Receiving Weather Satellites
A practical guide to this fast growing pastime
by Mike Christieson, G8FCD

Project to Build
Combined 2m SWR bridge
and wavemeter

Shed to Shack
Thinking of turning the garden shed into a radio room?

Meteosat view of Europe and North Africa

The Multimate keyer
Customised and programmable iambic keyer/keyboard sender/morse trainer

Win the Dewsbury Electronics 'Star Master' keyer reviewed inside...
AN HF BEST SELLER
FT757GX

- 100 Watt multimode * AM, FM, CW, SSB.
- Gen. coverage RX * Computer compatible.

THE ULTIMATE
2m/70cms MOBILE
FT2700RH

- Full duplex * A big 25 watts on VHF/UHF
- 10 channel memory * Scanning * LCD display * ' S ' meter.

NEW PRODUCTS EXCLUSIVE TO R.W.C.

RAYCOM MODULAR RF AMPLIFIERS

A complete range of linear and fm amplifiers for use with both VHF and UHF hand portables and multimode portables such as the YAESU FT900R and FT790R. Power output from 15W to 45W depending on model. Eight are available. All units feature Mitsubishi or Toshiba power modules as used in the majority of mobile and base radio transceivers. Two versions are also available for business radio applications.

ORDER CODE | VHF UNITS (144-149MHz) | PRICE
---|---|---
V15F | £39.50
V25F | £49.50
V35L | £59.50
V45F | £69.50

ORDER CODE | UHF UNITS (430-440MHz) | PRICE
---|---|---
U15L | £39.50
U25F | £49.50
U35L | £59.50
U45F | £69.50

10 Mtr MOD BOARD

PRICE £22.50

+ £1.00 post free packing. Kit now available at £17.50

This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC717 series of synthesizer chip, the unit comprises of a compact pcb with six microchips and fits almost all current legal CB radios. The unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the current upsurge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10 metre amateur band. See other ads for more information. Over 300 sold in 2 months! Complete radios available & other kits.

We also sell and service Cellular Radio, and PMR (business) radio equipment.

Tel: 021 421 8201 (24hr answerphone)
Telex: 334303 G TXAGWM

ANNOUNCING THE SUPER YAESU FT757GX MOD BOARD UNIT from Raycom

- The modification serves two major purposes
  - (1) to improve VFO tuning and eliminate ' TUNING GLITCH ' 
  - (2) to increase tuning speed from 5kHz per dial revolution to 50kHz per dial revolution (selectable on the 500kHz step switch)
- UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. Instant fitting service available. Phone now.

£1000.00 instant credit available for licensed amateurs. Details upon request. Call now!

HP/PERSOAL LOANS AVAILABLE
[written details upon request]
REGULAR COLUMNS

LETTERS ............................................. 4
RADIO TODAY special report from Dayton Hamvention, USA .. 8
MICRO’ NET ........................................ 23
RADIO TOMORROW .............................. 47

CONSTRUCTION

COMBINED SWR BRIDGE AND WAVEMETER FOR 2m. .... 18
Just got a G1 or new to 2m? This simple project is ideal for you!

THE MULTIMATE KEYER .......................... 30
Superb keyboard sender, iambic keyer and morse tutor.
Design by Mike Bedford, G4AEE.

MEET THE MICRON ............................... 40
Final alignment and operating information from G4JST and G3WPO.

FEATURES

RECEIVING WEATHER SATELLITES ..................... 12
A practical guide to this fascinating and fast growing pastime.

FROM SHED TO SHACK ............................. 26
"You too can make the garden shed into a radio room", says Trevor Butler, G6LPZ

LOOP IN A LOFT .................................. 38
No room for outside antennas and want to work HF DX? Read on!

BOOKEND ........................................ 46
Julie Darby, goes undercover to survey some of the better and more unusual frequency listings.

REVIEWS

SQUEEZE KEYER SUPREME? ......................... 22
The editor takes Dewsbury’s Star Masterkey to National Field Day.

YAESU FT270RH MINIATURE 2m FM TRANSCEIVER .... 43
Tony Bailey, G3WPO, found a new Japanese driving companion...

COMPETITION!
WIN A DEWSBURY ‘STAR MASTERKEY’ ......... 6

ADDENDUM ...................................... 11

FREE READERS ADS ............................ 51

EMPORIUM GUIDE .............................. 55

CLASSIFIED .................................... 57

NEXT MONTH IN HRT ............................ 56

ADVERTISEMENT INDEX ......................... 56

Due to lack of space, we regret that 'A Look at the BBC Outside Broadcasts' part 2 has had to be held over.
PROVIDING PCBs
Sir, firstly, I have regularly obtained your excellent magazine since its inception during 1983, and must compliment you on a compact, well written, easily understood publication, which must stand at the forefront of those available to the hobbyist today.

I have only one criticism to make relating to your magazine; unlike many of the other publications within the field of electronics, you do not offer a "Printed Circuit Board Supply Service", to enable readers to construct projects as published in your magazine.

Whilst it might be argued that the hobbyist should produce his own PCB's, this being an integral part of the hobby. There are those amongst us however, who for one reason or another, fight shy of the problem of producing the basic artwork form. on the copperclad board.

Thinking about this problem, I feel that I might have a solution. The idea is that, rather than your publication holding stocks of space and money consuming PCB's, you could however from your original artwork, via a via foil-pattern(s) as published in the various articles, produce, sheets of etch-resist rub-down transfers of the circuit. These as previously stated, produce, sheets of foil-pattern(s) as published in the world know what is really going on? What are the published 'Council Proceedings', a thoroughly vetted version of events? There has to be something fundamentally wrong when the Society has to be obsessed with secrecy. Do the members really want this secrecy, or do they want and have a right to know, what is really going on?

One member stands up and lets the world know what is really going on and most of the other Council members attack him. What was the release of information about the election of the 1985 President Joan Heathershaw...? All does not look well for the future, especially with the RSGB membership falling.

Ian Abel

As a member, I would certainly like a more open society myself. The best way of changing things is from inside - when are you going to join the society, Ian? At the moment you can just be dismissed with 'He's not even a member, we must take account of the wishes of our members first. After all, they have put their money where their mouth's are'!

CRYSTAL CLEAR?
Sir, I have built the diode detector short wave receiver as detailed in the May '85 issue of Ham Radio Today. Unfortunately, I can only pick up Radio Manchester on 1458kHz! The amplifier section works OK (after I disconnected the earth side of the 10k volume control so it would appear that the tuning circuit is at fault although it has been built according to the article. Any help would be appreciated.

Ken Murgatroyd

The problem that you are experiencing with the diode detector short wave receiver is a common problem with simpler receivers of this kind without any selectivity at RF apart from the main tuning circuit. The strength of the Radio Manchester transmitter is probably such that with no RF stage and an untuned aerial, the receiver detector cannot cope with this.

Some months ago, whilst evaluating a simple TRF shortwave receiver I suffered a similar problem, living only a few miles distant from a BBC medium wave transmitter. The inclusion of a simple L-match aerial tuning unit produced almost complete rejection of the BBC 'breakthrough'!

I would suggest that you construct an ATU of this kind and also insert a parallel tuned circuit in the aerial lead, tuned to 1458kHz. The combination of these should cure your problem and may be useful on other shortwave receivers you have. A 1000pF capacitor connected between pin 14 of the IC and earth (the right hand side of the IC was incorrectly numbered and pin 14 is shown as pin 8) may also help the situation.

Finally, regarding the volume control, this is a strange one. You could try earthing pin 7 of the LM380 and then put the earthing back on the 10k potentiometer.

BEER AND HAM?
Sir, I am very concerned about what seems to be the close association between amateur radio and drinking. So what, some will say. Persons are free to make their own choice. If only it was so simple!

There is a national problem regarding drink. To quote this week's Radio Times "HELPINES. Teenage tots. Wednesday's QED (programme) 'Another Little Drink Won't Do Us Any Harm' looks at how society accepts
excessive alcohol consumption even among the young. Professor Maynard of the Centre for Health Economics at York University has recently produced a report which suggests that there has been a marked increase in drinking since 1960 and that the cost to society of alcohol related problems is around £1.6 thousand million each year."

In fact there is freedom if you are a drinker — but not if you are a non-drinker! There are many and subtle pressures (and some which are not so subtle), to persuade people to drink alcohol. Right there in the vanguard is amateur radio.

In our ranks we have, and we encourage, young people — the very people at risk to subtle pressure. Yet where do many clubs hold their meetings? At pubs! In articles about amateur radio activities, there is inevitably the mandatory plug about pubs/drinking/boozing. In fact I often wonder where ham radio comes in. We do not have many articles from lady hams but they seem the worst of all. My mind boggles at the picture these ladies present.

Is it too much to hope that amateur radio can change the image it presents and from now on present a picture of itself as being in the forefront of moderation. I hope so, because then I could encourage my own children in the hobby.

DB Slack, G3GFE

Keeping your children away from amateur radio isn't going to stop them drinking — or drinking to excess for that matter. Ham radio clubs usually have members from a wide range of age groups and there is always someone to keep a benign, fatherly (or motherly) eye on us youngsters. Wouldn't you rather have your children having a drink for the first time — of home made beer, suitably watered down with lemonade — in the healthy and open environment of National Field Day, rather than secretly with no one else around?

Finally, you seem to have a pretty poor picture of your fellow enthusiasts, particularly those of the opposite sex. Poisonally, I never drink and neither does Julie (hic) . . .
So you think you know all about CW? Get really keyed up (drive yourself 'dotty') with this month's whacky competition for the latest 'squeeze' keyer on the market!

1. When was the inventor of the Code, Samuel Finlay Breeze Morse born?
   (a) 1791  (b) 1799  (c) 1807

2. What was the original meaning of the telegraphy abbreviation '73'?
   (d) fraternal greetings  (e) best wishes  (f) my love to you

3. The number 0 is often abbreviated in CW contests. Is the abbreviation
   (g) T  (h) M  (i) O  (j) S

4. Who was the manufacturer of the semi-automatic key that came to be referred to as a 'bug'?
   (k) McElroy  (l) Marconi Company  (m) Vibroplex

5. Squeeze keyers are often referred to as being iambic. Is this term derived from
   (n) Medicine  (o) Greek Poetry  (p) Shakespeare  (q) Samuel Morse

6. Many of today's solid state transmitters are keyed by switching a positive voltage, whereas most valve type transceivers are keyed by switching a negative voltage. The method used in the TS530, TS820, TS830 and FT101 etc is usually known as
   (r) cathode keying  (s) grid block keying  (t) screen grid keying

---

**Dewsbury 'Star Master' squeeze keyer features**

- Variable speed from 1-55 wpm with dash/dot memories.
- Automatic or semi-automatic operation. Even a 'straight' key can be used!
- Built-in sidetone with variable volume and pitch control for maximum operator comfort.
- Selectable 'positive' and 'negative' keying to suit semiconductor and valve PA rigs.
- Runs off a PP9 and is British made!

How To Enter

Look at the list of questions nearby, designed to test out your knowledge of 10m FM operation. Each question has a number of possible answers. Choose which you think are the correct answers and write them in sequence on the coupon below. For example, if you think the answer to question 1 is B and question 2 is D, your sequence will begin B,D.... IMPORTANT: write your choice of the order on the back of your envelope in addition to the coupon. Send your entry to Dewsbury 'Star Master' Competition, Ham Radio Today, No.1 Golden Square, LONDON W1R 3AB. Closing date is first post on 2nd August '85.

Complete the coupon fully and clearly — if you are the winner this will be used as a label. All correct entries will be placed in the HRT competition hat (size 14) and the winning entry drawn by the editor himself. You may enter as many times as you like, but each entry must be on an official coupon — not a copy — and sealed in a separate envelope.

The Rules

Entries will not be accepted from employees of Argus Specialist Publications, Dewsbury Electronics or Garden City Press. This restriction also applies to employees’ families and agents of the companies. The ‘How To Enter’ section forms part of the rules.
EAST LONDON'S HAM STORE

SUMMERTIME ANTENNA SPECIALS

MET—TONNA—ETC
Rotators from £49.00 — £350.00.
Poles & lashing kits.
Bearings, Cables, Towers, Preamps, Connectors etc.
Erection service available!!
And when you’ve got all that up. What about a new rig?

Full range of accessories for all makes

HOW ABOUT A HANDHELD?

FT757GX  FT726R  ICR71  TS-940S

IC02E  IC04E  TH41  TH21  MT-20  FT-209R  FT-709R  IC-2E
HP FACILITIES AVAILABLE  PROMPT MAIL ORDER  OPEN: MON - SAT 9AM - 5.30PM
Dayton USA: The World's Largest 'Hamfest'

Take the RSGB's NEC, multiply the floor area by three, add a ten acre outside flea market, multiply the number of attendees by three or four, add a multi-stream amateur radio conference programme covering everything from moonbounce to HF contesting and you will have an idea of the dimensions of the world's largest Amateur Radio gathering: the Dayton Hamvention in Ohio, USA.

The three day Dayton Hamvention attracted over 30,000 visitors from all over the US as well as overseas. Overseas amateurs planning to visit the US on business or vacation often try to time their visit to coincide with Dayton. As well as a number of European amateurs, several VKs, ZLs and JA's were seen to be wandering around Dayton this year.

Apart from the enormity, an important difference between Dayton and the NEC is that Dayton is run just by one local club - not by the national society. The Dayton Hamvention is organised and managed by a team of amateurs from the Dayton Amateur Radio Association. The ARRL, the national amateur radio society of the US, are in attendance at Dayton, but do not take part in organising it.

Flea Market

"If you can't find it at Dayton, you'll never find it" is the way the Dayton organisers describe the world's largest amateur flea market. From Collins 3051 1kW linear amplifiers to QRP components, everything and anything that a radio amateur needs can be found at the Dayton flea-market. Even with the high Dollar, there are still amazing bargains to be found and for overseas visitors the real problem is 'excess baggage' on the journey home.

The best bargains in the flea market go early. And 'early' in the US means early. The Dayton flea-market opens at 6am. Bargain hunters flock to the flea market just as the gates open soon after sunrise. The flea market is just one of the many attractions at the Dayton Hamvention.

Full Programme

Starting at noon on the Friday, Dayton runs for three days through until Sunday evening. Dayton is not only a daytime event but there is also a full programme of entertainments and activities in the evenings too.

On Saturday evenings there is a vast banquet at which several thousand amateurs, wives and friends sit down to a huge dinner and a programme of speeches and entertainment from prominent amateurs in the US. As well as the formal evening dinner, there are also a whole range of much less formal entertainment: the aptly named 'hospitality suites'.

Hospitality suites are organised by clubs and groups with specialist interests in order to receive and entertain visiting amateurs of similar dispositions. One hotel in Dayton houses the hospitality suites run by the DX and Contest clubs. Other hotels have hospitality suites for ORPers, VHFers, Amateur TV enthusiasts and many other interests. In true American style, bathtubs are filled with cans of beer and ice. 'Fisherman’s tales' of DXing are exchanged well into the early hours at all the DX Club hospitality suites.

With the flea market opening at dawn, it is not unknown for Dayton hamfesters to roll out after an all night session in the hospitality suites straight into the flea market!

Forum

The programme of lectures organised for the 'forums' is formidable. There are three days of lecture programmes covering subjects such as packet radio, AMSAT, 10 metres, contests, DX, VHF/UHF, RTTY, SSTV/ATV, amateur radio and the law, weather satellites, photovoltaic power, 2200MHz SWL, QRP, antique amateur radio, handicapped and amateur radio, repeater frequency coordination and the ARRL to mention but a few. Under each of these headings there was a full programme of lectures. At the contest forum for instance, there were about a dozen lectures in a three hour programme, covering everything from contesting on 160 metres to contesting in the USSR. Many different lecture streams are running in parallel.

Trying to attend all the lectures that are of interest; searching the flea market for that super bargain; and staying awake after the late night sessions at the hospitality suites makes Dayton not only a most memorable amateur radio event, but also an extremely tiring three days!
New Products in Brief...

- Interested in a DIY CB to 10m conversion? Roycom Ltd (Ray Withers Comms) are now offering their popular conversion PCB for CB sets with LC7137 PLL chips as a kit, with full instructions for £17.50. Further details on 021 421 8203.

- Armstrong Kirkwood Developments (AKD), well known for their VHF/UHF wavemeters also market a useful wide range of filters for both inner and outer braid of a UHF TV coax downlead and suitable for interference from HF transmissions. For stubborn cases of interference, where this occurs during operation on a particular band, tuned filters, providing a 'notch' on both inner and outer of the TV coax are available for 200(TNF20), 15(TNF15)m 10(TNF10) and 2 m. Also available, providing a 'notch' on the inner of the TV coax, is a tuned filter for 70cm(RBF1). AKD have also recently developed a new 2m preamplifier, the GPA1. The preamp will give 15dB of gain and is RF switched, capable of handling up to a maximum of 25W. John Armstrong reports excellent results on test with an FT2900 and further details of all the above are obtainable from him on 01-205-4704.

- BNOs have recently announced two very compact additions to its range of linear amplifiers. The BNOS LP144-10-50 developed a new 2m preamplifier, the GPA1. The preamp will give 15dB of gain and is RF switched, capable of handling up to a maximum of 25W. John Armstrong reports excellent results on test with an FT2900 and further details of all the above are obtainable from him on 01-205-4704.

Starting On Satellites?

We were unable to obtain both the current membership details and prices of the Orbital Prediction Calendar at the time of going to press on the recent series 'Getting Started On Amateur Satellites', Ron Broadbent, G3AAJ, Hon. Sec./Treasurer of AMSAT UK, recently supplied us with the following information.

"AMSAT-UK, the Amateur Satellite Organisation of the United Kingdom, is open for membership to any person or persons interested in the reception or transmission to the current amateur satellites. Information on membership can be obtained from Ron Broadbent G3AAJ, AMSAT-UK, LONDON E12 SEQ for the courtesy of a stamped self addressed envelope. A sample copy of Oscar News and the current copies of the Orbital Prediction Calendar can be obtained by the addition of £1.30 by cheque or postage stamps to cover publication costs. Non-members of AMSAT-UK may obtain the current orbital calendar which is produced every two months by sending £1.15 on the 1st June or 1st August, or postage stamps to cover publication costs. There is also available a publication called The Sheffield Project, a primer for newcomers to UOSAT which guides the reader gently through the problems of obtaining a receiver, an antenna system, and the collection and collation of data from our newest British satellite. This is priced at £2.75 including postage and packing."

Did You Know?

- The RSGB had a wartime magazine known as the 'Tar Bulletin'. In December 1941, a fund was started by British members to send parcels of cigarettes, tobacco and books to POWs in Germany and Italy. In the same issue there was a report concerning Denise, G2DTB, whose fiancée was imprisoned in Norway by the occupying forces. Norwegian amateurs were able to get a message to the UK by radio, to say that he was well. By the end of the war, monies raised by the Bulletin appeal totalled £1,356.199 96d.

- Dr Alex Comfort, author of the best selling book 'The Joy of Sex', is a radio amateur living in Santa Barbara, California.

- 88 was used by telegraph operators from well before the turn of the century although it never received official recognition. During the first world war, 88 was used by the US Signal Corps in unofficial communications(1) and with the cessation of hostilities, achieved 'official' status among amateur's terminology as 'love and kisses'.

AUGUST 1985
**Welsh 934 MHz Transceiver**

Uniace Telecommunications Ltd recently announced the availability of their new Uniace 400 Personal Mobile Transceiver for the 934MHz leisure band. All British made using state of the art design and surface mounted component techniques, the transceiver performance equals or exceeds the basic DTI specifications. Using micro-processor control and an integrated VCO, the frequency stability is ensured by the use of a ‘TXCO’ type reference oscillator giving a tolerance of +1-1PPM over a temperature range of 0°-60°C.

The Rx is a dual conversion superhet with IF’s at 21.4MHz and 100kHz. Selectivity is ensured by the use of ‘Gigafil’ pre-tuned cavity filters as well as the more conventional crystal filtering. Double-balanced Schottky diode mixers are used for frequency mixing. A bi-polar transistor pre-amp in the Rx front end gives low noise and excellent sensitivity, at about 0.5uV for 20dB quieting, which Uniace claim matches "any other 934MHz equipment on the British market".

On the transmit side, a VOGAD IC takes care of the audio, providing automatic speech processing. Filtering by 'Gigafil's' in the Tx line makes for a nice clean RF signal to the PA module, which gives a full 5W transmitted power.

Finally, at the present time, the Uniace 400 is supplied tuned to the 20 channels as allocated by the DTI, but provision has been made for easy conversion to 40 channels, and as when these are available. There is an Rx signal strength meter, a transmit indicator LED, and the usual LED channel number display. The supply voltage should be 13.4V at 3A and the antenna socket is a low-loss BNC type for ease of mobile installation.

The Uniace 400 is available from leading distributors or direct from Uniace Telecommunications Ltd, Unit 8 Conway Road Industrial Estate, Llandudno Junction, North Wales (0492 61 3232) for £395 inc. VAT.

**VHF-HF Okay!**

In the past, crossband operation from VHF-HF between a class 'B' amateur and a class 'A' amateur has been deemed illegal. Indeed, the editor and a G8 friend were rapped over the knuckles by the G8 editor and a G8 friend were recently a class 'A' amateur has been working a class 'B' amateur from Milton Keynes DARS QTH. Pictured L-R are Doris, G3 ZZD, G1 CKF and G1 G0F.

The Straight Key Evening/activity day on 30th May was quite a success with over 235 contacts made by G8 HRT from the Milton Keynes DARS QTH. Pictured L-R are Doris, G3 ZZD, G1 CKF and G1 G0F.

