INTERFERENCE — is there a breakthrough in sight?

CHEAPER STILL!
PF1 pocketphone conversion

PROJECTS
Converters for the Modula or any HF receiver
RTTY decoder and serial interface

REVIEW — Datong audio speech processor
The AE Connection

Head Office:
504 Alum Rock Rd, Alum Rock, Birmingham, B8 3HX
Telephone: 021-327 1497/6313

If you want to buy Yaesu

If you want to buy Yaesu equipment from any of the authorised dealers above. Your local contact is only a phone call away.

* Factory backed spares availability * Technical expertise *
* Service back-up * Comprehensive range in stock * Regular Manufacturers contact.

Don't leave it to chance. Our advice is free and there's no obligation.

Yaesu MUSEN
VOLUME FOUR NO 6 JUNE 1986

REGULAR COLUMNS

LETTERS ........................................... 6
SQUELCH ........................................... 7
RADIO TODAY ....................................... 10
MICRO' NET ........................................ 18
METREWAVE ......................................... 21
RADIO TOMORROW ................................. 34

CONSTRUCTION

POCKETPHONE FUN – A PF1 FOR 70 ............. 23
Chris Lorek, G4HCL, tunes into 432-435MHz.

THE MODULA CONVERTERS ...................... 38
S Niewiadomski describes how to receive all the HF bands.

RTTY DECODER AND SERIAL INTERFACE ....... 50
Homebrew some computer hardware for amateur radio use.

FEATURES

INTERFERENCE ..................................... 14
G4JKS and G3UFB look at the past, present and future of this persistent problem.

AERIAL BENT IN EIRE ............................. 31
A DXpedition to get across the pond on 2m, by Dave Green, G40TV.

GET ONTO HF CHEAPLY part 2 ................. 40
Old can be very good as long as you know what you’re looking for.

THE MET OFFICE .................................. 56
Weather forecasting the professional way by Ken Michaelson, G3RDG.

REVIEWS

THE ASP – A PROCESSOR WITH A DIFFERENCE? 28
Ian Poole, G3YWX, evaluates the Datong speech processor.

AN 'ACE' HEADSET FOR MOBILING? ........... 43
Pete Metcalfe, G8DCZ, wonders is it legal?

STRAIGHT KEY EVENING 1986 .................. 8
ADDENDUM .......................................... 13
100kHz AND DOWN POSTSCRIPT ............... 45
NEXT MONTH IN HRT ............................ 49
ADVERTISERS INDEX ............................... 49
FREE READERS ADS ............................... 59
CLASSIFIED ........................................ 64
EMPORIUM GUIDE ................................. 65

Ham Radio Today is normally published on the first Friday in the month preceding cover date. The contents of this publication including all articles, designs, plans, drawings and programs and all copyright and other intellectual property rights therein belong to Argus Specialist Publications Limited. All rights conferred by the Law of Copyright and other intellectual property rights and by virtue of international copyright conventions are specifically reserved to Argus Specialist Publications Limited and any reproduction requires the prior written consent of the Company. © 1986 Argus Specialist Publications Ltd.

ABC

ICOM are proud to launch their new flagship. The IC-751 was good, the new ICOM IC-751A is even better. With a general coverage receiver 100KHz - 30MHz it is a full featured all-mode solid state transceiver that covers all the WARC bands. The IC-751A has an excellent 105db dynamic range and features pass band tuning, notch filter, adjustable AGC, noise blanker and RIT. A receiver pre-amp provides additional sensitivity when required.

On C.W. the electronic keyer is standard and 40 w.p.m. at full break-in is possible. The FL32 500Hz C.W. filter is fitted as is sidetone on receive mode. On SSB the new FL80 2.4KHz high shape factor filter is fitted.

The high reliability transmitter, full 100% duty cycle designed for SSB, CW, AM, FM, RTTY and RTTY, with a high performance speech processor to enhance the IC-751A transmitters and AM transmitters are possible from the transceiver or from the HM12 mic supplied. The IC-751A is fully compatible with ICOM auto units such as the AT500 automatic antenna tuner and the IC-2001 linear amplifier. Options available: PS35 internal A.C. P.S.U., EX310 voice synthesizer, SM6 and SM10 desk mics and various filter options.

The IC-751A is fully compatible with ICOM auto units such as the AT500 automatic antenna tuner and the IC-2001 linear amplifier. Options available: PS35 internal A.C. P.S.U., EX310 voice synthesizer, SM6 and SM10 desk mics and various filter options.
ICOM

IC-02E/04E Handportables

These direct entry micro-processor controlled handhelds, one for 2 metres, the other for 70 centimetres. Scanning, 10 memories, duplex offset storage in memory and odd offsets also stored in memory. Keyboard entry is made through the 16 button pad allowing easy access to frequencies, duplex, memories, memory scan and priority. They have a LCD readout indicating frequency, memory channel, signal strength, transmitter/output and scanning functions. A range of accessories include the HS10 Headset and boom microphone, HS10SB PTT switch box with pre-amp, HS10SA voice operated (VOX) switch box. The IC-2E and IC-4E still continue to be available.

New Retail Shop

We are pleased to announce that we have moved to a new larger retail shop. This will be managed by Andy G6MRI and is situated on the corner of Stanley Road and Kings Road, Herne Bay, Kent. Tel: (0227) 369464. Give it a visit for demonstrations and advice on anything to do with your shack. BCNU.

You can get what you want just by picking up the telephone. Our Mail Order department offers you free same day despatch whenever possible, instant credit, interest free H.P. Telephone Barclaycard and Access facility. 24 hr answerphone service.

WANT TO LEARN MORE?

Telephone us free-of-charge on:

HELPLINE 0800-521145.

Mon-Fri 09.00-13.00 and 1400-17.30

This is strictly a helpline for obtaining information about or ordering ICOM equipment. We regret this service cannot be used by dealers or for repair enquiries and parts orders. Thank you.

IC-290D/25 Watt Mobile

290D is the state of the art 2 meter mobile. It has 5 memories and VFO's to store your favourite repeaters and priority channel to check your most important frequency automatically. Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz. The squelch on SSB silently scans for signals, while VFO's with equalising capability mark your signal frequency with the touch of a button. Other features include: RIT, 1KHz or 100Hz tuning/CW sidetone. AGC slow or fast in SSB and CW. Noise blanker to suppress pulse type noises on SSB/CW.
AMATEUR RADIO IN THE WORLD

Sir, Your readers may be interested in
a practical example of what is
sometimes represented as the
entrenched conservatism of the world
of amateur radio.

Last year, on May 25th, the
Frensham Heights School Amateur
Radio Club celebrated the school's
60th anniversary with a day on the
air. Working on 15 and 20 metres, six
operators mounted a 12 hour spon-
sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
eral basis the feasibility of national
and international DX contests, spon-
sored by 'off-the-air' subscription,
organized to raise money for Third
World projects was considered. Fol-
lowing in the wake of Bob Geldoff's
mighty exploits, the title Radio Aid
world projects was considered. Fol-

sored contest. We raised £300 from
staff, pupils and parents, but rather
more significantly we made contacts
with a licenced aid official in Sudan
(STSALR, Alastair Scott-Villiers).

Through this contact we are now fin-
cancing a crop planting project being
implemented by three schools in
drought ridden Kordofan Province.

From this link up there developed
the notion of an international network
of radio amateurs raising money for
aid and development work. Through
the medium of amateurs in the Third
World, contact would be made with
local small scale projects and funding
would be made available. There
emerged too the idea of regional and
school radio clubs adopting specific
aid projects under the general aegis of
the aid organisations. On a more gen-
erg
the Americans use a similar format for their RAE equivalents as do other administrations. One doesn't notice US amateurs having contempt for their system, and industry in this country certainly respects the quality of qualification represented by the C and G exams.

As one who runs a very successful private RAE course with a 100% pass rate last year and with 13 candidates well prepared for this May's exam, I feel that I am reasonably familiar with the level of knowledge required to obtain a pass. I can assure your writer that the "loud mouth and pin" approach with which he seems so familiar would not be likely to assure success.

I would venture to suggest that if the RAE were to be raised to the level of a vocational qualification, as he advocates, then the number of passes would be considerably lower than it is at present. There would probably be an insufficient readership to support the publication of the several amateur radio magazines that are on the bookstalls today and he may find himself without a job to thumb.

With reference to your correspondent, Mr Richards, he would seem to have been misled, the pass mark for the RAE in common with many other public examinations is about 40%

L N Buck, GODLR.

As an article published in May 1986 HRT pointed out the US system of examinations is radically different from the RAE and does not allow easy comparison between the two. For example, Mr Buck, they do use multiple choice questions but they also publish the questions, answers and even the so called distractors. What you along with many course tutors may have found, that a certain amount of valuable teaching time must be spent explaining the technique of answering multiple choice questions.

MODULA ON THE SHORTWAVES?

Sir, Regarding the article on the Modula HF Receiver. I am an active shortwave listener who also enjoys construction and modifying electronic equipment, receivers etc. I bought your magazine hoping perhaps the Modula was not just another receiver dedicated to amateur bands only with SSB and CW reception, but it was! Pity because I am searching for a diagram to enable me to construct a receiver like the Modula, but with converters that will bring in SW broadcast bands, (my favourite DX area is 90 and 60m) and maybe even MW! The reception on these bands requires very selective and sensitive receivers with good dynamic range to cope with the high QRM levels, but the only circuits I have across are for ‘novelty’ general coverage beginners sets with no digital frequency readout and no selectivity etc.

So what about it HRT, why not capture a few constructing SWLs to your readership, and you will be the only magazine to cater for SWL tastes with some decent circuits.

Steve Parry.

The first problem with what appears to be a quite simple project is that all the SW broadcast stations use AM, something radio amateurs gave up sometime ago. However, we hope to be publishing in the near future an AM/FM adaptor which will work off any transmitter/receiver with an IF on 10.7MHz. Once you've got the AM receiver, there are no problems making the converters for the bands you want to listen to. Although, if you want all the trimmings as well, this can get a bit complicated. Digital readout is available on the Modula and since your selectivity is only as good as your receiver and the Modula gives superb reception...

Finally, a magazine is only as good as its authors so the challenge has been made, can you help?

TARNISHED COUNCIL?

Sir, The news item in your April issue regarding the 1987 RSGB President misses some important points.

1. Why has the RSGB announced the election of G8VR as executive vice-president in Radcom but concealed the "election" of Mrs Heathershaw from the membership? This typifies the obsessive Masonic secrecy which pervades the way the RSGB Council conducts it's affairs.

2. The only other person to hold the post twice during the last thirty years was John Allaway in recognition of his outstanding service to amateur radio worldwide. Whilst Mrs Heathershaw may have been a good ambassador for amateur radio in the UK, she is clearly not in the same league as G3FKM.

3. It is a very sad reflection on the members of Council that none of them saw fit to propose any other candidate since unanimous votes are always suspicious.

4. I can confidently predict that for 1988 a "prestige" President who has only a very nebulous connection with amateur radio with be "elected" to celebrate the RSGB's 75th anniversary.

I urge members to lobby the RSGB Council to correct the damage that has been done to its public image before it is too late.

Peter L. Crosland, G6JNS.

If one can determine public opinion by our post bag, it seems, Peter, that no one gives a damn about the RSGB presidency.

TALKBOX SOLUTION

Sir, Further to my letter (published February '86 HRT), in which I refered
to problems with the front end FETs (Q1 and Q2) in the FM Talkbox 2m receiver. I thought you may like to know that these problems have now been resolved and that the receiver is now working. Thanks to some timely assistance from Tony Bailey, G3WPO.

The problem of apparent low gain, was found to be due to parasitic oscillation of both 3SK85 transistors, in spite of the use of ferrite beads on their respective drain leads.

Substitution of the correct device (3SK60) cleared this particular problem. Work is now proceeding on the associated transmitter. The only slight difficulty that I have had to overcome is that I have had to file down the edges of the boards to fit them into the box. This is not easy after the boards have been assembled, so check beforehand.

Another useful tip, whether building from kits or otherwise is to lay out all the components on a large sheet of white card and then tape them down. Each component can then be checked for type, value and tolerance where applicable this information is written immediately adjacent to each component on the card. By reference to the circuit diagram and/or component list, each item on the card is then assigned its component reference number, which is also written on the card. This serves as a cross check to ensure that the correct devices are used when assembling the PCB.

Dennis Hickman, GW4ZTE.

SHRINKING PLANET?

Sir, You greatly improved the appearance of my Oscar 10 orbit chart before reproducing it on p36 of Dr Gee’s interesting article in the March 86 issue (Working Oscar 10). What a pity that you somehow decreased the diameter of the earth in the process. Fortunately anyone wishing to use the chart need only redraw the earth circle in the same position but about one sixteenth of an inch greater in radius.

Although drawn in 1983, the chart is still sufficiently accurate for most purposes today. Up to date values of apogee and perigee are given in ‘Oscar News’ and in the weekend bulletins from Uosat Oscar 9. They are about 36, 350 and 4100km at present. Eccentricity is still about 0.6.

Harold Meerza.

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

AN INVITATION TO

STRAIGHT KEY EVENING

Organised by Edgware DRS/Ham Radio Today

80m CW on Thursday 29th May

Like last year, we will be awarding the ‘best fist’ as determined by our panel of CW buffs, a prize of a Hi Mound HK808 Deluxe straight key. The key is set on a hefty marble plinth that will ensure that it will stay where you want it. It retails at £39.95 but was kindly donated to the evening by Amateur Electronics of Alum Rock, Birmingham.

Starting at about 1900 BST and finishing when your arm gives up, call CQ SKE or answer one of the calls from the special event stations. The suggested frequencies are between 3.520 and 3.580MHz with QRP at about 3.550MHz. Please send your comments on keys, ‘fists’ and equipment to John Bluff, G3SJE, 52 Winchester Road, Kenton, Harrow, Middlesex.

Listen out for GB4HRT during the day and GB3SKE and GB4HRT in the evening.
EXCITING BOOKS FOR RADIO ENTHUSIASTS

VHF/UHF AIRBAND FREQUENCY LIST
This frequency manual is without doubt the most comprehensive list of VHF/UHF aircraft listings available in the UK. Of vital importance to the airband enthusiast or indeed any keen VHF/UHF listener it sets out in a very easy to follow manner full details of a whole host of stations. Every known UK airfield equipped with radio is listed together with the appropriate frequencies. Included are GAF, RAF, USAF, MOD, Naval fields on both VHF and UHF bands. There are also air to air frequencies, the Red Arrows frequency, and much more. See how much you have been missing! £3.95 + 45p p&p

OCEANIC HF AIRBAND SUPPLEMENT
This little guide sets out to explain to the beginner how the hf band works in relation to air traffic. It contains full details of the world aircraft frequency bands in the range 2 to 23 mHz together with control frequencies and those commonly used for Oceanic control. Also included are many VOLMET frequencies, the Search and Rescue frequencies used by RAF helicopters and Nimrods, the HF RT network, London Company frequencies, European control centres etc. An ideal companion for the hf airband listener. Send today for your copy. £1.95 + 35p p&p

SCANNERS OPERATORS GUIDE TO THE VHF/UHF SPECTRUM
Many listeners have asked for a guide to the wide VHF/UHF spectrum and to meet this request we have recently published this frequency manual. It covers the range 27 to 1300 mHz and has been specially prepared for the UK listener. Anybody who has used a scanning receiver will know that the wide frequency range involved means that it is difficult to know exactly where to listen. This guide takes all the guessing out of scanning. It lists all the services throughout the wide spectrum together with both simplex and duplex frequency splits. If you’ve spent your hard earned money on a scanning receiver or are considering buying one you’ll find that this publication contains a wealth of information that has previously remained un-published!! £3.95 + 50p p&p

WORLD RADIO RTTY HF FREQUENCY LIST
Just published at the request of many would-be RTTY listeners. It gives comprehensive listings of the World RTTY frequencies together with time schedules for much of the news and press bulletins. If you are at all interested in this most fascinating medium then you’ll most certainly need a copy of this guide. £5.95 + 75p P&P

AIRBAND HANDBOOK £4.99 + 50p post
WORLD RADIO & TV HANDBOOK£17.95 + £1.50 post.

WHAM RADIO TODAY JUNE 1986
9

HAM RADIO TODAY JUNE 1986
The winner of our competition for a Kenpro KT400EE 70cm handheld is R D Sexton of Dursley, Gloucestershire.

The answers were A F H K M P.

More Power To Your Mobile

Want a bit more power than a 2m mobile rig at a very reasonable price? Well, ICS Electronics of Arundel who import the Alinco range of Jap amateur equipment, are now marketing the ALR206E which offers a compact 25W on high power, 5W on low. It also has ten memories and scan facilities on both the band and the memories all of which are operated from the keypad on the microphone. All this for the princely sum of £295 including VAT.

ICS have just received the linear amplifier for the handheld ALM203E which should boost its power to 30W and gives 10dB gain with a GaAsFET pre-amplifier. The linear plus handheld combination including the connecting lead cost £249.95 inc VAT and ICS can supply more details on (024 265) 590.

Coupled For Life?

The Amcomm 9000 antenna coupler is produced and marketed by the new 'conglomerate' of the amateur dealer world Amcomm/ARE. The unit uses a capacitively tuned T network and 1:4 toroidal balun to enable you to connect a low impedance (50-75) ohms transmitter output via 300 ohm balanced feeder to your antenna.

The coupler will tune from 1.7 to 30MHz with selection by means of a twelve position 'inductor' switch. The 'tune' and 'load' capacitors can be adjusted during operation to obtain minimum VSWR and can have up to 100 watts put through it. The unit costs £89 and is available from Amcomm/ARE at 373 Uxbridge Road, Acton, London.

Special Events

GB4LF will be operational during the fifth annual Llantrisant Festival on the weekend of 4/5th May. It will be using SSB and CW on 80, 20 and 2m from 10am until 6pm on each day. There will be a special QSL card available and SWL reports are also welcomed. The organiser, GW3POM can be contacted on (0443) 224532 or at Coed yr Esgob, Llantrisant, Mid Glamorgan.

The QSL cards the station will supply have been provided by the Shetland Island Tourist Organisation and illustrate ten different aspects of Shetland life. Further details can be obtained from GMOAVR on receipt of an sae to 4 Ladieside Brae, Shetlands (phone 080622 406).

Another island venture comes from the Binstead ARC who have informed us of their Isle of Wight award. All you have to do is contact ten stations on the island including the club station GOBAR for the VHF award, only five contacts (including the club station) are needed for HF. Send the details of your contacts with £2.50 to QSL/Awards Manager GIB2ZC, 4 Green Street, Ryde PO33 2QE.
The RSGB's National Convention took place at the National Exhibition Centre, Birmingham on 5th and 6th April. As Trevor Butler, G6LPZ, reports, this year saw discontentment from visitors, traders and even the organisers.

Hall 3A once again housed the RSGB's main rally of the season. All the big names were there, plus a large flea market for components and second hand items, a programme of lectures, on-the-spot morse testing and a large RSGB Stand with smaller ones for the committees. Talk-in was performed professionally by the local Raynet group, who also advised on traffic problems and areas to avoid.

The entrance fee of £2.50 for adults (half price for children) upset a number of exhibitors. One told me that while anyone determined to attend would, the price deterred those who might have otherwise gone and bought on spec. He went on "This is about a £1 or £1.50 too much, other rallies are not so expensive." What is the answer? It was suggested that a smaller hall would be adequate. In such a large environment, much of the atmosphere associated with amateur radio rallies was lost. The whole thing was too modular, each stand was like a separate little shop, with no overall hustle and bustle.

Whatever the problem, it has been estimated that the numbers attending were some 1000 less than on the Saturday last year and 1500 down on the Sunday, with all the major retailers reporting a lower takings figure than last year. The organisers declined to confirm or deny these estimates.

Organisational Problems

The RSGB came in for some criticism of its organisation of the show. One importer told me he was still receiving paperwork connected with the exhibition as late as the day before it opened. In some cases, the car park passes were sent out so late that traders had already arrived in the Midlands as the passes arrived at their offices. On arrival at the hall on the Friday, stands were half built, electricity, in a number of cases, not connected and telephones not working.

Provisions for exhibitors were reported as fair to poor. A small bar was provided, but only limited catering facilities were available. Visitors to the show were often queuing for up to 30 minutes for the hot food counter although the bar seemed to do a roaring trade.

Anyone expecting a catalogue of who was there, facilities available, lecture programme etc was in for a surprise. They were given a free folded sheet, that was, in some places, illegible. Traders were hoping for a smart catalogue and many offered to buy space in such a publication. When it became clear that the organisers were not going to provide one, Thanet offered to organise its publication. This offer was refused.

It was not a good weekend for those fine men from Herne Bay - their stand was still being built two hours after the show opened. They had some carpet laid to add a professional touch, only to discover that the hall floor was painted, and the wet paint was trodden onto their stand! In the view of a director, it was truly an 'amateur' exhibition, in every respect.

Morse testing was available in a side room. It had been announced that, with effect from April 1st, the RSGB would operate the morse testing service. The fee at the NEC was £7 - the same as the Society intends to charge.
US Testing Over Here
Readers of G3ZAY’s recent article on US licensing may like to know that a number of US voluntary examiners are working in the UK and have expressed a willingness to arrange FCC tests wherever possible. Although the new rules (paragraph 2) do not allow them access to the upper half of the 2m band over there, where many of the local repeaters are to be found. A full licence gets around this problem. Further information is available from the Membership Services Department, RSGB, Lambda House, Cranborne Road, Poole Bar.

Ear, Here!
We have heard more news of NDXE, the new station mentioned in last month’s Listening On...
column. The programming will include live concerts, sporting events, worldwide phone-ins, international weather and pop music. To ensure ‘quality transmissions’ they will be using a 100kW stereo shortwave transmitter and 100 foot rotatable log periodic antenna to deliver “three million watts of power”. The station will be giving away three dimensional QSL cards amongst other things, and hopes to be on the air from 4th July. If you would like to know more about NDXE, write to the headquarters at PO Box 569, Opelika, AL 36801, USA.

Two books have just come onto the market specifically for the shortwave listener. The first is the fourth edition of Dial Search by George Wilcox. George has designed the book as a listeners checklist and guide to European broadcasting and is an essential reference for UK listeners. The book includes two “unique” maps; MW and LW lists of European stations that can actually be heard in the UK and their operating times and languages spoken; and the music notation of 80 signature and interval tunes.

The book costs £3 plus 30p p&p and is available direct from George Wilcox at 9 Thurrock Close, Lower Willingdon, Eastbourne, East Sussex BN20 9NF. The second book comes from our sister company, Argus Books, and is called Scanners by Peter Rouse, GUIDKD. As a reference guide to the scanning receiver user, it covers not only the equipment — what it does and how to use it — but also has several chapters on communications theory and practice. The book costs £7.95 and is available by post from Argus Books, Freepost, Hemel Hempstead, Herts HP2 4SS (please add 10% for p&p).

From Our Man In Japan
Kiyohiro, JP1MDT, reports on the Japanese amateur radio scene.

One feature of Japan not often realised by Westerners is that Japan is about twice the size of the UK with about twice the population. However, due to the interior of the country being very mountainous, the population is concentrated far more than in this country. Add to this the fact that there are nearly 700,000 radio amateurs and you’ll realise that the 2m band is very crowded! One effect of this has been that there are no repeaters permitted on 2m. Another effect has been that manufacturers have developed selective calling systems. The DCL system may already be known to you as Kenwood (better known as Trio here) and Azden have already sold sets with the system here. Yaesu Icom and Standard have chosen the system known as Amateur Quinmatic System (AQS). This is fully compatible between the three manufacturers and many new models are now on the market in Japan with the system incorporated in the design. AQS is a five way system that allows multi-function use of selective calling and data exchange, allowing many stations to use the same channel at the same time without mutual interference. It does this by utilising the capture effect of the FM system, without audio degradation. The basic features are:

1. Callsign squelch which means that the squelch only opens when the right callsign is sent.
2. Code squelch which is similar to 1. but uses five digital figures for group or club calling.
3. Channel access enables automatic selection of free or empty channels or for returning to the calling channel.
4. Code memory is for selecting five group codes, two callsign modes and one CQ mode.
5. Data message transmit mode which requires the optional display and contains three statement data messages/memories (which can be up to 14 characters long) for transmitting to recipient stations. These are used for leaving a message when the amateur is out, sending QTH/QRA information and the like. It can also be used when mobile for logging or QSL records.

