobile 70cm antennas in stock

FT730 70cm 10W FM mobile **£239**

FULL YAESU RANGE ALWAYS IN STOCK + MATCHING ACCESSORIES

ANTENNAS — REMEMBER IT'S THE ANTENNA THAT MAKES THE STATION!

Sun KG-144 Triple 5/8 Base	£29.95	£3.00
Hoxin 8/8 Mobile 88	SPECIAL £16.50	£2.00
Sun Double 5/8 KG5 Mobile	SPECIAL £11.50	£2.00
Hoxin DC Grounded	SPECIAL £10.50	£2.00

HB9CV from the company that first made them in the UK. (Don't settle for cheaper immitations)

2mtr HB9CV	£6.99	£2.00
70cm HB9CV	£5.99	£1.00
10mtr HB9CV	£29.50	£3.50

+ All Tonna & Jaybeam in stock

FREE Advice on your Antenna requirements

It's here at last! . . . . .
ARM 7ele "TRACTOR BEAM"

Antenna Research Manufacture

* The Strongest Beam in the World!
* 10.8 dbD Gain (144-146 mhz 1kw)
* Unique Boom & Element Construction – so simple!

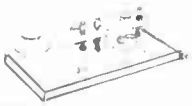
"Have a QSO on one at our shop"

* Posidrive screwdriver needed for assembly
* This antenna represents the latest technology in Yagi beams, can be used portable & phasing kits available. @ £12.50 extra (fits most 2mtr beams)

All this for **£32.80** p&p £3.00 IIe @ £42.80 p&p £3.50
SAE for details or see forthcoming reviews

MAIN DISTRIBUTOR FOR GW MORSE KEYS

* Solid Brass (Polished) 'made in GW LAND'
* Hand Made
* Solid Slate Base
* Personal Call Sign Plate Available.



ONLY £34.50 Plus £2..50 PP

SAE Details
Dealers wanted

REVCO RS2000 SUPER SCANNER

The Scanner you can BUY

Why Wait? Listen NOW!

RWC EXCLUSIVE

NEW

* 70 Memories
* AM-FM (Narrow Band)
* 60-179mhz Continous (depending on Model) + 380-520mhz
* Modifyable 60-520mhz continous **(Out Now) – £299.00 + p&p £3.00**
* Large Clear Red LED Readout
* Push Button Keyboard (No plastic Film)
* Various Models at Prices to suit your Pocket

SAE for more details
From **ONLY £259.00*** P&P £3.00
Please allow 14 days for extended versions
(*Depending on coverage Required)

* GAS-FET Front End Model Availble
* 12v DC + Mains PSU Built in
* Plus many many more facilities

RWC HAVE THE TECHNOLOGY!!

NOW, listen to all sorts of interesting activities! Including the

THE NEW PORTABLE ANTENNA THEY ARE ALL TALKING ABOUT!

ARM Antenna Research Manufacture

Due to increased production – 2Meter Travelling Jim **Now Only £7.95**

NEW

£1.00 Post & Packing. **70cm version £6.95 p&p 50p**

We are confident you will be happy with your Travelling Jim, if you are not you can return the Antenna (Within 7 days) for full refund.

2 metre kit available @ £4.75 +75p P+P

Overseas customers welcome.
We speak German & Japanese.
Import/Export no problem.
Please telephone during working hours or
Telex 334303 TXAGWM-G

Don't Forget We stock almost all Power Transistors/Modules for amateur radios which we import ourselves proving we mean business when it comes to service back-up! — Phone us for your requirements.Part exchange welcome. Please send a SAE for any information you require and our latest s/h list. Full demonstration facilities. E & OE
Why not visit our shop, Junction 3, M5, 2 mins along the A456 towards Birmingham. We promise your visit will be worthwhile

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

One of the biggest worries facing a newcomer to the hobby is making sure that he isn't ripped off financially when purchasing his first rig. As promised last month, readers of this learned column are now privileged to see a list of prices that amateur equipment has actually *sold* for, as distinct from that at which it was advertised. The list covers only working, clean, unmodified equipment that has actually changed hands in the presence of the author (with one exception, details in a minute).

The price is only given when three or more sales have been witnessed, and the start date is 1.1.83. Equipments have either changed hands due to private sales, junk sales, auctions, at rally bring and buys (or flea markets), or in response to advertisements in magazines. If an enquiry is made to a seller over the 'phone and the equipment has been sold, if the seller has kindly indicated the price that it sold for this does count and is the exception referred to above.

The aim

You are obviously free to buy or sell at any price, the aim of the list being to give a 'ball park' figure, and I must stress that a dealer is quite justified in charging more, say even 25% more, to cover servicing prior to sale and after sales service. Please note that neither the magazine nor the author will undertake to give valuations on equipment and accept no liability for any use to which the list may be put.

Crystal controlled rigs normally have three to five channels: add £1 per extra channel. Hand portables are not normally supplied with rechargeables: add £5 if nicads fitted. Seriously modified equipments (and I include minor modifications that have spoilt the physical appearance), or those in poor shape do not count and are worth considerably less. Non-working examples, as a rule of thumb, go for about a third of normal price.

Cast your mind back to the three days of continuous rain laughingly called the Spring Bank Holiday, and the Wireless Revival at Ipswich. Add the fact that a massive new road (the by-pass) has come into being since last year and you will imagine the relief felt by visitors when they saw signs marked 'Rally' at the side of the road. It was an honour to watch streams of aerial laden cars drive into a farmyard at the end of the trail and start shouting at each other – the signs were to a caravan rally! At 9am signs to the real rally were conspicuous by their absence.

Now for the good news: there was not only a flea market, but a car boot sale area as well. Despite the rain everything went well, although I did hear a few grumbles from the bigger traders about not much business happening. The model aircraft display at this event is so good that it would be worth going to see this alone.

The Liner Two

Each month I shall be writing about one item of common amateur equipment. I will try and detail its shortcomings, its good points and its known servicing faults, in other words a mini-review of the equipment. I thought I would start with what is often the newly licensed amateur's first SSB rig, the Liner Two.

The rigs are a bit strange in as much as they generate the signal on ten metres and hetrodyne the signal up onto two. Although interesting in as much as several useful modifications exist to make a ten metre rig (or even a dual band rig) out of them, amateurs in active areas may experience breakthrough. The 'synthesiser' in them is in fact a multiple crystal mix arrangement. The main tuning knob just switches the crystals in 10KHz steps and another knob does the fine tune in between – difficult to use to tune the band when used as a base station but a grade one pain in the neck when used mobile – they are also a bit big by modern day standards and awkward to fit into a car.

Having said all of the above, you probably wouldn't expect this review to get worse, but it does. The main drawback with the Liner Two is spurious outputs. These can be 'in-band', ie totally readable (though sometimes just mush) signals being radiated within the amateur band, or worse, much worse, out of band. Why is this worse? Because the police have allocations up from the top of the band!

To be fair, when these rigs were new they were probably 'clean', but demon tweakers will open the rigs up and tune for maximum output from the transmitter. The more technical amongst you will already know that most amplifiers are not in their most linear mode when giving their maximum output, and couple the uninformed tweak with this rig's tendency towards instability and you have a recipe for disaster. Better to have a clean five watts out rather than seven and a street full of police cars! To be serious, if you know someone with a spectrum analyser, get it checked out prior to use.

The good points? Rugged and reliable. Get a 'clean' one and it will work for ever. The Liner Two had a couple of variants available in this country, the Liner Ten and the Liner Four Thirty, for 10m and 70cm respectively. Although not sharing the same spurious output problems, the drawbacks of the switched synthesiser and larger size are still there.

Due to the list, I've run out of room, but more chat next month, particularly secondhand Icom gear.

