

HAM

AN ARGUS SPECIALIST PUBLICATION

FEBRUARY 1988 £1.30

RADIO

TODAY

Read 'QRZ' —
our brand new HF operating column!

New ALD-24
Alinco goes mobile with cross
band duplex

RN Electronics
2m to 6m transverter



First UK Review of
the new Tokyo mono-bander
Build our 4 band VHF to HF transverter project

FREE! INSIDE THIS ISSUE
32-page SATELLITE TV SUPPLEMENT



For Tomorrow's Radio Technology TODAY

BASE STATIONS

Good News for FT767 owners. Kenwood owners take note!
IMPROVED YAESU FT767 RWC/MK2 HF-UHF BASE STATION

We are pleased to announce that we have now improved the synthesizer (see reviews) leading to better dynamic range by up to 20dB which now puts this transceiver in a class of its own! This modification is only available from RWC and is fitted FREE to all New units sold by us, or we will modify any existing unit for £59.50 inc. return carriage. Available at some Yeasu dealers.

FT767 RWC MK2 COMPLETE TOP CLASS BASE STATION (EX VHF-UHF) £1499.00
 FT767 RWC MK2 COMPLETE TOP CLASS BASE STATION (EX VHF-UHF) WITH 2M FITTED £1599.00
 FT757 MK2 NEW IMPROVED HF TRANSCEIVER £895.00
£699.00
FT726R MULTIMODE BASE STATION WITH 2MTRS. (SPECIAL PRICE)
 ICOM IC735 SUPER MINI HF ALL BAND TRANSCEIVER £892.50
 ICOM IC275E 2MTR 25W BASE STATION, C/W AC PSU £949.00
NEW ICOM IC575 6M 10W BASE STATION, 26-56 MHz RECEIVER TX10 AND 6M £949.00

Many more Makes and Models in stock. Please enquire.



ICOM IC735

FT67GX RWC MK2



NEW

HANDHELDS

* = Extended RX coverage available, call for details

YAESU FT727R 2.5W (5W) DUAL BANDER C/W CHRGR £395.00
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 ICOM MICRO 2E MINI 2.5W 2MTR C/W CHRGR £209.00
 CTE1600 (VY SIM, IC2E) 2.5W 2MTR C/W CHRGR £189.00
 KENPRO KT400EE 2.5W 70CM C/W CHRGR £199.00
 *KENPRO KT20EE 2.5W (5W) 2MTR LCD C/W CHRGR £199.00
 KENWOOD/TRIO TH-21E 2W 2MTRS. (WHILE STOCKS LAST) £139.00

PORTABLES

FT690R/MK2 2.5W MULTIMODE, JOIN IN THE FUN! £399.00
 FT690R/MK2 AS ABOVE C/W NICADS AND CHARGER £425.00
 FT290R/MK2 2.5W MULTIMODE, IMPROVED RECEIVER £395.00
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FT290R/MK1 2MTR MULTIMODE SPECIAL PRICE £329.00

MOBILES

*YAESU FT211E 45W 2MTR NEW SUPER MOBILE FREE £299.00
 SUN 5/8 MOBILE ANTENNA C/W SO239 G/MOUNT
 *ICOM IC28E 25W SUPER MINI MOBILE FREE SUN
 5/8 SO239 GUTTERMOUNT ASSY+EXT LOUDSPEAKER £359.00

NEW LICENCEES CALL FOR SPECIAL DEALS



NEW

SCANNERS

YAESU FRG9600/RWC

FRG 9600

We supply the Yaesu FRG 9600 modified receiver to Government departments and professional users. We offer more options and facilities than any other company. We transform the basic unit by improving sensitivity and adding extra bands. No other scanner has this many options and modes available. Call now for much more information. Overseas dealer required for our kit.

Modified Yaesu receivers, NOBODY can tune 'em like WE can!
 YAESU FRG9600 RWC/MK1 60-905MHZ IMPROVED RECEIVER £465.00
 YAESU FRG9600 RWC/MK2 60-950MHZ N CONNECTOR £495.00
 YAESU FRG9600 RWC/MK3 100KHZ-950MHZ MULTIMODE £596.00

NEW YAESU FRG9600 RWC/MK5 100KHZ-950MHZ ACTIVE F/END £625.00 NEW

YAESU FRG9600 MK3/AH7000/GSRV/PA4C AC PSU, COMPLETE 100KHZ-950MHZ ALL BAND, ALL MODE RECEIVING STATION £699.00
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UNIDEN-BEARCAT UBC175XL SUPER DESK-TOP C/W PSU £179.00
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YAESU FRG8800/FRV8800 AS ABOVE WITH VHF CONVERTER £659.00
 ICOM ICR71 100KHZ-30MHZ A TOP CLASS RECEIVER £799.00

NEW PRODUCTS

INTERNATIONAL MODEL 877R AIR-BAND RECEIVERS

This new tuneable receiver covers 52-174 Mhz as well as CB in three bands and is a **cost-effective alternative to handheld scanners**. The receiver is fitted with a Helical antenna and has good performance for a radio with this coverage. It is ideal for monitoring Air Band, the two-metre and PMR/Marne bands as well as Band 2 FM Broadcast. A squelch control is also provided. Two versions are currently available.