The AQS is compatible with the CAT system that Yaesu market and uses serial data.

New Miniature VHF/UHF RF Power Modules
A new range of miniature class C (FM) RF power modules have been introduced by Seraken KK primarily for handheld or portable transceivers. The modules size is only 10mm by 10mm by 40mm which is less than half the size of conventional units used in most mobile and base transceivers. There are two versions, one for the 2m band which is rated at 6.5W, at 12V for 20mW input and 3.6W at 9.6V for 20mW input, the 7cm CH-122CM gives 7W out for 12V and 150mW in or 4W for 9.6V and 150mW in.

The two modules are designed to work over a very wide voltage range starting at 7.2V and up to a temperature of 80 degrees.

New Products In Brief
Tono have announced an in car mobile mic repeater system using a micro handheld (200mW on 80MHz) to a linear sized unit that matches any mobile transceiver. Puma have a dual band 144/432MHz FM handheld. Standard have launched a new 25W dual ban mobile with AQS and twin LCD display of both frequencies which will be called the CS500. Icom have released a 10W 2m mobile with AQS with the name IC26 and you’ve guessed it, Yaesu have a new dual banded, the FT3900, with AQS and optional FMPI-1 display. Mizuho have a pocket sized 80m SSB/CW transceiver on the market with 25W output and finally, Kenwood have announced a 1W 1200MHz Tx/Rx with matching 1W amplifier.

Did You Know...
In Japan, we mainly use vertical polarisation for DX on most VHF/UHF bands and that several stations have worked Australia on 6m. There is quite a lot of activity on 10m FM and also on 1200MHz FM. We have repeaters on 70cm and 1200MHz...
NEW FROM KENPRO

FULLY COMPUTERIZED HAND HELD KT220 EE/T

With facilities not yet available in other brands, look at the outstanding list of features and incorporating Kenpro's Legendary quality. This is a Top Line transceiver which should be amongst the most expensive, but our low overheads make it the Best Value for money available today.

- Built in LCD Clock
- 10 Memories for 10 Repeaters
- 4 Scan Mode
- "Scanlock" locks out unwanted channels
- 3.5 - 5 Watts Output
- 1750 Tone Burst
- CTCSS, DTMF, & Auto Dial
- Very Sensitive L/Noise Rcvr
- Auto Battery Save Function

Don't forget the trusty economy version continues to be available.

KT 220 C/W ST ACC Basic £229.00
KT 220 C/W Nicads etc £249.00
KT 200 C/W ST ACC Basic £185.00
KT 200 C/W Nicads etc £189.00
KT 400 C/W Nicads etc £209.00

Full range of accessories available
Post, PK & Ins Transceivers £5.00

HP/PERSOAL LOANS

Hi-TEC WORLDWIDE LIMITED
Importers, Exporters and Distributors of Specialist Communications

584 Hagley Road West, Quinton, Birmingham B68 OBS.
Tel: 021-421 8201 (24hr) Telex: 334303 TXAGWM-G.

SELEETRONIC

ANOTHER FIRST FROM THE UK's LEADING SUPPLIER OF 934 MHZ PERSONAL RADIO EQUIPMENT

MT 370 — 934 MHZ HAND HELD TRANSCEIVER

- FEATURES *
  - 20 CHANNELS
  - 10 MEMORY CHANNELS
  - FULL SCAN FACILITY
  - HIGH PERFORMANCE R.F. OUTPUT
  - 5W + 2W SWITCHABLE
  - VERY SENSITIVE RECEIVER
  - OUTSTANDING AUDIO QUALITY
  - HIGH CAPACITY BATTERY PACK
  - HALF WAVE WHIP ANTENNA

BASE ADAPTOR, PJ-31A
This multi-purpose unit is a power supply, automatic charger and a 5 Watt audio amplifier with volume control.

REMOTE ADAPTOR, FZ-214A
Simply plugs into handset and allows remote use of the keypad loudspeaker/microphone section.

MOBILE ADAPTOR, WD-3
Use this adaptor for a more permanent installation. The handset plugs into the adaptor without the battery pack.

NICAD CHARGER, PJ-34A
Mains battery charger for 7.2v nicad pack.

NICAD PACK
7.2v 1500mah replacement nicad battery pack.

MOBILE ADAPTOR, PJ-33A
Fitted with a cigar lighter plug, this unit will charge your handset from the car's power. Also included is a 5 watt audio amplifier with volume control.

MOBILE ADAPTOR, PJ-34B
Fitted with a cigarette lighter plug, this unit will charge your handset from the car's power. Also included is a 5 watt audio amplifier with volume control.

HPC-3T
Mobile Boot Lid Mount.

HPC-3R
Mobile Gutter Mount.

203 HIGH STREET, CANVEY ISLAND, ESSEX
Telephone: Canvey Island 691481

HAM RADIO TODAY JUNE 1986
Interference
Is There A Breakthrough In Sight?

Radio frequency interference (RFI) was quoted recently as being "one of the twentieth century contents of Pandora's Box". Certainly it must have brought as much misery to many people as some of the Box's traditional contents.

Interference is perhaps the bane of the radio amateur's operating life. Although the problems run deep, their effects can be limited. Here Hilary Claytonsmith, G4JKS, and Neil Brinkworth, G3UFB, provide a background to our war on interference.

Barney Owl only uses his station between 4am and 7am these days. The hash and birdies from the local TVs and computers make non-local contacts impossible at any other time. For Sid Scared the 2m band is only "open" when both of his neighbours go out, or go to bed. However Fred Fearless can operate at any time of day. Unfortunately, Fred and his family have no friends in their street. Fred's neighbours are unimpressed by his own interference free TV and hifi. They are encouraging Fred and his family to move house by various very unsubtle means.

These three rather simplistic examples indicate some of the problems which the radio amateur can experience in the day to day pursuit of his hobby. How did this sorry state of affairs arise? Could things be improved and have other countries been more successful in dealing with this situation?

Design Flaws

These problems are not there because they lack technical solutions. Nearly all the technical solutions required to combat RFI have existed for a long time. Some of them are just standard "good engineering practice" while many more are well known in the electromagnetic compatibility (EMC) world. If these solutions are implemented at the design stage of a product, they are neither expensive nor difficult.

Yet they are not used — why?

One common reason is the failure of designers to appreciate that RF currents exist at all! Even among professionally qualified engineers, many regard decoupling, earthing and screening as aids to circuit stability, rather than aids to achieving EMC. Nowhere is this more apparent than in the field of digital electronics. The use of good decoupling, adequate earth returns and logical signal path routing by digital circuit designers, would not only reduce RF radiation but also improve circuit reliability, by enhancing noise margins.

Another common reason is lack of design integrity. Today, designers are neither trained nor encouraged to consider EMC as part of good design. Frequently the designer is asked to do only as much as is necessary to ensure that the design meets its specification. Provided the legal requirements are met, a company has no incentive to consider the EMC rating of a product, as rarely does this appear to damage them financially.

Legal Eagles

The lack of social and legal solutions is historical. RFI problems are not new. The first UK legislation to consider radio interference, was the 1924 Wireless Telegraphy Act. Between the end of the First World War and the passage of this act, there was pressure to do away with amateur radio altogether on the grounds that it could not co-exist with other services without causing interference to them! Professor W. H. Eccles, a member of the advisory council of the Wireless Society of London (later to become its president) wrote at the time "It is not impossible to devise laws to impose restrictions upon the emission of waves as will preclude interference with the public radio service of the future and yet allow liberal opportunity for the experimental study of wireless telegraphy".

Fortunately for us, considerable persuasion from various quarters led to the 1924 Wireless Telegraphy Act including provisions for amateur radio licences. Today as then, a common feature of RFI related legislation is that it only comes about after considerable pressure and inevitably several years late.

It is not surprising, therefore,
that the majority of RFI legislation in this country since 1924, has been to protect public broadcasting and other "essential" services. Both the general public and the essential services have considerable political clout and they are not slow in coming forward when they have a problem.

The RFI story in the USA has been remarkably similar. The Federal Communications Commission (FCC) was established in 1934 and the majority of the FCC regulations since then, have also been concerned with the control of interference to broadcasting and the essential services. Today the situation of interference received by radio amateurs is much the same. Internationally, amateur radio is not a "protected service". It has no legal protection against interference from "non-transmitting" sources. Most regulatory authorities categorise it as a non-essential activity. What little practical protection the amateur does have, is afforded by regulations designed to protect public broadcast reception. You may have some success in getting amateur band interference reduced if it also affects broadcast reception. However the allowable interference levels are still often much too high to protect the weak signal operation common in amateur radio circles.

We are not alone in this area though. Many Private Mobile Radio (PMR) users are also concerned about RFI. Already there are "no-go" areas for mobile radio users in several towns. In a rapidly expanding communication based society, our problem today, could well become many other people's problem tomorrow.

**Victim Vulnerability**

The situation of the susceptibility or electromagnetic vulnerability (EMV) of electronic equipment is less clear cut. Although no specific regulation recognises it, technically it has always been the responsibility of the "victims" to keep unwanted radio signals out of their equipment. This has been the policy of most regulatory authorities throughout the world, including the Post Office (and now the DTI) in this country. However it was not until 1984 that our DTI had any real power to regulate EMV. The 1984 Telecommunications Act gave it powers to control the EMV although they do not require domestic electronic equipment to comply with any mandatory standards as yet.

Currently the EMV performance of broadcast television and radio receivers is specified in BS 905 (1985). This standard only applies to equipment containing broadcast receivers and primarily it is aimed at controlling their susceptibility to Citizens Band transmissions. Compliance to BS 905 gives no guarantee of protection against 144MHz transmissions, for example, and it does not require the level of directly picked up radio signals to be measured at all.

Ironically, this was almost entirely the radio amateur's fault. Frequently the radio amateur either helps to cure peoples' breakthrough problems, or he closes down, even though it is not his fault. As a result, amateur radio transmissions produce comparatively few complaints compared with the deluge which arise from Citizen's Band operation. The RSGB was not represented on the relevant British Standards Institute (BSI) committee when this standard was first prepared, although an RSGB representative does sit on this committee now. Hopefully the radio amateur's view will be considered when, or if, any further changes are made.

In Europe an European Communities' (EC) immunity standard is being prepared, and the British contributions are made by the committee responsible for BS 905. The EC standard is based upon existing standards in several of the member countries, including Germany, where a mandatory standard has existed for several years. Although the first issue of this standard is not likely to be strikingly effective in keeping out radio amateur's breakthrough, all the member countries will be required to make it a mandatory national standard before too long.

**The US Experience**

In the USA, the FCC did not have adequate power to regulate EMV until the successful passage of the much publicised "RFI Bill" of 1982/83. It seems strange that in a country that prides itself in it's protection of oppressed minorities, the embattled radio amateur received so little protection.

Up until 1950 the 7,000 to 8,000 per year EMV problems that did occur, were dealt with individually by FCC officers. The explosive growth in the use of television receivers in the 1950s changed all that. The number of complaints grew so large that by 1958, the FCC was forced to fall back on correspondence to deal with many of the complaints. FCC officers only made on-site investigations if they had the time.

This created quite a few problems and the ARRL decided to encourage the setting up of local RFI committees. These consisted largely of local radio amateurs, although they received considerable support from the FCC. They were intended to provide experienced advice to the radio amateur, to offer practical assistance in conducting tests and to give information on points of contact with other bodies. Their achievements depended both upon the character and experience of the members and upon the amount of time and money they were willing to put into running the committee. Inevitably as a voluntary organisation, the RFI committee scheme has had some failures as well as some successes. It maybe that much of their success was the result of their "united radio amateur" image.

The first of the RFI bills designed to deal with EMV was put before the United States Congress in 1972 but it failed to become law. Similar bills were presented in every session until...
1982 with eventual success. However, even now three years afterwards, although the FCC has the power to regulate EMV they have decided not to make compliance with any standards mandatory. Many people thought that the passage of this “RFI” bill in 1983 would compel manufacturers in the USA to reduce the effects of radio signals on their products — it did not!

An American National Standards Institute (ANSI) committee is preparing a draft EMV standard for issue in the spring of 1986, although it will cover television receivers and video tape recorders only. (Yes — the ARRL are represented on this committee). The FCC are not going to make compliance with this standard compulsory, as they are expecting a high degree of voluntary compliance. In the USA as here, the influence of the electronic equipment manufacturers is powerful and this standard is unlikely to be very demanding.

In practice, EMV standards rarely will be set to cope with “worst case” situations as to do so would place an unreasonable burden on both manufacturers and users. These standards are likely to be based on more average situations. We should beware of pinning too much hope on such standards however. Imagine what would happen in interference cases where the complainant has bought some equipment with the label “interference immunity to BS ***” on the rear. He may not be impressed by your comments that his equipment is not up to scratch any more then, than he is now! Also we may find that more attention is paid to the licence condition that requires us “not to cause undue interference". Many of our stations are not designed with this requirement in mind. Carefully read the “Interference” chapters of the ARRL Handbook, RSGB Handbook, and the Radio Amateurs Examination Manual for more details on keeping your signals out of the houses.

Where To Now?

So where do we go from here? Firstly, we must remember that more members of the general public come into contact with amateur radio through interference cases than by other means. Not surprisingly our public image is poor. It could be made better though if we were better prepared. It would help if local clubs organised more interference related activities. At the moment we treat interference like a form of “electronic VD”. Do you have any books or articles on solving interference problems? Do you have a free copy of “How to improve your radio and television reception”, obtainable from the Post Office? Could you demonstrate that your own TV, radio, or hi-fi is free from “interference”. Could you explain to a neighbour what his problem really is, without offending him and in a way that he can understand? (Try practicing your routine with a friend or maybe make a competition of it down at the local club). Do you know all your legal rights? When that unwelcome knock on the door comes, would you project the image of a responsible person who knows what he is doing, or would you seem like someone who just “tinkers with radio”?

Secondly, love them or loath them, the RSGB is the only organisation we have that is in a position to press the UK amateur’s case upon manufacturers and local or national Government. The Society is keen to improve our enjoyment of amateur’s radio but how well they do this depends upon your active support. The letters that arrive at RSGB HQ are the barometer of amateur concern and at the moment the EMC pressure is low. Sounding off over the air or down at your local club will achieve very little. If you can’t write to HQ to say how concerned you are, then you probably don’t care too much. The frequent complaints about subscription levels and trivial expenditure will not encourage the RSGB to raise the tiny sum per member they currently spend on EMC matters either. If the current subscription sounds too much, compare it with what you spend per year on the rest of your hobby. In a world where you get what you pay for, the UK radio amateur already receives from RSGB more than his money’s worth.

Lastly, here is where you can help. If you’ve been interested enough to read this far, then probably you’ve had some interference experiences of your own. Don’t keep them to yourself. Your success story could be passed on to other radio amateurs with the same problem. Your problems and failures, either technical or social, could form the evidence required to solve the problem nationally. Please help by writing down your experiences in detail and sending them to the authors (QTHR).

Solving the radio amateurs’ EMC problems is a job for us all as “them”. A more RFI free world for tomorrow, will not arrive, if everyone leaves it up to everyone else today.
NOW EVEN BETTER
The RX-4 Multimode Receive Program

Great as it was, this program has now been improved even more. Better performance and more features you have asked for.

CW software filters and autotrack control to 250wpm.
RTTY 4 baud rates covering all the usual stations.
AMTOR receives lost of commercial TOR transmissions also.
RTTY and AMTOR have Normal/Reverse switching, selectable Unshift-on-Space and tuning is really easy and accurate using the on-screen frequency scale which shows the tones directly.
SSTV receives 8, 16 or 32 second frames, has keyboard grey-scale adjustment and 2 modes of picture storage.

This is easily the best performing, best value program ever for the SWL.

For SPECTRUM (not 16k), BBC -B, CBM64, VIC20 (+ at least 8k)
For BBC -B, CBM64, VIC20 (+ at least 8k). Tape £20, disc £22

BINARY STAR TECHNOLOGY
AMATEUR RADIO SOFTWARE

SATELLITE TRACKING ON THE COMMODORE 64 AND 128
This superb program tracks all of the following - (May be altered by the user)
RS 5, 7, 8, 9, 10, OSCAR 9, 10, 11, NOAA 8, 9, JAS 1 - SPACE SHUTTLE - MOON

Available on disk only. 12.95

RTTY TRANSCEIVE ON THE CBM64 OR VIC-20 (8k) Speed 5 to 50WPM (59WPM on CBM64)
Full transceive using a simple interface. Programmable stores for station details etc. Type-ahead on transmit.................. Cassette 5.95 Interface kit 14.95

MORSE TUTOR FOR THE BBC/CBM64/64/48k SPECTRUM (Speed from 5 to about 50WPM) - Novice to beyond the test. Morse keyboard, random letters/figures, punctuation, plain language. SENDING TUTOR FEATURE Decodes morse from a key plugged into a joystick port .................. EPROM (BBC ONLY) 11.95 Cassette 5.95

RTTY TRANSCEIVE VERSION 3 (FOR THE 48k SPECTRUM ONLY) Baud rates 45/50/75/110
Split-screen buffer Auto PTT control. Tuning indicator LED
Cassette only 7.95 Microdrive 9.95

Interface kit inc. edge-connector, pcb, relay and all other components 14.95 Ready built add 5.00

SAE FOR MORE DETAILS FOR BBC/ELECTRON/SPECTRUM/ZX-81/CBM64/VIC-20

Prices INC post & packing.

Orders to DEPT HR1, 6 Waveney Terrace, Haverhill, SUFFOLK CB5 8DZ

BINDER S
FOR YOUR VALUABLE COLLECTION OF HAM RADIO TODAY MAGAZINES
'SMART' EASY TO USE 'TOP QUALITY'

£5.20 inc P&P

To ASP Readers Service, PO Box 35, Welsey House, Welsey Road, Hemel Hempstead, Herts HP2 4SS (0442-41221)
Please supply... Ham Radio Today Binders £5.20 Inc. P&P Total £... (Please make cheques payable to ASP Ltd.)

Name
Address
Please allow 21 days for delivery

AMATEUR RADIO & ELECTRONICS HOBBY FAIR:
To be held at WEMBLEY CONFERENCE CENTRE SATURDAY 5th SUNDAY 6th JULY 1986

The first two day fair to be held in the South of England.
A major new event in the radio amateur calendar.
Over 200 retail & manufacturers stands — plus lots more.

Host of special groups. Star prize raffle/tombola etc. Special souvenir programme will make this an occasion to remember for all.

See future publications for more details.

The Organisers are:

AMATEUR RADIO PROMOTIONS, LTD.
Woodthorpe House, Clapgate Lane, Birmingham B32 3BU. Tel: 021 421 5516
As this edition of Micro' Net goes to press many people in Scotland are counting the cost of what can only be described as their own pet hurricane. This was not the usual forgettable type but the real McCoy with winds of 95mph at ground level and gusting to 153mph.

Dave Bobbett, G4IRQ, fights against all the odds to bring you the news and takes a look at some software and hardware that has taken his fancy.

New amateur radio programs still seem to be coming onto the market in a steady trickle. This month we'll be looking at one written for the Spectrum series of micros and at the new 'Astrid' hardware and software combination for use in satellite reception and transmission. We will be considering the RF interference levels of one of the newer micros. First of all though we appear to have:

Spots Before the Eyes!

Neil Taylor, G4HLX has written a "location aid for the radio amateur", better known as Spot, which is designed to run on the ZX Spectrum 48k or the Spectrum Plus computers. In common with the trend towards better use of graphics in programs, Spot can display a map of Europe and then superimpose such things as station locations and transmission paths (ie great circle routes) upon it so that the user can relate to the data visually. A location can be defined in any of the IARU (ie Maidenhead), QRA, National Grid Reference or good old Lat and Long systems and it has the added advantage of being able to accept 'mixed' data. You can enter your own location in IARU format and that of the other station(s) in one of the other formats and regardless of whichever system you choose, the program will sort it all out for you.

Conversion from one locator system to another can sometimes lead to ambiguities and when or if these occur the 'suspect' figure on the screen has its background colour changed so as to warn you of this possibility. If you are interested in achieving the greatest accuracy possible then the manual recommends that you stick to Lat and Long nomenclature although I think that the majority of users would be quite happy to sacrifice a little accuracy in...
favour of having the convenience of being able to input in any location system data.

The package also sports a number of other facilities such as overlaying the map with major square boundaries in the form of a grid and giving a contest log facility. The latter will produce RSGB format log pages with 25 QSO's per page complete with the distance and radial ring points plus sub-totals at the foot of each page. All the screen information can be printed out in the form of a 'screen dump' to a suitable printer (ie an Alphacom 32 or ZX printer) and there is even a facility which is capable of plotting 1,000 'stations worked' locations on the display — hence my comment about spots before the eyes!

The package is fully micro-drive compatible, is supplied in cassette form and comes with a six page manual. This A5 sized booklet (that's about 15 x 21cms, or 6" x 8.5" if you still work in pounds and groats) did suffer from a failing common to the majority of documentation in that the photocopying wasn't of quite a good enough quality to give a nice crisp image. It could also have benefited further from not being photo-reduced — the print was rather small and not everybody is blessed with perfect eyesight.

However, having said that, the manual did more than redeem itself in a number of respects. Firstly, the printing consisted of a proper typeface and not a normal dot matrix or NNLQ (Nowhere Near Letter Quality) output. Secondly, by adopting a pleasant and easily readable style which neither patronised nor bored the user — other software authors please note! Thirdly, the layout of the booklet was good and made things easy to find.

**Astrid's Seeking Satellites Again!**

One of the problems with the tone standards used by the UOSAT space vehicles is that the days of the computer cassette interface really do seem to be numbered. The CUTS tones uses in these spacecraft were originally chosen precisely because they were compatible with the cassette interfaces of a wide variety of home micros and thus interfacing was made much easier. However, as more and more machines are being produced as being solely disc-based systems, the problem of interfacing is becoming more widespread. This is rather a shame when you consider that these newer machines generally tend to possess exactly the graphics abilities which are so useful when used with the CCD camera systems etc, currently being commissioned on UOSAT2. In the education field the popularity of the BBC micro and the upwardly compatible nature of the new

---

**Questions Arising**

At the time or writing, we haven't been able to lay our hands on an Astrid in the flesh so there are a couple of questions which spring to mind. Firstly, it would be interesting to know if the receiver is able to track the doppler shift of the satellite's down-link, as this would lead to an improvement in the duration of useable signal (I know of at least one Rx which will do this automatically). Secondly, bearing in mind the fact that the vast majority of computers use RS232 standards for their serial ports, is there a 1200 baud ASCII output available at RS232 levels? We will endeavour to find out . . .