Secondhand Price Guide

ICOM	£
IC2E	95
IC22A	60
IC202E	70
IC202S	80
IC211E	255
IC225	95
IC245	120
IC251	365
IC701 + 701PS	345
ICB1035 (10m)	25

TRIO	£
9R59DS	35
AT200	55
QR666	60
RX599	120
R820	325
R1000	120
TS120V	245
TS130S	370
TS180S	385
TV502	45
TS520	280
TS520S	300
TX599	135
TS700	225
TS700G	250
TS770	400
TS830S	470

TRIO	£
TR2200	45
TR2200G	50
TR2200GX	55
TR2300	90
TR2500	90
TR7010	60
TR9000	230
TR9130	325

YAESU	£
FL2100	185
FL2100B	260
FL2100Z	300
FR50B	65
FRG7	85
FRG7700	200
FT7	215
FT7B	225
FT75	60
FT101	200
FT101EE	295
FT(DX)150	130
FT200 + FP200	175
FT220	165
FT227R	120
FT290R	190
FTDX560	180
FT707	295

VARIOUS	£
AR240	85
EA12	130
EC10	45
FS1007P	45
HA700	30
H E30	30
HRO (5 coils)	25
KF430	80
KP202	40
LINER 2	45
LINER 10	65
LINER 430	90
PF1 Rx (NO XTAL)	1.50
PF1 Tx (NO XTAL)	5

MICROWAVE MODULES	£
TV CONVERTER (Rx ONLY)	15
TV Tx	100
MORSETALKER	75
CONVERTERS 4m 2m 70cm	12
TRANSVERTERS:	
2 in 70 out	80
2 in 10 out	50
10 in 2 out	60
10 in 70 out	75
LINEARS	
2m 100 watts (all drive levels)	85
2m 30 watts (all drive levels)	35

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer you the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space. We will accept ads not on our order form.

Send to: ***Amateur Radio Classified Ads,*** Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted.

FOR SALE

■ Ham Int Jumbo, Mark 3, 6 months old, under guarantee £330. Must sell, going abroad. J Tarleton, 499 Burton Road, Midway, Burton-on-Trent. Tel: 0283 221870.

■ Yaesu FRG7 receiver as new with manual £100. Rotel 220 CB with K40 mag mount and SWR meter. All new £35. Tel: 021 742 4033.

■ GEC BRT400 receiver, excellent condition, including manual £80. Smith. Tel: 0278 785246.

■ Trio R-2000 communications receiver, memory, scan, tuning-speed, timer record, etc. Little used, boxed, mint condition £295. Buyer to collect. Tel: Ingrebourne (Essex) 45945, Tom.

■ Realistic DX200 £55 and Sony ICF7600 £25. Both vgc. Will exchange for DX160 or WHY. L J Taylor, 1 Cadley Close, Blandford Forum, Dorset DT11 7RY. Tel: 0258 53933.

■ Wolec legal radio mic, pocket transmitter, mains receiver, 174.8MHz £125. NRD NDH-515, 24 channel memory unit with manual, almost new, £125. Racal diversity unit. MA168B with manual £45. Nombrex, type 31, signal generator, 160KHz to 340MHz £15. Iskra Unimer 3 multi meter £9. Decade attenuator, AT201, 0-111dB, 600Ω, audio £12. All plus carriage. Spark Rite SX2000 electronic ignition unit, almost new, £20. For all these items tel: 0704 840328.

■ Yaesu FRG7 communications receiver in excellent condition, suit beginner. Joymatch 500 ATU if required, £125. Tel: 0425 612007.

■ Exchange Yaesu FT227 RB 2m FM mobile rig plus Micronta 9501 oscilloscope and various heat sinks for VHF/UHF scanner SX200N or similar. Willing to make cash adjustment if necessary. Will also consider 934MHz and associated equip as alternative. V Wyland, 35 Beechway, Maghull, Merseyside L31 1HP. Tel: 051 531 7497.

■ Icom IC271E £550. Also PS15, Hirschmann rotator, 8 element J-Beam Yagi, collinear and ⅞ wave mobile whip with gutter mount. All as new in original packing and approx 3 months old. Sell or prefer to exchange for recent HF transceiver with cash adjustment. G3XPO QTHR Tel: Thanet 601187 (after 6pm).

■ Ex-RAF Tx/Rx set, WSC12, superb cond + PSU connection lead and coax plug to fit. Needs PSU £70. Also Yaesu comms Rx FRG7700 still under guarantee, 5 months old CB Serpent UK4000 also included £300. Buyer must collect. E G, 26 Langdale Grove, Brayton, Selby, North Yorks YO8 9BQ.

■ President Madison base station transceiver, Multimode plus Leson DT-251 desk mic, plus GAP 27 half wave vertical and three element beam antenna, £125. Exchange above plus, Raleigh Royal ten speed touring cycle, only three months old, 23½in frame, value £180 for FT101, Sommerkamp TS788, Belcom LS102L, any HF gear, considered. Write or telephone: Paul, 4 Ridgway Road, Luton, Beds LU2 7RR. Tel: (0582) 421534.

■ Kenwood R600 communications receiver plus Yaesu ATU 0-30MHz £175 Tel: Worthing 505296.

■ AOR AR2001 scanning receiver. Brand new. Boxed with power supply unit £299. Also Sony TC399 reel-to-reel three-speed tape recorder in excellent condition £130. T Manning, 24 Croftdown Road, London NW5. Tel: 01-485 4251.

■ FRG7 complete with Amtech 200 ATU and 2m converter. All in excellent cond. Also Codar ATS Tx with power supply. Sell for £150 or swop for 2m transceiver. Tel: Jeff 01-439 6512 (days), 01-803 5235 (evenings).

■ Datong PCI converts any 2 metre multi-mode rig into a superb general coverage receiver, 0-30MHz in thirty synth steps of 1MHz each. No receiver mods required. Plus Amtech 200 ATU and SEM Ezitune for perfect SWL station. All mint. £130 or swop for standard C78 or any 70cm FM rig. Tel: 01-247 6097 (day). Ask for Dean.

■ KW 2000B transceiver with ac power unit, good condition £200. Tape recorder, 5¾ 2-track, good condition, £15, and one £20 ono. E E Goldsmith, 25 Conyngham Close, Ramsgate, Kent CT12 6PQ.

■ Yaesu FR101 Rx complete with 2m, 6m and FM, vgc, £225 ono. DBX model 222 tape noise reduction system and decibel range expander £100 ono. Tel: 01 500 5395.

■ Daiwa infrared mobile mic. No more trailing wire problems and locking PTT. Unit includes second sensor and 2 windshields. New and unused. 4 pin output plug can be adapted to most 2m or 70cm mobile rigs, or even to use in the shack leaving hands free etc, £35. G4WAU (QTHR G1AMO). Tel: 061-427 6586 (weekends or evenings, 6-7pm).

■ Spain San Feliu, Costa-Brava, may suit radio amateur or SWL. Attractive villa, residential area, convenient Gerona airport. 4 double bedrooms, bath, showers, toilets. Lounge 17ft x 19ft, fitted kitchen 17ft x 14ft. One floor. Furnished. Swimming pool. 1200 square metres. Ideal retirement or letting investment, £65,000. Freehold. Photos, details, Alan, G3MBL. Tel: 01-445 4321 (for EA3DJF).

■ Icom IC240 2 metre transceiver £80. Fortop TVT432 70cm transmitter for amateur television £85. Both excellent condition, no offers, genuine reason for sale. Tel: 021-360 9655 (anytime, Ansafone).

■ Labgear, quad spider, eight bamboo canes 14ft, suitable three band, two element quad £15. CDE rotator, AR40, medium duty, approx 60ft control cable £50. US Navy, LM14 freq meter with ac PSU and charts £20. Trio TS515 Tx/Rx, five bands, matching PSU, external VFO £250. Payne, 78 Carver Hill Road, High Wycombe. Tel: 0494 30018.