**ARE to Become AE UK – But Only In London!**

An announcement made recently by Amateur Radio Exchange and Amateur Electronics Limited confirms that Amateur Electronics Limited of Birmingham has purchased the lease and Goodwill of the shop occupied by Amateur Radio Exchange of London. Amateur Radio Exchange of London will continue to operate under the ownership of Amateur Electronics Limited of Birmingham, but both Bernie and Brenda will be available to Amateur Electronics Limited on a consultancy basis for continuity of the London business for a limited period. Customers who frequent the London shop can be assured that Amateur Electronics Limited will continue to offer the same policies adopted by the previous owners, offering good service and a friendly welcome to all callers.

This sale, of lease and Goodwill, is for the London shop only and the Northen branch of ARE will still continue under the ownership of both Bernie and Brenda as before, managed by Peter Roberts, G4 KXN, and trade as ARE Communications. Under this banner they will continue to exhibit at rallies and exhibitions throughout the UK, and both Bernie and Brenda will attend as many as possible.

**Software Saves The Day!**

Recently, radio amateurs with Technical Software's RTTY/CW transceive program may have been having problems when using the Commodore 64 home computer. Yet these only seemed to have been happening on some 64s and not others...

The problem was found to be with the computers themselves and not 'bugs' in the program. Now Technical Software have overcome the 64's inability to transmit CW and RTTY with the program, by rewriting it to avoid the computer fault. All programs now being run on 64s are capable of running correctly on all Commodore 64s.

Contact Technical Software on 0296 88 1886 for further details.

---

**The Radio Society of Great Britain awarded its annual Wortley Talbot trophy to Paul Elliot, G4 MOC, partner with his father, Frank Elliot, G4 PDZ, in Elliot Electronics in Leicester.**

Paul won the award for his work developing GB3 SKV (24cm) the first ATV repeater to come on air in the country. The trophy was presented to Paul at the AGM for the most outstanding experimental achievement during the year". He accepted the trophy on behalf of the Leicestershire Repeater Group under whose aegis the repeater was initiated and funded.
Addendum

AN RF NOISE BRIDGE FROM A-Z (June '85)

The transistors used in the bridge should have been listed as BF194 - not the BF184. Apologies from HRT and Duncan Walters.

Some readers have had difficulty in obtaining the Amidon T-50-2 toroid core. This can be obtained from Cirkit Holdings, Park Lane, Broxbourne, Herts EN10 7NQ for 87p including postage.

HALBAR AERIAL MANUFACTURER
UNIT 1 BURY WALK
BEDFORD MK41 0AQ
(0234)44720

QUALITY SATELLITE AERIALS FOR
UoSAT AND TIROS/NOAA SIGNALS

There are two versions of the I.T aerial. The I.T/u is designed to receive left-hand polarized signals from UoSAT. The I.T/tn aerial will receive right-hand polarized signals from TIROS/NOAA. State requirement on order. Supplied with mast clamp.

SAE please for further information.

PRICE COMPLETE AS ILLUSTRATED
£19.50 INCL. VAT
P&P £2.50

We produce a range of 2 metre, 70cm and 23cm aerials for the amateur bands. SAE please for lists.

AERIAL MANUFACTURER
UNIT 1 BURY WALK
BEDFORD MK41 0AQ
(0234)44720

QUALITY SATELLITE AERIALS FOR
UoSAT AND TIROS/NOAA SIGNALS

There are two versions of the I.T aerial. The I.T/u is designed to receive left-hand polarized signals from UoSAT. The I.T/tn aerial will receive right-hand polarized signals from TIROS/NOAA. State requirement on order. Supplied with mast clamp.

SAE please for further information.

PRICE COMPLETE AS ILLUSTRATED
£19.50 INCL. VAT
P&P £2.50

We produce a range of 2 metre, 70cm and 23cm aerials for the amateur bands. SAE please for lists.

ALL GOODS DESPATCHED WITHIN 24 HOURS

VHF Weather Satellite Receiver

We are proud to announce the introduction of the new Cirkit VHF Satellite Receiver.

This receiver has been designed to receive the data transmissions from NOAA series (and other) weather satellites. These satellites are constantly orbiting the earth and as they pass overhead we are able to receive 'local' pictures live. These show cloud cover, wind direction and pressure zones and are now seen regularly as part of the television weather forecast.

The Cirkit receiver has been designed specifically to receive these transmissions (not modified from a 2m receiver) and offers the following features:

★ High Sensitivity
★ Large Image rejection
★ Crystal Controlled
★ 6 Channel
★ PLL Detector
★ On Board Audio Amp

The Cirkit Kit

The receiver is built on a double-sided PCB (134 x 87mm) to give stable and repeatable results, all RF coils are pre-wound and full construction and alignment details are supplied with the kit. A complete kit of parts is supplied which includes the following: Double sided fibre glass PCB; All resistors, capacitors, semiconductors and filters; All coils, all TOKO pre-wound types; Pot, switch and sockets; Loudspeaker; Xtal for 137.5MHz; Construction and alignment details.
Receiving
WEATHER SATELLITES

Contrary to popular amateur belief there is a whole world of VHF radio outside the amateur frequency allocations. Almost everybody is aware of the broadcasting band from 88 to 100MHz and many are aware of the aircraft to experts, the weather satellites send pictures which can be appreciated by the layman (or woman!) without specialized meteorological training.

How easy is it to receive and print out these pictures? The answer is 'not as difficult as it might seem'. In the early days of weather satellites (TIROS 1 was launched 25 years ago last April) the transmission parameters were chosen to make reception as easy as possible for low cost ground stations. Since then, the basic format has remained unchanged in order to maintain compatibility with the large numbers of existing ground stations. Originally all transmissions were in analogue form; later digital transmissions were added but the low resolution analogue format was retained. It is these analogue pictures which are the easiest for the amateur to receive. They are referred to as APT (Automatic Picture Transmission) from the polar orbiting satellites and WEFAX (Weather Facsimile) from geostationary satellites. Let's take a step-by-step look at the transmission formats and the equipment required to cope with them.

Receiving the Signal

The APT signal is quite easy to receive since the transmitter power is 5W and the height only 500 miles. The bandwidth is 50kHz and so the requirements are similar to a 2 metre amateur station. For maximum reception time, ie from horizon to horizon, a small steerable directional antenna with right hand circular polarization is usually used, such as a cross yagi or a helix. If slightly less coverage is acceptable, eg 10 degrees minimum elevation, a fixed antenna firing upwards such as a turnstile (crossed dipole) or a small helix can be used. Many professional installations use fixed antennas. A low noise preamplifier should be mounted as near to the antenna as possible, which should have a noise figure better than 2dB although no worthwhile improvement will be gained by one with less than 1dB. A pre-amp using dual gate MOSFETs should be satisfactory. Due to the proximity to the aircraft and 2m band, some front end selectivity is desirable, centred on 137.5MHz.

Frequency modulation is employed with a deviation of +17kHz. This is quite wide by amateur standards and a sufficient IF bandwidth should be used in the receiver; there is at least one kit on

---

transmission between 108 and 136MHz. Few know about the space communication band of 136-138MHz. Almost any time of the day or night a casual band-scan will reveal a selection of peculiar whining and buzzing sounds, particularly between 137 and 138MHz. Many of these are digital data streams from the hundreds of satellites in various orbits around the earth. One of the strongest signals, with a quite distinctive sound, comes from the American and Russian series of weather satellites in polar orbit. From an altitude of a few hundred miles, they transmit a continuous stream of cloud pictures, used by over 1,000 stations every day.

Another series of weather satellites, located in geosynchronous orbit (ie in such an orbit that the satellites are each stationary with respect to a geographical area of the Earth) 22,000 miles above the equator, transmit pictures of a complete hemisphere on a daily broadcast schedule. These transmissions are at microwave frequencies, in the so-called 'S' band (1.55 - 5.20GHz) because of the lower background noise.

While many satellites send scientific data which is only useful

---

In the last twelve months, interest in weather satellite reception has really taken off, with the commercial availability of both micro computer assisted and 'stand alone' systems/building blocks. How easy is it to receive these pictures from space? According to Mike Christieson, G8FCD, "not as difficult as it might seem"...
Reasonably sharp satellite pictures can be obtained by using a micro with high resolution graphics as a frame store. Polar orbiting NOAA9, received on a Cirkit VHF satellite receiver, is shown above 'resolved' by a BBC 'B' micro using software by Clappison and Atkinson, available from Timestep.

The market for a suitable unit (see appendix). The exact transmission frequencies in use at present are:

**Russian Satellites:** 137.3, 137.4, 137.85MHz.

**American Satellites:** 137.5, 137.62MHz.

Any FM detector may be used but best results are obtained with a phase lock loop, particularly at low signal levels.

The analogue data is transmitted as an amplitude modulated sub-carrier of 2400Hz; ie the FM detector output is a 2400Hz sine wave, the instantaneous amplitude of which represents the brightness of the picture. The video bandwidth is about 1.1kHz so the post detection filter should have 3dB points of about 1.3kHz and 3.5kHz.

Some of the foregoing probably sounds rather technical, but do not let this put you off. As an experiment in order to wet your appetite, simply retune an ordinary FM broadcast receiver to 137.5MHz and connect a simple dipole, poked out of the nearest window or in the loft, and listen. Sometime between 1200 and 1500 or 0600 and 0900 or 1700 and 1900 (GMT) you should hear one of the satellites go over. The 2400Hz sub carrier with a 2Hz 'throb' on it should be easily recognisable.

An alternative and perhaps simpler method is to retune a 2 metre converter and listen 6.5MHz below the IF frequency for 144MHz. In fact, most converters are wide enough to hear something without retuning although the sensitivity may be poor. Remember the signal will be distorted on a receive system with a narrow band FM detector.

**S Band Reception**

The pictures from the geostationary satellites hold a particular fascination because, being geostationary (ie effectively stationary with respect to the Earth) they can provide data, and thus pictures, virtually continuously. Also, unlike the polar satellites, which transmit only the narrow strip of earth immediately below them, those in the more distant geostationary orbits transmit **global** pictures, where the Earth is seen as a disc hanging in space. The greater distance (remember, they are 22,300 miles away!) creates problems for low cost reception because, even though the transmitted power is about 80W ERP, the received signal strength is very low.

All transmissions take place near to 1700MHz, where the background noise is an order of magnitude lower than VHF. There is an advantage though; because the satellite is always at the same point in the sky, a highly directional antenna may be used without the need for tracking. Also, at this higher frequency directional and hence high gain antennas are of manageable proportions. Another advantage of geostationary satellites is that they are transmitting almost continuously and test and line-up problems are this considerably eased. The European satellite operates on two frequencies, 1691.0MHz and 1694.5MHz.

The commonest form of antenna is the front fed parabolic dish. How big the dish needs to be depends on the quality of the preamplifier which of course must be located at the antenna or very close to it. Using a good gallium arsenide (GaAs) FET amplifier with a noise figure of less than 1.5dB, excellent reception is possible using a 1 metre dish. If a 2 metre dish is available, a very inexpensive preamplifier may be used.

After amplification, the most...
practical thing to do is convert the signal to a lower frequency. The first IF needs to be in the VHF band and 137MHz is often chosen so the converter output may plug directly into an existing APT receiver. The format of the signal is very similar to APT (the frequency deviation is 9kHz) and so the same IF amplifier and detector may be used. There have been many designs for preamplifiers and converters published and there are several reasonably low cost commercial units designed for amateur use (again, see appendix). The techniques are closely allied to those used on 1296MHz, the 23cm amateur band.

**Subcarrier Demodulation and Picture Printing**

Once a suitable antenna and receiving system is working, the problem arises how to convert this amplitude modulated 2400Hz tone into pictures. The APT signal has a line rate of 2 lines per second, each line consisting of infra-red for half a line and visible for half a line. The transmission from the spacecraft is continuous (even though an individual station will only pick it up for a short time) and line sync information is included on every line. It is normal however to use it only once, when acquiring the signal. The exact format is shown in Fig. 2. The WEFAX signal is slightly different because each image is separate; they therefore have a start and finish and contain only either visible or infra-red data. The WEFAX format is also shown in Fig. 2. The line rate is 4 per second.

Up to a few years ago, the conventional method for display was a facsimile recorder using either photographic or chemical paper. These machines can still be obtained on the second-hand market and provide an easy method for printing high quality images. Some were specifically designed for satellite use and contain the subcarrier demodulator, sync, and start/stop detection. Many only contain the demodulator and a number were designed for other purposes like 'wire-photo' (ie a photograph transmitted by radio, often used by newspapers) and have different characteristics such as line rate, line scan direction and index of cooperation. (IOC is a measure of aspect ratio). The mechanical modification of a facsimile recorder is not easy and often beyond an amateur without machine-shop facilities. The running costs can also be appreciable, particularly for those which use photographic paper. Even the electrochemical ones, which use wet paper, cost about 15p per picture to run. Nevertheless, this type of display...
Still provides the cheapest method for hard-copy.

Now that semiconductor memory is relatively inexpensive, digitising the signal and storing it in a 'frame store' is becoming very popular, both in the amateur field and commercially. One ready made source of frame stores is those microcomputers with reasonably high resolution graphics. The minimum resolution for commercial grade picture is 256 pixels by 256 lines and 16 grey levels (4-bit storage). This is not normally obtainable on a microcomputer and so special frame stores are often built. However, many amateurs have obtained quite acceptable results using computers such as the BBC model 'B'. Of course special software has to be written, some of it in assembler (a program which translates assembly language into machine code) in order to operate fast enough, and a number of schemes for this have been published. The interface between the receiver and computer is quite important and can mean the difference between very poor and acceptable results.

There is at least one way of combining sub-carrier detection and digitization in one circuit, but the most straightforward method is to amplitude demodulate the sub-carrier first. Since the sub-carrier frequency, 2400Hz, and the maximum video bandwidth, 1.1kHz, are quite close, a simple half wave rectifier and filter is unsuitable. Full wave rectification or synchronous demodulation is required, followed by a multipole post detection filter. The resulting video has a bandwidth from 0 to 1.1kHz. It may then be digitised at a rate chosen by the user, although clearly a rate above about 3kHz is fairly pointless. The number of bits is again up to the user; commercial systems have up to 8 bits but it depends on the number of grey levels that can be stored or displayed.

As many of the microcomputers have colour displays, a careful choice of colour representation each grey level must be made or the resulting image will be very difficult to recognise.

**Sync Detection**

Software sync. detection has

---

**Sources of commercial weather satellite reception equipment**

*Microwave Modules Their MMS1690 'Meteoset' receiver system is the Rolls Royce of the bunch. The complete system is intended for very high quality 'Meteosat' (S band) reception. A 32 segment antenna with phased array reflector (£270) feeds a GaAsFET pre-amplifier with a noise figure of 1.2dB, which in turn feeds a 'S band' to VHF satellite band (APT) converter (£126). This feeds a 137MHz 6 channel (£345) which, with an appropriate aerial could also be used to receive the APT satellites. The signal is then treated by a combined scan converter/digital frame store, offering colour and monochrome outputs and very high resolution of 256 lines, each of 256 pixels, obtained with 84 grey levels (£859). The complete system works out at £1738 plus VAT. Further details on 051 523 4011.

*Timestep Electronics Intended for the APT format polar satellites (NOAA-6 and NOAA-9). Timestep also supply a complete package which is based around a BBC 'B' computer. Jaybeam have apparently been "commissioned to make a special aerial" for Timestep (£34.50) and this feeds a pre-amp (£10.95 built) which feed a 137MHz receiver with a claimed performance of 0.5uV for 12dB SINAD (£52.95 boxed). An interface, containing several switchable op-amp filters and giving claimed enhanced pictures from weak signals (£88.50), feeds the signal to the BBC 'B', also allowing low frequency FAX data to be demodulated. An E-PROM program (£37.50) fitted to the BBC 'B', written by Peter Clappison and Mathew Atkinson, allows the signal to be resolved as a monochrome picture with 320x 256 pixels and 4 grey levels (white, light grey, dark grey and black). To quote a recent article on this, "while the resolution is reasonable, the grey scale is somewhat restricted". In costing this system, you must take into account (obviously) that a BBC 'B' computer and a monitor is also needed. Much of the above is also available in kit form. Further details on 0440 820040.

*Cirkit Holdings Currently in the process of launching a system for the APT format polar satellites. A 6 channel crystal controlled receiver kit (£37.50) offering a claimed 0.4uV for 12dB SINAD is currently available (£48.90) and their popular 2m pre-amp can be simply returned for 137.9Mhz.

Muirhead FAX machines can sometimes be found in surplus stores or at rallies, and can often be used to display polar and geostationary satellite pictures after some modifications; although no source of these could be found as we went to press.
been used quite successfully but the preferred method is an op-amp tuned circuit to pick off the tone bursts on the side of the APT data. The start and stop tones may also be detected by analogue means and the edge of the WEFAX data located from the phasing period. These signals, after conversion to logic levels, can be applied to the computer via another port.

In the initial stages of building a station it is possible to operate without automatic sync, the operator standing by to centre the picture.

**Satellite Orbits and Pictures**

The two types of orbit are shown in the diagram. Since the APT pictures are taken from relatively near to the ground, little processing is required before they reach individual users and in fact these images are transmitted in near real-time. Let me explain further. As the satellite passes over the ground, it scans the earth at right angles to its track and sends the picture line by line. By the time it has completed one orbit, about 102 minutes, the earth has turned and the satellite scans an adjacent strip. 12 hours later, it again passes over the station, this time in the opposite direction. The American satellites have their orbits arranged so they keep a constant angle to the 'sun' so overhead passes occur at roughly the same time every day. There are normally two satellites covering each station with their orbit planes set 90 degrees apart, hence local coverage is every six hours. There are no geographical reference points on the pictures from the polar satellites.

From their distant position, the geostationary satellites take pictures that require considerable processing before they are useful. It is not sensible to put this on board the satellites and so they transmit the 'raw' images to a main ground station. Here processing takes place. The processed images are then relayed to users via the same satellite, using on-board transponding facilities. One particularly useful feature is the addition of coastal outlines and latitude/longitude marks, both which make picture identification very easy.

Of course, one geostationary satellite only sees one side of the earth so there have to be several for global coverage. The satellite available in Europe is Meteosat located at 0° longitude. There are normally two over the USA, called GOES-east (75°W) and GOES-west (135°W). The Japanese operate one at 140°E which has slightly different characteristics. A Russian satellite will shortly be operating at 70°E.

**Locating Geostationary Satellites**

A number of software programs have been written for this but for the UK, Meteosat is almost due south at about 30° elevation above the horizon. GOES east is 'visible' from the western Britain but the elevation is only a degree or so. Once a receiver is working, the simplest method is to swing the antenna around by degrees until the signal is heard.

**Tracking Polar Satellites**

The polar satellites at present in orbit are NOAA-9 (south to north during the afternoon, 137.62MHz) and NOAA-6 (south to north during the evening and north to south during the morning, 137.5MHz). The orbit is very similar to some of the OSCAR satellites with approximate parameters as shown in Table 1.

Many of the programs written for the OSCAR series will work with the NOAA series with suitable modifications.

The reception of weather satellites is a fascinating facet of radio and can provide the enthusiastic with years of experimental fun, of gradually refining a satellite picture from almost unrecognisable smudges to images better than many commercial ones. Do not be daunted by the apparent complexity of the operation, a step-by-step procedure will yield very rewarding results.

<table>
<thead>
<tr>
<th>List of Useful Publications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Data Extraction and Calibration of the TIROS/NOAA Radiometers (NESS-107) (published by NOAA).</td>
</tr>
<tr>
<td>Meteosat WEFAX (published by ESA).</td>
</tr>
<tr>
<td>Meteosat Schedule (published periodically by ESA).</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>List of Useful Addresses</th>
</tr>
</thead>
<tbody>
<tr>
<td>NOAA (National Oceanic and Atmospheric Administration) Satellite Program Specialist NOAA/NESDIS E/ER2 Room 3306 FB4 Washington DC 20233 USA</td>
</tr>
<tr>
<td>ESA (European Space Agency) European Space Operation Centre MDMD Robert-Bosch-Strasse 5 D-61100 Darmstadt West Germany</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Table 1 Parameters of Polar Satellites</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
<tr>
<td>period</td>
</tr>
<tr>
<td>inclination</td>
</tr>
<tr>
<td>height</td>
</tr>
<tr>
<td>typical pass duration</td>
</tr>
</tbody>
</table>
UoSAT 2 SATELLITE

At last everything you need to receive and display UoSAT 2 data on your BBC computer. Our custom designed software is the first on the open market to decode the data and display it in an easily understood format on the screen. Each channel is identified and labelled with a full description. Using an inbuilt printer dump routine eliminates the need for a printer rom. Written by Tony Ferneyhough this new improved software is rapidly becoming the standard for schools and enthusiasts. A review of the previous version is featured in May R&EW.

Proving our ability to lead the forefronts of RF Technology we have already sold over 2,000 of the receivers and pre amps that this system is based on. Tracking of the aerial and receiver is not needed for any of the satellite passes. For the ultimate the optional data correlator designed by James Miller can be used. Using advanced correlation detection techniques and a matched filter this unit provides stable data under most signal conditions. The correlator is suitable for both UoSAT 1 and 2.

For satellites in education talk to the experts, Timestep Electronics.

Aerial .................................................. £18.50
Aerial cable ........................................... 20p metre
Pre amp kit ........................................... £4.95
Built module ......................................... £10.95
Receiver (MK2) kit .................................. £37.50
Built module ......................................... £48.50
Software on disc ..................................... £12.95
Data correlator kit ................................... £42.00
Built module ......................................... £56.50
Receiver and correlator built and boxed .......... £138.50
Full data .............................................. 35p

All prices include VAT and postage and packing.
Allow up to 28 days for delivery.

Timestep Electronics Ltd Wickhambrook Newmarket Suffolk CB8 8QA
Tel 0440 820040 Telex 817015 TIMEST G

WEATHER SATELLITES

We are able to supply the complete weather satellite reception package. Everything you need has been designed around the superb new ROM from Peter Clappison and Mathew Atkinson. We have commissioned Jaybeam to make a special aerial for us that doesn’t need to be moved or turned when it is used with our pre-amp and receiver, it gives good predictable pictures. Our receiver will give 12dB SINAD with only 0.15µV which is considerably better than any of our competitors. The interface unit has several switchable op-amp filters giving enhanced pictures from weak signals and also allows low frequency FAX data to be demodulated. The BBC EPROM has been designed to be used with our interface and will also decode the HF and VLF data from our interface.