**Return Of The Sprogii**

Continuing on the theme of the seemingly mutually incompatible nature of computing and radio operation, I had the chance recently of comparing the spurious emissions of a more up to date computer with that of the BBC workhorse I normally use. The micro in question was the Apricot F1, a 16-bit MSDOS machine using a 8086 CPU running at 4.67MHz. I must admit that the test was rather rough and ready in that the spurri

---

**Table 1 Micro RF emissions**

<table>
<thead>
<tr>
<th>APRICOT F1</th>
<th>BBC 'B'</th>
</tr>
</thead>
<tbody>
<tr>
<td>144.375 +/- 25kHz moderate</td>
<td>144.100 +/- 50kHz v strong</td>
</tr>
<tr>
<td>144.675 +/- 50kHz moderate</td>
<td>144.400 +/- strong</td>
</tr>
<tr>
<td>145.000 +/- 25kHz weak</td>
<td>144.675 carrier v strong</td>
</tr>
<tr>
<td>145.125 carrier v strong</td>
<td>145.250 +/- 25kHz moderate</td>
</tr>
<tr>
<td>145.500 +/- 50kHz strong</td>
<td>145.600 +/- 25kHz moderate</td>
</tr>
</tbody>
</table>

---

A white box solution to the problem of receiving UOSAT data on your home micro.

Master series will postpone the problem for a few years but for other users the question of how to get the data into a machine readable form will still remain.

In an attempt to overcome the receiver-and-interface-cobbled-together syndrome M M Microwave has produced a complete UOSAT receiving and interfacing package called Astrid. It is a 'black box' solution to UOSAT as it incorporates both a receiver for the 145.825MHz downlink and an interface which converts the tones into a binary data stream. I would guess that the system is aimed primarily at the education market where easily installed, ready to run demonstrations are essential to interest people in satellite technology. It could also appeal to those interested in the field who lack either the time or inclination to build their own.

Astrid is supplied complete with aerial and 8m of feeder which connects to a double conversion superhet receiver. The Rx is nominally turned to 145.825MHz (12kHz bandwidth) and its audio output can be fed either into a cassette recorder or directly through the internal tone decoder circuit to give a 1200 baud TTL level output.

The tape facility could be rather useful as it gives the user the option of either decoding data 'live' off air (and recording it simultaneously) if the computer generates too much noise, the tones can be recorded on tape with the micro switched off and then played back later when the receiver is out of circuit — also useful for when real-time demonstrations go wrong!
of each machine were measured by means of an FT208 handheld plus helical whip positioned about 2 metres from each computer.

Table 1 summarises the results. As you can see, the difference is quite dramatic, especially when you consider that only about 2 or 3 years separates the design of the circuit boards. The Beeb is characterised by half a dozen 'clusters' of interference which spread for about 50kHz or so either side of the central (strongest) interference frequency. The Apricot, on the other hand, only exhibited one 'cluster' group centred on 144.375MHz which extended only 25kHz either side of the centre frequency plus a single oscillator-derived carrier (as opposed to switching generated mush) which was on 144.675. The other point which was very noticeable was that the strength of the signals coming from the Apricot was generally very much lower than those of the BBC. In fact, the squelch control had to be turned a good way up above the 'just closed' position with the latter machine in order to dissuade the receiver's scan function from stopping on every channel!

Needless to say, I wanted to know why there was such a disparity between the two machines. The screwdriver revealed all, as the photos nearby show, the difference is not due to some swish hi-tech solution but is accounted for simply by means of the extra metal screening and strengthening components contained inside the box. The switched mode PSU (rearmost box in the picture) is totally enclosed and the major portion of the rest of the circuitry is covered by the ventilated metal cover at the front of the machine, although the screening doesn't extend underneath the main PCB which runs the length of the case.

It is interesting to note that the same treatment has been given to the monitor too, as you can see, it is only unscreened part of the VDU is the face of the CRT. This is worth bearing in mind if you are ever in two minds about whether to buy a plastic or metal cased monitor.

Er... About Prestel (Blush!)

Apologies are due to all those readers who have attempted to contact me via my Prestel mailbox since the last issue of Micro Net. By this time I wouldn't be surprised if you had begun thinking that I was a figment of my computer's imagination. The fact is that there have been some hardware problems at my end of things which have at last been sorted out. Those who have MBX'ed me will have had replies by the time this HRT reaches the shelves. If you haven't already got in touch, please don't forget that I always look forward to hearing from people.

If you prefer putting pen to paper please note that in addition to being able to contact me through the HRT editorial offices, you can also write to me direct at the address shown in the box.

Address Box
'Spot' amateur radio location aid for the ZX Spectrum and Spectrum Plus computers. Includes cassette and manual.
Price: £4.50 inc VAT and P&P
Available from: N P Taylor, G4HLX, 87 Hunters Field, Stanford in the Vale, Faringdon, Oxon SN7 8ND
'Astrid' Satellite Rx system. Includes aerial, feeder, receiver/decoder, PSU, test tape, manual and connecting leads.
Price: £149.00 inc VAT and P&P
Available from: M M Microwave Ltd, Ings Lane, Kirkbymoorside, North Yorkshire YO6 6DW Tel: (0751) 31620
To contact Micro Net:
'Micro' Net, Ham Radio Today, 1 Golden Square, London W1R 3AB
or:
D G Bobbett, PO Box 49, Colchester, Essex
Prestel Mailbox no 01-999-9045

please mention HRT when replying to advertisements. 73 G4NXV
Precisely as predicted activity on the 50MHz band tailed off markedly after the first fine raptures of February 1st and the succeeding days. This was to be expected. Formerly, the original 100 licensees were compelled to operate only during nine unsocial hours late night and early morning; now it was possible to come on to ‘six’ at any time.

If you did, what would you find? On a day to day basis, there is only modest, but very interesting, activity that demonstrated the potential of six in no uncertain terms. With users now compelled by the regulations to limit their transmitter outputs to something like 10 watts where gainy aerials were used (to stay within the prescribed limits of 20dBW PEP and 14dBW carrier power), it soon became evident that excellent results were being achieved. Contacts at 100 miles QRB became the norm under average conditions, often with the simple dipoles which a majority of stations appeared to be using — intimidated no doubt by the size of the “bedstead” they would need to haul aloft if they were to install directional antennas for the new band.

Dipole Pros and Cons

This brings one straight to the first question which many operators new to six have put: “noting the emphasis in ‘Metrewave’ on the use of good aerials to put the signal where it should go, and not all around, what is the thinking in respect of dipoles at 6m?”

Answer: better a dipole than nothing at all, even if it be no more than a thick wire one in the roof space. If you can make it of metal rod and put it outside on an existing rotating system so much the better. The metal can be readily obtained for free from TV aerial contractors, who, as has been said here before, are only too anxious to dispose of their piles of old Band 1 skyhooks languishing in their backyards.

Always mount your dipole horizontally: there is virtually no vertical polarisation at six. You will soon discover that it does not “squirt the RF antisocially in all directions”: you can utilise its characteristic directivity by pointing one of its lobes towards the source of the most wanted signals. No apology is offered for repeating here its basic properties and to emphasise its propensity to perform well, unlike those dreadful omnis that still persist on ‘two’. Just what could be done with a dipole and 10W was dramatically demonstrated only a week after the 50MHz band was released. An intense aurora developed, visible well down into southern Britain, and producing such an opening on two and ‘seventy’ that QSOs into the Baltic on those bands became routine. Meanwhile, on six the first phase of the Ar opening brought far south stations into contact with hitherto unheard northern stations on an unprecedented scale. If you were quick about it you could work five countries in ten minutes on the key (it took rather longer on SSB as you unscrambled the gargling noises).

But it was the expected second Ar phase two hours later (well after midnight) that opened the UK to Norway path for contacts, with a dipole and...
10W, with the greatest of ease for those staying up that late. To those who didn’t, there was the consoling thought that “... it’ll all happen again: the tropo season is right ahead,” so watch for the DX then.

The value of the three UK beacons became evident during the February Ar opening. Their ranges were enormously extended, and they were detected by operators who had never before heard them. There were even reports that GB3SIX, with its west facing antenna, had done what was expected of it and got itself heard across the Atlantic (though not for the first time).

Promoting Activity

Back to the problem of diluted activity on six and a question from many readers: “is there a case for a 6m activity night?” The answer came from many: “please don’t give us yet another activity night”, and they have a point. Already there’s 4m activity night on Tuesdays. The decades old CW activity night around 144.05MHz has been coinciding during 1985-6 with the newer 70cm Monday night “Alphabetical Competition” (the latter very desirable to promote more activity on 432MHz, which it has certainly done).

Instead of creating yet another activity night where 6m is concerned, would it not be preferable to try something quite different, namely to put out a CQ call on the band regularly on the hour to promote — and provoke — a response? It has often been said that if you don’t send a signal you won’t get an answer: a CQ call on the hour might result in a surprising reaction. You never know who’s listening. There may be many people, waiting on six, monitoring in the hope that someone somewhere would press the button or pound the key.

What does “on the hour” mean in practical terms? It means sending a CQ call on 50.2MHz at the 7, 8, 9 and 10pm peak activity hours whenever you happen to be in the radio room. It also means putting out calls at odd intervals in between to catch people who may have settled to their rigs since the last hour has passed.

Note the recommendation to use 50.2MHz. This on six is the equivalent of 144.3MHz on two, an SSB centre of activity, as the new jargon has it, but still a calling frequency to most people. Already apparent on six but sadly less so on two is the operators’ practice of sending CQ calls a few kilohertz away from the calling frequency to keep out of one another’s hair and to give themselves a better chance of earning a reply. If this were done more often on two the 144.3MHz calling frequency would be more tenable under lift conditions than it is now, when bedlam develops when two dozen powerful J3E signals simply cancel each other out.

No, this has not to date been happening on six. May the present spreading out trend continue, along with the substantial QSYs away from 50.2.

Where telegraphy is concerned, the frequency to monitor is 50.1MHz plus or minus a few kilohertz. You will find it sustains QSOs more effectively than sideband does.

Another question: “is FM frowned upon on six?” Answer: it shouldn’t be. To most human ears it sounds more pleasant than single sideband, and the bandplan provides for its use in the top 100kHz.

Yet another, from many class B licensees: “may I cross-band from 2m/70cm to 6m?”. Answer: indeed you may under the relaxed regulations that now allow this method of communication. Warning: never allow your callsign to be emitted through another station’s microphone into a band for which you are not licensed. With this proviso always in mind, it is useful for class B operators to enjoy a listening entré into the band to give them the feel of it against the time when the licensing authority may allow them to transmit on it.

"I'M GOING TO GET SOMETHING FOR SIX METRES — I RATHER LIKE THE IDEA OF HORIZONTAL POLARISATION..."
In the 1960s, life changed dramatically for the policeman on the beat in Britain, with the introduction of the first ever truly portable radio available, the Pye PF1 Tx/Rx, which was quite revolutionary in its time.

**What They Offer**

The receiver is a double conversion superheterodyne, with IFs of 10.7MHz followed by 100kHz. A battery economiser is used which effectively switches the receiver on for around 60ms every 600ms, thus prolonging battery life. When the squelch opens, this is defeated of course, and stays in the 'open' state for two seconds after the squelch has closed to allow for movement in any blind spots in coverage area. If you place a working receiver to your ear, you may hear a soft 'pulsing' noise showing the economiser to be in operation and the battery to be charged.

First there was the immensely popular PF70, then the two Wessies, now finally (well maybe...) Chris Lorek, G4HCL, converts (or should we say retunes) the Pye PF1 pocketphone.

A receiver is normally carried in your top pocket and it has its own small internal aerial. The separate transmitter is carried in a side pocket and taken out when required. A novel feature of this unit is that on depression of the PTT button, a 6" quarter wave aerial rod pops up giving better performance for a low power set than an internal aerial. I remember with amusement being at a football match in my younger days, watching a constable extracting the aerial which unfortunately went right up his nose on transmit!

With the improvement in technology, there has recently been a large number of these sets released onto the secondhand market, much to the delight of many amateurs. I have seen receivers sold for £1.50 each and transmitter/receiver sets at £8 a pair at rallies in the East Anglian area, with spare NiCad batteries at 10 for £1. You would normally however expect to pay slightly more 'off the shelf' from dealers.

One enterprising shop in Peterborough did a roaring trade by crystallising them up on the local repeater, since people were understandably reluctant to try to tune them up themselves. Well this article I hope will show you how simple it is, with the bare minimum of test equipment. It will certainly get you going for very little outlay, and a lot less than by buying a Japanese portable just to use on your local repeater.

**Channel Spacings**

The equipment was made for both 50kHz and 25kHz channel spacing. This means that the receiver will have either a +/-15kHz or a +/-7.5kHz filter fitted; the
matching transmitter will be preset to either 15kHz or 5kHz peak deviation. The transmitter may be modified simply by changing one resistor value, but receiver modification involves the change of a crystal filter. Unless you expect to receive reasonable strength signals at +/-25kHz spacing, for instance a repeater on the next channel, you probably won't have any problems. However, by opening up the receiver case you may discriminate between the two by the markings on the large metal crystal filter which are: filter type FC03219 : 25kHz spacing; filter type FC03208 : 50kHz spacing.

If you do have problems, Garex Ltd stock replacements although it would be best to check inside the receiver before purchase if you live in a congested 70cm area.

Crystals

These are available ex-stock from several suppliers on popular 70cm channels, the crystal frequencies required are:

\[
\begin{align*}
\text{Tx xtal freq (MHz)} &= \text{transmit freq (MHz)} \\
\text{Rx xtal freq (MHz)} &= \text{receive freq (MHz)} + 10.7
\end{align*}
\]

The crystal can size is HC25/μ; be sure to quote the PF1 when ordering to ensure the correct loading etc.

In the commercial band of 450-470MHz, subtractive rather than additive mixing is used in the receiver, which means that the image frequency will fall in the 70cm band. This can certainly be a great advantage, as if you have a choice of receivers then take a look at the rear serial number plate and note the frequency marked on it, if shown. Note that some receivers do not have this shown for security.

If you find one marked exactly 21.4MHz higher than your intended receive frequency then a quick retune is all you need, no crystal to buy! For instance a receiver on 454.750MHz will be fitted with the correct crystal to operate on 70cm channel RB14, 453.350MHz. Many suppliers do not remove the crystals as this entails removing a screening can and its associated tiny fixings as well as desoldering the crystal itself, more difficult than the usual exercise of unplugging a visible crystal.

Transmitter Alignment

Remove the case back and desolder the main board output link from the aerial connection. In its place connect a piece of coax, inner to the link tapping point and braid to earth, leading to a 50 ohm load (a 47 ohm ¾ watt resistor serves well) via a power meter or some form of power indication such as a diode probe or absorption wavemeter. You can now gently hinge the transmitter out from its case. Remove the screen by undoing the small nuts on the rear side of the PCB and desolder the existing crystal, replacing it with your own, keeping lead lengths short. Replace the screen. Take a look at the ferrite cores used in the set, you will need to make up a small non-metallic adjusting tool to fit these; I would suggest a filed down matchstick or knitting needle.

Set your multimeter to a low voltage range, ideally 1V max deflection, and connect the negative lead to supply negative. With an 18V supply, either from the battery or an external power supply, key the transmitter and referring to Fig. 1 tune the core of L1 for maximum voltage on the TR6 emitter test point. Note that this will be fairly broad, with a typical reading of 0.25V, do not worry if a definite peak cannot be achieved initially. Then transfer multimeter positive to TR7 emitter, tuning L2 and L3 for maximum, typical reading 0.4V. Transfer to TR8 emitter, tuning L4 and L5 for maximum, typical reading 0.7V. Now set your multimeter to the next voltage range up, around 2.5V ideally, and modify the other end of your matchstick into a flat screwdriver shape, for tuning the variable capacitors at the end of the board. Now adjust C41 for maximum voltage on TR9 emitter, finally retuning slightly the previously adjusted coils for absolute maximum voltage at TR9 emitter, typically 1.8V.

Now place your multimeter, set to a current range around 100mA, in series with the 18V supply. Set C53 and C56 for minimum capacity, ie vanes fully apart, and tune C47 for maximum current indicated on your meter. By now you should be seeing
some output power on your in-line power meter or diode probe. Set C56 for maximum capacity, ie vanes fully meshed, and tune C53 for maximum power output, then retune C56 again for maximum. Carefully readjust C47, C53 and C56 for absolute maximum output, you should be able to get around 100mW.

The internal aerial may now be reconnected, and although not absolutely necessary, you may if you wish slightly readjust C53 and C56 for maximum radiated power if you have access to a field strength meter, although in the past I have only achieved a very marginal improvement. Final frequency setting is done by adjusting C17, accessible through a hole in the screen, and may be done with a frequency counter if you have or can scrounge one, by a quick on-air check, or by monitoring on an adjacent 2m receiver tuned to one-third of the 70cm transmit frequency.

We now go back to L1 which is the phase modulator coil, again by an on-air check either on an adjacent 70cm or 2m receiver, tune L1 for absolute maximum transmitted audio level. The technical boffins amongst us may wish to use an audio oscillator on the microphone connection and a deviation meter coupled to an oscilloscope to do the job correctly; but when I first tuned one up ten years ago a loud "Haaarrrl" into the mike whilst getting deafened from my 2m rig worked just as well!

If audio level reports on 70cm are reasonable then I would leave the deviation setting alone, it will already be set to near 5kHz. However if every speech peak drops you out of the squelch then it appears you have a 15kHz deviation set. Don't worry, by altering the value of R9, a pre-set resistor value, you may vary the peak deviation to the required amount. I would suggest a miniature 1M potentiometer placed in line, at least until the required level is found, then replacement by a fixed resistor of the nearest value can be made. A useful test for deviation is by a friend switching between input and output on a repeater and comparing your peak audio level to that of the repeater, we can't all afford posh deviation meters!

The telescopic aerial originally had a small plastic disc fitted to the top, but these invariably get lost in commercial usage. To avoid damaging the facia features when in use, I would advise you add a similar form of protection to the top.

Receiver Alignment

Remove the case back and hinge the receiver board out carefully, you will need to slide the earphone socket out first. Now remove the large silver plated screen by undoing the four tiny securing nuts, two on each side of the board. Beneath this you will find the receiver crystal, desolder this and replace it with your 70cm crystal, then replace the screen, remembering to tighten the nuts. The positioning of this screen is critical to the tuning, so if you remove it for any reason again you will need to slightly retune the receiver to obtain the best possible performance. You will also see a further crystal outside the can, this is the 10.80MHz conversion crystal which should be left in place.

Before applying power, temporarily short out R51 to defeat the squelch, this will considerably aid tuning. Connect 9V either from battery or external power supply, and check you can hear squelch noise from the speaker or transducer. If not, then check the contacts on the earphone socket, this is often a cause of problems when the mating connection in series with the audio output becomes corroded slightly.

Now you will need to find a strong 70cm signal, I have known amateurs in the past to drive up to the local 70cm repeater site for this reason, but if you have a 2m rig then the third harmonic of this will perform adequately. Using your home made trimming tool, tune L2 for clearest reception, ie least distortion, of a signal with speech modulation. This is the crystal frequency adjuster, and will ensure that right from the start you will hear something. Otherwise you would be frantically tuning everything else with no results and probably make things much more difficult later on. Remember that if you use the third harmonic of a 2m rig with a 25kHz spacing set, your received deviation will be 15kHz peak, so bear this in mind and talk much further away from the microphone when testing to give lower deviation.

Once you've got the receiver on frequency, you'll need to gradually reduce the received signal strength, by varying aerials, transmitter power and so on. You may at this point connect an external aerial in place of the internal one if you wish to aid tuning. Having received a signal with a detectable amount of noise present, tune T2 and L3 alternately...
for the best quieting, reducing the received signal level as required. Now tune C2, C6, C11 and C18, again for the best quieting. Note that these adjustments will be fairly sharp, particularly C6 and C11, so take care.

If you intend using the internal aerial, carry out the final tuning of C2 with that aerial connected and the receiver mounted as far as possible in its plastic case to ensure the best performance. Once you cannot get any better quieting level on a weak signal, you can try slightly retuning L2 again for absolute best (least distorted) reception, and then remove the link from R51 to return the squelch to normal operation. That’s it, congratulations, you now have a fully tuned PF1 set-up.

There is one thing that some amateurs may contest me on. Some ‘alignment instructions’ photocopied and produced in an authentic looking light blue cover are sold at rallies, often alongside PF1s for sale. They instruct you to leave L3 alone and tune T3, well that isn’t correct! T3 should not need realignment as it is the 10.7MHz IF coil, and if you don’t tune L3 you’ll have a deaf receiver.

Receiver Improvements

If you find the weak signal performance rather lacking when portable, you may like to try fitting a 6" quarter wave aerial made from a piece of stiff wire. Put in place of the internal aerial, with some form of protection at the end, and a small coax socket fitted to the case top, it will allow you to plug in a whip or helical (Feb 86 HRT for a low cost high performance helical design) or an external aerial from the home QTH.

Batteries

Both batteries are rated at 80mA/H, in use they will give around 20 hours of normal operation in both the transmitter and receiver. There are three connection points at the top, the centre is always positive and the two outside connections are both negative, internally linked. To recharge them, use a current limited supply at 8mA, charging for 14 hours from a completely flat state. A standard PP3 battery charger circuit is ideal for the receive battery for instance.

Rally Hunting

The rally season is now in full swing, I hope you find a few bargains. If you have been following this series you’ll know what to look out for and more importantly what not to waste your money on, eg AM sets hoping for a simple FM conversion. Eventually more and more equipment featured in this series will no doubt become available on the second hand market as firms update existing equipment. As an example, at the time of writing I know of over 2000 Pye sets just waiting to be sold, makes you think doesn’t it?

This concludes the present series on converting ex-professional Pye equipment onto the amateur bands, thank you for all your letters and calls on the series, I have been pleasantly surprised at the large amount of interest shown, and it only remains for me to wish you — good hunting!

My thanks go to Mr B Bamber of Anglia Industrial Auctions for the loan of the PF1s photographed in this article.
HAM RADIO TODAY JUNE 1986

QUARTZ CRYSTALS

<table>
<thead>
<tr>
<th>STOCK CRYSTALS</th>
</tr>
</thead>
<tbody>
<tr>
<td>HCC-28</td>
</tr>
<tr>
<td>HCC-29</td>
</tr>
<tr>
<td>HCC-30</td>
</tr>
<tr>
<td>HCC-31</td>
</tr>
<tr>
<td>HCC-32</td>
</tr>
</tbody>
</table>

FUNDAMENTAL FREQUENCY RANGE |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>5 TO 10 MHz</td>
</tr>
<tr>
<td>10 TO 15 MHz</td>
</tr>
<tr>
<td>15 TO 20 MHz</td>
</tr>
<tr>
<td>20 TO 25 MHz</td>
</tr>
</tbody>
</table>

MADE TO ORDER CRYSTALS

<table>
<thead>
<tr>
<th>OVERTONES</th>
</tr>
</thead>
<tbody>
<tr>
<td>PRICE</td>
</tr>
<tr>
<td>-----------------------------</td>
</tr>
<tr>
<td>3rd OCT</td>
</tr>
<tr>
<td>5th OCT</td>
</tr>
<tr>
<td>7th OCT</td>
</tr>
</tbody>
</table>

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS, HP23 4LS

Specialists in used Pye Radiotelephone equipment and spares

Extensive range of guaranteed parts for Cambridge, Vanguard, Westminster, PF70, Olympic, Europa, Whitehall, Mascot, etc.

Suppliers to Emergency Services, Government and Public Authorities throughout the world.

Full range of REVCO VHF/UHF ANTENNAS suitable for P.M.R. and Amateur bands. Visit our stand at Amateur Radio Shows and Rallies to see the full range at special “post free” prices.


S.A.E. for free extensive list (please state product range required)

Established over 20 years.

We regret that we are normally unable to provide a technical data service: manuals, circuits, etc. (refer to articles in “HRT” for information)

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. 062 87 6114 (24 hr service)

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

BECOME A RADIO AMATEUR

FREE brochure without obligation from—

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

Government normally despatched by return

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS, HP23 4LS
Phone 0296 668848. Callers by appointment only

放射性材料

HAM RADIO TODAY JUNE 1986

6 m RS Here!

Why not explore this new and interesting band with the Cirkit 6m Transverter?

6m version

Get on the band quickly with this all mode linear transverter kit from 28MHz to 50MHz which can also be built for the 4m (70MHz) band (as featured in the January issue of Ham Radio Today).