■ Trio R1000 communications receiver in perfect condition, 200KHz -30.0MHz AM SSB, CW handbook £150, no offers. Buyer collects. F J Scott, 66 Birch Crescent, Hornchurch, Essex RM11 2NW. Tel: Hornchurch 77603.

■ Trio R600 general coverage receiver, 0-30MHz, 6 months old, hardly ever used, mint condition cost £260 accept £200 ono. Still under manufacturers guarantee would swop for 2m mobile transceiver of same value swap for 934MHz CB radio in good condition and same value. Will deliver in radius of 15 miles of Stockton if necessary. Dale Gardiner, 9 Cook Cresent, Norton, Stockton-on-Tees, Cleveland TS20 2NF.

■ Early valve GEC Xtal calibrator. Salford Instruments OSC dial, £9. Old Ekco CB227/4, 12V car radio with external vibrator power unit, £8. Various air spaced tuning condensers (not high powr Tx) for ATU, etc. VHF Tx/Rx on 70MHz, VFO on receive. GCC 69D AM with external 12V p/p, handbook £9. Six E/R round flag batteries 1½V, £5. Tel: 01-445 4321.

■ Moving coil microphone on stand, chromium plated with matching transformer, £12 plus postage. Tel: Harold, 0538 382550.

■ FT708R 70cm synth, handheld, complete with nicad pack, speaker mike, and charger as new, and boxed with manual circuits £170 ono. FDK700EX, 25W 2m/FM, synth, good cond with manual etc £135. Video Genie computer with built in cassette recorder and lots of software EDTASM etc. Offers. 35mm Practika MTL3 as new with teleconverter and sunpack flash. P/X any of above and cash for 2m/70cms multi mode rig. Tel: Dennis (G6HKD) Tel: Weymouth 787747 after 6pm but weekends are best.

■ Eddystone EA12 amateur band receiver 1.8mcs to 30mcs in nine bands. AM/CW USB/LSB slot filter, CW filter, variable BFO. Pitch AGC S meter, 13 valve in excellent condition with manual £100 ono WHY.WE Niall, 4 Ham Road, Worthing, Sussex BN11 2QX.

■ Power supply PLB made by Agfa with all components mounted, only requires 10/22 volts ac supply for rectified, smoothed and regulated, fully variable outputs of 2/15 volts dc positive. Also negative outputs at up to 2 amps £7.50. Buzzer PCB with speaker suitable for Morse practise, only requries 3-9 volts dc, adjustable tone (3 positions) £2.50. Tel: Kings Langley 63773.

■ Sagem 5 ASR teleprinter + RTTY TU. Compact TTY complete with tape perf/reader. Electronic Baud rate switchable 45.45 50 75 with 70 rolls 2 ply paper. TU comprises BPF/PLL 20m interface + computer (YYL) interface. Good performer on VHF and HF. Complete ready to run Tx/Rx RTTY system £75. Datong FL3 audio filter with auto notch. Excellent on RTTY/CW and magic on phone. New condx/few months old, cost £129 accept £85 ono. Keyboard, neat, cased, ex-computer, 86 keys alphanumeric plus 2 numeric keypads. Ideal for use with RTTY/ZX81 Micros etc £5. Mains spike filter, stop mains spikes on computers/radio rigs etc, 10amp uncased ex-computer £2.50. G4PEY Horsham (0403) 69835.

■ Kenwood TS830M (same as TS830S but with AM), 9 bands Tx/Rx, AT230, 200W ATU power meter £550 ono. Yaesu FT480R, 10W, 2 metre multimode £295 ono. All mint with original packaging etc. Tel: St Helens 817144 after 5.30pm (G4WZS QTHR).

■ Exchange Robot model 800, dedicated RTTY, CW slowscan terminal unit for BBC 'B' computer. Excellent, with manual, leads, etc. Sharp M280A computer, mint, with manual, several books on programming, only £199 for quick sale. Complete with inbuilt screen and cassette unit. G6GUW, Newsome, Wits End, Stillington, North Yorks YO6 12F. Tel: 0347 810066.

■ Robot Model 400 SSTV converter with two extra W9NTP memories for colour RGB or black and white SSTV pictures. Sensible moderate offers invited to Thurlow, 2 Church Street, Wimblington, March, Cambs. Tel: 0354 740255.

■ FT767DX Summerkamp, FU707DM Digiscan, FC707 ATU, Yaesu FP707 turner desk, mike, aeriel and rotor cable £750 ono. Siltronix 1011D Commanche speaker, external Digiscan and power mike £250 ono. Tel: Stevenage 0438 316171.

■ Yaesu FT225 RD, Mutek front end, as new with hand book, original carton, sensible offers. Collins 7553 amateur bands receiver,all crystals fitted, unmarked, sensible offers. G6NJJ QTHR. Tel: 0695 26527.

■ Brand new, Jaybeam amateur radio UHF antenna MBM, 48 element, 70cm, 50ohms £30. J Whyte, 5 Derby Road, Old Skelmersdale, Lancs. Tel: Skelmersdale 26368.

■ Rye MF6 AM E Band, 68-88Hz, low band 12KHz, c/spac, 5W RF, 10 channel, complete with service manual mobile cradle. Good condition, working order, boxed, cost £100. Nickel C/batteries for Marconi RC555, AM/FM sets, battery type BC1240, fit GEC. Dymar sets, new £25 each. Tel: Bishops Stortford 0297 56017 (after 7pm).

■ AEA BT1 Morse tutor £35. Creed 444 and Radio Products terminal unit £95. Jaybeam 6 ele quad, 2m, £24 unused. Altai UH74, 50MHz to 430MHz PWR/SWR meter £18. 3.5a power supply £6. HK703 key £10. Set Brooks terminal unit PCB's £10. John, G4VOZ. Tel: 0455 209125.

■ IC02E hand-held transceiver complete with rubber helical aerial, charger and carrying case, 6 months old, hardly used £200. G S Beynon, Bungalow No 1, Raca-Decca Tx Station, Llancarean, Barry, S Glam CF6 9AR. Tel: 04468 261.

■ Midland home base F/Ms, Bremi 200 watt burner, power microphone, Echo adaptor and Mighty magnum four aerial. All as new, will not split. £180 ono. Tel: Telford 0952 595489.

■ Microwave Modules MM4001 key board, RTTY

FREE CLASSIFIED ADS

FOR SALE

transceiver £200. Microwave Modules MMS2 advanced Morse trainer £100. Microwave Modules MMT28/144, 2m, input 10W, 28MHz output, £45. Thandar, divide by ten, 600MHz prescaler, standard 658 2m multimode portable £165 with nicads and charger or £175 including sun ⅝wave mobile ant. Fincher, 27 Albert Street, Tring, Herts HP23 6AX. Tel: Tring 6752 (24 hour answer).

■ IC4E with mains PSU £180. TS430S with FM, SSB filter, Shure 444 mic, PS30 PSU, £810. Mobile mount for TS430S with G-whip ant £45. Total £1035, will take £950 the lot. Jim Harding, G4PFB. Tel: Wendover, Bucks 623802.

■ Original Vibroplex mechanical bug key, very good condition, £15 only. Also Bolex sound super 8 camera in mint condition. Gunuine offers invited. Tel: Sapcote 2955. G3HNP.

■ Icom two metre FM handheld transceiver IC2E in mint condition plus mobile fist mike/spkr plus car accessory lead complete with nicad and charger, hardly used, £80. Tel: (G3HNP) Sapcote 2955.