Aerial £34.50 Interface Kit £39.50
Pre-amp Kit £4.95 Built £58.00
Built £10.95 Boxed £88.50
Receiver Kit £37.50 Software Eprom £37.50
Built £48.50 Full data £0.50
Boxed £79.95

UoSAT systems send SAE

TIMESTEP ELECTRONICS LTD
Wickhambrook, Newmarket, Suffolk CB8 8QA
Tel: 0440 820040 Telex: 817015 TIMEST-G
For the newly licensed class 'B' amateur, the two most useful pieces of ancillary equipment are an SWR bridge and an absorption wavemeter. Tony Smith, G4FAI, shows how to build a simple combined unit to provide both personal satisfaction and good performance.

The amateur radio licence requires that “Equipment shall be provided capable of verifying that the sending apparatus comprised in the Station is operating with emissions within the authorised frequency bands”. This includes the ability to detect any emissions outside the bands. A simple device which will perform both functions is the absorption wavemeter, provided, as stated in the notes attached to the licence, the frequency coverage of this extends to at least the second harmonic of the radiated frequency.

An SWR bridge is often left connected in the antenna feeder line of an amateur station and a wavemeter could conveniently be incorporated in the same unit. This would enable regular tests for the radiation of harmonics and other spurious emissions to be made without any special setting up of equipment. Often absorption wavemeters tend to spend their time in cupboards and out of sight is out of mind. Both circuits have appeared in various versions over the years, and the novelty of this article is merely in the way they are brought together.

**SWR bridge.** This is the well known “Monimatch”, a simply constructed circuit which samples RF from a feeder to provide a relative indication of forward and reflected power. The sampling line is terminated by a resistor, R1, of approximately the same impedance as the transmission line, at one end, and by a diode, D1, at the other. Rectified current from the diode activates the meter from which readings are taken. A switch, SW1, effectively reverses the positions of resistor and diode on the sampling line, permitting either forward or reflected SWR readings to be made.

**Absorption wavemeter.** This consists of a calibrated tuned circuit loosely coupled to the sampling line of the SWR bridge. The circuit absorbs power from the line when it is tuned to the same frequency at that passing through the coaxial feeder line hence the name. SW2 routes the power absorbed to the meter of the SWR bridge, via
the diode, and maximum deflection of the meter indicates the point of resonance of the tuned circuit coinciding with the frequency of the RF power sampled.

This type of instrument is not especially accurate for frequency measurement, but fulfills the licence requirement by registering the presence of either wanted or unwanted emissions at approximate frequencies sufficient to indicate the need, or otherwise, for further investigations. The device has the advantage that it responds only to the frequency of the RF energy to which it is tuned, not to the frequency of the circuit in which the energy is present, and not to any other harmonic frequency, until it is tuned to that harmonic.

This version tunes from approximately 110 to 300 MHz, and covers the second harmonic of the highest frequency in the 144 MHz band (2 x 146 MHz) ie 292 MHz.

**Construction**

The heart of the unit is the sampling line, which comprises two lengths of single strand plastic covered wire, such as telephone type wire, threaded between the braid and the dielectric of a short length of coaxial cable of the same impedance as the main station feeder.

A 180mm length of outer covering is stripped away, care being taken not to cut the braid. Three holes are made and enlarged in the braid, one at each end of the stripped section and one in the centre of this, again without cutting the strands. By careful bunching of the braid it is now possible to insert one of the wires at each end of the stripped section, both to emerge through the centre holes. The braid is then smoothed back to its original length.

The single turn radiating coil, L2, for the wavemeter has no specific dimensions, and is constructed so that it runs parallel to the tuned coil, L1, linked to it, depending on the position of SW1 and L2, (at centre) the link coil, is mounted on the back of SW1 and above and parallel to the tuning coil, L1.

**Calibration**

**SWR.** This type of bridge does not provide a highly accurate measurement of standing wave ratio. It does however provide sufficient accuracy to enable the effect of small adjustments to an antenna to be monitored adequately. The actual calibration of the meter in SWR can be simply and conveniently obtained. For instance, if the meter scale is already marked in tenths of full scale deflection, as are the majority of meters, these markings can be converted to SWR by use of the formula:

$$F + R/F - R$$

where $F = 100\%$ full scale, and $R =$ the % intermediate point to be calibrated.

eg for 10% deflection $= 100 + 10$ SWR approx. $= 1.2 : 1$.

Similarly, $30\% = 1.85 : 1$, and $50\% = 3 : 1$.

An adequate scale would markings at $1.2 (10\%); 1.5 (20\%); 2.0 (33\%); and 3.0 (50\%).

**Wavemeter.** Calibration is made initially with the instrument in-line between the transmitter and the antenna (or dummy load). A low power transmission of RF at
approximately 145 MHz should cause the meter to register when the tuning capacitor, VC1, is rotated, and the front panel of the instrument should be marked with the position of VC1 when maximum meter deflection is obtained.

Provided the transmitter has no unwanted spurii, rotation clockwise from this point may produce one further, very small, deflection of the meter, representing the second harmonic of the transmitted frequency, which can also be marked on the panel.

An alternative method of calibration is to use a friend's grid-dip oscillator. With the cover of the dual unit removed, the coil of the GDO is placed close to the tuned coil of the wavemeter. Set the GDO, in the oscillator mode, to the calibration frequency required, and then tune the wavemeter for maximum deflection as before. This method will, of course, enable intermediate frequencies to be calibrated apart from the fundamental and its second harmonic.

Operation

The unit can now be left permanently in-line. The coaxial cable connecting the transmitter to the instrument should be one or more multiples of half-wavelength at the most commonly used frequency, taking into account the velocity factor of the cable used. This ensures that the bridge "sees", as near as possible, the same electrical conditions as that at the transmitter output socket.

SW2 selects SWR or wavemeter operation. When using the SWR bridge, VC1 should be detuned from the frequency of the transmission to avoid upsetting the balance of the bridge.

SW1 selects SWR FORWARD or REFLECTED readings and, initially, in the FORWARD mode, the sensitivity control, VR1, should be adjusted for meter FSD. Reversal of SW1 then indicates SWR. This should not normally exceed 3:1, and ideally should be less than 1.5:1.

When using the wavemeter, SW1 should be in the FORWARD position to provide best sensitivity. Spurious frequencies, or an unusually high second harmonic can easily be detected by rotating VC1 and observing the meter — and appropriate steps then taken to correct the malfunction! Every time the wavemeter is used, an entry can be made in the station log book as required by the licence regulations. As shown, the unit works well with powers of up to about 30 watts.

Construction shown from above.

COMPONENTS LISTING

Resistors
R1 47Ω, 0.5W
VR1 10k lin.

Capacitors
C1 500pF, Polystyrene
VC1 50pF, eg, Jackson CB04

Semiconductor
D1 0A91 or similar, germanium

Inductors
L1,2 see text

Aluminium box, (Maplin A813) 6·4 x 2-5";
Ferrite beads (2) FX1115, Double-Pole
Switch, Min. Toggle; Single-Pole Switch,
Min. Toggle; Milliammeter, 1 mA; RF
sockets (2) of choice, eg. SO-239, BNC.
Knobs (2), for VR1, VC1; Rubber feet (4), to
choice; Tinned copper wire, 18 swg; Solder
tags; C/sunk self-tap screws.

please mention HRT when replying to advertisements. 73 G4 NXV AUGUST 1985
HAM RADIO TODAY AUGUST 1985 Please mention HRT when replying to advertisements. 24NXV.

**BUILD YOURSELF A MICRON TRANSCEIVER AT A PRICE YOU CAN AFFORD**

£241 FOR 6 BANDS/INTERNAL ATU/DIGITAL DISPLAY AND CASE

OUR LATEST TRANSCEIVER KIT setting new standards in QRP performance. The MICRON is a 6 band CW only 8/10W output rig covering 80,40,30,20,15 & 10 metres (bottom 200kHz of each). A 0.25μV sensitivity receiver with AGC, 5 Meter, very stable VFO with IRT, 1W AF o/p to speaker and 3 position LC filter + selective attenuator. Silent solid-state Rx/Tx switching with fast semi-break-in + sidetone. Fully variable RF power o/p + optional SWR metering. + 12V required.

PLUS fully finished smart CUSTOM CASE and hardware with UNIQUE facility for optional internal TRANSMATCH ATU and Full Frequency DIGITAL DISPLAY. The MICRON uses a high grade solder masked screen printed pcb with comprehensive instructions using a step-by-step assembly manual designed for the relative newcomer. Mostly prewound coils and minimal test equipment needed for alignment.

**EXPO A PLEASURE!**

Why not join the ranks of satisfied customers building our Projects? All of our kits come with copious instructions, all components, pcb, wire, etc, and many are designed for beginners. Our Products are used world wide and can help YOU get on the air. KITS sent in 7-10 days but please allow up to 28 days for popular items. All prices include VAT and Post. OVERSEAS - Europe use UK prices.

**10 Willow Green, Graham Park Estate, London, NW9. Tel: 01-205 4704**

**NEW!** The MICRON MATCH ATU Kit, developed from the MICRON ATU, with its own case, connectors, etc. Suitable for SWL, or QRP (15W) from 1.8 -30Mhz. With air spaced capacitors for only £39.95 inc.

**2M FM UNDER £70?**

**2MTR PRE-AMP**

18dB gain. Fail safe circuit. Min. 25 watts through power. Both products carry a 2 year no quibble guarantee. Also available from MOST LEADING AMATEUR RADIO DEALERS.

**AKD Armstrong Kinkirk Developments**

VHF/UHF ABSORPTION WAVEMETER

Covers 120-450 MHz. Extremely sensitive. Low profile. Requires PP3 battery. Only £24.95

**2MTR PRE-AMP**

18dB of gain. Fail safe circuit.

Min. 25 watts through power.

30239 connectors

Only £24.95

Both products carry a 2 year no quibble guarantee.

ALSO AVAILABLE FROM MOST LEADING AMATEUR RADIO DEALERS.

**WPO COMMUNICATIONS**

**BECOME A RADIO AMATEUR**

Train now for the Radio Amateur Licence examination. No previous knowledge needed, only a few hours per week of home study for 3 to 6 months. Post coupon now for details or tel. 0X1 867 2542. 24 hr service)

British National Radio & Electronics School P.O. Box 7, Teignmouth, Devon, TQ14 OHS

**FREE brochure without obligation from:-**

British National Radio & Electronics School P.O. Box 7, TEIGNMOUTH, DEVON, TQ14 OHS

Name

Address

**TONNA**

**THE NAME FOR WAVEMETERS, PRE-AMPS AND RF FILTERS**

2MTR PRE-AMP

18dB of gain. Fail safe circuit.

Min. 25 watts through power.

30239 connectors

Only £24.95

Both products carry a 2 year no quibble guarantee.

ALSO AVAILABLE FROM MOST LEADING AMATEUR RADIO DEALERS.

**AMATEUR ELECTRONICS UK**

**TONNA**

A professional service to amateurs and S.W.L.s from the East Midlands Emporium.

Stockists for: Yaeuu, Tokyo lines, Sun antennas, Hi Mount Keys, RSGB books, Tokyo Power/SWR meter.

Specialist components for the radio amateur. Xfil filters, capacitors etc. Send for FREE list.

Cellular and PMR sales and service. Vodafone authorised dealer.

Answer phone sales for the business and private user. B.T. approved phone sales. 27 and 934 CB equipment.

Full after sales service/ workshops.

P.X. your equipment.

Retail shop now open. 9.30-5.30 Mon-Sat. ½ day Wed.

151a Bilton Rd., Rugby CV22 7AJ. Tel: (0788) 764704

**GENERAL COVERAGE RECEIVER KIT FCR 130**

Model FCR 130 Receiver kit

For Constructors and SWLs

- 30.1 Stepped analogue tuning
- 3 Band switch with spare position
- Tape record socket
- Headphone socket
- Signal Meter
- Internal Speaker + On/Off sw.
- A.F. Gain and Tone Control
- C.W. A.M. SSB.

This is a kit designed as an introduction to the hobby of Radio and Short Wave Listening. It has been designed with beginners in mind and does not require any test equipment to align. It comes complete with easy to understand instructions and notes. The pleasure does not finish with the building as there are many hours of enjoyment using it afterwards. Ideal for those who want to stay to the basics of radio and have something to actually use afterwards. Enter the world of SWLs and listen to the WORLD "New York Weather", "Tokyo Power" and many others - including to one of our customers... ZK2RS hive Island, Pacific Ocean. Send for details.

**COMMUTECH (Devon) LTD**

12 Edgcombe Way, St. Ann's Chapel, Gummedlake, Cornwall PL18 9HJ

Tel: (0577) 627279

**HAM RADIO TODAY AUGUST 1985 Please mention HRT when replying to advertisements. 24NXV.**

**UK DESIGN AND MANUFACTURE**

**20 FARNHAM AVENUE, HASSOCKS, SUSSEX BN6 8NS**

MAIL ORDER ONLY

24hr Anaphone 07918 6149
The first thing I should say about this article is that it is a users review, rather than the opinions of one person. National Field Day at the West Kent Amateur Radio Society is a time of reunion and a social occasion par excellence, in addition to it being the CW contest event of the year. Consequently there is quite a high attendance, many people coming from considerable distances, all keen to try their fist, even though some may not have been on the air in the previous twelve months. This latter is quite difficult to say that the operator's are not skilled — their pedigree on the contrary is long and most distinguished — but, because of where they are currently living or working, regular operation is impossible.

The result of this situation is when these people (myself included) are confronted with National Field Day, their latent CW tendencies rise violently to the surface and they become positively enthusiastic (manic?) and very critical. Any equipment that is thought to be below par is torn off the operating bench and (almost) thrown aside, regardless of the feelings of the owner.

**Technicalities**

Circuit information is limited. The keyer comes complete with four sided leaflet, giving fairly comprehensive operating instructions but no circuit diagram. A look inside the unit revealed a total of seven ICs and seven transistors, the former being CMOS Motorola 1400 series — 14001, 14011, 14025, 14015 and 14071. No relays of any kind are used in the keyer, the switching being entirely 'solid state'.

The unit is designed to run from 9-18V; either a PP6 battery may be mounted internally or powered externally via a miniature jack plug, supplied with the unit. Sidetone is provided by the keyer, variable in both level and pitch on the front panel, and a miniature speaker is mounted at the rear of the unit, although a socket is also provided for an external speaker. There are three basic controls for the actual keyer; two potentiometers, one controlling 'speed' — very slow up to about 55 wpm — and the other, 'weight', or the dot-to-dash ratio of the unit. This is fixed at 3:1 in the majority of keyers. Having a facility of this kind is not essential but does allow the operator to adjust the ratio to their own taste.

A miniature 3 position toggle switch selects either 'automatic' (lambic/el bug), or 'semi automatic' (sidewiper bug) or 'tune' (short circuit) at the keyer output. The keyer may also be used with a straight key for keying relatively high current sources.

An external paddle is needed with the keyer.

**In The Arena**

On arrival at the NFD site, a space was first cleared for the keyer among the debris and other keyers (two pump handles, one 'el-bug' and one lambic) and the keyer plugged into the rig for the first session. Confusion initially resulted when I tried to plug the Hi-Mound paddle into the external speaker socket at the rear of the unit. Some labelling on the back panel in the form of small sticky pads would have helped here, especially as the only thing not labelled on the front panel is the paddle socket. Yes, it does tell you all this in the leaflet.

The unit was powered up via a small power unit (batteries are not a good idea in contests for obvious reasons) and away we went — or so I thought. The keyer was making all the right noises but the transmitter, an old FT101ZD with valve PAs, was not being keyed.

The keyer was designed for both 'positive' and 'negative' keying — ie the solid state switching will key either positive or negative voltages — to suit both solid state or valve type PA rigs, such as the FT101 series etc. Having valve PAs and 'grid block' type keying, negative keying was needed and the keyer was currently set to positive. A removal of the keyer lid and the repositioning of a small 'spade' terminal quickly corrected this.

**Conclusions**

The silence of the keying was appreciated by a number of operators, particularly myself. Many older type keyers with relays produce quite loud clicking, which can grate on the nerves after hours of contest operation. The sidetone is loud and clear, although slightly 'belchty' at some settings of the pitch control, and could be heard above all the constant din in the tent ("Where's that * * * check log!", "How's old Bill, haven't seen him for ages"... etc). The ability to change the pitch of the sidetone to suit your own personal preference also eased operator fatigue.

Comments on the keyer ranged from "How much is that, I think I'm going to buy one", through "the weighting facility is a good idea but adjustment is rather sharp" to "so this is an iambic key" (from an old straight key diehard). The keyer survived the contest without a hiccup and was used by all the squeeze/el-bug operators present, without being put aside once in preference to their own personal keyers.

The Dewsbury Star Masterkey costs £49.95 plus £3.00 pp and is available from Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands. See the competition in this issue if you would like to win one!
Now that summer is/should be (delete as applicable!) more or less upon us, quite a few of the more recently active radiophiles will be experiencing a rather odd phenomenon which was not touched upon in the RAE syllabus. Characterising the summer months, this can be seen as a polar opposite to 'anomalous propagation' (where signals are heard when they shouldn’t be). The appearance of the sun for any reasonable length of time results in signals which should be able to be heard being notable by their absence. I suppose you could call it ‘anonymous propagation’ or ‘operator QSB’! The fact is that ham activity often fades away as summer holidays, gardening and decorating take their tragic toll of the amateur community. Now I’m not going to try and persuade errant operators to get back to the rig and start taking advantage of the gradually improving conditions on the HF bands as we climb out of the sunspot minimum— but I am going to try and prise some information out of microphiles which may be useful to others once being indoors is a more attractive proposition than being outdoors.

Put Yourself On Our List!

A number of specialist micro-radio groups have had a lot of success with putting together lists of those who are interested in the various forms of data comms, and indeed they have kindly allowed Ham Radio Today to reproduce these from time to time in the past. If you happen to be a member of one of these groups there is a good chance that you can find someone with common interests not too far away, but if you are new to ham radio or experimenting with micros and radio for the first time, then there are quite a few problems facing you. How do you go about trying to find out who, if anyone, is ‘into’ data comms in your area; and having done that, there is the question of knowing which systems and which bands are likely to be used by them?

To try and help like-minded operators get in touch with one another (and based upon the fact that any good idea is worth copying!) Micro’Net is launching its own list of people who are interested in data communications and which, with a bit of luck, will be ready in time for the mass exodus back to the radio at the first hint of winter.

The general idea is that we are asking all operators who are active in this area or who would like to be active but cannot find a compatible station to work with, to send us a card showing details of their station and its facilities. Once we have a reasonable number of stations registered, we can then put together a list which will show, on a county-by-county basis, the callsigns of ‘data stations’, the types of data they are able to handle and the bands which they use. By doing this, we can not only get local contacts going (after all, it’s not too difficult to drop subtle hints like “Anywun wanna data QSO” through a local repeater) but perhaps encourage people further afield to get in on the act. Depending on the size of the list compiled, this will either be published or available from the editorial offices on receipt of an SAE.

What we would like you to do is fill out a post-card or a QSL card using Fig. 1 as a guide and include the following information:

1) Your Callsign
2) Your County
3) The band you use for data, ie 14MHz, 144MHz or 432MHz
4) The data system you use:
   a) Amtext
   ii) Amtor
   iii) AX.25 Packet system
   iv) Basicode
   v) Cambridge Packet
   vi) RTTY
   vii) Others

But please, please, please don’t send it to the editorial offices in London, instead send it to:

Micro’Net
PO Box 49
COLCHESTER
Essex

Naturally, if you are a short-wave listener with an interest in data,
then we are keen to hear from you, too. Include your BRS No. if you have one and give us the name of your town so that experimenters can get an idea of whether or not their test transmissions are likely to be intercepted by you or others.

I know that there are a number of local clubs springing up which are specifically aimed at data comms enthusiasts. If club secretaries would like to get in touch (as one or two already have) then we can also put their names (and maybe even the numbers) on the register and also get the clubs a little publicity through a mention in Micro'Net. The list should help newcomers to assess which data system is the most popular in their area and also help us to put together a picture of what is happening data comms wise over the country.

**Around The Pubs and Clubs**

Before we leave the subject of lists and clubs, I would like to briefly mention a letter which I've received from Trevor Tugwell, Secretary to the newly formed 'AMRAC' club in Fareham, Hants. AMRAC aims to encourage the use of computers in radio and although a remarkable 19 out of 22 youngsters present at a recent meeting were BBC Micro users, the club intends to cater for all makes of machine. Data communications activity seems to centre around a program written by club member Mark Johnson, G4ZRT, at the moment, and 'activity' seems to be the key word here. Since the club was formed, the data frequency of 144.675 has become so crowded that 144.525 and 144.550 have had to be used so as to accommodate everybody. Who says data will never catch on!

At the moment the club meets bi-monthly and will be going over to a monthly schedule in the autumn; the venue is the Crown Public House, Bishops Waltham, Hants and further details can be obtained from Trevor at the address shown nearby.

**Smoothing Micro Inputs**

Regular readers of Micro'Net will know that I have previously referred to the problem of square-wave audio inputs to transceivers and the resultant interference risk caused by the inherently high harmonic content of a square wave signal. Up until recently, I had been led to believe that I was one of the lucky ones in so far as the BBC Micro allegedly put out a sine wave from its cassette port. I decided to take a look and see how it was done.