High performance design suitable for modern transceivers can be driven to 50W pep 3DB or 1W CW from as little as 1mW drive. RF VOLT all-mode switching with adjustable delay for automatic VHT operation. Signal better than -35dB at 50W pep.

The receive section features -129 dBm (=0.08uV) sensitivity (SSB bandwidths 10dB SSB or 1W CW’FM from as little as 1mW drive. RF VOX all-mode switching with modern HF transceiver. Overall gain is +14dB. Separate Schottky ring mixers are used for 4 metre (70MHz) band (as featured to 50MHz which can also be built for linear transverter kit from 28MHz)

4m version

Get on the band quickly with this all mode linear transverter kit from 28MHz to 50MHz which can also be built for the 4m (70MHz) band (as featured in the January issue of Ham Radio Today).

High performance design suitable for modern transceivers can be driven to 50W pep 3DB or 1W CW from as little as 1mW drive. RF VOLT all-mode switching with adjustable delay for automatic VHT operation. Signal better than -35dB at 50W pep.

The receive section features -129 dBm (=0.08uV) sensitivity (SSB bandwidths 10dB SSB or 1W CW’FM from as little as 1mW drive. RF VOX all-mode switching with modern HF transceiver. Overall gain is +14dB. Separate Schottky ring mixers are used for 4 metre (70MHz) band (as featured to 50MHz which can also be built for linear transverter kit from 28MHz)

Cirkit Distribution Ltd
Park Lane, Broxbourne, Herts. EN10 7QN. Telephone (0923) 444111. Telex: 8817271 GECOMS-G (Attention QUARTSLAB)

All prices include VAT. Please add 60p for postage and packing.

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS, HP23 4LS
Phone 0296 668848. Callers by appointment only

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS, HP23 4LS
Phone 0296 668848. Callers by appointment only
Breaking through a pile-up need not require very high power and/or a fantastic aerial system since a good speech processor can be worth several valuable dBs.

Ian Poole, G3YWX, looks at the Datong Automatic Speech Processor which is definitely not a snake in the grass!

David Tong of Datong Electronics was once quoted as saying "Single sideband without speech processing is an outdated form of communication". This was never more true than in today's crowded band conditions when every bit of available power should be used to its maximum effect — the signal contains as much useful modulation as possible.

It is, of course, possible to increase the signal strength of a station by adding a linear or putting up a larger aerial; but surely with today's technology it is better to first make the best use of the power already available. Using a processor is a far more cost effective way of improving one's signal strength because even the most sophisticated processors will cost less than a linear or new aerial system.

The Need for Processing

Speech does not have the ideal waveform to modulate a transmitter efficiently. If it is viewed on a 'scope it will be seen that there are transient peaks followed by periods of lower intensity. This gives speech a low average power level when compared with the transient peaks. To make matters worse, the average level will also vary as the speaker places a different emphasis on some words or speaks closer to or further away from the microphone. These factors lead to a very inefficient use of a transmitter's power which logically should be improved. Fortunately the human ear is very tolerant of electronically processed speech used to increase the average power level as long as it does not introduce undue amounts of distortion.

Speech processing basically involves reducing the dynamic range of a signal. This is normally accomplished by clipping the speech waveform or altering the gain of an amplifier to compensate for changes in level of the speech. Both methods can be employed if required.

Speech clipping involves passing the audio through a non linear circuit which limits or clips the peaks and troughs of the waveform if they exceed a certain level. Depending on the amount of clipping applied, this will reduce the dynamic range of the audio and increase the average power. The resulting distortion products take the form of harmonics and inter-modulation. If the signal is clipped at audio frequencies then only the products which lie outside the required audio bandwidth will be removed. This still leaves the 'in band' distortion products which cannot be filtered out. The result of this is that the speech will sound distorted and if high levels of clipping are employed, it will actually reduce the intelligibility of the speech.

The way to surmount this problem is to generate a single sideband signal at a suitable frequency to be clipped. Again harmonics and inter-modulation distortion will be produced but they will fall outside the bandwidth of the SSB signal...
and can easily be removed. The audio can then be regenerated to produce a cleanly clipped signal with the absolute minimum of unwanted distortion.

In order to overcome the problem of level variations in the speech an audio automatic gain control can be used. These circuits vary greatly in their design, some having very fast time constants whilst others have slower ones. However, they are particularly useful in maintaining a constant level to a modulator or circuit so that a constant and known amount of clipping is employed.

The Datong ASP (Automatic Speech Processor) incorporates both an RF clipper with selectable clipping levels and a sophisticated level control. It is housed in a very smart aluminium fold round type case, with a front panel that has been well thought out so that in spite of the number of switches and LED’s it is uncluttered. It is certainly not in the same category as much of today’s Japanese equipment where the controls are too small for the British Standard Finger!

The microphone input socket is located on the left hand side of the front panel. The socket is the standard four pin type which can be wired to be compatible with either Yaesu or Trio equipment depending on the variant of the ASP bought. The two LED’s indicating the input level are located next to the microphone socket. They provide an ’at-a-glance’ indication of whether the voice input is within the wide acceptable range. If it is too low the LO light comes on, if correct the ‘ok’ LED lights.

Further to the right is the bank of push buttons. Six of them control the clipping level from 0 to 30dB in steps of 6dB. The remaining three select the input impedance (either 100K or 600 ohms), turn the unit off, and select a tone which can be used to set the output level. On the far right there is another LED, which gives an indication of speech present and background noise.

The back panel has three sockets and a small hole giving access to the output level pot. Two of the sockets are phono types for the audio output and press to talk lines. The third is a jack socket for an external power supply.

**Inside**

Access to the inside of the unit is by removing the four screws which hold on the feet. Then the top of the wrap around section of the case slides off to reveal the electronics and the battery holders.

The layout of the components on the board is neat and uncluttered, illustrating a well thought out board design. At either end of the board, there is a battery holder which take four HP7 type cells. All the switches and sockets are mounted on the board, except the microphone input which is bolted to the front panel using a “special” washer. This gives a good earth connection to the case and enables the microphone input to be directly decoupled to earth using the washer as the earth point.

The board itself is single sided with a few short wire links, which saves the added cost of having to use a double sided board with plated through holes, clearly unnecessary here. All the components are of good quality and in the unlikely event of a failure there should be no difficulty in obtaining replacements.

The Datong ASP employs RF speech processing which has selectable levels of clipping. Unlike most processors, the amount of clipping selected is accurately maintained by an audio level control. The circuits used to control these levels do not use any of the propriety speech processor IC’s. They have, apparently, been completely designed by Datong Electronics so that the performance is not set by the limits of the processor IC’s.

Following the circuit it can be seen that the audio is fed into a low noise amplifier, whose gain is controlled by sophisticated level detection circuitry. This circuit quickly determines the level of the incoming speech and retains the information even during speech pauses. In addition to this, extra time constants in the circuit prevent one off transients — such as dropping the microphone — from causing long term gain reductions. This means that the processor will smoothly follow any variation in speech level without the unpleasant effects associated with many simpler circuits.

The audio then passes into the clipper section where initially the level is predetermined. The signal is converted into single sideband at 60kHz which is clipped and filtered to remove the unwanted distortion products. It is, then, demodulated to give the clearly processed audio. The level of this audio is corrected so that it remains constant.

---

[Diagram of AF and RF clipping]

**Fig. 1 Comparison of AF and RF clipping. Note how it is possible to remove harmonic distortion.**

---

Please mention HRT when replying to advertisements: 73G4NXV.
regardless of the level of clipping chosen. The final stage is a buffer circuit in which the gain can be preset to suit the user's requirement.

In addition to processed speech, it is possible to generate a 700Hz tone for setting the correct level for the processor output. This is generated by switching in circuitry around the RF section of the processor so that the tone is generated at exactly the same level as the processed speech.

In Use

Setting up the unit proved to be a very simple matter. Having installed the batteries, the microphone was plugged into the processor which was connected to the transmitter via a supplied lead. The only remaining procedure was to set the correct output level. This was easily accomplished using the 'tone' button. The tone enables the processor output level to be adjusted to the correct setting. This feature is one I have not seen on any other processors and it proves to be particularly useful and effective for setting the level rather than guessing what it should be.

With the ASP on and the required level of processing selected, I noticed the three LED's on the front panel lighting up at various times. I must admit I dislike unnecessary flashing lights and frills but these gave a good indication of the audio levels and proved to be useful and not at all unnecessary.

When on the air on VHF using an aerial fairly close by, some RF feedback was noticed at high clipping levels. Any RF finding its way back into the processor will be particularly troublesome because of the very high audio gains which have to be employed. However the problem was overcome by adding some more filtering on the microphone input to ensure the unit was trouble free. Datong Electronics were informed of the problem and were helpful in sorting it out.

Reports received over the air proved to be very encouraging. They indicated that in the 6 or 12dB position, the audio sounded louder but in no way harsh. As the processing level increased it became louder but sounded more clipped. No reports indicated that the signal sounded unclear or unduly harsh as some processors do.

Other tests carried out using a tape recorder and a noise source proved the processor to be surprisingly good. Initially tests were carried out to investigate the reduction in speech quality with increased clipping. It was found that at 6 or 12dB clipping there was almost no reduction in quality, but there was a distinct increase in audio level. As the processing was increased, the lower intensity sounds like 's' and 'f' became more prominent as would be expected. Nevertheless the speech quality remained high and the speech did not sound distorted.

The final test was to set the noise level so that at 0dB clipping the signal just could not be copied. From this point the clipping level was increased in 6dB steps. It was found that at 12dB clipping, copy was possible but difficult; when using 30dB copy was perfectly clear. This demonstrated, if in a simple way, the value of good processing.

For normal use, the settings recommended by Datong are probably most suitable: 6 or 12dB for local contacts; 12 or 18dB for DX and 24 or 30dB for pile ups.

Summary

The processor proved to be an invaluable asset once the RFI problem was overcome. It gave considerable flexibility of operation and enabled the best level of clipping to be chosen for each situation with the minimum of fuss. The cleanliness of the processed audio was particularly impressive, and having spoken to people who have regularly been the cause of pile-up they say this factor alone can be worth several dB's.

Overall the performance of this unit was very good and the price tag of £82.80 makes it good value for money especially when compared to a linear or larger aerial system! When ordering there are two variants, ASP/A which has the microphone connections wired for compatibility with Yaesu equipment and ASP/B for Trio. Thanks are due to Dr D Tong of Datong Electronics for his assistance and to G4SVG for helping with some of the tests over the air.

---

**Specifications**

<table>
<thead>
<tr>
<th>Specification</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Degree of clipping available</td>
<td>0.30dB in 6dB steps</td>
</tr>
<tr>
<td>Frequency response at 0dB clipping</td>
<td>400-3400Hz ±3dB</td>
</tr>
<tr>
<td>Total harmonic distortion</td>
<td>0.5%</td>
</tr>
<tr>
<td>Automatic control range</td>
<td></td>
</tr>
<tr>
<td>Rin = 'LO'</td>
<td>1.4 to 200 mV ptp</td>
</tr>
<tr>
<td>Rin = 'HT'</td>
<td>10 to 1500 mV ptp</td>
</tr>
<tr>
<td>Maximum output level</td>
<td></td>
</tr>
<tr>
<td>External supply voltage range</td>
<td></td>
</tr>
<tr>
<td>Rin = 'LO':</td>
<td>800 R</td>
</tr>
<tr>
<td>Rin = 'HT':</td>
<td>200 kilohms</td>
</tr>
<tr>
<td>Internal batteries:</td>
<td></td>
</tr>
<tr>
<td>Max supply voltage (short duration):</td>
<td>35V</td>
</tr>
<tr>
<td>Current drain</td>
<td>15 mA</td>
</tr>
<tr>
<td>Dimenstions:</td>
<td></td>
</tr>
<tr>
<td>Width</td>
<td>184mm (7.2 inches)</td>
</tr>
<tr>
<td>Depth</td>
<td>153mm (6 inches)</td>
</tr>
<tr>
<td>Height</td>
<td>44mm (1.7 inches)</td>
</tr>
<tr>
<td>Weight including packing</td>
<td>11mm (0.4 inches)</td>
</tr>
<tr>
<td>Weight</td>
<td>1kg</td>
</tr>
<tr>
<td>Accessories supplied complete</td>
<td>with plugs for all connectors ie 4 pin mic plug</td>
</tr>
<tr>
<td></td>
<td>2 phone plugs</td>
</tr>
<tr>
<td></td>
<td>1 jack plug</td>
</tr>
</tbody>
</table>

---

30 please mention HRT when replying to advertisements. 73 G4NXV

HAM RADIO TODAY JUNE 1986
The idea of upping sticks and setting up an amateur radio station in some rare and exotic DX location must be one that has attracted many amateurs at one time or another. Unfortunately, turning the pipe dream into a reality is something that requires lots of planning and financial commitment and is not to be undertaken lightly.

When the idea was put forward at the West Kent Amateur Radio Society in the autumn of 1983, there was no shortage of enthusiastic potential participants. The idea was not to charter aeroplanes and ships to get to some remote island in the Indian Ocean but a more modest expedition to a European location; perhaps with a view to gaining experience and expertise so that a real DXpedition could be undertaken in a few years time. Our first decision was to plan for a journey in the summer of 1985 which at that time was 20 months away. This may seem a ridiculously long time in the future, but in the event we made full use of all that time in planning and making the necessary arrangements for the trip.

Our second decision had to be the selection of the location. A number of sites were considered on the basis of their relative rareness on the amateur bands. These included Andorra, Liechtenstein, San Marino and the Balearic Islands. This last idea would have made a very pleasant summer location although how much operating would have got done amongst all those topless holiday makers is another matter. But another idea put forward was not necessarily to go to a rare location, but rather to try to do something which had never been done before. It was Roger, G4BIA, who had the brainwave of having a go at making the first ever direct transatlantic contact on the 2m band. Out came our maps. The closest European location to North America was the west coast of the Republic of Ireland and that was what we eventually decided to try.

Now at last the real planning could begin. We decided on a two week expedition to commence in mid August 1985 with part of the time being spent in the Galway mountains and part on the small island of Inishmore off the west coast. Inishmore is the largest of a group of three islands making up the Aran group. The island it was thought would give us a real taste of DXpeditioning since Inishmore is served only by a passenger ferry. All gear, estimated at about one ton, would have to be manhandled onto the ferry, off the ferry and up to the site.

If we were to try contacting North America on 2m, we were hardly likely to succeed with an FT290 and a telescopic whip. We thought that to have the maximum chance of success, we would need a 2m transceiver with an excellent front end, a maximum legal power linear amplifier, four long yagis and a 40 foot mast with heavy duty rotator, as well as HF equipment for talk back purposes.

Fortunately, West Kent ARS already owned some of the equipment needed including an FT221 with MuTek front end, a pneumatic mast and a Ten Tec Argosy for HF. Had the mast not been available, we would have had to consider taking scaffold tubing which would have been far less convenient for transport purposes, although there would of course have been no need for the heavy duty rotator. How on earth we would have got a scaffold...
Putting up the aerials before the wind had really started blowing.

mast aloft with the antenna array which we eventually purchased is something we prefer not to think about.

Our next problem was to raise sufficient money to buy all the gear which we felt we needed. We began thinking of suitable potential sponsors until someone had a brainwave... Was there not a beer which refreshed parts other beers could not reach? And were we not trying to get radio waves where other radio waves had not reached? The answer was Heineken. Poste haste we wrote to them giving details of the expedition and its objectives and asked for their assistance. Yes, they said, they were interested and so a meeting was arranged with their public relations company in London.

At the meeting we had to be careful not to talk in technicalities of high gain yagis and sporadic E propagation effects. Our PR man asked us if we could produce a broadcast quality tape recording of the first transatlantic 2m conversation! The PR company sent a recommendation to their principals Heineken, who eventually offered us a substantial sum towards our costs and we were extremely grateful to them for it. So you won't forget which beer to drink will you?

The balance of the money needed was raised by donations from the West Kent ARS and a variety of fund raising events such as jumble sales, a disco, raffles and other nefarious means.

We also had to sort out how we were going to shift over a ton of equipment. In the end we decided on a Sherpa diesel van, kindly loaned to us for the trip by G4RPQ's employers, a Volvo 245 estate car and a Citroen Visa hatchback. In addition Tony decided to tow his caravan behind the Volvo.

At this stage we issued advance publicity and press releases which were well covered in the amateur radio press, in local newspapers and on local radio. We had made contact with a number of American amateurs interested in participating in the tests on their side of the Atlantic including Harry, K3HZO, who visited us in Tunbridge Wells on two occasions. He was to act as Stateside co-ordinator for the various US and Canadian stations who wanted to be involved.

The first time we were able to try out the new equipment in anger was the May 144MHz contest. Everything was erected, tested and given a good trial and whilst we only managed to operate for 19½ hours out of the 24, we nonetheless had a fairly respectable result to show for our efforts.

Eventually, August 17 arrived and it was time to set off on the expedition proper. The group set off at 1100 hours that morning and drove to the ferry terminal at Holyhead stopping several times on route. In the dock the vehicles were separated since the van was travelling under cover of an EEC Community Carnet and therefore had to travel as a freight vehicle. With customs formalities quickly completed on arrival at Dun Laoghaire the group drove across Ireland to Slieve Elva arriving at about 1500 hours on Sunday.

A number of the group walked up the mountain, but having reached what they thought was the summit they were unable to see the sea. The true summit was several hundred yards further away and separated from hard ground by a bog which was impossible for us to traverse, let alone getting the equipment across. A council of war was held. By now it was pouring with rain, and Jim, Alex and Brian were sent off to investigate any possible alternative ways of getting to the top of the mountain or failing to find an alternative west facing site.

Eventually, Brian returned with what appeared to be good news. He had discovered a site further down the mountain which overlooked the Aran Islands in Galway Bay and was complete with a friendly landowner who was willing to allow us to do as we pleased on her land. We drove to the site and found a heavily sloping field, part bog, with a narrow entrance gate. We decided that this would have to be it and managed to get Tony's caravan into the field by the armstrong method. We erected the tents and retired for the night.

On the next day, Monday August 19th, we got up early and began unloading the vehicles. It rained for most of the day turning the field into a quagmire but nevertheless we managed to get the aerials erected and both the 2m and HF stations on the air. Our evening sked to our UK co-ordination station Gerry, G4JZP, was made successfully. Our first 2m sked on the transatlantic path was moonbounce, but there was a heavy mist obscuring the moon and no echoes could be heard from our own transmissions.

By Tuesday, we had begun to fear that the mast head pre-amplifier, kindly loaded to us by MuTek, was not working. We, therefore, closed the station at 0230 hours and retired to bed. We were awakened at 0430 by the noise of a terrific storm raging out-
By lunchtime the storm had abated somewhat although there was still heavy rain. The damage was assessed and new plans made. No important equipment had been damaged although all packing cases had been ruined and the operating tent was in a parlous state. In addition, Roger's personal tent was all but destroyed. The army mess tent had suffered several corner tears as a result of the high winds to which temporary repairs were effected. It had not been the most pleasant of days!

The next day, the weather started somewhat brighter and a contingent was sent off to Galway to buy extra rope, heavy polythene sheeting and a new spade. The Galway party also took wet sleeping bags, bedding and clothes with instructions to find a launderette with lots and lots of tumble dryers. The remaining group members tidied up the camp as best they could and re-installed as much of the equipment as possible. It was confirmed that the mast head pre-amp was not working and it was therefore bypassed.

Skeds with North America were recommenced in the evening although no 2m signals were heard other than a few pings which could have been reflections from random meteors. Subsequently, we found out from America that they too heard pings at similar times. It does therefore seem likely that some signal was getting through but because of the heavy winds the aerials were now at minimum height.

On Thursday there was more rain and no 2m signals were heard other than some very weak auroral sounds. This may have been morse but they could not be resolved sufficiently well to claim as Au signals with any certainty. Because we now had the bulk of the mountain behind us our signals were blocked in all directions except for the sector between north and west. This meant that no European or British signals could be heard. Many European and North American stations were worked on HF but generally the bands were in very poor condition. Skeds back to the UK with Gerry, G4JZP, and Syd, G3A1O, were maintained on 40 and 80 metres without much trouble.

By Friday, weather conditions were getting worse and worse. Because of warnings of further gale force winds we had to add to the lashings on the remains of the operating tent and to another frame tent. The operating tent was now continually awash with mud and was virtually uninhabitable. Alex, who had been feeling ill for the last two days, decided that morning that he would not continue and was therefore driven into Limerick in order to make his way home by train and ferry.

The future of the expedition was now in doubt with some members of the group feeling that abandonment should now be seriously considered. Despite all of these difficulties we continued to maintain all specific schedules on the 2m band. Also regular contacts were maintained with the UK and there was some general HF working. A further ping was heard on 2m in the early hours of the morning but nothing more. In the afternoon we made our first contact with G3YPO/MM on the QE II and tried some 2m tests with him which were unfortunately unsuccessful. At that time the QE II was positioned 150 miles off the US coast in 70 knot winds. 2 metre equipment onboard the vessel was very limited and therefore the chances of success were not good. However, we were encouraged by the HF contact and made a further sked for the following day.

Saturday turned out to be a fateful day. There was heavy rain for most of the night. At breakfast time a meeting was held to discuss a proposal. In view of the virtually untenable condition of the site, the fact that most people were sleeping in wet bedding, together with the continuing low pressure area over the Atlantic, the expedition should be abandoned. Every member expressed great disappointment at having to consider taking such a
decision but when a poll was taken 2 were in favour of staying on, 7 were in favour of abandonment and 1 was undecided.

It was however agreed that a group of four would go on to the island of Inishmore for low power HF working although no 2m operation would be possible. The Inishmore group consisted of Brian, G4 MXL, his son Paul, Jane, G4 UPI and Dave, G4O TV. During our usual sked with Gerry we told him of the group's decision and received the welcome news that Alex had arrived home safely that morning.

Work began on dismantling the station at 0815 with an attempt being made to clean up pieces of equipment before they were reloaded into the vehicles. The operating tent was considered to be written off and was therefore given a viking funeral in a hollow below the man operating site. Despite continuous working, the reloading of the vehicles was not completed until about 1800 hours that evening.

A deputation visited the two long suffering elderly ladies whose land we had turned into a quagmire and whose television we had made unwatchable during the 2m operation. We gave our sincere thanks and some small gifts for them and their grandchildren before making our farewells. The main group then embarked on the journey back to Dun Laoghaire and England with the sub group setting off to find comfortable bed and breakfast accommodation before catching the ferry to Kilronan the next day.

The party of four which had decided to go on to Inishmore, ironically travelled in bright sunshine on the small ferry from Rosaveel to Kilronan and looked across to watch the rain clouds pouring their contents onto the mountainside site which had so recently been abandoned. They were staying at Mrs O'Flaherty's comfortable bed and breakfast accommodation on the island from which low power HF operation was undertaken. The group also identified two sites on the island which would make a good basis for a further attempt on a transatlantic 2 metre QSO - although one site was totally inaccessible by road and would have required an air lift to get the equipment to it.

Many lessons have been learnt on the expedition which will stand the group in good stead should a second attempt be made. The week spent on the island was most enjoyable with the return trip to the mainland being made particularly memorable by the small ferry being followed by a school of dolphins.

As to the mainland site which we had been forced to abandon, our memories are of a totally inhospitable climate in a very hospitable country. As far as the 2m attempt is concerned we are convinced that it is possible to bridge the Atlantic on the band. As so often happens it is a matter of being in the right place at the right time. We think it will happen, and sooner rather than later.
4 May  British Amateur Television Club rally at the Crick Post House Hotel, junction 18 on M1, with more space for demos and traders plus lecture programme and lots for all the family. Free admission and doors open 10.30am. Mid Ulster ARC: meets at the Guide Hall, Castle Hill, Gilford at 3pm.  Kelsae Amateur Radio Rally.