Model 877R, for use with Dry cells £39.50
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DEALERS CALL FOR TRADE PRICES

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IDEAL INTRODUCTION TO VHF LISTENING



NEW

RAYCOM PRODUCTS

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Trade and Dealer enquiries welcome. Call for more details
 P&P £2.50 per order

Business radio users call now!



NEW

ANTENNAS & ACCESSORIES

ICOM AH7000 SUPER DISCONE 25-1300MHZ INC POST £79.00
 NEW RAYCOM AIR BAND DISCONE 118-170 MHZ 6 ELEMENTS £12.50
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 SUN MOBILE 5/8 SO239 C/W SO239 MOULDED LEAD/G/MOUNT £22.50
 G5RV 1/2 SIZE HF MULTIBAND HF ANTENNA (INC POST) £15.00
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 JAYBEAM, TONNA, MET, SUN, HOXIN, POPULAR MODELS IN STOCK.

NEW RWC are now appointed dealers for the West Midlands for Butternut, Cushcraft and MFJ products. Please ask for details of the range currently available.

MOD KITS

RWC MOD KITS, ANNOUNCEMENT

We apologize to customers waiting for various mod kits, supplies of crystals and components are inconsistent and demand for kits varies, so there is occasionally a delay before we can send your kit of parts, please be patient. Rome was NOT built in a DAY! Kits still available.

SANYO LC7137 SYNTHESIZER CB-10MTRS, LCL/DNT CB-10MTRS, FT757GX MK1 FAST TUNING MOD, STORNO COM713 PMR-2MTR KIT, PYE A200 E-BAND 50MHZ KIT, call for technical details, prices and delivery.

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Most other products advertised in this magazine are available at RWC/RAYCOM.

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HAM RADIO CONTENTS

TODAY

VOLUME 6 NO 2 FEBRUARY 1988

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Published by:Argus Specialist
Publications Ltd**Distributed by**

SM Distribution Ltd

Printed by:Adlard & Son Ltd, The Garden
City Press, Letchworth, Herts
SG6 1JS**Design by**

ASP Design Studio

**Editorial and Advertising
address:**Ham Radio Today
ASP Ltd1 Golden Square
London W1R 3AB
Tel: 01 437 0626*(please mark your letter for the
appropriate department)***Subscriptions and back issues:**Ham Radio Today Subscription
Dept, Infonet Ltd, 5 River Park
Estate, Berkhamsted, Herts
HP4 1HL

Tel: (04427) 76661/4

Subscription rates:UK £15.60, Europe £20.10,
Middle East £20.30, USA \$30,
Far East £22.00, Rest of world
£20.60. Airmail rates on request
ISSN No. 0269-8269**ARGUS
PRESS
GROUP**Member of the
Audit Bureau
of Circulation**ABC**

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ICOM

BASE STATIONS



IC-275E/475E 25 Watt 2 metre/70cm. Multimode Transceivers.

Tech Talk from ICOM: THE EXCITEMENT OF SATELLITE COMMUNICATIONS

An ever increasing number of radio amateurs are joining the excitement of Phase 111 - type satellite communications. This new medium combines the communications range of the 20 and 80 metre bands with the line-of-sight reliability of 2 metres. It's equivalent to a totally new band, and a vast technical background is not necessary for enjoying the action. ICOM is able to help you enjoy the fascinating new capabilities of OSCAR and future amateur satellites. Its all mode 2 metre and 70cm base transceivers bring the operating conveniences of low band units to the VHF and UHF amateur bands. They can be used for local FM operations via repeaters or for SSB/CW communications via Phase 111 satellites. The IC-1271E all mode 23cm transceiver is in a class of its own, providing mode L satellite uplink capability. (Mode L: 1269MHz uplink, 436 downlink) (Mode U: 435 uplink 145 downlink). Satellite relayed signals are somewhat weak in nature and the IC-275E's low noise/high

sensitivity receiver gives the highest performance for hearing everyone regardless of their uplink performance. The noise blanker prevents pulse type electrical interference from masking desired DX signals, the selectable AGC can follow fast fades associated with spin modulation. There are also the 99 mode memories which can be used for intermixed FM repeater and SSB/CW operators. When the IC-275E is equipped with the optional mast mounted AG25 GaAsFET pre-amp, it becomes a satellite operations dream come true. ICOM's IC-475E 70cms transceiver has a front panel continuously adjustable power output to allow for daily signal variations. This overcomes the practice of over loading a satellites on-board receiver. The IC-475E also includes 99 all mode memories for the ultimate in operating flexibility. Using the ICOM CT16 satellite communications interface these base stations will track together via the ICOM CI-V system. If you are interested in joining today's most exciting era of amateur communications ie, OSCAR and future Phase 111 satellites, ICOM is the logical choice for top performance equipment.

Icom (UK) Ltd.

Dept HRT, Sea Street, Herne Bay, Kent CT6 8LD. Tel: 0227 363859. 24 Hour.

Count on us!