First of all, I decided to take a look at the output from the special ULA chip which takes care of cassette interfacing on the Beeb. Fig. 2a shows the resulting trace (taken from IC7, pin 27 if you want to try it yourself) and Fig. 2b illustrates the same waveform after it has been passed through a shaping network. As you can see, the wave-shape is far from sinusoidal to start off with and, even after shaping, there are quite a few unpleasant 'corners' still remaining. To be fair, I should say that Fig.2B was traced when there was no cassette recorder connected. However, as there is no guarantee that the micro will always see a perfect load, it is clear that a filter or shaper is needed for radio work, even if a certain amount of shaping is done inside the computer itself.

A solution to this problem was finally found on page 10.11 of the *Radio Communication Handbook* and takes the form of a very simple two-transistor circuit which is reproduced in Fig. 3.

Any square wave, or other waveform possessing the sharp edge-transitions which are characteristic of harmonically rich signals, can be fed into the circuit and emerge with these features removed, ready for feeding to a transceiver. The circuit itself is so simple that it would seem to be a worthwhile exercise just to knock one together for use as a form of 'insurance' — at least that way, regardless of whatever may go wrong 'upwind' of the device, you'll know that indescribable nasties will not be emanating from your PA stage!

**That's All Folks!**

That about rounds it up for this month, Micro' Net will be back again next month with something very special for HF aficionados in the shape of a 'grey line' prediction program and guide which will make this type of DXing both more exciting and easier than before. Watch this space!

**ADDRESS BOX**

Further details concerning the AMRAC club can be obtained from:

AMRAC
Trevor Tugwell
50 Maybridge
FAREHAM
Hants
PO14 4OP

Tel: 04895 81032

An SAE would no doubt be appreciated.

Please send your data station cards, comments, letters and details of micro/radio clubs for inclusion in Micro' Net to:

Micro'Net
PO Box 49
COLCHESTER
Essex
STOP PRESS!

The first RTTY transceive package for Amstrad CPC464 is now available. The computer is connected to the radio via a terminal unit such as the MPTU-1. 5 screens include Rx/Tx window, type ahead window, menu and status report areas. 10 memories with total storage capability of 10k. QSO is stored in a buffer which can be recaptured or saved and loaded from tape. Program cassette £10.50. With MPTU-1 £78.

BBC SSTV. Slow Scan Rx/Tx package is now available for the BBC. There are three Rx modes - line or Frame sync. and Browse. Up to 99 screens can be saved for later recall and transmission. Onboard PTT circuitry. Requires +12v -12v and 5v external power supply. A circuit diagram can be obtained for home build or a ready assembled unit is available. Program, PCB and demonstration tape £17.50. As above plus complete kit £88.50. Please add £2 if Disk option is preferred.

Prices include VAT and are correct at time of going to press. Trade enquiries welcome. Scarab Systems produce many other top-quality programs and equipment for the radio amateur. Use the coupon now for details.

SCARAB SYSTEMS

39 Stafford Street, Gillingham, Kent ME7 5EN.
Tel: (0634) 570441

RTTY and CW TRANSCHEIVE with NO TERMINAL UNIT

This fantastic program interfaces direct to your rig, slashing the cost of previous systems. Split screen, type ahead, all the usual features and more. Tape and kit for the very simple interface only £20. Ready-made interfaces available. For CBM64, VIC20 (+ at least 8k), BBC-B, CW-only version for SPECTRUM £15.

And four superb programs for CBM64, VIC20, BBC-B, SPECTRUM LOCATOR QTHR or Maidenhead locator or lat/long. Distances, headings, contest points, convex between locations and lat/long. Tape £6.

LOGBOOK Date, band, mode, call and remarks. Superfast callsign search. Easy, fast updating of files. Screen/printer output. Tape £6. VIC20 needs at least 8k expansion.

MORSE TUTOR Britain's best. Learn fast in easy stages from absolute beginner to over 100 wpm. Join the hundreds who have succeeded with this program. Tape and full learning guide £6. For ZX-16k also.

All programs are very easy to use and come with full instructions. Prices include p&p 1st class by return. Add £1 per tape if outside UK or Ireland.

UK orders: add 15% VAT

technical software (HRT)

Farnborough Communications

97 Osborne Road, North Camp
Farnborough, Hants. Tel: 0252 518009

HAM RADIO TODAY AUGUST 1985 Please mention HRT when replying to advertisements. G4NXV.
I sometimes wonder how many other budding radio enthusiasts or indeed people with a similar noisy hobby find themselves in the same predicament that I was in some time ago. The basic problem was that DX conditions was never popular at the best of times, let alone at three in the morning when the HB9’s were five and nine on 2m!

Frustrated at often not being able to make the most of good conditions when they arose “out of hours”, I searched for a solution. My first thoughts were of the roof-space, having heard in many a QSO that this allows for short feeder lengths if the antenna is mounted on the roof. My problem was that the loft was immediately above the main bedrooms!

Looking further afield, I spent some time measuring the concrete garage. This seemed a distinct possibility, complete with power and lighting and (almost) waterproof. I couldn’t, though, persuade the car owner in the household that his much loved and cared for vehicle would be just as happy parked in the driveway, because certainly there wasn’t room for car and radio gear.

The whole subject was becoming a problem until, one morning, a handyman arrived to replace the felting in the potting-shed roof. This rather small, certainly dingy and very dirty structure (the shed, not the roofing man) lay at the bottom of the garden, full only with a selection of seed-trays during the planting season, at other times stuffed with odd garden tools which rarely saw daylight and some deck-chairs and three lawnmowers. Indeed, during the colder months icicles had been seen hanging from the inside of the roof. Hardly an ideal location to base one’s radio operation and not a place to leave what amounted to about a thousand pounds worth of electronic equipment.

First Steps

The odd-job-man departed and at least the roof should be weather-tight, I thought. If only I could lay on some electricity and ensure a warm and damp-free atmosphere, there was the remotest possibility that this would make a shack, and even perhaps a workshop for those home construction projects one is always trying to assemble on the kitchen table. I certainly couldn’t afford to be sociable, though, for there would be room for only one person, due to the small nature of the hut.

Having cleared out all the old garden equipment, a thorough clean-out was called for and a new coat of wood preservative. Whilst looking through a Consumer Association publication to try and decide what sort of treatment to use, I came across a chapter on “outhouses”. The book suggested that for insulation the walls of structures be lined with hardboard, with a layer of loft Fibreglass material sandwiched between this and the walls for even better results. Two layers of old, but clean carpet were recommended for the...
floor, and all gaps and cracks in the walls should be sealed with a good filler. Another old dodge I discovered later is to use crumpled up newspaper between the wall and the hardboard but this apparently does encourage insects.

**Putting It Together**

My most costly exercise was to run the mains supply out to my new "den". Having a friend, who's an electrician helped, for although he didn't actually do the work, I was able to ask him to check everything before the final connection to the mains was made, something which really should be done for safety's sake. He recommended mineral type cable for the run between the house and the shed, which is very expensive but hard wearing and suitable for long runs out-of-doors.

After first fitting a new distribution board in the shed, I then installed four double wall-sockets. These all have to be in metal boxes to comply with regulations (IEE 15th edition, usually known as 'the regs'), and of course this adds to the cost.

My first thoughts were to install a fluorescent tube type light fitting, but, remembering the amount of interference generated by my teleprinters alone and the fact that 'fluorescents' are renowned for electrical noise, I went instead for three bulk-head lights, each with a 100 watt bulb, one of which was directly over where I intended to install a work-bench.

Now carpentry is not my strong point, indeed I failed my woodwork at school and prefer working with more durable substances like steel and aluminium. A visit to the local DIY was thus extremely valuable; the advice I gained there was certainly more than I had been able to extract from a nearby home-superstore establishment, even if their prices were lower, as they
claimed. I purchased a large amount of hardboard for the lining and some laminated chipboard for the bench and other hardwood for shelving (don't buy chipboard for this, it tends to bow badly under even moderate loading), together with brackets, screws and some wood-filler. These were actually delivered free of charge by the DIY shop.

Having settled this account, the project was becoming rather expensive, so I knuckled down and did all of the measuring, sawing and fixing myself, despite my dislike of woodworking... I put in one main workbench and two made-to-measure for the teleprinters, and shelves just about everywhere else I could in order to accommodate all the 'junk' that we amateurs seem to accumulate (I was working on the premise that I would also probably acquire more as the years went on).

Strength was all-important, for I had seen other people's shelves in garages and outhouses bowing in the centre and in extreme cases, even from the wall altogether under the extreme weight to which they were subjected. I employed the strongest brackets I could find and fixed them to the structural pillars of the shed. If you intend to line the shed walls before putting the shelf brackets up, be careful to mark the position of the supporting pillars on the lining so you can find them to put the brackets on... I didn't.

Some floor covering was essential if I was to prevent rising draughts, for I had a wooden floor. Anyone with a concrete floor would be advised to seal it from the damp with one of the proprietary sealants available. Try your DIY shop again.

I went in search of some carpet, old but not threadbare; I began by visiting jumble sales but, alas, all that was on offer was amounts to cover complete rooms and enough for my new shack three or four times over. My next sortie was more successful. A casual visit to a local and friendly carpet shop brought forth the promise from the staff to save me some odds and ends. Two weeks later I collected a number of useful sized pieces from their fitter and was able to patch these together to cover the floor. The pieces were of the foam-backed variety so I used a layer of old-fashioned under-felt for extra warmth. After all, it's no use spending pounds fitting up and heating the shack, only to find that half the heat is lost through lack of insulation and the place is uninhabitable in mid winter as well as costing a fortune to heat the rest of the time.

As can be seen, the G6LPZ operating space doubles as a workbench. The shelves are made from hardwood rather than chipboard, which tends to bow even under moderate loads. Note the surplus telephone used as an intercom.

Storage systems like the above can be either obtained from local hardware stores or brought as single drawer units and assembled to suit your own requirements from Maplin Electronics.
Re-locating

Having made my home-from-home alternative operating area, I had to transfer my VHF/UHF antenna feeder cables. In my case, this was simply a matter of removing the feeders from a window-frame and re-trailing them from the mast in the garden. In fact I was able to reduce their length somewhat, which must be to the good of received and transmitted signals.

Deciding that the plain hardboard walls were certainly less than attractive and seemed to absorb most of the light emitted from the bulkhead lights, I fixed up some maps and charts and stuck up all but my most prized QSL cards, and the whole effect was quite cheerful. As is the nature of things, the eight power points proved to be insufficient and I ended up installing some multi-way trailing outlets, (Currys is a good and cheap source of these), and settled down to wait for the DX to arrive. Even with the teleprinters running and two rigs turned on, only a slight rumbling noise could be heard outside, although I think the neighbours are quite tolerant, for now I was nearer other dwellings, although certainly out of sound and sight of my own.

This isolation proved inconvenient, for I had no idea when I was required indoors — ie when to col-

An advantage of having a shack in a garden shed is that masts with VHF/UHF antennas may be erected nearby and conveniently rotated by hand.

A large amount of space for cables, masts and general junk is essential, preferable in the shape of a cupboard as in the case of G6LPZ's shack.

Taking Out Insurance

Another hazard that the seclusion brought was the security risk, something that my insurance company was not happy with. Two seven-lever padlocks were required to make them content, and as an added precaution I fixed a door magnet switch with a buzzer and hung a large bell, previously ac-

Please mention HRT when replying to advertisements. 73 G4NXV
Keer it could be argued that the most efficient morse code keyer is a keyboard sender, since any character may be sent by a single key stroke compared to as many as 4 for some characters on some issue and that for a single keyer unit to achieve universal acclaim, this would require both a double paddle unit and a keyboard.

The keyboard presented here, however, is more than just a keyboard sender and a squeeze keyer, with memory facilities, sharing common electronics. The 'Multimate' is a piece of equipment in which these two devices can be used in conjunction with each other. For example, a user who prefers to use a conventional squeeze keyer may well find it preferable to use a keyboard for programming up memories. It is envisaged that such a keyer will be especially attractive in a club environment, in contest operation, where it is likely to be used by a number of people with different keying preferences, and in the Multimate's additional role as a morse tutor. To further allow its customisation to individual requirements, various characteristics may be altered from the keyboard. For example, as an alternative to iambic operation, the key may be configured for semi-automatic or 'bug-key' operation and, additionally, auto inter-character spacing may be turned on or off. When in the 'tutor' mode, either 12 groups of 5 figures or 20 groups of 5 letters may be sent at random, and subsequently either repeated or checked.

The keyer is based on a minimally populated and slightly modified Microtanic Computer Systems single board controller using a 6809 processor. Since this card is available as a bare PCB and thus populated as required, this can result in a very attractively priced unit. Despite the impressive specification, the Multimate may

Fig.1 Modifications to Microtanic PCB to enable 6821s to be used in place of 6522s.

Ideal for club or individual use, the Multimate is a combined Iambic keyer with programmable memories — suitable for meteor scatter to contest working — keyboard sender and morse tutor, with built-in checking facilities to boot. In short, the Multimate is the ultimate in CW flexibility. Design by Mike Bedford, G4AEE.

other types of automatic keyer. Although the recent increase in popularity of keyboard senders goes some way to supporting this point of view, it is significant that the 'squeeze' keyer still remains the most popular type of morse sender within amateur circles. Admittedly financial considerations play a part in restricting the use of keyboard senders, but it also has to be said that many amateurs prefer to use double paddled keyers. It is therefore clear that the choice of a keyer is very much of a subjective

please mention HRT when replying to advertisements. 73 G4NXV AUGUST 1985
be constructed for a cost comparable to that of a commercially available squeeze keyer with memories.

Construction

As mentioned previously, the controller board used in this project is a stripped down and slightly modified version of the Microtanic Computer Systems single board controller. The first task in constructing this board is therefore to carry out the few modifications to the actual PCB which are needed to enable the replacement of the 6522s with cheaper 6821s. This modification consists of making 5 cuts to PCB tracks and making 5 wire links as illustrated in Fig.1. This being complete, the board can now be built up using only those components specified in the parts list and thus leaving a number of unfilled positions on the board.

It is suggested that DIL type sockets are used for the 6809, 6821, RAM and 2716. DIL sockets will also require fitting in positions A1, A2 and A5, the first two for making connections to the PIA’s and A5 for connecting the power supply.

The address buffers E2 and E3 are replaced by wire links as shown in Fig.3 and the memory mapping PROM (N3) is replaced by the configuration shown in Fig.4, which can be wired to a DIL header (dummy plug) and plugged into the socket. The standard controller board options are link selectable and the following link configurations are required for this application: LK1-A, LK2-A, LK4, LK7, LK9, LK13, LK15 x to b, LK18 x to c, LK20, LK21-A, LK22-A, LK24-A, LK25. If a pre-programmed EPROM is not used, the ‘hex dump’ given in Table 1 will require entering into an EPROM programmer (subject to changing the individual requirements of callsign and default speed) and then programmed into a 2716. The would-be programmer is warned that typing in long hex dumps is very prone to errors, and even assuming 99% accuracy on each hex digit, the 2K program would contain 40 errors! Readers may be comforted to know that a pre-programmed EPROM with your callsign and chosen ‘default’ speed is available from the author (see Buylines).

Fig.2 Circuit diagram of Multimate keyer
driven via a resistor from the standard keyer output.

The power supply with the exception of the transformer, mains switch, neon and fuse is also built up on a small single sided PCB, a foil pattern for which is given. Once again Vero-board can be used if preferred. The transformer is bolted to the base of the case, the mains switch and neon to the top surface and the mains fuse to the rear panel. The PCB artwork and component overlay are shown in Fig.6.

Customising The Keyboard

Since the keyboard is dedicated to the morse keyer, unlike the situation of running a program on a home computer, the keyboard can be customised to this application. The special function keys on the top row, i.e. shifted 1,2,3 etc can be labelled on the top surface of the case immediately above these keys. In those cases where a LED indicates the mode, the labelling also applies to the LED.

For the other function keys e.g. speed up/down, CQ, DE etc it is suggested that the keys in question are re-labelled. This can be achieved by respraying and then applying new legends, either by engraving or 'letraset', followed by a coat of clear varnish. Rather than attempt to match the colours of the other keys, it is probably preferable to use a completely different colour for these special function keys. For the Q-codes, which are generated by control keys, it is suggested that the codes are labelled on the front surfaces of the keys in question.

Mechanical Matters

As regards the mechanical construction, a few points are worth bearing in mind. If the suggested instrument case is used, the only mechanical work which needs carrying out is to make a cutout for the keyboard, holes for the LEDs, mains neon and switch and a few small holes for the speaker in the lid.
Basic Hardware

The design is built around a Microtanic Computer Systems Ltd single board controller. This is a processor board intended as the heart of a Tangerine computer system, which may be configured to use either the 6502 or 6809 processors. Whereas a fully populated board would provide much more comprehensive facilities than are required for a morse keyer and the price would be prohibitive, using a bare PCB and populating as required provides a very effective solution to this project.

A recent article by the author in Electronics Today International describes the single board controller in detail and outlines a number of modifications which can be made to get rid of some of the more expensive components, which are not required in control applications. These modifications include:

a. Simplifying the memory map by replacing the mapping PROM by wire links and a single inverter wired to a DIL header.
b. Replacing the 6522 VIA's by the less expensive 6821 PIAs (these are 'peripheral interface adaptors'!) and provide selective buffering for the microprocessor inputs and outputs.
c. Linking across the address buffers which are not required in our 'minimal' system and di. Omitting those components connected with the RS232 port and cassette interface.

The board as configured for this project uses the 6809 processor running at 1 MHz, 1 6821 PIA providing interface for the keyboard, paddle, LEDs, sidetone and keying circuitry, 2K bytes of RAM and a 2716 EPROM.

The interface board consists of 4 'darlington' drivers, which are driven from one of the PIA ports, and drives 4 LEDs indicating keyer status, an oscillator and amplifier for sidetone and the keying circuit which has been made 'solid state' to avoid all the problems associated with keying relays, such as noise, arcing etc.

The power supply is of a standard design and provides +5V and -12V. The -12V supply is required on some types of keyboard but if a +5V only keyboard is used, the -12V part of the power supply circuit may be omitted.

No design is given here for a keyboard but the requirements are not particularly critical and suitable keyboards are available at a modest cost from various sources. The keyboard should provide 7-bit parallel data with a positive going strobe, all signal levels being TTL.

References

1. Single Board Controller, Mike Bedford; Electronics Today International, March '85, p.35.

Fig.6 Overlay diagram of power supply board

in addition to those holes clearly identified in the mechanical drawing. The processor board and power supply boards are mounted flat in the case and, accordingly, stand off insulators will be required for their mounting.

The keyboard is mounted above the processor board and long bolts, or pillars, will be required to raise it to the height required for the keys to protrude through the cut-out in the lid. The mounting method will clearly depend on the physical characteristics of the particular keyboard used, but I suggested that more than 4 fixing screws are used, or, alternatively, some other means of support is used to prevent it bending under the pressure of use.

The easiest way to mount the interface board is to bolt it to the keyboard as shown in Fig.7. This will ensure that the LEDs will line up with the holes in the lid when the keyboard is in position. If this approach is adopted, care should be taken to ensure that bolt holes do not damage tracks on the keyboard.

Operating The Multimate

On first switching on the multkeyer, it can be used from either a keyboard or a double paddled 'key'. When operating from the paddle key, the initial conditions will include iambic operation with auto inter-character spacing turned on. The built-in sidetone oscillator will also be (and is always) active. Since a rear panel volume control is provided, this can be turned down to zero if the facility is not required.

Turning to the keyboard, the letter A-Z, figures 0-9 and various punctuations (./?) all give the expected results and letters may be entered either as upper case or lower case. In order to give the correct inter-character spacing, the keyboard input is buffered as it is entered, which means that the actual morse being sent may be ac-
ually keyed a few seconds earlier. This buffering necessitates the use of the space bar, which increases the inter-character space to an inter-word space.

Buffering can potentially be a problem in that stopping keying does not necessarily cause the keyer to stop sending. Two keys are available to help overcome this. The pause key will cause the keyer to suspend output of characters, whereas subsequently pressing any standard key will cause keying from the buffer to be resumed. Pause mode is indicated by the LED situated above the pause key. It should also be noted that the keyer goes into 'pause mode' whenever the paddles are operated, thereby allowing the operator to break-in on the buffered keying. If the operator wishes to not only suspend buffered keying, but also clear out the buffer, then the DELETE key may be used.

A number of keys are provided to allow commonly used words or special morse characters to be sent by a single key depression. The special characters are as follows and the keys used to send them are listed in Table 1: (.........), (-.-.), (.--.) and (.....). The keys in the category of commonly used words are CQ, DE, Callsign and CQ call. The CQ call key causes a message of the following form to be sent:

```
CQ CQ CQ DE Callsign Callsign
```

whereas subsequently pressing any standard key will cause keying from the buffer to be resumed. Pause mode is indicated by the LED above this key. The 2nd key to be pressed should be one of the keys 1-5 (5 being 'callsign') to indicate the memory to be programmed. Following this, the required message up to the maximum length for the particular memory should be entered, terminating with program memory again. In addition to letters and figures, memories may be programmed to include all the special characters, words, Q-codes etc. and even other memories — although it would not normally be required(1), it is quite feasible for a memory to include itself, or to include a second memory which in turn includes the first. Cases such as these would clearly cause the memory to loop forever. Since this is undesirable, the keyer is able to detect this situation and stop sending once it has looped for 30 or so times. Memory programming is not buffered but takes place immediately.

The keyer automatically sets itself to a particular speed when switched on (referred to as the 'default' speed), but various means are available for varying this speed. For memory programming, all speed change commands are executed immediately rather than being buffered. Program speed mode is entered by pressing the 'program speed' key and is indicated by the LED above this key. Once in this mode, 1 or 2 figures representing the speed in wpm should be entered, terminating with program speed again. For small changes in speed, the 'speed up' and 'speed down' keys may be used for decreasing or increasing the speed by 1 wpm per depression. When shifted, these keys have a similar effect but in steps of 5 wpm. It should be noted that this speed is common to keying with either the keyboard or the paddles.