5 May  Borehamwood and Elstree ARC: meeting.  Basingstoke ARC: Home Construction with G3CSU.  Felixstowe DARS: Fibre Optic TV.  Todmorden DARS: chat night and RTTY.  Dartmoor Mobile Rally at the Town Hall, Princetown. From 10 am till 3 pm for traders followed by an auction of equipment. Further details phone Cliff on Tavistock 2818.  Sandwell ARC: meets every Monday and Thursday evenings at 7.30pm in the Broadway, Oldbury, Warley.


10 May  Radio Boot Fair at Whitefield near Dover opening at 10am with an entrance fee of 20p. Further details available from Ian, G3IRO, on 0304 821588.


18 May  Mid Ulster ARC: annual mobile rally at Parknairn House, six miles from Dungannon on the main Ballygalley Road, usual trade stands and bring and buy stall. Talk in on S22.  Basingstoke ARC: Contest Operator Training.  Special event station GB6STJ will be on the air from St Johns Middle School, Kenilworth from 9 till 4pm to celebrate the May Fair. Operation on 2m and possibly 70cm.


<table>
<thead>
<tr>
<th>Date</th>
<th>Event Description</th>
</tr>
</thead>
</table>
| 22 May     | Greater Peterborough ARC: VHF NFD preparations.  
N Wakefield RC: social at the Water Prince Floating Restaurant.  
Edgeware DRS: constructors contest and NFD briefing.  
Preston ARS: preparation for HF NFD.  
Stirling DARS: meeting.  
Pontefract DARS: 2m DF hunt for the G8BVH trophy. |
| 23 May     | Dunstable Downs RC: rig doctor checks your equipment.  
Nunsfield House ARG: rally job distribution.  
Borders ARS: meeting.  
Coventry ARS: an evening portable at Hartshill Hayes Country Park.  
Aberdeen ARS: fox hunt. |
| 25 May     | Plymouth Mobile Radio Rally at Plymstock Comprehensive School, Plymstock, Plymouth.  
From 10 till 5 with talk in on S22. Details from G0BN7 on 0752 777777.  
Southdown ARS: raft race.  
Wolverhampton ARS: 2m DF hunt. |
| 26 May     | Atherstone ARC: DF hunt.  
27 May     | Bromsgrove ARS: club night.  
Wirral DARC: Lecture by G3LEQ.  
Chester DRS: ATV by G4EZO.  
Delyn RC: meeting.  
Wolverhampton ARS: your problems solved plus night on the air.  
Keighley ARS: Amateur Radio on a Shoestring by G3RUV.  
Dorking DRS: informal at the Cock, Headley.  
Verulam ARS: Is There Life Below 40? by G3R00. |
| 28 May     | White Rose ARS: NFD briefing.  
Three Counties ARS: junk sale.  
Fareham DARC: on the air natter night.  
Lothians RS: DF hunt.  
Stockport RS: meeting.  
Havering DARC: DF hunt.  
Crawley ARC: quiz vs Mid Sussex ARC.  
Cheshunt DARC: Contest Operating and Logging by G3TIK and G3WLM.  
Stroud ARC: meeting.  
S E Kent (YMCA) ARC: visit to a brewery.  
Glossop DARC: activity night from Dinting Railway Centre.  
Coulsdon ATS: a general morse and RAE help night. |
| 30 May     | Ayr ARG: Stargazing.  
W Kent ARS: meeting.  
Maidstone YMCA Sportscentre ARS: AGM.  
Wimbledon DARS: summer barbecue.  
Nunsfield House ARG: rally preparation.  
Coventry ARS: night on the air.  
Aberdeen ARS: building competition. |
| 1-6 June   | GB2NM Centenary special event station at the Chalk Pits Museum operated by Chichester DARC.  
1 June     | Southend DRS Amateur Radio and Electronics Rally at the Rocheway Centre, Rochford, Essex. Trade stands, bring and buy, refreshments, RTTY demonstration and family amusements. Talk in on S22 and further details Ron G6SOH or Brian G4ARDS.  
Mid Ulster ARC: meets at the Guide Hall, Castle Hill, Gilford at 3pm.  
2 June     | Basingstoke ARC: VHF NFD arrangements.  
Felixstowe DARS: meeting.  
Southdown ARS: meeting.  
Todmorden DARS: car treasure hunt. |
| 3 June     | Workop ARS: visit to Scunthorpe club.  
Dartford Heath DFC: pre hunt meeting.  
Fylde ARS: top band DF hunt.  
Wolverhampton ARS: Electricity in Water by G3RVA.  
Bourne ARS: meeting at the Village Hall, Edenham, Bourne, starting at 7.30 pm.  
Chichester DARC: meeting. |
| 4 June     | Fareham DARC: The G6NZ Lecture.  
Havering DARC: informal.  
Cheshunt DARC: NFD final arrangements.  
S E Kent (YMCA) ARC: natter nite. |
| 5 June     | Horndean ARC: SSTV.  
N Wakefield RC: visit to Spen Valley junk sale.  
Preston ARS: test your rig night by G3SYA.  
Sandwell ARC: meets every Monday and Thursday at their premises in Broadway, Oldbury, Warley.  
Barry College FE RS: meets every Thursday in the College Annexe, Weycock Cross, Barry.  
Pontefract DARS: visit to the Spen Valley junk sale. |
| 6 June     | Taunton DARC: meets every Friday at 7.30pm in the Basement of County Hall, The Crescent, Taunton.  
Clifton ARS: meeting.  
Nunsfield House ARG: rally preparations.  
Borders ARS: meeting.  
Dunstable Downs RC: Wire Antennas by G3WLM.  
S Manchester RC: meets every Friday.  
Aberdeen ARS: HF NFD preparations on site. |
| 7-8 June   | HF National Field Day.  
Three Counties ARC operating a portable station at the Lurgshall Fete.  
Wolverhampton ARS operating a demonstration station at the 21st Tipton Carnival and show. |
| 8 June     | Dartford Heath DFC: DF hunt.  
17th Elvaston Castle Mobile Radio Rally in the showground of the Country Park, 5 miles SE of Derby on the B5010. Admission is free although there is a car park charge of 45p. Over 90 trade stands, bring and buy and flea market, plus fun for all the family. Further details from the sec or G4CTZ on 0332 799452. |
| 9 June     | Southdown ARS: meeting.  
Morecambe Bay ARS: SSTV by GOAVF.  
Milton Keynes DARC: meeting.  
Coulsdon ATS: an open evening for anyone interested in amateur radio and the club.  
Dorking DRS: informal at the Star and Garter pub.  
Newbury DARS: Intermodulation, Phase Noise and Dynamic Range by G3RZP.  
Bromsgrove ARS: lecture. |
| 10 June    | Chester DRS: surplus equipment sale.  
Delyn RC: meeting at 8 pm at the Daniel Owen Centre, Mold.  
Keighley ARS: informal.  
Dorking DRS: informal at the Star and Garter pub.  
Newbury DARS: Intermodulation, Phase Noise and Dynamic Range by G3RZP. |
| 11 June    | Three Counties ARC: Cellular Radio.  
Fareham DARC: on the air natter nite.  
Lothians RS: AGM.  
Wirral DARC: practice DF hunt.  
Havering DARC: VHF NFD briefing and crystal set competition.  
Crawley ARC: informal.  
Cheshunt DARC: natter nite.  
Stroud ARS: meeting.  
S E Kent (YMCA) ARC: top band DF hunt. |


19 June N Wakefield RC: fox hunt and barbecue. Preston ARS: Analysis by G3ZXC.


22 June Wolverhampton ARS: 2m DF hunt.

23 June Morecambe Bay ARS: Raynet.


28 June Three Counties ARC: summer barbecue.

30 June Felixstowe DARS: meeting. Sandwell ARS: Amateur Radio on the Burma Railway by G3BA.


Will club secretaries please note that the deadline for the August segment of Radio Tomorrow (covering radio activities from 1st July to 1st September) is 25th July.
Two types of amateur band converters have been designed, one with an RF amplifier for use on bands above 14MHz and one without an RF amplifier for bands below 14MHz. 14MHz is the normally accepted frequency above which RF amplifiers are useful, but sufficient information is given to allow either type of converter to be built for any band. Since the 14MHz receiver can demodulate only USB signals, the conversion with the 14MHz receiver, since they can be used with any receiver covering 14-14.5MHz. The converters for the 10, 18 and 24MHz bands, for example, could be used with amateur band receivers which do not cover these relatively new bands.

Circuit Description

In this part, S Niewiadomski describes the construction and alignment of a set of simple matching amateur band converters to extend the coverage to 1.8-30MHz, including the WARC bands.

![Block diagram of the amateur band converters](image)

Fig. 25 The block diagram of the amateur band converters.

![Circuit diagram for the converter without an RF stage](image)

Fig. 26 The circuit diagram for the converter without an RF stage (type 1).
primary of T603 and C610, set to resonate at approximately 14.25MHz. A low impedance output from the converter is taken from the secondary of T603 via SK602.

Q601 and associated components form the conversion oscillator. The exact frequency of oscillation is set by varying TC601 and the output level is set by varying VR601.

Table 1 shows the types of transformers, the capacitor values and the crystal frequencies used for each band. The frequency given for X601 is the most convenient to use if a new crystal is being bought for this project. A crystal in the alternative X601 range might well be available in the shack junkbox.

The circuit of the type 2 converters (Fig. 27) is identical to that for the type 1 converters with the addition of an RF amplifier stage, Q701, and an extra tuned circuit coupling the RF amplifier to the mixer. Table 2 shows the transformer types, capacitor values and crystal frequencies for each band.

Construction and Alignment

Each converter is built on its own PCB and mounted in a die cast box. The foil pattern for the type 1 converters is shown in Fig. 28 and the component layout in Fig. 29. The type 2 converter is shown in Figs. 30 and 31. As used for the 14MHz receiver, the converters are built on single-sided PCB, and the technique described in part 2 used for producing the boards.

Assembly of the boards is straightforward and again a socket was used in the prototypes for the SL6440, without any problems being encountered.

Fig. 27 Circuit diagram for the converter with an RF stage (type 2).
Have been made, the input and output filters can be aligned.

Inject with a signal generator a sine wave of a frequency in the middle of the band to be covered of approximately 100mV peak-to-peak into the antenna input and monitor between IC601/701 pin 13 and earth with the oscilloscope. Adjust the core of T601/701 and T602/702 (and T703, if fitted) for maximum signal at IC601/701 pin 13. Several adjustments of each core will be needed before the best setting will be found.

Now monitor the 14MHz output, SK602/702, and adjust the core of T603/704 for maximum output in the 14MHz band. The tuning of this resonant circuit is quite broad, the major selection at 14MHz being provided by the main receiver input tuned circuits.

In Use

Preparing a converter for use is simply a process of connecting its power supply sockets in parallel with those of the 14MHz receiver, coupling the converter 14MHz output to the receiver antenna input and connecting an antenna to the converter input. Tuning charts relating the receiver digital frequency readout and the received frequency for each band are shown in Fig. 36. These charts assume that the single value given for X601/701 has been used, rather than a value in the alternative range.

CPL Electronics have informed us that they can supply a kit of the 14MHz Rx for £142 (+£2 p+p). The five PCBs are available from them for £14 (+70p p+p). Contact CPL at 8 Southdean Close, Hemlington, Middlesborough TS8 9HE (phone 0642 591157).
References

1 A Transceiver for the HF Bands — L Knight, G2DXK, Radio Communication, June 1984.
6 The RX80 MK2 — AL Bailey, G3WPO, Rad Comm 1981.

Fig. 32 The mechanical details of the power input sockets, side of the converter case.

Fig. 33 Drilling details for the lid of the converter case.

Fig. 34 How to make the bottom of the converter case (viewed from the bottom).

"Oh, Hello, Mary... Make it short will you, dear!"

Fig. 35 The view from the top of both types of converter showing the position of the major components.

Fig. 36 Tuning charts for the amateur band converters.
Components List

Converter Without RF Stage

RESISTORS
R601 470R
R602, 604 270R
R603 100R
R605 100k
All resistors are 0.25W 5% carbon film
VR601 470R preset min horiz.

CAPACITORS
C601, 602, 603, 612 see Table 1, cer
C604, 606, 609, 611 10n disc cer
C605, 607, 608 1000p cer
C610 22p cer
TC601 5-60p foil trimmer (Cirkit 06-60001)

INDUCTORS
T601, 602, 604 see Table 1, Toko
T603 KANK3334R Toko

SEMICONDUCTORS
D601 4V7 400mW zener
D602 6V2 400mW zener
D603 6V6 400mW zener
D604 1N4148
G601 BF256
IC601 SL6440 (Plessey)

MISCELLANEOUS
X601 HC18U (see Table 2)
SK601 to suit antenna plug
SK602 to suit lead to receiver
SK603, 604 4mm insulated terminals, red and black
16 pin IC socket (if required); die cast box 113x63x31mm; 1mm (0.040") terminals; 6BA screws and nuts.

Converter With RF Stage

RESISTORS
R701 703, 706 100R
R702 22R
R704 470R
R705, 707 270R
R708 100k
All resistors are 0.25W 5% carbon film
VR701 470R preset min horiz.

CAPACITORS
C701, 702, 703, 706, 715 see Table 2, cer
C704, 705, 707, 710, 712, 714 10n disc cer
C708, 709, 711 1000p cer
C713 22p cer
TC701 5-60p foil trimmer (Cirkit 06-60001)

INDUCTORS
T701, 702, 703, 705, 707 see Table 2, Toko
T704 KANK3334 (Toko)

SEMICONDUCTORS
D701 4V7 400mW zener
D702 6V2 400mW zener
D703 6V8 400mW zener
D704 1N4148
Q701 J310 (Cirkit 89-02310)
Q702 BF256
IC701 SL6440 (Plessey)

MISCELLANEOUS
X701 HC18U (see Table 2)

Table 1 Component values for converters without RF stages.

<table>
<thead>
<tr>
<th>BAND (MHz)</th>
<th>T601, 602</th>
<th>C601, 603 (pF)</th>
<th>C602 (pF)</th>
<th>C612 (pF)</th>
<th>X601 (MHz)</th>
<th>ALTERNATIVE X601 (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.8-2.0</td>
<td>3333</td>
<td>150</td>
<td>12</td>
<td>3335</td>
<td>82</td>
<td>16.0</td>
</tr>
<tr>
<td>1.5-1.8</td>
<td>3333</td>
<td>39</td>
<td>6.8</td>
<td>3335</td>
<td>68</td>
<td>18.0</td>
</tr>
<tr>
<td>7.0-7.3</td>
<td>3334</td>
<td>100</td>
<td>12</td>
<td>3335</td>
<td>47</td>
<td>21.3</td>
</tr>
<tr>
<td>10.1-10.15</td>
<td>3334</td>
<td>47</td>
<td>6.8</td>
<td>6440</td>
<td>39</td>
<td>4.0</td>
</tr>
</tbody>
</table>

Key to transformer types:
3333 KANK3333R
3334 KANK3334R
3335 KANK3335R
6440 154AN7A6440E

Notes:
1. This frequency for X601 gives a converter output frequency with its lower end at 14MHz.
2. This is the full IARU regions 1, 2 and 3 frequency allocation.
3. This range of frequencies for X601 does not necessarily give the full 3.5-4.0MHz band coverage.
4. This range of frequencies for X601 does not necessarily give the full 7.0-7.3MHz band coverage.
5. This frequency for X601 gives a converter output frequency of 14.1-14.15MHz for an input range of 10.1-10.15MHz.

Table 2 Component values for converters with RF stages.

<table>
<thead>
<tr>
<th>BAND (MHz)</th>
<th>T701, 702, 703</th>
<th>C701, 703, 706 (pF)</th>
<th>C702 (pF)</th>
<th>C715 (pF)</th>
<th>X701 (MHz)</th>
<th>ALTERNATIVE X701 (MHz)</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.07-18.17</td>
<td>3335</td>
<td>68</td>
<td>6.8</td>
<td>6440</td>
<td>39</td>
<td>4.0</td>
</tr>
<tr>
<td>21.0-21.45</td>
<td>3335</td>
<td>47</td>
<td>6.8</td>
<td>3334</td>
<td>100</td>
<td>7.0</td>
</tr>
<tr>
<td>24.89-24.99</td>
<td>3335</td>
<td>33</td>
<td>3.3</td>
<td>3334</td>
<td>39</td>
<td>10.89</td>
</tr>
<tr>
<td>28.0-28.5</td>
<td>3335</td>
<td>22</td>
<td>3.3</td>
<td>3334</td>
<td>22</td>
<td>14.0</td>
</tr>
<tr>
<td>28.5-29.0</td>
<td>3335</td>
<td>22</td>
<td>3.3</td>
<td>3334</td>
<td>22</td>
<td>14.5</td>
</tr>
<tr>
<td>29.0-29.5</td>
<td>3335</td>
<td>22</td>
<td>3.3</td>
<td>3334</td>
<td>22</td>
<td>15.0</td>
</tr>
<tr>
<td>29.5-29.7</td>
<td>3335</td>
<td>22</td>
<td>3.3</td>
<td>3334</td>
<td>22</td>
<td>15.5</td>
</tr>
</tbody>
</table>

Notes:
1. This frequency for X701 gives a converter output frequency of 14.07-14.17MHz for an input range of 18.07-18.17MHz.
2. This frequency for X701 gives a converter output frequency with its lower end at 14MHz.
An 'Ace' Headset For Mobiling

Peter Metcalfe, G8DCZ, tries out one of the many headsets available on the market and looks at the rather confused legal situation.

"...Yes OK from G2 XYZ/M...I do agree...mobile operation using...QRX...er...where was I? Oh yes...a handmike is so tricky...QRX gears...the cable gets all wrapped up with the wheel...QRX roundabout..." (Insert sound effects of bangs and crashes followed by an abrupt dropping of carrier!)

Does this all seem a little far fetched? Well may be, but while operating a special event station a few years ago, as many of our visitors will confirm, we were treated to a minor version of the above situation. Thankfully no damage was done and the mobile operator merely mounted the kerb — not a good advert for the hobby! Now be honest, how many times have you been operating 'handheld mobile' and had a near miss? I'm not that virtuous myself; when I started 'mobiling' I spent about four weeks with a handmike. It took a very near miss with a tree on a narrow country road (plus a couple of well-chosen words from my co-pilot) to get me rushing for my cheque book!

All too often the priority of a new licensee (or even old-stagers for that matter) is to fork out hard-earned money for the mobile rig and aerials, while some form of safety or boom mic is relegated to "I'll get round to it someday". So when I was asked to write a piece on the Ace MH1 headset, paying particular attention to the safety aspects, I thought it an ideal opportunity to clear up a few popular misconceptions about mobile operation.

Handmikes Illegal?!

There is a rumour going around CB and amateur circles that, at about the time that CB was legalised, there was a law passed banning the use of handmikes. But, where does it leave the PMR and radio telephone people? With this in mind, I sought the advice of our...
local friendly constabulary. Here's where some of the confusion begins as they didn't know! The classic line from one chap was something like "...there are so many laws around — how do you expect me to know them all — I'm only traffic police"! To be fair to this poor overworked fellow he did give me a phone number to ring at the Lewes training school and this proved to be most helpful.

The legal situation is as follows: if a police officer notices someone operating a handmike while driving but that the driver has full control of the vehicle there is no problem. However, this implies that the overs are kept short, ie that you pull into a parking place if you want to "waffle". The trouble begins if, in the opinion of the officer, the driver does not have 'proper control' of the vehicle or, of course, if an accident ensues. Then the 'Proper Control' subsection of the 1978 Regulation 119 Motor Vehicle (Construction and Use) takes over. (Incidentally, part of this regulation also states that headworn apparatus on motorcycles must be approved, including headsets and boom mics. I'm not sure who has to do the approving in this case so you'll have to check yourselves.)

Depending on the seriousness of the 'incident', the result could be anything from a 'warning' to a 'driving without due care and attention' summons, which could lead to an endorsement and about a £100 fine (or worse). In extreme cases, anything from a summons of 'reckless driving' to be said where injury to a third party is involved. Then the 'Proper Control' ensues. Then the 'Proper Control' is to 'waffle'. The trouble begins if, in the opinion of the officer, the driver does not have 'proper control' of the vehicle or, if an accident ensues. Then the 'Proper Control' subsection of the 1978 Regulation 119 Motor Vehicle (Construction and Use) takes over. (Incidentally, part of this regulation also states that headworn apparatus on motorcycles must be approved, including headsets and boom mics. I'm not sure who has to do the approving in this case so you'll have to check yourselves.)

Alternatives

An attractive alternative to a fine could be a headphone boom mic set. The Ace MH1 headset is a single earphone on a flexible headband with an electret mic insert attached to a moveable boom extension. A look at the construction and specifications makes it obvious that this is simply a standard pair of medium range headphones with one speaker removed and a mic section added. I found that this made it awkward and very heavy to wear. In fact the whole unit, being weighted only on one side, tended to slide down gradually into a most uncomfortable position — if not on to the floor. My other main gripe is with the lead which is very thick, heavy — thus aggravating the slipping problem — and very short. Although the length would be adequate for use with a portable rig clipped onto a belt, it would not be practical in a car and I found that an extension cable was necessary.

I must say that having operated mobile for years with just a boom mic, I found the speaker facility very useful. It makes listening to weak signals a pleasure, without all the car and wind noise to contend with. However, one word of warning if you have both the headset speaker and the rig's internal speaker on for passengers to hear, do put an attenuator in the headset lead otherwise it is deafening!

There are many headsets on the market specifically tailored to a particular rig, so matching problems should never arise. However, the Ace unit as supplied is merely a basic electret/speaker set up and some form of interface is required. Unfortunately the review sample came without any information, but after a little poking around with a meter I devised a little interface circuit, see Fig. 1 for the FDK700. The problems here are that a 12V supply is needed (or anything greater than 1.5V, with appropriate resistor changes). A possible solution is that, as the current consumption is going to be no more that 1mA or so, a battery could be used. For long term economy some form of on/off switch would be beneficial.

Canal Mobile

In preparation for this year's holiday I also modified the headset to work with a belt/handheld TR2400. This rig has the advantage that all the relevant sockets are on one side of it, including the power supply, ie the battery charg-
stage, since the power must be available anyway. The only major snag that I can see is when using it with the IC2E or IC4E which have their own peculiar PTT switching technique. I am sure that there must be ways round it but I'll have to leave you to experiment. In summary the Ace MH1 unit, while having its problems, is a very cheap way to be safe when mobile — a bargain at £9.50. You'll have to add the cost of plugs when budgeting, but it beats a £100 fine anyway! Many thanks to Sgt Pryor, lecturer at the Lewes Traffic Officers Training Centre, for his valuable legal advice.
Limiting the cost of getting onto HF sufficiently to enable you to look your bank manager in the eye requires certain compromises. However, as we saw last month, these need not degrade the efficiency of the station.

**Setting up a really cheap HF station can be done with the minimum of fuss if you know your animal... As Brian Kendal, G3GDU, explains.**

The equipment selected will obviously be determined largely by the finance available. In increasing cost the possible options are:

1. All home-brew station.
2. Commercial receiver with home-brew transmitter (CW only).
3. Commercial receiver and AM/CW transmitter (CW only).
4. Commercial receiver and SSB transmitter (all modes).
5. Commercial SSB transceiver (all modes).

The first two options call for the home construction of equipment. Possibly the simplest way of achieving this would be to purchase one of the excellent kits available from several manufacturers. But within the scale of cost we are considering, these kits would all be QRP and may not necessarily be the cheapest way to get on the air.

Although it is quite feasible to build a receiver, this can be very time consuming for anything more than a very simple circuit. I would therefore recommend that the purchase of a good receiver should be the first consideration. This will serve as station receiver, and if it has a crystal calibrator, also meeting the licensing requirements for frequency standards.