■ Antique radios and things. General radio sig/gen battery operated 1935ish. Grid Leakes pocket phone radio early 30s. Ardron 2 valve radio early 30s. Amplion battery and accumulator eliminator. 19 set and power pack. High quality decade air condenser. Simrad add-on echo sounder. Transformer mains in 2240 volts out about 1½-2 kilowatt weight 75lbs. Furuno 4 unit radar 24 volt 35 mile range. Exchange any of the above for test gear, money, general coverage receiver, 35mm camera Practika or Leica accessories, Hartley 13a scope working or not must be complete, Marconi TF1330 scope complete or EHT panel only. A Keys, Mill Lane Farm, South Somercotes, Louth, Lincs.

■ Ten-Tec Argonaut 509 in excellent condition £300. Trio linear amplifier TL-911, 2KW input £230. Three 10-foot lengths tower sections £60. Buyer arrange collection. Martin Wills, G3ZZS, 21 Woodford Road, Glenholt, Plymouth, PL6 7HX. Tel: Plymouth 707550.

■ Class D wavemeter and phones converted to mains input £28. Crystals 39, top band frequencies £2 each, three for £5. Ten channel aircraft transceiver 100MHz to 146MHz £45. 19 set mains input £65. AVO model 7, new condition £65, with new set leads. 140W SSB mains linear 26MHz to 30MHz £69, new condition. 1475 receiver and power unit £65. Wanted Racal RA17, RA117 receiver, will exchange or swop. The 'Moorings', Halvarras Rd, Playing Place, Truro TR3 6HD. Tel: 0872 862575.

■ Ham International Jumbo FM, AM, LSB, USB, 100Kc shift, mid, hi, lo, plus mini beam with rotator, antenna matcher, 250W linear amp, all as new, orig packaging. Owner now licensed. £350 ono, sell as complete station. Tel: Camborne 0209 719544.

■ Datong Morse tutor in original box, little used £40. USA Navy wartime receiver, type CIH 46159A, 1500-12000Kcs, made by Hamilton Radio Corps £15, postage extra. Transformer 240V ac input, 24V output at 40amps £25 postage extra. D J Thompson, 112 Lexton Drive, Southport PR9 8QW. Tel: 20003.

■ Vintage valves, CV1079, CV511, CV1085, VR55, EBC33, ACVP2, PL38, PZ30, 6V6GT, 6J5G, Plessey Mk4s, old pots, VAR condensers, old field loudspeakers, old relays. These belonged to RAF chap who died on service. The lot may be taken free but for a small contribution to the RAF Benevolent Fund. Museums etc may be interested. Vincent, 55 Kestrel Road, Basingstoke, Hants RG22 5PW. Tel: 0256 26058.

■ Bearcat 200 scanner. Swap 4-colour Genie Spectrum 48K or equivalent. Steve Keel, Fortune Field, Baydon, Wilts SN8 2HZ.

■ Hygain 5 AM, FM, USB, LSB, CB, 26.325-28.305. Also Stalker XX home base CB, all mode, many features. Zetagi 26-30MHz linear amp, 100W, AM, FM, 180W SSB and Leson DT 251 base mic. Sell for £200 but would prefer swap for Yaesu FRG 7700 HF receiver. Tel: 0738 28120 (ask for Greig).

■ Trio HF transceiver TSS10, 7 band 3-5 to 29.6 LSB, USB, CW. Also matching VFO 50 using same frequencies with TS510 power supply unit and built in speaker. Used only for listening last nine months so no aerial for transmit. Bring as much test equipment as you want and try it. Offers around £200. Call anytime. R Dunn, 107 Chorley St, Bolton, Lancs, BL1 4AL.

■ Electric diagram scanner AR2001 £3. Xerox copy of service manual £7. Air and meteo code manual, discloses those RTTY 5-figure transmissions and others £11. Worldwide frequency list 10 to 160KHz £7. Utility stations lists CW/SSB/FAX or RTTY £12 each. Wanted: TWT's 18GHz upwards. Crispino Messina, I5XWW, Via di Porto 10, 50058 Signa FI, Italy.

■ Realistic PRO2008 scanning receiver. Scans up to 8 channels from 68-88MHz, 144-174MHz, 410-512, full working order £60. S Davies, Woodley, Cheshire. Tel: 061 494 2729.

■ Sony ICF 7600D, 150KHz to 30MHz, superb portable communications receiver, perfect condition, two months old, complete with all accessories and handbooks. Cost £170, asking £130. Tel: Uttoxeter 3495 (evenings).

■ Icom 290E HM10 scanning mic, SM5 base mic mobile mount 9 ele. Tonna. All vgc £300 or swap HF rig FT707 1012 Trio 120V WHY. Tel: Stevenage 350310.

■ Buzzers on small PCB 3in x 1¾in with 4 resistors, 3 diodes, 2 capacitors, 1 transistor with 4 screw terminals one common one soft one med one loud tones, new £2 each. Mixed bags of components, resistors/capacitors/transistors with some other devices, pack of 100 + £2.50. All new except oddments. Crocodile clips 1½in long, 10 for £2. Space needed in shack. Full money returned when sold out. D Martin, 29 St Johns Close, Leatherhead, Surrey.

■ Heathkit Apache Tx, 40.10m. Heathkit SB10U SSB adaptor. Star 700 a/bands Rx. £75 ono. T W Cooper, 82 Daken Grove, Haxby, York, YO3 8QZ. Tel: York 769414 (evenings).

■ Transceiver multi-mode, 10m, 11m and 27MHz USB and LSB, £195 good condition. Realistic monitor, six wavebands, Dx/60 £20. Tel: 01 207 0706 (evenings).

■ Sommerkamp FL200B SSB transmitter and FR100B receiver, both with instruction manuals. Yaesu hand held microphone. Equipment not used since 1973 so in very good condition, £200 ono. B Portrey, G4BNG, 12 St Peter's Drive, Conisbrough, Doncaster, DN12 2ER. Tel: Rotherham 863217.

■ Yaesu FRG7700M comms Rx plus Microwave Modules MM2001 RTTY to TV converter. Complete and little used. Sorry, can't split, but only £330 together. P Ellis, Gatehouse Studio, London Road, Blewbury, Oxon. Tel: 0235 850693 (evenings).

■ Trio R1000 receiver, immaculate. Original packing and manual, £210. Tel: Taunton 53904.

■ Belcom LS202E 2m, FM, SSB, soft case and quarter wave telescoping antenna plus .875λ vertical and base mount. Only used for two weeks, £225. Tel: 01 247 8131 ext 287 (working hours).

■ Trio TS830S with narrow CW filter £550. Bedford, G4NJP, 39 Hamilton Road, Bridlington, Yorkshire, YO15 3HP. Tel: 0262 73635.

■ AR88 receiver. Meter and improved front end. Very sensitive for AR88 and in very good working order. Spare valves inc £70, no offers. Five fig freq countr, small, in good cond, red display £20. Original RCA manual to go with AR88 inc CCT diags inclusive. Sheer. Tel: Maidstone 672116 (pm).

■ Fully protected 30A PSU £40, lambic keyer £10, Creed 656 paper tape reader £4, Pye Vanguard £9, Pye Cambridge £9, Top Band DSB Rx £15, Morse key £1.50; 2m FM Tx 5W output, 3 channel £10, Hudson Tx/Rx £9, 4m FM, Tx, 40W o/p £15. Fully protected 20a PSU £32, resistors in packs of 210 for £1 or 2 packs for £1.60. Gino Martorano, 81 Sapcote Drive, Melton Mowbray, Leics. Tel: 0664 500228.

■ Model R107 receiver covers 1.2MHz thro 17.5MHz, AM, SSB, old, large and heavy. Works OK, good cond £15 ono or swap CB gear, or WHY. Buyer collects. Gary. Tel: Reading (0734) 303492.