MORE BASE STATIONS

IC-1271E, 1.2GHz Multimode Transceiver



ICOM, a pioneer in 1.2GHz technology are proud to introduce the first full feature 1240-1300MHz base station transceiver. Features include: multimode operation, 32 memories, scanning and 10 watts RF output. The IC-1271E allows you to explore the world of 1.2GHz thanks to a newly developed PLL circuit that covers the entire band, a total of 60MHz, SSB, CW, and FM modes may be used anywhere in the band making the IC-1271E ideal for mobile, DX, repeater, satellite or moonbounce operation. The IC-1271E has outstanding receiver sensitivity, the RF amplifiers use a low noise figure and high-gain disc type GaAs FET's for microwave applications. The rugged power amplifier provides 10 Watts

which can be adjusted from 1 to 10 Watts. A sophisticated scanning system includes memory scan, programme scan, mode-selective scan and auto-stop feature. Scanning of frequencies and memories is possible from either the transceiver or the HM12 scanning microphone. 32 programmable memories are provided to store the mode and frequency in 32 different channels. All functions including memory channel are shown clearly on a seven digit luminescent dual colour display. The IC-1271E has a dial-lock, noise blander, RIT, AGC fast or slow and VOX functions. With a powerful 2 Watt audio output the IC-1271E is easily audible even in a noisy environment. The transceiver operates with either a 240V AC (optional) or 12 volt DC power supply.

IC-AG1200 Masthead pre-amp. Designed to use with the IC-1271E, the D.C. voltage and T/R switching for the amplifier is superimposed on the R.F. coaxial cable and switched by the pre-amp switch on the IC-1271E front panel. The new pre-amp provides excellent performance as a low noise microwave amplifier (0.6 noise figure typical).

IC-575, 28/50MHz Dual band multimode base station.

The ICOM IC-575 base station was developed to meet the demand for advanced communications for the recently acquired 6m band. Similar in appearance to the IC-275/475 2m and 70cm base stations, the beauty of this new transceiver from ICOM is that it gives you the best of both worlds, 6 & 10m in one compact unit. The IC-575 covers 28-30MHz and 50-54MHz. Operating modes are SSB, CW, AM & FM. Power output is 10 watts (AM 4 watts) with a front panel control to reduce output for QRP operations. A pass band tuning circuit narrows the I.F. passband width, eliminating signal in the passband. A built-in notch filter eliminates beat signals with sharp attenuation characteristics. Some PLL systems have difficulty meeting the lockup time demands placed on them by new data communications. This is why ICOM developed the DDS (Direct Digital Synthesizer) method. With a lockup time of just 5msec the DDS method allows the IC-575 to handle data communications such as packet or AMTOR. 99 programmable memories can store frequency, mode, offset frequency and direction. A total of four scanning functions for easy access to a wide range of frequencies, memory scan, programmed scan, selected mode memory scan and lock out scan. The IC-575 has an internal A.C. power supply, but can also be used on 13.8v DC for mobile or portable operation. Optional accessories available are the UT36 voice synthesizer, the IC-FL83 CW narrow filter, SP7 external loudspeaker, HP2 communication headphones and SM8/SM10 desk microphones. Other transceivers available in this range are: IC-275E 2m multimode 25w, IC-275H 2m multimode 100w, IC-475E 70cm multimode 25w, IC-475H 70cm multimode 75w.



Helpline: Telephone us free-of-charge on 0800 521145, Mon-Fri 09.00-13.00 and 14.00-17.30, This service is strictly for obtaining information about or ordering ICOM equipment. We regret this cannot be used by dealers or for repair enquiries and parts orders, thank you.

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430/726 70cms UNIT £199
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- ★ Priority channel monitoring
- ★ CCC/w Hand mic and mobile mounting bracket

THE FT211RH
THE FT711RH
and the NEW FT2311R



*FT711RH \$FT2311R

OPTIONAL ACCESSORIES

SP55	External Speaker	£19.55
YH1	Headset (C/W Mic)	£19.99
SB10	PTT Switch Unit	£22.00
MH 10F8	Speaker/Mic	£25.00
MH 14A8	Speaker/Mic (C/W Tone Burst)	£23.00
MF 1A3B	Boom Mic (Via SB10)	£25.00

TOP BAND TO 70CMS* TRANSCEIVERS



- ★ ALL MODE LSB/USB, CW, FSK, AM & FM
- ★ All BAND Transmit, General Coverage Receive
- ★ Optional VHF/UHF units (6M, 2M & 70cms)*
- ★ 100% DUTY CYCLE (Key down CW for 30 mins)
- ★ Built in AUTOMATIC ATU (One memory on each band)
- ★ Computer & Packet radio compatibility

OPTIONAL ACCESSORIES

50/767 6M Unit 10W O/P	£169.00	FL7000	500W PEP HF Linear	£160.00
144/767 2M Unit 10W O/P	£169.00	SP767	External Speaker	£69.95
430/767 70cms Unit 10W O/P	£215.00	FIF232C	Computer Interface	£75.00

FT767GX RRP £1550 inc. VAT

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INTRODUCING THE FT736R FROM YAESU



The FT-736R is a solid-state, frequency-synthesized VHF and UHF amateur transceiver incorporating up to four band modules covering the 50, 144, 430 and 1200 MHz amateur bands. The standard model provides 25 watts RF power output on the 144 and 430 MHz amateur bands in SSB, CW and FM modes, with any two of the remaining three bands installable as options (10 watts output on the 50 and 1200 MHz bands).

