AN ARGUS SPECIALIST PUBLICATION

April 1985 £1.20

HAM RADIO TODAY

CQ ET?

Radio Amateurs could be the first to communicate with alien intelligence – seriously!

The Vital Link – Exploration and the Role of Amateur Radio

Send MCW on VHF/UHF with your FM rig and our 'KEYDAPTOR'

Micro-7 Budget 70cm Handheld reviewed

DXCC!

GOT A GOOD 'FIST'? Have fun and win a GW Morse Key! Details inside...

electronics today international

BOOK SERVICE

How to order: indicate the books required by ticking the boxes and send this page, together with your payment, to: ETI Book Service, Argus Specialist Publications Ltd, 1, Golden Square, London W1 R 3AB. Make cheques payable to ETI Book Service. Payment in sterling only please. All prices include P & P. Prices may be subject to change without notice.

BEGINNERS GUIDE

☐ Beginner's Guide to Basic Programming Stephenson	£5.35
☐ Beginner's Guide to Digital Electronics	£5.35
☐ Beginner's Guide to Electronics	£5.35
☐ Beginner's Guide to Integrated Circuits	£5.35
☐ Beginner's Guide to Computers	£5.35
☐ Beginner's Guide to Microprocessors	£5.35

COOKBOOKS

☐ Master IC Cookbook Hallmark	£10.15
☐ Microprocessor Cookbook M. Hordeski	£7.70
☐ IC Op Amp Cookbook Jung	£14.25
☐ PLL Synthesiser Cookbook H. Kinley	£7.70
☐ Active Filter Cookbook Lancaster	£13.40
☐ TV Typewriter Cookbook Lancaster	£11.15
☐ CMOS Cookbook Lancaster	£11.85
☐ TTL Cookbook Lancaster	£10.95
☐ Micro Cookbook Vol. 1 Lancaster	£15.30
☐ BASIC Cookbook K. Tracton	£6.00
☐ MC6809 Cookbook C. Warren	£7.25

ELECTRONICS

☐ Principles of Transistor Circuits Amos	£8.50
☐ Design of Active Filters with experiments Berlin	£11.30
☐ 49 Easy to Build Electronic Projects Brown	£6.00
☐ Electronic Devices & Circuit Theory Boylestad	£13.20
☐ How to build Electronic Kits Capel	£3.55
☐ How to Design and build electronic instrumentation Carr	£9.35
☐ Introduction to Microcomputers Daglecs	£7.20
☐ Electronic Components and Systems Dennis	£15.00
☐ Principles of Electronic Instrumentation De Sa	£11.40
☐ Giant Handbook of Computer Software	£12.95
☐ Giant Handbook of Electronic Circuits	£17.35
☐ Giant Handbook of Electronic Projects	£11.75
☐ Electronic Logic Circuits Gibson	£5.55
☐ Analysis and Design of Analogue Integrated Circuits Gray	£30.25
☐ Basic Electronics Grob	£11.30
☐ Lasers – The Light Fantastic Hallmark	£7.70
☐ Introduction to Digital Electronics & Logic Joynson	£5.25
☐ Electronic Testing and Fault Diagnosis Loveday	£7.85
☐ Electronic Fault Diagnosis Loveday	£6.25
☐ Essential Electronics A-Z Guide Loveday	£7.50
☐ Microelectronics Digital & Analogue circuits and systems Millman	£12.70
☐ 103 Projects for Electronics Experimenters Minis	£8.30
☐ VLSI System Design Muroga	£34.10
☐ Power FETs and their application Dxner	£9.40
☐ Practical Solid State Circuit Design Dlesky	£25.00
☐ Master Handbook of IC Circuits Powers	£12.85
☐ Electronic Drafting and Design Raskhodoff	£22.15
☐ VOM – VTVM Handbook Risse	£8.50
☐ Video and Digital Electronic Displays Sherr	£28.85
☐ Understanding Electronic Components Sinclair	£7.50
☐ Electronic Fault Diagnosis Sinclair	£4.50
☐ Physics of Semiconductor Devices Sze	£17.35
☐ Digital Circuits and Microprocessors Taub	£32.00
☐ Active Filter Handbook	£7.60
☐ Designing with TTL Integrated Circuits Texas	£15.20
☐ Transistor Circuit Design Texas	£15.20
☐ Digital Systems: Principles and Applications Tocci	£12.95
☐ Master Handbook of Telephones Traister	£10.00
☐ How to build Metal/Treasure Locators Traister	£6.00
☐ 99 Fun to Make Electronic Projects Tymony	£8.50
☐ 33 Electronic Music Projects you can build Winston	£6.95

COMPUTERS & MICROCOMPUTERS

☐ BASIC Computer Games Ahl	£6.35
☐ From BASIC to PASCAL Anderson	£9.95
☐ Mastering Machine Code on your ZX81 T. Baker	£7.25
☐ UNIX – The Book Banaham	£8.75
☐ Z80 Microcomputer Handbook Barden	£10.95
☐ Microcomputer Maths Barden	£11.90
☐ Digital Computer Fundamentals Barter	£9.90
☐ Visicalc Book. APPLE Edition Bell	£15.55
☐ Visicalc Book. ATARI Edition Bell	£15.55
☐ Introduction to Microprocessors Brunner	£23.00
☐ Programming your APPLE II Computer Bryan	£9.25
☐ Microprocessor Interfacing Carr	£7.70
☐ Microcomputer Interfacing Handbook A/D & D/A Carr	£9.50
☐ Musical Applications of Microprocessors Chamberlain	£28.85
☐ 30 Computer Programs for the Home Owner in BASIC D. Chance	£9.25
☐ Microcomputers Dirkson	£9.30
☐ APPLE Personal Computer for Beginners Dunn	£9.50
☐ Microcomputers/Microcomputers – An Intro Gioone	£11.80
☐ Troubleshooting Microprocessors and Digital Logic Goodman	£9.25
☐ Getting Acquainted with your VIC 20 Hartnell	£8.50
☐ Getting Acquainted with your ZX81 Hartnell	£5.95
☐ Let your BBC Micro Teach you to program Hartnell	£7.90
☐ Programming your ZX Spectrum Hartnell	£8.50
☐ The ZX Spectrum Explored Hartnell	£6.95
☐ How to Design, Build and Program your own working Computer System Haviland	£9.30
☐ BASIC Principles and Practice of Microprocessors Heffer	£7.15
☐ Hints and Tips for the ZX81 Hewson	£5.25
☐ What to do when you get your hand on a Microcomputer Holtzman	£9.95
☐ 34 More Tested Ready to Run Game Programs in BASIC Horn	£7.70
☐ Microcomputer Builders' Bible Johnson	£12.40
☐ Digital Circuits and Microcomputers Johnson	£14.55
☐ PASCAL for Students Kemp	£7.20
☐ The C – Programming Language Kernighan	£18.20
☐ COBOL Jackson	£9.25
☐ The ZX81 Companion Maunder	£9.50
☐ Guide to Good Programming Practice Meek	£6.40
☐ Principles of Interactive Computer Graphics Newman	£13.95
☐ Theory and Practice of Microprocessors Nicholas	£11.35
☐ Exploring the World of the Personal Computer Nilles	£12.95
☐ Microprocessor Circuits Vol. 1. Fundamentals and Microcontrollers Noll	£9.80
☐ Beginner's Guide to Microprocessors Parr	£5.35
☐ Microcomputer Based Design Peatman	£11.30
☐ Digital Hardware Design Peatman	£9.80
☐ BBC Micro Reavealed Ruston	£9.45
☐ Handbook of Advanced Robotics Safford	£14.45
☐ 1001 Things to do with your own personal computer Sawusch	£8.50
☐ Easy Programming for the ZX Spectrum Stewart	£7.15
☐ Microprocessor Applications Handbook Stout	£34.40
☐ Handbook of Microprocessor Design and Applications Stout	£37.60
☐ Programming the PET/CBM West	£17.80
☐ An Introduction to Microcomputer Technology Williamson	£8.20
☐ Computer Peripherals that you can build Wolfe	£12.40
☐ Microprocessors and Microcomputers for Engineering Students and Technicians Wooland	£7.10

REFERENCE BOOKS

☐ Electronic Engineers' Handbook Fink	£56.45
☐ Electronic Designers' Handbook Giacoletto	£59.55
☐ Illustrated Dictionary of Microcomputer Technology Hordeski	£8.45
☐ Handbook for Electronic Engineering Technicians Kauffman	£27.50
☐ Handbook of Electronic Calculators Kauffman	£35.00
☐ Modern Electronic Circuit Reference Manual Marcus	£44.00
☐ International Transistor Selector Towers	£10.70
☐ International Microprocessor Selector Towers	£16.00
☐ International Digital IC Selector Towers	£10.95
☐ International Op Amp Linear IC Selector Towers	£8.50
☐ Illustrated Dictionary of Electronics Turner	£12.95

VIDEO

☐ Servicing Home Video Cassette Recorders Hobbs	£12.95
☐ Complete Handbook of Videocassette Recorders Kybett	£9.25
☐ Theory and Servicing of Videocassette Recorders McGinty	£12.95
☐ Beginner's Guide to Video Matthewson	£5.35
☐ Video Recording: Theory and Practice Robinson	£14.40
☐ Video Handbook Van Wezel	£21.90
☐ Video Techniques White	£12.95

Please send me the books indicated. I enclose cheque/postal order for £..... Prices include postage and packing

I wish to pay by Access/Barclaycard. Please debit my account.

5	2	2	4													

4	9	2	9													

Signed.....

Name .....

Address .....

.....

.....

HAM RADIO TODAY

CONTENTS

VOLUME THREE NO. 4 APRIL 1985

Editor
Steve Ireland, G3ZZD
Editorial Assistant
Julie Darby, G1CKF
Group Editor
Dave Bradshaw, G1HRT
Advertisement Manager
Dave Gadsden, G4NXV
Classified Sales Executive
Caroline Faulkner
Publisher
Peter Welham
Chairman
Jim Connell

Design by
MM DESIGN

Published by:
Argus Specialist Publications Ltd.,
1,Golden Square,
London W1R 3AB.
Telephone: 01-437 0626
Distributed by:
SM Distribution Ltd.
Printed by.
The Garden City Press Ltd.
Subscription Rate
UK £17.00
O/Seas Sur: £18.50
USA Sur: $25.00
O/Seas Air: £33.50
Ham Radio Today,
Subscriptions Dept,
Infonet Ltd,
Times House,
179 The Marlowes,
Hemel Hempstead,
Herts HP1 1BB
Tel: (0442) 48432

ABC

REGULAR COLUMNS

CONSTRUCTION

FEATURES

REVIEWS

LETTERS

MORE ON THE FT102

Sir, Reference my letter which you published in July issue of *Ham Radio Today* and in reply to 'Got an FT102' by Sean Quinn, GI4PCQ, in 'Letters' *HRT* November 1984 regarding the problem with my FT102 and the missing R84. Placing a 100K resistor in the empty holes did improve selectivity. In reply to my query to Yaesu, they did state that R84 had been replaced by a 120K resistor on the underneath side of PCB. Yaesu also stated that there should be a 12mV reading in test point 10. Mine read between 3 and 4 volts. Replacing the 120K with a 1.2M improved selectivity, but I could only obtain a reading of 26mV.

Broad selectivity still prevailed and adjusting the IF Shift/Width would not improve matters. Installing a 455 CW filter helped. Finally, after months of frustration, I took off bottom panels to modify the 'Sep/Norm' switch so I could operate a loop antenna on 1.8MHz without affecting the main input antenna (contrary to what it states on page 10 of Instruction Manual). Completing the modification, I switched on the set to check that it worked OK, when lo and behold, the selectivity was sharp and could be controlled by the IF/Shift/width controls.

I can now make the selectivity such that I do not need to use the CW filter. Switching R84 from 120K to 1.2M does not appear to affect the selectivity as noticeable as before, but the 1.2M does drop the internal receiver noise level by at least 6dB. With the 'improved' selectivity operating, that pleases me. If I ever find out why it suddenly came good I will advise. Can anyone explain why at times one has to de-select the noise blanker to stop poor selectivity?

C H Castle, VK5KL

The above letter originated from a condition in an early batch of FT102's (2M71000-2M071100). R84 is ***apparently*** *missing from its rightful place but this is because it has been relocated between the 'cold' end of T09 and J15 on the solder side of the PCB. According to Yaesu in a letter to GI4PCQ,* ***"fitting one (a 120k resistor) on top of the board in the holes marked R84 will seriously degrade the rig's performance."***

It very much sounds to me as though VK5KL's FT102 suffers from an intermittent fault — a 'dry' joint or poor connection, perhaps — which causes a lack of selectivity and was (temporarily) cured by movement when modifying the antenna switch.

If you have an FT102 within this batch and you are concerned about its performance, by all means check to see that R84 is in place between T09 and J15 as above. Otherwise, rest easy!

ANGRY SWL

Sir, I felt I must write to point out the deplorable attitude of some amateurs towards SWLs. Notice I state *some amateurs*. Thankfully not all of the amateur fraternity treat SWLs like the dunce in the corner. Possibly, it does not occur to this amateur minority that the SWL that is treated disparagingly today maybe the amateur of tomorrow. *And* even if the SWL wanted to stay a listener till the day he dropped, more power to his elbow. There is too much nepotism amongst some amateurs. If they think that some of us are without knowledge, then consider this — I have been involved in the radio hobby in some way or another for 22 years. I admit I have only just got involved in the construction side of it, but this was through sheer laziness, not lack of knowledge.

I am teaching myself the RAE theory which is hard going but I feel better for it because if I pass, I've only myself to thank. Hardly the work of a moron, and I'm sure there are thousands, yes, thousands, of other SWLs that are in the same boat.

D J Burton

AMATEURS AND CBERS TOGETHER?

Sir, Being a relatively new licencee and coming up from 11m after four years of it, I am appalled at the state of the band and how it has deteriorated over the years since legislation.

My own thoughts on the subject are that if the CB community were given a better system as regards aerials and height, callsigns were issued and the Radio Society of Great Britain 'accepted' them — instead of treating them as a 'no go' area — things would improve. Then, if licenced amateurs had this band written into their licence too, 11m could be used as a novice band and breaker cum novice aspects like operating procedure and (even) some radio theory could be learnt over the air. This way, the next generation of licenced amateurs won't be dumbfounded like some of us were when our callsign dropped through the letter box.

Peter Copeland, G1JBS

DATA COMMUNICTIONS FOR THE BLIND

Further experimentation has prompted me to write again to give you some more details of further capabilities available in the Braid speech synthesiser (See 'RTTY and AMTOR now possible for the Blind' in 'Radio Today', March '85)

Firstly, may I state that we have found out that there is available an interface that can convert from Centronics parallel to RS-232C serial for those particular users of computers that have only the parallel port for the printer. This should be readily available from most computer hardware retailers, although I must add that the Centronics port can be fitted as an option on the synthesiser from Braid Systems Ltd but these would be a delay in delivery if required.

One particular question that we have been asked by the various people who have visited us so far to see a demonstration of this unit is, "Can it read CW?" The answer to this is YES!!, providing that you are using a MODEM that converts the CW into ASCII code. Possibly the best system that can do this is the ICS Electronics model AMT-2 because it is data compatible with the "Braid synthesiser" ie, the speed of input and output data being 300 baud.

However, the receiving of this particular mode does have one or two disadvantages; firstly, because you do have to lock perfectly onto the signal you are trying to de-code (which could

"I CAN CLEAR THE SHACK IN TWO MINUTES AND BE PLAYING PING PONG .."

take up quite some considerable time); Secondly, at the moment there is not a computer available that can de-code *perfect* 100% morse because of the various differences in sending from one station to another and also the conditions of propagation, QRM, etc.

There is one great advantage however, for those SWL's and "B" licenced operators that wish to study morse using their home computers. If the particular computer has an RS-232C printer port, then quite simply all you have to do is just connect the "Braid synth" to the output port and set up the speed and parity levels (details of which come with the handbook of the computer, usually). Upon loading of the appropriate software for CW, all you do is press the particular letters numbers, or text you require, the unit will the convert it into speech (each letter or number is spoken after a return key is pressed) 'say' it.

You may perhaps want to write a small program that can convert text to be spoken after every word upon receipt of space code, which is fairly simple to do.

The idea of this particular unit was basically to de-code all data communications which are transmitted, from Amateur Radio through to general coverage stations ie, Reuters News and Associated Press etc. The other main useful feature is not only can it help with regards to the facilities mentioned, but the whole purpose of the unit originally was to help those individuals interested in the art of computer programming, (incidentally, our dear (blind) friend Steve (G4VWW-IK3CSU) has successfully written a program in BASIC, converting Miles to Kilo's, fahrenheit to centigrade etc, and has only been learning to program for two weeks(!!) — totally independently).

Literature can be obtained from myself at 67 Clapham Rd, London SW9 OHY (enclosing a stamped addressed envelope) or if you are interested in purchasing the equipment contact: Braid Systems Ltd., 130, Buckingham Palace Road, London SW1W 9SA

Phillip Stanley

MICROWAVES IN A MUSTARD TIN

Sir, I was interested in the novel 'Microwaves from a Mustard Tin' by Frank Ogden (January '85 *HRT*). However I've tried five local stockists for the BFT95. It seems a rare one (and apparently has no equivalent).

Could you kindly point me in the direction of a supplier? I'd be most grateful.

A Coleman

HRT *have received a number of letters similar to the above. The BFT95 is available from Cirkit Holdings PLC, Park Lane, Broxbourne, Herts. EN10 7NQ (0992 444111) for £1.59 including postage — the stock no. is 58-10095. Those of you who possess a current Cirkit catalogue and can't find it may have been confused by the transistor being misprinted as BTF95.*

Please address correspondence to:
Ham Radio Today,
1, Golden Square,
LONDON W1R 3AB.

RADIO TODAY

Dirty Rumours On The High Seas

According to an account in 'Marketing Weekly' (Vol 7 No 44), ILR station boss Eddie Blackwell (that's Independent Local Radio) has admitted discussing a plan to put the North Sea pirate radio ship off the air by a raid on the ship to remove various vital parts of the transmitter.

Paul Rusling, who helped set up Laser and whose recently published book 'The Lid Off Laser 558', is reviewed in next month's *HRT*, was apparently the other party in Blackwell's discussions. Paul, who seems something of a (successful) self publicist, has alleged that a group of five ''powerful names in broadcasting'' are still plotting to get rid of Laser. Pirate radio gets more like 'Dallas' every day!

Even better, the piece then goes on to say that Blackwell contends he had no intention of actually carrying the action out but was in reality acting as an ''agent provocateur'', hoping to persuade Rusling to name his former employers (with whom Rusling is somewhat less than enamoured (!) by our reading of 'The Lid Off')! No, it's not 'Dallas' after all, but 'Dynasty'. . .

Retailers Donate Antennas To Aid Medical Research Council

The Medical Research Council's Dunn Nutrition Unit in Cambridge has for many years now been carrying out research into the causes and effects of malnutrition at their research station in the remote vollage of Keneba, in The Gambia, West Africa.

Over the years, maintaining staff morale during difficult circumstances, has been helped by daily communications between the unit's amateur radio club station G4DUN at Cambridge, and licensed staff members in Keneba (See item in *Radio Today*, December '84). A potentially dangerous epidemic of meninococcal meningitis was also averted by the unit at Cambridge being able to trace a source of drugs and despatch them to The Gambia on the same day as the disease was diagnosed. Amateur radio was used to send the diagnosis from Keneba to the UK and inform Keneba that the drugs were on the way.

The link up consisted of a Yaesu FT101ZD Transceiver at each end. Until last year, daily voice contact had been maintained, but with the drop in sunspot activity, this became progressively difficult, and so two AMTOR teleprinter units were purchased, enabling information to be passed with certainty of receipt at the other end.

During the filming of a recent programme by BBC EAST, on the units work in Keneba, propagation conditions had continued to deteriorate, and it was evident that a further 'upgrade' of the system was essential if the link was to be maintained. The BBC approached Dr. Tim Thirst G4CTT, of Eastern Communications, in Norwich, and an appraisal of the system showed that the weak point was the use of 'mini-beams' at both ends of the link. Although it was felt that a change to large mono-bander beams would be ideal, this lost the ability to change band, which would also become necessary as conditions continue to deteriorate. It was decided that a large tri-bander would be ideal for installation at Cambridge, and a smaller one for Keneba. As this would involve a large expenditure by the unit, two TET beams were donated jointly by Eastern Communications and Amateur Electronics UK.

Within a couple of days, one beam had been flown out to Keneba, and when the other was presented recently to Dr. Tim Cole, G4RHQ of the Cambridge Unit, by Dr. Thirst, the smaller beam had already been installed in Keneba and was making a considerable difference to the signal.

Working Halley's Comet?

British Telecom are now providing a telephone news service on Halley's comet. Called the 'Halley Hotline', the recorded information will be updated weekly to begin with, then more frequently as the comet draws near, the info being provided by Mr Brian Harpur of the Halley's Comet Society.

The comet will become visible from Britain by the end of the year and become brighter during the following months before departing during 1986. Six spacecraft are set to intercept the comet on scientific missions during its 'once in a lifetime' visit.

The Halley Hotline is available on

Dr Tim Thirst (left) of Eastern Communications presenting one of the TET beam aerials to Dr Tim Cole of the MRC's Dunn Nutrition Unit. (Photo BBC East).

the following numbers: London 01-790 3400; Glasgow 041-552 6300; Cardiff 0222 399855; Belfast 0232 230505; Liverpool 051-236 8474; Bristol 0272 279494; Birmingham 021-355 6144; Leeds 0532 8013; Manchester 061-246 8061.

Morse Tests at 1985 NEC

Mr G H Williams, G3YCP, of BTI Radio will be holding Morse tests at the 2985 RSGB Convention of the NEC. These will be available on pre-booking for the duration of the exhibition, both on Saturday and Sunday. A limited number of places will be reserved for RAIBC members, should any wish to apply. To book your place, please contact Mr C V Astley, Worston Road, High Bridge, Somerset TA9 3JY.

Club News

The **Harlow DARS** have informed us that they now meet every Tuesday at 8.30pm in the Mark Hall Barn, First Avenue, Harlow. Anyone wanting to know more can ring Keith, G3WRO, on Harlow 30609.

The **Bromsgrove ARS** sent us considerable details of their society which seems to include interests covering virtually all aspects of amateur radio. Visitors and new members are very welcome and can find out more by contacting, the Secretary, G4OJS, on 021 445 3207.

Verulam ARC based in St. Albans, are holding their annual G3PAO Memorial Lecture on the 26th March which, as usual, has an educational theme. This year the lecture is given by Jim Bacon, G3YLA, who will be drawing on his experience at the London Weather Centre for his lecture entitled ''There's A Bit Of A Lift On''.

All visitors are welcome. The meeting starts at 7.30pm and there will be a talk-in from 7pm on S14. Further details can be obtained from Brian, G4DUS, on Rickmansworth 720616.

Repeater Latest — Meet The RMG In Scotland

The Repeater Management Group (RMG) are holding an open meeting in the Scottish Borders on Sunday 31st March. The meeting will start at 2.0 pm after the hosts, the Scottish Border Repeater Group, have held their AGM.

The meeting will be held at the Lilliardsedge Caravan Park, which is on the A68 between Jedburgh and St. Boswells. Further information can be obtained from Bruce McCartney, GM4BDJ, of the Scottish Borders RG or Colin Dalziel, GM8LBC, of the RMG.

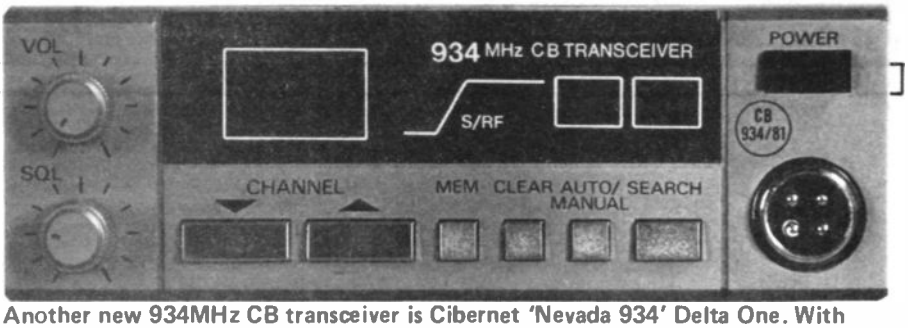
Chris Lorek. G4HCL, reports that **GB3PS**, the 23 cm repeater/beacon is on the air from Barkway, Cambridge. He goes on to say, ''The repeater transmits on 1297.075 MHz continuously, radiating an FSK (inaudible on FM) callsign every fifteen seconds. To place it into 'talkthrough' mode, you must transmit a 1750Hz toneburst (at 5kHz deviation recommended maximum) on 1291.075 MHz. Remember when using a tripler to reduce your 70cm deviation to 1.66Hz or you're going to have problems! When you drop carrier, the box will immediately reply with a low frequency 'courtesy pip' to confirm you have successfully accessed.

There is a 'time-out' period of the minutes, the reason for this will be obvious to stations operational on 23cm who may suffer from radar interference, appearing as burst of noise every few seconds. Luckily we have not suffered this annoying effect on PS but we have not taken chances!

When in talkthrough mode the box radiates a 100Hz sub-audible tone, to enable user stations to have a tone operated squelch if they wish to avoid receiving a carrer at all times, especially useful if at the fringe range of the repeater or when operation mobile. The repeater employs horizontal polarisation which is the standard on 23cm, and uses a single Alford slot aerial fed by LDF550 Heliax coax. A circulator is used to enable single aerial operation.

GB3PY on RB14 had recently been moved to a new location on the north side of Cambridge. The coverage has apparently improved considerably as a result. If you could hear 'PY' before but not access it, now is the time to try again.

On a lighter note, anyone who visited the South Coast at Christmas and accessed **GB3ES** on R4 was in for a surprise. After ES announced its location in CW, a bar from one of four well known Christmas carols was played, in sequence. Nice touch, folks.



Another new 934MHz CB transceiver is Cibernet 'Nevada 934' Delta One. With a claimed 12dB SINAD sensitivity of better than 0.5uV, the Delta One promises well and retails at £355 excluding carriage from UK distributors, Telecomms of Portsmouth (0705 662145).

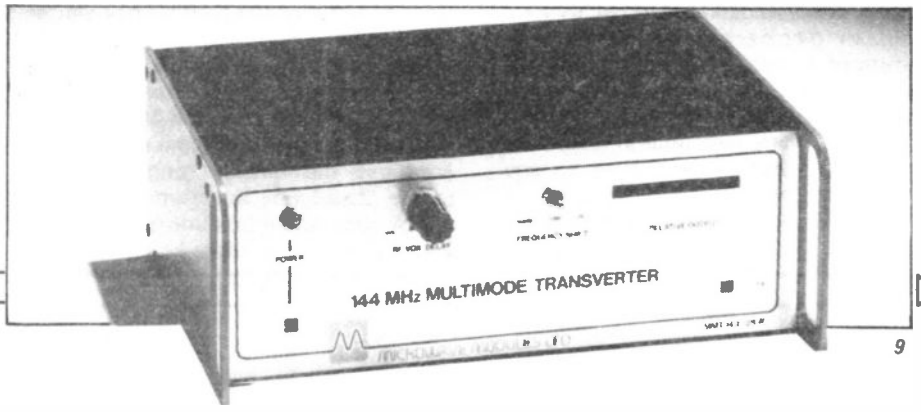
Trio For Arrow

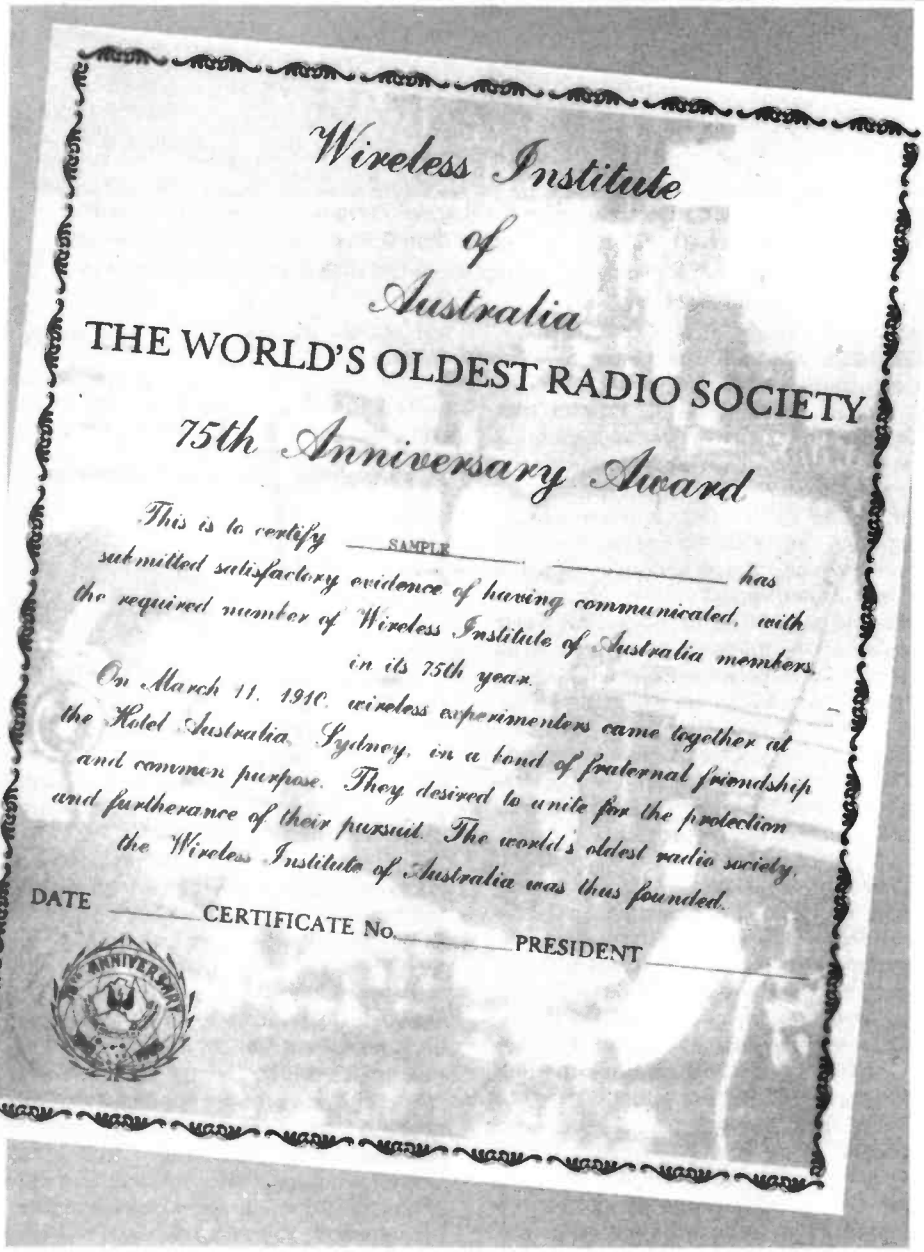
A very pleased Peter Clarke of Arrow Electronics recently informed *HRT* that they are now official dealers in Trio equipment. Adding Trio to their franchise list gives Arrow a virtually complete range of all the major amateur radio manufacturers.

Trio equipment in stock at Arrow's Hatfield Peverel showrooms includes all the latest Trio models — TS711E with CD10 call sign decoder unit, TM211E, the miniature FM mobile transceiver with the tilting head and digital coded squelch, TR2600 the latest keyboard entry handheld for 2m and the TH21E, the smallest FM 'handy' for 2m yet seen, and apparently popular too, according to Arrow. Arrow report ''marvellous co-operation'' from the Trio distributors, who were able to meet almost all Arrow's stock requirements off-the-shelf. Within a few days of their appointment Arrow had apparently sold out of several lines and received replacement stock within 24 hours, — no wonder Peter Clark was pleased!

Any customers wishing details of the Trio range are invited to sent a stamped-addressed envelope for details. Arrow are located at 5, The Street, Hatfield Peverel, Near Chelmsford, Essex.

Latest in the line of transverters from Microwave Modules is their MMT 144/28-R 2m multimode transverter. Features include 25W Tx output repeater shift, high level balanced receive mixer and GaAsFET RF stage. Claimed receive performance in particular is excellent: better than 2dB noise figure and a 3rd order intercept of +19dBm. Further details from MM on 051-523 4011.





Wireless Institute
of
Australia
THE WORLD'S OLDEST RADIO SOCIETY
75th Anniversary Award

This is to certify SAMPLE has submitted satisfactory evidence of having communicated with the required number of Wireless Institute of Australia members in its 75th year.

On March 11, 1910, wireless experimenters came together at the Hotel Australia, Sydney, in a bond of fraternal friendship and common purpose. They desired to unite for the protection and furtherance of their pursuit. The world's oldest radio society, the Wireless Institute of Australia was thus founded.

DATE CERTIFICATE No. PRESIDENT

A Vintage Award Without QSLs

The world's first and oldest radio society, the Wireless Institute of Australia, celebrates its 75th Anniversary during 1985. One of the many planned activities is the WIA 75 Award which will be available during the period March 1 to December 31, 1985.

To qualify, radio amateurs (and shortwave listeners) need to contact (log) 75 members of the Wireless Institute of Australia. A contact will *only* be valid if the WIA member's individual membership number is logged. No more than 30 WIA member's individual membership number is logged on any one callsign area.

Claims should include a log extract of the 75 WIA members contacted, $2 (Aust.) to cover certificate, handling and postage costs, and be sent to: WIA 75 Award Manager, Wireless Institute of Australia, 412 Brunswick Street, FITZROY. 3065. Victoria. Australia.

Sinclair Amateur Radio User's Group

A letter was recently received at the *HRT* offices from Paul Newman, G4INP, editor of the SARUG newsletter and general driving force, informing us of the continued existence of SARUG and giving an update on their activities. Perhaps this is stating the obvious, but SARUG are a group of radio enthusiasts who use the Sinclair range of computers (ZX80/81, Spectrum and QL).

A substantial amount of new software is now available either through SARUG (the sale of which benefits the Radio Amateur Invalid & Blind Club, amongst others) or directly from the addresses given in the new SARUG software list. Some worthwhile discounts are available on certain major software items.

A recent innovation in the SARUG newsletter is the inclusion of software reviews which in Paul's words, "are being recognised as reliable and informative by many members". The group offers opportunities for world-wide exchange of news, views of ideas, SARUG having members in over 25 countries.

UK membership of SARUG is £5.00 and overseas £8.00. Further details from Paul at 3, Red House Lane, Leiston, Suffolk and enclose an SAE please.

Did You Know...

	No. of amateurs	Population
USA	400 000	220 000 000
UK	50 000	55 000 000

Therefore, the USA has twice as many amateurs per 1000 people as the UK. Interesting, eh.

Commercial radio stations worldwide have been discussing ceasing Morse transmissions from 1990.

Philips, who are celebrating their 60th anniversary this year, claim to be "the first to make a worldwide short wave radio broadcast"; to produce a practical (commercial) all mains radio receiver; and 30 line TV set, which was "used to test the first transmissions from the BBC in London". Is there anybody who would dispute any of the above?

BT are building a new satellite earth station near Aberdeen with an 8m diameter dish. Using the European Communications satellite EUTELSAT 1-F2, this will enable satellite communications to the North Sea oil and gas platforms.

IBA engineers have received the first pictures transmitted using the European satellite ECS-2 and the C-MC/packet system. The programmes were transmitted by the Norwegian Broadcasting Corp., NRK, who are providing the service for communities in the Svalbard Islands in the Arctic Circle.

In Nov '84 issue, we carried a photograph of the 'Nortower' 30' extendable tower, manufactured and sold by Northern Communications of Claremount, Halifax. Northern Communications wish to point out they have no connection with the company linked to them in the photograph, 'Amtronics'.