■ Complete VHF FM station, Yaesu FT230R, Welz SP15m, SWR PWR meter, Bremi 10amp PSU, 6 element quad, all boxed and in excellent condition. Will split if enough interested. Will supply a photograph for 50p. Tel: 0685 74061.

■ Trio R1000 communications receiver, excellent condition, boxed as new, matching speaker, Gloabal ATU as new. Bargain £180 ovno. With digital readout AM wide USB, LSB, CW. AM narrow 200KHz, 30MHz 301MHz bands. J A Loveland, 19 Alowyck Way, Pakefield, Lowestoft, Suffolk.

■ Radio valves, new and still boxed, ECL82 70p, EZ80 60p, UCH81 75p, UABC80 65p, UCC85 70p, UL84 £1, UY85 60p. 8 pin IC sockets, 10 for £1; 14 pin, 10 for £1.20. Also some bags of mixed components, over 100 items £2.50. List of electronics gear to clear send SAE. Space needed in shack. D Martin, 29 St Johns Close, Leatherhead, Surrey.

■ FT250 HF transceiver plus mains PSU/speaker and fan £200. TR7850 2m FM mobile transceiver 50W o/p, boxed £200. FT208R 2m FM handheld plus 2 nicad packs, charger, speaker/mic, PA3 mobile adaptor, boxed £170. Daiwa CN620A SWR/power meter, boxed £40. Daiwa CS201 coax, switch, boxed £7. Welz AC38M ATU, boxed £50. DL600 600 watt dummy load, boxed £25, HK708 morse key, boxed £7. Trio HS6 headphones, boxed £10. Shure 450 desk mic £20. All above transceivers and accessories in vgc. Signal gen CT53, 8.65-300MHz £30. PFI Tx and Rx plus nicads and charger, crystalled on RB14, £20. Tel: 041 638 3343 (ask for Garrey).

■ Two Bush VHF low band transceivers, Mod TR821. They require PSU and mikes. Also Philips 1502 video recorder which requires attention. Wants any scanner. Buyer arranges collection. Tel: 0333 350993.

■ DR31 Panasonic shortwave 32 band receiver with Yaesu antenna tuner and headphones, perfect condition, only £150 complete. Buyer collects. Tel: 01-440 0476.

■ Oscilloscope, Tektronix 585A with type 82 plug-in, 85MHz bandwidth, dual trace, delayed time-base, accessories, manuals, working order. A very useable scope with a very bright trace even at high speed. Risetime 4ns. £120 ono. Transport to be discussed. (G3VBG QTHR): Tel: Alsager 09363 4641.

■ Icom IC251E 2m trans m/m 50 watt linear AR40 rotator LL12. Beam + all cables and mast + sel beam. £550 complete. Tel: 0642 604408.

■ Yaesu FRG7 receiver, as new, with circuit and manual, £125. Carriage at cost, packing and local delivery free. View any evening, off M1 near Luton. Tel: 0525 220527.

■ Tektronix 585A oscilloscope with type 82 plug-in, 85MHz bandwidth, dual trace, delayed time-base, accessories, manuals, working order, £120 ono. The price is low because I need the space! G3VBG QTHR. Tel: Alsager 09363 4641.

■ Sangamo Weston micro-ammeter, portable laboratory type, Model J82. Three ranges, 150-300-750. New condition £10. Also Pye reflectometer, Model RFL4, new with instructions £36. What offers for pre-WW11 GEC wire recorder, still in good working order? W Walker, 23 Forest Hill, Yeovil, BA20 2PF. Tel: 0935 25225.

■ Video monitor Hitachi 9in, cased, black and white, very solid and very transportable, £50 only. Tel: 01 218 0304 (anytime during the day).

WANTED

■ Trio PSU-PS20 for TS120V, also VFO 120. Write with details and price to C. Booker, 54 Lodge Hill

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer readers the opportunity to sell your unwanted equipment or advertise your 'wants'.

Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space. We will accept ads not on our order form. Send to ***Amateur Radio,*** Classified Ads, Sovereign House, Brentwood, Essex CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted.

FREE CLASSIFIED ADS

WANTED

Lane, Chattenden, Nr Rochester, Kent, ME3 8NR.

■ Swap Casio MT800 stereo electronic organ plus Yaesu FT208R handheld for IC251, or Yaesu FT77 or swap Casio MT800 for FT290R or Standard C58. Mr Keen, 30 Bath Rd, Chiswick, London W4. Tel: 01 995 7339.

■ Astrad Orion, MW, LW subminiature Russian radio with earpiece, manufactured approx 1966. Also wanted, any literature on Hygain 5 rig, manual, circuit diagram, sales leaflets etc, photostat copies OK. J Bellion, 19 Tanfields, New Church Farm, Skelmersdale, Lancs, WN8 8NS.

■ Receiver in good condition, Icom R70Rx, Yaesu FRG7700, Trio 2000 with FM extension preferred. K Faulkner, 2 Blackhurst Road, Lydiate, Liverpool, L31 4JN. Tel: 051 520 1086.

■ Bi-pak stereo, FM tuner, type S450. Ayres, 31 Barr Common Road, Aldridge, Walsall, WS9 0SY. Tel: Aldridge 51591.

■ A Burndept VHF handheld in good cond, for a PF8 with base charger and nicads in good cond. Tel: 0782 612868.

■ Heathkit RA-1 receivers, also pre-war plug in coils and bases by Eddystone and Raymart. Marris, 35 Kingswood House, Farnham Road, Slough, Berks. SL2 1DA.

■ 934 radio, NATO 2000. Tel: 0283 221870.

■ Shortwave radio, Heathkit Mohican RA11, B40, EC10, HR0, CR100, T155, B40, R107. Good price paid. John Savage, 7 Weyhill Close, Pk North, Swindon.

■ Drake 2B Rx. Also 10W, CW, Tx, all bands. Any condition (repairable) considered. Tel: Cheltenham 513395.

■ Good modern DB oscilloscope with probes and manual. Gould, Tektronix. Up to £300 cash available. Details (age, model No). J W Johnson, 6 Waveney Grove, Clayton, Newcastle, Staffs. Tel: 0782 634780.

■ Heathkit HD-1410 electronic keyer kit or assembled unit. Also Shure 444 desk mike or non-working body shell. Tel: Herne Bay 02273 3511 (evenings or weekend).

■ Racal RA 17L, must be in very good condition. State price wanted. G Wegg, 23 Kerdang, Orchard Park Estate, Hull HU6 9EB. Tel: 855052.

■ To exchange for shortwave gear Tx/Rx or WHY. Plustron 2 two/band radios. Polaroid Land cameras. 2 band car radio. Two mini wall clocks railway pattern. Mr A Beecroft, 16 Heol Glannant, Edmondstown, Mid-Glam CF40 IPX. Tel: 0443 438126.

■ US amateur wishes to meet UK amateurs, via mail or HF. HF Skeds OK. I write software manuals, teach Banjo and brew ale and wine. Drop me a line! KD7WS, ex-KA7NYB. John V Hedtke, 8729 Palatine North, Seattle, Washington, USA 98103.

■ Data and application books for Nuvistors. Also books of the 1940's and 1950's on Radar and microwaves. Fair prices paid. Andy Emmerson (G8PTH), 71 Falcutt Way, Northampton NN2 8PH. Tel: 0604 844130.

■ Help wanted to convert Narco Mk12 UK aircraft transceiver for use as mains operated receiver. Require circuit diagram for external connections, power pack, general know-how. Alan. Holly Cottage, Church Road, Halstead, Kent TN14 7HG. Tel: 0959 33176.