An 8-bit CMOS main microprocessor and 4-bit i/o coprocessor provide exceptional digital integration and control; including selectable tuning rates or mode-dependent channelized tuning selectable steps for each mode.

Operating conveniences usually found only HF transceivers, such as front panel adjustable IF shift and IF notch, a noise blanker, all-mode VOX and three-speed selectable AGC are included. GaAs FET receiver RF amplifiers are provided in the 430 and 1200 MHz band modules.

The innovative memory system includes one hundred general purpose memories plus ten full duplex cross-band memories, all of which store mode and receive and transmit frequencies independently. In addition, fourteen vfos are provided: two general purpose plus one PMS (Programmable Memory limit Scanning) on each band, two special-purpose full duplex vfos, and up to four clarifier (receiver offset) memories, one per band.

Each of the two full duplex vfos can be selected so that its receive and transmit frequencies and modes can be displayed and turned independently, or linked to tune synchronously in opposite directions for satellite operation. You can retain twelve satellite uplink/downlink modes in the special vfos and ten full duplex memories at all times. Of course, metering of either transmitter or receiver parameters is selectable during full duplex communications. For CW operations, the FT-736R offers quick-changeover semi break-in and includes provisions for an optional internal electronic keyer and narrow (600 Hz) CW crystal filter.

Naturally, with FM the predominant mode on the VHF and UHF bands, the FT-736R includes all manner of convenient features for both FM simplex and repeater operation, special narrow FM mode (to cut adjacent channel interference in crowded areas), Automatic Repeater Shift when turned to 2-meter repeater subbands and a 1750 Hz Burst Tone Generator is installed as standard.

An enhanced CAT (Computer Aided Transceiver) System allows addition and customization of features and user-designed controls from an external computer. The FT-736R also includes a 1/r-switched DC supply line for masthead preamplifiers, activated from the front panel, and digital input connection directly to the modulator for high performance packet radio tnc interfacing.

Optional add-on accessories include the TV-736 Amateur Television Modulator/Demodulator for ATV operation, FIF-series CAT Interface Units, SP-767 External Loudspeaker, FMP-1 AQS Message Processor, and FVS-1 Voice Synthesizer and FTS-8 CTCSS Tone Squelch Unit (both mount internally).

OPTIONAL ACCESSORIES

FEX736/50	50MHz module	TBA	XF455MC	600Hz CW Filter	£ 60.00
FEX736/1.2	1.2GHz module	TBA	SP767	External Spkr c/w Audio Filters	£69.95
FMP-1	AQS Message Processor c/w display	TBA	MD-1B8	Desktop Microphone	£ 79.00
FTS-8	CTCSS Tone Squelch Unit	£45.00	MH-1B8	Hand Scanning Microphone	£21.00
FVS-1	Voice Synthesiser Unit	£33.00	FIF232Cvan	CAT/TNC Interface for Packet & CAT	TBA
Keyer Unit B	Internal Lambic Keyer Unit	TBA	FIF232C	CAT Interface for RS232 O/P	£75.00
TV-736	Fast Scan TV (ATV) Mod/Demod Unit	TBA	FIF65A	CAT Interface for Apple II series	£60.00

See inside front cover for more details.

EXPECTED PRICE AROUND £1500 C/W 2m & 70cms.