WPO COMMUNICATIONS

20 FARNHAM AVENUE, HASSOCKS G3WPO
WEST SUSSEX BN6 8NS MAIL ORDER ONLY
24hr Ansaphone 07918 6149

DSB/CW DSB80 2w+

Still our most popular kit with over 1000 sold! Suits beginners and will build a sensitive 80 metre VFO controlled Tx/Rx for DSB or CW — kit can be modded for 160m if preferred. Basic pcb kit (only needs psu/mic/speaker) complete for **£37.45.** Punched case & Hardware @ £24.45 and digital dispaly option at **£24.10. All above for £79.00.** +12v operation.

only £37.45 Basic Kit

2W + DSB CW DSB2 ANY SINGLE BAND 160-15m

QRP Transceiver with mini-PLL VFO. Semi Break-in CW, AF filter etc. **ANY SINGLE BAND 160-15M.** Digital display option. Basic pcb Kits (2) £68 only needs psu (12v) mic + key/speaker. Kits with case (punched but unfinished) hardware £89.50 or with case plus display £113 (160/180m) or £118 (40-15m).

SPECIAL OFFER best selling 20m DSB2 basic kits only £63)

ALPHA — SINGLE BAND SSB/CW 50W TRANSCEIVER KIT

20m or 160m

NEW LOW PRICE — £179.95 complete! to quote a customer 'Very pleased with the kit, and you must be congratulated on the standard of the design, which is excellent'. 90dB+ Dynamic range, PLL VFO, Digital display, Blanker, IF Gain, Custom Finished Case with mobile bracket etc etc. Join the ALPHA builders! Comprehensive instructions & drawings.

WE SPECIALISE in kits for the home constructor. Why not try something from us soon? Many kits are suitable for beginners and come with comprehensive instructions, drilled tinned pcb and pots, wire etc. Our products are used worldwide and can help **YOU** get on the air to work the world or locals. Many other products under development — watch this space for details. Most kits have pcb's and instructions only available.
Our full Catalogue is available for 50p in stamps (no cheques etc) or short form for SAE.
Kits are sent in 7-10 days, but allow up to 28 days for delivery of popular items if not ex-stock. Export — Europe use UK prices, Rest of World — UK + 5%. All prices include Post & VAT. Leave your credit card orders on our ansaphone.

BUILD AS PORTABLE OR BASE STATION

Get on 2m FM! 6 channel max. 1W+ Tx and ideal for beginners. These are popular kits with RX @ £39.50 & Tx £32.90. Both kits for £68. Verocase (undrilled) to make portable rig £7.50.
2M FM TRANSCEIVER

£68!

VFO & OTHER KITS

MINISYNTH — As used in the DSB2, 1 band simple PLL VFO — versions for most bands and i.f.'s. Full kit with tuning cap **ONLY £29.70. VHF MINISYNTH,** 2 Meter version with 2MHz coverage for Rx & Tx, repeater options — full kit £38.50. **SPEECH PROCESSOR** — very popular kit to get through to the DX — **ONLY £13.90. 1-30MHz RF PREAMP** — 15dB gain (usable with G3ZVC/G4CLF i.f.'s) — Kit only £13.50. Coming soon — sort out that microphone (or your voice) with our unique fully tunable **PARAMETRIC EQUALISER** — drop us an SAE for more details.

NEW

micron

OUR LATEST TRANSCEIVER KIT, sets new standards in QRP performance — LOOK AT THESE FEATURES — a 6 band CW only 8/10W output rig covering the 80, 40, 30, 20, 15 & 10m bands (bottom 200kHz of each). 0.25uV sensitivity receiver, featuring AGC, with S Meter. Stable 2 speed VFO with IRT (Spot facility), 1W AF output to speaker, and 3 position LC filter + switchable attenuator. Silent solid state Rx/Tx switching with fast semi break-in and shaped keying. Sidetone facility. Fully variable RF power output from 0W to full power metering. Needs +12v/14v supply.
PLUS CUSTOM punched & painted aluminium case/hardware and speaker with unique facility for optional INTERNAL ATU (Transmatch type) & SWR metering. DIGITAL READOUT option. The MICRON uses a compact single pcb design with easy step-by-step assembly instructions and drawings designed for the relative newcomer - minimum test equipment needed! Mostly prewound coils and transformers.
PRICES: Basic pcb kit inc. VFO capacitor/drive/enclosure, for 2 bands (state which) £99.45 - extra bands £11.75 each. Full pcb kit for 6 bands Tx/Rx £145. Case £46.20. COMPLETE KIT WITH CASE/6 BANDS £182.50. Optional extras - Digital readout (LCD) kit £33.56, and ATU Kit (for internal mounting) with SWR/Power metering at £37.00. COMPLETE KIT/CASE WITH DISPLAY AND ATU - £241.00.
Please phone or write for full brochure on the MICRON or place your order now!

AMATEUR ELECTRONICS UK

G6XBH

R.A.S. (Nottingham)
Radio Amateur Supplies
Tel: 0602 280267

G8UUS AUTHORISED YAESU

Visit your Local Emporium

Large Selection of New/Used Equipment on Show

AGENTS FOR: ICOM, YAESU, FORTOP ATV, F.D.K., AZDEN

ACCESSORIES: Barenco Mast Supports, DRAE PSU and Wave Meters, Microwave Modules, Welz Range, Adonis Mics, Mutek Pre-Amps

AERIAL: Tonna, Halbar, New Diamond Range of Mobile Whips

PLUS OWN
'Special' Q.R.P. GW5 HF5 Band Beams
JUST GIVE US A RING
Monday: CLOSED Tuesday-Saturday: 10.00am to 5.00pm

3 Farndon Green, Wollaton Park, Nottingham
Off Ring Rd. between A52 (Derby Rd.) & A609 (Ilkeston Rd.)

ELLIOTT ELECTRONICS

Books for radio amateurs
FDK
AUTHORISED YAESU
AERIAL ACCESSORIES AND MASTS
THE 'HAM SHACK'
for the Radio Enthusiast
MICROWAVE MODULES
APPOINTED DISTRIBUTOR

JAYBEAM AMATEUR ANTENNAS

QSY OLD MAN TO

RIGS, ANTENNAS, SWR BRIDGES, POWER SUPPLIES, TEST GEAR, COMPONENTS, MORSE KEYS, COAXIAL CABLES, ROTATORS, MICS, PLUGS AND SOCKETS, SWITCHES
Call us on (0533) 553293
OR COME AND LOOK AROUND AT
26/28 Braunstone Gate, Leicester

Bredhurst electronics

BARCLAYCARD VISA ACCESS

MAIL ORDER/RETAIL SALES

ANTENNA BITS	£	C&P
HI-Q Balun 1:1 5kW P.E.P.	11.95	(1.00)
7.1 MHz Raltraps — white epoxy — pair	8.95	(1.50)
Self-amalgermating Tape 10m x 25mm	3.95	(0.75)
T-piece Polyprop. Dipole centre	1.50	(0.50)
Polyprop. Strain Insulators	0.50	(0.10)
Small ceramic egg insulators	0.50	(0.10)
Large ceramic egg insulators	0.75	(0.10)
75 ohm twin feeder — Light duty — per mtr.	0.16	(0.04)
300 ohm ribbon feeder — per mtr	0.14	(0.04)
300 ohm slotted — per mtr	0.22	(0.04)
URM67 low-loss coax — per mtr	0.65	(0.20)
UR76 50 ohm coax — per mtr	0.25	(0.05)
UR70 70 ohm coax — per mtr	0.30	(0.05)
4mm Polyester Guy Rope (400 kg) — per mtr	0.18	(0.04)

H.F. RECEIVERS	£	C&P
ICOM IC-R71 Gen. cov. receiver	699.00	—
ICOM IC-R70 Gen. cov. receiver	599.00	—
TRIO R2000 Gen. cov. receiver	479.00	—
TRIO VC10 VHF converter. 118-174MHz	128.00	—
YAESU FRG8800 Gen. cov. receiver	525.00	—
YAESU FRV8800 VHF converter	95.00	—
TRIO R600 Gen. cov. receiver	299.00	—
YAESU FRT 7700 Receiver a.t.u.	48.30	(1.50)

UHF/VHF RECEIVERS		
A.D.R. AR 2001 25.500 MHz	378.00	—
J.I.L SX 200N	299.00	—
J.I.L. SX 400	598.00	—
FDK ATC 720 Airband Handheld	175.00	—
FDK RX40 141-179 MHz handheld	142.00	—
R532 Airband 100 memory 12v d.c.	189.00	—

ANTENNA SWITCHES		
SA 450 2 way diecast SO239.(500MHz)	13.95	(0.75)
SA 450N 2 way diecast N plug (500MHz)	17.95	(0.75)
CH 20A 2 way Weiz SO239 (900MHz)	21.95	(1.00)
CH 20N 2 way Weiz N plug (900MHz)	38.75	(1.00)
DRAE 3 way SO239 skts	15.40	(0.75)
DRAE 3 way N skts	19.90	(0.75)

H.F. TRANSCEIVERS			
TRIO TS 930S	£1350	YAESU FT 757GX	£759
TRIO TS 430S	£769	OCOM IC 745	£898
TRIO TS 830S	£832	YAESU FT 980	£1475
TR TS 530SP	£735	YAESU FT 77	£479

VHF/UHF BASE TRANSCEIVERS			
TRIO TS 711E	£831	TRIO TS 811E	£964
ICOM IC 271E	£699	ICOM IC 471E	£799
TRIO TS 780	£981	YAESU FT 726R(2M)	£839

VHF/UHF MOBILE TRANSCEIVERS			
TRIO TW 4000A	£536	YAESU FT 2700R	£520
TRIO TS 9130	£499	ICOM IC 290D	£459
TRIO TM 211E	£396	TRIO TM 411E	£452
TRIO TM 201A	£309	TRIO TM 401A	£340

VHF/UHF PORTABLE HANDHELDS			
YAESU FT 290R	£309	YAESU FT 203R	£185
TRIO TH 21E	£188	TRIO TH 41E	£214
ICOM IC 2E	£199	ICOM IC 4E	£259
ICOM IC 02E	£259	ICOM IC 04E	£269
YAESU FT 209RH	£269	YAESU FT 209R	£239

BREDHURST ELECTRONICS — HIGH ST — HANDCROSS — W. SUSSEX — 0444 400796

E&OE

DXCC!

Like something to show for your HF operation? Why not try DXCC! Martin Atherton, G3ZAY, profiles the most popular amateur radio awards programme in the world.

Anyone listening or operating on the HF bands these days cannot help, sooner or later, stumbling across someone pleading for a contact or a QSL card "for a new DXCC country". What is DXCC? What are DXCC countries? How many of them are there? Who decides what is and what isn't a country? This article answers all these questions and more.

Ham Radio Today readers may remember a recent article by G3ZAY on mishaps which befell DXpeditions visiting remote islands. The information below, explains the reasons why a particular island may justify an expedition by becoming that most curious of places — a separate DXCC country.

What Is DXCC?

DXCC stands for DX Century Club and is a comprehensive awards programme administered by the American Radio Relay League (ARRL), the national society of the USA, from its headquarters near Hartford, Connecticut. The general idea is that to win any award in the programme, you have to make contacts with, and get QSLs from, at least 100 different countries. The ARRL official list is used to determine what counts as a country, but more about that later.

There are separate awards for contacts that are mixed-mode, all on phone, all on CW, all on RTTY, all via satellites, and all on 160 metres. And there is even an award for working 100 countries on each of the five bands between 80 & 10 metres. At the time of writing, all but the satellite award are "endorsable". That's to say, if you work more than 100 countries (out of the 315 possible at present) you can apply for stickers to upgrade your basic certificate so that it shows your exact total. The satellite award is likely to become endorsable in the near future.

Don Search, W3AZD, ARRL staff member responsible for administering the DXCC programme.

A further refinement is that if you get to within 10 of the maximum score on any of the endorsable awards, you become a member of the appropriate "Honor Roll". At present, with a maximum of 315, a score of 306 or more is required. The UK members in June, 1984 were: Mixed Mode — G3AAE G3FKM G3FXB G3HCT GI3IVJ and GW3AHN (315 countries), G2FSP G3JAG G3KMA G4CP G5VT (314), G2FYT (313), G3LQP G3UML G5RP (312), G3JEC (311), G3IOR GM3ITN GI3OQR (310), G3HTA G3KDB G3RCA (309), G2BOZ G3GIQ G3ZAY G3TOE (308), G2DMR G4DYO G3RUX (307), G3DOG G3MCS G3SJH (306); Phone Only — G3FKM (315), G5VT (314), GI3IVJ (313), G3NLY G3UML (312), G3JEC G5AFA (311), G3TJW G3ZBA (310), G3KMA (309), G3TOE (308), G3RCA (307), G3SJH (306). The CW Honor Roll is for scores greater than 300, a lower level because the CW only award has only been going since January, 1975. There are no UK stations listed in this at present.

The entire DXCC programme is taken quite seriously in the USA and at any amateur gathering, a large proportion of the participants will be wearing badges proclaiming their country scores. A frequent ritual is for the Chairman of a meeting to ask people with scores above a certain level to stand up. He then calls out gradually increasing numbers and people sit down as their score is reached. When only one or two are left on their feet, they get a round of applause, a prize, or both.

Getting on to the Honor Roll is a long term project! Even though the basic 100 countries *can* be contacted in a weekend (say, in a large scale contest), it will usually take 6-10 years of hard work to find the remaining 206. At any one time, there always seem to be a dozen or so places where government attitudes are so hostile to amateur radio that nobody ever gets on the air. From time to time, various DX publications compile lists giving the date each country was last heard, and an examination of these lists shows that nobody licensed since 1977 could possible have achieved Honor Roll membership — even if they had been on the bands continuously from the moment their licence dropped on the mat!

Once on the Honor Roll, it's still not possible to relax because the ARRL is continually deleting old countries from the list and creating new ones as world affairs re-draw geographical and political boundaries. If you just retire from DXing once you have 306 countries con-

firmed, your appearance on the Roll is likely to be very brief.

Full details of the DXCC programme including application forms can be obtained from the ARRL HQ, 225 Main Street, Newington, Connecticut, 06111 USA, or alternatively, the author would be pleased to answer any questions himself (SASE please). The starting dates for the awards are as follows: Mixed, Phone, RTTY, 160m — November 15th 1945, Satellite — March 1st 1965 5 Band DXCC — January 1st 1969, CW — January 1st 1975.

So What Is A DXCC Country?

To put it simply, a DXCC country is whatever the ARRL says it is! At present, the list includes:

* Single, fully independent, countries eg Germany, Austria, Sweden, etc.
* Parts of an independent country which have some political or administrative autonomy, eg England, Wales, Scotland, Northern Ireland, Jersey, Guernsey, Isle of Man; North & South Sudan; all the individual countries in the Soviet Union; etc.
* Offshore reefs/rocks/islands which count separately for DXCC because they are further than some arbitrary distance from their parent country.

Over the years, the criteria for separate country status have changed. The current rules, which apply *only* to new candidates for country status and are not used to decide whether a place should be deleted, are displayed in the box (inset), and are moderately strict. However, not so long ago, a place could count on the grounds of having a "distinctively separate administration" and it was only when application for large numbers of nature reserves, Indian reservations, etc., began to flow in that the rule was changed to its present form requiring a separate government.

"Countries" which qualified under the separate administration rule and are still on the list include: Sable Island, and St Paul Island — both administered by the Canadian Federal Government instead of the local province; Desecheo Island — administered by the US Dept of the Interior, and Kingman Reef — administered by the US Navy and the Dept of the Interior.

The criteria for new country status are interpreted by the ARRL DX Advisory Committee, which also considers potential deletions. Final decisions are taken by the ARRL Awards Committee. Global politics are taken into consideration, and in recent years there seem to have been a decision not to recognise the South African "Homelands". Thus, although Venda, Bophutatswana, Transkei, etc have all issued licences with distinctive callsigns prefixes, the QSL cards count only for South Africa as far as DXCC is concerned.

At the moment, the whole question of DXCC countries criteria is under review and it is possible that the situation will change in the near future.

The official DXCC countries list (totalling 315) is the one produced by the ARRL and may be obtained from their HQ. However, at present the Radio Society of Great Britain list is identical to the ARRL one, and copies can be obtained from the RSGB for a small fee. Another useful RSGB product is a nine band countries check list, which contains a table enabling you to mark off the countries you've worked and the one's you have cards from. Both these products are held on the Society's computer and are updated regularly to allow for prefix changes and additions or deletions to the ARRL list.

When Is A Contact Valid?

Another vexed question dealt with by the staff at the ARRL HQ is the question of the validity of a particular QSO. There were a number of DXpeditions in the past which, to say the least, raised considerable doubts about whether they were actually in the country they claimed, and whether they had valid licences.

Nowadays, the ARRL may require proof, in the form of passport stamps or sworn statements, that an operator actually reached his claimed operating point, and may also require a photocopy of his licence. Yet even when both these conditions are satisfied, there can be problems.

G3JKI/5A was active from Libya on several occasions in the early 1980s and received written operating permission from a local militia commander as there was no mechanism for issuing licenses on a national basis. However, the ARRL refused to accept his QSL cards for DXCC on the grounds that his "licence" did not specifically say it was for the amateur bands.

ARRL headquarters near Hartford, Connecticut

Further complications arose when stations started to operate from guerrilla enclaves in Kampuchea (Cambodia) and Burma. Because the Association of South East Asian Nations, and most members of the UN, recognise the Kampuchean guerrillas as the rightful government, their cards (XU1SS & XU1KC) were OK for DXCC. But the Burmese cards (1Z9A & 1Z9B) were rejected because the UN recognises the central government and not the guerrillas! Even more problems arose over Burma when a couple of German operators came up on the bands from Rangoon. The telecommunications authority was giving verbal operating permission, but was not prepared to put anything in writing that would satisfy the ARRL. Burma remains a blank in most people's check sheets, despite the fact that almost everybody has a QSL card from the place!

Because of this stringent control over standards, it is necessary to physically send QSL cards to the USA when applying for the DXCC awards. Only the ARRL apparently has a complete list of legal and illegal operations as well as the expertise to detect forged cards. An alternative, if you are not prepared to entrust your QSLs to the mail, is to get someone to take them to the ARRL HQ in person as it is usually possible to have them checked on the spot.

A common misconception is that some minimum signal report is required for DXCC QSOs. This is not the case. As long as the QSL states that a 2 way QSO has taken place, that is all that is required. Other awards are rather more strict on this point.

What Does The Future Hold For DXCC?

There are a number of changes to the DXCC list in the offing. The Antarctic island of Peter the 1st will be added — if anyone ever manages to operate from there(!) — and the country presently defined as "Baker, Howland, & American Phoenix Islands" may soon be deleted and replaced by "Baker & Howland Islands" because the Phoenix Islands have been handed over to the Republic of Kiribati. This will mean that all of us who worked the old country will have to start searching for the new one. In addition, the DX Advisory Committee will vote shortly on whether to add the Pribilof Islands (off the Alaskan Coast), the United Nations Centre in Vienna (4U1VIC) and the UK Sovereign Base Areas on Cyprus to the list. A recent vote on the Pribilof question was tied.

So there in brief is the ARRL DXCC Programme, one of the most respected awards systems in the amateur radio world. There is an award for everyone, ranging from the basic certificate requiring 100 confirmed countries, through to the 5 band DXCC award and Honor Roll lists. See you in the pile-ups?

ARRL CRITERIA FOR COUNTRY STATUS
(To be applied to new candidates. Not applicable to possible deletions)

1) ***Government/Administration.*** An area by reason of Government constitutes a separate entity.
2) ***Separation by Water.*** An island or a group of islands, not having its own government is considered as a separate entity under the following conditions:
   a. Islands situated off-shore from their governing area must be geographically separated by a minimum of 225 miles of open water. This point is concerned with islands off-shore from the mainland only. This point is not concerned with islands which are part of an island group or are geographically located adjacent to an island group.
   b. Islands forming part of an island group or which are geographically located adjacent to an island or island group, which are a common government, will be considered as separate entities provided there is at least 500 miles of open water separation between the two areas in question.
3) ***Separation by Foreign Land.*** In the case of a country, such as that covered by Point 1, which has a common government but which is geographically separated by and which is foreign to that country, if there is a complete separation of the country in question by a minimum of 75 miles of foreign land, the country is considered as two separate entries. This 75 miles of land is a requirement which is applicable to land areas only. In case of areas made up of a chain of islands, there is no minimum requirement concerned with the separation by foreign land.
4) ***Unadministered Area.*** Any area which is unadministered will not be eligible for consideration as a separate entity.
5) a. Any area which is classified as a Demilitarised Zone, Neutral Zone, or Buffer Zone, will not be eligible for consideration as a separate entity.
   b. Embassies, consulates and extra-territorial monuments will not be eligible for consideration as a separate entity from the host country.

STOP PRESS! The DX advisory committee have formally added the UK Sovereign base areas in Cyprus to the DXCC list. This will come into force on 1st June '85 and contacts with UK bases since 1960 will then count for the award.

ATTENTION ALL WRITERS . . .

. . . or just those of you who sometimes think "I could do better than that!"

We want to hear from you!

The magazine you hold in your hand is part of ASP's electronics group of titles. These include *ETI, Ham Radio Today, Digital and Micro Electronics,* and our new magazine, *Electronics.* All these magazines are looking for new authors, so if you've designed something for yourself that you think may be of interest to others, or if you've a subject you'd like to write a feature article on, then drop us a line with an outline of what you have in mind.

We particularly need:
- Projects for the Commodore Vic 20 and 64, the Amstrad, the BBC A and B, and the Electron computers;
- Simple projects that do something useful, perhaps in a novel or instructive way;
- Radio projects (not necessarily for radio amateurs);
- Features on amateur satellite radio.

If you're interested in writing for us, send an outline of your proposed article to: Dave Bradshaw, Group Editor (Electronics), Argus Specialist Publications, 1 Golden Square, London W1R 3AB.

Please note that while we take ever care, we cannot be held responsible for the loss of unsolicited manuscripts. We advise all authors to keep a photocopy or carbon copy of any article they send us.

The 'KEYDAPTOR'

– for MCW on VHF/UHF

This unit provides the facility of MCW (Modulated Continuous Wave) Morse transmission for VHF and UHF "FM" Transceivers which are not normally equipped to send CW Morse. MCW is classified in the present licence schedule as F2E if used on a *true* Frequency Modulated emission, or G2E if used on a Phase Angle Modulated emission. The schedule defines these as "A single channel containing quantized or digital information with the use of a modulating subcarrier". In simple terms (!) this means a radio frequency carrier wave, modulated by an interrupted audio tone; the interrupted tone we are interested in generating being the Morse Code.

Many Class 'B' licencees will be wishing to take advantage of the new legislation allowing them to use morse code on the bands allocated to them, as of 1st April '85. Now, a fairly good percentage of 'B' licencees — and Class 'A' for that matter — have FM only equipment for 2m and 70cm. The obvious and unfortunately expensive answer for our would be CW operator is the purchase of a 'multimode' transceiver for the desired band. Let us say that you are saving hard for such a piece of equipment, but would like to try your hand at CW first. Well, in the interim, there is always MCW . . .

The editor recently spoke to a prominent member of the licencing branch of the DTI with regard to the legality of Class 'B' licencees using MCW. Whilst the official pointed out that MCW was not as efficient as CW in terms of communicating ability and, more importantly, in our overcrowded cities, frequency space (remember that a MCW transmission using FM will take up as much space as an FM phone signal, more or less), in view that the mode would help develop the Morse skills of Class 'B' licencees and encourage them to use 'real' CW — with all its comcommitant space saving advantages — he thought MCW was permissible. All Class 'B' licencees will be receiving a letter of variation of their licence terms and a copy of a leaflet entitled 'Guidelines for Class 'B' licencees using Morse' in the near future. Unfortunately, both were not available at the time of going to press.

Got an FM only VHF or UHF transceiver but would like to try your hand at some Morse? Duncan Walters, G4DFV, and MCW could provide the answer. . .

The prototype unit was designed to work in conjunction with a Trio TR2300 transceiver for 2 metres, but can be easily adapted for use with other transceivers simply by using the particular type of microphone input plug-and-socket arrangement, as well as adapting to the different microphone and PTT (push-to talk) connections. In use, the unit is merely connected to the transceiver microphone input socket, no internal modifications to the transceiver or microphone being necessary. The mic. and morse key are plugged into the unit, which

will provide either "phone" or MCW at the literal flick of a switch. The unit is self-powered by an internal volt battery. When not being used as a MCW device, the unit doubles as a morse practice oscillator, simply by using the sidetone monitoring facility.

Circuit Description

As can be seen by referring to **Fig.1**, the block diagram, the unit comprises five circuit operations, all of which except the changeover system are contained on a single printed circuit board. Looking at the circuit diagram, **Fig.2**, this shows the circuit comprising a keyed audio oscillator, in this case an astable (free-running) multivibrator, based around the NE555V, IC1. Keying is provided by Q1, which is in series with the positive supply rail to ICl. Q1 is normally in the 'off' state, by virtue of R4 between base and emitter. When the key, connected via JK1, is closed, Q1 is based 'on' through R3 being grounded, thus supplying current to IC1. When key contact is broken, Q1 tries to switch off immediately, but is delayed by the charge in C15, which imparts a slowed down turn-off of a fraction of a second. This produces a better keying characteristic.

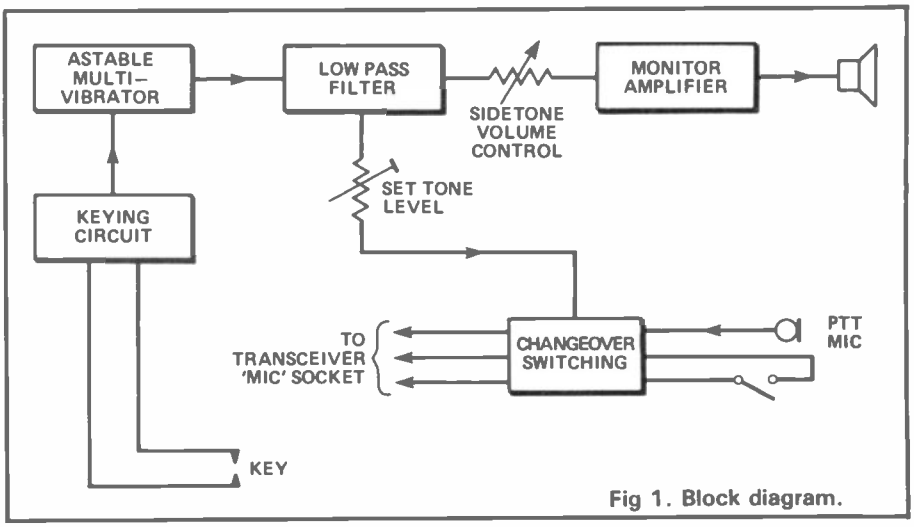


Fig 1. Block diagram.

The frequency of oscillation of IC1 is determined by the values of R1, R2, and C1. The values chosen in this application allow IC1 to oscillate at approximately 700Hz. D1 and D2 are included to produce a symmetrical squarewave output from IC1. The output at Pin 3, being square, and consequently rich in unwanted harmonics, is passed through a lowpass filter formed by R5,C4,R6,C5,R7 and C6. The resulting waveform is nearly sinusoidal. From the filter, the signal follows two separate paths. C7 couples part of the signal through VR1 to ground. VR1 is a preset control which eventually feeds the attenuated signal to the transceiver. The signal also passes via C8 to VR2 which acts as a volume control for IC2, a simple audio amplifier built around the LM380N-8, a low-voltage version of the popular LM380N IC which in this case acts as a sidetone monitor amplifier, driving loudspeaker through C14. Decoupling of the supply rail is effected by C11, R8 and C12.

The attenuated signal appearing at VR1 slider is fed via an RF filter, comprising C10, RFC1 and C13, to one side of an MCW/PHONE changeover switch, SW2A. The function of SW2A is to permit normal microphone signals to be passed through to the transceiver when in the PHONE position, but allowing only the

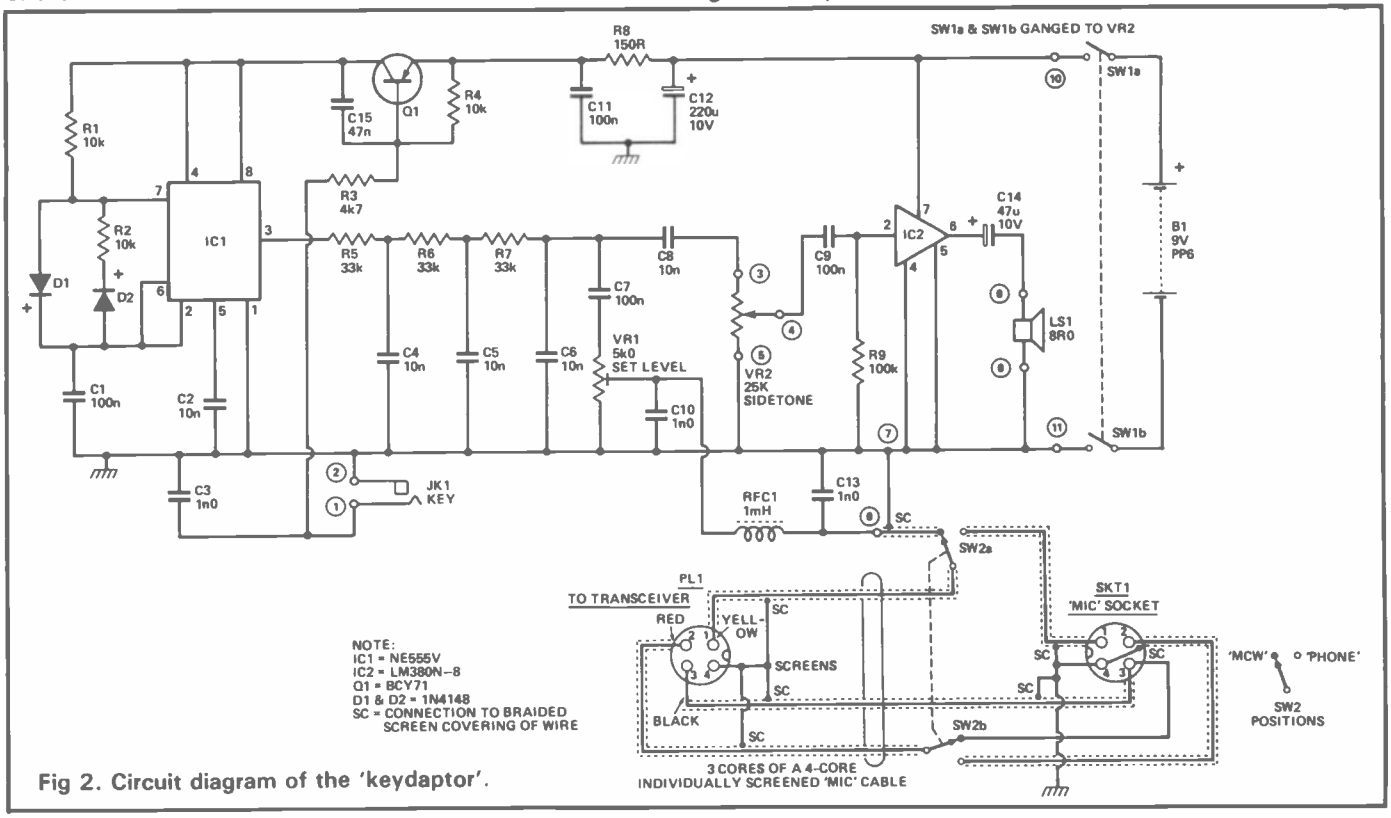


Fig 2. Circuit diagram of the 'keydaptor'.

keyed audio tone through when switched to MCW. Switch SW2B provides PTT (push-to-talk) override. In MCW mode, normal PTT facility, available at the microphone, is overridden, the transceiver being put into the transmit mode. With SW2B in PHONE position, normal PTT is restored.

Construction

This part of the proceedings should not prove too difficult, but details will be given to help where thought necessary. Basically, all components are mounted on a single circuit board, except the loudspeaker, volume control, function switch, key jack and microphone socket and transceiver plug. Printed circuit board component layout and trackside pattern are shown in **Fig.3**.

Once the board has been prepared and drilled, the 11 terminal pins should be inserted and soldered. The resistors should follow, then the capacitors. The choke, RFC1, should then be inserted, together with the two diodes, transistor and two integrated circuits. Ensure when inserting the two electrolytics C12 and C14, as well as the transistor, diodes and ICs that they are orientated into correct positions as shown on the diagram of the board layout. All leads should be bent over, cropped to length and soldered. VR1 is fitted last, with the lugs protruding through to the trackside of the PCB carefully bent over and soldered.

At this stage, the board should be checked for any unsoldered, dry or bridged joints. Any shorts due to copper turnings from the drilling of the PCB should also be removed. Afterwards the completed board can be put aside.

The unit is housed in an aluminium box with lid, Norman Rose Type BA9, which measures 6 x 4 x 2 inches. The printed circuit assembly is mounted on four 6BA screws with ¼ inch spacers to stand the board off, in the bottom of the box. The function switch, volume control/on-off switch, key jack and microphone socket are mounted along one 6 inch side of the box. The lead terminating in the transceiver plug passes through a small grommet in a hole in the rear side.

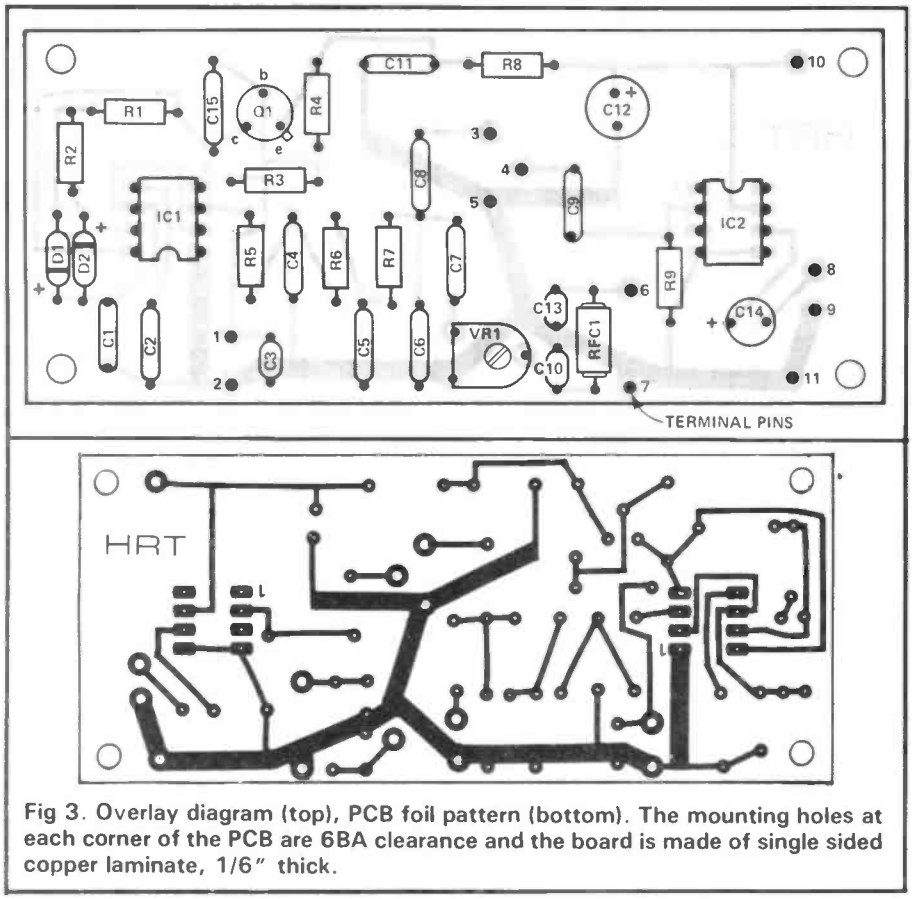


Fig 3. Overlay diagram (top), PCB foil pattern (bottom). The mounting holes at each corner of the PCB are 6BA clearance and the board is made of single sided copper laminate, 1/6" thick.