The classic National HRO receiver. Still giving excellent performance on most HF bands, the bandspread coils enable the widely spaced dial calibrations to each represent about 1kHz.

One useful item which can still be found from time to time is the Geloso VFO unit. This came in several models that all comprised a Clapp-Gouriet oscillator, a buffer or frequency multiplier second stage, and a medium power valve, such as an 807 or 6146, in the PA. Such a circuit could easily provide up to 50 watts on three different bands. Recently I have heard Soviet stations using this combination.

Components for this type of equipment can be obtained quite cheaply at rallies or junk sales. Even old valve TVs and broadcast receivers can provide many of the items needed. You may find it preferable to buy a quantity of the appropriate components and then design to match the parts available rather than attempting to find parts for a specific circuit configuration. For powers up to about 50 watts, receiving type components are quite feasible.

One useful item which can still be found from time to time is the Geloso VFO unit. This came in several models that all comprised a Clapp-Gouriet oscillator, a buffer or frequency multiplier second stage, and a medium power valve, such as an 807 or 6146, in the PA. Such a circuit could easily provide up to 50 watts on three different bands. Recently I have heard Soviet stations using this combination.

Components for this type of equipment can be obtained quite cheaply at rallies or junk sales. Even old valve TVs and broadcast receivers can provide many of the items needed. You may find it preferable to buy a quantity of the appropriate components and then design to match the parts available rather than attempting to find parts for a specific circuit configuration. For powers up to about 50 watts, receiving type components are quite feasible.

One useful item which can still be found from time to time is the Geloso VFO unit. This came in several models that all comprised a Clapp-Gouriet oscillator, a buffer or frequency multiplier second stage, and a medium power valve, such as an 807 or 6146, in the PA. Such a circuit could easily provide up to 50 watts on three different bands. Recently I have heard Soviet stations using this combination.

Components for this type of equipment can be obtained quite cheaply at rallies or junk sales. Even old valve TVs and broadcast receivers can provide many of the items needed. You may find it preferable to buy a quantity of the appropriate components and then design to match the parts available rather than attempting to find parts for a specific circuit configuration. For powers up to about 50 watts, receiving type components are quite feasible.
The first of a series of Eddystone post war receivers, the 504. Even today, this would be a good buy for general coverage and amateur CW reception. Equipment of the 1950s, particularly those from the KW stable.

Geloso also produced a receive converter which gave a good performance on all the pre-WARC bands except 160m. Using one of these with a general coverage receiver would give excellent bandspread. Alternatively, modification to cover 160 metres and the new WARC bands is quite simple.

Should you decide to use a commercial CW/AM transmitter for CW only, as suggested in last month's article, you need to remove the modulator valves and short circuit the modulation transformer.

**Equipment Available**

Very little, if any, older equipment is available on dealers' shelves, so recourse has to be made to "readers ads", rallies and junk sales. Except for old timers, many may find the type numbers mean nothing. If you are not careful, you may be left with an expensive piece of equipment which is of little use. Here is a basic guide to what equipment may be suitable.

**Ex-government Equipment**

Many wartime receivers were extremely well made and will still give a good account of themselves on CW. Some, such as the National HRO, Hallicrafters SX28, RCA AR88 and the Hammarlund Super Pro, were pre-war general coverage designs which proved ideal for service use. Of these the HRO and AR88 are still regularly available. The AR88 is rather large but, the HRO is a more appropriate size for the shack bench. It has the disadvantage, however, of requiring a separate coil pack for each band. Some of these coil sets are "bandspread" which give an equivalent of 10 feet of dial length for each amateur band! Both sets have excellent crystal filters and either would make a good station receiver.

Several excellent HF receivers were manufactured for the American armed services, the most commonly available being the BC342 and the BC348. The upper frequency limit of each was 18MHz. Both were quite sensitive and the filters were excellent for CW working, although the BC348 filter has to be adjusted internally for optimum bandwidth.

The British equivalents were: the R1155 aircraft set, Eddystone 358X, Marconi CR100 and the R1475. The first of these, although excellent for its purpose, has poor bandspread (14 MHz covers about ¾ inch on the dial) no crystal filter and needs considerable modification, so cannot be recommended except for historical interest. The Marconi CR100 also suffers from poor bandspread and most samples are rather insensitive on the highest band. The bandswitch is also prone to trouble and in consequence this receiver would not be a good buy.

For some reason, the R1475 has never proved popular, but in good condition, it is an excellent receiver. It has good bandspread and is reasonably sensitive. It also has several switched bandwidths and incorporates a crystal calibrator. It is, however, a complex circuit design which makes repair time consuming rather than difficult. The frequency coverage is from 2.0 to 20MHz enabling operation on the 3.5, 7, 10.1, 14 and 18MHz bands and 160m may also be added by a very simple modification.

Few ex-government transmitters are suitable for amateur use. The best is probably the TCS set which was made by Collins and other manufacturers. This transmitter is very well made and will give an extremely stable 20-50 watts on the three lower frequency bands.

The 888 is the last in a long line of amateur band receivers from Eddystone.

All the above equipment is suitable for CW operation.

**Post War Receivers Up To 1965**

Most pre-war receiver manufacturers turned their attention to other things at the end of the war — the market was flooded with ex-government equipment which made sales difficult. Until the late 1960s, when Japanese equipment reached Europe, few firms made amateur equipment.

However, during this time, the leader in the UK receiver market was Eddystone who produced a range of excellent equipment, starting with the 504 and shortly followed by the cheaper 640. The earlier models used a single crystal filter and are more suitable for CW operation. Later they introduced the 680, the 880 and the 888. These were double superhets with product (SSB) detectors, variable bandwidth, good sensitivity and good bandspread, even on the general coverage models. Any of the larger Eddystone receivers (9 valves or more) would make an excellent shack receiver for any mode of operation. All these receivers are available for under £75 with the R1475 as low as £10-£15.

Also in this period, KW Electronics introduced their KW 76, 77 and 202 which were manufactured to a full SSB specification. Samples still occasionally appear for sale.

Only one American receiver for each amateur band! Both sets have excellent crystal filters and either would make a good station receiver.

A block diagram of a typical double superhet of the late 1950s and early 1960s. The selectivity was gained in the IF amplifier which frequently had mechanics to vary the response.
made any real impact in the UK at this time. This was the Drake 2B which was specifically designed for SSB operation. The bandspread, selectivity and stability are excellent and it is surely a high recommendation that, even today, owners will rarely part with their receivers. When available, these usually sell for about £80.

Finally, there were the Racal RA17 and Collins 51J series professional receivers. These are superb even by present day standards and still have fairly high prices.

**Post War Transmitters**

The first UK manufacturer to introduce amateur band transmitters after the war was Labgear of Cambridge with their LG50 and LG300 ranges. The LG50 was crystal controlled and ran at 50 watts input, CW or AM whilst the LG300 ran the full legal limit (150 watts) to an 813 output stage with VFO control.

KW Electronics manufactured a series of AM/CW transmitters capable of 50 or 150 watts input. In 1958, KW introduced the 'Viceroy' SSB transmitter which proved to be the most popular commercial transmitter available at that time. It gave a clean steady output of about 100 watts PEP on all bands from 80-10 metres and was housed in a table top cabinet. It appeared in four versions (mk I-IV) and although the earliest model radiated upper sideband on 40 metres, this was corrected in the later versions. Later, KW produced the Vespa transmitter which was somewhat smaller and ran about half the power.

Minimitter manufactured a low power mobile and a 150 watt static transmitter, both capable of AM and CW operation. The former turned out to be unsatisfactory and should be avoided, but the latter is a worthwhile buy.

Heathkit produced both low (DX40), high power (DX100) AM/CW and later a series of SSB transmitters which gained a good reputation. A further Heathkit product which still appears in the "readers ads" columns from time to time is the SB10 SSB adpotor. This unit may be fitted after the driver stage of a CW transmitter and by phasing techniques produces 5 watts of upper or lower SSB drive for the power amplifier which is then biased for linear operation.

All these transmitters mentioned should be available for £50 or less.

**Transceivers**

The earliest SSB transceivers generally available were the Collins KWM series followed later by their S line. These were built to the highest standards — with prices to match. They still command high prices.

Less expensive were two models produced by National. The NCX3 covered three bands and the NCX5 five. Although widely advertised for a while, they never really became popular and it was left to KW Electronics to open up the market with the KW2000. Originally, it was rated at 90 watts PEP input, but later models (suffixd A to E) ran at twice this power. Even today, these are a very popular range and, especially when upgraded, can still hold their own in performance terms with the best that Japan has to offer. (Malcolm Healey, G3TNO, described a variety of mods for the KW2000 series in articles published in Jan, Feb, Mar, May, July and Oct '83 and Jan '84 HRT.) Despite this, KW2000s can be bought for as little as £150.

When the large Japanese manufacturers entered the market, one of the earliest sets was the Yaesu FR100 receiver and FL200 transmitter. These could be used as "separates" or coupled for transceive operation. The performance was broadly similar to the transmitters and receivers previously mentioned and today the combination would cost £100-£150.

Yaesu then manufactured a series of transceivers which culminated in the FTDX 560. These were introduced in the late 1960s and early 1970s and give considerably more power than earlier equipment. By replacing the 6146 PA valves with TV sweep tubes, the output was increased to about 250 watts PEP. These transceivers now sell at about £200-£250.

The Swan 100MX is a much more modern, fully solid state, mobile rig in the same price range although it does not possess all the "extras" available on other, more expensive, mains transceivers.

In this brief survey, it is obviously not possible to mention every piece of equipment which may be suitable. If, therefore, you are offered a wartime or early post war receiver or transmitter which I have not mentioned and with which you are not familiar, I can only suggest that you seek the advice of an amateur who was operating in the early post war period.

Many different models have
been introduced since those mentioned above, but being more modern, tend to fetch prices which take them beyond the scope of this article.

The final selection must be made on the basis of price and availability. Within the past year I have seen almost all those mentioned for sale, either in the pages of various amateur magazines or at rallies or club junk sales.

For less than £50, the R1475 could be allied with one of the 100 watt AM/CW transmitters. With the modifications suggested, a potent, maximum legal power CW station will be available on 80, 40 and 20 metres.

For a few pounds more, the same transmitter could be combined with an Eddystone or a Drake 2B receiver to give the additional availability of 15 and 10 metres, whilst for just over a hundred pounds these receivers with a KW Viceroy would give CW and SSB operation from 80 metres through to 10. Finally, for £150 the KW2000 transceiver or the FR100-FL200 combination becomes available.

If, however, even these costs are too much, consider home-brewing the transmitter. With careful buying, it should be quite possible to build a 25-50 watt valve equipment for less than £10 with the whole station less than £25.

Postscript

In September 1985 issue of 'Wireless World', Pat Hawker, G3VA, told of Phil Evans, GW8WJ, who was licensed in 1937 and still uses his original 10 watt, two valve transmitter in conjunction with an HRO receiver and an 85’ aerial. This equipment puts out a useful signal which has reached as far as VK and ZL on 80 metres. Now that’s real amateur radio.
RTTY Decoder and Serial Interface

Until quite recently RTTY (radio teletype) was very much a minority interest in amateur radio. Things have changed considerably with the arrival of the home computer; with the aid of a suitable machine it is now relatively easy to send and receive RTTY signals. Large and noisy teletype machines are no longer needed; messages are read from the television or monitor screen, with hard copy via an inexpensive thermal or dot-matrix printer.

The system described is for reception only. It consists of two units: a tone decoder to convert the received tones into a serial output signal, and a serial interface for the popular BBC model B, CBM64, or VIC-20 computers (or any computer having port B of a 6522 VIA available). It is not essential to use the two units together — the tone decoder can be used with any computer having a suitable serial interface or RTTY decoder program. Similarly, the serial interface can be fed from any decoder which provides standard 5V logic output levels.

Tone Decoding

RTTY communications rely on a tone encoding and decoding process to transmit digital signals. There are various standards for digital radio links, and the most common one being the ordinary RTTY five bit code type. The serial signals are similar to those used in standard computer serial interfaces such as the RS232C and RS423 types, but with only five bits (rather than seven or eight) normal ASCII or ASCII based codes can not be used. Instead, Baudot codes are used, and these use a shift system to accommodate the alphabet, numbers and punctuation marks within the 32 available codes. Details of the Baudot codes are provided in Table 1. As Table 1 shows, only upper case letters are provided. Normally, received characters are assumed to be letters, but if the ‘Figures Shift’ character is received, subsequent characters are taken to be figures or punctuation marks. At least, they are until the ‘Letters Shift’ character is received, whereupon characters are interpreted as being letters once again.

The serial signals are transmitted in standard asynchronous serial fashion, as shown in Fig. 1. Normally the signal is in the ‘mark’ or high logic state, and the start of the character is indicated by it going to the ‘space’ or low logic state for a certain period of time (the start bit). After the start bit has been detected, the receiving equipment must check the state of the input signal at regular

---

**Table 1 Baudot Codes**

<table>
<thead>
<tr>
<th>LETTERS</th>
<th>FIGURES</th>
<th>CODE NO.</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>?</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>:</td>
<td>25</td>
</tr>
<tr>
<td>C</td>
<td>$</td>
<td>14</td>
</tr>
<tr>
<td>D</td>
<td>$</td>
<td>9</td>
</tr>
<tr>
<td>E</td>
<td>%</td>
<td>13</td>
</tr>
<tr>
<td>F</td>
<td>&amp;</td>
<td>26</td>
</tr>
<tr>
<td>G</td>
<td>£</td>
<td>20</td>
</tr>
<tr>
<td>H</td>
<td>8</td>
<td>6</td>
</tr>
<tr>
<td>I</td>
<td>(</td>
<td>11</td>
</tr>
<tr>
<td>J</td>
<td>)</td>
<td>15</td>
</tr>
<tr>
<td>K</td>
<td>-</td>
<td>28</td>
</tr>
<tr>
<td>L</td>
<td>9</td>
<td>12</td>
</tr>
<tr>
<td>M</td>
<td>24</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>22</td>
<td></td>
</tr>
<tr>
<td>O</td>
<td>23</td>
<td></td>
</tr>
<tr>
<td>P</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>Q</td>
<td>bell</td>
<td>5</td>
</tr>
<tr>
<td>R</td>
<td>5</td>
<td>16</td>
</tr>
<tr>
<td>S</td>
<td>7</td>
<td>7</td>
</tr>
<tr>
<td>T</td>
<td>:</td>
<td>30</td>
</tr>
<tr>
<td>U</td>
<td>2</td>
<td>19</td>
</tr>
<tr>
<td>V</td>
<td>/</td>
<td>29</td>
</tr>
<tr>
<td>W</td>
<td>6</td>
<td>21</td>
</tr>
<tr>
<td>X</td>
<td>(</td>
<td>17</td>
</tr>
<tr>
<td>Y</td>
<td>)</td>
<td></td>
</tr>
<tr>
<td>Z</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>not used</td>
<td>not used</td>
<td>0</td>
</tr>
<tr>
<td>LineFeed</td>
<td>Line Feed</td>
<td>2</td>
</tr>
<tr>
<td>Space</td>
<td>Space</td>
<td>4</td>
</tr>
<tr>
<td>Return</td>
<td>Return</td>
<td>8</td>
</tr>
<tr>
<td>Figures</td>
<td>Figures</td>
<td>27</td>
</tr>
<tr>
<td>Letters</td>
<td>Letters</td>
<td>31</td>
</tr>
</tbody>
</table>

---

**Fig. 1** RTTY uses one start bit, five data bits and 1.5 stop bits giving the type of wave form shown here.
intervals to determine the states of the five data bits. These are transmitted with the least significant bit sent first, running through in sequence to the most significant bit. Finally, a 'stop' bit is added at the end of the data stream. Its main purpose is simply to provide a reasonable gap between one character and the next. This is 1.5 times longer than the other bits, although correct operation can be obtained if a stop bit of one or two bits in duration has to be used.

With a system based on accurate timing it is essential for the rate at which bits are transmitted to be the same as the rate at which they are sampled at the receiving end. There are several standard transmission/reception or baud rates. This is the number of bits transmitted per second with continuous transmission. Commercial RTTY is mostly sent at 50 or 75 baud, but amateur RTTY is standardised at 45 baud – 45.45 baud to be precise. This seems set to gradually change to 50 baud and some amateur RTTY is already sent at 50 baud.

The serial signals are transmitted using a simple tone encoding system, where one carrier frequency represents the mark signal and a slightly different frequency the space signal. This is known as 'FSK' (frequency shift keying). Direct frequency modulation of the carrier can be used, but these days it is more common for a two tone audio signal to be fed to the input of an SSB transmitter. With the carrier and one sideband suppressed this gives an output signal which is indistinguishable from a frequency shifted carrier. RTTY signals received in the SSB mode produce the warbling sound that will be very familiar to most short wave users.

Most RTTY signals are transmitted with one of three standard frequency shifts, but only one of these (170Hz) is commonly used by radio amateurs. Shifts of 425 and 850Hz are also used for commercial RTTY. There is no standardisation of the audio tones used — there is no need for it since by tuning the receiver it is possible to obtain any two audio tones (within reason) that have the correct spacing. In practice, the audio tones are made quite high (about 1-2kHz) so that they are well above the modulation frequency, and simple decoder circuits will suffice.

Decoder Operation

Fig. 2 shows the tone decoder block diagram which helps to explain the method of operation. The first stage is a low pass filter, which attenuates signals below about 1kHz. The decoder only requires a pass band from just over 1kHz to a little under 2kHz and the low pass filtering helps to avoid problems with adjacent channel interference. In particular, there is a danger of strong signals below 1kHz being clipped and producing harmonics in the 1kHz to 2kHz range.

The output of the low pass filter is split with the signal being fed to two practically identical circuits. These are band pass filters feeding into rectifier and smoothing circuits. The only difference between the two circuits is the filter frequency, with one filter having a fixed operating frequency of just over 1kHz. The other filter has three switched operating frequencies set at 175, 425, and 850Hz above the centre frequency of the first filter. The unit can therefore accommodate all three standard shifts.

Each smoothing circuit produces an output voltage that is fairly high when the tone is at the operating frequency of the preceding filter, and close to zero when the tone switches to the frequency of the other filter. This gives a see-saw effect at the two outputs as the input signal alternates from one tone to the other, and a voltage comparator is used to provide a logic output level that varies according to which circuit provides the higher voltage.

The output from the comparator is, of course, the decoded serial signal, but it might be of the wrong polarity. The polarity of the signal can be changed by switching the receiver's mode switch from one sideband to the other, but this is an inconvenient way of doing things as it normally requires retuning the set.

It is easier in use to have an inverter at the output of the decoder so that a signal of either polarity can be provided. Incidentally, the convention has the 'space' as the lower carrier frequency, but not all stations conform to this convention.

Tuning RTTY signals accurately can be difficult, some form of tuning indicator makes things very much easier. In this case each smoothing circuit drives a LED indicator via a buffer stage. When a signal is tuned accurately the two LEDs should flash on and off as the input signal switches from one tone to the other.

Decoder Circuit

Low pass filtering is provided by IC1 and its associated components which form a standard 18db per octave active low pass filter. The fixed frequency band pass filter is based on IC2a, and uses what is another standard configuration. It only differs from the normal type in that the single input resistor has been replaced by R5 and R6. These form an attenuator which is needed to counteract the high voltage gain through the filter. The rectifier and filter circuit is a simple half wave type using D1 and D2.

The other band pass filter is of the same basic type, but three sets of filter capacitors switched by SW1 provide three different operating frequencies. Also, one of the filter resistors has been replaced by three switched presets so that the filter frequencies can be trimmed to precisely the correct figures.

IC3a acts as the voltage comparator. The two input signals will contain a small amount of ripple, and R15 is used to introduce a certain amount of hysteresis to prevent this from giving spurious pulses during transitions from one signal level to the other. IC3b is the inverter stage. An opto-isolator is used at the output. There are two reasons for doing this: one is to avoid any direct
connection between the receiver and the computer which could couple noise from the computer into the receiver. There can also be a substantial voltage difference between the chassis’ of the receiver and computer and a direct connection between the two could result in damage to either or both (I have a damaged CBM64 this way, so it is a real rather than a theoretical risk). An output at normal 5 volt logic levels is easily achieved, by simply taking the signal from the pole of SW2 and using a 5V zener diode across the output to prevent excessive output potentials.

In the tuning indicator circuit IC5 provides the two buffer amplifiers. Often the input signal will be predominantly in the ‘mark’ state as few people can type consistently dominantly in the ‘mark’ state as few. Often the input signal will be pre-

providing the two buffer amplifiers.

output to prevent excessive output potentials.

In the tuning indicator circuit IC5 provides the two buffer amplifiers. Often the input signal will be predominantly in the ‘mark’ state as few people can type consistently dominantly in the ‘mark’ state as few.

Here we are only using the receiver section of IC6, which detects the start bit and then clocks the data bits into a serial register bit by bit. When a complete character has been received the DR (data received) output at pin 19 goes high. This is detected by a software loop which monitors this output via line PB6 of the user port. The 6 bit code is then read from IC6 via lines PB0 to PB4. Line CB2 of the user port then provides a negative pulse to an input of IC6 to reset the DR output. This whole process is repeated each time a character is received.

The Interface

The circuit diagram of the serial interface is shown in Fig. 5. Most of the work is done by IC6 which is a 6402 industry standard UART (universal asynchronous receiver/transmitter), or the almost identical AY-3-1015D device. Many commercial RTTY systems rely on machine code software to provide decoding of the serial signal. However with a suitable computer, a UART offers a perfectly practical alternative, a more interesting project for those more interested in hardware than software. Some software is still needed, but only in the form of a simple Basic program.

Here we are only using the receiver section of IC6, which detects the start bit and then clocks the data bits into a serial register bit by bit. When a complete character has been received the DR (data received) output at pin 19 goes high. This is detected by a software loop which monitors this output via line PB6 of the user port. The 5 bit code is then read from IC6 via lines PB0 to PB4. Line CB2 of the user port then provides a negative pulse to an input of IC6 to reset the DR output. This whole process is repeated each time a character is received.

The transistor in the optoisolator at the output of the tone decoder requires a load resistor, R25. If the interface is to be fed from an alternative decoder which provides standard logic levels, the only modification needed is to connect the earthy side of SK4 to the negative rather than the positive supply rail. C19 and R23 provide a reset pulse to IC6 at switch-on. D9 is driven from the framing error output of IC6, and this will flash on and off if the baud rate is wrong or the signal is of the wrong polarity. If this does not come on and the data on the screen is unintelligible, this is probably due to the signal being coded or just in a foreign language.

The 6402 requires an external clock signal at 16 times the baud rate. The BBC model B and the two Commodore computers have built-in timer/counters that can be used to provide a wide range of frequencies from line PB7 of the user port. This facility is used to provide the clock signal, and it enables any standard baud rate to be decoded. Although the BBC machine has an RS423 serial input, it is unsuitable for the present application as it can not
handle 45 or 50 baud signals, or 5 bit types. The Commodore computers have built-in software for serial decoding, and this accepts 5 bit codes with 1 or 2 stop bits, and baud rates of 50 and 75 are both available. Unfortunately, 45 baud is not, and 50 baud at best gives poor results with 45 baud amateur signals.

The circuit requires a single +5 volt supply with a current consumption of only a few milliamps, supplied by the computer.

**Construction**

Although I built the prototype system as two separate units, it could easily go into a single unit if preferred. In either case the printed circuit layouts of Fig. 6 and 7 can be utilized. Both boards offer little that is out of the ordinary and are quite easy to construct. Bear in mind though, that IC6 is a MOS type and is not particularly cheap. An IC socket should be essential and the other normal antistatic handling precautions should be observed. 40 pin devices are often difficult to fit into their sockets and take care to avoid buckling any of the pins.