A SELECTION FROM OUR CATALOGUE

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LR1/2M	Vertical Colinear 4.3dbd £35.71
LR2/2M	Vertical omnidirectional £28.18
LW5/2M	5 Element Yagi 7.8dbd £17.31
LW8/2M	8 Element Yagi 9.5dbd £21.85
LW10/2M	10 Element Yagi 10.5dbd £28.23
LW16/2M	16 Element Yagi 13.4dbd £42.44
PBM10/2M	10 Element Parabeam 11.7dbd £55.20
PBM14/2M	14 Element Parabeam 13.7dbd £58.08
O4/2M	4 Element Quad 9.4dbd £35.31
O6/2M	6 Element Quad 10.9dbd £46.28
D5/2M	5 over 5 slot led Yagi 10.0dbd £30.82
D6/2M	8 over 8 slot led Yagi 11.1dbd £42.38
5XY/2M	5 Element crossed Yagi 7.8dbd £33.41
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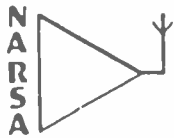
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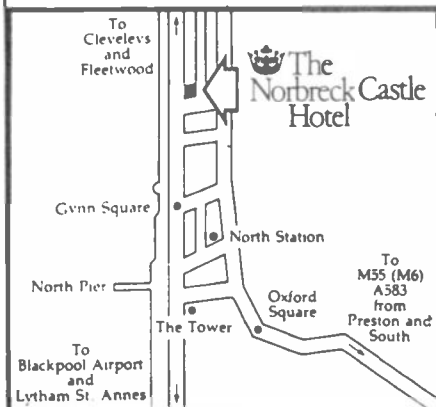
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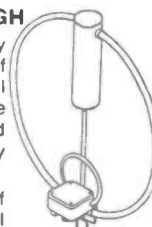
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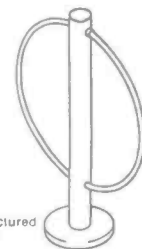
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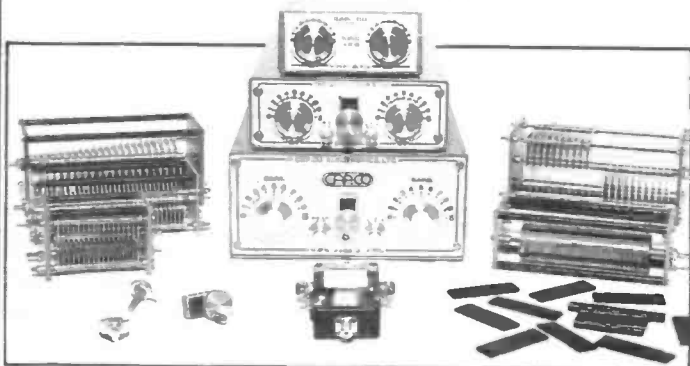
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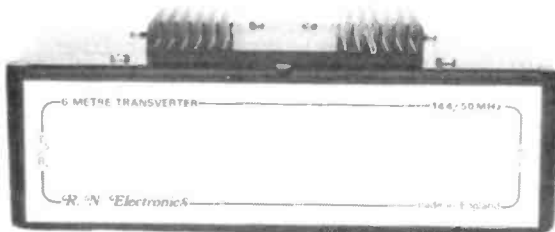
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LETTERS

Letter Of The Month

Raynet Revisited

Dear HRT, In response to the letter by GW1LLN, (HRT, Dec '87), the answer to his question is really quite simple. RAYNET do not own frequencies and they are obliged to operate within the amateur bands to the same rules as every other amateur. They may wish to nominate certain spot frequencies for operating convenience, but they have no specific right to them, neither is any other amateur under any obligation to avoid them.

They are not emergency channels and RAYNET have no special priorities on the amateur bands which means that when they are playing games they must fit in with everyone else and have right to request any other station to vacate a particular frequency. They can of course ask politely. In the event of a real emergency I am sure most amateurs will move frequency to accommodate them.

M J Grierson G3TSO/KD3CL

More Homebrew please

Dear HRT, As there seems to be a general upturn in interest concerning homebrew, probably due to extortionate equipment prices and a desire return to basics, perhaps it is about time for you to begin another one of your excellent projects!

How about an SSB Transceiver for 6m or 4m? Or better still how about a Dual Bander? QRP of course, then we have a choice of PA's. For the HF operator there are already several excellent kits available so how about something for the VHF op? Keep up the good work.

M Barratt G6VXM

The Facts of Life

Dear HRT, Ref: Class B's and HF. I feel I must put pen to paper to let a few folks know the facts of (radio) life.

If you want to drive a car, fly an aircraft, or operate an HF transmitter you need certain abilities, and a licence that says you have. There are valid reasons for this; to be allowed onto the

HF bands with a transmitter and a GO call is to me, a privilege and an honour, and if the whining and bleating 'B' licence holders consider for a moment the damage their HF transmissions might do thousands of miles away to a professional CW station *and* not be able to read requests to cease QRM it might make some sense to them.

The HF spectrum is precious and there is no more — to be let loose on these areas CW is an *absolute minimum* requirement. I get very brassed off with repeated requests for novice (read 'lazy') bands, if this is what some people want then their prayers have been answered — there are three of them! (1) 26MHz (2) 27MHz and (3) 934MHz, and at a licence cost of (I think) £10. Any more questions?

Almost every letter I see from 'B' licensees tries (failing pathetically) to convince the world that they don't *really* want to use HF (honest), however I wouldn't mind betting that if HF was given to class 'B's' overnight we'd get trampled in the rush.

All in all, the pressure seems to be on for 'something for nothing.' I for one am a firm believer in 'what you put in, you get out.' It's quite simple really, if you want touse HF then CW is what you need. If as much energy went into learning it as seems to be expended on trying to get it for 'free' then I'm sure that more fun would be had by all around.

Lastly, I am reminded of an old Chinese proverb that goes a bit like: 'Better to light a candle than to complain forever of the darkness.'

E Greenhaigh G0AQI

Your letter raises a number of points. Firstly, as you rightly say, a licence is an indication of certain abilities but it is also true that 'hands-on' experience is also part and parcel of virtually any learning process. Secondly, how many class A licence holders really do make use of their morse - and how many could cope with a morse QSO after years away from the mode?

The final, and most probably most important point, is that hams should be seriously concerned about the lack of new blood entering the hobby - if an introductory/novice licence or relaxation of morse requirements is what it takes then I would be in favour of it. I for one don't to be working a dwindling band of geriatrics when I'm 70 or so. - G4IRQ

Kapacitive Keyers

Dear HRT, As a newcomer to the bands I am a little confused about electronic keyers for CW — and at present I use the old original brass key.