### Table 1 Summary of keyboard commands

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>C0</td>
<td>Figures</td>
</tr>
<tr>
<td>A-Z</td>
<td>Letters</td>
</tr>
<tr>
<td>A or</td>
<td>MEM 1</td>
</tr>
<tr>
<td>L</td>
<td>MEMORY 2</td>
</tr>
<tr>
<td>I</td>
<td>MEMORY 3</td>
</tr>
<tr>
<td>/</td>
<td>MEMORY 4</td>
</tr>
<tr>
<td>C</td>
<td>CALLSIGN</td>
</tr>
<tr>
<td>E</td>
<td>PROGRAMME MEMORY</td>
</tr>
<tr>
<td>M</td>
<td>PROGRAMME SPEED</td>
</tr>
<tr>
<td>U</td>
<td>PAUSE</td>
</tr>
<tr>
<td>J</td>
<td>PRACTICE MODE</td>
</tr>
<tr>
<td>D</td>
<td>AS CALL</td>
</tr>
</tbody>
</table>

Available as single key depreations. If the subset of Q-codes commonly used on amateur circles is analysed, with a couple of exceptions they have unique final letters. In other words, if ORZ is in general use then neither of the other two possibilities (i.e. QSZ and QTZ) are commonly encountered. This being the case, (almost) any Q-code is generated by pressing the key for its last letter in conjunction with the CTRL key. The two exceptions are O and P as QSO/ORO and QSP/QRP are all in common use. In this case CTRL O and CTRL P generated QSO and QSP respectively, whereas QRO and QRP are generated by CTRL / and CTRL _ respectively.

The callsign mentioned under the CQ call is in fact a special case of the programmable memories of which the keyer has 5. Memories 1-4 each allow a string of 126 characters, whereas the callsign memory has a capacity of 15 characters. Unlike the others, this latter memory is initialised to a default value at switch-on.

Pressing the program memory key initiates 'program memory mode', which is indicated by the LED above this key. The 2nd key to be pressed should be one of the keys 1-5 (5 being 'callsign') to indicate the memory to be programmed. Following this, the required message up to the maximum length for the particular memory should be entered, terminating with program memory again. In addition to letters and figures, memories may be programmed to include all the special characters, words, Q-codes etc. and even other memories — although it would not normally be required(1), it is quite feasible for a memory to include itself, or to include a second memory which in turn includes the first. Cases such as these would clearly cause the memory to loop forever. Since this is undesirable, the keyer is able to detect this situation and stop sending once it has looped for 30 or so times. Memory programming is not buffered but takes place immediately.

The keyer automatically sets itself to a particular speed when switched on (referred to as the 'default' speed), but various means are available for varying this speed. For memory programming, all speed change commands are executed immediately rather than being buffered. Program speed mode is entered by pressing the 'program speed' key and is indicated by the LED above this key. Once in this mode, 1 or 2 figures representing the speed in wpm should be entered, terminating with program speed again. For small changes in speed, the 'speed up' and 'speed down' keys may be used for decreasing or increasing the speed by 1 wpm per depression. When shifted, these keys have a similar effect but in steps of 5 wpm. It should be noted that this speed is common to keying with either the keyboard or the paddles.

---

**Inside the Multimate**

![Image of Multimate](image-url)
Mode Selection

Some further functions are available as 'escape' sequences. These are mode changing commands, and since mode changing is carried out relatively infrequently, it was not considered that the use of 2 characters would be too inconvenient. Escape sequences consist of the ESCAPE key followed by one other letter. For example, semi-automatic or 'bug-key' operation is selected by ESC B and cancelled in favour of iambic operation by ESC A. You should note that when in iambic operation, the keyer brings into play dot and dash memories, both of which are edge triggered, hence avoiding sending extra dots or dashes at the end of a squeeze operation.

ESC C turns on auto inter-character spacing for paddle keying, whereas ESC D turns this feature off. ESC M selects 'meteor scatter mode' in which the speed is increased to about 250 wpm. Although direct keyboard entry and the squeeze key are not prohibited in meteor mode, they are clearly of little use and the mode will normally be used in conjunction with the programmable memory facility. In this mode, the increase/decrease speed keys have no effect, nor can programme speed mode be entered. ESC N turns off meteor mode, restoring the previously selected speed.

Pressing the tune key short circuits the keyer output to provide a 'tune' function for use on transmitters without this facility. Depressing the key again open circuits the keyer output. It should be noted that the above function also puts the keyer into pause mode.

It should be pointed out that the keyer is to some extent 'multi-tasking' or in other words, more than one operation may be carried out at the same time. For example, if the keyer is sending from the buffer or a memory (hence not requiring keyboard depressions) or is being used as a squeeze keyer, other operations can be carried out in parallel from the keyboard. In the case of the latter, this would of course necessitate an extra pair of hands. Such operations include speed changing, programming memories or mode changing by escape sequence.

Using As A Tutor

Turning from using the unit as a keyer to its use as a morse tutor, this mode is selected by pressing the 'practice' key. Practice mode is indicated by the LED situated above this key. Once the mode has been selected, a key should be pressed to indicate the type of practice required. Pressing any let-
A letter key will cause 20 5 letter groups to be sent, whereas pressing any figure key will cause 12 5 figure groups to be sent. There will be a short delay from pressing this key to the actual start of the sending.

During the sending of these groups, the speed may be increased or decreased, as described earlier for keying. Once the groups have been sent, a number of options are available. Pressing a further letter or figure will cause more groups to be sent, but it should be noted that even if letters or numbers are requested twice in succession, different random groups will be generated in both cases. Pressing the RETURN key, however, will cause the previously sent series of groups to be repeated.

Pressing the ? key will put the keyer into a checking mode. In check mode, the keyer will send the K character, after which the characters actually received during the previous practice session should be entered by the pupil. If the character is correct, a single short bleep will be 'echoed' whereas three short bleeps would result from entering a wrong character. After all the characters have been checked, the keyer will send a R and the check mode will be automatically terminated. Practice mode is terminated by pressing the practice key a second time as long as the keyer is not in the middle of sending or checking a set of groups.

### Components Listing

<table>
<thead>
<tr>
<th>RESISTORS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>R1,2,16</td>
<td>4k7</td>
</tr>
<tr>
<td>R3,4,5,7,9,11,13,14</td>
<td>10k</td>
</tr>
<tr>
<td>R6,8,10,12</td>
<td>470R</td>
</tr>
<tr>
<td>R15</td>
<td>1k</td>
</tr>
<tr>
<td>RV1</td>
<td>4k7 log panel mounting</td>
</tr>
<tr>
<td>RV2</td>
<td>10k lin PCB mount min. horiz. preset</td>
</tr>
<tr>
<td>All resistors</td>
<td>0.125W 5% carbon film</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAPACITORS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>C1</td>
<td>4700u 10V axial electro</td>
</tr>
<tr>
<td>C2</td>
<td>2200u 25V axial electro</td>
</tr>
<tr>
<td>C3,5</td>
<td>220 n ceramic</td>
</tr>
<tr>
<td>C4,6</td>
<td>470 n ceramic</td>
</tr>
<tr>
<td>C7,8,9</td>
<td>10 n ceramic</td>
</tr>
<tr>
<td>C10,11</td>
<td>100 n ceramic</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SEMICONDUCTORS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>B1,2</td>
<td>1A bridge rectifier</td>
</tr>
<tr>
<td>IC1</td>
<td>7805 1A</td>
</tr>
<tr>
<td>IC2</td>
<td>7912 1A</td>
</tr>
<tr>
<td>Q1,2,3,4,5,6,7,8</td>
<td>BC184</td>
</tr>
<tr>
<td>Q9</td>
<td>BFY52</td>
</tr>
<tr>
<td>Q10</td>
<td>BC108</td>
</tr>
<tr>
<td>L1,2,3,4</td>
<td>standard red LEDs</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MISCELLANEOUS</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>T1</td>
<td>6VA mains transformer 6V, 12V</td>
</tr>
</tbody>
</table>

### RESISTORS

- R5, 11, 12, 14: 4k7
- R13: 470R
- RP1: 4k7 SIL pack (7 comnected)
- RP3: 1k0 SIL pack (4 separate resistors)
- RP4: 1k0 SIL pack (7 comnected)

### CAPACITORS

- C1, 7-14: 100n ceramic
- C2, 15: 10 n ceramic

### RESISTORS

- SW1: mains switch
- N1: mains neon
- SK1: 3 pin DIN socket
- SK2: 2 pin phono socket
- LS1: 35R min. loudspeaker

### DISCRETE SEMICONDUCTORS

- D2, 3: 1N4001
- Xtal 1: 8.0 MHz

### INTEGRATED CIRCUITS

- B1: 6821
- C1: 74LS393
- C2: 74LS04
- D2: 6809
- F3: 74LS139
- G3: 74LS00
- H3: 74LS266
- J3: 74LS12
- K3: 74LS10
- L3: 74LS08
- M3: 74LS138

### MISCELLANEOUS

- N3 PROM replacement wired on DIL 'header' as described in text
- E2, E3: Wire links on DIL 'header' as described in text
- A1, A2, A5: 14 pin DIL sockets
The above listing is a hexadecimal dump of the firmware. For those not familiar with hex dumps a few words of explanation will be appropriate. The column on the left is the address in hexadecimal of the first byte on that line. It will be noticed that these addresses (which relate to the start of the EPROM) are separated by 10 (hex) (16 decimal) which means that each line contains the data for 16 bytes. Each such byte is represented by a 2 digit hexadecimal number.

Two items of information in the firmware listing will require modifying to suit the individual's needs being the default callsign and speed. The speed is at address 07BD (hex) and occupies a single byte. This byte should be changed to the required default speed in hex and must be in the range 1-70 wpm. The following table shows the default values of various likely speeds.

<table>
<thead>
<tr>
<th>Speed (wpm)</th>
<th>Hex Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-30</td>
<td>25-19</td>
</tr>
<tr>
<td>31-34</td>
<td>26-1A</td>
</tr>
<tr>
<td>35-38</td>
<td>27-1B</td>
</tr>
<tr>
<td>39-42</td>
<td>28-1C</td>
</tr>
<tr>
<td>43-46</td>
<td>29-1D</td>
</tr>
<tr>
<td>47-50</td>
<td>30-1E</td>
</tr>
<tr>
<td>51-54</td>
<td>31-1F</td>
</tr>
<tr>
<td>55-58</td>
<td>32-20</td>
</tr>
<tr>
<td>59-62</td>
<td>33-21</td>
</tr>
<tr>
<td>63-66</td>
<td>34-22</td>
</tr>
<tr>
<td>67-70</td>
<td>35-23</td>
</tr>
<tr>
<td>71-74</td>
<td>36-24</td>
</tr>
<tr>
<td>75-78</td>
<td>37-25</td>
</tr>
<tr>
<td>79-82</td>
<td>38-26</td>
</tr>
<tr>
<td>83-86</td>
<td>39-27</td>
</tr>
<tr>
<td>87-90</td>
<td>3A-28</td>
</tr>
<tr>
<td>91-94</td>
<td>3B-29</td>
</tr>
<tr>
<td>95-98</td>
<td>3C-2A</td>
</tr>
<tr>
<td>99-102</td>
<td>3D-2B</td>
</tr>
<tr>
<td>103-106</td>
<td>3E-2C</td>
</tr>
<tr>
<td>107-110</td>
<td>3F-2D</td>
</tr>
</tbody>
</table>

The default callsign starts at address 07BE (hex) or in other words immediately after the default speed. It may consist of up to 15 characters represented in hexadecimal ASCII, followed by the hex value 04 which acts as a terminator, marking the end of the callsign. The table below shows the hex ASCII values of all characters which could be used in a callsign.

<table>
<thead>
<tr>
<th>Character</th>
<th>Hex Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>41</td>
</tr>
<tr>
<td>B</td>
<td>42</td>
</tr>
<tr>
<td>C</td>
<td>43</td>
</tr>
<tr>
<td>D</td>
<td>44</td>
</tr>
<tr>
<td>E</td>
<td>45</td>
</tr>
<tr>
<td>F</td>
<td>46</td>
</tr>
<tr>
<td>G</td>
<td>47</td>
</tr>
<tr>
<td>H</td>
<td>48</td>
</tr>
<tr>
<td>I</td>
<td>49</td>
</tr>
<tr>
<td>J</td>
<td>4A</td>
</tr>
<tr>
<td>K</td>
<td>4B</td>
</tr>
<tr>
<td>L</td>
<td>4C</td>
</tr>
<tr>
<td>M</td>
<td>4D</td>
</tr>
<tr>
<td>N</td>
<td>4E</td>
</tr>
<tr>
<td>O</td>
<td>4F</td>
</tr>
<tr>
<td>P</td>
<td>50</td>
</tr>
<tr>
<td>Q</td>
<td>51</td>
</tr>
<tr>
<td>R</td>
<td>52</td>
</tr>
<tr>
<td>S</td>
<td>53</td>
</tr>
<tr>
<td>T</td>
<td>54</td>
</tr>
<tr>
<td>U</td>
<td>55</td>
</tr>
<tr>
<td>V</td>
<td>56</td>
</tr>
<tr>
<td>W</td>
<td>57</td>
</tr>
<tr>
<td>X</td>
<td>58</td>
</tr>
<tr>
<td>Y</td>
<td>59</td>
</tr>
<tr>
<td>Z</td>
<td>5A</td>
</tr>
</tbody>
</table>

From the above information it will be clear that in the dump given, that of the prototype keyer, the default speed is 15 wpm and that the default callsign is G4AEE.
Having enjoyed the amenities of a Hygain TH3 atop a Westower 3HD in the heart of Aberdeen for over five years, it was particularly frustrating to be refused planning permission after a move south. I had chosen my new QTH with care. It was a derelict cottage on an elevated site and with the rolling Cleveland Hills of North Yorkshire just to the south of me and theoretist friends had proclaimed a better-than-average take off in all directions that mattered. The siting of the mast was to be such that even my immediate neighbours would not normally see it and would not be seen from the roadway at all. The rear 150' garden was next to a large recreation ground and the antenna would be some 200' from the nearest spectator’s view.

Looking back I realise I was too complacent. I should have taken more time in preparing my application with supportive signatures. At the time I did not realise until it was too late that a strong objector, in the form of a councillor (!) had made it their business to visit near-residents and urge them to object. Although some were reluctant to do this (and subsequently signed a petition supporting my appeal) the powers that be came up with a decided NO to my application and appeal.

Can’t put up an outside antenna but would like to work some DX? A full wave loop in the loft was the answer for Stan Crabtree, G3OXC.

A chance article I read got me thinking about a loft antenna. To inhabitants of housing estates where the authorities maintain restrictive policies with regard to external antennas, an indoor aerial of one sort or another is often the only chance to get on the air. VHF stalwarts can probably manage a small outside array without notice but, from ten metres down, even a humble vertical can arouse interest especially if a ‘busy body’ is on the look-out.

Pros And Cons

I pondered with the idea of trying an aerial in my attic and the more I considered this, the more attractive it became. In fact the advantages soon seemed to outweigh the disadvantages. On the negative side, the screening effects of roofing materials limit radiation to a large extent so that an indoor antenna can never perform as well as an external array of comparable height. Space is usually confined and the actual layout of the antenna must take into account electrical wiring, water tanks, plumbing etc.

But consider the advantages. Virtual secrecy. No one need know you are in operation at all. I am not suggesting illegal operation but this factor could be very useful in the event of you causing TVI. At least you would have time to investigate any problem on your own set before an irate neighbour was finally able to pin you down! (You will note how easily I have developed a persecution complex?). Under cover you are able to arrange the layout easily and make any adjustments that may subsequently be necessary almost immediately. Whatever feed point or aerial wire you use, you have the satisfaction of knowing it will not be subject to the effects of the weather. No masts are required; you have an average height of some 25° as a starter!

I started to consider the facts. My QTH was a detached Georgian house with a roof of clay pantiles and the attic had been floored with chipboard and the only appreciable amount of conductive material was the copper hot water tank and the piping.

The Raison D’etre

After further thought, I decided on single band operation and not to get involved with loading coils and earth systems. Simplicity was to be the prime aim. I did not want to spend too much time in exploratory work and subsequently find out all my efforts had been wasted.

To ensure the outward appearance of the house complied with the original period, two lengths of metal guttering ran along the front and back. At first I considered trying to incorporate these as either a director or reflector.

<table>
<thead>
<tr>
<th>Fig. 1 Delta loop configurations. (a) and (b) provide horiz. polarised radiation whilst (c) provides vertical.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
</tr>
<tr>
<td>(b)</td>
</tr>
<tr>
<td>(c)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Fig. 2 Original planned configuration is at (a) and (b) if final layout.</th>
</tr>
</thead>
<tbody>
<tr>
<td>(a)</td>
</tr>
<tr>
<td>(b)</td>
</tr>
</tbody>
</table>
However, the separation between them of approximately 22" did not compute too well with the chosen band of 20 metres. The house runs virtually North/South which for a simple dipole meant bi-directional radiation of a fashion to the Caribbean and Northern Europe — not ideal!

A single quad element was unfortunately out of the question as the required 16' sides could not be accommodated in the vertical plane. There seemed only one variety of antenna left - the delta loop.

Using the formula 
\[ 1005 / F(MHz) \] the overall length for 14025kHz would be 71 feet. Now there are a number of possible feed configurations for a delta loop and depending upon the type chosen, the antenna will (theoretically) radiate in either a horizontally or vertically polarised fashion (Fig.1). After some thought, the configuration in Fig.1 b was chosen as a starting point.

To fit in the two 'vertical' sides a compromise was necessary. The top section was moved away from the apex to a point 4' above the loft floor. This was also conveniently further away from the plumbing system. The feed point was then laid out at the centre of the extreme western side of the roof space area. The above meant the plane of the antenna was more nearer the horizontal than the vertical and so what exactly the polarisation of the antenna radiation would be was anyone's guess... At the feed point I used a small die-cast box with a SO239 co-axial socket and two audio type sockets for the antenna connection. The aerial wire was supported as necessary from wooden rafters by electrical plastic cable clips. I planned to replace these, if the system worked, with nylon fishline later. The down leg of the loop passing nearest to the water system was classed as the 'earth' side and this wire was plugged in the socket on the box that was also connected to the screen of the 50 ohm co-axial feeder. Cheap insulated flex was used for the antenna.

When I came to the stage of connecting the aerial wire to the connection box, I realised the vertical-ish sections of the antenna were too long to fit in the run direct and had to 'square off' the points they left the top section of the loop in order to use up the wire. The installation took less than half an hour.

In Operation

After firing up I was disappointed to see the SWR was very high. I wanted to get this right down because I intended to drive the antenna direct from a transceiver with a solid state output. After checking the resonant frequency with a GDO at the feed point, I was surprised to find it around 13MHz. Theoretically this meant the antenna was far too long and I commenced pruning one of the legs. I had finally to dispense with 7 feet off one side section to end up with a total aerial length of 64'. But the result was worth it. An SWR meter showed less than 1:1.5 right across the band! (The antenna's resonant frequency was probably affected by house wiring etc - Ed.)

An air test was approached with some trepidation. I remembered once spending half a day coaxing a low SWR from a tower ostensibly serving as a mast type radiator. I ended up with a 'text-book' SWR - but never worked anyone!

At 1600gmt there was not a lot on the band. A few UA3's and some very weak W's. I tail-ender a QSO and managed to contact an old friend W8VSK who gave me 559 but said there was little coming out of Europe anyway. My next opportunity came on New Year's Day when HA8, UC1 and a string of other Eastern Europeans gave me 559! Although this is almost routine during radio competitive sports nowadays, this wasn't a contest. Later OH6YJ also gave me 599 and I was finally convinced.

I am not of course able to say this spate of flattering reports continued but the antenna performance has certainly more than come up to expectations. Since its installation I have worked W1, W4, JA, UA and PY during limited operation. Admittedly one report was 429 but I worked him! I have now got to the stage where I call a distant station and often forget I have an indoor antenna.

If you are in a modern housing estate check the construction at joist floor level. Occasionally, metallic material is used as sheet insulation and this will of course make any attempted aerial system futile.
Final Alignment

The final stage is to check the operation of the transmit strip. There is no alignment involved as the strip is broadband. This test can only be done with heatsinks fitted.

In Part 4, Tony Bailey, G3WPO, and Frank Ogden, G4JST, complete the alignment and describe the switched attenuator.

to Q39 and the PA transistor. If you are using the Micron case, then the basic PCB will have to be fitted to this to carry out the next tests. Alternatively, if you are to use your own case, it will be necessary to make up a suitable heatsink. The testing can be carried out using a piece of 18 swg aluminium sheet, the length of the PCB, bent into an L shape so that the PCB can be mounted on it via spacers. The two transistors then mount against the rear vertical part of this sheet using the insulating washers and bushings supplied. See the next section for more details.

11. Insert Q49 (2SC1969) into position with the metal tab facing the rear of the PCB. Make sure it is down as far as it will go and standing vertically, then solder the emitter (right) lead to the top foil, and the three leads on the underside. Finally remove excess lead lengths.

12. You will now require the chassis part of the case and some of the fittings to continue the construction.

Insert a 12mmx6BA round head bolt through each of the holes on the base of the chassis, from the underside, ignoring the three holes along the front - as you insert the bolts, place a small piece of masking or insulating tape over the head of each to stop it falling out when you let go! Drop a 6mm long round nickel plated spacer over each bolt on the inside of the chassis.

13. Smear a small amount of the heatsink compound supplied evenly over the rear of Q49, and a further small amount over the area to be occupied by the tab of Q49 around the 3mm hole on the lower right hand side of the rear panel. Place the small rectangular insulating washer over the latter hole with the main area of the washer facing downwards.

Carefully drop the PCB down over the bolts taking care not to disturb the insulating washer. Insert a 6BAx6mm thread length countersunk screw through the hole from the rear. Slide the small plastic bush supplied over the screw and seat it into the transistor tab. Then place a 6BA lockwasher over the screw and tighten up loosely with a 6BA nut.

14. Temporarily place 6BA nuts over the outside four screws only on the PCB and tighten down, then tighten up the PA transistor nut.