Assuming the system is built as two separate units, a Verocase measuring about 180 x 120 x 39
mm is suitable for the tone decoder, and will give a very neat finish. The general layout can be seen from the photographs, but this is not critical and any sensible layout can be used. 3.5mm jack sockets are suitable for SK1 and SK2, but if the case has a metal front panel insulated sockets must be used. Otherwise the two sockets will be connected via the front panel, bypassing the opto-isolator.

The serial interface is built into an aluminium box measuring about 133 x 102 x 38 mm. A piece of 10 way ribbon cable up to about 1m long connects the unit to the computer. This cable can be taken out through the slight gap between the top and bottom sections of the case. An exit slot must be cut in the case if this is not possible. Connection to the user port of the BBC B machine is by way of a 20 way IDC header socket. The two Commodore machines require a 2 by 12 way 0.156 inch edge connector. As it is unlikely that an edge connector fitted with a suitable polarising key will be available the top and bottom edges of the connector should be clearly marked as such to avoid confusion. Connection details for both types of connector are provided in Fig. 8. Note that with the CBM64 line PC2 of the user port is used instead of CB2.

**Setting Up**

Adjustment of the three tuning presets is quite easy if suitable audio test equipment is available. First find the precise frequency at which the fixed frequency filter peaks, and then adjust RV1 to RV3 to peak the other filter 850, 425, and 170Hz (respectively) higher than this. Without suitable test equipment it becomes a matter of first finding an RTTY transmission with the required shift, tuning the receiver to make the lower tone give maximum brightness from D6, and then adjusting the appropriate preset to give peak brightness from D8 (and what should be a correctly decoded signal). If no output is obtained you are peaking the tunable filter at the same frequency as the other filter. A strong and interference free signal is needed to carry out this process properly.

If the receiver has a 'line-output' this can drive the tone decoder without problems. The prototype system was used in this way with a Yaesu FRG8800. Alternatively a loudspeaker or headphone output can be used, but the volume control must then be given a suitable setting. Inadequate volume will be apparent since the tuning LEDs will either fail to light, or be very dim. An excessive volume will result in the LEDs tending to light up quite brightly almost regardless of the input tones present. In either case proper decoding would be difficult or impossible to obtain.

**Inside the RTTY decoder.**
In Use

When 20 metres is open it is usually possible to find a few RTTY transmissions around 14.090MHz. If conditions are not favourable then 80 metres at around 3.585MHz might prove to be better, though not all the RTTY transmissions within the 80 metre band are amateur stations. There are numerous commercial RTTY stations to be found if you have a general coverage receiver, and the system is capable of handling many of these, but it could be illegal to receive them. Also, many RTTY transmissions are coded these days anyway, and will not provide any meaningful output.

Tuning in an RTTY signal accurately can be quite difficult, especially when you first try out the system. However, when a signal is tuned accurately, the two tuning LEDs should both light quite brightly (assuming the carrier is being modulated). Any slight flashing of the LEDs should be in antiphase. If they flash on and off in unison the tuning LEDs should be in antiphase. If they flash on and off in unison the tuning LEDs should both light quite brightly tuned accurately, the two tuning system. However, when a signal is set up the user port for the appropriate mode of operation and to provide the correct clock frequency for the selected baud rate. When fresh characters are detected they are read from the user port and the look-up table method used to convert the code numbers to the corresponding characters which are then printed on-screen. Actually two look-up tables are required, together with a simple routine to detect shift codes and to switch to the correct table.

Pressing the 'L' key (or CTRL 'L'

<table>
<thead>
<tr>
<th>RESISTORS</th>
<th>POTENTIOMETERS</th>
<th>CAPACITORS</th>
<th>MISCELLANEOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>R1 5k6</td>
<td>RV1,2,3 1k hor sub-min preset</td>
<td>C1,2,3 22nF poly</td>
<td>SK1,2 Insulated 3.5mm jack sockets</td>
</tr>
<tr>
<td>R2 3k3</td>
<td></td>
<td>C4,5,9,12 10nF poly</td>
<td>SW1 3 way 4 pole rotary</td>
</tr>
<tr>
<td>R3,4,9,10 100k</td>
<td></td>
<td>C6,15 330nF poly</td>
<td>SW2 SPDT sub-min toggle</td>
</tr>
<tr>
<td>R5,11 22k</td>
<td></td>
<td>C7,16 100nF poly</td>
<td>SW3 SPST sub-min toggle</td>
</tr>
<tr>
<td>R6 470R</td>
<td></td>
<td></td>
<td>B1 9 volt (PP3); case about 180 x 120</td>
</tr>
<tr>
<td>R7,12 560k</td>
<td></td>
<td></td>
<td>x 39 mm; PCB; four 8 pin DIL IC</td>
</tr>
<tr>
<td>R8,14 150k</td>
<td></td>
<td></td>
<td>holders; control knob; battery connect</td>
</tr>
<tr>
<td>R13,17,18 47k</td>
<td></td>
<td></td>
<td>or; wire, solder, etc.</td>
</tr>
<tr>
<td>R15 1M8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R16 6k8</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R19 10k</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R20 680R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>R21,22 820R</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>All resistors 1/4W 5% carbon film</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Components List For The Tone Decoder

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>RESISTORS</th>
<th>POTENTIOMETERS</th>
<th>CAPACITORS</th>
<th>MISCELLANEOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC1 741C</td>
<td>R23 2k2</td>
<td>RV1,2,3 1k hor sub-min preset</td>
<td>C1,2,3 22nF poly</td>
<td>SK1,2 Insulated 3.5mm jack sockets</td>
</tr>
<tr>
<td>IC2 LF353</td>
<td>R24 1k</td>
<td></td>
<td>C4,5,9,12 10nF poly</td>
<td>SW1 3 way 4 pole rotary</td>
</tr>
<tr>
<td>IC3,5 LM358</td>
<td>R25 680R</td>
<td></td>
<td>C6,15 330nF poly</td>
<td>SW2 SPDT sub-min toggle</td>
</tr>
<tr>
<td>IC4 TIL111 opto-isolator</td>
<td>C19 47uF 10V radial elect</td>
<td>SW3 SPST sub-min toggle</td>
<td></td>
<td></td>
</tr>
<tr>
<td>D1,2,3,4 OA91</td>
<td></td>
<td></td>
<td>D1,2,3,4 OA91</td>
<td>B1 9 volt (PP3); case about 180 x 120</td>
</tr>
<tr>
<td>D5,7 1N4148</td>
<td></td>
<td></td>
<td>D5,7 1N4148</td>
<td>x 39 mm; PCB; four 8 pin DIL IC</td>
</tr>
<tr>
<td>D6,8 panel LEDs</td>
<td></td>
<td></td>
<td>D6,8 panel LEDs</td>
<td>holders; control knob; battery connect</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or; wire, solder, etc.</td>
</tr>
</tbody>
</table>

Components List For The Serial Interface

<table>
<thead>
<tr>
<th>COMPONENTS</th>
<th>RESISTORS</th>
<th>POTENTIOMETERS</th>
<th>CAPACITORS</th>
<th>MISCELLANEOUS</th>
</tr>
</thead>
<tbody>
<tr>
<td>IC6 6402 or AY-3-10150</td>
<td>R23 2k2</td>
<td>RV1,2,3 1k hor sub-min preset</td>
<td>C1,2,3 22nF poly</td>
<td>SK1,2 Insulated 3.5mm jack sockets</td>
</tr>
<tr>
<td>D9 panel LED</td>
<td>R24 1k</td>
<td></td>
<td>C4,5,9,12 10nF poly</td>
<td>SW1 3 way 4 pole rotary</td>
</tr>
<tr>
<td></td>
<td>R25 680R</td>
<td></td>
<td>C6,15 330nF poly</td>
<td>SW2 SPDT sub-min toggle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>SW3 SPST sub-min toggle</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>B1 9 volt (PP3); case about 180 x 120</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>x 39 mm; PCB; four 8 pin DIL IC</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>holders; control knob; battery connect</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>or; wire, solder, etc.</td>
</tr>
</tbody>
</table>

Not much to see in the serial interface box.

Unfortunately, we are unable to reproduce the listings for the three computers mentioned. However, we will supply a copy of which ever listing is requested to anyone who sends us an s.a.e. Please address your envelope to 'Listing', Ham Radio Today, 1 Golden Square, London W1R 3AB stating on the envelope whether you want the BBC B, CBM 64 or Vic 20 listing.
I have always been interested in weather forecasting and at one time optimistically hoped to be able to predict whether the sun would shine on our annual holiday although I never got it right! Originally, I tried using the five figure groups of information which are transmitted from Bracknell, callsign GFL26, and from other stations around Europe. My appetite was further whetted by an article by Paul Richards in the BARTG quarterly newsletter, (July 1982, page 9), but I was never able to obtain any accurate results.

For a while I gave up. Then at the RSGB Convention I saw a stand displaying pictures and printouts recorded from orbiting space craft and I was hooked again. After tentative enquiries, I obtained an interface and an EPROM, both marketed by Timestep Electronics of Newmarket, and a receiver covering 137/138MHz with a bandwidth of 30kHz. I already had the necessary BBC computer with monitor, and the required pair of crossed dipoles. With this system, I obtained some very satisfactory pictures and my interest was renewed.

Since the official use of the data imagery is weather forecasting, I thought that a visit to the Meteorological Office at Bracknell would be useful.

### The Meteorological Office

The Met Office administration and computers are based in Bracknell although the rest of the equipment, including the antennas, is down at Lasham in Hampshire. The Met Office receives a wide range of information from a variety of sources, however, I shall be concentrating on the Autosat system which obtains its information from the orbiting satellites, including the geostationary ones. The Autosat system is concerned with the acquisition of satellite image data for dissemination over the facsimile network, known as Satfax, which is illustrated in Fig. 1. It is by no means the only system in the Met Office that deals with satellite data, but it does directly relate to how amateurs receive weather satellite pictures.

All data used on the Satfax network is acquired from meteorological satellites by the ground station at Lasham. At present data is taken from two US polar orbiting satellites, NOAA8 and NOAA9, the US geostationary satellite GOES-E which is located at 75° west, the European Space Agency (ESA) geostationary satellite Meteosat 2, and, indirectly, from US GEOS-W. (For the uninitiated, ‘geostationary’ means that the satellite appears to stand still in the sky. It rotates at the same speed as the earth and takes photos of the same area. The data is then passed to Bracknell using two private telegraph lines).

The polar orbiting satellites transmit on a frequency of

---

**Fig. 1** The current Autosat/Satfax configuration.
137.500MHz and 137.62MHz and have an orbital period of approximately 102 minutes. The average height above ground is 835km. NOAA9 crosses the equator in a northerly direction during the day and NOAA8 in a southerly direction during daylight hours. The two channels, on each satellite, transmit information derived from scanning ‘radiometers’. Channel 'A' is in the near infra-red spectrum and channel 'B' has its radiometer in the visible range. The resolution of the data is 4km.

As far as the geostationary satellite Meteosat 2 is concerned, both the latitude and longitude are 0 degrees and the height above the earth is 35,780km. The frequencies of the two channels are 1694.5MHz and 1691MHz respectively, and down converters from these two frequencies to 137 are commercially available. Meteosat 2 was launched in June 1981, and provides pictures, normally every half hour day and night over an area which includes Africa, Europe and the North and South Atlantic oceans. As with all geostationary satellites, the view near the horizon is too oblique to yield much information.

Picture This

All available APT (automatic picture transmission) data and some AVHRR (automatic very high resolution radiometry) data is used, but only a limited amount is taken from the geostationary satellites. When the data arrives at Bracknell it is digitised and stored in a DEC PDP 11/60 mini computer, (which is in fact called Autosat). The computer is programmed to accomplish the following tasks:

a) To improve the grey scales. (On my system there are only four grey scales. This is sufficient for me but obviously unsuitable for a commercial undertaking). The program in the computer adjusts the grey scales according to the time of the day, with the constants changed during the year.

b) To select pictures for output to the various channels.

c) To project pictures and a grid onto a polar stereographic projection at a scale of approximately 1:20 million. These pictures are then assembled as a composite picture which contains the outputs for 2, 3 or 4 consecutive passes. This is the sort of thing we see on television.

d) Storage. At present the APT pictures are stored for about 4 hours and the AVHRR ones for approximately 12 hours. The projected pictures are stored until the start of the corresponding set of orbits on the next day. The pictures from the geostationary satellites are stored for up to 24 hours, but if the same area is covered by several pictures during the day then the storage time may be reduced.

Where To Now?

The output from the PDP 11/60 computer is then taken to the CFO (Central Forecasting Office) where amongst other things, the forecaster can change the 'grey scales' to improve contrast and brightness of the picture). A sequence of up to 20 pictures is available, and if required, can be repeated. The time limit between pictures can be selected by the forecaster with a minimum of 0.2 seconds. In practice an interval of between 0.5 and 2 seconds is used.

Fig. 2 shows the layout of the hardware controlling the input of data from the receiving station. The output is then distributed to the various interested users, shown in Fig. 3, the Satfax network, through a network of dedicated British Telecom telegraph lines and display on facsimile recorders at the receiving stations. These produce the imagery, messages containing operational information and ‘grey-scale’ to assist in the tuning of the recorder.

There are four outputs from Autosat plus a TV display in the CFO which can be used to display any picture stored in Autosat. In addition
there is a facility to output selected pictures, via magnetic tape, onto film. This is used to build up a 'quick look' archive of the projected pictures. The routine operational control of this network is undertaken by the duty staff at the Meteorological Telecommunications Centre (Met TC) at Bracknell.

For The Layman

We can, of course, receive at least some of these transmissions which are known as slow scan images. The receiver covering the required frequencies of 137-138MHz with a bandwidth of 30kHz, is not difficult to come by. Timestep Electronics, Microwave Modules and Cirkit Holdings all make a suitable unit. A pair of crossed dipoles needs to be erected for receiving NOAA satellites (a parabolic dish for Meteosat 2) and a masthead preamplifier is strongly recommended, especially if your coax feeder is more than five metres long. The pictures will have to be stored in some form of memory — either a dedicated framestore unit or a home micro with a suitable software and interface. Finally, you will of course need a monitor!

Unfortunately, it is not so easy for radio amateurs to receive pictures as for the Met Office. You need to know the position of the satellite you want to receive. After several unsuccessful attempts I contacted AMSAT UK who put me in touch with a group. This group have written a suite of programs which enable you to locate the position of any satellite, including those of high orbital eccentricity, and to plot its ground track. It displays the information in a variety of forms including tabular, whole earth Mercator projection and European Theatre projection. It can even operate 'real time' control of a tracking aerial. The program is called Satpack and is available from AMSAT UK (see address box).

The visit to the Met Office was a very rewarding experience and put a new dimension on the reception of satellite signals. Should you wish to receive the five figure groups of the Met broadcasts from any Met Station, GFL26 included, then an application must be made to the Met Office (Licensing) M017, London Road, Bracknell, RG12 2SZ giving the following information:—

1. The transmissions to be received.
2. The proposed frequency (frequencies) to be used.
3. The apparatus to be used.
4. The location of the apparatus.
5. The purpose of taking the broadcasts, eg amateur interest in the weather.

If the purpose of taking the broadcasts involves some commercial activity, a fee of £5 is payable. Once this permission has been obtained, it must be sent to the Department of Trade and Industry at Waterloo Bridge House, Waterloo Road, London who may charge a fee unless you are an amateur with a current licence.

Finally, there is now a group called the Remote Imaging Group who produce a newsletter at frequent intervals. If you are thinking of taking up this interest seriously, I would advise you to join them.

Address Box

AMSAT UK 94 Herongate Road, Wanstead Park, London E12 5EQ, enclose an SAE please.
Remote Imaging Group, Mr P. Seaford, 12 Jupiter Close, Leighton Buzzard, Beds LU7 8XA.
FOR SALE

TRIO R2000 Rx Gen cov. all mode one year old £935. Used with H01 triband minibeam 10,15,20mtr £80 Works well on other frequencies, when used with ATU £420, for both ring Ely (0233) 613223.

FOR SALE 2 element quad DX240 2,10,15,20m antenna sell for £160, or exchange for Western DX33 Yagi beam in gwo. Tel Steve G4WY 0885 83428 after 6pm.

YAESU 757 GX uaesu 707 power supply Yaesu MD1 scan microphone £600 no offers. RS8711. Phone Rugby (0788) 812560.

FOR SALE FT708R plus accessories, inc mobile mount and speaker mike plus various 170cm ant. £180 ono. Tel DFve G1DMX (QTHR) (0229) 56816 between 6-7pm.

19 SET Ganadiav russian markings complete with No2 RF amplifier £120. British 19 set £60, 1154 with matching 1155 £80 other 1155 £30 Racal 17L receiver £140 knob missing WW2 German radio eqipment offers. Ring for details and other military sets. 0258 880523.

HEWLEY PACKARD power meter 430C. Bolometer range 0-10 megs. 10GHz. £35. Marconi VTVM 1014C probe on AC good to 1GHz £35. handbook included G3BNL 0280 703512.

Brackley.

YAESU FT209R 5 meter hand held 5W extra power pack speakers mike etc. 6 months old. £245. Phone 0227 375168.


TRIO 700G 2m multimode manual boxed excellent condition all supplementary crystals fitted SAE brochure £275 also Dragon 32 micro excellent condition trainer and games books used few times for RTTY/CW £35 software all sold. John G4WLD 01 957 8096.


SHARP MZ80B CPM system computer, dual disk, printer parallel interface, serial interface, wordstar cost over £2000 will exchange for good base HF rig 10m-160m or sell for £700. Phone 01 955 3771.

Trio TS530 SP tvcr. Phone Kendal 24461.

EX ARMY No 88 set perfect inside apparently never used £40 38 set mark III £30, forces sender No 18 Mark III also its receiver counterpart £30 pair. Telephone 01 650 3686 (Beckenham) BR3 2PQ outer London.

YAESU FT707 ATU FC707, VFO VF707DM, PSUP7707, micro YM35, boxed as new £640. 11m crystals if required. Oscilloscope Scopepex 4D10 dual trace, solid state, one lazy trace, new condition £120. Datong ASPA speech processor with PSU and leads £48. Frequency meter PFM200 plus leads etc 20Hz to 200MHz £48. Telephone Uxbridge 54116 (Middlesex).

SSTV and FAX transceiver, WRASSE SC1. All modes and to 200MHz £48. Telephone 01 674 7626.

MULTIMODE GW3SPA Eeprom conversion to ten meters covers, 28.51MHz to 29.70MHz in 3 bands. 10KHz steps crystal USB, LSB, AM, FM, with repeater shift £100 inclusive of postage. Contact GW3SPA QTHR. Telephone (0222) 707794 or telephone office hours (0222) 499022 ext 3156.

LOOK 2m station & Trio 9000 plus PSU 90 100 watt linear amplifier 9 ELE Tona and lots more, price around £400 please ring Bob on Keynsham 67737.

FC102 ATU 160-10m including power and SWR meters £120. 29MHz FM transceiver, 4 watt, RF gain etc £40. Trio TR7800 2m transceiver, 14 memories, keyboard entry £160. 2m valve linear pair 4CX250B's 400 watt, 3/5 watt input. £480 (0772) 63856.

FOR SALE 2X PRO ZP 2002, 60 channel air ham, marine, utility, and FM broadcast bands, as new in original box, 6 weeks old, current price £300 will sell for £250. Telephone 228 4835 London.

FOR SALE realistic Pro 2002 - 50 channel scanner receiver covers VH-F high VH-F low, UHF-High-Lo 12V DC mains operation, £125 or offer. Ring 01-692 0944.

COMPLETE electronic RTTY terminal, Radsort terminal, interface, video, Genie computer fully featured transceiver unit, £99. AR40 rotator, Transformer 230V input 850V 480mA. 315V C 350mA, Transformer 230V input 850V 480mA. 315V C 350mA, 4X 19 ele 2m sets £30 each. £4 way splitter £15. Carriage extra 4GJB QTHR (0935) 23873.

VHF TV aerial for caravan or boat or lorry £12. Stereo amplifier 30 watts per channel £45 made by Leak 8 track cartridge player £10. Various cartridges £1.50 each. Mike, 4 Doverfield Road, Brixton, London SW2 SNB. Tel 01-674 0513.


FOR SALE Yaesu YO-901 with bandscope £120 one, Yaesu FT-901R 2m transverter £130 ono, Yaesu YV-901DM VFO £130 ono, or all for £360 ono, all in G.W.O. + manuals. Buyer collects. Tel 01-471 0669. After 5pm ask for Danny.


Free Readers' ADS!
FOR SALE Trio 9130 as new, 3 months old under guarantee. Recently passed morse going for sale. £620. Tel. Nailsea 851608.

Yaesu FR6-7 Receiver excellent condition no modification £90 ono. Cummermutes 324.

CIRCUIT copies of Heathkit HW16, HG-10B, RAJ, CLI, RG1 also Pye 1101A/3017A receiver and Pyle Blackbox HiFi record reproducer £2 each, plus stamp. Marris 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA.

GOING ABROAD, so homes needed for B40, KW Viceroys and CD711S.2 scope. Offers to GADX, QTHR. Tel 0732 455757.


FOR SALE BCC 456 portable radio telephone with manual, ideal for person with conversion ability to convert to frequency required to £10, with post and packing or £1. Buyer collects. Phone 0295 55488.

Ask for Dave.

CR100 receiver surplus to requirements, goes to best offer or would exchange for good PSU, must be collected. Reg G11HN. Phone 0533 889303 or 58 Horsewell Lane, Bedfont, Middlesex, Magina, Leicester LE8 2HQ.

COBRA 148 GTL-DX 11m multimode, ideal for conversion to 10m with 10w pep output. In good condition and includes circuit diagrams etc £110 one. Tel 0453822759. Possible exchange for test equipment.

FOR SALE Yaesu FTDX401 in superb condition with manual and mic and ext-vo with one full set of new valves for spares £230 ono. Buyer collects. Tel 0246 36496.

130S 180 watt compact go anywhere transceiver 80-10 inc ware: digital readout, noise cancelling mike £375. G3MP Notthingham 602634.

BROTHER BR-30 colour graphic writer, only ten months old, still boxed and complete with instruction manual, good condition £120 ono. Sharp PC-1500 pocket computer and printer, plus PSU instruction book and applications manual £180 ono. Phone Tadley 4111 ext 6176 (Berkshire).

DIPLOE of delight 4 bands 40m-10m no ATU required too big for new QTH £30. 2m linear BNOS 110-100 as new £90. GILO Colchester (0206) 210878.


FDK 700E multi 2 mtr FM 25V GWC. Colin 0476 70887 evenings £120.

FOR SALE Cobra 388 GTL-1200 minor Gain 5 suitable for conversion to 28MHz £75. Phone 0283 221870. WANTED Nato 2000 in good working order. SMC transmatch urgent wanted rotor system three. Tel 0283 221870.

YAESU 1012D excellent condition only used on transverter boxed manual fan etc £425 or pass swap FT 221R, FT225R or TS700, TS770 why? Offers rings anytime 02572 60679 (Lancs). WANTED B/spread coilds for HRO all bands and FRG7 un mod mint only.

FOR SALE Tokyo Hy-power all modes with unterminated antenna coupler mod HC200 as new £55+ p/p. Wolfen W-1200 VHF scanner with FO six crystals fitted £46 postpaid number of RSGB and ARLL publications for sale send SAE for list. Tel Avonmouth 828586.

YAESU FT707 USB, LSB, AM, FM. 100W output full 11m fitted 25-28.500 vgc £395 ono. Tel Paul 01-968 4659. YAESU FT707 all modes complete £260. Tele 02077 757 or gen-cov.