■ Exchange President Madison base station, AM, FM, SSB. Plus Leson DT-251 desk mic, GAP 27 half wave vertical, three element beam, value £125, plus Raleigh Royal ten speed touring cycle, 23½in frame, front and rear carriers, bar bag, panniers. Brooks leather saddle. Only three months old, value £180, for FT101, Sommerkamp TS788DX, Belcom LS102L, or WHY. Write or tel Paul, 4 Ridgway Road, Luton, Beds, LU2 7RR. Tel: 0582 421534.

■ HQ1 mini beam in working order. Will collect. (QTHR as G8UQN). Telephone: John G4XJS, 0727 62052.

■ Bendix, type MN26C or MN28C DF receiver. A H Baker, 34 Wenny Estate, Chatteris, Cambs.

■ FT221R multimode transceiver, 1974/1975 period, must be in working order. State price. Tel. Harold, 0538 382550.

■ Very old wireless books, magazines, catalogues. Wartime and pre-war Radio Times. Twenties Gamages catalogue. Douglas Byrne. G3KPO (QTHR). Tel: Ryde 0983 62513.

■ Service manual for Trio TR9130 transceiver. Could photocopy and return with costs. Contact Stan, G3XON, 14 Dagden Road, Shalford, Guildford, Surrey. Tel: Guildford 0483 36953.

■ Trio PS30 or PS430 dc power supply. Also rotator, anything considered. Tel: Stowmarket 0449 672710.

■ Help! Due to let down by rally dealer require any info on Eddystone 840C Rx, especially alignment details urgent. Also same for Hallicrafters Super Skyrider and Labgear LG300 Tx. All to copy and return. Any costs refunded. I also want a 2 metre converter and details of any mods to a Trio JR310 Rx. E Parkes, 1 Silkstone View, Platts Common, Barnsley, South Yorkshire.

■ KW 2000A or similar Tx/Rx. T W Cooper, 82 Oaken Grove, Haxby, York. YO3 8Q2. Tel: York 769414 (evenings).

■ Handbook for reception set DST 100 MkIII, Army reference ZA11322. Your price paid for original or photocopy. K G Whitehead, Bryncroft, Reynoldston, Swansea. SA3 1AE. Tel: Gower 390070.

■ RTTY have BBC Micro and wish to build rig and inter-face. 3.5MHz preferred band. Circuits, books, advice, second hand rig quotes, all gratefully received. State your terms. T Artingstoll, 101A Memorial Ave, West Ham, London.

■ HF QRP transceiver; HW7, HW8 or Mizu Ho, etc, also dc receiver; details/price. Tel: Newbury 40750.

■ QRP Tx and/or Rx, CW/SSB particularly for 80m. Key and mike also required to set up a shack, for a newcomer to Amateur Radio. Have up to £150 to spend. Sorry no telephone. Mark Goodwill, 9 Kemerton Road, Beckenham, Kent. BR3 2NJ.

FREE CLASSIFIED AD FORM

Send to: Amateur Radio Classified Ads · Sovereign House · Brentwood · Essex CM14 4SE

Classification: (tick appropriate box) If you want to insert ads under more than one classification use separate sheets for second and subsequent ads

For Sale ..... ☐ Wanted ..... ☐

USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone							

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

CONDITIONS: Ads will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted

Amateur RADIO SMALL ADS

ADVERTISERS INDEX

Amateur Radio Exchange 34, 35
Amtronics ..... Inside Front Cover
Ant Products 73

Barratronics 68
Bredhurst Electronics 7
Booth Holdings 72

Cabelec 72
Caswell Press 73
D W Communications 73
PNP Communications 6, 72

Dewsbury Electronics 7, 17
Display Electronics ..... Inside Back Cover

Eastern Communications 73
M H Electronics 73
Eurolec Video Services 73

Garex Electronics 16
Grosvenor Software 72

Keytronics 57

Lowe Electronics 4, 5

Microwave Modules ..... Outside Back Cover
G W Morse Keys 73

PM Components 52, 53
Paul Sergent 73
Pinehurst Data Studios 72

RAS (Nottingham) 42
Rapid Results College 68

Selectronics 42
Southdown Radio 72
J Sykes 72

TMEC Ltd 72
Thanet Electronics 26, 27, 28, 29
Timestep Electronics 40

VSWK 56
Viola Plastics 72

WPO Communications 6, 63
Weirmead Ltd 68
W H Westlake 56
R Withers Communications 66
Wood & Douglas 42

Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛ page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

depth mm x width mm	ad space	1 issue (colour rates exclude cost of separations)	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Oct 84	30 Aug 84	5 Sep 84	7 Sep 84	27 Sep 84
Nov 84	27 Sep 84	3 Oct 84	5 Oct 84	25 Oct 84
Dec 84	25 Oct 84	31 Oct 84	2 Nov 84	22 Nov 84
Jan 85	22 Nov 84*	28 Nov 84*	30 Nov 84*	27 Dec 84

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

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

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations.

Printed — web-offset.

PAYMENT
All single insertion ads are accepted on a pre-payment basis only, unless an account is held. Accounts will be opened for series rate advertisers subject to satisfactory credit references. Accounts are strictly net and must be settled by the publication date.
Overseas payments by International Money Order.

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

Commission to approved advertising agencies is 10%.

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

COMPUTER WAREHOUSE

1000's OF BARGAINS FOR CALLERS

THE 'ALADDIN'S' CAVE OF COMPUTER AND ELECTRONIC EQUIPMENT

HARD DISK DRIVES

Fully refurbished DIABLO/DRE series 30 2.5 Mb disk drives.
DEC RK05, NOVA, TEXAS compatible
Front load. Free stand or rack mount £350.00
Exchangeable type (via lid removal) £295.00
me3029 PSU unit for 2 drives £125.00
DIABLO/DRE 44-4000A/B 5+5 ex stock from £995.00
1000's of spares for S30, 4000, 3200, HAWK ex stock
Plus in house repair, refurbishing service.
Call for details or quotation.

HOT LINE DATA BASE

DISTEL©

THE ORIGINAL FREE OF CHARGE dial up data base
1000's of stock items and one off bargains.
ON LINE NOW – 300 baud, full duplex CCITT tones, 8 bit word, no parity.

01-679 1888

COMPUTER 'CAB'

All in one quality computer cabinet with integral switched mode PSU, Mains filtering, and twin fan cooling. Originally made for the famous DEC PDP8 computer system costing thousands of pounds. Made to run 24 hours per day the PSU is fully screened and will deliver a massive +5v DC at 17 amps, +15v DC at 1 amp and –15v DC at 5 amps. The complete unit is fully enclosed with removable top lid, filtering, trip switch, 'Power' and 'Run' LEDs mounted on Ali front panel, rear cable entries, etc. etc. Units are in good but used condition – supplied for 240v operation complete with full circuit and tech. man. **Give your system that professional finish** for only £49.95 + Carr. Dim. 19" wide 16" deep 10.5" high. Useable area 16"w 10.5"h 11.5"d.
Also available **LESS PSU**, with FANS etc. Internal dim. 19"w. 16"d. 10.5"h. **£19.95.** Carriage & insurance £9.50.