I am sure many other newcomers would like some articles upon this topic, dealing with the theory and practical approach, eg, how to connect the electronic key into our rigs, what ancillary equipment do we need? Perhaps an article on making such a keyer and equipment would help us.

I am interested in the idea of a touch type keyer — using the capacitance effect — one pad for dots and one for dashes. I cannot find any practical information on this topic.

Your magazine is of great interest and I always look forward to its arrival through the letterbox.

Francis Hook G0BOP

We'll certainly look into it. In the meantime take a look at our regular 'Morse Forum' and if any readers can help Francis out, do drop us a line.

A Newcomer's View

Dear HRT, Having been interested in ham radio for many years (early 30's) but unable to do much about it (mainly economic) I thought that now I am retired, I could seriously think about making a start.

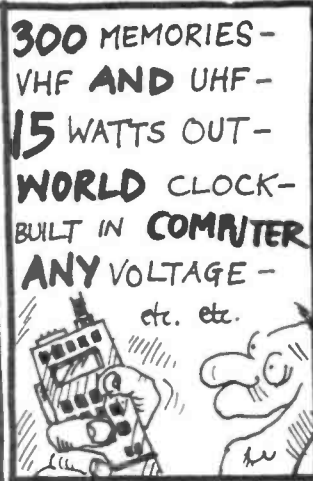
I have HRT December copy and what do I find? Metrewave wondering why numbers of licences are falling. To me it is all too obvious by reading through your magazine. The undignified bickering between dog in the manger Class A's and Class B's. And what is the difference, a morse test which most Class A's forget as soon as they have passed.

Adverts! They seem to cater for the more-money-than-sense brigade and forget about the real homebrew enthusiast who has to think carefully before picking up a few quids' worth of third of fourth hand gear at a junk sale. How many folk like me can afford to lay out £1000+ on gear? We wonder if we could even afford to join RSGB.

It would seem from reading through your magazine that the amateur has to be a well heeled university graduate to even get started. There is a local club in Peterborough, but I back away from contacting them in case they look down their noses at

SQUEALS

87
29



an old codger who is barely coming to terms with transistors. If I am wrong I apologise, but that is the impression I get from reading various publications.
E P Mapleston

There are cheap (sane?) ways to get on the bands, and quite a few perfectly acceptable secondhand valve rigs can be found in places such as our own Free Readers Ads section - I've never bought a brand new rig yet! Do give your local club a chance though, it's a good source of info, equipment and social contact and I'm sure that they would welcome a visit whether you are an old codger or a new one! - G4IRQ

A Gold Star for Spectrum

Dear HRT, I just had to put pen to paper. Whenever I read one of the radio mags there is always someone complaining about this, complaining about that. What about a complement for a change? Well this someone is Spectrum Communications Ltd.

Late one Friday night (10.30pm) I rang them to place an order, got an answering machine, fine, gave my name, address, charge card and what I wanted, and then waited about a week — nothing!

Anyway, gave a ring after 4pm, spoke to a very pleasant young woman who apologised for the delay due to the answerphone going wrong. Anyway gave her all the details, now this being Monday. She said it would be in the post first thing Tuesday and should be with me in a few days. Well first post Wednesday came my order. Boy!

All I can say, with your help is 'Thank you for a very fine service,' and let's have more fine services and thank you letters. Let's face it, amateur radio is meant to be fun, not only complaints. Signed, a very satisfied customer.
Colin G1NPK

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Q R Z



We radio amateurs must spend thousands of hours on the air, yet little of our activities get into print. In this brand new bi-monthly series Steve Telenius-Lowe, G4JVG, looks back at the major HF events of the past few weeks.

As a regular reader of *HRT* I have long thought that the one thing the magazine lacked was a regular column about operating on the HF bands. A chance comment to this effect to the then Deputy Ed. at the RSGB HF Convention in September brought forth an immediate request for me to dust the cobwebs off the typewriter and to produce one. Initially, at least, the HF Band Report will appear every other month. I would be very interested to hear what *you* have been working on the HF Bands, which DXpeditions you think have been successful and which disastrous, which contests you have entered, which awards you are working towards, in fact anything concerning your HF operating activities. But I do not intend this report to degenerate just

into a list of callsigns worked, rather I hope it will be a chatty reflection of what has been happening on the HF bands over the last few weeks.

The HF Convention

The RSGB HF Convention held near Oxford has now surely established itself as the major amateur radio event of the year for those interested in HF DXing. There are no trade stands inside (though there was a small car boot sale in the hotel car park) — the organisers have made a deliberate decision that the HF Convention should not just be another occasion to look at black boxes, but rather a social event with lectures and slide shows of interest to HF operators.