The loudspeaker is mounted to the underside surface of the unit lid. A piece of fine expanded aluminium grill is cut to size and fixed to the back of the lid by means of 'Araldite' epoxy resin of the quick-setting variety. The loudspeaker is carefully applied to the back of the grill in the same manner, care being taken not to smear the resin onto the loudspeaker cone. Full drilling details for the box and lid are given in **Fig.4**. After drilling, these can be given a professional-looking finish by spraying with car-type cellulose aerosol paint.

Wiring Up

All interconnecting wiring between the PC and box-mounted components is shown in **Fig.5**. Most of the wiring is done with miniature single-screened 'microphone' type cable. This is used to discourage any introduction of RF, or the likelihood of instability, or hum being picked up by the unit. A point worth mentioning here is that the lead from the key to the jack socket JK1 should also be screened cable with one end of the screen earthed to reduce the likelihood of RF pickup.

Setting Up

After the adaptor unit has been completely wired up, a careful check should be made to ensure all the wiring is correct. Using a multimeter set to the lowest resistance range, or a simple continuity tester, check out all the wiring point-to-point, as well as testing out the switching actions continuity wise of SW2A and B. If all seems correct, proceed to the next stage.

With the volume control/on-off switch VR2 knob in the fully anti-clockwise position (ie 'off'), plug in a morse key (preferably a 'pump-handle' type for this application during testing), via jack JK1. Connect a multimeter, set to read 100mA DC or higher full scale deflection, in series with one side of the battery and the battery connector. The other side of the battery connector should be coupled straight to the battery. No current should be flowing at this time.

Rotate VR2 knob clockwise to the 'on' position. A reading of approximately 11mA should be observed. If the reading is higher, say about 25mA, then something is wrong. A re-check of the wiring

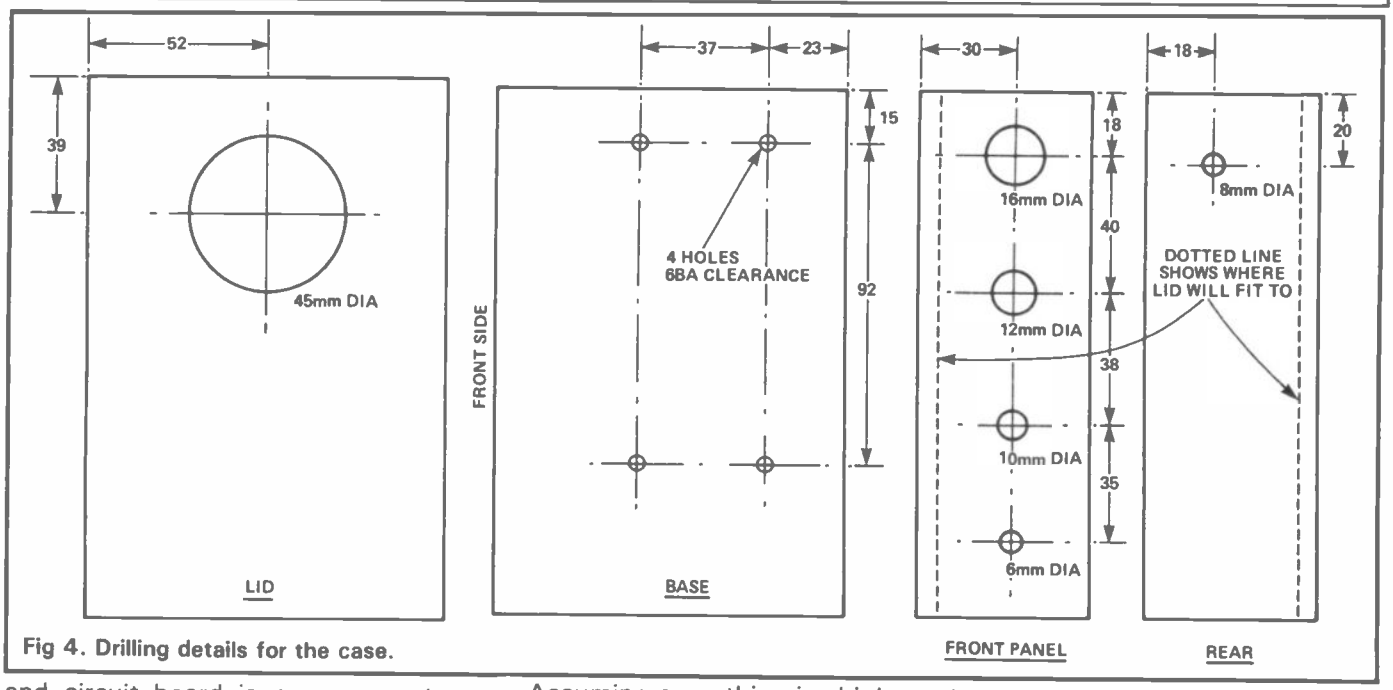
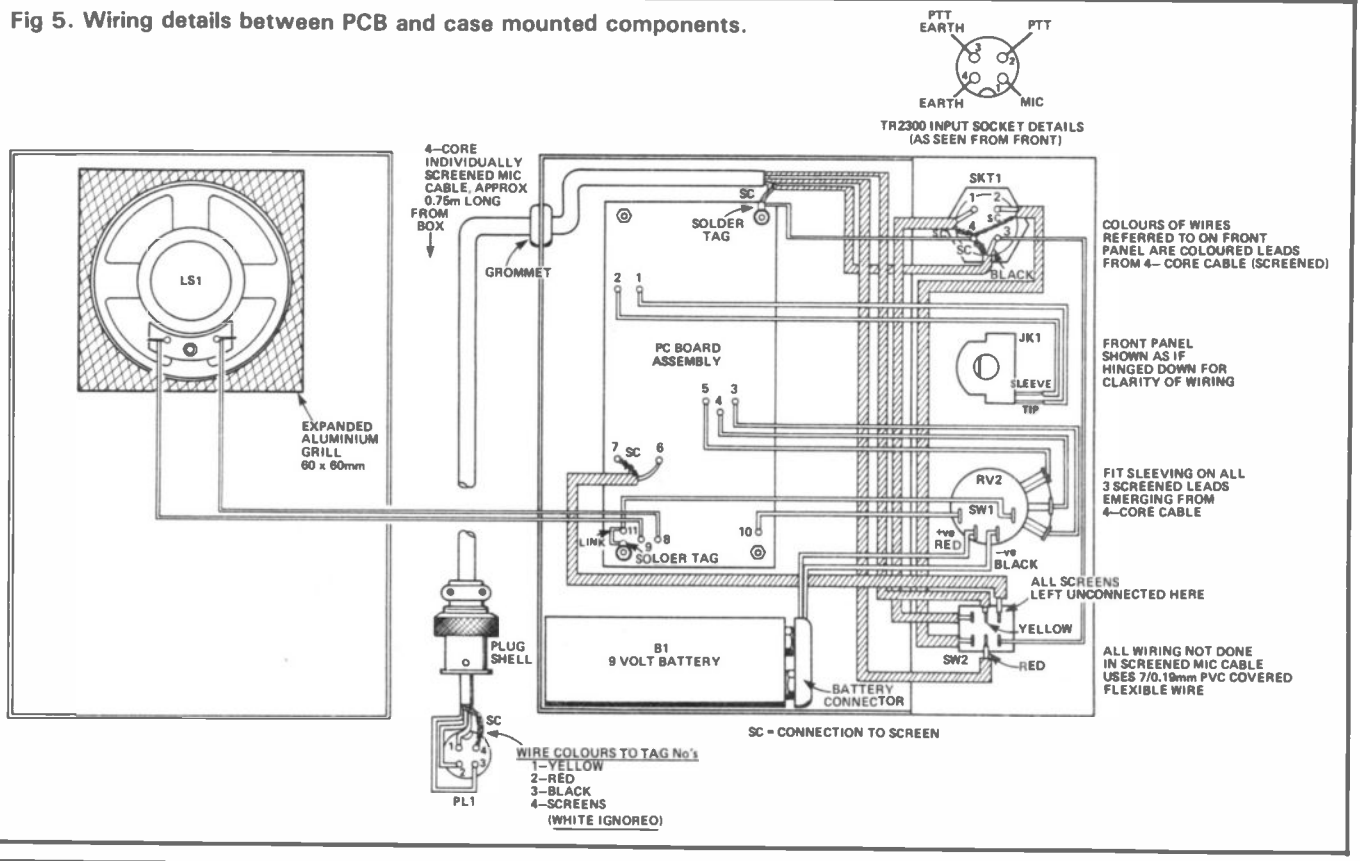


Fig 4. Drilling details for the case.

and circuit board is necessary at this stage if this happens. Assuming the reading appears to be about the 11mA mark, close the key contacts, and rotate the knob of VR2 fully clockwise to the stop. The reading should rise to approximately 70mA, and should be accompanied by a loud tone from the loudspeaker. If no tone appears, or the current reading is much lower, say 30mA, then again a re-check is called for.

Assuming everything is alright, remove the meter and restore the battery connection. Turn down the sidetone volume to a comfortable listening level. This level of tone should take about 20mA drain from the battery. Keep the key closed. The preset tone level which feeds the transceiver now requires setting. The ideal way to do this is to use an oscilloscope, valve or FET voltmeter, or any other high-impedance AC voltage measuring instrument. If such an instrument is available, then take the microphone normally used with the transceiver, or intended to be used with it, and connect it across the input terminals of the instrument, ensuring proper 'earth' and 'live' connection of the signal leads, to avoid possible pickup of hum which would give incorrect readings. After connection, hold the microphone at the normal position for operating, and produce a whistle or tone by mouth

Fig 5. Wiring details between PCB and case mounted components.



of a level comparable to that of the normal operating level of your voice. (This is easy, just sounds complicated). Adjust the sensitivity controls of the measuring instrument until a steady reading is obtained and note the reading. With the microphone of the TR2300 transceiver used with the prototype, a reading of 30mV peak-to-peak was measured on an oscilloscope.

Disconnect the microphone from the oscilloscope or whatever, and, in its place connect to the contact of the plug on the flying lead from the 'Keydaptor', again, ensuring correct connections ie screen to earth of scope etc. Set VR1 preset to fully clockwise position (minimum output). Set function switch SW1 to 'MCW', and whilst monitoring the level on the measuring instrument in use, rotate VR1 slider until the reading equals that obtained from the microphone. The maximum level of signal obtained when VR1 is fully anti-clockwise is approximately 200mV peak-to-peak, as measured on the prototype. Leave VR1 at the correct setting as described.

If none of this equipment is available, the alternative ways to set up the output level of the 'keydaptor' are either to monitor the transmission yourself on another receiver tuned to the appropriate frequency, or to enlist the services of another amateur station who would be kind enough to listen to your transmission whilst the adjustment was made. With the prototype unit, optimum level was obtained with VR1 slider in the "1 o'clock" position, but of course this setting will differ with each individual case. The signal level will be slightly "damped" or attenuated when applied to input circuitry of your transceiver, but this will be negligible and should not upset performance.

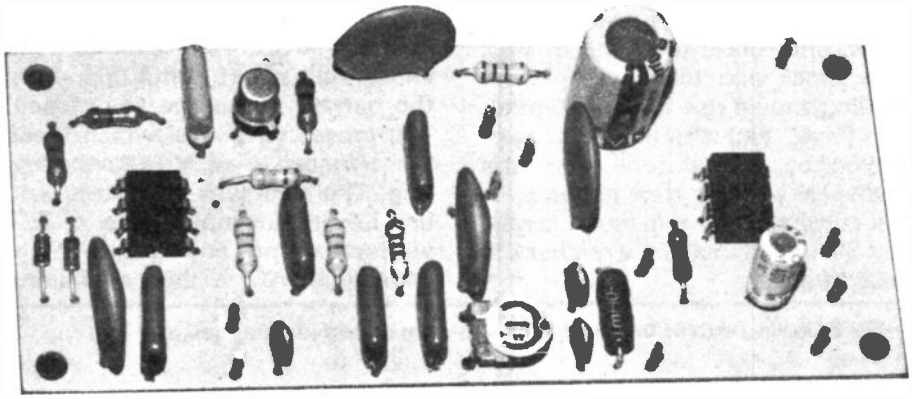
Testing, Testing

The unit can now be connected to a transceiver. Remove the microphone from the transceiver, and insert this into the microphone socket on the unit. Insert the plug on the flying lead from the adaptor unit into the transceiver microphone input socket. An antenna and power should be connected to your transceiver. Ensuring the function switch is in the PHONE position, switch on the transceiver, which should be functioning normally on receiver. Adjust the transceiver tuning to find a clear channel and then press the PTT lever or button on the microphone. The transceiver should go into the transmit mode, and a carrier strength level should be indicated on the S-meter/RF meter of the set. Release the PTT momentarily, and the transceiver should revert back to receive.

Plug in the key, and then switch on the 'keydaptor'. Turning VR2 knob, hold down the key and set VR2 to a normal listening level. Release the key. Set the function switch to MCW. The transceiver should change over to transmit as before, but this time without pressing the PTT. RF should be indicated as before. Looking at the meter indicator, close the key contacts. There should be very little change in the position of your RF meter/SWR Bridge. If another receiver is to hand, listen to the transmission. A clean tone-modulated signal should be heard. Restore the function switch to PHONE, and the transceiver is ready for microphone operation straight away.

Conclusions

Although this method of transmitting morse possibly only has around the same effective range as that of a normal voice-modulated emission, or perhaps a little further at best, it is an effective way of "getting on the air" with CW on a transceiver not equipped for proper keyed-carrier CW. *The all-mode sections of the 2 metre and 70 cms bands are possibly the best areas for communications via F2E/G2E modes.*



Components Listing

RESISTORS

R1,R2,R4	10K
R3	4K7
R5,R6,R7	33K
R8	150R
R9	100K
VR1	5K Min. Horiz. Preset.
VR2	25K Log. Pot. with DPST Switch.

All resistors 0.25W 5% Carbon film

CAPACITORS

C1,C7,C11,C9	100nF Poly. or ceramic
C2,C4,C5,C6,C8	10nF Poly. or Ceramic
C3,C10,C13	1nF Ceramic
C12	220uF 10V Electrolytic.
C14	47uF 10V Electrolytic.
C15	47nF Poly. or Ceramic.

All capacitors at 10V DC working.

SEMICONDUCTORS

Q1	BCY71 or similar PNP transistor
IC1	NE555V
IC2	LM380N-8 (8-pin version of LM380)
D1,D2	IN4148

INDUCTORS

RFC1	1mH min. wire ended

Aluminium Box with Lid, (Norman Rose Type BA9) size 6×4×2"; 8 ohms min. loudspeaker (2¼); Copper laminated single sided PCB, 100×45mm; aluminium grill, approx. 2½×2½; Araldite Rapid; 4-pin Mic. Socket (see text); 4-pin Mic. Plug (see test); Mono ¼" jack socket, insulated type; Double-Pole Switch, Min. Toggle; 1m 4-core Individually-Screened Microphone Cable; 2ft Min. Single-screened 'mic' cable; 3ft PVC Insulated flexible wire; PP6 Battery; Battery Connector; 2 8-pin DIL IC Sockets (if required); Knob for VR2, 4×6BA×5/8" Cheese Head Screws, washers, nuts, solder tags, ¼" spacers; PCB Terminal Pins; 4 Rubber Feet; and 2ft or 3 or 4mm PVC Sleeving.

MICRO NET

This month, Dave Bobbett, G4IRQ, looks at ways of screening your micro, coping with small VDUs and BASICODE and gives an update on his satellite predictor program

Not so long ago, a reader of one of the monthly computer magazines wrote to ask (tongue in cheek) whether or not a transmitting licence was required in view of the number of radio frequency 'sproggies' which were being churned out by his computer. The magazine's agony aunt or uncle replies that of course you didn't and besides, all micro-computers generated interference so it was just one of those things that you have to live with.

Needless to say, readers of HRT, being radio users, will know that this is totally incorrect and that interference can, at the very least, be reduced to bearable levels in the majority of instances. In this particular case, the complainant was not trying to work Fiji on a watt, or anything exotic — all he wanted to do was to listen to Aunty Beeb on VHF and compute at the same time!

Whilst thinking about this question of RFI, it occured to me that there was a tremendous disparity between levels of regulation found in, say, the amateur radio field and that of 'accidental transmitting stations such as TV sets, light dimmers and the humble micro-computer. The really strange thing in the case of the micro' is that identical machines are being sold abroad, except that they have had either metal cases or foil screening added, so as to comply with the relevant national RFI standards. Back here in the UK, town dwellers are expected to sit in a veritable fog of TTL generated rubbish simply because nobody seems particularly bothered about the problem. It strikes me as being highly illogical to closely control transmitting stations (be they CB, amateur or broadcast) but allow manufacturers to produce equipment, by the thousand, which pollutes the very radio spectrum such legislation seeks to protect.

Raising The Standard?

On a number of occasions where domestic hi-fi equipment has been found to have AFI 'faults', manufacturers have agreed to correct this design 'fault' by fitting the suppression components which should have been there in the first place. Just as our previous hypothetical hi-fi user had the equipment modified because the unit was bought as an amplifier and not as a radio receiver, it would seem reasonable to require computer manufacturers to correct the design faults which result in micros functioning both as radio transmitters and computers. I would be most interested to hear from readers who have had any success in arguing along these lines!

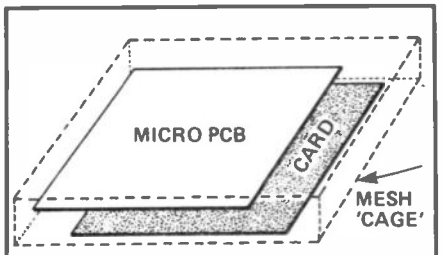


Fig 1. The mesh screen method of RFI suppression.

Earlier this year, the British Standards Institute issued BS6527 which defines acceptable radio emission levels for computers. It will be interesting to see how these compare with American and European standards and also what sort of impact will be made on the micro-computer industry. For those who are interested in getting to grips with the definitive item, a copy of the new standard is available for a mere(!) £10 or so from the BSI; details are in the address box. The more canny readers will already be on their way to the local library!

Get Stuck In

In the meantime, some stalwarts are levering the lids of their computers and trying to cure the RFI problems themselves — one of these is John Pile (GW4EPF) of Swansea who contacted me with a number of ideas for Dragon 32 computers. Essentially, John's experiments were based on making what amounts to a Faraday cage out of perforated alloy mesh (see **Fig.1**) and protecting the underside of the PCB from inadvertent shorts by placing a piece of card between the board and the 'cage'. Now this may seem to be a rather primitive way of going about it; but in view of the fact that Commodore, in the Vic 20, use a piece of cardboard with silver foil on one side to reduce RFI, a hi-tech approach isn't really necessary.

Due to the limited clearance of the PCB inside my own micro, I opted for a slightly different approach which uses a home-made laminate. This sandwich consists of two layers of adhesive-backed plastic which enclose a single sheet of aluminium cooking foil (see **Fig.2a** and **b**) Fig.2a uses the plastic film's own adhesive to attach the laminate to the case and has the advantage of being removable at a later date if required. Figure 2b, on the other hand, uses an adhesive between case and screen. I would *not* recommend the use of a contact adhesive unless you are absolutely sure that you can get everything in the right place at the first attempt — here I am speaking with the voice of bitter experience!

A far better idea would be to use a thixotropic type of adhesive which allows the laminate to be positioned precisely and only sets when pressure is applied to it. The important thing to bear in mind when using a laminate is to draw an accurate plan of the required

shape beforehand and to try and have as few joins as possible. Don't be tempted to cover ventilation holes, otherwise your micro may cease causing RFI permanently!

As for earthing the laminate shield, I carefully removed a small section of the uppermost plastic film and bolted a shake-proof washer down onto the exposed metal foil. The same bolt carried a Lucar type connector, which served as a connection point for the screening inside the lid and a single common earth connection was made to the main earthing point inside the machine. Although this solution only seeks to cure the directly radiated component of the RFI problem (I have yet to get to grips with QRM emanating from the cables), there is a noticeable reduction in spurii which has rendered certain, previously useless, 2m frequencies usable once more.

There are other ways to tackle the problem; for example, it is possible to have the inside surfaces of the computer's case sprayed with a special RFI-screening paint, although at £18 a time it isn't exactly cheap and there is the disadvantage of the micro being unusable whilst the case is being treated. If *you* have any hints or tips on computer RFI suppression which may be of use to others, please do drop me a line as I'm sure that any such ideas would be greatly appreciated.

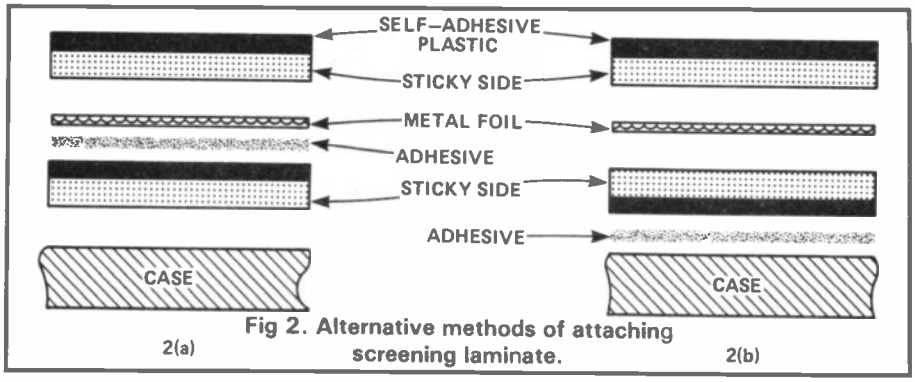


Fig 2. Alternative methods of attaching screening laminate.

Back To Basicode

When designing Basicode the authors decided that a reasonable compromise for a standard screen format would be 40 columns by 24 lines. Unfortunately this means that for some users, whose machines have 'smaller' screens, problems can arise when text is printed out during a program run. However, the subroutines which take care of the conversion of Basicode programs into the host micro's dialect of Basic also provide us with a means of solving the screen-size compatiblity problem.

In Basicode, the cursor may be moved to any position on the screen simply by first defining the horizontal position (HO) and vertical position (VE) which is required and calling GOSUB 110, which will move the cursor to the appropriate place. Thus the top left-hand corner would be HO = 39, VE = 23 which are the maximum values each variable is able to adopt (see **Fig.3**). Whilst GOSUB 110 allows us to *move* the cursor, GOSUB 120 makes it possible for us to *find* it, if the cursor's position isn't known. By using GOSUB 120 and then printing the values of HO and VE we can discover the unknown co-ordinates.

By using these two sub-routines, it is possible to write a short program which repeatedly moves the cursor one position to the right across the screen and reads the new position by use of the GOSUB 120 'find-the-cursor' routine. In this way the value read-back in HO will always be 1 greater than the previous value of HO until the edge of the screen is reached. Whereupon HO will assume a value of 0 as the cursor 'wraps around' to start the line again. This is precisely the method used in the program (**Fig.4**) to measure the screen width. The current cursor position is stored in CO and the cursor is in-

```
 1000 A=250:GOTO20:REM ***SCREEN MEASURE ROUTINE ***
 1010 GOSUB100:GOSUB120:CO=0:LI=0
 1020 CO=HO:HO=HO+1:GOSUB110:GOSUB120:IF HO>CO THEN 1020
 1030 LI=VE:VE=VE+1:GOSUB110:GOSUB120:IF VE>LI THEN 1030
 1040 GOSUB100:PRINT"SCREEN SIZE IS:-"
 1050 PRINT (CO+1);" COLS  ";(LI+1);" LINES"
 1060 GOSUB 1900
 1100 :
 1200 :
 1300 :
 1400 REM ***TEXT PLACING ROUTINE ***
 1500 READ A$:IF A$=".*" THEN 2000
 1510 GOSUB120:IF HO+(LEN(A$)+1)>CO THEN HO=0:VE=VE+1
 1520 GOSUB110:IF VE>=(LI-2) THEN GOSUB1900
 1530 HO=HO+(LEN(A$)+1):GOSUB120:GOSUB110
 1540 PRINT A$;" ";:GOTO1500
 1550 :
 1600 :
 1700 :
 1800 REM *** NEW PAGE ROUTINE ***
 1900 HO=0:VE=(LI-1):GOSUB110:GOSUB250
 1910 PRINT"<<Any key to cont>>"
 1920 GOSUB210:GOSUB100:RETURN
 1930 :
 1940 :
 1950 :
 1960 REM *** MEMORY AVAILABLE ***
 2000 GOSUB270:HO=0:VE=VE+2:GOSUB110:PRINT FR;" BYTES FREE"
 2010 :
 2020 :
 2500 END
 2510 :
 2520 :
 2530 :
25000 DATA"This","is","an","example","of","one","of","the"
25010 DATA"ways","in","which","text","may","be","displayed"
25020 DATA"during","a","program","run.","For","further"
25030 DATA"details","please","see","article.",".*"
```

```
      ***** SATELLITE PROGRAM DATA LINE UPDATE *****
25000 DATA0,31,28,31,30,31,30,31,31,30,31,30,31
25010 DATA "UOSAT 1" 46, 02, 18666, 900.58611
25020 DATA 347.6, 94,3685, 23.5898
```

Fig 4. Listing and DATA line update of G4IRQ satellite program.

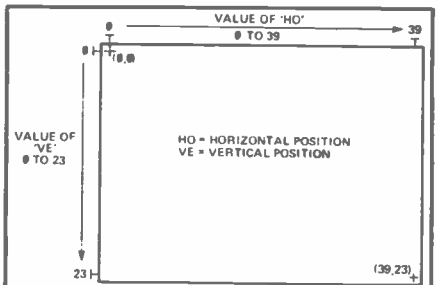


Fig 3.

cremented one space, if the new cursor position is greater than the old then the cycle is repeated. When the last cursor position on the screen is reached however, the next increment will result in the wrap-around effect, HO will be 0 and CO will be 39 — so as soon as HO becomes less than the value of CO, the edge of the screen has been reached and the total number of columns is the same as the value held by CO.

The same method is applied in order to find the number of lines on the screen, with VE being the cursor's vertical position and LI the number of lines. By using this screen measuring technique any computer is able to measure it's own screen size and store the information as CO (COlumns) and LI (LInes) ready for further use in other programs.

Printing Horrors

The second part of the program illustrates how screen-measuring can be used to overcome the problems associated with printing text on machines with varying screen formats. In this particular case the text has been stored in the form of DATA statements from line 25000 onwards and operates by measuring the length of each word prior to printing; if there is sufficient space remaining on the current line then the word is printed, if not, the printing commences at the start of the next line. By keeping track of the number of free lines still remaining on the screen, the program is able to call a separate subroutine when the screen is about to be filled completely, which prevents the display from scrolling the top lines out of sight.

Thus when only one free line remains the computer will print a prompt ("any key to continue") and wait until a key is pressed, giving the user time to read the text. Once a key is pressed, the screen is cleared and the printing continues following the same rules until the end of text marker is encountered. In this particular case, the end of the text is marked by ".*", but of course any combination of characters which is unlikely to occur in normal text would be suitable. In larger programs, the marker would be used as a link from a section of explanatory text into the main program.

An alternative approach would be to use ordinary strings to hold the text required in a program and use the Basicode 'LEN' command to measure the size of each word within the string. Individual words could be extracted from the text string by looking for the 'space' character (ASCII code 32) which would mark the end of each word. The limitation of this method is that no more than 255 characters (about 40 words) are allowed in one string. This may or may not be a problem depending upon the volume of text and the number of string variables required by the rest of the program.

Fig 5. Breakdown of information in satellite program DATA line.

Contents	Variable Name	Function
LINE 25010:		
DATA	—	—
"UOSAT 1"	R$	Satellite Name
21	RD	DAY of Reference Orbit
07	RM	MONTH of Reference Orbit
15476	RN	Reference Orbit Number
792.983333	RX	Equatorial Crossing Time GMT (in Decimins)
LINE 25020:		
DATA	—	—
318.4	RL	Equatorial Crossing Point °W (in Decidegs)
95.4063	RP	Orbital Period (in Decimins)
23.5996	RW	Orbital Increment (in Decidegs)

And Now The News

Owners of the Tatung Einstein computer may be glad to know that they will soon be able to make use of Basicode programs as a translation program is currently under development for this machine. I have no further details, at the moment, but by the time this edition of Micro Net appears it may be worth contacting your supplier.

For those micro radio users who dabble in land-line computing (shame on you!), there is the Hamnet Bulletin Board System which is located in Hull. Details are in the address box; but please note that this BBS is *not* a 24 hour service but, rather sensibly, is available during the cheap-rate phone periods.

James McKnight (SW Scotland) dropped me a line asking for more details on the DATA lines contained in the satellite prediction program (October Micro Net). As it is about time for the orbital information to be updated here are the details. As 1984 was a leap year, line 25000, which contains 'days-in-each-month' information will need up-dating too. For convenience, the up-dated lines appear at the bottom of Fig.4 following this month's demo' programs and the details of the functions of each DATA item in lines 25010 and 25020 are shown below together with their old values. The reference orbit times and bearings were all translated into their decimal equivalents so as to make the program shorter and therefore faster in operation. To convert a GMT 24 hour clock value into 'decimal minutes' or 'Decimins' the following formula is used:
(Hours × 60)
+(Minutes/60)+(Seconds/3600)
=Decimins. Similarly, bearings are expressed in 'Decidegs' which can be calculated by inserting the appropriate values into the following equation:
(Degrees)+(Minutes/60)+(Seconds/3600)=Decidegs.

Well that's about all for one more month. I would like to extend my thanks to Lorne Computers of Oban, Scotland who were kind enough to provide printer facilities when I was stranded up North by the Essex weather. Don't forget to drop me a line if you should come across any snippets of interesting information, but please note that I will no longer be QTHR. Drop me a line via the *HRT* offices.

MICRO' NET will be appearing on a monthly basis from this month due to the excellent response from readers.

Address Box

New RFI standards:
Sales Department
British Standards Institute,
Linford Wood,
Milton Keynes, MK14 6LE
Telesales: 0908-320066

Ham Radio Bulletin Board:
Hamnet BBS
Tel: Hull (0482) 497150
Hours: 1800 to 0800

BARTG
Change of address!
John Beedie,
Membership Secretary,
'Ffynnonlas',
Salem,
Llandeilo,
Dyfed,
Wales

Contact address for Micro Net:
David Bobbett,
'Micro Net',
Ham Radio Today,
1 Golden Square,
London W1R 3AB

Please note that I am no longer QTHR!

THE VITAL LINK
Exploration and Amateur Radio

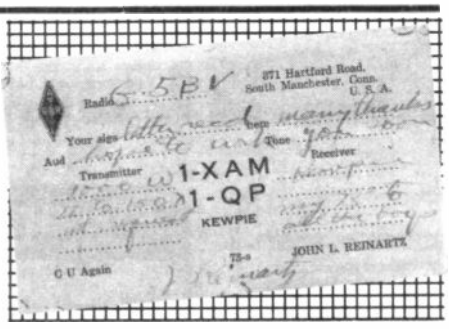
Radio amateurs have played a crucial part in ensuring the success and safety of exploration teams. Pith helmeted John Heys, G3BDQ, will now take us on a passage of discovery through his radio archives...

The early explorers, whether as individuals or in teams of intrepid souls, eager to visit remote and dangerous places, shared one great handicap; once the mast-heads of their ships disappeared over the horizon, they suddenly and completely lost all contact with their home bases. Often these adventurous travellers vanished from sight and never returned, their untimely ends remaining a mystery even to this day. In more recent times, that is since about 1920, expeditions to distant and inhospitable places have fortunately been able to avail themselves of radio communication. This article is an attempt to describe just a few of the occasions when radio amateurs played a vital part in ensuring the success and safety of exploration teams.

The Schooner 'Bowdoin'

The first recorded instance of a radio amateur operator going along as part of an expedition to enable reliable communications with the 'civilised world' concerns the MacMillan Arctic Expedition of 1923-4. Captain Donald B MacMillan, an American, had already made eight previous journeys above the Arctic Circle and he readily told of his fears that isolation could spell disaster for an expedition. In the spring of 1923, MacMillan visited ARRL HQ in Hartford to discuss the possibility of having two-way radio communications available when he led a team north again on a small schooner, the 'Bowdoin'.

His visit resulted in the equipping of the schooner with a complete 200 metre amateur station, kindly donated by the Zenith Radio Corporation, who also provided an



amateur operator of no mean ability. The latter was Donald H Mix, who held the call 1TS (later to be W1TS). The venture was a complete success and between June 23rd 1923 and their return on September 20th 1924, hundreds of messages had been sent to and from the 'Bowdoin' to the North American Press Alliance, to the back-up organisation at home and, not least, to hundreds of American amateurs. The expedition's callsign was WNP (Wireless North Pole) and whilst on the trip, they set up a new world DX record too! Ironically, whilst Don Mix was away, the great "DX revolution" had erupted and the wavelengths used by radio amateurs fell below 100 metres (up to this time, these 'short wavelengths' had been generally regarded as useless). This resulted in much long distance 'working', and even inter-continental contacts became commonplace.

The 200 metre band was soon abandoned for DX working but Mix and his station WNP had proved, that explorers and adventurers travelling to distant parts, anywhere on the earth's surface, need never again endure the dangers of isolation inherent on earlier journeys. Don Mix, as W1TS, was listed in the 1952 Call Book as living in his home state of Connecticut.

In 1925, the 'Bowdoin' once again carried a MacMillan expedition to the far North. This time WNP, using more up-to-date gear, was operated by one of the legendary figures in amateur radio, John L Reinartz (calls 1QP and 1AXM). His work in the devising of new and better circuits for the new 'Short Waves' was a major factor in the great leap forward in consistent long distance working by amateurs. Reinartz invented a detector circuit which will be remembered in the history of amateur radio, for it enabled reliable regenerative reception down to very short wavelengths (Reinartz had gear working on 10 metres in 1924) using the rather inadequate valves then available, which had poor amplification and high inter-electrode capacities.

Also aboard the 'Bowdoin' was Lt Commander Richard Byrd, who, a few years later as Admiral Byrd, led two famous expeditions to the Antarctic. Byrd's first expedition South will be described later in this article.

Around Africa

Between March and August 1927, an Italian Motor Vessel, the 'Perla', was engaged upon a voyage of scientific discovery around the coast of the continent of Africa. There was no real danger attached to this trip, but it is noteworthy that the Perla had on

board an amateur to operate the ship's 600 watt 'Short Wave' rig and call XEI1FP. This was Senor Franco Pugliese, whose home QTH was in Milan where he held the call I1FP. The trip began in Venice and after passing through the Suez Canal, the Perla stopped at eighteen ports before her return to Genoa on August 5th. The receiver used on board ship was a superhet — very unusual and 'advanced technology' for that date! During the 1920's, the Italian Navy had several ships with operators on board who worked the amateur bands. this was useful in determining communications limits for their Navy!

The Byrd Expedition of 1929-30

This famous and well documented expedition set sail in the summer of 1928 and included *six* radio operators. These included four amateurs; three American and one New Zealander. On the journey South many 'skeds', using the callsign WFA, were successfully kept with amateur stations and the ice base was reached during the Antarctic mid-summer in January 1929. Three tall towers supported a variety of antennas down at their base, 'Little Amarica' in the Bay of Whales. A simple self-excited power oscillator in a TPTG (tuned plate-tuned grid) circuit running a pair of 204A tubes (valves for the un-initiated) was used as the transmitter. This simple but powerful rig could be almost guaranteed to work, even in the most rigorous conditions (a long, long way below freezing) and although unstable by today's standards — and also no doubt 'chirpy' — it could be easily received. Its 500Hz self rectified HT supply from a generator would also impart a certain 'music' to its note!

The receiver was a General Electric type AR 1496-B which used the then latest 'state of art' design and included a screened grid (tetrode) valve as an RF amplifier stage, followed by a detector and two stages of audio.