EX STOCK INTEGRATED CIRCUITS

D8085AH-2	D8086	D8257-5
D8202	D8271	AM2764-3DC
74LS86	74LS112	74LS373
7407	2102-6	4116-3

CALL SALES OFFICE FOR PRICES

MAINS FILTERS

Cure those unnerving hang ups and data glitches caused by mains interference
SD5A As recommended by ZX81 news letter matchbox size up to 1000 watt load £5.95
L2127 compact completely cased unit with 3 pin fitted socket Up to 750 watts £9.99

COOLING FANS

Keep your hot parts COOL and RELIABLE with our range of **BRAND NEW** professional cooling fans.
ETRI 99XU01 Dim. 92 x 92 x 25 mm. Miniature 240 v equipment fan complete with finger guard. **£9.95.**
GOULD JB-3AR Dim. 3" x 3" x 2.5" compact very quiet running 240 v operation. **NEW £6.95**
BUHLER 69.11.22. 8-16 v DC micro miniature reversible fan. Uses a brushless servo motor for extremely high air flow, almost silent running and guaranteed 10,000 hr life. Measures only 62 x 62 x 22 mm. Current cost £32.00. **OUR PRICE ONLY £12.95 complete with data.**
MUFFIN-CENTAUR standard 4" x 4" x 1.25" fan supplied tested EX EQUIPMENT 240 v at £6.25 or 110 v at £4.95 or BRAND NEW 240 v at £10.50. 1000's of other fans Ex Stock. Call for Details. Post & Packing on all fans £1.60

SAVE £250 SUPER PRINTER SCOOP

BRAND NEW CENTRONICS 739-2

The "Do Everything Printer" at a price that will **NEVER** be repeated. Standard **CENTRONICS** parallel interface for direct connection to **BBC, ORIC, DRAGON** etc. Superb print quality with full pin addressable graphics and 4 type fonts plus **HIGH DEFINITION** internal **PROPORTIONAL SPACED MODE** for **WORD PROCESSOR** applications. 80-132 columns, single sheet, sprocket or roll paper handling plus much more. Available **ONLY** from **DISPLAY ELECTRONICS** at the ridiculous price of ***ONLY £199.00*** + VAT Complete with full manual etc. Limited quantity –Hurry while stocks last.
Options. Interface cable (specify) for BBC, ORIC, DRAGON or CENTRONICS 36 way plg £12.50. Spare ribbon £3.00 each. BBC graphics screen dump utility program £8.60.
Carriage and Ins. £10.00 + VAT

BUDGET RANGE VIDEO MONITORS

At a price YOU can afford, our range of EX EQUIPMENT video monitors defy competition!! All are for 240v working with standard composite video input. Units are pre tested and set for up to 80 col use on BBC micro. Even where MINOR screen burns MAY exist – normal data displays are unaffected.

1000's SOLD TO DATE

9" HITACHI very compact fully cased. dim. 21cm H x 21cm W x 22cm D. Black and white screen ***£44.95***
12" KGM 320-321, high bandwidth input, will display up to 132 columns x 25 lines. Housed in attractive fully enclosed brushed alloy case. B/W only ***£32.95***
GREEN screen *£39.95*
24" KGM large screen black & white monitor fully enclosed in light alloy case. Ideal schools, shops, clubs etc. ***ONLY £55.00***
14" BRAND NEW Novex **COLOUR** type **NC1414-CL.** Many exacting features such as RGB TTL and composite video input, **GREEN TEXT** key, internal speaker and audio amp. Even finished in BBC micro matching colours. Fully guaranteed. ***ONLY £199.00***
Carriage and ins on ALL videos £10.00

TRANSTEL PRINTERS

EX NEWS SERVICE compact, quality built 50 column matrix printer. Standard 5 bit serial, **BAUDOT CODE** current loop interface for connection to computer or radio receiver via simple filter network to decode and print most world-wide **NEWS, TELEX** and **RTTY** services. Supplied tested and in good condition with data, large paper roll and 50 and 75 baud xtals. ***ONLY £49.95***
Carr. £6.00

GE TERMIPRINTER

A massive purchase of these desk top printer -terminals enables us to offer you these quality 30 cps printers at a **SUPER LOW PRICE** against their original cost of over £1000. Unit comprises of full QWERTY, electronic keyboard and printer mech with print face similar to correspondence quality typewriter. Variable forms tractor unit enables full width – up to 13.5" 120 column paper, upper – lower case, standard RS232 serial interface, internal vertical and horizontal tab settings, standard ribbon adjustable baud rates, quiet operation plus many other features. Supplied complete with manual. Guaranteed working ***£130.00*** or untested ***£85.00***, optional floor stand £12.50 Carr & Ins £10.00.

DUAL 5" DISK DRIVES

Current, quality, professional product of a major computer company, comprising 2 x 40 track **MPI** or **Shugart FULLY BBC COMPATIBLE** single sided drives in a compact, attractively styled, grey ABS structured case with internal switched mode PSU. The PSU was intended to drive both drives and an intelligent Z80 controller with over 70 ic's. The controller has been removed leaving ample space and current on the +, –5, +12 and –12 supply for all your future expansion requirements. Supplied tested with 90 day guarantee in **BRAND NEW** condition with cable for **BBC micro.** Ex Stock at only ***£259.00*** + £10.00 carr. **Limited Quantity Only**

PROFESSIONAL KEYBOARD OFFER

An advantageous purchase of brand new surplus allows a great **QWERTY**, full travel, chassis keyboard offer at fractions of their original costs.
ALPHAMERIC 7204/60 full **ASCII** 60 key, upper, lower + control key, parallel TTL output plus strobe. Dim 12" x 6" +5 & –12 DC ***£39.50.***
DEC LA34 Uncoded keyboard with 67 quality, **GOLD**, normally open switches on standard X, Y matrix. Complete with 3 LED indicators & i/o cable – ideal micro conversions etc. pcb DIM 15" x 4.5" ***£24.95*** Carriage on keyboards £3.00.

SEMICONDUCTOR 'GRAB BAGS'

Mixed Semis amazing value contents include transistors, digital, linear, I.C.'s triacs, diodes, bridge recs., etc. etc. All devices guaranteed brand new full spec. with manufacturer's markings, fully guaranteed, 50+ ***£2.95*** 100+ ***£5.15.***
TTL 74 Series A gigantic purchase of an "across the board" range of 74 TTL series I.C.'s enables us to offer 100+ mixed "mostly TTL" grab bags at a price which two or three chips in the bag would normally cost to buy Fully guaranteed all I.C.'s full spec. 100+ ***£6.90*** 200+ ***£13.30*** 300+ ***£19.50***

TELETYPE ASR 33

DATA I/O TERMINALS

Industry standard combined **ASCII** 110 baud printer, keyboard and 8 hole paper tape punch and reader. Standard **RS232** serial interface. Ideal as cheap hard copy unit or tape prep. for **CNC** and NC machines. **TESTED** and in good condition. Only ***£235.00*** floor stand 10.00
Carr & Ins £15.00

THE BENEFITS OF INSURANCE

Almost four months ago, on the 29th of February 1984, we, DISPLAY ELECTRONICS were unfortunate enough to have a serious fire at our main location, reducing a substantial part of our stock, warehouse and offices to a pile of ashes and rubble. HOWEVER, we had seen the adverts about the "Benefits of Insurance" and some years ago had taken comprehensive insurance cover to protect against an event such as this.
The day after the fire we did not even have a single pen to write with, to say nothing of the non existant showroom and burnt out warehouse with direct access to the stars via our now non existant roof!!
The loss of stock and damage to the premises has resulted in losses in excess of £400,000 pounds in real money – no price can value time and effort.
We are still, although working under great difficulties, **VERY MUCH** in business. We owe this to supreme efforts by all our staff – perhaps knowing their jobs could have been at stake, stock being located at several different locations, help from business colleagues and our bank.
To these people, I say a very loud THANK YOU.
To both the mighty **PRUDENTIAL** and **GENERAL ACCIDENT** Insurance Companies who from the date of our fire have NOT even offered or paid **A SINGLE PENNY** in compensation or have not even offered an ounce of moral support . . .
To both the mighty **PRUDENTIAL** and **GENERAL ACCIDENT** Insurance Companies who only answer our requests for help and information with "We are still looking at reports . . ." I say **"STRONG STUFF THIS INSURANCE????"** .
David Fisher, Managing Director, DISPLAY ELECTRONICS