Their success in this regard is illustrated by the large number of

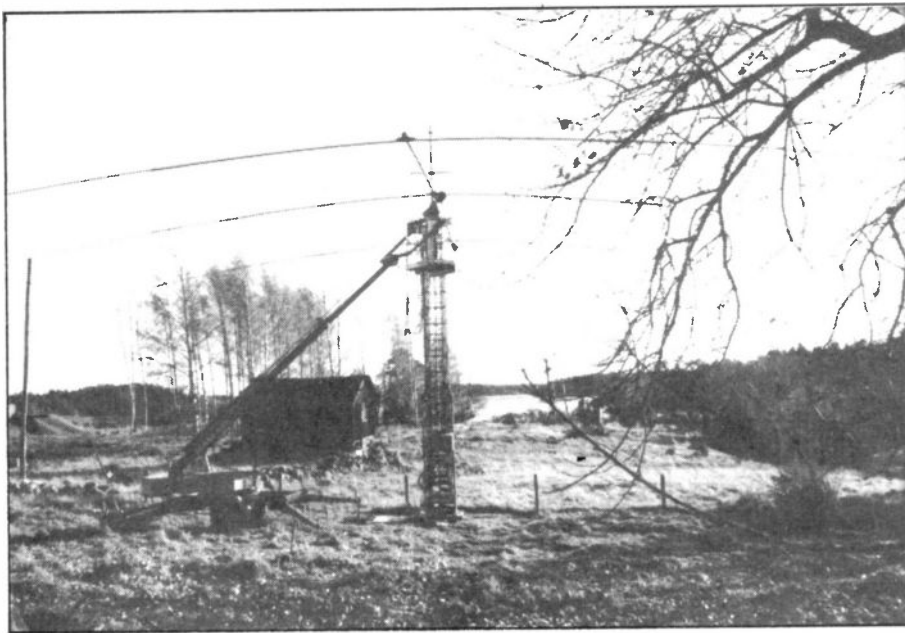
overseas visitors who have travelled especially for the event. It was a great pleasure for me to meet some very famous callsigns, some for the first time, and to renew acquaintances with others. The star of the show was Einar, LA1EE, who will always be remembered for his activity with Kåre, LA2GV, on the first-ever DXpedition to Peter 1st Island as 3Y1EE. Einar showed some magnificent slides and gave a fascinating talk on their experiences down in Antarctica. John, ON4UN, was one of a large contingent of amateurs from Belgium which included Jan ON6JG of WAB fame and Ghis, ON5NT who has been on several expeditions to some rare countries. John was signing copies of his new book *Low-Band DXing* and apparently doing a roaring trade.

Suri VU2MY and Bharathi VU2RBI, who were closely involved with activating both the Laccadive Islands and the Andaman Islands for the first time for many years, where also there. They explained that no-one seemed prepared to give permission for operations from the Andamans, so they went right to the top: to Mr Rajiv Gandhi, himself a radio amateur. They are both now roving ambassadors for amateur radio and doing an excellent job.

Andaman Islands

Indeed, it was largely thanks to the efforts of Suri, Bharathi and others that there has been yet another recent expedition to the Andamans in October, using the callsign VU4GDG. I found them very easy indeed to work, even using an indoor 20 metre dipole: who would have thought this possible a few years ago, when the Andaman Islands was one of the rarest countries in the world?

The expedition had been on the



Hawk, SM5AQD, making the final adjustments to his 7MHz full size 3 element beam. The boom is 39ft long and the longest element is over 75ft!

air for a long time, and it seemed they were running short of people who wanted to work the Andamans for a new country. Nevertheless a few days later, during the CQ World Wide SSB contest, VU4GDG was attracting a huge pile-up, from contesters keen not only to get a rare country multiplier, but also one of the most difficult zones, zone 26. Despite the large pile-up, they were not too difficult to work on 15 metres, with operator VU2TS working the pile-up in grand style. I heard them later on 80 metres, but despite the fact that VU4GDG was a good signal (much stronger than previous operations from there) there was just too much competition to make it worthwhile calling.

The CQ World Wide Contest

During the CQ World Wide contest I operated from the Aston University club station, G3UOA, in Birmingham. The Aston University Contest Group is a new group of enthusiastic students and guest operators, who were entering the CQ World Wide contest for the first time. They have also taken part in the spring WPX contest, also organised by the American CQ magazine with some not inconsiderable success, being the first placed multi-operator single transmitter entry from England last year.

Unfortunately, the antennas were not the best possible when the contest started, though we

improved things during the contest. Arguably our most successful band was 160 metres, where a dipole supported at the top of two 21 metre high masts, which are themselves on top of the university buildings, 40 metres above street level, performed as well as high antennas are supposed to. Stations like VP9AD, UG7GWO, VE1ZZ and several USA stations were worked on 160 metres without too much difficulty, and as far as I know the only multiplier/gotaway/was WA8DIB/VP2M. Having operating from Montserrat on 160 metres in the CQ World Wide contest myself (as part of the VP2MW team in 1984) I can understand why, as the static QRN level was rarely below — and often much above — S9 on top band.