I consider myself more than fortunate in having a WFA QSL card in my collection. This card confirmed a QSO with J Kyle, Scottish G6WL (at that time there was no GM prefix) living in Ayrshire near Glasgow. It was written out and signed by 'Pete' alias Carl O Peterson, one of the non-amateur expedition operators. The front of the card has small line drawings showing penguins and the base with its three mighty towers and three grounded aircraft. The expedition handled more than 2 million words of copy, most of this traffic going through amateur stations who could maintain contact with the Byrd Expedition even when the commercial 'Big Boys' lost out!

The Indefatigable Krenkel

Ernst Krenkel, unfortunately now no longer with us, was undoubtedly the most famous and lauded amateur in the Soviet Union. He first worked as a wireless operator in Arctic Russia from 1927 when based on the island of Novaya Zemlya. It was whilst there and using 250 watts of power that he contacted Byrd's expedition (WFA) in January 1930. The 7MHz band, a favourite for DX in those days, was used for this contact and it was the first time that such a long-haul North/South contact had been achieved.

July 1933 saw Krenkel as chief radio operator on the SS Chelyuskin, an icebreaker used to explore arctic waters and find paths along the northern Siberian coastline. On February 13th 1934, she was crushed by pack ice off the coast and soon sank. The survivors, which included women and children, took what they could salvage from the stricken vessel before she went down and then made camp on the ice. For two months, the survivor's only contact with the outside world was through Krenkel's radio gear. He used the Chelyuskin's callsign RAEM during that time and eventually the survivors were rescued by Russian planes. the last six people, which included Krenkel and some husky dogs, were picked up on April 13th 1934.

For this exploit, which saved the lives of *everyone* from the Chelyuskin, Krenkel was made a Hero of the Soviet Union, the highest honour that that nation bestows, and was remarkably allowed to take the callsign of the Chelyuskin as his own personal

The amazing Ernest Krenkel. Top card is an 'artistic' illustration of Krenkel's work on the ice cap after the Chelyuskin sank. Note that the Chelyuskin appears to be beached rather than sunk! The postcard at the bottom right shows Krenkel (2nd from top) and the three other men who made up the expedition to the North Pole in 1937.

amateur call. A QSL card received from the Russian amateur U3DI by G6MU in 1936 shows the ill-fated Chelyuskin trapped in the ice, some Russian aircraft fitted with skis, and an inset portrait of Krenkel wearing his 'phones.

This was not to be the final chapter in Krenkel's adventurous life story, for on the 21st May 1937, the Soviet Union announced to the world that four men and a dog had been landed by plane on to the ice of the North Pole! The expedition leader was Ivan Papanin. There were also two scientists and the fourth man was Ernest Krenkel. Krenkel soon set up his radio station and using the call UPOL was kept extremely busy handling traffic and amazingly also finding enough time to contact amateur stations.

His first such QSO was with a Norwegian station on June 24th and this was soon followed over the months by contacts with DX all over the world. His little 20 watt transmitter received its power from lead-acid accumulators which could be charged by a wind generator. During the rare calm periods, a pedalled 'bicycle-like' contraption was used for this purpose – which needed two men to work it properly. Krenkel's antenna was a simple 76 metre 'long wire', held up by two poles.

The ice drifted rapidly and by December the party were almost 1300 km from the pole and were reaching warmer seas which would soon melt the ice floe they were 'travelling' on. The expedition eventually had to move camp, pulling all their equipment and supplies on a sledge. Krenkel kept up an almost constant contact with the ships which were racing to effect a rescue before the ice floes all melted, and it is said that he often operated in the open with bar fingers on his key. At such times Krenkel could only work for ten minutes at a time because of the intense cold.

The expedition was eventually rescued on February 19th 1938 after their epic journey which took them to a point off the east coast of Greenland.

Krenkel's QSL cards in later years showed in colour the UPOL Polar Ice Station. One of them, sent to old timer G6VC in Kent in 1958, has on its back the interesting information that all cards for Russian amateurs with the sole exception of cards for Krenkel were to go via Box 88 in Moscow. Krenkel's private home address in Chapligin Street, Moscow was given, together with a short explanation for his having the callsign RAEM.

UPOL was just the first of a long series of drifting Polar Ice Stations. A later one was UPOL-9 which was set up during 1960-61. G6VC worked this remote station too and received an interesting QSL card from the operator Victor Boronin, who was using 70 watts input and a 9 tube receiver. The 'picture' side of this card shows the Ice Base with its huts, antenna masts, a helicopter and a fine display of the Aurora Borealis, the Northern Lights, overhead.

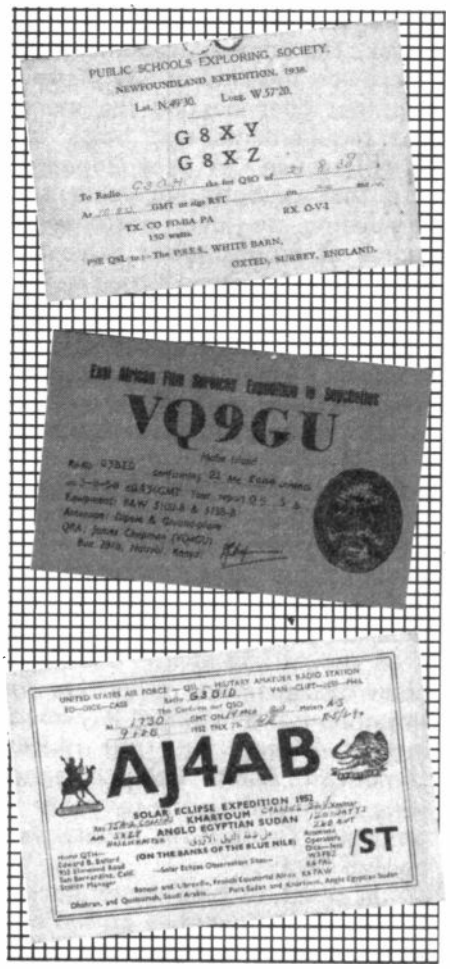
A final highlight from Krenkel's amazing story was his appointment, when no longer a young man, as the Commander of an Antarctic Expedition in 1968-69. A trip to the Antarctic was something he had long desired, it is said.

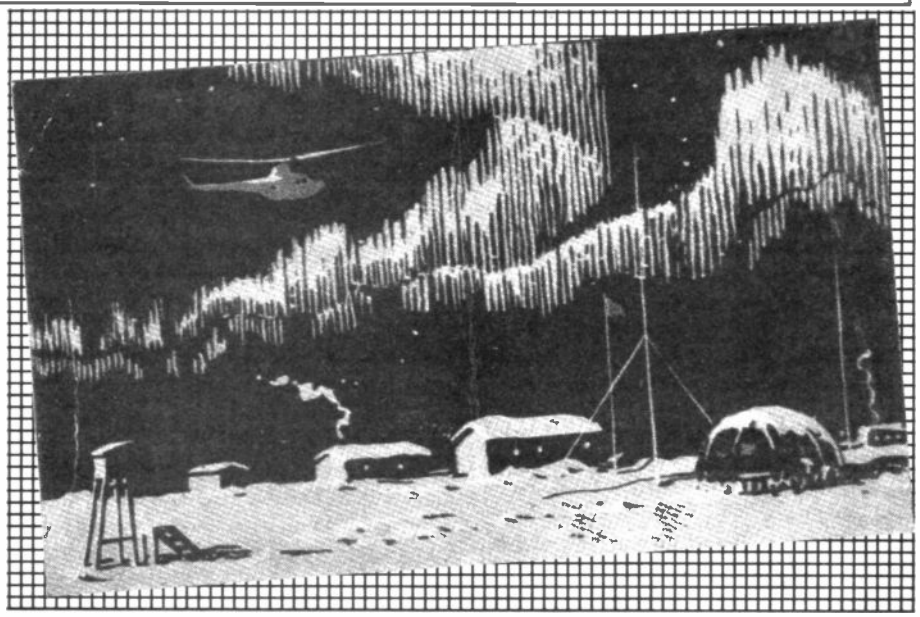
Some Minor British Expeditions

The late Lt Col A B 'Brownie'

Whatman, MBE, G2BQ, was the radio operator for the Oxford University Arctic Expedition back in 1935-6. He went with them to North East Land (80 degrees N and 20 degrees E) and used the call GVX. 'Brownie' held the call G6BW in the 1920's and at various times had worked as VS6BE, MJL in Spitsbergen (1942/3) VU2BC, MD2BC (Tripoli) and MD2BC/SU in Egypt during 1951. He certainly got around during his life in the Army! Another and earlier Oxford University Expedition which went to British Guiana in 1929 had relied upon amateur radio and used the call VP5OUX.

Each year, the Public Schools' Exploring Society sends a small party of lads and masters to explore remote places, often in colder climes. Their trip to Newfoundland in 1938, using the callsigns G8XY and G8XZ, had G6DW as chief operator. Their simple and rather dull looking QSL card tells us that they had a crystal controlled 150 watt transmitter and a simple 0-V-1 'straight' receiver. The card in my possession was sent to G3OH for a contact on 20 metres and locates the expedition at Lat N 49'30, Long W 57'20.





QSL card sent to G6VC for a contact with Drifting Ice Station UPOL-9.

The British North Greenland Expedition during 1952/4 must not be forgotten, for they had numerous contacts with amateurs and used the call G3AAT/OX. I once received a card from this expedition but like so many things that are accumulated it seems to have vanished. It will hopefully 'resurface' one day!

More Recent Times

The year 1952 saw a spectacular astronomical event; a full eclipse of the Sun which was observable from sites in the Sudan and across to French Equatorial Africa and also Saudi Arabia. Radio amateurs accompanied the scientists to a site near Khartoum in what was then known as the Anglo-Egyptian Sudan, and these were Messrs. W3PBZ, K6FAL and K6FAW. I have two QSL cards from this expedition which was located on the banks of the Blue Nile and both were for their contacts with the late G3BID. One callsign used was ST2AB and the other was the American MARS callsign AJ4AB/ST. This expedition has many contacts world-wide and examples of their QSL are not rare.

A much scarcer card comes from VQ9GU, which was the call of a station set up on the Island of Mahe in the Seychelles in August 1958. The expedition to Mahe was organised by the East African Film Services and the radio operator was VQ4GU from Nairobi. Commercial gear was used during the trip and this is perhaps an indicator of the rapidly changing face of amateur radio in more recent times. the simple transmitters and 'straight' receivers of the earlier days could no longer cope with the QRM and band conditions induced by hordes of fanatical DX chasers!

Signing Off

This article has only scraped the surface of the topic of amateur involvement in expeditions and exploration, for there were perhaps several hundreds of occasions between Don Mix's efforts in 1923 and the present day. Over the last thirty years, there has been a succession of expeditions to the Polar regions and many semi-permanent bases have been established in Antarctica. A detailed account of amateur operations from these bases is beyond the scope of this article which has only tried to tell something about the 'old days'.

I have also quite purposely not mentioned the so called 'DX-peditions' to rare and wanted locations over the world, for I feel that such stations belong in quite a different category. They are set up for the sole purpose of giving a new country to the hundreds of thousands of DX 'hounds' everywhere and are not incidental to a more important purpose. If you have any QSL cards for QSO's with 'real' expeditions, hang on to them; they are going to be interesting and perhaps even valuable research material for future historians!

GOT A GOOD FIST?

CW is the oldest, simplest and most efficient form or radio communication there is. Data systems, such as Packet Radio and AMTOR, may be able to come within a whisker of CW for communication under adverse conditions with their built-in error correction facility, but as efficient in real terms as CW — never!

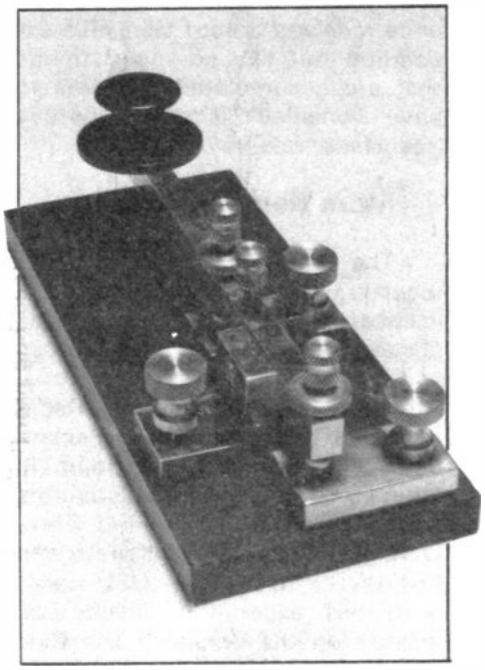
Firstly, think of all the hardware, not to say software, you need to actually transmit the information. And remember, the person at the other end has to have all this gear as well.

About fourteen years ago, when the integrated circuit revolution really got off the ground, and the amount of circuitry that could be contained within an IC quadrupled in about six months, there emerged a philosophical backlash in industry against all this rampant technology. The name for this was KISS, an abbreviation for 'keep it simple stupid'. The broad notion behind it was to use technology *efficiently*, not merely for its own sake.

This backlash fed immediately into amateur radio. Perhaps it was already there. People started playing around with direct conversion receivers and crystal control transmitters, reviving old simple wire antennas, such as loops and open wire fed dipoles. Pat Hawker, G3VA, an enthusiastic supporter of KISS, gave some of these ideas an outlet through his 'Technical Topics' column in 'Rad Com' and the G-QRP Club was soon formed, with the deliberate philosophy of using only as much power as was necessary for two way communication. Most of the G-QRP Club activity was on CW — as it still is today. We should hardly need reminding that CW, as well as only needing a pair of headphones and a simple switch or 'key' as peripheral equipment, lends itself to very simple, cost efficient transmitters and receivers. In short, CW is thriving today, alongside Packet Radio, AMTOR, repeaters and all.

Down To Brass Keys

The point of my previous history lesson/sermon is as a trailer for a *celebration* of KISS communication to be held on the evening of the 30th May. The brain child of John Bluff, G3SJE, chairman of Edgware DARS (G3ASR), who has been teaching newcomers to amateur radio morse code for some eighteen years via slow morse transmissions on 160 and 2m, the celebration takes the form of an evening of simple CW communication at the low end of the 80m band. In John's words, "an opportunity for newcomers and old timers alike to get together on 80m CW *and ragchew*".



The brass and slate based 'GW Morse Key' is available from GW8WND at 4 Owen Close, Rhyl, Clwyd, N. Wales

The few hours of relaxed and chatty contacts at whatever speed suits you has one important condition attached — it must be done with that most basic of operating instruments, the 'straight key'. Once more, over to John, to put the case for the straight key.

"SKE was started with the idea of encouraging the new licencee to get on CW; reviving the spirits and interest of those who didn't take easily to the electronic CW age, and providing the chance for the elbug whizz kids to show they could still use the hand pump. Above all the idea was to have fun on the key.

"It is one thing to help people through the morse test. For many actually going on the air on CW is a daunting prospect. Although anyone battling away to surmount the 10wpm mark may hardly think so, the morse test is really rather rudimentary. It has little relation to CW as used on the air. The trepidation of the newcomer is all too well apparent: electronic keyers battling away at what seem to be prodigious speeds — whether under control is something else; and a whole new world of operating procedures and seemingly endless abbreviation.

"Even coping with letters and figures mixed together can be quite a task. The Edgware Club has tried to provide the kind of CW instruction that goes beyond the morse test requirements and helps the learner to use CW *as a language*. One that is both enjoyable and stimulating to use once some degree of proficiency is achieved. For those who haven't tried it, it is hard to convey the pleasure in the rhythm of the mode that begins to be felt as speed increases.

"Having circulated various magazines and clubs, there was little indication of how well the first SKE in April 1982 would go down. Not being a contest, there were no formal entries to submit. Nevertheless the response was much bigger than expected and very enthusiastic."

I should add at this point that John disclaims any originality for the notion of a 'straight key evening', pointing out the ARRL (American Radio Relay League) have been holding one for years — on New Year's Eve, would you believe (hic).

In order to give everyone the flavour of the event, a potted and amusing report of SKE in 1982 is

given nearby. G3MCK well and truly got into the spirit of the evening with his crystal oscillator/PA and old HRO receiver. Participation in the SKEs since has spread over the UK and on the Continent.

By the way, those of you who haven't got the Morse test can still participate in the evening. Speeds of sending can be slow and there is a chance to get — practice at actually listening in to real QSOs and be able to read some of them. Hearing (relatively) ancient G3s like myself grappling with a 'straight key' for the first time on air for far too many years could also prove a source of considerable amusement!

The Key To The Evening

Most people usually have some kind of straight key kicking around the 'shack'. Many of these are exforces 'surplus', and frequently change hands at radio society junk sale — perhaps too many times! Springs lose their spring and contacts wear down.

If you are reasonably practical, these may be simply reconditioned — the editor has an WW2 RAF key which was given a new lease of life by a spring taken from a ball point pen!

If you can't find a good surplus key, are not particularly practical and have a bit of cash to spare, you could always purchase a new straight key. The continual demand for straight keys coupled with the virtual drying up of war surplus key supply has tempted a number of manufacturers into this area. SMC of Southampton market a range of straight keys made in Japan by Hi-Mound. These range for the very basic HK700 (£16.95) to the swish, expensive brass HK802 (£85.85). There is also a very nice Swedish model, whose name escapes me (*Ingrid? — Ed. Asst*) at present, but which you can see advertised from time to time at around £75. Although the cheaper models of Hi-Mound work reasonably satisfactorily, they are rather plasticky.

At a rally during the Autumn, I met John Wilkes, GW8WND, who manufactures straight keys (in Britain!) under the banner of GW Morse Keys, John's key, illustrated nearby, is made of solid brass with silvered contacts, has a base made of ¾ inch Welsh slate to minimise slippage and sells at a very modest £37.50 inclusive.

GW8WND is a keen vintage radio enthusiast and possesses a very large collection of vintage keys. Impressed with his enthusiasm — and the quality of his key — I started to tell him about 'Straight Key Evening'. He immediately offered to donate a key as token of esteem for the person with the cleanest, steadiest fist.

The Final Key

The conditions for the evening are given in a box nearby. There are no rules as such — other than the type of key to use — as the box says, "finish as late as your arm holds out". We don't care if you're QRO with an 807 or QRP with a BFY51 or just QRU with a TS930S (although we'd prefer the former two for sentimental reasons). Please send your comments on keys (oddest key, eldest key), 'fists' (best fist, worst fist?), equiment and the evening in general to John Bluff, G3SJE, 52 Winchester Road, Kenton, Harrow, Middlesex HA3 9PE. A panel of CW fiends including John and the editor will decide on the best 'fist'. Oh yes, and there will also be a chance to work GB4HRT — although the editor is not sure how long he can managed to send the callsign!

All that there is left to say is get those keys polished and see you then! **G3ZZD**

Those of you who listen to or work 2m or 160m SSB and feel left out, will have the chance to take in a totally frivolous competition in the Autumn, with a prize or two (I hope). Watch HRT for details.

Being bugged in '85! Suffer from uncontrolled dottiness? For all these low end symptoms, Doctors recommend SKE! Health Warning — SKE can be addictive! Encourage the noble art of brass pounding (guaranteed bug proof).

A warm invitation to

SKE

STRAIGHT KEY EVENING

Ham Radio Today/ Edgware DARS 80m CW on Thursday 30th May, 1985

Start at a very nominal 1900 BST.
Finish as late as your arm holds out.
Suggested frequencies: 3.520-3.580 MHz, QRP around 3.550 MHz
Call CQ SKE
Comments on keys, 'fists' and equipment to John Bluff, G3SJE, 52 Winchester Road, Kenton, HARROW, Middlesex. or HRT offices.

Renew old acquaintances and make new ones. This is *not* a contest!

STRAIGHT KEY EVENING 1982

The evening of 29th April seems to have produced a good deal of rummaging in draws and cupboards. Fancy electronic wonders were pushed aside as a multitudinous variety of straight keys emerged into the light again. The first event ever in the UK exclusively devoted to the gentlemanly art of pumping the brass was getting under way: not a contest but an opportunity for newcomers and oldtimers alike to get together on 80m CW and ragchew.

The response far exceeded expectations, from G2+2s to the latest G4s; from some who hadn't touched any sort of key in years to at least one keen contest man finding it was actually fun to talk to people again. No hassle of streams of ill-controlled, electronically generated dot and dashes, but a relaxed atmosphere in which all could work at their own pace.

Later in the evening a few fists were beginning to lose some of their initial crispness as little used muscles began to complain. As to quality of fist, particularly honourable mentions were made of G6JJ, G3DOJ, G3RXP and G4HIU, with a special mention of G4NYM licenced then for just one week.

The following comments on the evening are just a sample; "It's been 17 years since I used one of these in anger" - G3HIU: "only time I use this thing is for very QRS DX working" - G3PEK:"this will do our arms a lot of good" -G3HOH: "this key has platinum contacts which will handle several amps!" - anon: "should be one a week" - G4ITP.

FREE FINANCE*

HAMPSHIRE, DERBYSHIRE, LOTHIAN, STAFFORDSHIRE

FT290R "MULTIMODE PORTABLE"
Multimode 2M Transceiver
Dual VFOs
Microprocessor Control
Selectable Synthesiser Steps
Large LCD Display
Ten Memory Channels
'+' & '−' Repeater Function
Nicads for Portable Available
2.5W / 0.5W RF Output
58(H) × 150(W) × 195(D) mm

FT726R "MULTI BANDER"
Synthesised Multimode Base Station
10W Output on HF, VHF & UHF, Possible
Full Duplex! (Crossband, with Option)
Continuous RF Power Control (0-10W)
Dual VFOs – Crossband Operation
Eleven Memories – Mode & Frequency
LED Displays, Dual Meters (S. & P.O.)
8 Bit Microprocessor Control
IF Shift / Width System
129(H) × 334(W) × 315(D) mm

FT730R UHF "MOBILES"
Synthesised FM Transceivers
Full Microprocessor Control
Dual VFO's
Ten Memory Channels c/w Priority
Selectable Synthesiser Steps
LCD Readout / Analogue 'S' Meter
Switchable '+' & '−' Repeater Split
Better than 0.25uV for 12dB Sinad
Outputs – 10W FT730R
58(H) × 150(W) × 174(D) mm

FT730R UHF "MOBILES"

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

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

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

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

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

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

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

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

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

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

SMC = South Midlands

Ten subscriptions to be won!

HAM RADIO TODAY

READERS SURVEY 1985

Planning for the future with Ham Radio Today.

Ham Radio Today has been going for some time now and we think it is time we asked our readers what they want in a direct fashion. We have our own ideas, of course. We think that we are going to be more informative, more up to date, more entertainingly creative and offer more straightforward, practical projects. We want to know what you think. Overleaf, we have our readers survey. We want to receive — at least 25,000 replies. This means you! It's fully post paid; all you have to do is fill it in, tear it out, fold it up and stick it down. Oh yes, and post it. All replies received by 1st May will eligible for a prize draw — we will be giving away 10 twelve-month subscriptions to Ham Radio Today to the lucky winners. Rumours that the draw will be made from the editor's hat are purely malicious and probably spread by the editorial assistant (ouch!).

The questions cover the next two pages, but if you have any comments of a general nature, put them here — just so that we have been warned!

Please write your name, address and callsign (if any) here, along with any comments you may have, eg, suggestions for articles you'd like to see, etc .

Now turn overleaf for our custom-designed, user-friendly questionnaire . . .

1. Sex: are you?

Male ☐
Female ☐

2. What age range are you in?

Under 15 ☐
15-19 ☐
20-24 ☐
25-29 ☐
30-39 ☐
40-49 ☐
50-64 ☐
64 + ☐

3. Marital status: are you?

Married ☐
Single ☐

4. Do you own:

(a) Your home Yes ☐
(b A car Yes ☐

5. In which independent TV station area do you live? (This information is used to code the area.)

LWT/Thames ☐
TVS ☐
TSW ☐
Scottish ☐
Granada ☐
Yorkshire ☐
Central ☐
Harlech/HTV ☐
Anglia ☐
Tyne-Tees ☐
UTV ☐
Channel ☐

6. Occupation — please bear with us, this is a little complicated!

(a) Are you studying full-time?
Yes ☐
If 'No', please go to part (b)

School ☐
FE College ☐
University(TT/CHE/Poly/etc ☐

Are you sponsored in your studies? Yes ☐

Please go to part (d)

(b) Are you employed, either full or part-time? Yes ☐
If 'No', please go to part (c)
Is your work:

Of a general technical nature ☐
Radio/electronics industry ☐
Other electronics ☐
Other ☐
Are you self employed? Yes ☐
What is your occupation (please state)

. . . . . .

Please go to part (d)

(c) Are you:

Unemployed ☐
Retired ☐
Invalid ☐
Housewife/husband ☐
YOPs/TOPs course ☐

(d) What is your approximate income, per year?

Under 3000 ☐
£3000 to £5000 ☐
£5000 to £7000 ☐
£7000 to £9000 ☐
£9000 to £12000 ☐
Over £12000 ☐
No income — just pocket money ☐
Mind your own business! ☐

7. What level of education have you reached?

No formal qualifications ☐
CSE ☐
'O' Level/SCE ☐
'A' Level/Scottish Higher ☐
ONC ☐
HNC ☐
Degree or above ☐

Are you still studying, full or part time?
Yes ☐
Did or does your course of study involve radio or electronics?
Yes ☐
Was or is your main subject radio or electronics?
Yes ☐

8. How did you obtain your copy of Ham Radio Today? Was it:

Subscription ☐
Through a regular order at a newsagent. ☐
Bought from newsagent's shelves. ☐
From a radio shop ☐
From a friend ☐

9. Do you have any difficulty in finding 'Ham Radio Tdoay'?

Yes, some difficulty ☐
If so, where do you live (nearest town)?

. . . . . .

10. How many people read your copy?

Just you ☐
You and one or two others ☐
You and three or more others ☐

11. Do you own any of the following makes of equipment?

(Tick those you own if this is large in value eg a transceiver, and cross if something small eg ATU or microphone.)

Yaesu ☐
Trio ☐
Icom ☐
Other Japanese ☐
KW ☐
Drake/Collins/American ☐

12. Do you use CB 27/934MHz? Yes ☐

13. Are you:

(a) a short wave listener ☐
(b) studying for the RAE ☐
(c) a class 'B' licensed amateur ☐
(d) a class 'A' licensed amateur ☐

14. (a) Do you belong to the Radio Society of Great Britain (RSGB)? Yes ☐

(b) If no, do you intend to join the RSGB? ☐

15. (a) Do you belong to a local radio or electronics club?
Yes ☐

(b) If no, do you casually attend any clubs? ☐

16. Please rate the following types of article on the list below; please score from 1 (poor) to 5 (brilliant).

Micro Net column ☐
Projects by G3WPO and G4JST ☐
Other projects in HRT ☐
Feature on radio overseas ☐
Features on Radio Yesterday ☐
Reviews by Angus McKenzie ☐
Other reviews in HRT ☐
Metrewave ☐
Practicalities ☐

17. Do you intend building any of the following projects that appeared in HRT in the past year?

Project Omega ☐
Alpha Transceiver ☐
DSB 80 ☐
'Mighty Mouth' processor ☐
Simple Iambic Keyer ☐
SWL active antenna ☐
Mustard tin microwave transmitter ☐

18. Do you intend building any other projects from previous issues of HRT? Yes ☐

19. If yes, which one(s)?

. . . . . .

20. How many projects do you build a year?

None ☐
None — only just got interested ☐
1-3 ☐
4-12 ☐
12 or more ☐

21. Do you have problems in finding the components for your projects?

Yes, some problems ☐

22. (a) Do you usually build projects:

exactly as printed ☐
with a few mods ☐
with a large number of mods ☐
designed from scratch yourself (with a few sections borrowed) ☐

(b) Do you usually use:

PCBs ☐
Veroboard or similar ☐
Other form of construction ☐

(c) Do you make your own PCBs? Yes ☐

If 'No', would you like to make your own eventually? Yes ☐

23. How much do you intend to spend on equipment of projects this year?

£50 or less ☐
£50-£100 ☐
£200-£500 ☐
£500-£1000 ☐
More than £1000 ☐

24. Do you own a home computer? Yes ☐

If 'No', please go to part (b).

(a) Please tick the computer(s) you own:

Spectrum/ZX81 ☐
Vic 20/Com 64 ☐
BBC/Electron ☐
Oric/Atmos ☐
TRS 80 ☐
Other ☐

(b) Do you intend to buy a home computer in the near future? Yes ☐

25. (a) Do you read the advertisements in HRT? Yes ☐

(b) Do you buy items mail order from HRT advertisers? Yes ☐

(c) Do you buy items mail order through advertisements in other magazines? Yes ☐

(d) Do you buy items from the same supplier(s)?

No, but I shop around for the best prices. ☐
Yes, I use the same few suppliers most of the time. ☐
Yes, I use the same suppliers all the time, when I can. ☐

26. Do you prefer the advertisements spread evenly through the magazine, or all in the front and back of the magazine?

Spread through ☐
Front and back ☐

27. Would you like to see a job/recruitment section in our advertising pages? Yes ☐

28. What national newspapers do you read (if any)?

Mirror ☐
Star ☐
Sun ☐
Telegraph ☐
Guardian ☐
Times ☐
Express ☐
Mail ☐
Other ☐

29. Which other magazines do you read, how often, and what do you think of them?

	How often do you read?			Your rating:		
	Every Issue	Some Issues	Rarely Never	Good	Average	Poor
Radio Communication	☐	☐	☐	☐	☐	☐
Practical Wireless	☐	☐	☐	☐	☐	☐
Short Wave Magazine	☐	☐	☐	☐	☐	☐
Amateur Radio	☐	☐	☐	☐	☐	☐
Radio and Electronics World	☐	☐	☐	☐	☐	☐
Wireless World	☐	☐	☐	☐	☐	☐
Electronics Today International	☐	☐	☐	☐	☐	☐
Everyday Electronics	☐	☐	☐	☐	☐	☐

How do you think 'Ham Radio Today' rates on these scales?

THIRD FOLD

Postage will be paid by licensee

Do not affix Postage Stamps if posted in Gt Britain, Channel Islands, N Ireland or the Isle of Man

BUSINESS REPLY SERVICE
Licence No. WC3970

HRT READERS SURVEY
ASP Ltd,
No.1 Golden Square,
LONDON W1R 3AB

2

FIRST FOLD

SECOND FOLD

TUCK INTO A

SURVEY

2 YEAR GUARANTEE

YORKSHIRE, HUMBERSIDE, CO.DOWN, CLWYD, JERSEY

FT77 "SUPERB-VALUE HF"

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

FT757 GX GEN. COV. HF

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

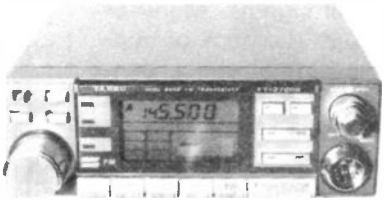
FRG8800
£525 INC

STOP PRESS

FRG9600
60-900 MHZ
AM, NBFM, WBFM, SSB
SCANNER.

FL7000
500W HF
SOLID STATE
LINEAR

FT2700RH
£520 INC



FT270R £325 INC
FT270RH £380 INC

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

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

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

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

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

Communications Ltd.

AUTHORISED YAESU

Tokyo Micro-7 Reviewed

Hard up for cash? Want to try UHF and have a local repeater handy? If you can find around £100, Steve Ireland, G3ZZD, may well have the answer.

"I'd like to try 70cm but my main priority is 2m. After all, that's where my mates are and I've only got so much time and money. . ." Listening around, on the air, at rallies and radio club meetings this editor has heard these or similar words many times; from newly licenced amateurs and confirmed HF operators tuning to the 'very highs' for the first time.

Rather than argue with the above proposition — which has been skilfully done in these pages before by other writers — I intend to accept this. Despite the very competitive price of commercial 70cm equipment, 2m is definitely the place where the action, or rather activity, is to be found in the main. *Many* more stations use 2m than 70cm and the chances of a never ending variety of contacts are virtually guaranteed these days, given a transmitter power of 5-10 watts and a 6 or 8 element beam.

That being said, there are currently over 80 repeaters now active on 70cm. The situation in Scotland (6 repeaters), Wales (5 repeaters) and the Northern Border counties is pretty sparse but the rest of the country is very well served, especially along the M1, M4, M5 and M6 routes. With the growing pressure for air-space in the UHF region from commercial interests, "use or lose" has never been more true.

Right then, so we've got our Brand X 2m multimode and matching Tonnup beam and been on the air a while. The infinite variety of 'two' seems rather more finite that it was and the Bank Manager is still talking to us. Around a hundred quid remains in the deposit account and our thoughts begin to rise in frequency. . . "70cm for a hundred quid, can it be done?"

A Few Solutions

Going back about five, ten years ago you could obtain from emporiums who traded in government surplus gear, a device (or rather devices) called the Pye 'Pocketphone'. Consisting of a separate UHF transmitter and receiver, these could be purchased for a tenner or so, and, with a pair of crystals and a little tweaking, got going on 'seventy'.

In those days, the 'Pocketphone' suffered from many disadvantages. They only gave a few milliwatts of RF, ran off batteries which ran down rather quickly and there were very few repeaters to boost their small signals. Many of these ended up in the back of cupboards or buried under shack benches, brought out only to be sold off at a society junk sale.

Well, the Pocketphone was ahead of its time. With the growth of 70cm repeaters, the Pocketphone came out of the closet, to become a fairly sought after piece of equipment and can change hands today at three or four times the original surplus price. Not very elegant but for value (probably under ⅛ price of an IC4E for example) the Pocketphone is hard to beat. . . if you can find one.

Another cheap solution, also well under the £100, is the purchase of a varactor tripler — see Hugh Allison's excellent 'A Single Channel Transverter for 70cm' in July '84 HRT. Used in conjunction with your 2m multimode and a separate crystal oscillator, this will generate a 70cm signal by mixing the incoming 144MHz with 288MHz. Although originally designed as a transmit only device, if modified as per Hugh's article the varactor tripler will perform on receive as well.

Back in the early 1970's, the days of 2m AM, this means of generating 70cm RF was very popular. Many of these triplers were 'home brewed' and Microwave Modules produced a successful commercial design. Both can occasionally be found for sale in the second hand columns of the various radio magazines but, like the Pocketphone, have become fairly sought after because of their relative cheapness (£10-20).

OK, we can't find or don't like a pocketphone or a tripler and a hundred quid is burning a hole in our pockets. Is there another solution? Well there is — the Tokyo Micro-7. . .

Retailing currently at £99.50, the Micro-7 is admittedly only just within our budget. A 3 channel capability, crystal controlled FM handheld transceiver, putting out some 200mW, the Micro-7 is a kind of Pocketphone for today, I suppose.

Included in the £99.50 is a rubberized ¼ wave antenna, an earphone for noisy environments and crystals (one for transmit, one for receive) for one channel.

The receive section is a double conversion superhetrodyne with a low noise bipolar transistor (2SC2498) in the front end. Two stages of RF amplification are used, with a 2SC2498 as a single ended mixer stage. This is followed by an 21.4MHz IF section with a two element ceramic filter and a monolithic crystal filter to provide

the selectivity. The 2nd IF is 455kHz.

The transmit section is similarly straightforward. A 12MHz VXO is multiplied up to 432MHz by a four stage multiplier chain. The frequency modulation is produced by a single stage mic amplifier driving a varicap diode and the PA, a 2SC2644, is followed by bandpass and low pass filtering to make any spurious radiation negligible. A small electret microphone is located at the lower RHS of the speaker enclosure.