15. As with Q49, smear a small amount of heatsink compound over the rear of Q39 (TIP34A), and over the area to be occupied by the tab (hole above the PA transistor). Place the remaining insulating washer over the hole with the main area of the washer projecting downwards. Carefully bend the leads of Q39 up at right angles to...
the body. Then insert a 6BAx6mm thread countersunk screw through the hole and washer from the rear, place Q39 over the screw and slide on the remaining insulating bush until it is seated inside the tab. Fix in place with a 6BA lockwasher and nut. Note: providing the transceiver is not keyed continuously in the following tests for more than 5 seconds at a time, the additional external heatsink supplied is not required.

16. Before carrying on, make sure that all leads and controls coming from the board are clear of the metal chassis and not shorting. Attach a 50 ohm dummy load capable of dissipating 10W or more to the antenna pins on the PCB, preferably via a power meter or SWR bridge so that you can check the power output. Remember, most of the inexpensive SWR/power meters only measure relative power, and cannot be used for absolute power measurements unless you have previously calibrated them against a calibrated ‘power meter’ at the frequency being used (their response usually varies with frequency).

17. Apply power — the PSU should be capable of delivering up to 2.5/3A at 13.8V DC. Keying the transceiver should result in a power output of not less than 8W on all bands except for 10m, where the minimum of 6W can be expected. The Drive control should vary the power smoothly from virtually zero to full output.

Lack of output on all bands would indicate a fault somewhere in the PA strip. If this happens, the services of an oscilloscope are invaluable for tracing the fault. Detailed and specific fault finding details are not practical for this stage of Micron unless instrumentation is available. If you find that the PA transistor gets very hot but no power is delivered, suspect the winding of T5 or T6. Lack of output on a single band would indicate a fault in the switching of low pass filters.

18. Using a 25cm length of coaxial cable, stripped as before, link point AW (below left of IC6) to the antenna pins (which are already connected to the power meter). The Tx power metering should then be set with RV8 so that the meter indicates one division from full scale at maximum power output.

If you are using the Micron case, and all tests have been successful, all 8 of the mounting screws should now be fitted with lockwashers and nuts, and tightened. +12V to the digital display module is taken from the marked position just left of RV5 at the front of the PCB.

**Switched Attenuator**

The switched attenuator is constructed directly on the 2 pole, 3 way slide switch supplied with the Micron case kit (you may use any similar slide or rotary switch for your own case). The drawing gives details. Keep all leads as short as possible when building this item.

Start by soldering the resistors directly to the switch as shown. When you have done this, remove the coax link to point E (left to S1c) and connect the coax to the input of the attenuator as shown. Then use a further 12cm length of coax to link the output of the attenuator back to point E.

You will find the attenuator useful when dealing with very high strength local signals, or when operating on 40m at night where very high levels of adjacent broadcast station signals are present which may overload the receiver. The effect of the attenuator is to reduce or remove this overload, but with far less effect on the wanted in-band signals.

An LED may be used to indicate transmit mode on the front panel. Connect the anode (usually the longer lead) of the LED to point AP using insulated wire, and the other bulb tag to earth. Bulb life can be prolonged by reducing the applied voltage using a series dropping resistor (82R 0.5W recommended).

**Tidying Up**

Once the main wiring is complete, you should neatly tie the wiring together in the area behind the VFO enclosure so that the various cables are as high up and as near to the top of the enclosure as possible. If certain of the wires are close to the audio pre-amplifier stages, you may experience some audio feedback at high volume levels — some experimentation with the position of the wires will cure this. Also avoid running cables directly over the top of the VCO coils as this may induce ‘synthesiser buzz’ into the received signals.

**Finishing Touches**

1. The Tx IRT preset, RV1, should be reset after installation in the.
case so that the received frequency with the RIT control knob indicator line vertical (control at mid-position) is the same as when the spot button is pressed. The wiring of the spot button is shown in the wiring diagram in these instructions. When this is complete, the VCO lid should be fitted - place it on top of the enclosure and solder a short piece of wire at each end of the two longer sides to link the lid to the sides of the enclosure.

2. If you are using your own case, it is important that all 8 of the mounting holes on the PCB are used to provide a good earth from the board to the chassis. Failure to do this may result in poor quality transmissions due to earth loops. If you wish to purchase any of the switches used on our case for your own, please contact us. The filter switch may be any type of 1 pole - 3 position slide or rotary switch, which should be connected as illustrated.

Coming Next
The next parts of this series will deal with the frequency display, the internal ATU and the case assembly.

USING THE MICRON
The Micron operates like most other CW transceivers with the advantage of a semi break-in operation. As with all direct conversion transceivers, or superhet designs such as the HW-9 which use a wide roofing filter rather than a narrow band filter, you will be able to copy a CW signal by tuning both sides of its nominal carrier frequency. With most superior DC or superhet transceivers, a fixed transmit offset is used so that when you tune on receive to the 800Hz note that most operators prefer, going to transmit offsets the Tx frequency by 800Hz - this results in the other station also hearing a 800Hz beat note. This does mean that you must always tune to the same 'side' of the received signal - ie always tune from the high end of the low end of the band when looking for a station. If you do it the other way, you will be transmitting up to 2kHz off the other stations' frequency and they will not hear you.

We have opted to provide a 'spot' button to overcome this. In use, having found a station to work, you leave the IRT control at mid setting, press the 'spot' button to zero beat the received station using the main tuning knob. Having done this, you then re-tune in the station you decide to work, using the IRT control, for a comfortable beat note, on either side of the carrier (whichever is the more free of interference). You can therefore adjust the IRT control as much as you like without affecting the transmitted frequency.

The rear panel mounted Balance control will only require adjustment if you suffer from direct broadcast station demodulation. This is likely only to occur on 80 or 40m, where there are adjacent high level broadcast bands. Simply adjust the control until the interference is removed or considerably reduced. The control may require re-adjustment when changing bands.

IMPORTANT
In common with any other rig with a 'solid state' broadband PA, the Micron requires a well matched antenna close to 50 ohms for best performance, both on receive and transmit. You should not operate at full power into a high VSWR - this will result in low output power and possible damage to the PA transistor. The correct procedure is to use an Antenna Matching Unit, either the optional internal Micron unit, or an external matching unit of your own choice.

STOP PRESS
Psst! Have You Worked Rockall?
Tom Maclean, the ex-Transatlantic oarsman, currently living on Rockall, the 70' rock outcrop some 250 miles W off the Hebrides and claimed by Britain, Denmark and Iceland, has been active on the amateur bands.

Using the callsign GM1TM and GR1TM, Tom has been active on 14MHz and is known to have contacted a number of UK stations, included one who allowed the contact to be filmed for ITN's News At Ten! Strong rumour has it that he is operating illegally and that the DTI will be paying him a visit when he returns to the UK.

Personally, the editor would not fancy their chances of making a prosecution without looking somewhat humourless and getting a lot of adverse publicity...

New Intermediate Licence Category To Be Introduced?
Draft proposals for a new category of amateur radio licence have recently been submitted to the DTI by Council of the RSGB. This 'licence' would permit the holder of a class 'B' licence or an RAE certificate to operate CW on 3 HF bands after passing a test of 5wpm, with a power limit of 9dBW.

David Evans, general manager of the RSGB, when interviewed, stressed that the proposals had been submitted as a basis for discussion and could be revised or rejected by the DTI. Information received from Ian Abel, secretary of the Amateur Radio Novice Licence Campaign, had indicated that the proposal submitted were for a 'novice' licence. David Evans firmly denied this claiming that a licence category with a lower technical standard than the present RAE neither accorded with the wishes of the members of the Society or the DTI and that the introduction of such a licence would only serve to devalue the technical credibility of amateur radio. The notion was "to pitch a licence category which was somewhat easier than a full class 'A' licence and would give an HF capability but without the full privileges of a class 'A' and which would act as an incentive."

The 'limited' licence would thus allow the holder to experience the wide range of HF propagation and techniques whilst minimising any chance of interference.

David Evans put forward the view that because most people take the RAE before attempting the morse test, the natural reaction is to take out a class 'B' licence just so as to get on the air. Once on VHF/UHF, many then look no further, a situation which is depriving them of a very different and fascinating facet of radio.

The above proposals dovetail in with the recent granting of permission for class 'B's to operate CW on VHF/UHF and seem to be an excellent idea. Proposed bands are presently 28, 21 and 1.8MHz - all of which could do with some extra occupancy at present!!
At one time, a few watts mobile on 2 metres would have meant a large box, probably in the boot, almost certainly an ex-PMR rig, lots of valves getting hot, and several amps of current on receive alone! Today there is no shortage of 2m rigs — the problem is what to choose from the vast range, most of which are of the ‘all-singing-dancing’ type.

The subject of this review is one of the latest ‘mini-rigs’ available from the Orient, all the more impressive as it runs all of 45W output from a box 5.5” wide, 6.5” deep and only 1.5” high, together with all the facilities we have come to accept lately in 2m mobile rigs. The FT270RH is the ‘high power’ version and the ‘low power’ version runs 25W.

The first thing you notice on unpacking it is that the miniaturisation means that the usual rear panel antenna and power connectors have had to be relegated to flying leads as there is no longer room for them in standard form! The power lead has a pair of short non-reversible leads which plug into the normal mobile fused lead, while the antenna socket is a flying SO239 socket.

You may wonder how on earth 45W can be got out of a box this size? Or rather, how you get rid of the heat! The answer is a specially designed ‘duct-flow’ diecast chassis, with the heatsink running from the back to the front of the case, plus a small extruded heat-sink on the back plus a miniature blower! The latter jumps into action as required by means of a thermal sensor. In the low power position (5W) it did occasionally come on when the car was warm, but was on most of the time at 45W with any extended QSO (I should say at this point that the 25W version doesn’t have the fan).

Depending on the circumstances, the fan can be regarded as noisy — under mobile conditions this tends to get lost in all the other car noise (you might find it distracting in a Rolls though!) but in the shack it is a different matter. The first time it came on I leapt up wondering what on earth the noise was, thinking that something was about to explode in my power supply. As the fan is only about 1.5” square it is bound to make a fair amount of noise at high speed and this can be distracting in a quiet shack. Several people commented on the noise in the background.

All the usual extras are there — memories, memory scanning, ‘priority’, band scanning, toneburst, repeater shift, reverse shift, and two VFOs with 12.5/25kHz VFO steps. An optional Tone Encoder is available, as is a ‘speech synthesizer’, giving a ‘talk-out’ of your operating frequency. This is either on all the time, or on request via a microphone button. For the blind operator this is obviously a ‘godsend’ and possibly for the sighted operator as well.

Small Affects

I make the latter remark because one of the effects of miniaturisation is that you get smaller and smaller control buttons. In the environment of a car, where your concentration is (hopefully) devoted to the lunatics round you, attempting to press a very small button, close to other very small buttons, when you want to change something can be a hit-and-miss affair. A persistent example of this I found was the VFO/memory buttons — these are side-by-side and it was easy to hit the wrong one and find that you were not where you thought you...
were. Not a problem in the shack where you tend to look at what you are pressing. In fact, I did find that a lot of the time whilst 'mobile' I felt compelled to glance at the display to check that the right operation had been carried out, a side effect of this.

The display has a pleasant green background and differs from many LCD readouts in that it can be viewed from very wide angles in any direction — you don't have to be right in front of it to see the frequency. Also shown on the display, by means of small annunciators, are the actual facilities in use, including memory channel, priority, scan, VFO A or B, and, if you foul up the button pressing, the diminutive Err to indicate an error.

The S Meter is of the 'lemons and cherries' type (LED bargraph to the uninitiated) and sits underneath the LCD display. This also functions as the power output monitor, showing about half scale for low power.

There is a 'beep' function which is activated when you press any button involving a change of function, plus a double-beep when an error condition exists. Unfortunately you can't get rid of this if you want to. When in scan mode this fires off every time the scanner stops — every 6 seconds or so if the band is busy. Possibly an 'invalidate-the-guarantee' piece of surgery might get over this, but there was insufficient information on the circuit diagram to evaluate this.

Plain Speaking

Fancy your own Japanese lady in the car? Well, Yaesu will oblige for a small sum but limit themselves to providing her voice only! The optional voice synthesiser comes on a very small pre-aligned PCB which is very easy to fit and allows you to be told where you are, rather than having to look. The synthesiser will work 'continuously', speaking every time the frequency is changed, or on 'demand', via a button on the microphone.

The first thing to be announced is which VFO is in operation, saying 'VFO A', followed by 'V' for VHF, then the frequency, missing out the first two numbers. So, the 'talk-out' for 144.525 on VFO B would be 'VFO B, V, Four point five two five'. The VFO and V indications are only omitted if you are in 'programmed memory scan' mode and select a frequency manually while it is not scanning.

Memory Matters

There are 10 standard memory channels, and each can hold a different transmit frequency to that of receive if required. You can scan these for either 'busy' or 'vacant' operation, with a 6 second stop on a busy channel. To stay on a channel you just push the PTT switch once. Also, a memory channel can be 'masked' from the scan routine temporarily, if desired.

In addition to being normal memory channels, memory channels 9 and 0 hold the limit frequencies for the programmed scan. In this, the rig scans between the two frequencies stored, either up or down — a very useful facility for just monitoring the FM portion of the band, or perhaps the simplex or repeater sections.

You can scan the whole 2MHz if needed by selecting scan mode on either of the VFOs. If you have the voice synthesiser running, this will tell you which VFO is in use every time the scan returns to 144.000MHz; this also changes the VFO statement to 'MEMORY' plus the memory number when a memory channel is selected manually.

The other scan/memory function is 'priority' — this flips back to a selected memory channel every 6 seconds from the operating frequency and will stay there if it is busy. This mode cannot be used while actually scanning, only in conjunction with a static VFO frequency.

The remaining front panel controls are firstly the main tuning knob (optical encoder type) which steps a channel at a time — either 25kHz or 12.5kHz, depending on the setting of the 'step' switch. You can also move a whole MHz at a time, either up or down, with another button — this also doubles as a memory channel selector. The only annoying thing

please mention HRT when replying to advertisements. 73 G4 NXV AUGUST 1985
about this switch is that if you go from, say, 144.8 to 145.8 then pressing this again, you don't get 144.8 back, but 144MHz, with the VFO resetting itself to the nearest whole MHz.

A slide switch allows selection of standard repeater shifts, either + or - 600kHz, with another button giving the 'reverse repeater' shift at a touch. If you need a non-standard shift, this can be achieved via the memory facility with the transmit storage programmed for the frequency required.

Two buttons which are somewhat superfluous in this country, are those associated with the optional tone encoder. The rig does have an internal toneburst which can either be fired up from the front panel as required, or on continuously, via a small switch on the underside of the case. The panel button would have been much better placed on the microphone - you have to reach for the rig when mobile to bring up a repeater.

Other than the audio and squelch controls (dual concentric knobs are quite small) this only leaves the mic. socket which is of the 8-pin type.

Manual Situation

The manual for the rig is in A5 format and runs to 28 pages, plus a pull-out circuit diagram. It is to the usual comprehensive Yaesu standards and they even appear to have used someone with a good grasp of English to write it for a change! For the technically minded, there is, unfortunately, absolutely no circuit description (other than a brief introductory overview) or guide to servicing. There is probably a separate Service Manual available if you want it, but with an abundance of dedicated chips on the rig, most people will be very limited in what they could do and would have to seek dealer back-up should the need arise. This is a good reason for ensuring that you purchase from an Approved Stockist.

The receive side uses the ubiquitous MC3357 for the main FM processing functions, running with a 2.1.6MHz first IF and 455kHz second IF in a standard superhet configuration. The RF stage is MOSFET followed by a comprehensive bandpass filter, plus solid state antenna changeover switch. On the transmit side, the PA is one of the block module type, found in almost all such rigs these days, but expensive to replace when they go pop! The FT270 series are microprocessor controlled, using two 4-bit CPU's.

The output power was measured at 47W (spec 45W), and receive sensitivity at 0.14uV for 12db SINAD (spec 0.2uV/12db SINAD).

In Use

The rig was used for many weeks, both as a base station and mobile, the latter running into either a helical 5/8th wave, or standard 7/8 whip. As a base station it functioned admirably, albeit with noisy help from the internal fan when at high power. The audio was quite pleasant from the internal speaker (which is mounted on the bottom of the case but has a grill outlet on the top). There is some considerable distortion at full volume, caused by the rather small speaker.

Voice synthesiser

One of the most noticeable things about the performance of the FT270RH was that you didn't have to ask what the audio quality was like - most stations commented on the excellent response without being asked. The transmission bandwidth appeared to be controlled within a fairly tight limit and no adverse reports were received from locals on adjacent channels - likewise, no trouble was experienced on receive from strong adjacent channel locals at 25kHz spacing. Although the rig is capable of 12.5kHz spacing operation, you will get trouble when using this with another strong station 12.5kHz away, as the ceramic IF filter is too wide for such spacing, being suited for 25kHz channels and having a 14kHz bandwidth at -6db.

As mentioned earlier, the crammed front panel made mobile operation awkward to say the least, and several times a stop had to be made to sort out buttons pressed in error when QSY'ing. For reasons which I am unable to duplicate, I twice lost the memory transmit frequencies while mobile, being presented with an 'ERR' condition on pressing the PTT. The most useful facility I found was the programmed scan between two frequency limits, used for listening between the bottom end of the FM simplex section and the top end of the repeater frequencies, whilst mobile.

When using a repeater that requires a tone, you have to make up your mind before you leave on your journey as to whether to dive for the tone call button whilst driving, or leave the burst switched on permanently.

Conclusions

Overall, allowing for the ergonomically poor controls, dictated by trying to get a lot of functions into a small area, I liked the FT270RH a lot. It has all the facilities one could possibly want in a very small box and combines high output power with good sensitivity/performance. The modern small car needs a compact rig, one that can be easily removed when the car is left unattended and this fits the bill. The small speaker and case size does mean that an external speaker is really needed when mobile, but this is true of many other 2m mobiles.

As a base station for a small shack it is again ideal, but I would like to have seen a means of disabling the 'Beep' tone and a quieter fan. One final amusing point, the voice synthesiser appears to suffer from the Japanese problem of pronouncing 'R's and 'L's - 'Error' comes out near to sounding like 'Eilor' . . .

Thanks to SMC Limited for the loan of the rig and its voice synthesiser. The price at the time of writing is £380 for the /RH version, and £325 for the /R (25W) model. The FVS-1 voice synthesiser costs an additional £21.45.
DIALSEARCH (3rd edition),
By George Wilcox, 9 Thurrock Close,
Eastbourne, East Sussex. BN20 9NF.
This is a very useful booklet for the
uninitiated short wave listener and is
updated every two years, the next ed-
tion coming out in early 1986. The
author has set out to provide a
‘Listeners Checklist and Guide to Euro-
pean Broadcasting’ but has, in fact,
given the absolute beginner all the
essential information on how to actu-
ally get started in this area, what to listen
for and when.

The booklet includes two maps one
of which gives all the major broad-
casting stations in Europe. The second
map is of the British Isles and is part of
the full and thorough ‘package’ on how
to gain the best from a simple portable
radio receiver.

The listings of stations to be heard
are grouped into short, medium and
long wave and are listed by frequency,
with notes on language, time, transmit-
ter power and programme content. The
major European programme networks
are listed by the language of the
transmission and some brief program-
ning details are also given. Mr Wilcox has
also managed to accumulate informa-
tion on foreign stations that transmit
in English and has listed the time that
they transmit classical music and jazz.
Also, amusingly, for the musically mind-
ed, there are the music ‘scripts’ of all
the major world broadcast stations’
signature tunes.

The booklet is available from
George Wilcox at the above address for
£2.50 plus 50p postage.

Short wave listening seems to cover a
wide range of specialised areas, and has
subsequently spawned a number of
guides and books on these areas, as
well as some general guides. Recent
‘listening’ books have covered the
world press frequencies, European and
world broadcast stations and secret
governmental (and anti-governmental)
transmissions. These books come in a
variety of shapes, sizes and prices, from
the cheap pamphlet to the expensive
tome. A selection of better and more
unusual short wave listening books are
reviewed here.

WORLD RADIO TV HANDBOOK (39th
dition)
Published by Billboard,
Distributed in the UK by Pitman
Publishing Ltd, 128 Long Acre, London
WC2 E 9 AN
This tome is claimed by its editors, and
many radio enthusiasts, to be the com-
prehensive guide to listening around the
world. However, WRTV Handbook not
only gives about the most thorough
listing country-by-country of what
can be heard on the airwaves anywhere
but also has some very interesting ar-
ticles by famous and authoritative radio
enthusiasts.

The section that will be most useful
to the majority of SWLs, is the listing
by country of all the known broad-
casting stations in the world. These
are grouped by country and region. Each
regional breakdown is preceded by a
map of the region abbreviated details of
the stations are given, ie times of opera-
tion, frequencies and language(s) used.
This list is followed by one of the stan-
dard frequency (ie WWV) and time
signal stations, which for the amateur
listener are useful for checking the ac-
curacy of the shack clock, receiver
calibration and propagation conditions.
Later in the handbook, the reader will
find a useful cross reference listing,
headed by band frequency and detailing
the countries which have stations oper-
ating on that band, their power out-
put and location.

The title of the handbook does
include television, however, the actual
section on TV is rather limited, since the
editors have merely aimed to give an
‘accurate impression of the state of
development of TV services in each
country’. They go on to explain that
reception of ‘foreign’ TV is often dif-
ficult because of the various different
systems of transmission, (ie PAL, SECAN) antenna polarisations and col-
our standard (PAL, NTSC). These are
given in the country-by-country listing
of TV services. One failing of the book,
that the editors are considering remedy-
ing, is the lack of information on
satellite TV and cable services.

The book includes some reasonably
useful tables concerning propagation, in
particular the one covering the most
suitable shortwave bands reception for
certain areas from transmission from
the various regions at different times of
the year. One of the last tables in the
book is vital in this sort of listing book.
Although all the book times are in UTC
(ie GMT), having a table of local time
around the world can be of assistance.