YAESU FT1012Z with 2D digital counter fitted. USB LSB AM, FM. Full 11m +10m fitted cover 26.000-30.000 recently overhauled by dealer £195 ono. Tel Paul 01-961 4659 away time, part x FT 757 or gen-cov.


YAESU FRG-7 receiver 0.5MHz to 29.9MHz. Hardy used since new (mainly been in storage) excellent condition includes Jaybeam and Joymatch ATU £160 ono. Tel Frank (089) 275 638.

MM+KEYBOARD keyboard RTTY outfit £95 ono or exchange for 12" colour television. Also FOK RX40 2 mtr band receiver £60 ono. 101 ZD FM immaculate condition £500 ono. Special offer 101 ZD FM plus MM RTTY and keyboard £560 ono. Dave 06286 64567.

YAESU FT980 gen/con HF one year old, c/w curtis keyer 300Mz cw filter manual service, manual full break-in suitable for AMTOR, recently realigned by importer, boxed as new £999 ono. G4WVK Bruce, QTHR. Tel 06286 64415.

TRIO R600 receiver, as new, with original packing, £195. Welz SP400 power meter, 130-500MHz 5/20/150W, ‘N’ connectors power + SWR, £60. Jaybeam 48 ele multi-beam for 70CM, £16. Tel Warlick (0926) 498388.

BURNDEPT 3 channel UHF trans/rec, hand held, expen- sive unit, good order, offers.umberband exchange, what have you? 0480 300278 any time.

FOR sale. Murphy receiver, exc. Navy, B40, working, no longer required, £50. Tel: 021 360 6560, after 6 pm.

DSBBO QRP rig. Ready built in case with calibrated dial, plus fine tuning, CW sidetone, PTT switching. £40. Telephone, evenings. Ian, G4UWK (QTHR), 062 982 3072.

YAESU FT290 complete with Mutek batteries and charger. Also 30 amp linear, £250. E. Maybury, 27 Ballard Close, Maybury, 27 Ballard Close, Brierley Hill 263020.

FOR sale. 80M CW TX comprising CM Howes VFO and TX boards, used for many QSO’s, power to 5 watts, £45 ono. Also Howes 80M RX board, still in packaging with TX to make QRP transceiver. Contact Tony on Bristol 719613.


YAESU FT230R, boxed and as new, £215. G. Horwood, 01-561 6194 or 01-573 0442.

TRIO R-2000 receiver for sale, 150KHz-30MHZ, VHF converter fitted, only four months old, little used, bargain, £450. Telephone: Derby 881840.

FOR sale. Standard C58 multi-mode with mobile mount, linear, batteries, charger and case, £250. Two 6-element Jaybeam quads, power splitter, £60. Telephone: 01-527 6775.

FT2930 as new with mutes at front end, carrying case, charger, manual, boxed, £220. Tel: (0734) 413656, ask for Jon.

TRIO R600 RX, as new, £235 ono + Trio TR7800 2M/25W RXTX, excellent cond, £195 ono. Ring Paul, Tues evening after 18.30, on 061 682 5533.

SHIMIZU SS105S 9 band HF transceiver 1.5-28 full 27MCS FM 558 Kenwood mic Scarab RTTY tuner unit interface and programme for Spectrum. Exchange for any 934 MHz equipment, transceiver, etc. Slaley 043473 554, Northumberland.

Also 30 amp linear, £260. E. Maybury, 27 Ballard Close, Brierley Hill 263020.

TEN-TEC 228 ATU SWR bridge 1.8 to 30MHz, 200W intermittent, 100W continuous, switched for dummy load, bypass, coaxes, LW, twin feeder, VGC, GWO, £55. Derby 700610.


TOKYO Hy-power 70cms linear 3W in 45W out, as new, £125 ono. NEC 68 12" very high res colour monitor £40 x 400, perfect. £250. Also NEC 12" green screen monitor, composite video, perfect, £75. Phone Paul, G4XHF. (0293) 515201.
NEMS-CLARKE special purpose receiver No. 1302A AM, FM, wide 300kHz bandwidth 10kHz video bandwidth 1kHz. BFO/squelch controls—signal strength and tuning meters 53.0-260MHz approx effective scale length 36in, in super condition, £175, buyer to inspect and collect. Phone Jon, 0242 524217.

FOR sale. FT101E AC/DC leads, mic, 250Hz CW filter, spare PA valves and driver, £350 cash only. Bill Kitchen, 18 Welch Road, Newton, Hyde SK14 4DJ.

REALISTIC TRC 1005 for sale, hand held 40 channel CB as new with battery charger, DC power plugs and leads, rubber duck antenna, DYN microphone, condition mint, £162 with extras, will sell for £90. Telephone: 01-228 4835.

FT901D HF rig including all options, AM, FM, FSK, etc. In pristine condition and very little used as back-up rig. Would exchange for 2M base station multimode and general coverage receiver in similar condition or would sell with a hagggle around £500. 4F4KZ, 061 624 2808.

ACORN Electron 32K home computer, BBC basic, also PSV several games tapes and accsy. Tel: 061 962 0384.

KENWOOD TL922. 2KW input, HF linear 550. Mast five 10' sections holding 4 element tri-band TET antenna (as new), older but perfect condition ham M rotator, (as new), older but perfect condition, £100. Kenwood FC901 antenna, coupler for 2M, £75. Tel: Caernarvon 5468 or WHY.

DATONG Morse tutor D70, one year old, VGC, no need for it now as I have passed the morse test, £35. Brian Devlin, 22 Vulcan Street, Motherwell, (0698) 67379.

YAESU FT101E plus spares and LLL FM, £375. YAESU FT290R with two sets of nicads, carrying case and mobile mounting bracket, £250. Realistic DX160 comms RX, £40. P. Johnson, 61 Moss Lane, Alderley Edge, Cheshire SK9 7HP.

RACAL Collector buys or swaps anything “Green”. TRA931, TRA967, MA985, MA986, MA968, MA945, BCC528, BCC533, MA422, TA944, RA929, TA970, PSUs, antennas, incomplete units, carrying or mounting frames, connectors, leads, spares, brochures, manuals, WHY?分布器, Bob 120 Birmingham Road, Redditch, Worcs. B97 6EP.

SUPER STAR 360FM beautiful radio five bands plus legal forty 2605 to 2830 five KC shift ten KC shift for Alpha channels £150, also Zetagi B300PS all band mobile linear £15, MRP £137, or PXR FCC 10M £75. Tel: 027 4975X plus cash adjust. Reading 411501.

SOUND level meter advance electronics 25db to 150db octave analysis dbA dbB dBC fully portable Bruel Kier microphone and accelerometer, offers or exchange VHF or HF gear. WHY. Tel: Matt 0246 260375 or 203863.

LATTICE mast, heavy duty, three section, 30 foot, galvanised with 17 inch sides. Steps up one side, base needs slight attention, buyer collects or transport arranged at cost. No reasonable offer refused. 0202 745185 (Dorset).

YAESU FT209R, 5 watt 2 meter hand held extra nicad pack speaker mike charger, etc, 6 months old, as new condition, £245. Phone 0227 375168.

AIRBAND R-532 scanner, complete with mains power unit, excellent condition, few mods old, £110. CHELSEA 01-864 6555. After 6 pm.

COBRA 148 GTL-DX FM AM SSB CW SWR meter built in +/- 5kHz shift 26.515-27.855 with service manual and 10 metre conversion info. Microwave Modules 28/14 converter RX-only, both for £150. Tel: Caernarvon 5468 or WHY.

P. Johnson, 61 Moss Lane, Alderley Edge, Cheshire SK9 7HP. 

REFTEC MK II Crestbyte pre amp 934 for sale. Complete factory overhaul of both units recently, £255. T. Clayton, Brook Ash, Norfolke, telephone Mulbarton 78120.

TS770 2M/70CM dual band multi mode transceiver £500. Extended basic module for Texas T199/4A computer £20. Avometer model M 8845 £130. Tel: (0296) 493838.

RX Sommerkamp FR 100B, good condn., TX Sommerkamp Fl. 200B new valves (untuned), offers. Pembroke 681371, GW4LGN.

FOR sale. Solid state variable HF Linear amp pre amp, £180 ono, model SL2500D. S. G. Braid, 22 Cleveland Crescent, Holyhead, Gwynedd LL65 2LD.

RACAL RA17L communications receiver 0.5MHz-30MHz, good condition with circuit diagram and some spare valves. Plus Datong AD270 active antenna, price £180. Ring 051 336 4239, evenings.


YAESU FT209R £350, 5 watt 2 meter hand held extra nicad pack speaker mike charger, etc, 6 months old, as new condition, £245. Phone 0227 375168.

YAESU FT101Z HF transceiver £160. Blackmore, 17 Welch Road, Newton, Hyde SK14 4DJ.

YAESU FT-480, FT-7. G4AFY not interested in swap. YORKS, WALES, RACAL RA17L HF transceiver modified to cover 11 metre band, CW filter and base mike included, good working order, sell £295 or PX HF receiver plus cash. Phone 01-733 0865.

FT290R with nicads, charger, case and speaker/microphone in original box, £230. Tel: Teerchoy (0443) 776131.

RACAL RA-17 rx vgc £120. Hallicrafters SX-117 RX Ht-37 tx £250. KW-77rx £90. KW Viceroy £55. Codar PR-30 £20. Part exch? Want KW-202 RX, FT-480, FT-7. G4AFY not interested in swap. RACAL Collector buys or swaps anything “Green”. TRA931, TRA967, MA985, MA986, MA968, MA945, BCC528, BCC533, MA422, TA944, RA929, TA970, PSUs, antennas, incomplete units, carrying or mounting frames, connectors, leads, spares, brochures, manuals, WHY?分布器, Bob 120 Birmingham Road, Redditch, Worcs. B97 6EP.
SALE Radio Shack DX160 Rx general coverage receiver 150KHz to 30MHz SSB AM CW all solid state with FETS ICS etc with matching communications SP150 speaker in grey case AC 2400R 110 volts A/C or 12 UDC, only £110 own, mint condition. Phone 01-785 9325.

CONVERTER 100KHz-60MHz input 100MHz-160MHz output manufactured by SEM, £25. Tel: Stevenage (0438) 725926.

FOR sale once again. TS120S HF solid state transceiver, 80m to 10m, with mike and handbook, excellent condition, not used mobile, digital readout, no valves, £345 includes SG/10. No time wasters please! Telephone Llanelli (0554) 753186.

FOR sale. Summerkamp FL linear amplifier 160 to 10m, 1200 WEP. Yaesu UV901R transverter 2m 70cm and 6 metre board fitted multimode variable output, both as new with instruction books, also Microwave Modules 2m linear 10 in 40 out. (Wanted 757D or 403S) Scarisbrick 880345.

PANASONIC DR28 six band digital frequency readout L/M/35W/VHF 3.2MHz 30MHz variable BFO two speed tuning. Battery mains, tun/batt meter, lightweight, portable, first reasonable offer. 0273 (Brighton) 737076.

SOLON iron 230-250V, 56W, £3. Large circuit for VKW Vanguard Mk 2, £2. KT66, £6. Exchange HRO coil 14-30MHz. NO-10 calibrator, 500kHz crystal, VFO, manual, receiver (2-U3) and 90V, £6. EX-WD whip base, £3. Tel: (0284) 60984 (Bury St Edmunds).

HAM international black shadow, converted for 10m band, 80ch Am/Ssb, E5 Class "D" wavemeter Mk 2, 1.9-8MHz plus harmonics xtls 1MHz, 100kHz, VFO, mains, £12. G66L £25. Edwards (Bury St. Edmunds, Suffolk), tel: (0284) 60984.

YAESU FSP1 80hm 6W speaker, extension, mobile, £6. "Pye" marine grey battery box 64x121x103mm, E5 Class. "D" wavemeter Mk 2, 1.9-8MHz plus harmonics xtls 1MHz, 100kHz, VFO, mains, £12. G66L £25. Edwards (Bury St. Edmunds, Suffolk), tel: (0284) 60984.

FT726R tribander with 2 mtrs for sale, £600 or swap for HF rig with new bands and frequency display, mains operated. Also wanted, 2 mt transverter in 28MHz to 144MHz. Contact, G6TEE GTHR, or telephone 021 472 3571 anytime.
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).
SOFTWARE

TERMINAL UNITS

Improve your computer decoding of CW & RTTY signals (all known software). Switched tuning, constant output for 10mW to 5V input. Three outputs—Audio, TTL & open collector load (active high or active low). Narrow bandwidth internal loudspeaker — tuning metre — requires 12-16V DC supply.

Available only from the manufacturers at £45 inc. For full details & specifications SAE to:

JEP ELECTRONICS
NEW ROAD COMPLEX
NEW ROAD,
KIDDERMINSTER
DY10 1AL
Tel: 0562-753893

DATASOURCE. BBC -B SPEC-TRUM. Multiplex Amateur/SWL Programmes. Worldwide Pre-fixes, Times, Bandplans, Locators. Inclusive 16.75 cassette, £7.95 BBC-disc includes Duplicate Chacker. R. Wilmot, 1 Retreat Court, Church Lane, Broadbridge

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, crowbar circuits, etc. also fitted. For full details please ring 0536 743496

CARDS, STICKERS

HIGH CLASS QSL CARDS. Competitive prices, free artwork. SAE for samples stating ham or breaker to:

JEP ELECTRONICS
NEW ROAD COMPLEX
NEW ROAD,
KIDDERMINSTER
DY10 1AL
Tel: 0562-753893


CARDS, STICKERS

HIGH CLASS QSL CARDS. Competitive prices, free artwork. SAE for samples stating ham or breaker to:

JEP ELECTRONICS
NEW ROAD COMPLEX
NEW ROAD,
KIDDERMINSTER
DY10 1AL
Tel: 0562-753893

DATASOURCE. BBC -B SPEC-TRUM. Multiplex Amateur/SWL Programmes. Worldwide Pre-fixes, Times, Bandplans, Locators. Inclusive 16.75 cassette, £7.95 BBC-disc includes Duplicate Chacker. R. Wilmot, 1 Retreat Court, Church Lane, Broadbridge

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, crowbar circuits, etc. also fitted. For full details please ring 0536 743496

CARDS, STICKERS

HIGH CLASS QSL CARDS. Competitive prices, free artwork. SAE for samples stating ham or breaker to:

JEP ELECTRONICS
NEW ROAD COMPLEX
NEW ROAD,
KIDDERMINSTER
DY10 1AL
Tel: 0562-753893


EQUIPMENT

USED AMATEUR EQUIPMENT?

I BUY, SELL AND 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

HORNCHURCH (040 24) 57722 ANYTIME or send SAE for latest list to:
G4TNY AMATEUR RADIO 132 Albany Road, Hornchurch, Essex RM11 4AQ

MISCELLANEOUS

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

CB AND ACCESSORIES

THE NORTH's Leading C.B. Distributors including 934 Mhz equipment. Please ring 0388-528464, Ian Fisher Communications, CB Works, Stanhope, Co. Durham DL13 2YT.

FOR SALE

NEW STOCK! Sinclair 16K rampacks for ZX81, £6 including VAT and postage. Halbar, Unit 1,

READER'S ADVERT FORM USED
MORSE TUTOR

For Spectrum/QL/BBC-
WD Morse Tutor
(cassette £4, microdrive/£5.25" disc £6)

From absolute beginner to beyond RYA and
Amateur Radio receiving. Adjust pitch. Set speed
to your test level (4-18 wpm). Learn from single
characters. via groups with wide spaces to ran-
dom sentences; decrease spacing to normal.
Write down what you hear, then CHECK on
Screen or Printer (or speech for Spectrum fitted
with Currah Micro—speech). Also own message,
random figures, letters or mixed. Punctuation in
own message or single characters. Discs may be
40 or 80 -track tSPDOS for Spectrum. Price
Includes postage in Europe. CI extra outside.
WO Software, Hilltop, St Mary, Jersey.

COPY DEADLINES
FOR H.R.T. ARE AS
Aug Issue - 2nd May
Sept Issue - 2nd June
Oct Issue - 30th June
Nov Issue - 4th Aug
PHONE 01-437 0699
FOR ADVERTISING
DETAILS

CLASSIFIED ADVERTISEMENT ORDER FORM
Advertise nationally in these columns to over 100,000 readers for only 46p per word (minimum charge
15 words). Simply print your message in the coupon and send with your cheque or postal order made
payable to Argus Specialist Publications Ltd to:
CLASSIFIED DEPT., HAM RADIO TODAY
1 Golden Square, London W1R 3AB.
Tel: 01-437 0699
Please indicate classification required.
Name
Address
Tel. No. (Day)

CLASSIFIED DEPARTMENT ORDER FORM
Advertise nationally in these columns to over 100,000 readers for only 46p per word (minimum charge
15 words). Simply print your message in the coupon and send with your cheque or postal order made
payable to Argus Specialist Publications Ltd to:
CLASSIFIED DEPT., HAM RADIO TODAY
1 Golden Square, London W1R 3AB.
Tel: 01-437 0699
Please indicate classification required.
Name
Address
Tel. No. (Day)

EYMPORIUM GUIDE

BIRMINGHAM

AMATEUR
ELECTRONICS LTD
510-512 Alum Rock Road, Alum Rock,
Birmingham B6 3HX.
Tel: 021-327 1497/6313
YAESU DISTRIBUTORS
TO THE UK.

AGRICOM ELECTRONICS
25 RIVERSFIELD, MIDLETON, CO. CORK
Suppliers of YAESSU, ICOM, DATONG,
BNOS, DRESSLER, MU-TEK, S.E.M.
RF CABLES, CONNECTORS, ANTI-
NAS, ROTATORS, KEYS, METERS &
LOTS MORE.
RING (021) 632725

BIRMINGHAM

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

DEVON

AGRIMOTORS
Merton CB & Radio Centre
Merton Garage & Post Office, Merton,
Nr. Okehampton EX20 3DZ.
Tel: (08053) 200
Open 6 days 9-6 (Sundays by appointment)
Specialists in 934MHz
Suppliers of all 27MHz and 934MHz equipment

EIRE

RADCOM ELECTRONICS
822/4 Kingstanding Rd., Birmingham B44 9RT.
Tel: 021-354 2083
G4RJM with 38 years in The Radio Trade
Ham Equipment urgently wanted!
Open: Mon-Sat 9-6

ESSEX

SELECTRONIC
The UK's leading suppliers of 934MHz
personal radio equipment
203 High Street, Canvey Island, Essex
Tel: 0268 691481
(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

HAM RADIO TODAY JUNE 1986

65
Get on the Right Wavelength With Ham Radio Today Magazine

For Details of Advertising Ring Julie Dyson on 01-437 0699
### SPECIFICATION

#### General
- **Input Frequency Range**: 144-148 MHz
- **Output Frequency Range**: 50-54 MHz
- **Modes of Operation**: SSB, FM, CW, PSK, AM
- **Input/Output Impedance**: 50 ohm
- **RF Connectors**: S0239
- **Power Connector**: 5 pin DIN 240 degree
- **Size**: 250 x 150 x 85 mm
- **Weight**: 1.9 kg.

#### Transmit Section
- **Input level range**: 150 milliwatts to 15 watts
- **Level of spurious output**: better than -65 dB
- **RF Connectors**: S0239
- **DC Power Requirements**: 13.8 volts at 4 Amps peak
- **Weight**: 1.9 kg.

#### Receive Section
- **Conversion gain**: 20 dB +/- 1 dB
- **Noise figure**: better than 3.8 dB
- **Input 3rd order Intermod**: better than +10 dB
- **Spurious response rejection**: better than -80 dB

#### Local Oscillator Section
- **Frequency**: 95.00 MHz +/- 1 KHz
- **1 KHz noise sideband purity**: -135 dBc/Hz at 10 KHz from carrier

### WITH THIS TRANSVERTER IN YOUR SYSTEM

**TRANSMIT POWER OUTPUT OF 20 WATTS**
This power level of 20 watts, when used in conjunction with a typical antenna of 7 dB gain, gives an ERP of 100 watts (the maximum permissible in UK). This power level is also ideal for driving a grounded-grid amplifier.

**PURITY OF TRANSMISSION**
The MMT50/144 transverter has been optimally designed to ensure that spurious radiations falling with the 88-108 MHz broadcast band are typically better than 90 dB below full output. This has been achieved by the use of 16 poles of filtering, well-balanced mixing and push-pull amplification.

**EXCEPTIONAL LARGE SIGNAL RECEIVER PERFORMANCE**
The 50 MHz transverter enjoys a uniquely high overload characteristic of typically +12 dBm (third order intercept point at transverter input). This has been achieved by the use of parallel FET’s in the front end driving a balanced pair of FET’s in the mixer. Given that the background sky noise at this frequency represents an equivalent noise figure of greater than 8 dB, the low noise figure achieved in the transverter ensures that external noise is the limiting factor. The conversion gain of 10 dB is provided to ensure that the 144 MHz transceiver in use will detect the weakest of signals, while not being subjected to overload in the presence of strong signals on the 50 MHz band. In other words, a system of impressive dynamic range is guaranteed!

**FURTHER FEATURES**
The transverter will accept a drive level at 144 MHz of between 150 milliwatts and 15 watts. The automatic level control (ALC) ensures that the 20 watt output signal is of consistently high quality. An LED bargraph display indicates the relative transmit output power, and the RF VOX control allows the operator to select the "hang" time to anything from 20 milliseconds to 1.5 seconds.

---

**DURING THIS YEAR OUR SALES TEAM WILL BE VISITING MOST OF THE MOBILE RALLIES. PLEASE RING MICK, G4EFO, ON 0403 730 767 FOR DETAILS.**
THE NAME TO TRUST FOR PRICE & AFTER SALES SERVICE

INSTANT FINANCE!! We can offer immediate credit sale facilities to customers holding Credit Cards or Bankers cheque cards & to licenced Amateurs QTHR. in the current Callbook.

WE ARE TRIO AUTHORISED DEALERS

WE CARRY THE COMPLETE TRIO RANGE. SO BEFORE GOING ELSEWHERE GIVE US A RING AND WE'RE SURE WE WILL OFFER YOU A DEAL YOU CAN'T REFUSE - REMEMBER THE AFTER SALES SERVICE AND WARRANTIES - ARROW DOES. AND WON'T LET YOU DOWN.

Our normal despatch is one or two days (as thousands of satisfied customers will tell you). Subject to manufacturers' supplies being available. CARRIAGE FREE on all orders of £300 value and over (UK Mainland only)
Access and Barclayscard accepted. 5% cash discount. 5% order with us. Orders over £300 are accepted. Credit card delivery can be arranged on all items for a total charge of £7.50. Please phone for details. This offer applies to UK Mainland only.
N.B. The F.O.C. carriage offer does not apply when Express Delivery is requested.

NEW SHOWROOMS IN SCOTLAND
We have just opened our new showrooms in Scotland at 91 Dunbarton Road, Partick Cross, Glasgow.
Tel: 041-339 6445
Open Mon-Sat 9.00-5.30 (near Kelvin Museum) short distance Clyde Tunnel, easy parking. (All products except TRIO)

WE ARE ALSO YAESU DEALERS

Ring for Special Offers on our YAESU range

REMEMBER, ATTRACTIVE DISCOUNTS FOR CALLERS, ON CASH DEALS.

Large range of very useful accessories including: plugs, sockets, logbooks, tape, PSU's, aerials, aerial baluns, cables coax, Technical Publications and much much more. Call in to our premises and look around, stop and chat you'll be made very welcome.

BUY WITH CONFIDENCE. WE ARE TRIO, ICOM, YAESU AUTHORISED DEALERS

West Mids. Agent: Jim Cook 106 Wirral Dr. Winstanley Wigan. Tel 0942 214969 (All products except TRIO)

Welsh Agent: John Lewis 14 Carreg-y-Gad Llanfair-p-g Anglesey. Tel 0248 714657

East Mids. Agent: Alan Faint 33 Fairway Market Harborough Leics. Tel 0858 62827