Top panel

In Action

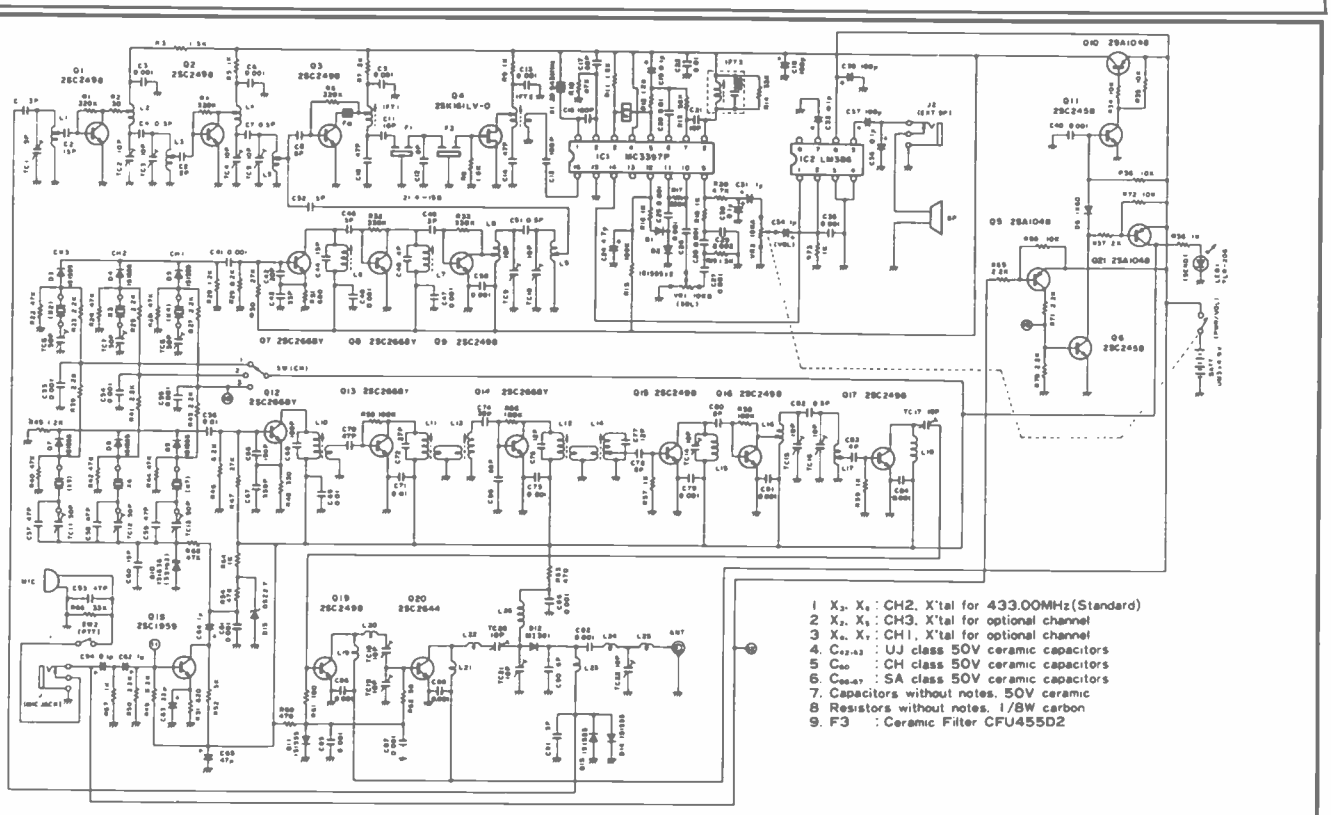
I decided to test the Micro-7 out over the Christmas holidays, whilst staying on the South Coast. The Micro-7 was a crystalled up for RB14 and RB4; the former to give the GB3HE, the Hastings repeater and the latter to give GB3NK, as I had originally intended testing the rig from a location in Kent.

My first sortie was to a local hilltop, 600' ASL and some 14 miles west of GB3HE. In addition to the set mounted 1/4 wave, I slipped a 'Slim Jim' antenna into the rucksack to give a little boost to the 200mW. Reaching the top of the hill, I switched the Micro-7 on and selected RB14 with the top mounted channel switch. On pressing the transmit switch (a small circular press button on the RHS) and giving a quick 'blip' to the toneburst (micro push button on the LHS) the repeater came up, fully quieting the Micro-7, I then gave a few calls requesting a report, all in vain. I decided to swop from the 1/4 wave to the 'Slim Jim' in order to maximise my transmitted signal. Still no luck!

More out of curiosity than anything else, I idly flipped the channel switch onto RB4. To my surprise I could hear an FM signal about S6/7. The received audio was crisp and clear and the 200mW output more than adequate despite a strong and rather noisy wind. When a callsign was given out in morse identifying the signals as emanating from GB3NK, over 40 miles distant, I was very pleased indeed. An attempt was made to break into the contact by my 200mW was not enough to access the repeater.

Settling down to listen to the QSO on GB3NK (as much as you can on a hilltop in December in a strong wind) I discovered that one of the stations was intending to QSY to GB3HE. Five minutes later I was having my first QSO.

The transmitted audio was pro-



Circuit diagram of the Micro-7

nounced as being ok but the station I was in contact with noted that I seemed about 5kHz off-channel, which made the audio seem weak. A second contact confirmed this. In order to compensate for any small errors in transmit and receive frequency (remember, that the crystal oscillator governing the transmit frequency is being multiplied some 36 times and a 5kHz difference at 432MHz means less than 0.15kHz difference at the fundamental frequency) each crystal position is equipped with a small trimming capacitor. A small adjustment to the appropriate trimmer whilst listening to the output on 432MHz receiver set to the correct frequency would soon cure this problem, I thought. Regarding the battery consumption, I was on my second pack of HP7's at the end of the Christmas holiday and would estimate the Micro-7 had well over 6 hours use on the first pack.

Conclusion

As a local talkbox, the Micro-7 is excellent. The sensitivity of the receiver from the strength of the signals received seemed to me to be up to the claimed response, which is based on a signal producing around 18dB S+N/N, although no laboratory tests to check this were performed. With a handheld, or any transceiver for that matter, the main concern about receive sensitivity is that it at least matches the potency of the transmitted signal and the Micro-7 does this and more — as the on-air tests illustrated.

The Micro-7 is light (420g) but very rugged in mechanical construction and should stand the knocks. The standard of the electrical construction is well up to that of the big 3 Japanese manufacturers we all know and love.

Four criticisms, none of which are serious. The major one I think, is the power supply, which is provided by 4 HP7 dry or NiCad batteries. With a transmit current of around 180mA, dry batteries are not going to last long. NiCads seem like the best idea but you will have to spend some extra money on these — and a suitable charger, of course.

If you are going to want to take the Micro-7 around the country, the 3 channel capability may cramp your style. Either 2 repeaters and 1 simplex (the calling channel?) or two simplex and the appropriate repeater channel would seem to be the most useful combinations, depending on how many repeaters are close to your QTH. My third criticism concerns the action of the channel control switch which seemed rather less than positive but in practice, the switch seemed to function all right.

The final gripe concerns the error in the transmitted frequency discussed earlier, which was largely my fault. If you're buying a Micro-7, get the retailer to fit the crystals you want and check the transmit and receive frequencies before you take it away. The review sample was collected in rather a hurry and I did not allow time for the exact output frequency to be checked.

Right then, if you want to have a cheapish dabble on seventy and have a repeater near to you, the Micro-7 could well suit your purposes. I enjoyed using it very much.

Many thanks to Amateur Electronics UK of Birmingham, who are the Tokyo UK importers, for providing the review sample.

STOP PRESS. Since this review was written, the demand for the Micro-7 has severely depleted AE UK's stocks. AE UK have requested new stock from Tokyo but due to the increasingly poor state of the exchange rate (!) they doubt if the present price of £99.50 can be maintained...

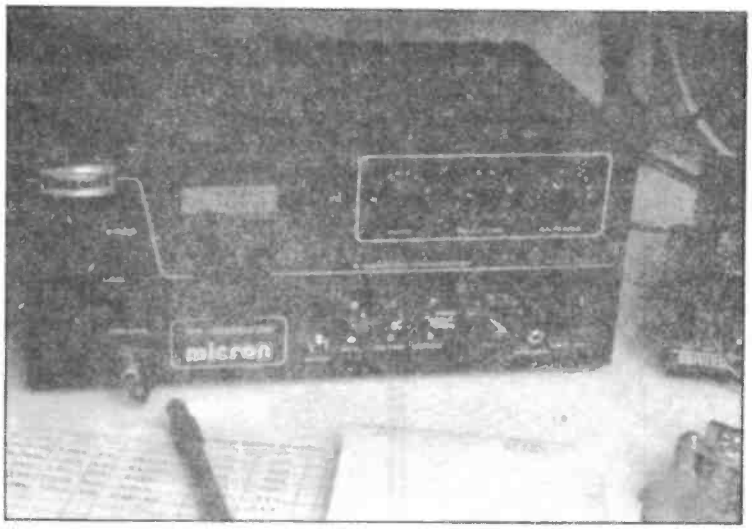
HAM RADIO TODAY

NEXT MONTH

MEET THE MIGHTY MICRON!

- a six band QRP transceiver project for HF by G3WPO and G4JST.

** 0 - 9W variable power*
** silent solid state TR switching*
** direct conversion receiver with full AGC*
** 0.25uV sensitivity.*



SWL SUPER REVIEW
We scrutinise the FRG8800 - latest in the Yaesu line of general coverage receivers

PLUS

CINDERELLA DID GO TO THE BALL
Rev. George Dobbs on the G-QRP Club.

CONVERTING YOUR RECEIVER OR TRANSCEIVER TO FM - WITH A CB SET.

A LOOK AT BBC 'OUTSIDE BROADCASTS'.

DON'T PANIC!
LAST MINUTE TIPS FOR THE MAY RAE

WIN A TOKYO MICRO-7 70cm HANDHELD!

CQ ET?

Radio amateurs could be the first to communicate with alien intelligence. Angus McKenzie, G3OSS, puts forward an argument for the close encounter to end all QSOs.

About 20 years ago Jocelyn Bell, a brilliant young radio astronomer at Cambridge, became the first person to detect pulsing radio waves from the sky. Most of the analysis was apparently done by her, but it was the head of her department, Professor Hewish, who was given the official credit and won the Nobel Prize for the discovery of the pulsing stars as 'pulsars', as they became to be termed. Those were less liberated times than today and many have suggested that if she had been a man she would probably have jointly won the Prize. That is another story though, so let us resume this one.

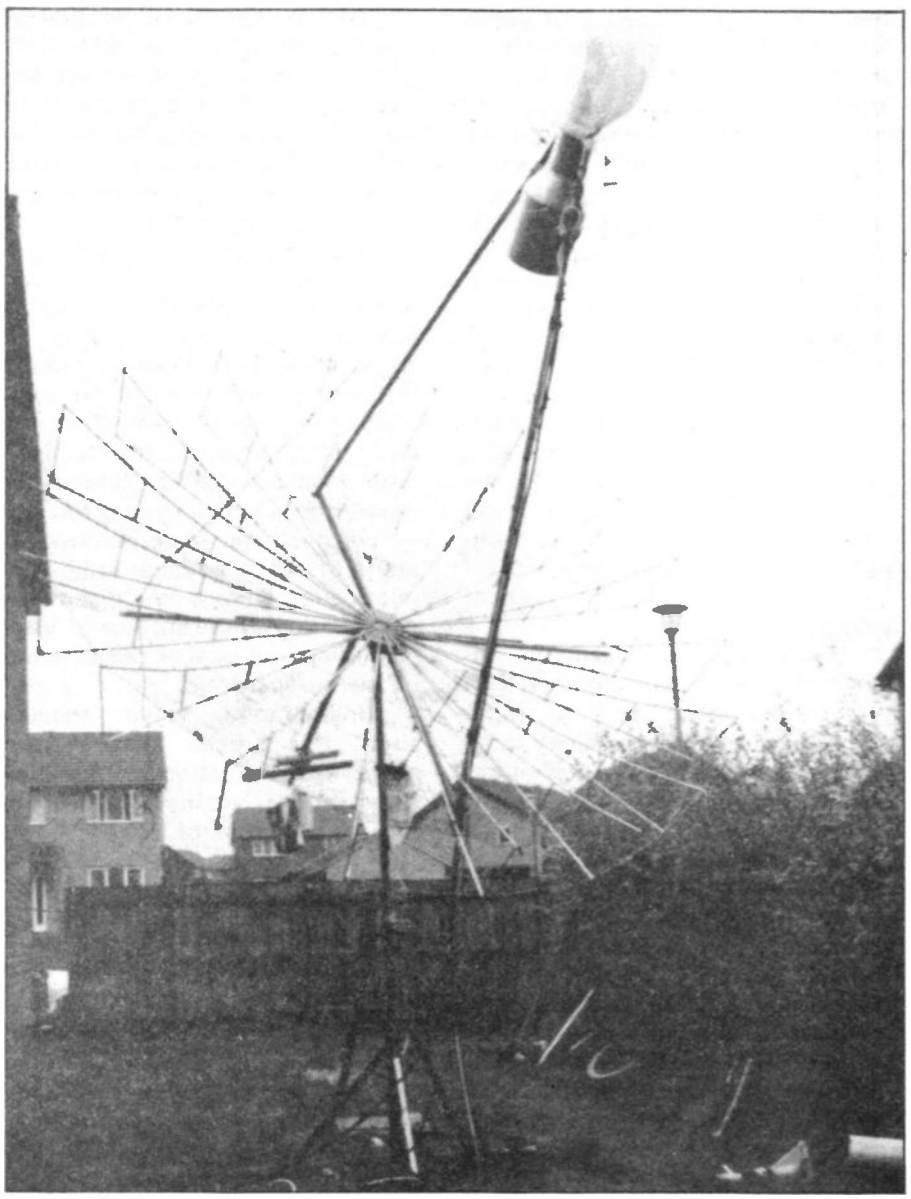
Following on from this discovery was the remarkable BBC television series of the later 60's, "A for Andromeda" by Sir Fred Hoyle. This began with scientists searching the skies for alien signals using radio telescopes tuned to the frequency, or rather wavelength, of the most common hydrogen line (hydrogen is the most common element in the known universe). The scientist then discovered radio signals on this wavelength which turned out to be alien binary coded transmissions.

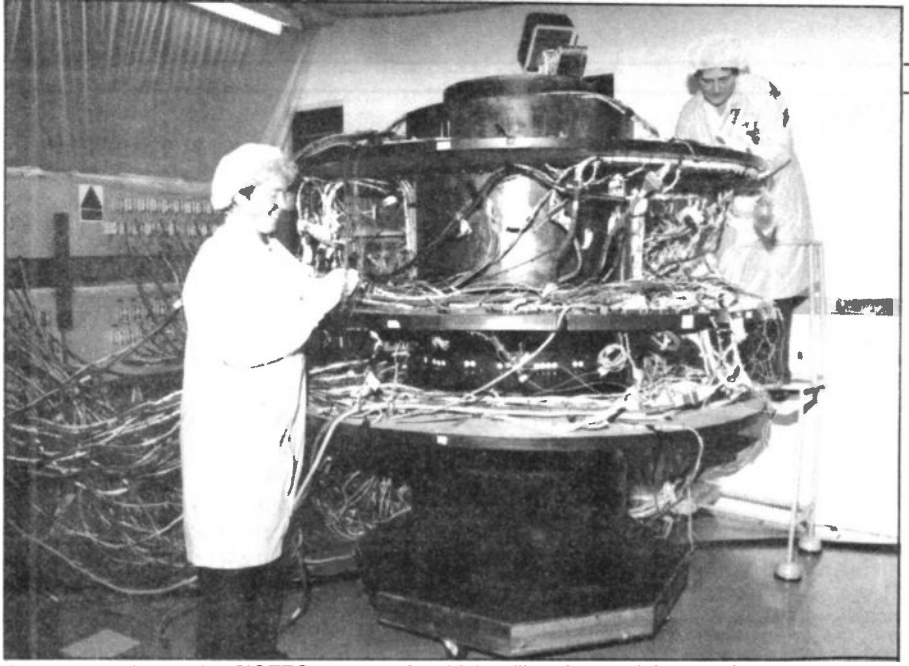
For a few days after the first 'pulsars' were received, the Cambridge team actually considered the possibility that the pulses were, in fact some form of communication. They were even referred to half jokingly (!) at the time as 'LGMs' — standing for little green men.

Throughout the professional scientific world can be found the belief that there is alien intelligence out there somewhere, and many serious meetings have been held to discuss possibilities and probabilities, such as Project Ozma, for example. This article deals with my own ideas on this subject and some facts which cause me to suggest that a radio amateur could well be the first person to pick up a signal from space from other living beings.

Let's have a look at a few basic ideas, and some rather 'hairy' assumptions that I believe many scientists would agree with, and which form the basis of this article. If there is alien intelligence, then there will either be quite a lot of it around, in which case sooner or later, it will communicate with us; if it is rather rare and perhaps far away, even if the intelligence is developed far in advance of us, they may not know about us at all.

If we look over the three to four





The picture shows the GIOTTO spacecraft which will make an eight month journey to intercept Halley's Comet this summer. GIOTTO will carry a variety of Europena scientific instruments to transmit to earth the data on the chemical composition of the comet. Despite a sophisticated protection system, the spacecraft will probably only last a few hours being destroyed by comet particles travelling at more than 50 times the speed of a bullet!

thousand million years that some form of life has existed on earth, it seems reasonable to assume — unless there were previous intelligent civilisations that we do not know about — that only in the last fifty years, or so, have we had the scientific knowledge and practice to transmit and receive electromagnetic waves other than heat and light. In terms of the span of the history of life on earth then, we are dealing with only one part in eighty million or so.

Assuming that we do not blow ourselves up, it seems reasonable that in a hundred years or so, we will have what to us now is an unbelievable advance in technology and much more potential for communication outside present scientific boundaries.

If alien or 'extra terrestial' intelligence (ETI) is fairly common then we will be more likely to come across one that is fairly close to us in development, but not behind us. We would only be able to detect the latter if we, ourselves, get into a space ship and go and find it. If this intelligence is in advance of us, it will probably have been through the same sorts of scientific discoveries we have made. First electricity, then electro-magnetic radiation, followed by atomic science, fission and fusion, will have had to be developed, all probably in parallel with the development of semi-conductor devices etc.

It may very well be that we have been visited by ETI in the past and possibly given up as a bad job for the time being. I feel there is a strong probability that if such a visit occurred, a sign would have been left in the solar system for us to find when we are intelligent enough (are we intelligent at all?) Such a sign is unlikely to be left on (the physical) earth, unless we can't see the wood for the trees, for ETI intelligent enough to be able to visit us would know about the destructive effects of wind, sun, rain etc. Sensible places would be on the far side of the moon (the side facing us is too easy — we need not have reached the stage of space travel or radio communication before we discovered signs here), on the surface of Mars, or perhaps on one of the satellites of the outer planets.

(Incidentally, whilst thinking about this article, I have heard news about a strange humanoid face being detected on the planetary surface of Mars.)

Looking for Electromagnetic Radiation

At the same time as leaving such a sign as I propose, would they not also be looking for electromagnetic radiation from earth? I suggest that if there is ETI, they would almost certainly have detected the first really high radiated powers transmitted to reach into space — in the form of radar during World War II. Even today, radar pulses are probably the highest energies beamed at any one instant in one direction, although very high ERP digital scatter transmissions are also being sent. One might also consider the vast energy in the EM spectrum of an atomic or hydrogen bomb explosion!

If really high energies were first transmitted around 40 years ago, then we might expect to have seen a reply by now, if there had been an intelligence higher than ours within 20 light years of us. One light year is approximately 10,000,000,000,000 kilometres. To help you grasp distances, the sun is around 8 light minutes away (150 million kilometres) whilst the next nearest star is 4.25 light years away (Proxima Centauri). Sirius, the brightest star in the sky from earth, with its companion white dwarf star, is 8.6 light years away and there are thousands of stars, many of them of similar composition to our Sun, within 50 light years. Quite a few of them are invisible to the naked eye as they are too dim to see.

The number of stars in our region of the Milky Way varies as the cube of the radius to be considered. This means that as every year passes, the chances of finding ETI, if it exists, increase. In the next 40 years, assuming that we use equipment no better than at present, the chances of receiving ETI are eight times better than they have been. Our radio transmissions will have reached eight times the number of possible star/planetary systems than they have so far, assuming World War II was the first time that we transmitted radio waves detectable outside the solar system.

It should be realised that frequencies as we express them in amateur radio are numbers directly related to the time taken by the Earth to revolve. One second, ie 1Hz, is a division of one day. However, there are also frequencies which must be the same anywhere. A typical example is that of the lowest resonance of the hydrogen atom — known as the hydrogen line — at 21cm. This is at approximately 1420MHz. This 'fre-

quency' varies slightly depending on doppler shift — the line frequency of hydrogen line radiation coming towards us will slightly increase. If the radiation is going away from us, the frequency will be decreased.

In exactly the same way, light radiation from the star shifts to the colour red it goes way from us. Since the universe appears to be expanding, the further away an object is, the more is its light 'red shifted'. The most distant sources of energy, 'quasars,' actually have their light frequency halved and can be subject to a shift of up to 3.4 times. However, the hydrogen 21cm line is normally fairly narrow and can be easily defined.

What type of transmission?

We now have to consider what type of transmission might be sent to us in reply, and at what frequency it might be. However, this is where we start the fun, for unfortunately we have an inconvenient number of fingers and thumbs. This has caused us to use the decimal system, which, to scientists, is a complete bore because 10 can only be divided by 1, 2, 5 and 10. Man's creator, perhaps, made one little error. It would have been so much more convenient to have had six digits on each hand.

If this had been the case, we could have used the duo-decimal system, 12 being divisible by 1, 2, 3, 4, 6 and 12! This is all rather unscientific, and in basic science, the binary system might well be more to the point — numbers such as 1, 2, 4 and 8, or ½, ¼, ⅛ and multiples of these fractions could be more likely.

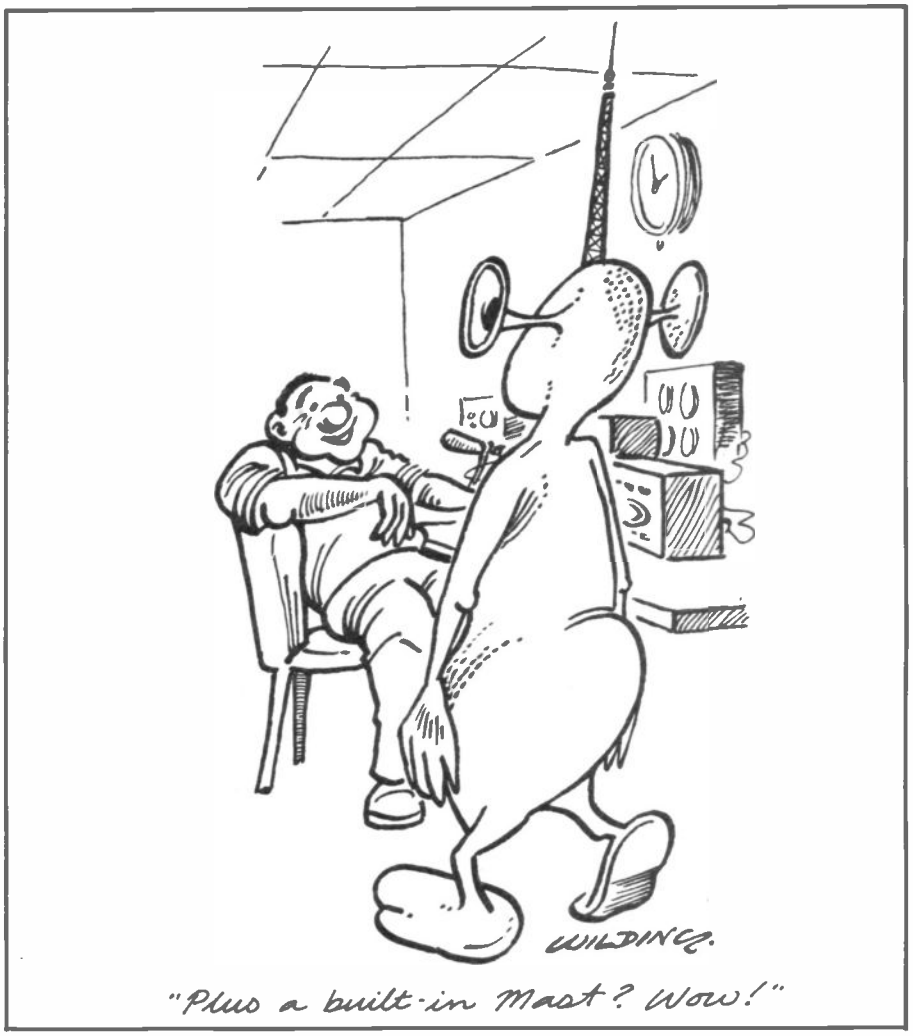
The characteristics of any alien transmissions are likely to be directly related to a binary division or multiplication of the hydrogen line frequency. ETI would be unlikely to transmit to us on 21cm itself, because the QRM coming from stars etc, at this frequency can be high. It is not impossible that 21cm would be the frequency. If it is not, the transmissions are likely to be at a spacing reasonably close to it, but far enough away from QRM to be very low — ie plus or minus 10% or, to use a binary sequency multiplication, between 7/8 and 1⅛ times the frequency.

ETI would certainly avoid frequencies below 250MHz and probably below 1GHz because they would know that low frequencies would either be absorbed by a (our) planetary atmosphere or intensely disturbed by it. Furthermore, normal VHF frequencies would be subject to a high degree of atmospheric noise. Such noise though, is at a much lower level above 1GHz.

Having received our earliest transmissions, they might come to the reasonable conclusion based on the aforesaid that they should send to us on a frequency between 1GHz and 1.420GHz. Higher frequencies would be less likely (but not impossible) because these require higher and higher technology to be used effectively. If they received signals sent between 1940, or so, and 1945, they could see that frequencies we were using were gradually increasing. But they might well appreciate that we could not use very high powers and also might not have extremely sensitive receivers for the higher microwave frequencies. They would also know that higher gain antennas, at frequencies over a few GHz, require much higher technology in the accuracy with which the dishes are made, especially the larger ones.

Therefore, I feel that the chances are high that a frequency between 1GHz and 1.4GHz would be used. A reasonable area around one-eighth lower than the hydrogen line falls slap in the middle of the 23cm amateur band. So, here we come to the big crunch. Radio astronomers do not use this band very much and we have to share it with some amazingly powerful radar stations such as the recently established chain putting out around 1000MW ERP at London Airport at around 1270MHz (*which could in time attract attention to this area also? — Ed*)

How about the mode of transmission? I have to ask myself here what I would do if I was an egghead on a planet going round a star in the Sirian sector of the universe who wanted to communicate with earth. I would vote for binary digital keying of some type, and I would use a spread



spectum and a lot of power. Such a spectrum might occupy around 10MHz of bandwidth with actual transmissions every 1200kHz or so, thus allowing any of them to be received. (Whoops, 12MHz and every 120kHz, I forgot I had just ten digits!).

Optimum reception would be with 100 (120?) different receivers picking up the entire spectrum and adding it together. However I don't think power would be a problem, although I have a hunch that extremely high power — such as 1 million MW into an 80dB gain antenna — would be fairly difficult at a frequency of 100MHz or so. Our LGMs might realise that they could select an unfortunate frequency which would be clobbered by terrestial transmission, even with spread spectrum transmissions. Despite this, we should all be ready though for "who's that down there saying who's that up here".

What Could Happen!

Let's look at the scenario that just could happen on April 1st 1985. I could imagine myself turning round my antennas on 1296MHz activity night (Monday) and coming across a strange and fairly wide digital transmission to the west. I suppose my curiosity is as good as anybody else's, so having adjudged the direction of the transmission, I might note that it had shifted just slightly in direction (thinks "perhaps it's G8TFI/P on the move?"). I would then contact another amateur on the band, preferably well beyond the horizon, a 100km away at least, and to my surprise he comes up with the same direction as me, let us say, due west. Our initial conclusion would be: somebody is having some fun on a large pimple in South Wales. But then another amateur to my north calls in and says he is getting it in the same direction. " 'Curiouser and curiouser', said Alice". So, is it an artificial satellite gone beserk?

Finally, one by one, all the stations now listening would note down the exact time that the signal begins to QSB violently and then completely fade. It might strike someone that these times were related to the longitude of the listeners. The band would soon be buzzing with the news that a satellite had gone wrong, in exactly the same way as actually happened on the 13cm band a few years ago. A few amateurs heard a whistling noise somewhere near 2304MHz which proved to be a Russian satellite that had gone wrong.

Almost one day later, when we were all sitting comfortably at our rigs, there is again a digital signal in the same direction. This time the signal disappears around four minutes earlier, thus revealing that it was keeping sidereal time (ie measured by the stars) rather than earth time. It was, therefore, ETI and not a satellite!

Telephones would start ringing, tape recorders going, using miles and miles of tape. I would most certainly telephone my friends connected with JPL in the States and Jodrell Bank in the UK. The game is up and the headlines would soon come out with "British radio hams discover ETI".

Ridiculous QSOs?

We now enter the realms of ridiculous QSOs (conversations or quaesi-stellar objects, take your pick!). It will be far worse than meteor bounce, and it will be more like an unbelievably slow AMTOR system. If there are space ships coming, at a probable acceleration of 1g, they could approach the speed of light within eight months or so, and so, in twenty years' time, we would be able to have a fine time talking them in on 23cm.

A few more facts have come to light as a result of very helpful radio astronomers, who are also radio amateurs, whom I have talked to since beginning this article. The hydrogen line frequency is 1420.405751MHz. The very quietest part of the electromagnetic spectrum, which would give the best signal-to-noise ratio for inter-stellar communications, is the band 1 to 2GHz, excluding the area around 1420MHz. Our old friend 1296MHz is getting more and more probable!

Keep Watching!

Just to keep the 24cm ATV enthusiasts looking or LGM, they can feel encouraged by the knowledge that their frequency is just about seven-eighths that to the hydrogen line — ie 1249.9 — just in the middle of a lurking video lower sideband. So, keep watching for LGM, and listening for ETI, for, also, don't forget that 1420 less one twelfth (duodecimal equivalent of 10%) is 1301.7MHz which, with a spread spectrum transmission, would cover 1296MHz beautifully.

Of course, I fully expect someone to send out a digital transmission from Wales in the general direction of London on April 1st. Would it not be unfortunate if this QRMed the real thing?! My attitude to the whole situation is the same as that of flying saucers: I don't believe there have been any real lurking ones for the last century or so, but in no way could I say that there will never be or never have been any.

Don't forget that there are thousands more 23cm radio amateurs than radio astronomers listening in this band, which makes you think, doesn't it! If we had a QSO with an ET we will, of course, be breaking our licence regulations — unless the IARU will give them a reciprocal licence!

How long is a piece of 'wet string'...

It is an established fact that any length of wire can be tuned to any frequency. The problems start when you attempt to achieve this... Bill Sparks, G8FBX, explains how, with the help of a little mathematics, you can make a 'random length of wire' radiate efficiently.

To many of the amateurs of today the idea of putting up a length of wire as an antenna may be considered ludicrous. However, it is an established fact that any length of wire can be tuned to any frequency, in theory. The problems start when one tries to carry out this apparently simple operation and attempts to match the antenna to a typically low impedance transmitter output of, say, 50 ohms.

Our odd length of wire, perhaps chosen to fit the confines of a suburban garden, is going to display a different impedance on each band, made up of differing amounts of capacitive and inductive reactance and, of course, resistance. To bridge the gap between the impedance of the wire and the transmitter output a matching unit is required. Now we could be unscientific about this and spend a lot of money on one of those commercial ATUs that are advertised with slogans like 'match any wire on any band'. On the other hand, we could try and work out the values of a suitable matching network ourselves using a bit of commonsense and some reasonably basic radio mathematics and build one ourselves — *and* maybe learn a little about impedance into the bargain.

A Little Theory

All antennas, depending on their length (and also, to some extent, height above ground), will exhibit impedance. The antenna can be considered to be formed of lumped quantities of resistance, capacitance and inductance (**Fig.1**). L and C exhibit forms of reactance *, normally represented by XL and XC respectively, whereas R shows resistance(!) and the effective impedance is built up from the impedance triangle shown below (**Fig.2**) where $Z^2 = X^2 + R^2$ (*Remember Pythagoras's theorem? — Ed.*).

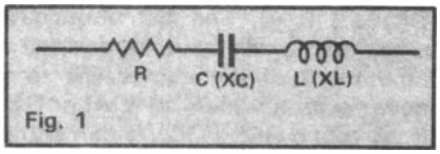


Fig. 1

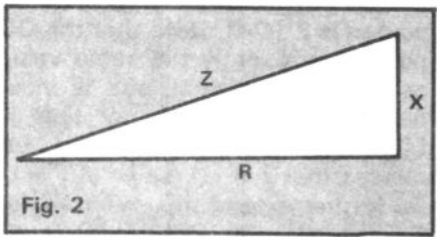


Fig. 2

This can be reduced to $Z = \sqrt{R^2 + X^2}$. If we think back to our basic tuned circuit theory, X = XL-XC. At resonance Z = R, the resistance of the tuned circuit, because XL, the inductive reactance of the tuned circuit, is equalled and cancelled out by XC, the capacitive reactance of the circuit.

** (By the way, reactance can be defined as the term given to the opposition to AC current flow in a capacitor or inductor, dependent on the frequency of the current and is stated in ohms — Ed.)*

The fullest expression of Z is

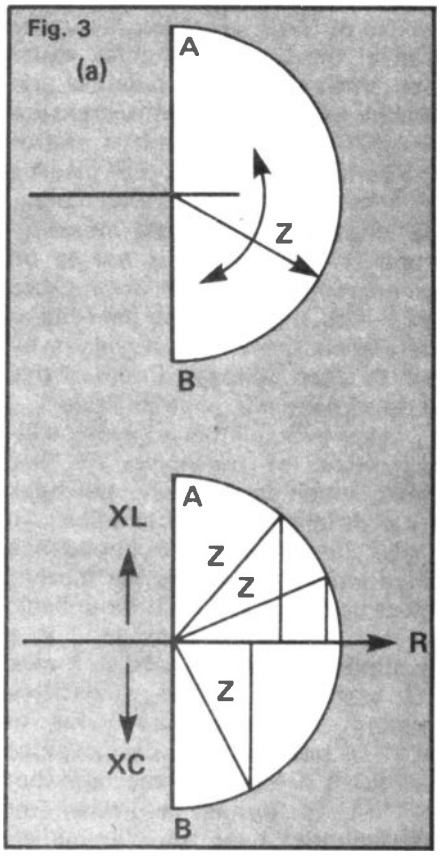
$$Z = \sqrt{R^2 + (WL - \frac{1}{WC})^2}$$

where R = resistance (ohms)
W = 2 π × frequency (hertz)
L = inductance (henrys)
C = capacitance (farads)

where X is made up of XL and XC.

Now, Z can also be regarded as a vector quantity and re-drawing the triangle as follows shows that the vector Z can move along the arc A-B so (**Fig.3a**). We can also alter our equation *in terms of vector quantities* to read Z = R + X.

By looking at **Fig.3b** we can see



that, for any value of Z there is a large variety of values of R and X which can give Z. Unfortunately, this means practically that a simple impedance bridge connected between our aerial and low power transmitter will be able to give the value of Z but *not* those of X and R. X and R can have *any* value within the limits shown by the arc of the circle.

In the course of work on aerials it has been established that a direct relationship existed between the resistive component of the aerial and its SWR or standing wave ratio. By artificially varying the resistive value, it is possible to shift the SWR to another value and the relationships between the two values of SWR will show the variation in the $Z = R \pm$ vector equation. Without going into details, the technique involved was to measure the SWR at the transmitter end of the aerial feeder cable, then insert a 27 ohm resistor in series with the coax inner and repeat the measurement. (*This process is not to be recommended with a Solid State PA! — Ed.*). It was then possible to determine the R and X values by Smith Chart Analysis (more of this later). These are given in **Table 1**.