The articles in this handbook, as I
have mentioned earlier, are by well
known participants in the hobby and are
generally well written and interesting.
They cover the future of the wave
bands, solar activity — which is rather
short and obvious — an insight into
Radio Nederland’s new transmitter sta-
tion, what to expect in the way of HF
broadcasting in 1985, a history of
Swiss Radio International and a descrip-
tion of tropical band DXing. There is a
list of national and international DX
clubs which is quite informative — giv-
ing details of their membership,
specialist interests and present ac-
tivities.

The final section of the handbook is
given over to reviews of some of the
newest receivers (about half a dozen)
and various signal boosting accessories
— the latest in pre-amplifiers and active
antennas. These reviews are com-
parative and although not all the equip-
ment reviewed is available in this coun-
try, the reviews should be useful. On
the whole the WRTH, as it often refers
to itself, is interesting and probably very
useful to the serious shortwave listener/
DXer. Apart from the lack of informa-
ton the TV front I think I can safely
say it is comprehensive. The tables are
reasonably easy to read, without having
to wade through the lists of abbrevia-
tions first. The book is well laid out and
the main listings easy to find. My only
other criticism concerns the lack of an
index of contents at the back of the
book and a contents page that I found
less than informative. The book costs
£17.95 and is available at most
bookshops and radio emporia.

46 please mention HRT when replying to advertisements. 73 G 4 NXV AUGUST 1985
CLANDESTINE CONFIDENTIAL
By G L Dexter,
Supplied by Interbook Ltd, Lynton,
Stanley, Perth PH1 4QQ.
This book sets out to show the short
wave listener another side to shortwave
broadcasting — that of illegal, anti-
government and government
'propaganda' stations. Mr Dexter
seems to have considerable experience,
from around the world, of playing
'detective' and searching out these sta-
tions. Firstly, of course, the author
defines what he means by a
'clandestine' station, why it (ap-
parently) broadcasts and how to iden-
tify them. The book is then divided into
three main sections, the first describing
a few past 'famous' stations, the se-
cond those that are still presently
broadcasting and the final section the
future prospects — where to look for
clandestine stations and that they are
what they seem to be!
Past 'clandestine' stations include
the suspected CIA backed 'Radio
Swan', that broadcast to Cuba until
quite recently. The stations that broad-
cast from the Falklands during the
Argentine occupation provides a topical
and interesting dimension to that par-
ticular conflict. These examples, being
fairly well known, have more documen-
tary conflict. These examples, being
and interesting dimension to that par-
ticularly the CIA backed Radio
Swan, that broadcast to Cuba until
quite recently. The stations that broad-
cast from the Falklands during the
Argentine occupation provides a topical
and interesting dimension to that par-
ticular conflict. These examples, being
fairly well known, have more documentary
evidence. Many other stations
mentioned later in the book present
more of a challenge to the listener.
The presently operating
clandestine stations are listed by coun-
try, with some having as many as ten
different stations. Interesting countries
to listen out for include Nicaragua, Cuba
and South and North Korea — the latter
two seem to have broken a mutual
agreement to 'stop verbal hostilities via
radio'. Once you've spotted a
clandestine station, the main probe may
well be understanding the
language, although some do use a
smattering of English.
Mr Dexter has made every effort to
assist the would-be clandestine listener
by giving times, frequencies and occa-
sionally the languages used. He also
provides a brief synopsis of the
organisation behind the station and the
country's recent past history. He ill-
ustrates the articles on the various sta-
tions with copies of verification letters
and a few 'clandestine' photos. There is
only very limited information on the sort
of equipment used on these stations,
despite some obvious big backers!
The final section looks to areas
where future clandestine operations
may arise. The Caribbean seems to be a
prime target, particularly for Cuban/
Russian radio activities (don't forget the
author is an American! — Ed.). Other
'hot' spots are also highlighted for
possible listening success. And once
you've 'caught' your clandestine, the
next step is to get it verified. This,
seems, is the hardest part — trying to
get an address for QSLing, let alone a
reply! However, this is apparently half
the fun of being a listening 'detective'.
On the whole, the book is written in
a very familiar and readable style. It
does not sink into the quagmire
of politics and is rather humourous
in places — something quite rare in most
of these books. On the bad side, the
type seems a bit too large and the ill-
ustrations and heading take up more
space than is necessary.
The book is available from Inter-
books Ltd., and costs £6.80 inc p + p.

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

1 July
Hornsea DARC: Working CW by G4DFG.
Hazelrigg ARC: meets every Monday at the
Community Centre, Hazelrigg.
Basingstoke ARC: VHF NFD arrangements.
Alyn and Deeside ARS: NFD arrangements.
N Staffs ARS: informal meeting.
Wolverhampton ARS: meeting.
Todmorden DARS: natter night.
Worcester DARC: natter night.
Southdown ARS: barbeque.
Bury RS: surplus equipment sale.

2 July
Fylde ARS: equipment construction contest.
E Lancashire ARC: fox hunt.

3 July
Wolverhampton ARS: visit to Central
Telephone Exchange.
Reading DARC: VHF NFD finalisations.
Wirral ARS: surplus equipment sale.
Worthing DARC: meets every Wednesday at
the Parish Hall, South St, Lancing at 7.30pm.
Cheshunt DARC: natter nite.
 Fareham DARC: AMTOR operation by
G4 FJO, G4CJO and G4EMR.
Exmouth ARC: meets at the Scout Hut, Mar-
pool Hill.
Denby Dale DARS: noggin n' natter.
Hornsea ARC: preparing for VHF NFD.
Wirral DARC: annual barbeque on Heswall
shore.

AUGUST 1985 please mention HRT when replying to advertisements. 73 G4 NXV 47
<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 July</td>
<td>N Wakefield RC: on the air. Inverness ARC: meets every Thursday, 7.30pm, Cameron Youth Club, Planefield Road, Inverness. Horsham ARC: pre VHF field day natter. Maidenhead DARC: lecture. Preston ARC: preparing for VHF NFD and natter night.</td>
</tr>
<tr>
<td>6-7 July</td>
<td>GB4CSB: VHF National Field Day - 70, 144, 432 and 1296MHz; portable operation only from 1400gmt to 1400gmt Sun. Alyn and Deeside ARC: DF hunt. N Staffs ARC: natter night plus special event station GB4SOT.</td>
</tr>
<tr>
<td>10 July</td>
<td>Clifton ARC: meeting. Bromsgrove DARC: main meeting. Coventry ARC: open night. Maltby ARC: Cheap QRP HF Transceiver by G4BVV.</td>
</tr>
</tbody>
</table>
the suffering in N Africa. There will also be a display of many different aspects of the hobby at the Shire Hall, J11 off the M4.

27 July
RSGB 432MHz Low Power Contest from 1700gmt to 2300gmt.

28 July
Scarborough Rally.
Dartford Heath DFC: DF hunt.
RSGB 144MHz Low Power Contest from 0900gmt to 1700gmt.

29 July
N Staffs ARS: informal night.
Chester DRS: rig on the air.
Wolverhampton ARS: committee meeting.
E Lancashire ARC: informal.
Bury TS: informal.

31 July
 Fareham DARC: planning for summer portable operation.

1 Aug
Exmouth ARC: meeting.
Derbyshire DARS: holiday special.
Wirral DARC: Revenge DF hunt for the GBPMF Rose Bowl.
Cheshunt DARC: natter nite.

2 Aug
N Wakefield RC: on the air night.
Preston ARS: informal meeting.
Maidenhead DARC: evening out.

3 Aug
Coventry ARS: 2m DF contest.
Maltby ARS: three lectures in a row (??)
Clifton ARS: meeting at New Cross.

5 Aug
Horsham DARC: Salvage of the SS Great Britain.
Basingstoke ARC: natter night.
Worcester DARC: Contesting by G4ERP.

6 Aug
E Lancashire ARC: visit to British Nuclear Fuels at Salwick.
Bury RS: informal.
Fylde ARS: visit to Lytham CAA radar station.
Kidderminster DARC: meeting.
Chichester DARC: club meeting in the Long Room.
Wolverhampton ARS: visit to Police motorway control centre.
Dartford Heath DFC: pre hunt meeting at the Horse and Groom.
Workop ARS: fox hunt.
Reading DARC: discussion of contest arrangements.

7 Aug
Three Counties ARC: film night.
Wirral ARS: meeting.
Denby Dale DARS: noggin n’ natter.
Brighton DARS: meeting.
Cheshunt DARC: junk sale.

8 Aug
Fareham DARC: portable operation.

9 Aug
N Wakefield RC: natter night.

10 Aug
Bromsgrove DARC: main meeting.

11 Aug
Wolverhampton RS: meeting.
Newbury DARC: informal at the Spotted Dog.
Wolverhampton ARS: club project discussion.
Clifton ARS: discussion of contest arrangements.

12 Aug
Exmouth ARC: meeting.

13 Aug
Derby Mobile rally at Lower Bemrose School, St Albans Rd, Derby. Talk in GB3ERD.
Hamfeast ‘85 organised by RAIBC and Flight Refuelling ARS. Contact Elaine Howard on 0202 671191 for further details.

14 Aug
Wolverhampton RS: meeting.
Newbury DARC: informal at the Spotted Dog.
Wolverhampton ARS: club project discussion.
Reading DARC: canal boat trip.

15 Aug
Exmouth ARC: meeting at the Scout Hut, Marpool.
Denby Dale DARS: Chairman’s evening — G3YWI.
Farnborough DRS: Field Day post mortem.
Cheshunt DARC: natter nite.

16 Aug
Fareham DARC: portable equipment.
N Wakefield RC: lecture/visit.

17 Aug
Preston ARS: final preparations for the rally.
Chichester DARC: club meeting — Green Room.

18 Aug
Maltby ARS: Getting on 2m SSB Cheaply by G1CAQ.
Clifton ARS: meeting.
Dunstable Downs RC: Improving your DX on 2m by G8VR.

19 Aug - 25 Aug
Special event station GB2TC run by Tamworth ARC to celebrate 500th anniversary of Henry Tudor’s visit to Tamworth prior to the
Battle of Bosworth. Operations on 3.5 and 144MHz from 10-8 Sat and 10-5 Sun from Tamworth castle.

18 Aug
Wolverhampton ARS: 144MHz DF hunt.
RSGB 1296/2320MHz contest, 0700 — 1300gmt.
West Manchester RC Red Rose Rally at Haydock Park. Newton le Willows. Talk-on on S22 and GB2RRR from 10am.

19 Aug
Worcester DARC: informal.
Maidenhead DARC: video show.
Midland ARS: Amateur TV by G8GWN.
Reading DARC: PAYNET by G4KWT.
Fylde ARS: top band fox hunt.
Workops ARS: junk sale.

20 Aug
Kidderminster DAR: meeting.

21 Aug
Three Counties ARC: 2m DX by G3VXM.
Wirral ARS: meeting.
Denby Dale DAR: noggin n’ natter.
Brighton DAR: meeting.
Chesunt DAR: 2m portable station.
Darlington DAR: portable operation.

22 Aug
Greater Peterborough ARC: informal social.

23 Aug
Bromsgrove DAR: construction meeting.
Malbyy ARS: Spitewinter.
Clifton ARS: meeting.

24-31 Aug
GB8SDX and GB6SDX will be operational on 2m and 70cm from IO97 locator square, organised by City and Brum Universities ARS using SSB, ATV, RTTY and Packet Radio modes.

25 Aug
Preston Annual Rally at Lancaster University.
Talk-in on 2m FM, entry 50p, open from 11am. Details G3DWO.

27 Aug
Chester DRS: Pre SSB HF field day contest meeting.
E Lancashire ARC: informal.
Wolverhampton ARS: night on the air and discussion group.

28 Aug
Exmouth ARC: meeting.
Denby Dale DAR: rally wind down meeting.
Cheshunt DAR: natter nite.

29 Aug
Fareham DAR: portable operation.
N Wakefield RC: monthly meeting.

30 Aug
Preston ARS: Audio visual evening by G3UEC.
Clifton ARS: meeting.

1 Sept
Cambridge Amateur Radio Rally at the Kelsey Kerridge Sports Hall, Gonville Place, Cambridge. Open from 10.30am.

Will club secretaries please note that the deadline for the October segment of Radio Tomorrow (covering radio activities from 1st September to 1st November) is 26th July.

Contacts

Abergavenny & NH ARC GW4XOH 0873 4655
Alyn and Dee-sided ARC GW4RXR 0244 669466
Axe Vale ARC Roger Jones 040 486 468
Barking RES R. Woodberry 01 594 4009
Bath DARC G4UMN Frome 63939
Basingstoke ARC Dave 07356 5185
Braintree ARC J. Roberts 0376 44857
Brighton DAR Peter 0273 607737
Bristol ARC GY0C Bitton 4116
Bury RS Bryan 0282 24254
Cambridge DAR W. G. Wilcox 0954 50597
Cheshunt DAR Roger Frisby 0992 467495
Chester DAR Alan 0244 40055
Chichester DAR C. Bryan 0243 789587
Clifton ARS Mr Hinton 01 301 1846
Coventry DAR R. Tew 0203 73999
Darford Heath DFC Pete 0322 844467
Denby Dale DAR G3SDY 0484 602905
Donegal DAR ED BOB 074 57155
Droitwich DAR G4HFP 0299 33818
Dudley ARC John 0384 278300
Dunstable Downs RC Philip Morris 0582 607623
East Kent RS Stuart 0227 88913
East Lancashire ARC Stuart 0254 887383
Edgware DAR John 01 306 4342
Exeter DAR Roger Tipper 0392 68065
Fairham DAR Brian 0329 234904
Farnborough DAR Mr Taylor 0252 837581
Fylde RS PRO 0253 737680
G. Peterborough ARC Frank 0733 231848
Halifax DAR D. Moss 0422 202306
Harrow RS Dave Atkins 0923 777942
Hastings ERC Dave Shirley 0422 402608
Haverhill DAR Rob Proctor 0787 281359
Hazleleig ARC G1HVD 274 2413
Horsem ARS Norman 0262 73635
Horsham ARC Pete Head 0403 64580
Inverness ARC Brian 0463 242463
Kidderminster DARs Tony 0562 751584
Leighton Linsalade RC Pete Brazier 052 523 270
Maidenhead DAR John 0268 28463

Malbyy ARS Ian Abel 0709 814911
Medway ARS Andy Wallis 0634 363960
Midland ARS G8BHE 021382 0086
Mid Sussex ARS G1FRF 0791 82937
Mid Ulster ARC DF Campbell 0782 42620
Mid-Warwickshire ARS G4TIL Southam 4765
N. Cornwall RS J. West 0288 4916
N. Staffs ARS G6MLI 0782 332657
N. Wakefield RC S. Thompson 0532 53663
Nunsfield HCA ARG G4PZY Derby 767994
Preston ARS George 0772 718175
Osweyry DAR Chris 0691 831023
Reading DARC Reading 471761
Rhyl DARC GW1AKT Nantglyn 469
Sheffield DAR G4PSO Hitchin 57849
S. Bristol ARS Len Baker 0272 834282
S. Lakeland ARS Dave 0229 54982
S. Manchester ARS Dave Holland 061 973 1837
Southdown ARS P. Henly 0323 763123
Stockton DAR John Walker 0642 582578
Stowmarket ARS M. Goodrum 0449 676288
St. Helens DARC A. Riley 051 430 9227
Swale ARC B. Hancock 0795 873147
Telford DAR Tom Crobie 0952 579506
Three Counties ARC R. Hodgson 0428 77368
Tiverton (SW) ARS G. Draper 0364 235
Todmorden DAR Mr Gamble 070 681 2494
V White Horse ARS Ian White Abingdon 315659
Verulam ARS Secretary St Albans 59318
WACRAL G4NPM 0795 873147
Wakefield DAR G8BPE 0924 737727
Welland Valley ARS J. Day 0858 32109
Welwyn Hatfield ARC Dave 07073 26138
West Kent ARS J. Green 0992 28377
Westmorland RS G. Chapman 0539 284941
Willenhall ARS G4LWJ 0902 782036
Wirral ARS Cedric 051 625 7311
Wirral DARC Gerry Scott 051 630 1393
Wolverhampton ARS Keith 0902 24870
Worcester DARC D. Batchelor 0905 641733
Workops ARS G4ZUN Workops 886164
Worthing DARC Jim Hicks 0903 690415
308 ARC (Surbiton) Dave Davis 01 309 5487
FOR SALE

SALE/SWAP FISHING TACKLE carbon float, sigma wand rods and two others ABU601, D.A.M. clipper reels tacklebox, landing and keep nets, banksticks etc. Swap for FT290R, FRG7700, WHY. Cash adjustment both ways money offers considered, inspection. Phone Michael Radlett 4172.

TRIO TS130S little used, SWR/Power meter, mic, 5 band G-whip antenna, £420 or offer and portable. Tel Leigh (0942) 729516.

YAESU FT290R plus NiCads, charger and 30W liner amplifier, all in v.g.c. £300, or will exchange for HF rig plus or minus cash balance. Phone 0953 607068.

SALE OR SWAP complete 2m station Trio 9000 multimode. Matching B9, SP120, PS20. Mobile mount, 1 4 whip, gutter clip and cable. Base 3 x 8 14 colinear, rotator with control box, cable 8 ele Yagi. £475. No offers. Seen working. (0323) 898515.

100 WATT audio amp including transformer, no case £35. 3A, 12V Farnell PSU £15. Phone Collin (85) 77075 or write Simon, 8 Ripon row, Halton Lodge, Runcorn, Cheshire. WA7 5YT. Plus Rad coms PSU’s etc. Inquire for prices. Buy collectors.

KW2000A TRANSCEIVER complete with matching power unit and manual in good condition £100. To inspect and collect telephone Aubrey Leeds 0532 674766. G4OOG OTH.

COMMUNICATIONS RECEIVERS, trio Lafatte, both complete with 2m converters £65 each. Rotator AA1002 new, still boxed £30. Buyer collects. Phone John 0705 261399.

TRIO 830M as S model but with AM as well. 2 years old, excellent condition, superb audio quality includes mobile unit supply. New price £830 first £550 secures. Manchester area ring Brian 061-904 9853.

VHF UHF FDK750E and 430 converter. 2m and 70CMs multimode, LO/HI power, dual VFO’s, repeater shifts, auto toneburst. Boxed as new with handbook. Sold complete with diplexer and dual band mobile antenna £350. Bought TS780 1G1EJ Burnwood (05436) 72275.

PET 2001, fully expanded two discs, mint. Also complete BBC B set up approx 1 year old. Offers. Or will swap or px for station equipment, transceiver etc. Phone John 051-420 3628.


35MSLR CAMERA Konica FS-1 motorwind auto. 35-70 autozoom, X2 converter. Semi-Fish-eye/Macro dedicated flash. Slave flash tripod etc. Excellent value £260+. Exchange 934 setup/Gencover RX AOR2001 WHY. Cash either way. Phone Frank weekday/evenings Ipswich 62867.

PRINTER Commodore CBM 2033 suit PET £50. Wanted HF bands VFO and ATU. Non workers considered. Telephone Caterham (Surrey) 42829 evenings.

TRIO TS711E 2M base station transceiver, fitted with VS1 speech synthesiser, in perfect condition. Under Lowe agents guarantee. £750. No offers, prefer buyer inspects and collects. Ring FH Watts QTHR. Newent (Glos) 820960.

TANDY CB handheld cost £130, with extension microphone, accept £65. 44MHz crystals for two metres £1.50 each. SWR meter and extension speaker for CB £5 both make, 2 Woodside, Wimbledon, London SW19. Tel 01-946 2967 and ask for Jane.

SSTV MONITOR venus S2 self contained factory built £125. Pne Romford 47998 G4FOQ QTHR.


CO DE MASTER CWR 600 complete unit £110. Phone Andy, Southampton 782545.

YAESU FT480R very good condition, proven receiver. Box and manual mobile mount bracket complete with any of above. Buyers please.

FOR SALE Yaesu FT480R only as base station. Offers around £320. Kenpro KR4000 rotator only used 4 months, 1 element J-beam no rot, 5/7 amp PSU all open to offers. FM/AM forces sale. Tel Hendnesford 77648.


35MSLR CAMERA Konica FS-1 motorwind auto. 35-70 autozoom, X2 converter. Semi-Fish-eye/Macro dedicated flash. Slave flash tripod etc. Excellent value £260+. Exchange 934 setup/Gencover RX AOR2001 WHY. Cash either way. Phone Frank weekday/evenings Ipswich 62867.

PRINTER Commodore CBM 2033 suit PET £50. Wanted HF bands VFO and ATU. Non workers considered. Telephone Caterham (Surrey) 42829 evenings.

TRIO TS711E 2M base station transceiver, fitted with VS1 speech synthesiser, in perfect condition. Under Lowe agents guarantee. £750. No offers, prefer buyer inspects and collects. Ring FH Watts QTHR. Newent (Glos) 820960.

TANDY CB handheld cost £130, with extension microphone, accept £65. 44MHz crystals for two metres £1.50 each. SWR meter and extension speaker for CB £5 both make, 2 Woodside, Wimbledon, London SW19. Tel 01-946 2967 and ask for Jane.

SSTV MONITOR venus S2 self contained factory built £125. Pne Romford 47998 G4FOQ QTHR.
YAESU FT-101 receiver £275. Wanted TS780, 471k, 451, 221R/225RD. FT780R. Phone Reading (07341) 59645 after 9pm or weekends. JAYBEAM D5/2M £15. Pye Vanguard modified for 2m FM, S18 and S20, £20. Teletype KSR3 with stand, vgc £35. Two army 19 sets, £10 each. Rotator Hirschman RO250 with cable £30. All wanted. Wanted Shimizu 10SS, G4SXH Tel 0242 571223.