DATA MODEMS

Join the communications revolution with our range of EX TELECOM data modems. Made to most stringent spec and designed to operate for 24 hrs per day. Units are made to the CCITT tone spec. With RS232 i/o levels via a 25 way 'D' skt. Units are sold in a tested and working condition with data. Permission may be required for connection to PO lines.
MODEM 2B "Hackers Special" fully fledged up to 300 baud full duplex, **ANSWER** or **CALL** modes. **AUTO ANSWER.** Data i/o via standard **RS232** 25 way 'D' socket. Just 2 wire connection to comms line. Ideal networks etc. Complete with data, tested, ready to run at a **NEW SUPER LOW PRICE** of ***ONLY £65.00*** + VAT + Carr.
MODEM 20-1 Compact unit for use with **MICRONET, PRESTEL** or **TELECOM GOLD** etc. 2 wire direct connect 75 baud transmit 1200 baud receive. Data i/o via RS232 'D' socket. Guaranteed working with data ***£49.95***
MODEM 20-2 same as 20-1 but 75 baud receive 1200 baud transmit ***£130.00***
TRANSDATA 307A 300 baud acoustic coupler RS232 i/o **£95.00**
NEW DSL2123 Multi Standard modem selectable V21 300-300 bps, V23 75-1200, V23 1200-75 full duplex. Or 1200-1200 half duplex modes. Full auto answer via modem or CPU. LED status indicators. CALL or ANS modes Switchable **CCITT** or **BELL 103 & 202.** Housed in ABS case size only 2.5" x 8.5" x 9". £286.00 + VAT
For further data or details on other EX STOCK modems contact sales office.
Carriage on all modems £10.00 + VAT.

EX STOCK

DEC CORNER

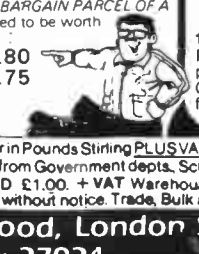
BA11-MB 3.5" Bax, PSU, LTC	£385.00
DH11-AD 16 x RS232 DMA interface	£2100.00
DLV11-J 4 x EIA interface	£310.00
DUP11 Sych. Serial data i/o	£650.00
DZ11-B 8 line RS232 mux board	£650.00
LA36 Decwriter EIA or 20 ma loop	£270.00
LAXX-NW LA180 RS232 serial interface and buffer option	£130.00
LAX34-AL LA34 tractor feed	£85.00
MS11-JP Unibus 32 kb Ram	£80.00
MS11-LB Unibus 128 kb Ram	£450.00
MS11-LD Unibus 256 kb Ram	£850.00
MSC4804 Qbus (Equiv MSV11-L) 256 kb	£499.00
PDP11/05 Cpu, Ram, i/o, etc.	£450.00
PDP11/40 Cpu, 124k MMU	£1850.00
RT11 ver. 3B documentation kit	£70.00
RK05-J 2.5 Mb disk drives	£650.00
KL8JA PDP 8 async i/o	£175.00
MI8E PDP 8 Bootstrap option	£75.00
VT50 VDU and Keyboard – current loop	£175.00

1000's of EX STOCK spares for **DEC PDP8, PDP8A, PDP11** systems & peripherals. Call for details. All types of Computer equipment and spares wanted for **PROMPT CASH PAYMENT.**

66% DISCOUNT ELECTRONIC COMPONENTS EQUIPMENT

Due to our massive bulk purchasing programme which enables us to bring you the best possible bargains, we have thousands of I.C.s, Transistors, Relays, Caps, P.C.B.s, Sub-assemblies, Switches, etc. etc. surplus to our requirements. Because we don't have sufficient stocks of any one item to include in our ads we are packing all these items into the *BARGAIN PARCEL OF A LIFETIME*. Thousands of components at giveaway prices! Guaranteed to be worth at least *3 times* what you pay. Unbeatable value!! Sold by weight:

2.5kls ***£4.25*** + pp £1.25 5kls ***£5.90*** + £1.80
10kls ***£10.25*** + pp £2.25 20 kls ***£17.50*** + £4.75



ALL PRICES PLUS VAT

All prices quoted are for U.K. Mainland, paid cash with order in Pounds Sterling PLUS VAT. Minimum order value ***£2.00***, Minimum Credit Card order ***£10.00***. Minimum BONAFIDE account orders from Government depts., Schools, Universities and established companies ***£20.00*** Where post and packing not indicated please ADD £1.00. + VAT Warehouse open Mon-Fri 9.30 – 5.30. Sat. 10.15 – 5.30. We reserve the right to change prices and specifications without notice. Trade, Bulk and Export enquiries welcome.

DISPLAY -ELECTRONICS-
32 Biggin Way, Upper Norwood, London SE19 3XF
Telephone 01-679 4414 Telex 27924

MICROWAVE MODULES LTD

NEW!

MML 144/200-S: 144 MHz 200 WATT LINEAR AMPLIFIER

NEW!

FEATURES

- 200 watts Output Power
- Linear All Mode Operation
- Suitable for 3, 10 & 25 watt Transceivers
- Ultra Low-Noise Receive Preamp — Front Panel Selectable
- Relative Output LED Bar Display
- Equipped with RF Vox & Manual Overide
- LED Status Lights for Power, Transmit, Preamp on and input level

£245 inc VAT (p&p £4.50)

144 MHz HIGH PERFORMANCE RECEIVE CONVERTER: MMC 144/28 HP

NEW!

FEATURES

- Excellent strong signal handling characteristics
- Gasfet RF amplifier
- High level double-balanced mixer
- Harmonic-free, regulated oscillator

Input frequency range:	144-146 MHz	**Image rejection:**	60 dB
Output frequency range;	28-30 MHz	**Input/output impedance:**	50 ohm
Typical gain:	20 dB minimum	**Power requirements:**	13.8V at 75mA
Noise figure:	2 dB	**Power connector:**	5 pin DIN socket
3rd order intercept point:	+ 19 dBm (output)	**RF connectors:**	SO239 or BNC, please specify

Size: 110 x 60 x 31 mm (4⅜ x 2⅜ x 1¼")

£42.90 inc VAT (p&p £1.25)

1296 MHz GaASFET PREAMPLIFIER — MMG1296

NEW!

This GaASFET 1296 MHz preamplifier is constructed on high-quality Teflon glass-fibre pcb and includes a microstripline filter which provides excellent rejection to mixer image frequencies and out of band signals. It has a power gain of 15dB and a noise figure of 1.2dB. The power requirements are 13.8V at 35mA and the unit is fitted with 50 ohm BNC sockets.

£59.95 inc VAT (p + p £1.25)

MMC50/28S — 6M CONVERTER

NEW!

This new Converter has switched oscillators to provide coverage of 50-54 MHz on a 28-30 MHz receiver. The design utilises MOSFETS in the RF amplifier and mixer stages, and the local oscillator is regulator controlled.

INPUT RANGES:	50-52 MHz 52-54 MHz	**OUTPUT RANGE:**	28-30 MHz
OVERALL GAIN:	30dB	**NOISE FIGURE:**	2.5dB

£34.90 inc VAT (p + p £1.25)

OUR ENTIRE RANGE OF PRODUCTS WILL BE EXHIBITED AND ON SALE AT MOST OF THE 1984 MOBILE RALLIES BY OUR OWN SALES TEAM, COME AND TAKE A CLOSER LOOK

ALL MICROWAVE MODULES PRODUCTS ARE FULLY GUARANTEED FOR 12 MONTHS (INCLUDING PA TRANSISTORS)

Access
VISA
WELCOME

MICROWAVE MODULES (AR)

BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND
Telephone: 051-523 4011 Telex: 628608 MICRO G
CALLERS ARE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E. & O.E.