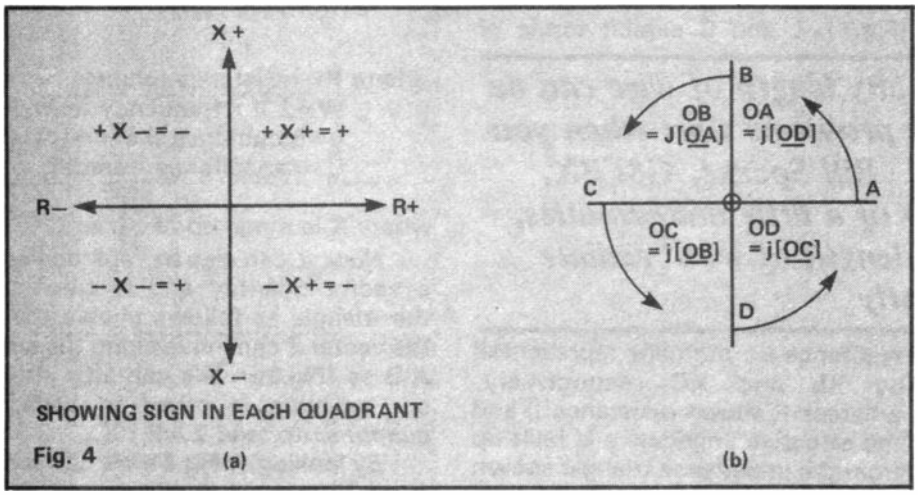


Fig. 4

However, all this is getting a little ahead of ourselves and we must, albeit temporarily, get back to a little more mathematics. To really understand the impedance situation in any aerial, the factor j must be incorporated into our basic vector impedance formula. j is a manipulating factor used in maths to transfer vector quantities around. It has a true value of $\sqrt{-1}$ but this is impossible since $-1 \times -1 = +1$ so the number $\sqrt{-1}$ is (what is known in mathematics as) an 'imaginary number'. Our reason for using it is that, in the lower right hand quadrant of impedance triangle arrangement, the values will be negative — as shown below in **Fig.4**.

To further develop the use of j (usually known as operator j) refer first to Fig.3b where the impedance is shown as the radius of a circle rotating round its centre. Looking now at **Fig.4b**, the indication is given that the radius is moving in an anti-clockwise direction so that its value of OA is transferred to position OB, then to OC and OD and finally back to OA., ie we have moved the radius in consecutive 90° swings back to its origin. In effect, we have transferred the value into any of three other directions, and we indicate this by showing our first move from OA to OB as j ($\underline{OA}$). The bar under OA signifies that we have carried out a movement of the vector OA to a new position which is j ($\underline{OA}$) or OB. If we move OB to OC we can show OC as j ($\underline{OB}$) or j.j ($\underline{OA}$). This of course is j^2 ($\underline{OA}$). Note that the OC position is exactly the same value as the OA original but is now *negative* so we can say that j^2 ($\underline{OA}$) $= -1 \times OA = OC$. This indicates that $j^2 = -1$ so $j = \sqrt{-1}$. To further extend this, we transfer OC to OD ie $OD = j$ ($\underline{OC}$) or $= \sqrt{-1} \times \sqrt{-1}$ OA, or $-1 \times -OA$. The direction of OD is negative on the y (+X to −X) axis so the above would be logical. OA = OD in magnitude but is *opposite in sign*.

By transferring OD to OA, we now multiply $OD \times j$, ie $OA = j$ ($\underline{OD}$) but $OD = j\ j^2$ ($\underline{OA}$) so $j \times j \times j^2$ ($\underline{OA}$) = OD or $j^2 \times j^2 \times OA = OA$ or $-1x-1xOA = OA$. $-1x-1 = +1$ so $OAx1 = OA$, which is correct.

The object of the exercise is to denote the direction of the vector Z, ie which quadrant it is in. We need only concern ourselves with the two RH quadrants so that $R + jX$ will show a point somewhere in the upper RH quadrant and $R - jX$ will show a position in the lower RH quadrant.

Since R and X are the sides of a right angled triangle, the position of the impedance point can be established and by joining this point to the centre, the value of the impedance can be measured.

Since the upper quadrant indicates a positive value of reactance, the aerial whose vector quantity of impedance is shown in this quadrant will have an excess of inductance (and thus inductive reactance) and will require added capacitance to cancel this. The reverse will apply (ie too much capacitive reactance) if the result is in the lower quadrant.

This type of presentation is a simplified form of an Argand diagram and j is known as a complex number. A further elaboration of the above technique is used in Smith Chart Analysis where impedances are matched in graphical form. This is the standard chart used in calculations of aerial impedance by broadcasting companies or people professionally concerned with aerial design.

Back to reality: we have now found an easy way of separating the two types of reactance present in the equation. The only remaining problem is that the method used does not indicate whether the reactance X is positive (the aerial is showing an excess of inductance and is therefore too long for resonance) or negative (capacitive aerial or too short for resonance). A simple check by clipping a short length of wire to the end of the aerial, thus lengthening it slightly, and repeating the test will soon show which of these two conditions the aerial is in.

By the above technique we have now established that vector $Z = R \pm jX$ and put figures to R and X so that Z can be calculated. Due to the active assistance of Professor Murphy, it can be forecast that Z will be nowhere near the 50 ohms of the transmitter output we are looking for and some compensating network will have to be introduced. This network (ie an

ATU!) can be very simple to construct and consist only of a coil and a capacitor. To establish the values of the components in question, simple formulae have been derived and these will be discussed shortly. Before going into these formulae the general idea of shifting a reactive impedance up or down in value and finishing with a pure resistive load (a resonant antenna!) will be demonstrated.

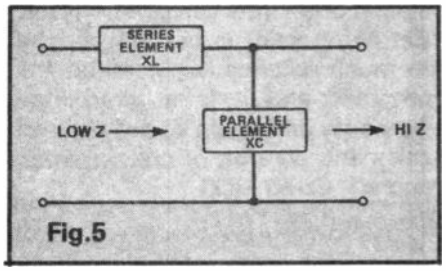


Fig.5

The simple L network shown nearby in **Fig.5** will transform a low impedance to a high impedance if connected as shown. By reversing the input and output a high impedance will finish as a low impedance. The observant reader will spot something straight away (See **Fig.6** for an extra hint).

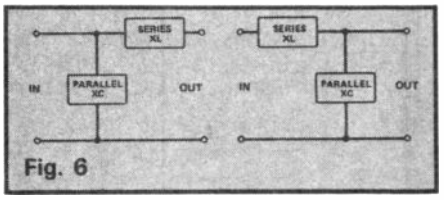


Fig. 6

If the two series elements are considered and made as inductors and the two parallel elements are made as capacitors we have the Collins or pi output network (**Fig.7**) used in many valve output transmitters.

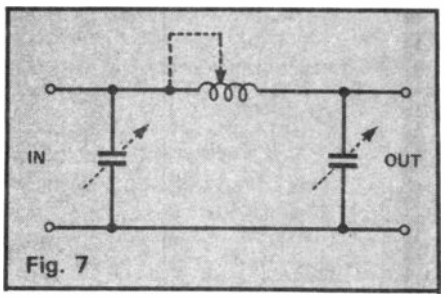


Fig. 7

The idea is to transform the typically high output impedance of the valve down to about 25 ohms and then step it up to between 25 and 500 by making the capacitors variable and the coil tapped. The centre transformation point varies along the coil with frequency and finds its own balance point. The value it transforms down to in the centre of the coil is about 25 ohms.

Look further into this arrangement and converting it to a real life situation

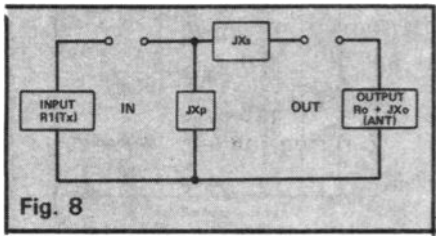


Fig. 8

we have the above (**Fig.8**). The transmitter output is resistive. The series element has reactance, the parallel element has reactance, the load has resistance and reactance. We can now derive the following:-

$$jXs = -jXo + Ro\,A \qquad (1)$$

$$jXp = \frac{-jR_i}{A} \qquad (2)$$

$$A = \sqrt{\frac{R_i - Ro}{Ro}} \qquad (3)$$

Taking an example of the type we would have found in our Table 1. Our aerial showed the following on 80 metres. $Ro + jX = 17 - j6.5$.

Then,
$$A = \sqrt{\frac{R_i - Ro}{Ro}} \qquad (4)$$

$$= \sqrt{\frac{50 - 17}{17}}$$

$$= \sqrt{1.94}$$

$$= 1.393$$

$$JXs = -jXo + jRoA \qquad (5)$$

$$= +j6.5 + j17 \times 1.393$$

$$= J30.2$$

Assuming we want to use our aerial on 3750 kHz, J30.2 is positive so is displaying (an) inductive reactance (value).
The coil will have an inductance of:
From $XL = 2 \quad FL$

then
$$L = \frac{XL}{2\pi F}$$

and so
$$L = \frac{30.2}{6.28 \times 3.75 \times 10^6}$$

$$= \frac{30.2}{23.5 \times 10^6}$$

$$= \frac{1.2}{10^6} \text{ approx}$$

$= 1.2$ microhenries

$$jXp = \frac{jRi}{A}$$

$$= \frac{-j50}{1.393}$$

$$= -j35.9 \qquad (6)$$

The negative value indicates capacitive reactance.

$$Cp = \frac{1}{2\pi F Xp}$$

$$= \frac{1}{6.28 \times (3.75 \times 10^6) \times 35.9}$$

$=$ approx 1250 pf

The tuning unit will then be as shown in **Fig.9**.

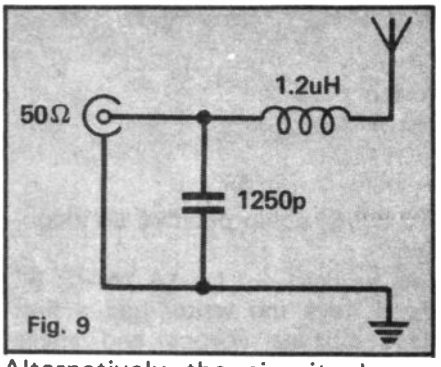


Fig. 9

Alternatively the circuit shown below in **Fig.10** could be used.

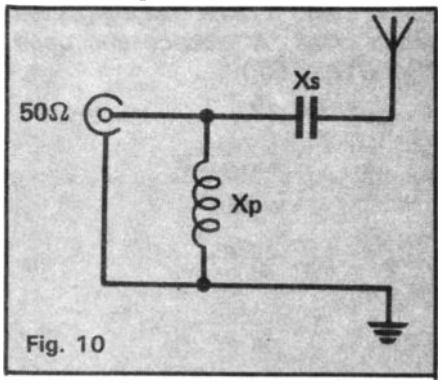


Fig. 10

Then $jXs = -jXo - jRoA$ (7)
$jXp = jRiA$

For the same as above this gives (**Fig.11**).

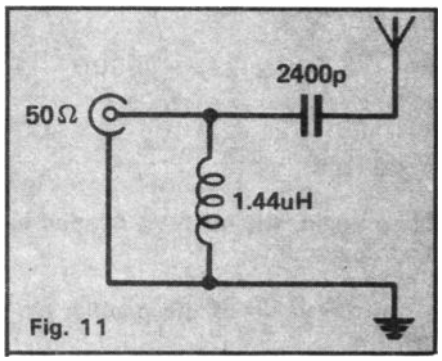


Fig. 11

For the step-up circuit we need the situation shown in **Fig.12**.

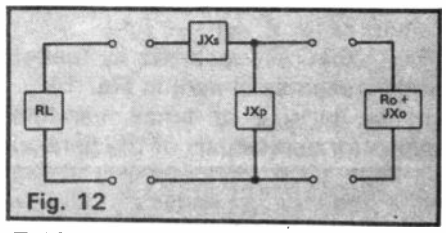


Fig. 12

Taking as an example, an aerial on 20 metres was found to have an SWR of 1.6 normal and 1.9 with the resistor in series. This showed 70 ohm +j20 ohm
The formulae in this case are:

$$ZO^2 = RO^2 + XO^2 \qquad (8)$$
$$= 70^2 + 20^2$$
$$= 4900 + 400$$
$$= 5300.$$

$$JXs = J\sqrt{ZO^2 \frac{(R1)}{(R0)} - R1^2} \quad (9)$$

$$= J\sqrt{5300 \times \frac{(50)}{(70)} - 50^2}$$

$$= J\sqrt{3785 - 2500}$$

$$= J\sqrt{1275}$$

= J 35.8, again positive so inductive.

This worked out (at 14.1MHz) (In those days the writer had a first class citizens licence and sharp pointed ears, a long nose and whiskers and used to squeak at his fellow men.) (*I think this means Bill had a class 'A' licence and used 20m CW — Ed.*)

$$Ls = \frac{Xs}{2\pi F}$$

$$= \frac{35.8}{6.28 \times 14.1 \times 10^6}$$

$$= 0.404uH$$

$$JXp = \frac{ZO^2}{\frac{(R0)}{(R1)}(JXs) + (JX0)} \quad (10)$$

$$= \frac{5300}{\frac{(70)}{(50)} J35.8 + J20}$$

$$= \frac{5300}{J50.2 + J20}$$

$$= \frac{5,300}{J70.2}$$

We cannot divide by J so we have to remove it from the bottom line by cancelling

so $\quad 5.300 \times -J = -J5300$

$\quad J70.2 \quad -J \quad 70.2$

$= -J75.5$

Once again, the element needed is again capacitive

— so the value of the parallel element is

$$C = \frac{1}{2\pi FXp}$$

$$= \frac{1}{6.28 \times (14.1 \times 10^6) \times 75.5}$$

= 150 pf

Thus, the unit inserted in feeder will be seen as shown in Fig. 13

By putting a small variable capacitor across part of the parallel

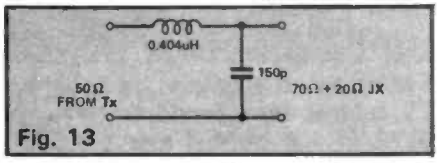


Fig. 13

capacitor a small degree of adjustment can be made. These units are very simple to make and it is an easy job to make one up for each band you wish your piece of 'wet string' on. These may be simply swapped over when changing bands, safe in the knowledge that on each of these, your antenna is properly resonant.

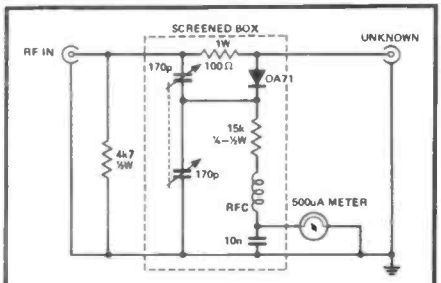


Fig. 14 Circuit of 27 ohm series resistor

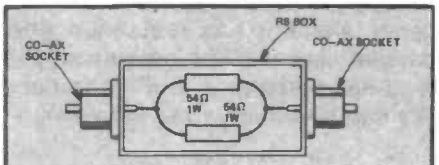


Fig. 15 Assembly of the resistor.

For those interested, the circuit diagram my original impedance bridge and construction details of the series resistor are given below in Fig. 14 and 15.

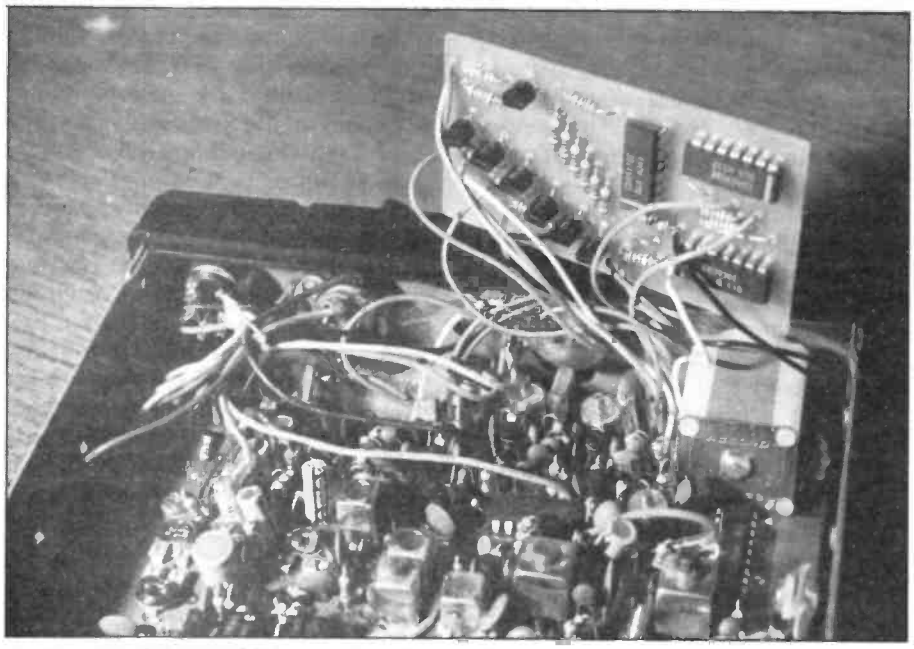
Most of the aforegoing was carried out in the late 1950s and early 1960s. Anyone with a computer and some (albeit fair) knowledge of programming could probably put my programme of calculations into program form. That being said, in our age maybe too much reliance is placed on the computer and it is a good idea every now and again to get back to basics and do a bit of mathematics yourself. Good luck!

NORMAL SWR	SWR WITH RESISTOR	R	JX	NORMAL SWR	SWR WITH RESISTOR	R	JX
1.0	1.53	51	0	2.4	2.2	47	44
1.2	1.3	43	0	2.4	2.6	74	51
1.2	1.4	44	5	2.4	2.8	98	43
1.2	1.5	48	8	2.4	3.0	121	11
1.2	1.6	53	9	3.0	1.0	17	0
1.2	1.7	59	6	3.0	1.2	17	5
1.2	1.8	61	3	3.0	1.4	19	15
1.3	1.2	39	0	3.0	1.6	21	23
1.3	1.4	42	8	3.0	2.0	28	37
1.3	1.6	51	13	3.0	2.2	33	44
1.3	1.8	64	8	3.0	2.6	47	56
1.3	1.9	66	4	3.0	3.0	71	67
1.4	1.2	36	0	3.0	3.4	122	57
1.4	1.3	38	6	3.0	3.6	152	13
1.4	1.4	40	11	4.0	1.25	13	0
1.4	1.6	48	17	4.0	1.5	14	16
1.4	1.8	61	16	4.0	1.75	16	25
1.4	2.0	71	4	4.0	2.0	19	34
1.5	1.1	34	0	4.0	2.25	22	42
1.5	1.3	36	9	4.0	2.5	27	50
1.5	1.4	38	13	4.0	3.0	38	65
1.5	1.5	42	17	4.0	3.5	58	81
1.5	1.6	46	19	4.0	4.0	95	95
1.5	1.7	51	21	4.0	4.5	193	45
1.5	1.8	56	21	6.0	1.25	9	0
1.5	1.9	64	19	6.0	2.0	11	28
1.5	2.0	73	11	6.0	3.0	19	56
1.5	2.1	76	4	6.0	4.0	34	83
2.0	1.0	26	0	6.0	4.5	45	98
2.0	1.2	27	9	6.0	5.0	62	114
2.0	1.4	30	17	6.0	5.5	90	133
2.0	1.6	34	24	6.0	6.0	143	148
2.0	1.8	41	31	6.0	6.5	288	71
2.0	2.0	50	36	6.0	6.75	306	11
2.0	2.2	64	38	8.0	1.5	6	0
2.0	2.4	83	33	8.0	2.0	8	25
2.0	2.6	102	5	8.0	2.5	10	39
2.0	2.8	102	5	8.0	3.0	13	51
2.4	1.0	21	0	8.0	4.0	20	74
2.4	1.2	22	9	8.0	5.0	32	98
2.4	1.4	24	17	8.0	6.0	51	126
2.4	1.6	28	25	8.0	7.0	87	161
2.4	1.8	33	32	8.0	8.0	194	200
2.4	2.0	39	38	8.0	8.5	385	94

Table 1 Values of resistance (R) and reactance (JX) of a long wire antenna, calculated using the 27 ohm series resistor and an impedance bridge.

Converting CB Displays

You can make your converted CB rig give a direct frequency readout on 10m. David Silvester, G4TJG, tells how.



A number of magazines have published articles on the conversion of both illegal AM and legal FM CB rigs for use on the 10 metre amateur band using frequencies from 29.300 to 29.700MHz. Most tend to use the system where the CB units original channel 1 counter for the voltage controlled oscillator, see Fig. 1. A few comments should be made about the PLL circuit since it contains some unusual features. The divide by n counter receives from the channel switch binary 168 to 207 to control the receive VCO over the necessary frequency range. This range is 10.695MHz below the received frequency. The output frequency of the VCO is too high to be connected directly to the MC145106 chip. Hence the output is mixed with the receive crystal oscillator output to produce a frequency in the acceptable range — these frequencies are 1.68 to 2.07MHz.

On transmit, the transmit-receive switch causes a number of changes to the PLL loop. First, the transmit VCO and transmit crystal oscillator are brought into use; but as the output of the transmit VCO is *doubled* before being amplified a number of other changes to the loop need to be made. The transmit-receive switch also doubles again the division ratio of the 10.24MHz reference oscillator to give 5kHz frequency steps. The divide by n counter is increased by the addition of 256, ie from 424 to 463.

By changing the transmit and

represents 29.310MHz, easing the calculation of frequency from the channel number. The author felt that for a small outlay, the display could be made to read the frequency directly, ie the calling channel of 29.600MHz becoming 60 on the display.

The PLL System

The CB rig chosen for conversion was the DNT M40FM, since this was freely available at all of the radio shows the author visited. This rig uses the MC145106 phase-locked-loop chip, containing not only the phase detector but also the counter for the reference frequency of 10.24MHz and the divide by n

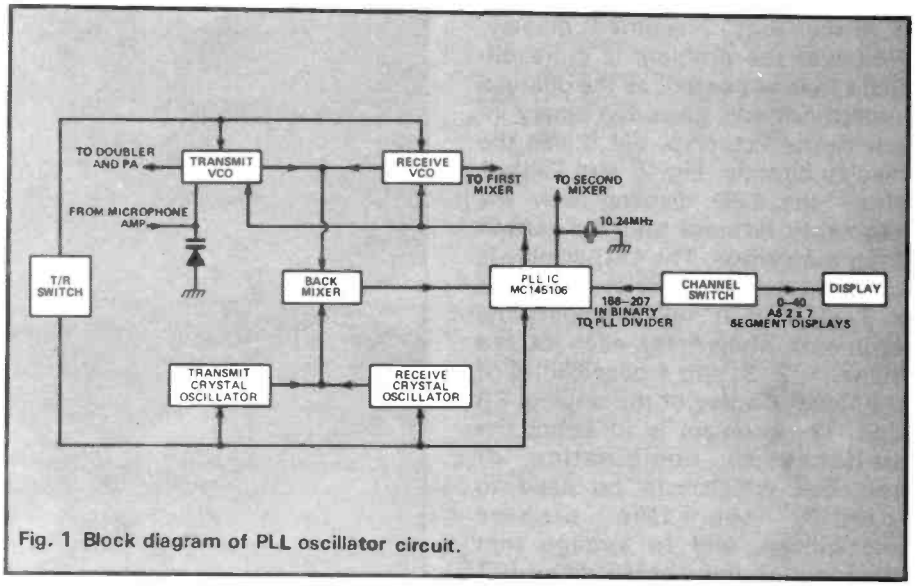


Fig. 1 Block diagram of PLL oscillator circuit.

receive crystals, it is possible to change the frequency range of the rig. For anyone wishing to alter the DNT rig these changes are:-

1. Receive oscillator from 15.2262 to 16.935MHz
2. Transmit oscillator, for simplex from 11.6806 to 12.535MHz, for duplex (−100kHz on transmit) to 12.485MHz.

Because of circuit capacitances, the frequencies of the crystals required are 16.932, 12.533, and 12.483MHz but they are finally tuned to the frequencies given above. The rig will also need to be retuned slightly but this is easy to do given the excellent diagrams supplied with the standard rig.

Fig. 2

	0	1	2	3	4
a	1	1	0	0	1
b	1	0	0	0	0
c	1	0	1	0	0
d	1	1	0	0	1
e	1	1	0	1	1
f	1	1	1	1	0
g	1	1	0	0	0

Table 1. Binary output from channel switch to drive display segments (Fig. 2).

The Display

With these alterations, a receive frequency of 29.600MHz shows as 30 on the display. To obtain a display of 60, we need to add 3 to the 'tens' 7-segment display. However the problem is more difficult than expected, as the channel switch not only gives the binary input to the PLL chip, but drives the display directly. **Fig. 2** and **Table 1** show the LED display with the segments lettered and the output from the switch. The LED display is of the common anode type so that in Table 1, a '0' will illuminate the segments shown for each of the blank, 1, 2, 3, and 4 possibilities of the 'tens' display of the original CB unit. The problem is to select the switches or combination of switches which can be used to identify the five display possibilities, and to arrange that the input to the display driver IC3 will give outputs over the newly required range of 3 to 7.

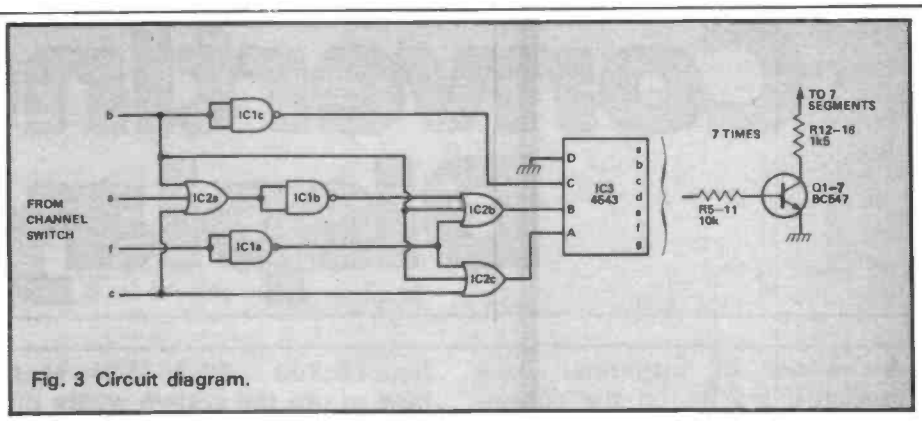


Fig. 3 Circuit diagram.

Circuit Design and Operation

It was decided that the easiest way to convert the switching of the 7 segments of the original display was to select specific combinations of the lines a to g and to use these to supply the inputs of the 4543 display driver, **Fig. 3**. The author chose the following combinations:-

f at '0', identifies old 4 and with b at '0' gives new input of 7.
b, c and a all '0', gives old output 3 equals new input 6.
b='0' and c='1', gives old output 2 equals new input 5.
a, b, and f all at '0', gives old output 1 equals new input 4.
b='1', indicates old blank and gives new input of 3.

The circuit is extremely simple and uses the outputs from the a, b, c, and f switches to drive the inputs of the logic circuitry. The display driver selected was the 4543 since no other circuit was easily available, which will drive the display directly and produce a 6 with segments a, c, d, e, f, and g illuminated to match the display produced by the unconverted unit's 7-segment LED. Both of the original switch sections operate the display by shorting the LED cathodes to earth through 1.5k ohm resistors. To achieve the necessary voltage drive to the logic chips, all of the inputs ie the a, b, c, and f lines are connected to the positive power supply by 10k ohm resistors, which hold the inputs positive when the switch elements are open circuit. These are not shown in Fig. 3. A secondary problem is that the 4543 display driver is designed for use with low power LCD displays, and, for safety, the driver's outputs were connected through seven resistor, transistor, resistor combinations to prevent overloading of the IC's output.

The PCB was mounted in the prototype with the trackside upwards in the upper part of the DNT M40FM, near the front panel.

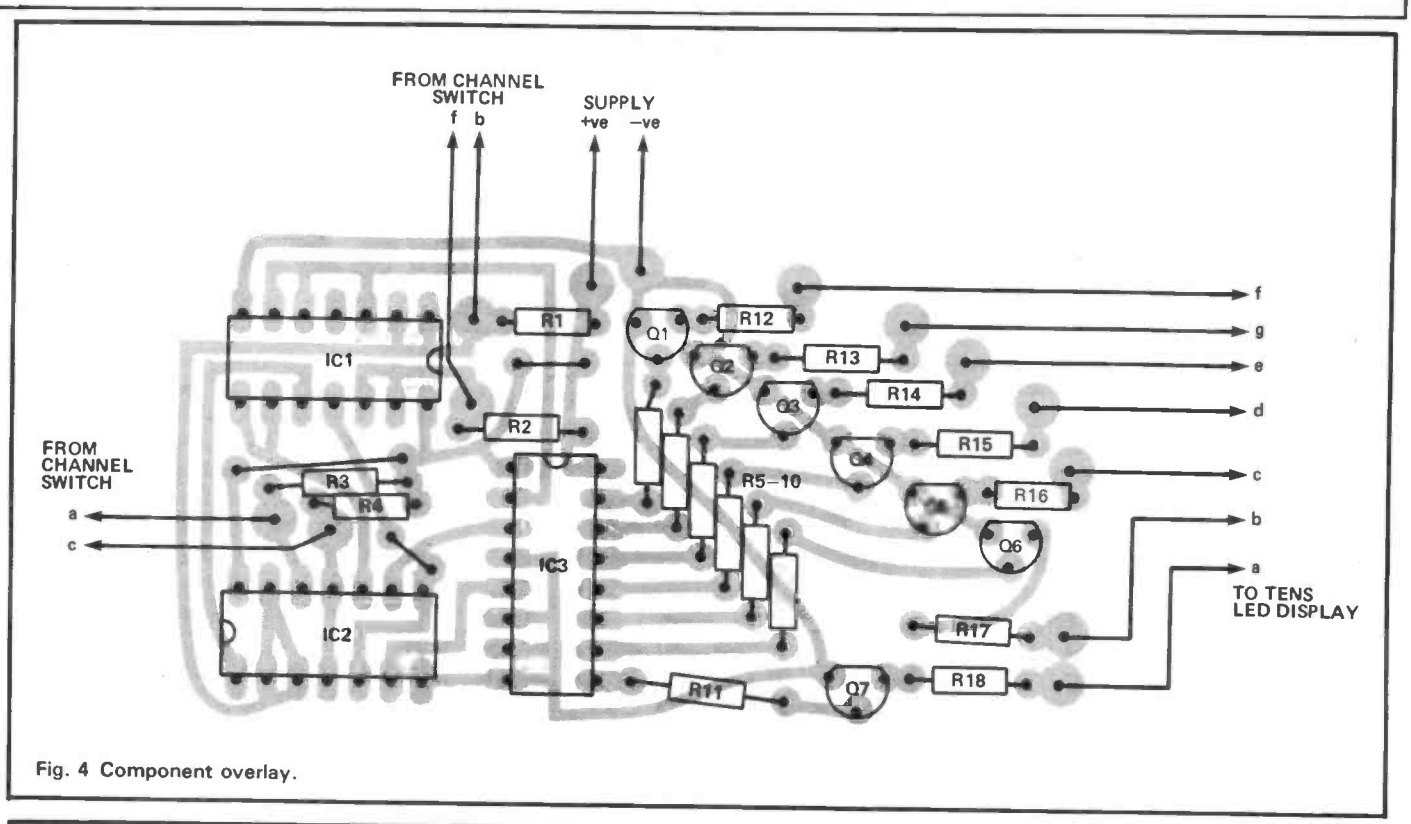
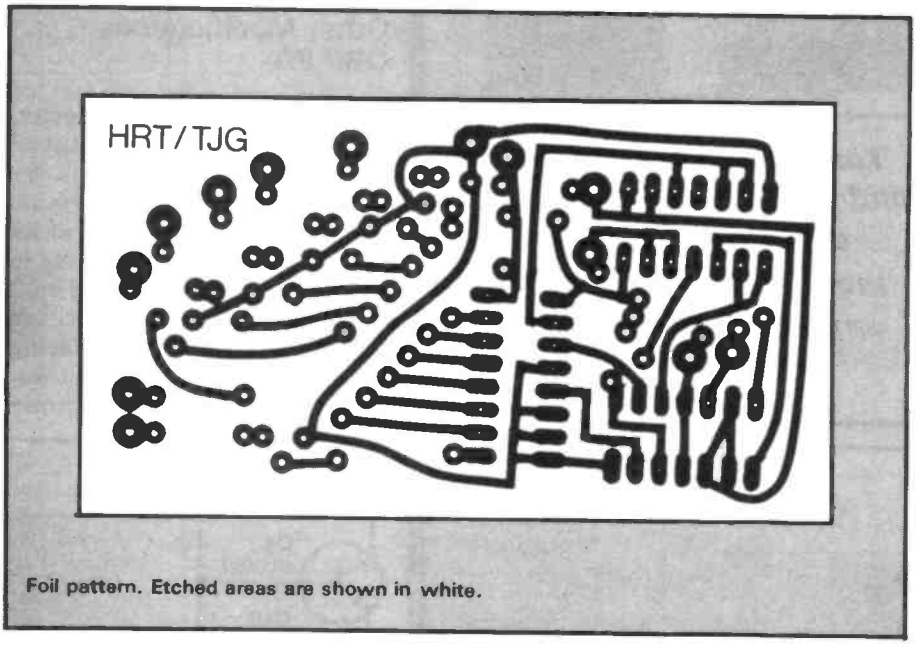


Fig. 4 Component overlay.



Foil pattern. Etched areas are shown in white.

Fig. 4. shows the completed PCB layout which was sufficiently small for placing inside the converted rig. After constructing the unit, the following conversions will need be made to the display area of the rig.

Installing The Unit

The switch positions corresponding to the LED display lines a to g will need to be identified. In some cases, the lines a and d will be connected together — as when displaying blank to 4 in the original CB application these display elements will be illuminated at the same time. This applies *only* to the switch — there are two resistors for the two display element (ie one each). Also the wires for the a to f lines to the 'tens' 7-segment display will need to be identified. Remove the resistors between the switch and all of the tens LED elements and replace with wires to connect the LED to the new PCB's output connections. A fine pointed soldering tip is almost essential for this work. In addition, add an additional 4 wires to the a, b, c and f switch positions, to give the input to the PCB. The 'pull-up' resistors are on the PCB so no components need to be added to the rig.

Final Comments

There is no reason why any ex-CB rig converted to 28MHz so that old channel 30 equals 29.600MHz and having the display driven directly from the channel switch cannot be modified in this fashion. It would be possible for a more enterprising amateur to add the 29, decimal point and final 0 to give a full 29.600 frequency display. The only other change necessary will be the alteration of R12 to R18 to the same value as that used in the directly driven display.

Components Listing

RESISTORS

R1-4	1.0k ohm
R5-11	10k ohm
R12-18	1.5k ohm

All resistors are carbon film, 0.33W 5%

SEMICONDUCTORS

IC1	4093 CMOS logic
IC2	4075 CMOS logic
IC3	4543 CMOS logic
Q1-7	BC547 or any T092 plastic transistor with Vec more than 15V and Hfe more than 10

ALL MODE TRANSCEIVER

PROJECT

OMEGA

Tony Bailey, G3WPO, and Frank Ogden, G4JST, detail some simple modifications to ensure smooth functioning of the QRO PA.

As those building Omega will be aware, the existing circuitry for the solid state antenna switch proved incapable of handling 100W of harmonic rich energy from the PA. The modifications detailed here will overcome this and allow the PA to be operated at its full 100W power rating with full break-in. The mods are simple to make to the existing PCB and involve no major circuit modifications.

Logic Switch Modifications

The mods involve the substitution of Q1, which was originally a BF259 (rated at 300V), for a BUX87 (rated at 1000V) and the removal of D8 (BA379 PIN diode) for a BF259, driven from the existing bias line. The latter diode is in the circuit as a 'safety' precaution, designed to remove any RF which might leak past Q1. The new transistor, Q10, acts more efficiently in this respect.