ICOM IC-251E with mute front end used very little, also IC-701 receiver with FM. Tested but never used. Both in superb condition. £450 each or £850 for both. Tel Markfield 243248. After 6pm.

G6NKB QTHR 0509 502989 each or £850 for both. Tel Ian, rigs in superb condition, £450 Tested but never used. Both front end used very little, also Wanted Shimizu with Two army 19 sets, £10 each. Vanguard modified for 2m FM, MM100/30 linear/preamp £85. Tony G4XBY.


ELBEX 906 monochrome surveillance video camera with wall mount, mains PSU, 'zoom' lens/pan' function, good condition £55 ono. 23cms brass PCA cavity (singe 23C9) £55 ono. 23cms inter digital filter, good £25 ono. Phone Paul G4XHF Crawley.

President 'GRANT' transceiver AM-SSB converted 29MHz, perfect £65. Collectors item, Marconi key, type 365A, all brass, with brass base, as new £35. Japanese meh., bug key, new £18. Telephone 0274 728219.

FT707 £300; FC707 £50; FT101 £175; FDX multi £270 £225; Trio 9R/500S £40; Tono 9000 £350; VDU £25; Sinclair Spectrum 48k £50; Scarab RTTY £60; fit Mobile Moonraker £25. Phone Tunbridge Wells 30819 or Crowborough 62790.

Complete RTTY/CW station. TRS 80 level II, plus VDU. Still boxed, dedicated Macrotronics terminal, software interface and manuals. Multiple band, ASCII, CW, 300 words per minute. Complete £250 or will separate. Exchange for other radio equipment considered. Telephone Bob GM 1 LYT 0563 2700 £225; Trio 9R/590S FT101E £18; TR2400 as new 144-148, 300 watts, manual, £180. MC50 350 watt £125. Scarab RTTY £50; 6ft 26-57.995MHz £185 as new little amplifier with preamp 10 or modules MML/100HS linear amplifier with pre-am 10 or 25 watt drive 100 watt output. £265. Mains PSU £125. Cunarder £200. £50; Scarab RTTY £50; 6ft Tx/Rx £30. Marine fixed frequency 300 VDC 140mA 300 VDC £275; Trio 9R/590S FT101E £275; Rapid 188 Low Derw, Trehafrew, Cardigan SY23 3RL £150 ono. Shackleton ITTY £150 ono.


Top of the range Bearcat 300 scanner covers 30MHz 512MHz in 5khz steps, 50 channels preset, fire, air, ham 220 and 12v £250 ono. Contact Colin Grellis, 8 Dreadnought, Bridport, Dorset. Tel 0308 24340 for complete details.

YAESU FT-290R virtually unused, as new, boxed, 8 months old. £1500. £560, £300, £250, £200, £150, £100, £75. The lot. Telephone Norman on 0928 314095. FT707 as new still in original packing for FT1012D or similar. Phone Dave on Northampton 36914. YAESU FTOR £750 for two units, plus delivery of £125. £500 for the lot. Telephone Norman on 0928 314095. FT707 as new still in original packing for FT1012D or similar. Phone Dave on Northampton 36914.
26.515-28.500 plus power supplies plus President Grant AM & sidebands 40 channel & mid. Offers to (0463) Inverness 236491.

FOR SALE Yaesu FT-757GX 0.5-30MHz Tx/Rx little used 4 months old. Boxed with hand microphone, operating and technical manuals, £650 ono. Tel 01-471 0669 after 5pm.

RADIODAYESTER for sale wartime type 3II portable transmitting/receiving equipment 1.6m, PA grid 3-16, crystal 3-8, with powerpack 90/250V or 6V battery ‘spares box’ and manual in 2 water tight 13” x 11” x 6” containers – best offer circa £140. Phone Mitchell (Cornwall) 221.

TRIOT9130 2m multimode, memories, 25W RF, complete with mobile mount, 5 ele Yagi and mic. Excellent condition, used only as base station. £330. Ten Tec Argonat 509 5W CW/SSB HF transceiver. Superb QRP rig. Full break in, excellent condition £220. Ireland 01-348-9780 (on holiday till 10th July).

LAGAFETTE 1200FM Tx/Rx.
26.515-27.855MHz. Very good condition. Will convert to 28MHz easily. Sell £45 or exchange fully regulate 1 3.8V 28MHz easily. £45 or £80.

YAESUF T301 100 watts HF transceiver with all filters fitted complete with Psu £300 ono. Phone G3KLV 0604 48091 after 6pm.

TRIO R1000 £180. U1000 RF amplifier/preselector, 1.8-30MHz, 25. £5AR HF omni-match £20. LAR linear omni-match £10. Buyer inspects and collects. Wanted HF band transceiver and 144MHz valve linear. Tel (0772) Preston 635560. Mike G3TSL.

YAESUF T902DM all modes, CW filter, DC-DC power unit, blower, mic. Yaesu FC902 ATU, excellent unit. Yaesu VF901DM, synthesised VFO, with 40 memory channels, normal tuning, fast/slow auto/man scan. All equipment complimentary and mint condition. Can be tested in my shack. First £600 secures the lot. Ring Mr Jones on 0394 28563.

FOR SALE icom IC202 all crystals, Nicads, charger £100 onvo. G8ZCC QTHR. FDK 2m transceiver 1-25 watts, variable FM only, ideal mobile rig. Complete with accessories. As new £160. Tel Alan on Wrexham (0978) 840473 after 5.30pm or write to Gernant, 39 Brynglas, Nosse, Wrexham, Clwyd, North Wales LL14 2EA.

SALE OR SWOP video – Genie EG3003 computer £85. Metz 402 flashgun with Nicad and charger £55, or exchange for HF gear, WHY G1 DGO, 3 Limes Road, Folkstone, Kent. FOR SALE Tri T910 2m multimode, transv. 40W box/ packing etc, mint cond used little. £520 Bearcat 220FB VHF/UHF scanner. Mains £150 G4FQR QTHR. Phone Peter, Romford 47998. DISC DRIVE, 400K 80 track, double sided, Shugart. For BBC or Shugart compatible computer. As new, £150. Telephone Nottingham 503312.

SX-200N VHF scanning receiver 26-514MHz with discone antenna £220. Yaesu FT-202R handheld transceiver one watt 2m R1 R2 R7 & R8 +2 £550 equipped with rechargeable batteries £80. Mike De-Wynter, 2 Woodside, Clitheroe (0200) 24716.

SALE OR SWOP video – G8ZCC QTHR.

FOR SALE Icom IC202 2m FM low, 14 channels £70 ono.

METX 402 flashgun with NiCad batteries £80. For SRD camera. £320. G6OCH QTHR.

NEW 250 VA mains isolating transformer £15. RS mains isolating transformer 5000VA £10. G4CLF board 3MHz version £40. £35.

SATS 2221D Rx, TS500 PSU and external VFO 80-10 mtrs, including spare valves. Excellent for beginner, £120 onvo. Tel: 0442 212891 extn 236. Check before purchase.

COMMODORE MPS 801 printer with box of paper in vg cond. £70 ono. Lucas FM Tx/Rx 10m £25 ono plus postage. Mr McAllister, 2/11 Dunphail Road, Brucefield Park, Glasgow G34 0BX.

SUPER COlT lawn mower exchanger for communication receiver valve £80. Sampo 6100 ran for 2 years, £300.

APPLE COMMODORE 801 printer with box of paper in vg cond, £350. Lucas FM Tx/Rx £100."
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
LEICESTERSHIRE

Elliott Electronics
26-28 Braunston Gate, Leicester. Tel: 563293
Open: Mon-Sat 9.00am to 5.30pm

W. MIDLANDS

Dewsbery Electronics
RXs from YAESU, JRC, ICOM
Stockists of microwave modules B N O S.
ICS AMTOR, CC MODORE

LONDON

Dressler UK Ltd
191 Frank Rd, Leyton, E10
Open 9.30pm Monday-Friday 10-5 Saturday
Authorized dealer for:
Dressler, YAESU, ICOM, Standard, Trio/Kenwood,
Datong, SCM, Microwave Modules, Tonna
Tel: 01-558 0845/556-1415 Teles: 0953608

LANCASHIRE

Amateur Electronics U.K./Holdings
YAESU, Tel, JAYBEAM, Frequency Counters, DNA, Datong, FT101
Export Repair 78815.0077.0006, For Details (balance)
Data, Work 2x12 S.A.E. Ltd, 15 min. Second time, Free parking.
70 Huxley Street, Birkenhead, Wirral
Tel: 0544 26513

EIRE

RADCMM Electronics
25 Riverfield, Co. Cork, Eire
SUPPLIERS OF YAESU, ICOM, DATONG, SEIM, JAYBEAM, BNIOS.
RF CABLES, CONNECTORS, ROTATORS, MOBILE ANTENNA
AND LOTS MORE!
RING (021) 637275 anytime for details.

WALLES

Beamrite
Amateur Radio and CB stockists,
TV aerials, telephone and computer
accessories
Open 9-1.00pm Monday-Saturday
Wed closed after 1.00pm
19 Broadway Roath, Cardiff
Tel: (0222) 4688864 or 469268

SURREY

Gildford Communications
34 Aldershot Rd., Guildford
Open Mon, Tues, Wed 9am-6.30pm
Sat 9am-5.30pm

SCOTLAND

Jaycee Electronics
John GM30PW
20 Woodside Way, Glessrothes, Fife KY7 5DF
Tel: 0592 756962
Open: Tues-Sat 9-5
Quality secondhand equipment in stock.Full range of
TRIO goodies. Jaybaum - Microwave Modules.

SCOTCOMMS
Open Tues-Friday 10am-12.30pm 2pm-5pm
Sat 9am-1pm. Closed Monday
25 Morton Street, Edinburgh 15
Tel: 031-657-2430

Please mention HRT when replying to advertisements. G4NXV. HAM RADIO TODAY AUGUST 1985
KENT

Thanet ELECTRONICS
95 Mortimer St, Herne Bay
Tel: (0227) 369464
Open Mon-Sat 9-5.30pm except Thursday 9-1pm

MIDDLESEX

AMCOMM
Authorized Icom dealer
OPEN 10am - 5.30pm TUES-SAT. CLOSED MONDAY
NORTHCOM Bldg, MARGARET MIDDLESEX
TEL: 01-422 0965

YORKSHIRE

NOTTINGHAM

R.A.S. (NOTTINGHAM)
P. Owner: GRIUS
3 FARNDON GREEN: WOLLATON PARK NOTTINGHAM: TEL: 0802 202267
Open: Tues-Fri 10-5.30, Sat 9-5
YAESU: FDJ, ICOM: TONNA
HALBAR: WELZ, ANTENNAS & OWN QWS H.F.

SCARAB SYSTEMS
AMATEUR RADIO SOFTWARE
I COM STOCKISTS
39 Stafford Street, Gillingham 0634-570441
Please see main advertisement

DON'T LEAVE IT TO CHANCE!
— GIVE YOUR BUSINESS A BOOST
BY ADVERTISING IN HRT
PHONE 01-437 0699 FOR DETAILS

HAM RADIO TODAY, AUGUST 1985
ADVERTISERS INDEX

Aerial Systems ........................................... 5
A.K.D. Ltd ............................................. 21
A.J.H. Electronics ...................................... 21
BNR&ES ............................................. 21
Cirkit Distribution .................................... 11
Commutech Ltd ........................................ 21
Dressler (UK) Ltd ..................................... 7
Dewsbury Electronics ................................. O.B.C.
Farnborough Communications .................... 25
RAS Nottingham ....................................... 25
Scarb Systems ........................................ 25
Technical Software .................................. 25
Timestep Electronics ................................. 17
WPO Communications ............................... 21

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

73's Dave Gadsden, G4NXV, Advertisement Manager
**EQUIPMENT**

### USED AMATEUR EQUIPMENT?

**BUY & EXCHANGE!**

**SELLING?** I pay the BEST POSSIBLE PRICES for clean used equipment!!

**BUYING?** I have the BEST SELECTION of TOP QUALITY USED EQUIPMENT AVAILABLE!!

Whether buying or selling phone Dave, anytime, for a deal you've been looking for on:
- **HORNCOURCH (040 24) 57722 ANYTIME**, or send SAE for latest list to:
- **G4TNY AMATEUR RADIO 132 Albany Road, Hornchurch, Essex RM12 4AQ.**

### 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.

### CARDS/STICKERS

#### CARDS / STICKERS

**PLASTIC / MEMBERSHIP / CARDS**, laminated cards, lapel badges, all made to your specification. KARDLINE, P.O. BOX 206, Woolton Bassett SN4 7EZ. Tel: 0793 853406.

**O.S.L. CARDS.** Many designs, reasonably priced. Free samples, please state if S.W.L. DEROGATION PRINTING, Whitwell Rd., Sparham, Norwich NR9 5PN.

### KITES

#### KITES FOR PORTABLE AERIALS


### MISCELLANEOUS

#### PERSONALISED LEATHER BELTS

Hand-made in top quality leather goods to order £7.50 + P&. (colours brown, tan, black)

#### TRUTONE MODULES

For various repeater users. Consoles and timer module combined on one board. For operating a transceiver with any 2 meter F.M. repeater in the UK. Accuracy equipment providing both visible and audible warnings at end of pre-determined period when user is about to time-out through repeater. SAE for details. Price £12.00. Timer or toneburst board supplied separately at £7.50 each. All parts price list (minimum £25.)

**TRUTONE MODULES, 54 Norman Rd., Balford, Bristol BS9 5BH.**

### SERVICE MANUALS

#### BOOKS AND PUBLICATIONS

- **SERVICE MANUALS**
  - Ham Concord 2, Ham multimode 2, Ham Jumbo 2, Ham Viking, Ham Puma, Cobra 148
  - GtL DX, PC 879 and PB610. Colt 1600 DX, Trister 777, York 863, York 861. All above at £9.00 + £1.00 p&. Special conversion for FMCB rigs £30 + £1.50 p&. Details on request.

- **C.B.T.**
  - 1 Prince of Wales Road, Swansea. (Tel: 0792 463821.)

- **PUBLICATIONS**
  - 132 Albany Road, Hornchurch, Essex RM12 4AQ.

#### DRAWING

- **TRUTONE MODULES, 54 Norman Rd., Balford, Bristol BS9 5BH.**

### HOLIDAYS

#### SELF-CATERING CHALETS.

Explore by day, DX by night. My aerials, your rig £15-£120 per chalet per week. Green, Goats, Crhylean Tintagel, Cornwall. Tel: (0840 212262).

#### RTTY

**RTTY - CW - AMTOR**

Now on the Dragon Complete set of Programs & Hardware to convert your DRAGON 32/64 into a complete communications terminal.

- Morse transceiver
  - Program (Cassette) £10.75
  - Interface (Module) £17.50
- RTTY
  - Program (Cassette) £12.00
  - Terminal unit of models £39.00
- AMTOR
  - Program (Cassette) £39.00
  - Clock/switch Module £18.00

### BUSINESS OPPORTUNITIES

#### MULTIPLY your income/profits working with the breakthrough ENTREPRENEUR ASSOCIATION, part-time or full-time. Send SAE for valuable free details: Atlantic Press, Dept P8 (1), 9 Cork Street, Mayfair, London W1.
COMPONENTS

RESISTORS, CAPACITORS. 1,000 mixed carbon film, 1/4W, 1/2W, 2%, 5%, 10% resistors £2.95 + 50p P&P. SAE for details to: D.J. Hooker, Romney Marsh, Electronics, Clark Road, Greatstone, New Romney, Kent TN28 8PB.

HEATHKIT U.K. spares and service centre. CEDAR ELECTRONICS, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel: 0684 73127.


BATTERIES. Rechargeable batteries. 12 volt. 2.6 Amp Hour £19.00. 6.6 Amp Hour £22.00 including VAT and postage. Other voltages and capacities available. Allen Electronic, Penybont, Waunfawr, Caernarfon, Gwynedd. Tel: (0286) 85400.


Rig Doctor.

POWER SUPPLY REPAIRS. We offer a fast repair service on most makes of D.C. power supplies in the 1 to 30 amp range, dropper circuits, etc. also fitted. For full details please ring 0536 743496.

MORSE TUTOR

FOR SALE Liner-2, good condition £80 o.n.o. Ring Robin Vesma, 0580-892637, evenings after 6pm.

WANTED

 turnovers tran- sitors, IC's etc into cash. Contact Coles Harding & Co., 103 South Brink, Wisbech, Cambs. Tel: 0945 584188. Immediate settlement.

RESERIES, SPECIALIST COMPONENTS FOR TRANSMITTERS. UNICO COMPONENTS, BRISTOL. 01-635 5000. SERVICING 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-METER AND 70CM. POWER AMPLIFIERS WITH AND WITHOUT PATCHING. ALIGNED AND READY FOR USE. DUE TO EXCHANGE FlUCTUATIONS WE CANNOT PRICE. SEND S.A.E. FOR FULL LISTS.

SOFTWARE

BEEBCOM (see Micro'Net, May 1985). BBC to BBC file transfer over air, error free, using no special hardware. Tape plus manual £6. With source code, £10. Demonstration, £1 SAE for details. STATE CALLSIGN WITH ORDER, CTP SOFTWARE, 107A Shacklewell Lane, London E8 2EB.

HAM RADIO TODAY JANUARY 1985 Please mention HRT when replying to advertisements. 58
Microwave Modules Ltd is a full time professional organisation, established over 16 years ago in 1969, and currently employs over 30 full time staff based in our two modern, purpose built factories. In addition, a similar number of Outworkers are involved in assembly and mechanical operations.

**OUR EXTENSIVE RANGE . . .**

Our product range now exceeds 50 individual items in total and is the widest range available from any one manufacturing company. Our technical resources have enabled us to not only become the largest and most successful designer and manufacturer of R F Products, such as Linear Amplifiers and transverters, but also designers and manufacturers of innovative microprocessor and digital products such as The Morsetalker, MMSI, and the RTTY to TV decoder, MM2001.

**ALL BRITISH . . .**

Every product in our range is designed and manufactured in the UK by our own employees, and wherever possible British Components are utilised.

**GUARANTEED . . .**

All Microwave Modules Products are Fully Guaranteed for 12 months. This includes all semi-conductors and PA Transistors. We have built our reputation around our customer service and back-up and it is second to one.

**OUR RANGE OF LINEAR AMPLIFIERS . . .**

### Table of Linear Amplifiers

<table>
<thead>
<tr>
<th>PRODUCT</th>
<th>INPUT POWER</th>
<th>OUTPUT POWER</th>
<th>MODES OF OPERATION</th>
<th>Pre Amplifier</th>
<th>POWER REQUIREMENTS</th>
<th>RF **</th>
<th>PRICE INC VAT</th>
</tr>
</thead>
<tbody>
<tr>
<td>MML144/30-LS</td>
<td>1 or 3W</td>
<td>30W</td>
<td>SSB</td>
<td>12dB</td>
<td>13.8V @ 4A</td>
<td></td>
<td>£160.90 (p&amp;p £3.50)</td>
</tr>
<tr>
<td>MML144/30-S</td>
<td>10W</td>
<td>50W</td>
<td>FM</td>
<td></td>
<td>13.8V @ 5A</td>
<td></td>
<td>£150.00 (p&amp;p £3.50)</td>
</tr>
<tr>
<td>MML144/100-S</td>
<td>10W</td>
<td>120W</td>
<td>AM</td>
<td></td>
<td>13.8V @ 12A</td>
<td></td>
<td>£199.95 (p&amp;p £6.00)</td>
</tr>
<tr>
<td>MML144/100-LS</td>
<td>25W</td>
<td>120W</td>
<td>CW</td>
<td></td>
<td>13.8V @ 14A</td>
<td></td>
<td>£199.95 (p&amp;p £6.00)</td>
</tr>
<tr>
<td>MML144/200-S</td>
<td>3, 10 or 25W</td>
<td>200W</td>
<td>CW</td>
<td></td>
<td>13.8V @ 20A</td>
<td></td>
<td>£299.00 (p&amp;p £5.25)</td>
</tr>
</tbody>
</table>

**CONNECTORS . . .**

144MHz Products — Our standard connector on these products is SO239. We use a high quality PTFE socket of superior quality, but we are able to supply the choice of BNC or ‘N’ type at no extra charge. Please specify.

432 MHz Products — The MML 432/30-L’s fitted with BNC connectors, ‘N’ type available, please specify. The MML432/50 and MML432/100 both have BNC input sockets and ‘N’ type output sockets. If this is not to your preference please specify when ordering.

**DATA SHEETS . . .**

A full printed data sheet is available on each product, and is free on request.

**CATALOGUE . . .**

A copy of our latest catalogue can be obtained free of charge on request.

**AVAILABILITY . . .**

Our products are normally available from stock, either direct from ourselves or any of our 75 UK outlets.
NEW PRODUCT NEWS

IF YOU'RE THINKING ABOUT C/W YOU MUST READ THIS!

* Iambic Keyer
* Dash/Dot Memory
* Keying Speed 1 — 55 wpm
* Built In Side Tone Oscillator And Speaker
* Headphone Socket
* Variable Weight Control * Side Tone Volume And Pitch Control
* Switchable Automatic/Semi Automatic Keying/Tune Control
* Operation From Internal Batteries Or 9 — 15v.
* External Supply * Low Current Drain
* British Made
* Selectable Positives or Negative Keying
5 YEAR GUARANTEE
Only £49.95 + £3.00 P&P To Include External Power Leads And Plugs.

POCOMOTOR AFR2000 RTTY ALL MODE DECODER
AFR2000 with built-in display now available. Write for details.

(Now with CW option) From £425

Stockists of DAIWA — MET ANTENNAS — MUTEK — WOOD & DOUGLAS — TASCO TELEREADERS — MICROWAVE MODULES — ICS AMTOR — AEA PRODUCTS — DRAE

Dewsbery Electronics, 176 Lower High Street, Stourbridge, West Midlands.
Telephone: Stourbridge (0384) 390063/371228
Telex: 337675 TELPES G

Instant finance available subject to status. Written details on request.