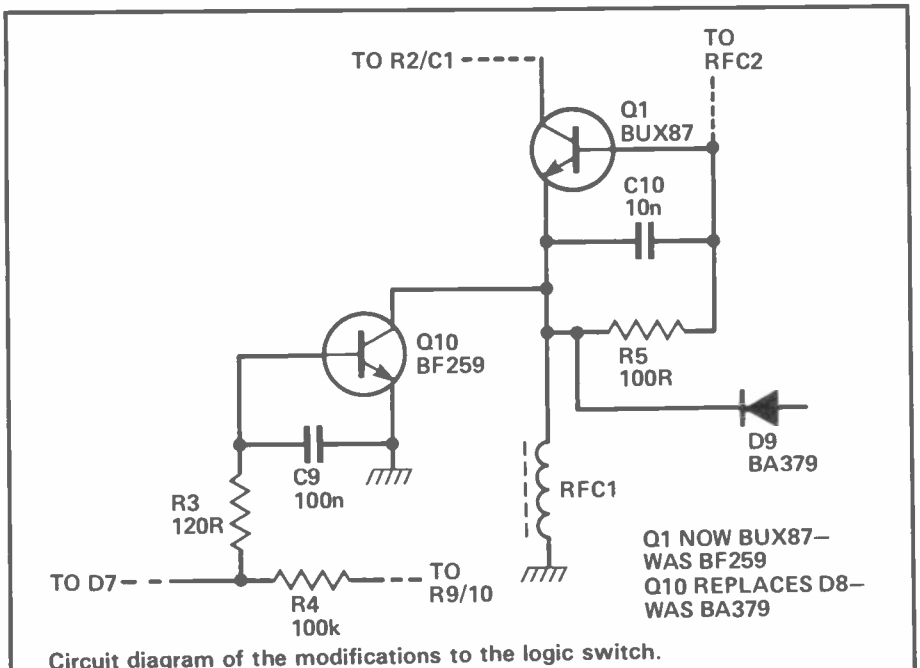
To make the changes, remove the existing BF259 and replace with a BUX87. The latter has a different case and pin-out to the BF259 (see drawing) and the leads will need re-orientating before insertion. It also has somewhat thicker leads and the PCB holes will need enlarging to 1mm or so. Then remove the existing D8. A new BF259 is recommended as a longish lead from the emitter is required. Insert the collector lead into the position previously occupied by the cathode (banded end) of the diode and the base to the anode end. The emitter lead goes to earth — either make a new hole adjacent to the earthed end of RFC1 for this or solder the emitter to the actual wire coming from RFC1.

You can now wire the logic switch up as per the original instructions using as direct connections as possible.

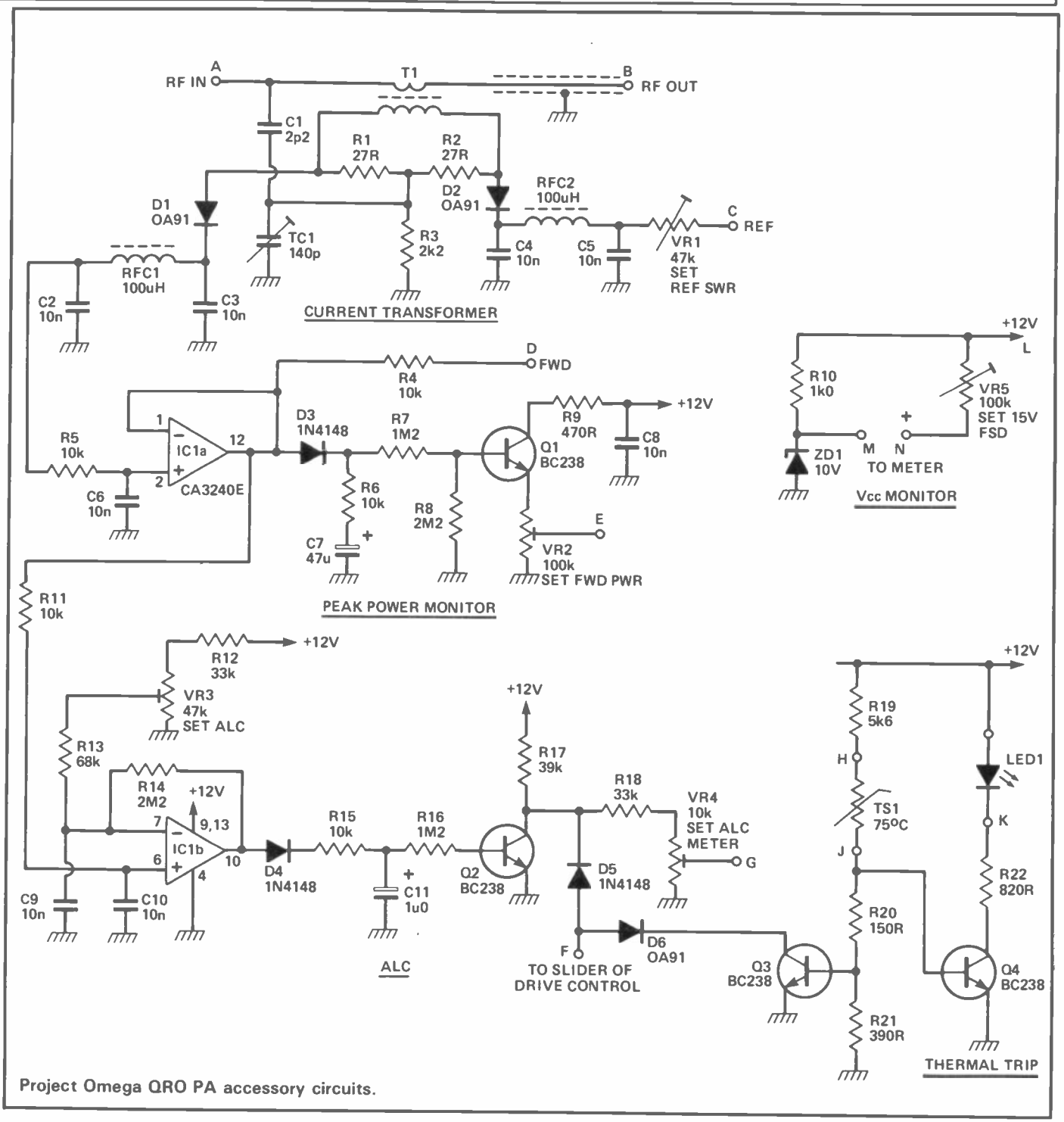
Warning: if during tests any problem arises which causes the logic switch to fail, even if only temporarily; (such as a high SWR causing self-oscillation of the PA) it is possible for the RF to be applied directly to the input of the QRP PA and the SBL-1 in the CIFPU. Thus causing failure of the QRP PA input buffer and the mixer. To prevent this, solder a set of back-to-back diodes from the input of the QRP PA to earth and from the preselector input to earth. This will limit any such voltage to safe proportions.

Other Modifications . . . QRP PA

As mentioned in the Newsletter, the QRP PA needs to be moved from its present position inside the QRO PA enclosure, as we found that there is some possibility of RF feedback with it positioned close to the amplifier. It now sits to the right of the Tx/Rx SSB adaptor, on top the VCO box, with its input facing the CIFPU, and mounted as far forward on this box as the screw holes



Circuit diagram of the modifications to the logic switch.



Project Omega QRO PA accessory circuits.

will allow (the accessory board mounts behind it on the rear panel).

The Accessory PCB

This board adds a number of extra facilities to Omega — ALC and metering, thermal protection, FWD/REF SWR, power metering and supply voltage monitor.

The required DC voltages for the power, SWR and ALC facilities are derived from a standard current transformer circuit, T1 and associated components. This type of circuit has the advantage that it is virtually frequency independent, providing the correct core is used in the transformer. In this case, ferrite — powdered iron will not work satisfactorily.

The primary is simply a single turn — consisting of a short piece of coax placed straight through the centre of the core — with the secondary wound from a number of turns of insulated wire wound evenly round the core itself. The outer braiding of the coax is earthed at one end only, so that coupling to the transformer is by magnetic leakage current from the line. This improves the null obtainable on reflected power compared with that using a single unscreened wire primary.

A resistive centre tap (R1/2) is used as the secondary load. This produces equal voltages at each end of the secondary winding but 180 degrees out of phase with each other. A small proportion of the RF voltage present on the line is sampled by C1/TC1 and fed back to the centre tap. If this is set to be

equal to one half of the secondary voltage under matched conditions, then the out-of-phase voltage at one end of the winding (REF) will be cancelled and the in-phase voltage (FWD) doubled.

D1/2 and the capacitors form peak detectors, giving two DC outputs proportional to the forward and reflected currents present on the line. The RF chokes and decoupling capacitors remove any RF from the line. This part of the circuit is also screened on the PCB from the rest of the circuit. The transformer windings are arranged so that 100W of RF gives 5V DC.

The reflected voltage is applied directly to the meter (via the meter switch and logic board) via VR1 (calibration).

Buffering

As the forward voltage is used for a number of applications, it is first buffered by IC1a (1/2 CA31240E) so that the resulting loading does not affect the calibration of the circuits. The forward voltage is then obtained for metering from pin 12, via R4 and the meter switch etc.

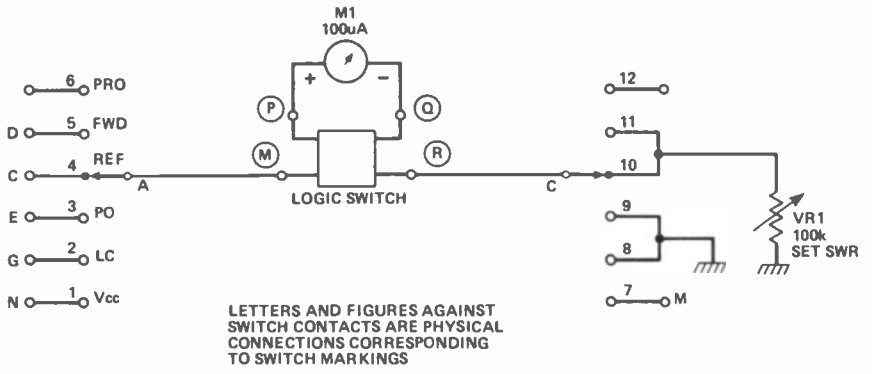
A simple peak detector circuit, consisting of Q1 and associated components, allows metering of the forward power directly. This requires calibration against an existing known power meter. Like most simple power meters, the overall accuracy is unlikely to be better than +/− 10/15%.

ALC

The purpose of the ALC is to prevent the transceiver being overdriven past its 100W design level. Many people use ALC as a form of signal processing, driving hard into ALC and effectively achieving RF compression. With most circuits, this also results in distortion — this circuit is no exception! Thus, its use should be confined as an indicator of the drive level and not as a processing circuit. On CW, if driven hard into ALC, the waveform will become extremely distorted.

A further op-amp (IC1b) is used as a comparator for the ALC function. VR3 (set ALC) is used as a preset threshold control such that the voltage at pin 7 of the op-amp is equal to the voltage at pin 6, when the latter is deriving its applied voltage from 100W of RF. Above this point, the output of IC1b goes high, turns on Q2, and thus progressively shorts out the slider of the drive control via D5, reducing the power output back to 100W. A time constant is also introduced into this circuit, via R15/C11/R16, to give acceptable results on SSB.

The ALC metering is derived from the collector voltage of Q2. Normally this is at around +12V and VR4 is pre-set so that the meter reads full scale. As soon as Q2 conducts, this voltage will drop and cause a corresponding decrease in the meter reading. In use, the meter is never allowed to drop more than 1/3 of full scale, either on CW or SSB.



Details of the meter switching circuit.

Thermal Protection

One of the killers of RF power transistors is overheating of the junction, so we have added a thermal protection feature to avoid this catastrophe. The actual sensor, TS1, is a small tab mounted semiconductor device, bolted close to one of the output devices on the rear of the interface plate. Under normal conditions the resistance of this device is very high, so that Q3/4 are both turned off. As the temperature reaches 75 deg C, the device undergoes a rapid drop in resistance to around 100 ohms, turn on both Q3 and 4. Q3 then removes drive (via the same mechanism as the ALC), and Q4 illuminates the thermal trip indicator (this is the spare LED on the front panel — see part 8). This low drive condition will persist until the temperature has dropped again.

Supply Metering

This simple circuit permits the existing meter to read from 10-15V for supply voltage monitoring. ZD1 provides a reference voltage for the −ve side of the meter, with preset VR5 set so that 15V is equivalent to full scale deflection.

Meter Switching

Up to this part, the metering on Omega has consisted only of the 'S' meter and RF Out from the QRP PA. The latter function is now no longer required and the wiring for this can be removed. Part 8 described the logic switch and the solid state meter switch. This gives the S meter function on receive, but on transmit allows metering of the functions controlled by the meter switch. The full wiring for this is given here (the letters and numbers immediately adjacent to the switch contacts correspond to the actual markings on the 2 pole 6 way meter switch). VR1 allows the full scale deflection of the meter to be set in the SWR mode.

Meter Scale

In the next instalment, dealing with this construction of the accessory PCB, we will also give a new scale for the meter to replace the existing one, covering all the functions described.

Preselector

The previously reported problem with a loss through this unit on 80 and 160m will be overcome with a small additional PCB, mounting on the side of the existing unit, which will switch in a separate low pass filter for these two bands. This will be published as soon as possible, first details will be in the next Newsletter.

RADIO Tomorrow

Your at-a-glance guide to what's happening around the clubs, on the air and in general radio-wise.

1 Mar
Loughborough ARC: social evening.
Radio Society of Harrow: *Multichannel Networks by G3YXZ.*
Coventry ARS: mini lectures, including one on computers.
Dunstable Downs RC: *Software Protection by G8PTP.*
Clifton ARS: meeting.
Maltby ARS: *The Novice Licence Dabate G3ZHI vs G4BVV.*
Axe Vale ARC: *Talk by Spectrum Communications rep.*

3 Mar
Doncaster Amateur Radio Show at the Doncaster Institute HE Annexe, Ellers Road, Bessacarr. Admission by programme, 30p, doors open 11 am. Talkin on S22. Further details from G8XTU on Doncaster 531365.

4 Mar
Horndean DARC: *Space Technology by John Bennett.*
Dudley ARC: natter nite.
Rhyl DARC: *Antennas and Propagation 3 by G3LEQ.*
Sutton and Cheam RS: natter nite.
Worcester DARC: club night.

5 Mar
Dartford Heath DFC: pre-hunt meeting.
Loughborough ARC: constructors group.
Bristol ARC: *PLL by G8GFZ.*
Wolverhampton ARS: *Frequency Synthesis by G6UDX.*
Reading DARC: meeting.
Tiverton (South West) RC: meeting.
Fylde ARS: *Home-brew Transceivers by G3KEN.*
Wakefield DRS: project night.
Chichester DARC: meeting — Long Room.
East Lancashire ARC: Surplus Equipment Sale at the Conservative Club, Cliffe St, Rishton, starting at 7.30.

6 Mar
Three Counties ARC: *Slow Scan TV with G8VOI.*
Cheshunt DARC: *Meteor Scatter by G4IJE.*
Rugby ATS: informal.
S Bristol ARC: *Air Traffic Control by G3HKA.*
Wirral ARS: *Slide Show — Past DXpeditions with G3EGX.*
Willenhall ARS: meeting

7 Mar
Cray Valley RS: Junk Sale.
North Wakefield RC: on-the-air night.

8 Mar
Loughborough ARC: *160m DF Receivers — bring along your old MW portables for the constructors group to modify to 1.9MHz.*
Radio Society of Harrow: activity night on 80m.
Coventry ARS: night on-the-air.
Clifton ARS: meeting.
Maltby ARS: *Home-brew Test Gear by G4BW.*

9-10 Mar
RSGB Commonwealth Contest. 1200-1200 GMT. A1A only in the 3.5, 7, 14, 21 and 28MHz, lower 30 kHz unless working a novice.

10 Mar
Dartford Heath DFC: club hunt.
Components Fair, organised by Pontefract DARS, based on the Mobile Rally but with the emphasis on the home constructor and DIY enthusiast. Traders are invited to sell only components, surplus equipment, instruments and antennas. New black box equipment is not allowed. It runs from 11-4.30 at the Carleton Community Centre Pontefract. Contact G4ISU, 7 Ridgedale Mount, Pontefract, (0977) 792784.
Amateur Radio, Computing and Electronics Exhibition, organised by the Northern Amateur Radio Societies Assoc., at the Central Hall, Belle Vue, Redgate Lane, Longsight, Manchester. The doors open at 11am. Admission is £1, OAPs and children 50p. Car parking (80p), restaurant and bar facilities are available. There will be a raffle, and contests, plus a play area for children. Talk in on S22 and SU8.

11 Mar
Antrim DARC: AGM.
Dudley ARC: meeting.

12 Mar
Loughborough ARC: constructors group.
Bury RS: film show.
Bristol ARC: *CB to 10m FM conversions by G4TRN.*
Wolverhampton ARS: meeting.
Tiverton (SW) RC: meeting.
Mid-Warwickshire ARS: Junk Sale.
Chester DRS: *Racal/Test Applications* at the Chester Rugby Football Club, Hare Lane, Vicars Cross Chester.

13 Mar
Cheshunt DARC: natter nite.
Rugby ATS: informal.
S Bristol ARC: HF activity night.
Willenhall ARS: meeting.
Farnborough DRS: *QRP with G4BUE.*

14 Mar
N Wakefield RC: *The RSGB — all you ever wanted to know with John Nelson.*
Edgware DRS: *Counterpoise Systems by G4UBB.*

Wolverhampton ARS: 144MHz DF Hunt.

15 Mar
Loughborough ARC: lecture in Leicester.
Radio Society of Harrow: *Your RSGB by John Nelson.*
Sutton and Cheam RS: Construction Contest.
Coventry ARS: *10m FM.*
Dunstable Downs RC: *A Bit Of A Lift On by G3YLA.*
Clifton ARS: meeting.
Maltby ARS: *Planning and Building in Amateur Radio Matters by G4TVD.*

17 Mar
Glenrothes DARC: *Computing with GM4ANB.*

18 Mar
Rhyl DARC: activity night.
Welland Valley ARS: AGM.
Worcester DARC: informal.

19 Mar
Loughborough ARC: constructors group.
Chester DRS: Surplus Equipment Sale.
Bristol ARC: club projects.
Wolverhampton ARS: committee meeting.
Reading DARC: meeting.
Tiverton (SW) RC: meeting.
Fylde ARS: informal with Morse practice.
Wakefield DRS: natter nite on the air.
Midland ARS: meeting.

20 Mar
Three Counties ARS: AGM.
Cheshunt DARC: Junk Sale auctioneer G4TQG.
Rugby ATS: Amateur Radio Video.
S Bristol ARC: *Microwave Workshop with G8BDZ.*
Willenhall ARS: meeting.
Wirral ARS: problems night.

21 Mar
Cray Valley RS: natter nite.
N Wakefield RC: Quiz Night NWRC vs White Rose ARS.
Chichester DARC: AGM and home-brew equipment contest for the Talbot Trophy.

22 Mar
Loughborough ARC: VHF night on-the-air 4m, 2m and 70cm
Radio Society of Harrow: activity night on 40m.
Coventry ARS: night on-the-air.
Clifton ARS: meeting.
Maltby ARS: Equipment Check — bring the rig!

23-25 Mar
BARTG RTTY Spring Contest. 0200 Sat to 0200 Mon. Bands 3.5, 7.0, 14.0, 21.0 and 28MHz. Check logs to G6LZB QTHR.

23 Mar
VHF Convention at Sandown Park.

24 Mar
White Rose Rally at the University of Leeds, starting at 11am with a talk-in on 2m and 70cm. Free parking but entrance fee 50p (children and pensioners free). Further details from Alan Bramley G4NDU, Leeds 689880.

25 Mar
Dudley ARC: ring PRO for details.

26 Mar
308 ARC: Surplus Equipment Sale.
Chester DRS: *Oscilloscope — Spectrum Analyser by G4JMF and G8ANS*
Loughborough ARC: constructors group
Bristol ARC: computer night.
Wolverhampton ARS: *The Basic Principles of SSB with G4WAS.*
Tiverton (SW) RC: meeting.
Mid-Warwickshire ARS: members computer demonstration.
Verulam ARC: The G3PAO Memorial Lecture given by Jim Bacon, G3YLA, who will be drawing on his considerable experience at the London Weather Centre to discuss 'There's a Bit of a Lift on'. All visitors welcome, talk-in on S14 from 7pm.
East Lancashire ARC: informal.

27 Mar
Cheshunt DARC: natter nite.
Rugby ATS: informal.
S Bristol ARC: RTTY activity night.
Willenhall ARS: meeting
Farnborough DRS: *Meteor Scatter with G8VR.*

28 Mar
N Wakefield RC: monthly meeting.
Edgware DRS: *Transceivers.*
Great Peterborough ARC: meeting.

29 Mar
Loughborough ARC: meeting.
Radio Society of Harrow: AGM.
Coventry ARS: Junk Sale.
Dunstable Downs RC: *Computer Networks by G8AMS.*
Clifton ARS: meeting.
Maltby ARS: AGM.

30 Mar
Sutton and Cheam RS: 36th Annual Dinner at the Woodstock, Morden.

31 Mar
RMG Open Meeting: Scottish Borders at Lilliardsedge, Caravan Park, on the A68 between Jedburgh and St. Boswells, starting at 2 pm.
Barking Club 144MHz contest. 1300-1700 GMT, all modes possible. 2 sections — full power and low power (20W PEP). Contact BRS31976, 32 Wellington Road, Rayleigh, Essex with sae for further details.

1 Apr
Horndean DARC: *Working Mobile (Suppression) by G4DIU.*
Rhyl DARC: Equipment demonstration with G3LEQ.
Sutton and Cheam RS: natter nite.
Worcester DARC: construction contest at the Old Pheasant.

2 Apr
Rugby ATS: AGM — note change from Wednesdays to Tuesdays.
Bristol ARC: Specialist Video.
Wolverhampton ARS: *The Third Method of SSB Generation by G6UDX.*
Wakefield DRS: AGM.
Chichester DARC: *QRP with G4BUE.*
Fylde ARS: *A Variety of Constructive Techniques by G3AEP.*
East Lancashire ARC: *Crime Prevention.*

3 Apr
Three Counties ARC: *Amateur Radio Satellites by a member of AMSAT-UK.*
Willenhall ARS: meeting.
Wirral ARS: Surplus Equipment Sale.
S Bristol ARC: *CW Operation by G3XED.*
Cheshunt DARC: *A Bit of a Lift On by G3YLA.*

4 Apr
Cray Valley RS: Construction Contest.
N Wakefield RC: on-the-air night.

5 Apr
Maltby ARS: DF Hunt.
Axe Vale ARC: meeting at the Cavalier, Axminster.

8 Apr
Amateur Radio and Computer Fair, organised by N Wakefield RC, at the Bretton Hall College, Bretton near Wakefield. The doors open at 11 am (10.30 for disabled visitors) and admission is free. Stands will cater for radio, electronics and computers. Plus a RSGB bookstall and handicraft films and stalls for all the family. There's a talk-in on S22 and GB3WU (RB15). Further details are available from G4RCH on 0532 536633.

9 Apr
Dartford Heath DFC: pre-hunt meeting.
Chester DRS: *HF Aerials and ATUs by G3NZ.*
Bristol ARC: club management meeting.
Mid-Warwickshire ARS: No meeting.

10 Apr
Willenhall ARS: meeting.
S Bristol ARC: QRP 2m CW activity night.
Farnborough DRS: Bring and Buy Sale.
Cheshunt DARC: natter nite.

11 Apr
N Wakefield RC: lecture/visit.
Edgware DRS: informal.

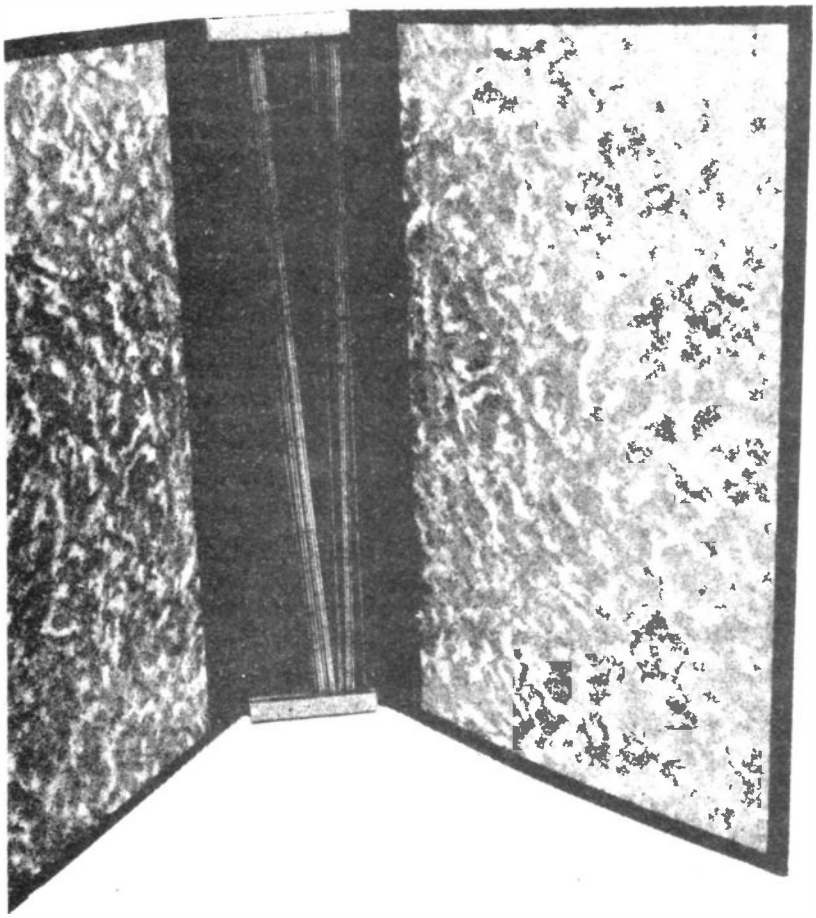
12 Apr	Wolverhampton ARS: 144MHz DF Hunt. Coventry ARS: night on-the-air. Dunstable Downs RC: *Solar Facts by G8AFN.* Clifton ARS: meeting. Maltby ARS: *Licence Rules and Regulations — Questions and Answers.*
13-14 Apr	**RSGB National Convention at the NEC, Birmingham.**
14 Apr	Dartford Heath DFC: club hunt.
15 Apr	Rhyl DARC: activity night. Worcester DARC: informal.
16 Apr	Bristol ARC: night on-the-air. Wolverhampton ARS: meeting. Chester DRS: *Installation of PMR Equipment by GW1ATZ.* Wakefield DRS: natter nite. Fylde ARS: informal plus Morse.
17 Apr	Three Counties ARC: *Kit Construction with Wood and Douglas.* Wirral ARS: *QRP Working with Rev Dobbs, G3RJV.* S Bristol ARC: computer night.
18 Apr	Cray Valley RS: AGM. N Wakefield RC: Pool Doubles competition. Chichester DARC: club meeting.
19 Apr	Sutton and Cheam RS: *Tape Recording by Malcolm Cunnings.* Coventry ARS: PCBs and a small project. Clifton ARS: meeting. Maltby ARS: *Short Wave Listening by G8NVS.*
23 Apr	Bristol ARC: computer night. Wolverhampton ARS: *Wolverhampton Repeater Group and its Repeaters.* Midland ARS: Surplus Equipment Sale.
24 Apr	Farnborough DRS: *AMTOR by G4EMR and G4CJO.*
25 Apr	N Wakefield RC: meeting. Edgware DRS: *Operating Techniques by G3SJE and Co.*
26 Apr	Coventry ARS: night on-the-air plus production of PCB project. Dunstable Downs RC: *The Best of QSL.* Clifton ARS: meeting. Chester DRS: *Entertainment Electronics by GW8ICT* Maltby ARS: computer night.
28 Apr	**Southend DRS Mobile Rally at the Rocheway Centre, Rochford, Essex. Stands cater for black boxes, components bring and buy and much more beside. Ample parking nearby on site. Rest room for the weary, bar food and drink. Talk-in on S22. For more info call Bryn, G4DEZ, on 0702 617749 or Brian, G4RDS, on 03745 50494.**
29 Apr	Worcester DARC: club night.
30 Apr	Bristol ARC: meeting. Chester DRS: outside activity evening. Wolverhampton ARS: Home Built Equipment Competition, Wakefield DRS: *Amateur Radio in SE Asia.* East Lancashire ARC: informal.
1 May	Three Countries ARC: *Horizontal FM by G4RRA.* Wirral ARS: *DF Techniques.*

Will club secretaries please note that the deadline for the June segment of Radio Tomorrow (covering radio activities from 1st May to 1st July) is 17th March.

Contacts		
Antrim DARC	GI4FUM	084 9464672
Axe Vale ARC	Bob Newland	029 74 5282
Bristol ARC	G4YOC	Bitton 4116
Bury RS	Bryan Tydesley	0282 24254
Cheshunt DARC	Roger Frisby	0992 464795
Chester DRS	Alan	Chester 40055
Chichester DARC	C. Bryan	0243 789587
Clifton ARS	Mr Hinton	01-301-1864
Coventry ARS	R. Tew	Coventry 73999
Dudley ARC	John	0384 278300
Dunstable Downs RC	Phill Morris	0582 607623
East Lancashire ARC	Stuart	0254 887385
Edgware DARS	John Cobley	01-30 64342
Farnborough DRS	Mr Taylor	0252 837581
Fylde RS	PRO	0253 737680
Harrow RS	Dave Atkins	0923 779942
Loughton DARS	G6FWT	01-508-7190
Maltby ARS	Ian Abel	0709 814911
Midlands ARS	*G8BHE*	021 442 9787
Mid-Warwickshire ARS	G4TIL	Southam 4765
N. Wakefield RC	S. Thompson	0532 536633
Reading DARC	Chris	Reading 471761
Rhyl DARC	GW1AKT	Nantglyn 469
Shefford DRS	G4PSO	Hitchin 57949
S. Bristol ARS	*Len Baker*	0272 834282
Three Counties ARC	R. Hodgson	0428 77368
Tiverton (South West) RC	G. Draper	03634 235
Verulam ARC	H. Clayton Smith	St Albans 59318
Wakefield DRS	G8PBE	Wakefield 378727
Welland Valley ARS	J. Day	0858 32109
Westmorland RS	G. Chapman	0539 28491
Willenhall ARS	G4LWI	0902 782036
Wirral ARS	Cedric, G4KPY	051 625 7311
Wolverhampton ARS	Keith	0902 24870
Worcester DARC	D. Batchelor	Worcester 641733
308 ARC (Surbiton)	Dave Davis	01 399 5487

SAVE £4.25 by receiving a FREE magazine binder when you subscribe to.....

HAM RADIO TODAY



It's true, by subscribing to *Ham Radio Today* you will not only receive your personal copy direct to your door for a whole year but also have a superb magazine binder in which to keep your copies AND IT'S FREE!

All you have to do to receive your FREE binder is book a new subscription or renew an existing subscription to *Ham Radio Today*.

What could be simpler? Normally priced at £4.25, these attractive binders will hold approximately 12 issues of *Ham Radio Today*.

Not for you any longer the chore of having to track down dogeared copies of your favourite magazine, instead you will merely go to your bookshelf and they will be waiting for you in pristine condition.

Don't miss out on this outstanding offer — subscribe today and receive your FREE binder within 14 days of your order being received.

SPECIAL OFFER

SUBSCRIPTION ORDER FORM

Cut out and send to.
HAM RADIO TODAY,
INFONET LTD,
TIMES HOUSE,
179 THE MARLOWES,
HEMEL HEMPSTEAD,
HERTS HP1 1BB

Please send my free binder and commence my personal subscription to HAM RADIO TODAY with the

. . . . . issue

SUBSCRIPTION RATES (tick as appropriate)

£17.00 for 12 issues UK ☐

£18.50 for 12 issues overseas surface ☐

£33.50 for 12 issues overseas air mail ☐

I am enclosing my (delete as necessary) Cheque/Postal Order/International Money Order for £. . . . . (made payable to ASP Ltd) OR Debit my Access/Barclaycard (*delete as necessary) Insert card no.*

Access | BARCLAYCARD VISA

Please use BLOCK CAPITALS and include post codes.

NAME (Mr/Mrs/Miss) (delete accordingly) . . . . . .

ADDRESS . . . . . .

. . . . . .

. . . . . POSTCODE. . . . . .

Signature . . . . . .

Date . . . . . .

Free Readers' ADS!

WANTED

HRT wanted by collector. Following issues: Jan 83, Aug 83, Sept 83, Nov 83, Dec 83 and June 84. Also wanted the first issue of Amateur Radio (who?). I will pay your price. G1IMR T. Smith 0326 280470.

WANTED YAESU FT780R and 934MHz FM CB. Consider 790R cash waiting. 0217453429.

WANTED. Ham International multi-mode or equivalent. Will swap President Madison home base, AM,FM,SSB. or will arrange part exchange. Telephone Stoke-on-Trent 516213. Evenings.

WANTED Murphy type 618 HF Tx, AP100333, and power unit, AP100336. Also Marconi Kestrel Tx and any other Marconi marine gear. G4FUY QTHR, Reading 733633.

WANTED The following TOR Bulls to complete collection: Mar '57, May '54, Jan, Mar '42, May, June '40, Mar, June, July, Dec, '30 and earlier. SWMs pre war, Mar '46, Jan '48 have various TOR Bulls from '31 QST from '32 CQ from '45 sell/exchange. Write Baker, Tan-Ffynnon, Penuwch, Tregaron Dyfed.

WANTED 2M transverter for use with FT7 trans must be able to take 10 watts input. Homebrew OK, must be cheap. 0723 366360.

WANTED old ARRL handbooks. Marris 35 Kingswood House, Farnham Road, Slough, Berks. SL2 1DA.

WANTED FTV-901R 2m transverter or microwave modules 144/28 transverter. Also FC-901 ATU. Phone Danny GI6EIR 026652 58657 after 6pm.

WANTED pair of 813s and/or bases at reasonable price. Tel 0265 823464 GI3CSV QTHR.

WANTED Atari computer information on amateur radio associated software, etc. Are there any other amateurs with Atari computers? Contact, Joe, G4WJR, 3, Willow Drive, Skelmerdale, Lancs, WN8 8PR. Tel. (0695) 22242.

WANTED URGENTLY servive manuals for Microcell Electronics type 400 and Telequipment S32A singlebeam oscilloscopes. Also have for sale/exchange advance UHF millivoltmeter type VM79. Require full range or testgear DVM/AV08 AF/SIG-GEN dualbeam scope 10-20MHz. WHY. Phone Luton (0582) 459354.

WANTED Cobra 2000GTL, mint condition or stalker 20 homebase. Reasonable prices. Considered. Write to W McCann, 1 Ross Rd, Belfast 12, N. Ireland. Tel 2432663. Code 0232.

WANTED Sept, Oct, Nov, Dec, 1984 issues of Ham Radio Today. Five pound the lot. Phone Edinburgh (031) 453-1282 4-11pm only. Also need simple transceiver project, even photocopies will pay.

WANTED Yaesu memory unit for FRG7700. Complee and good working condition. Will collect. Send details to L Leung 82 Beech Avenue, Beeston, Nottingham NG9 1Q9.

WANTED: wartime or pre-war "Radio Times", "Listener", and radio magazines. Please write or phone Douglas Bryne 52 West Hill Rd, Ryde, IOW. (0983) 67665.

KW 109 ATU WANTED must be in good condition. Also Drake desk mic type 7075 and LPF type 3300 LP Phone Pete Nuneaton 3433680.

WANTED NATO 2000 and FRG7700. 0283 221870. Mr. Tarleton, 499 Burton Road, Midiway, Burton on Trent.

WANTED six or eight digit frequency counter. G3VXS 56 Basford Park Road, Maybank, Newcastle under Lyme ST5 OPS 0782 625661.

WANTED Yaesu Musen FL50B transmitter and cables with handbook. First class condition only., Contact Mr. James, 2 Marian Road, Llandudno, Gwynedd. LL30 1HL.

COILS WANTED to cover 26-30 MHz. AE, HF, and OSC. Wearite, Denco, or similar. G8BSk, 290 Priory Road, St. Denys, Southampton SO2 1LS.

WANTED Kenwood Trio digital display DG5. Cash waiting Phone 061 653 8530. G4ZQL.

WANTED any World Radio and TV Handbook editions. Does not matter how old they are. Phone Rillington 671. Ask for David.

INFORMATION Wanted on quad spider. Where can I get one from? Write to Mr. Sales, 17 Chestnut Grove, Lancaster LA1 5RW.

WANTED non-working HRO receivers or parts for spares. Condition unimportant also original HRO power supply units and speaker units. Tel St. Albans 39333.

WANTED inexpensive AM low band transceiver, suitable for 86 MHz. Prefer Pye Motafone 0602 256178.

WANTED IC251, FT221(D) or any good 2m multi-mode or SSB Rig. Must be in good condition, BWT not too expensive!!! Phone 0277 220428, ask for Dave after 7pm. or write PO Box 388, Brentwood, Essex CM14 4BX.

WANTED FT101E or FT707 or FT7B, 148 Cobra 11 meter or FRG 7700 Phone 0283 221870.

WANTED FT225 in exchange for FT290R with cash adjustment where required. Also want R1155 BC348 CR100 WHY. All letters answered. Quested, 252 Bartons Hill, Minster, Sheerness, Kent.

WANTED heavy duty rotator, multi band HF beam, mast or tower, cables, etc Mervyn Collicott, G1GTC, 10 TOR Road, Hartley, Plymouth, Devon. (0752) 777777.

WANTED Belcom linear 2; or linear 10; 2m or 10M Tx/Rx; WHY G4ANW 0730 61859.

FT-207R accessories wanted — charger IAC adaptor NC-3A (or similar), SPKP/MIC YM24(A) DC adaptor PA3, mobile 2m antenna, gutter clip. Please phone Tom 01-450-0801.

WANTED K40 speech processor microphone in perfect working order. All letters will be answered. Rob Stafford, Haute Entree, Rozel, St. Martin Jersey, Channel Islands.

EXCHANGE

EXCHANGE DATONG FL2 audio filter for Trio 9R590, or Commtron CXX/NATO or Stalker CB, or Ham International CB, or similar CI am not fussy!) Telephone Matthew, Basingstoke (0256) 478731 anytime before 21.30.

EXCHANGE MM.2001 RTTY-TV converter for good condition spectrum 48K. Tel Northwich 45584.

EXCHANGE one Sigma IV antenna for any 144 beam antenna. Prefer one over four elements. Contact Bob anytime, Minehead (0643) 6603.

EXCHANGE WHY or offers for magazines Short Wave Mag 40 issues 79-83. Amsat UK (Oscar news) 30 issues 79-84 Electronics Today International 34 issues 78-80. Practical Wireless 55 issues 73-85. Practical Electronics 28 isasues 74-82. Ipug (ICPUG) + SER 28 issues 79-83 Elector 26 issues 75-83. Plus various others including BBC Micro Mags. Phone Horsham (0403) 69835.

SELL or SWAP have Commodore PET 4016 16K RAM with utilities, ROM 'Power' very useful. Swap for HF receiver, QRP TxRx or any reasonable offers, Alinco 230DH 2m linear, preampt, switchable, ideal for FT290 etc £40 Tel. after 6 pm. not QTHR, 061 7662132 G6VQS.

MM2001 RTTY to TV, new boxed, will exchange for good cond. Spectrum 48K computer. Tel Northwich 45584.

WHO will give me a Yaesu FRG7000 (or similar receiver) for my Yamaha PS-10 44-key portable keyboard (hardly used) Telephone 01821 8255, 10 Turner House, Erasmus Street, London SW1P 4DZ.

EXCHANGE Fairmate A532320 synthesiser scanner Rx. VHF/UHF AM/FM 20 mem channels. Swap for Bearcat FB220 or SX200A, External condition not important. Contact Mr. Blair, 55 Burnopfield Road, Rowlands Gill, Tyne-Wear NE39 1QQ.

FOR SALE

MICROWAVE MODULES convertors 70cm to 2m and 2m to MF Y18 each Phone 01 500 7073 after 8 pm.

WESTOWER 2S/FBP 42 ft two section tower. Telescopic and tilt over complete with Kenpro rotator and 10 ele. 2m crossed Yagi. £400 ono Buyer collects Tel 0621 816105.

Microwave 24 GHz; directional coupler and detector with crystal £28, variable attenuator £35. Microwave 10GHz; 75mW klystron with micrometer tuning and WG mount £18, 25mW klystron £4, professional micrometer wavemeter £78, variable attenuator and detector with crystal £48. Cambridge (0223) 860150.

SCANNER Regency M100 FM covers 4M, 2 70cm plus much more, keypad entry sell for £60 or swop for ATV transmitter. Phone Paul G6DQK 061 338 8507 after 6pm or weekends.

FT101E good condition, exchange for 2M mobile or sell £250 original packing, CW filter, fan, etc. Phone Nottingham 874235.

MONOBAND BEAM cushcraft 15/3CD unused £85. Integrated amplifier Yamaha CA 2010 60 watts/A 240watts/B £250 Thorens TD125MK2 electronic turntable TP16 arm Ortofon/M0FL £40 loudspeakers IMF/TL professional Monitors modified 25 Hz suit enthusiast 20x41x17 ins. £50 each other hi-fi car speakers cheap. Ring 055932 2333.

SCANNING RECEIVER 76-88 156-168 MH £80. Tandy handheld CB cost £170 accept £120. Sony ICF 2001 communications reciever 0.5-30 plus 76-108 MHz FM. Murphy CBFM £15. Bremi power supply £12-50 44MHz crystals, various frequencies 2M £2 each. 946-2967 ask for Jane.

YAESU FT290R including rubber whip, mic, Ni-Cads, charger and original packing only £210 including delivery Trio TS130V HF transceiver, 80-10m, SSB and CW, 25 watts, fitted narrow SSB filter, with original packing, £330 including delivery. Phone Graeme, G6CSY, Orpington 0689-29230 evenings.

VHF/UHF receiver type PRO2003 Covers 4m, 2m, 70cm and intermediate frequencies, Digital display, memories and scanning. 7 months old orig. packing, only £160 ono or might exchange for 2m handheld or mobile. Bristol (0372) 719163.

RTTY MICROWAVE modules MM4000 with keyboard £150. 10FM, MM 2M to 10M transverter £75 FT290R, NiCads charger, case no* mods £180. All as new. Exchange 70cm FT708 or WHY. Tel 01 882 5292 G3TXA QTHR.

ICOM IC24G PSU and accs. 10 watt VHS FM mobile rig £110. Would exchange for Icom, Yaesu, Trio or FDK general coverage Rx with digital readout. Phone Barnsley (0226) 202829 after 6.30 pm.

YAESU FT290R for sale good condition, original packing. Plus mobile mount, carring case, flexible whip, NiCads and charger, also mobile antenna and folded Dipole. £250 ono the lot. Contact Mike, G6TNM on Southampton (0703) 872451 after 6pm or at weekends.

SLIM CRANK up tiltover mast, wall mounting, rotator mounting, £60. 5" highres green screen monitor in wood case £30 2M Rx/Tx B/Brew to good spec, DBM, Rit, AR+RF and power controls, digital readout, SSB only £70 Jim 0202 518828.

TRIO TR9130 2m multimore, excellent condition, hardly used, £410 N. Purkins 32 Astral Road, Hessle. North Humberside HU134DD. Tel 0482 644122.

FOR SALE Nato 2000 multimode transceiver, little used, immaculate condition with manual £95. Also Zetagi 131 mains linear 200W PEP 100W FM £45 or £130 the pair. Phone (0980)-23331 Ext 2074 daytime or (0980)-23062 after 5pm.

QRP TRANSCEIVER 40M CW well built and neat unit with digital display (with external BNC for use as DFM) as per PW £60 ono. BBC-B games original tapes, instructions etc Castle of Riddles/Twin Kingdom Valley £3.50 each — both for £6 — unwanted presents. Phone Horsham (0403) 69835.

Drake T4XB and R4B separates plus matching speaker/PSU and MN4 ATU 160-£10m including WARC bands. Variable notch and 2.5/1.2/0.4 KHz filters. Complete with Sure 444 Microphone, manuals and many spare valves. £350 Tel. 01-348-9780 (equipment at SE coast)

UNIDEN UNIACE 100 legal CB, mint cond., never used mobile. Auto Squelch fitted by Bury Electronics, responds to signals not noise!! reason for sale going HF £25 ono or exchange for YM38 Yaesu base mike or similar WHY? Phone 01-247-6097 (day).

TRIO TH21E, 2m hand portable, 1 month old, including case, charger, 2 NiCad packs, DC converter. Cost new £230, needs cash, hence regret sale for £150. Contact Colin. Phone: 0322 523983 (Dartford) evenings, weekends.

4CX150A base, 70cm brass cavity £20 Rigonda Fiesta 6" TV £18. Robot SSTV camera board + scan coils, circuits £22 Marconi V322 viewfinder camera +manual £60. Pye Westminster low band FM £20. 50' Andrews Helix LD5450 £20 8844 Vidicon £18. Contact Mr. Hill, 7 Willowbrook, Greytree, Ross on Wye HR9 7JS.

Trio TS510 Tx/Rx PS510 PSU/speaker £120 only, to allow for repair slight audio level fault on speaker, OK on earphones. Tx ok. Wanted FRG7 Rx or similar? Exchange for above G4HBU. Tel Bristol 611093 30, Fairview Road, Kingswood Bristol BS15 2UT.

B. LICENSEES pull your finger out! Learn morse at St. Marks Church, Lymington Ave., N.22.(Behind Wood Green Tube) Beginners Thurs 14th March 1985, onwards 7-9pm other speed practice available. Contact Roy G4UNL for details 01-804-5643.

FOR SALE. YAESU FT 757 GX, FP 757 HD PSU, MH-21B8 mic, FC902 ATU. Never used £550 complete. Call Luton 422810 after 6pm.

RACAL RA17 general coverage receiver 0.5-30MHz good cond. CW manual £150. Heathkit transmatch 2kW. 80-10m £70. Wilson WE800 144-148 synthesized 2m FM mobile & portable 1w & 12w mobile mount manuals etc. Ideal for new licencee. £120 Phone: G4AAQ. Pontefract (0977) 791071 after 6-30 pm.

MUTEK FRONT END for IC171E unused, in manufacturers sealed packaging £70. Save £20! wanted; your abandoned VHF/UHF linear project 4CX250 type preferred but anything considered. Tel: Stuart, 031-667-9177 day 031-554-5667 evening.

YAESU FT560 QRO HF Tx/Rx. Many spare valves, PAs, driver. Good condition. £200. FV400S VFO £30. G4RJC, QTHR Upminster. Tel 040 22 21523, evenings not Sundays.

UNIDEN 2030 2m FM transceiver xtalled 12 channels, toneburst on mic. Good solid worker £60 ono. G4YXB (GICNE) QTHR. Phone (0535) 54337 anytime, ask for Andy.

DIGITAL READOUT FC7B offers. TS130 mobile rig, VGC, £400 or offers. Trapped HF ant, vertical offers. 2m colinear unused £25. 10m FM? DNT M40, new £28. 3-band Rx+ tape Rec £15. Martyn Bolt 112 Leeds Road, Mirfield, Yorks WF14 OJE. Tele 0924 495916.

FOR SALE Yaesu FT480R all mode 2m transceiver £240. Icom IC260E 2m all mode transceiver £250. Eddystone EC10 HF receiver £35. Bailey, Bellshill 747448.

TRIO AT230 ant tuner £95. Icom IC02S 2m transceiver £85. HK-708 key £10. MK-702 single lever, paddle key £15. G0ACS tel Northampton 740301.

TRANSVERTER SSM EUROPA 10m/2m, 200W PEP, SSB/CW/AM, complete with LT supply and connecting cables. Includes receive converter. Especially compatible Yaesu equipment a little used. Bargain at £60 carriage paid. G2BIM, Tel. Ottery St. Mary (040 481) 4359 evenings or weekends.

FRG-7D YAESU general coverage receiver, 0.5-30 MHz, fitted SMC digital readout and original small Yaesu SSB filter. Complete with manual £120. Can be seen in working order. Ring G4SNR, QTHR, Tel (0202) 474099 Christchurch, Dorset.

ICOm IC240 2m synthesised transceiver, good working order preampt fitted. £115 ono. G8HFU QTHR 0288 4787.

Free Readers' ADS!

Buy, sell or exchange your gear through our free service to readers

CONDITIONS

1. These advertisements are offered as a free service to readers who are not engaged in buying or selling the same equipment or services on a commercial basis. Readers who are should contact our advertising department who will be pleased to help.
2. Advertisements will be inserted as and when space becomes available.
3. The insertion of advertisements will be on a first-come, first-served basis, subject to condition (2). As a result, it will not be possible to guarantee the insertion of a particular advertisement into any particular issue of the magazine.
4. Readers should either write out their advertisement in BLOCK CAPITALS or type it, underlining any words that are to appear in bold.
5. The magazine cannot accept any responsibility for printers' errors in the advertisements; however, we will do our best to ensure that legibly written advertisements are reproduced correctly. In the event of a gross error, at the Editor's discretion, a corrected version of the advertisement will be printed (at the advertiser's request) at the earliest issue in which space is available.
6. The magazine or its publishers will not accept responsibility for the contents of the advertisements, and by acceptance of these conditions, the advertiser undertakes to indemnify the publisher against any legal action arising out of the contents of the advertisement.
7. The magazine reserves the right to refuse to accept or to delete sections of advertisements where this is judged necessary.
8. Advertisements are accepted in good faith; however, the publisher cannot be held responsible for any untruths or misrepresentations in the advertisement, nor for the activities of advertisers or respondents.
9. Advertisers must fill in their names, addresses and (if available) telephone number in the space provided, and sign the form to indicate acceptance of these conditions (forms returned without a signature will not be used).
10. All that is to be reproduced in the advertisement should be entered into the space provided on the form printed in the magazine – note that a **photocopy is not acceptable**. All advertisements must give either a telephone number and/or address for respondents to contact, and this must be included in the wording of the advertisement.
11. Advertisements must be 40 words or less in length (telephone numbers normally count as two words, exchange or exchange code plus number).

Name . . . . . .

Address . . . . . .

. . . . . .

. . . . . .

I accept the conditions above.

Signature . . . . . .

Send this form to: Free Readers Ads, Ham Radio Today, 1 Golden Square, London, W1R 3AB

ENTER YOUR ADVERTISEMENT HERE:

EMPORIUM GUIDE

AVON

Booth Holdings Bath
6 GOLF CLUB LANE, SALTFORD, BRISTOL
Tel: 02217 2402
Open Tues Sat 9am 9pm
Close Mondays

RING 557732 BRISTOL
Radio Communications
Amateur P.M.R. Marine
UPPINGTON Tele-Radio (Bristol) Ltd
12-14 PENNYWELL ROAD, BRISTOL, BS5 0TJ

ESSEX

ARROW
Electronics Ltd
5 The Street, Hatfield, Peverel
Nr. Chelmsford, Essex CM8 3YL
Tel: 0245 381673/381626
ICOM Trio/Kenwood, Tonna, Welz, T.E.T. K.D.K., Daiwa, Tono, Tasco

USED — NOT ABUSED!!
Only Top quality Amateur Equipment
BOUGHT, SOLD & EXCHANGED
For the best deal — Personally Guaranteed!
Ring G4TNY ELECTRONICS Dave,
On 025 587 663 or 040 24 57722 anytime!
Or write 132 Albany Road,
Hornchurch, Essex RM12 4AQ
Is my North Essex Office NEARER you?
Send SAE for our latest list of all popular makes -
Agent for Tau Systems Atu's, baluns etc in stock.
MAIL ORDER — A SPECIALITY

KENT

THANET ELECTRONICS
95 Mortimer St, Herne Bay
Tel: (02273) 69464
Open Mon-Sat 9-5.30pm
except Thursday 9-1pm

SCARAB SYSTEMS
AMATEUR RADIO SOFTWARE
ICOM STOCKISTS
39 Stafford Street, Gillingham 0634-570441
please see main advertisement

LANCASHIRE

AMATEUR ELECTRONICS U.K./HOLDINGS

Yaesu, Tet, Jaybeam, Frequency Counters, Drae, Datong, FT101 Experts, Repairs 6JS6C, 12BY7A, 6KD6, RF Clipper, Double Balanced Mixer, Warc Kit etc. S.A.E. List 15 min. Junc. 31 M6. Free parking.
45 Johnston Street
Blackburn BB2 1EF
(0254) 59595
CLOSED THURSDAYS
G3LLL

LONDON

DRESSLER UK LTD
191 Francis Rd, Leyton, E10
Open 9-5.30pm Monday-Friday 10-5 Saturday
Authorised dealers for:
Dressler, Yaesu, Icom, Standard, Trio/Kenwood
Datong, SCM, Microwave Modules, Tonna
Tel: 01-558 0845/556-1415 Telex: 8953609

W. MIDLANDS

DEWSBURY ELECTRONICS
RXs. from YAESU, JRC, ICOM
Stockists of microwave modules, B.N.O.S., M.E.T., GAMMA, DATONG, ICS, TASCO
Open Mon-Sat, 9-30-5.15
176 Lower High Street
Stourbridge (0384) 390063

HEWARD'S HOME STORES LTD. (Est. 1963)
822/4 Kingstanding Rd., Birmingham
B44 9RT. Tel. 021-354 2083
G4RJM with 38 years in The Radio Trade
Ham Equipment urgently wanted!
Open: Mon-Sat 9-6

WARD ELECTRONICS
DIAWA
LOWE PRODUCTS
COMMODORE
COMPUTERS
HOKUSHIN
I.C.S. AMTOR/
RTTY EQUIPMENT
RSGB BOOKS
G3LIV PCB'S FOR SSTV/RTTY
FOR RADIO ENTHUSIASTS
422 Bromford Lane, Ward End
Birmingham B8 2RX
Tel: 021-328 6070 (Closed Monday)

R. WITHERS COMMINICATIONS
584 Hagley Road West
Oldbury, Warley B66 0BS
(Quinton B'Ham) Tel: 021-421 8201/2/3
Opening hours 9.00-5.30pm. Late nights Thurs-Fri.
For all your communication requirements send SAE for latest used list and latest info.

NORFOLK

D.P. HOBBS (Norwich) Ltd
13 St. Benedicts Street, Norwich
Tel: 615786
Open Mon-Sat 9-5.30
Closed Thurs
Stockists of:
YAESU, FDK, ICOM, JAYBEAM
& Electronic Component Specialists

Eastern Communications
31 Cattle Market Street
NORWICH
(0603) 667189
MAIL ORDER
OPEN: 9.30-5.30 Mon-Fri 9.30-5 Sat
ICOM

SCOTLAND

JAYCEE ELECTRONICS
JOHN GM30PW
20 Woodside Way, Gelenrothes, Fife KY7 5DF
Tel: 0592 756962
Open: Tues-Sat 9-5
Quality secondhand equipment in stock. Full range of TRIO goodies. Jaybeam - Microwave Modules - LAR.

SURREY

GUILDFORD COMMUNICATIONS
34 Aldershot Rd., Guildford
Open Mon-Fri 8am-6.30pm
Sat 8am-5.30pm
Secondhand wanted
ICOM TRIO ASDEN TOTSUKO
0483-574434

TYNE & WEAR

Approved Dealer ALYN SONICS
ICOM
129 Chillingham Rd, Newcastle-upon-Tyne
Tel: 091-276 1002
Open: Tues-Sat 10am-6pm

YORKSHIRE

TELECOM
6 New Street, Barnsley
South Yorkshire
Tel: (0226) 5031
Specialists in Yaesu, Icom and So-Kamp

4 Cross Church St, Huddersfield Tel: 0484 20774
Open 6 days 9-5.30
Closed Weds Thurs 9am-8pm
G4MH Mini Beam, Trio & Yaesu
Always a good selection of new & 2nd hand equipment in stock
Amateur Radio Shop

••RADIO AMATEURS AND C.B PEOPLE TALK TO••
LAR 34 NEW BRIGGATE LEEDS LS1 6NU COMMUNICATIONS CENTRE
ELECTRONIC COMPONENTS - TELEPHONES
VIDEO - AUDIO LEADS - STYLI
LEEDS 452657 the PROFESSIONALS!
uniface TELECOMMUNICATIONS
TRIO ICOM YAESU
LARGE RANGE OF ACCESSORIES

Put Your Business on the map
Phone:
Caroline Faulkner
on
01-437 0699

HAM RADIO TODAY CLASSIFIED

Lineage:
35p per word (minimum 15 words)
Semi Display: (minimum 2 cms)
£7.00 per single column centimetre
Ring for information on series bookings/discounts
All advertisements in this section must be prepaid.
Advertisements are accepted subject to the terms and conditions printed on the advertisement rate card (available on request)

01-437 0669
EXT 332
Send your requirements to:
Caroline Faulkner
ASP Ltd.,
1 Golden Square,
London W1

HAM RADIO EQUIPMENT

GOING, GOING — GONE!

I BUY & SELL USED AMATUER RADIO GEAR CASH, PART EXCHANGE, MAIL-ORDER

Send S.A.E today for current list to:-

USED EQUIPMENT CENTRE, G3RCQ ELECTRONICS
65 Cecil Avenue, Hornchurch
Tel: 04024 55733

Please leave a message on the answer phone
73's de Dave & Coral G3RCQ & G4RCQ

CARDS, STICKERS & BADGES

LISTENER & QSL CARDS. Quality printing on coloured & white Glass Card at competitive prices. S.A.E. for samples: S.M. Tatham, "Woodside", Orchard Way, Fontwell, Arundel, W. Sussex.

COMPUTER LOG

SINCLAIR (48K + 16K) Spectrum ZX81 16K). Exciting programmes. Logger designed for amateur radio operators. Holds 720 logs (48K). All the legal requirements and niceties, full search and update. Price on cassette £5.50 each, cheques and P.O.'s to: Martello Computer Services, "Freepost Reading RG6 1BR".

COURSES

COURSES - RADIO AMATEURS EXAMINATION City & Guilds. Pass this important examination and obtain your licence, with any RRC Home Study Course. For details of this and other courses (GCE, professional examination, etc.) write or phone — THE RAPID RESULTS COLLEGE, Dept. JN2, Tuition House, London SW19 4DS. Tel: 01-947 7272 (9am-5pm) or use our 24 hr Recordacall Service: 01-946 1102 quoting Dept. JN2.

AERIALS

AERIAL WIRES & ACCESSORIES
Hard drawn copper wire 140ft 14swg **£7.90** 50 metres 16swg **£6.90** 10 metres 12swg soft enamelled copper wire **£3.50.** 50 metres 1.4mm soft enamelled copper wire **£5.75.** G5RV Type Aerials ½ size **£12.00.** Full size **£13.95.** 4mm Polypropylene Rope 50 metres **£3.95.** 4mm Nylon Guy Rope 50 metres **£6.90.** Ceramic Egg Insulators Large **50p.** Small **40p.** All items postage paid
S.M. TATHAM, 1, Orchard Way Fontwell, Arundel, West Sussex

ALARMS

BURGLAR ALARM EQUIPMENT. Please visit our 2,000 sq ft showrooms or write or phone for your free catalogue. C.W.A.S. Ltd, 100 Rooley Avenue, Bradford BD6 1DB. Telephone 0274 731532.

FOR SALE

SPECTRUM RTTY/CW
The RADSOFT complete Receive System which includes ready made boxed miniature terminal unit and machine language program. Plug in and receive RTTY @ 45, 50, 56 & 75 BAUDS MORSE from 5-70 WPM. This well proven system only **£40.**

Postage & V.A.T paid
From -
UPDATE COMPUTER SYSTEMS, 83 Nora St., Sunderland

MORSE SOFTWARE

MORSE READING PROGS.
Work on clean signals without hardware interface.

ZX81 1K UNEXPANDED MEMORY
Translated code with word and line spaces for easy reading. Automatic scroll action. **£7 incl.**

SPECTRUM 16/48K
Scroll action with 10-page scrolling memory, instantly accessible page by page. **£8 incl.** All types variable speeds. Feed signal directed into EAR socket.

Pinehurst Data Studios
69 Pinehurst Park, West Moors Wimborne, Dorset BH22 0BP

SOFTWARE

RTTY/MORSE RADIO SOFTWARE
RTTY/MORSE READER For 48K Spectrum. The ultimate RX Program. Features include: 45.5 Baud RTTY reception-full character set supported. Morse reception-auto speed control (5-35 WPM), punctuation and wordspace. Also includes 40 page text memory, and Copy facility for printer. No extra hardware required — Simple connection to radio via Computer EAR Socket. Price — **£8.00.**
MORSE TX/RX Program for 48K Spectrum. Allows full transceive operation, includes comprehensive morse tutor. No extra hardware required. Price — **£7.50.**
MORSE RX Program for 16K Spectrum and 1K ZX 18. Spectrum version includes comprehensive morse tutor. Price — **£5.20.**
All above Programs 100% Machine Code.
P. Anderson, Wellands, Pilton, Shepton Mallet, Somerset.

EQUIPMENT

AMATEUR RADIO EQUIPMENT. Bought, Sold, Exchanged. Phone Dave, G4TNY, on 025 587 663 or 04024 57722. Further details see 'Emporium Guide'.

MISCELLANEOUS

CONTINENTAL DX-pedition/ holiday plans? Start with "GB NEWS 1985". For copy, send 2 x 13p stamps. GB Car Club, FREE POST 3, Romsey, Hampshire, SO5 8ZT.

SERVICE MANUALS

SERVICE MANUALS. Amateur Radio Test, Audio, Television, Video etc. L.S.A.E. enquiries, Mauritron (HRT), 8 Cherrytree Road, Chinnor, Oxfordshire.

COMPONENTS

R.F. Transistors. Specialist Components for Transmitters. Unelco Capacitors. Sparague Mica Trimmers (500V). **Sole Agent for solid state Microwave R.F. Transistors supplied to full specification.** Full 2N range supplied. Special SD range 1W-100 WATT output 1 to 100 MHz Preamplifiers for 2 meters and 70cms. Power Amplifiers with and without switching. Aligned and ready for use. Due to exchange fluctuations we cannot price. Send S.A.E. for full lists.
Phone: Selsey
(0243) 823603. Modular Electronics, 1 Coniston Close, Felpham, Bognor Regis, Sussex.

SBL 1/8. Schottky ring mixers. £5.50. TIS88A UHF. JFET. 30p. 100pf. C804 variable capacitors. £2.50. 0.5 - 6pf glass piston trimmer capacitors. 30p. 500pf 20KV. RF capacitors for linears. £2.00. Plastic trimmer capacitors, 1 - 6.5 pf, 2 - 22 pf, 2 - 25 pf. 15p. Post 40p. Send 20p for lists. Many amplifier parts available. John Moxham 68K BQ. 22 Whiting Road, Glastonbury, Somerset, BA6 8HP.

RTTY

PNP Communications modular terminal units for RTTY - MORSE - AMTOR

PL1 RTTY mod/demod 14.50k 18.50a
TUI3 Bargraph LED 8.10k
tuning indicator 10.75a
FP1 Poser supploy/amp;;;;.11.50k 14.50a
a = assembled PCB, k = kit of parts.

Boxed versions available —
CTU20 RTTY only 56.50
RTTY & Morse 64.75

Software available for —
Dragon VIC20 CBM 64 BBC Amstrad CPC464 Acorn ATOM
Please ADD VAT at the current rate

ACCESS & VISA welcome
62, Lawes Avenue, NEWHAVEN, East Sussex BN9 9SB
Telephone (0273) 514465
LARGE SAE for full Catalogue.

DON'T LEAVE IT TO CHANCE — GIVE YOUR BUSINESS A BOOST BY ADVERTISING IN *HAM RADIO TODAY*

Phone: CAROLINE
on **01-437 0699**
FOR DETAILS

HAM RADIO TODAY
CLASSIFIED ADVERTISEMENT — ORDER FORM

IF YOU HAVE SOMETHING TO SELL
DON'T TURN THE PAGE — TURN TO US!

RATES OF CHARGE: 35p per word (minimum of 15 words)
semi-display £7.00 per single column cm

Advertise nationally in these columns over 60,000 readers for only 35p per word (minimum charge 15 words). Simply print your message in the coupon and send with your cheque or postal order made payable to Argus Specialist Publications Ltd. to:

CLASSIFIED DEPT. HAM RADIO TODAY
1 Golden Square, London W1R 3AB.
Tel: 01-437-0699.

Please indicate classification required.

Name .....

Address .....

.....

.....

Tel. No. (Day) .....

BARCLAYCARD VISA Or Debit my Access/Barclaycard (Delete as necessary) Access

HAM RADIO TODAY, APRIL 1985
ADVERTISERS INDEX

Don't forget, when calling an advertiser, mention Ham Radio Today — it helps them and us.

73's Dave Gadsden, G4NXV, Advertisement Manager.

MICROWAVE MODULES LTD

2 METRE MULTIMODE TRANSVERTER MMT 144/28-R

NEW RELEASE

FEATURES

- **25 Watts TX Output**
- **GaAsFET RF Stage**
- **Transmit ALC Circuit**
- **13.8V DC Operated**
- **Repeater Shift (normal, simplex, reverse)**
- **High Level DBM Mixer**
- **LED Bargraph Power Meter**
- **RF Vox — Adjustable Delay & PTT Override**

SPECIFICATION

GENERAL

INPUT FREQ RANGE	: 28-30MHz
OUTPUT FREQ RANGE	: 144-146MHz
REPEATER SHIFT	: Simplex, normal, reverse
DC REQUIREMENTS	: 13.8V DC at 6 Amps

TRANSMIT SECTION

OUTPUT POWER	: 25 watts +/- 1dB
INPUT LEVEL RANGE	: ¼mW to 300mW
ALC RANGE	: 20dB
MODES OF OPERATION	: SSB, FM, CW, AM, FSK
SPURIOUS OUTPUTS	: -65dB or better

RECEIVE SECTION

Gain	: 22dB +/- 1dB
N.F.	: 2dB or better
3RD ORDER INTERCEPT	: +19dBm (output)

DESCRIPTION

This new transverter has been designed to allow users of existing HF band transceivers to establish a first-class transceive facility on the 144 MHz band.

The MMT144/28-R incorporates many new and exciting features which combine to make this product simply superb.

RECEIVE SECTION

An NEC GaAsFET is employed in a noise-matched configuration feeding a high level double balanced mixer via a bandpass filter. IF gain is achieved by a JFET post amplifier. This combination produces a good signal to noise ratio, excellent immunity to overload and cross modulation, resulting in a rugged receive system having a third order output intercept point of +19dBm.

Two separate low-noise oscillators, operating at 116.00 and 115.40 MHz are included, running from a regulated 8.2 volt supply. Selection of the wanted oscillator is achieved by a quad op-amp circuit, controlled by the front panel mounted 'MODE' switch. This provides simplex, repeater and reverse repeater operation. The output of each oscillator feeds a JFET buffer amplifier via the quartz crystal which acts as a filtering element to reduce amplitude noise and reciprocal mixing products. The resultant high level injection is extremely pure and free-from harmonics.

TRANSMIT SECTION

The incoming 28MHz signal, in the range ¼mW to 300mW, is initially fed to the RF VOX circuit, ALC control circuit and the input level control.

This signal is then fed into a pair of MOSFETs in a balanced mixer configuration, together with the local oscillator injection, to produce the wanted signal in the range 144-146MHz.

This signal is then amplified by several linear stages upto the specified output power of 25 watts. A visual indication of relative output power is provided by a front panel mounted LED bargraph display.

A rear panel mounted level control allows the user to adjust the sensitivity of the transverter to suit the transceiver in use, and a front panel mounted RF VOX delay control allows adjustment to suit SSB/FM modes.

The ALC circuit has a 20dB dynamic range and has been incorporated to ensure that a particularly clean signal is produced by the transverter. This is an important feature which will virtually eliminate compressed signals and the resultant problems caused to local stations.

PRICE: £215 inc. VAT (P&P £3.50)

WELCOME

HOURS:
MONDAY-FRIDAY
9-12.30, 1-5.00
E. & O.E.

MICROWAVE MODULES LTD.
Brookfield Drive, Aintree, Liverpool L9 7AN, England.
Telephone: 051-523 4011.
Telex: 628608 MICRO G.

HAM RADIO TODAY

ONLY £11.45 INC. P&P!

The most effective route yet to your Class A amateur licence!

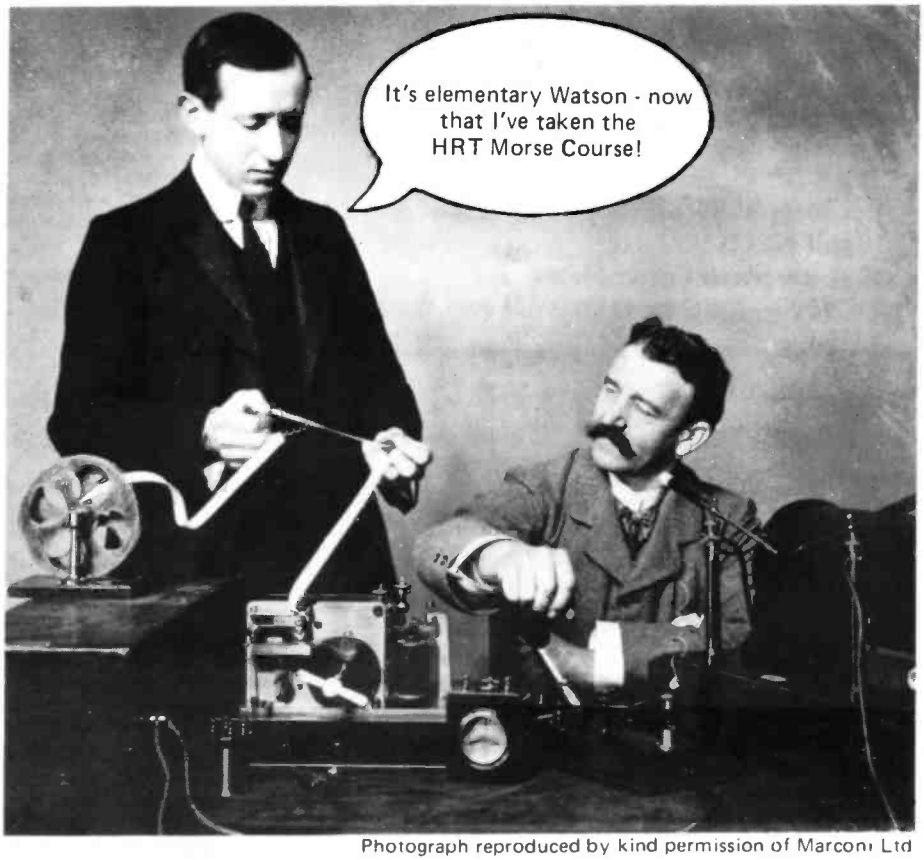
MORSE COURSE

Professionally produced for HAM RADIO TODAY by Shirley Hesketh G4HES and Ron Ray G3NCL, this advanced interactive learning system makes use of the stereo cassette format to provide tuition to the 12wpm test standard.

With its carefully designed structure, we think that the HRT MORSE COURSE is more effective than either morse classes or electronic morse generators.

Based on TWO C-60 cassettes, it offers the controlled prompting so necessary for the initial stages of morse tuition, followed by carefully paced test material to bring the student up to speed. Full tuition notes are provided with the cassettes.

To receive your MORSE COURSE simply fill in the coupon below and return it to: **'HRT MORSE COURSE', Argus Press Software, No. 1 Golden Square, London W1R 3AB.**



Photograph reproduced by kind permission of Marconi Ltd

Please send me the 'HRT Morse Course' at £11.45 all inclusive of P & P and VAT.
I enclose cheque/PO for £..... (payable to APS Ltd) OR Debit my Access/Barclaycard (delete as necessary).

Please use BLOCK CAPITALS
Name (Mr/Mrs/Miss) .....

Address .....

..... Postcode .....

Signature ..... Date .....

Please allow 21 days for delivery