Other rare DX worked in the contest included KL7RA and HC8DX, both on 40 metres, who had huge signals for several hours after local sunrise. Since they both copied our 350 watts to a dipole, they must have had some splendid antenna systems. There was the usual spate of American expeditions to the Caribbean, and the amount of RF emanating from the Netherlands Antilles in particular was phenomenal, with PJ1B, P40V, P40R and P40SS amongst others all going great guns. Apart from the Americans, the Finns are probably the greatest contest expeditioners, and this year's CQ World Wide was no exception, with Finnish DXpedi-

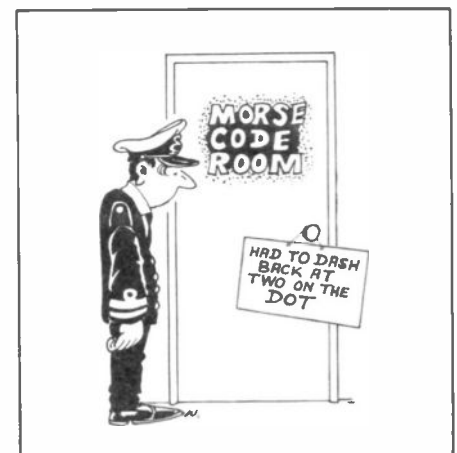
tions to French Guyana (FY5YE) and Gibraltar (ZB2X) providing contesters with much-appreciated rare multipliers.

I often wonder why there seem to be so few British amateurs on DXpeditions, not just for contests, but at any time. Obviously it is very expensive to go to the Caribbean or French Guyana, but there are several rare spots around Europe, such as GD, GU, GJ, the Shetland Islands — which count as a separate multiplier and are also extremely rare in the CQ World Wide contest. Slightly further afield Malta, Liechtenstein, Andorra and even Majorca (EA6) would be a worthwhile destination for a contest DXpedition.

In at the Finnish

If I had to name just one person who was responsible for the tremendous activity and enthusiasm of Finnish DXers, it would have to be Martti Laine, OH2BH, who can always be guaranteed to pop up in an unusual place with a radio, and usually coinciding with the CQ World Wide contest. This year was no exception and Martti was one of the operators of SORASD, from the Saharan Arab Democratic Republic. At present, this entity does not count as a DXCC country, being that part of the Western Sahara which was formerly known as Spanish Sahara and is now part of Morocco. The Polisario Front, supported by Algeria, have claimed independence and have been recognised by the Organisation of African Unity, so it seems likely that the DXCC desk at ARRL will eventually recognise this operation too. In all such circumstances the motto is *Work First, Worry Later!*

When I heard SORASD it was on





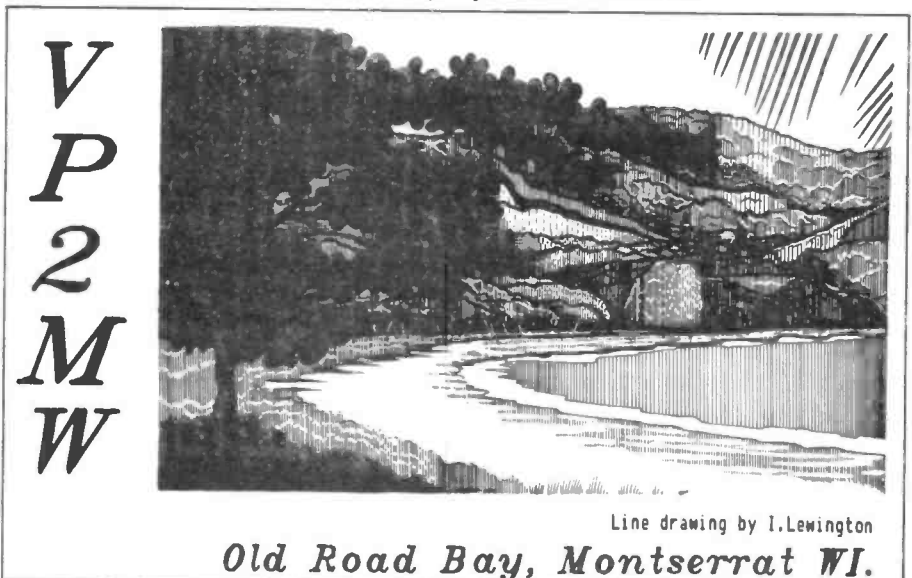
OFØMA QSL card which is now being sent out for QSOs made in July and August. Left to right: GM3YOR Drew, OHØNA Kee, G4EDG Steve, G4JVG Steve and SM5AQD Hawk. In the background is the lighthouse, one of only three buildings on Market Reef.

10 metres, the Spanish operator was on 28400, and listening between 28410 and 28440. I cannot remember *ever* hearing a DXpedition station working as many callers so quickly. Not only that, he was changing from English to Spanish, Italian, German or French depending on who was calling, at tremendous speed and without getting at all tongue-tied! An excellent operation and the organisers are to be congratulated.

Conditions during the CQ World Wide contest were fairly good on the Saturday, with some good Stateside runs, especially on 15 metres, though very little from Japan and the Far East. On the Sunday, however, conditions were not as good, with an aurora affecting northerly signals and thus those from USA and Canada. While auroras may be merely annoying us for in Britain, they are decidedly bad news for those HF DXers in Scandinavia, where, in severe cases, all the bands can be reduced to loud rasping buzz-saw noises with very, very few signals at all coming through. SM5AQD, Hawk at

Studsvik, near Stockholm, was operating on 40 metres single band during the contest and reports that on the Sunday conditions were very poor when, out of the blue, he was called by KH6XX in Hawaii when he (SM5AQD) was beaming south! Hawk has a full-size three element beam on 40 metres, with a very

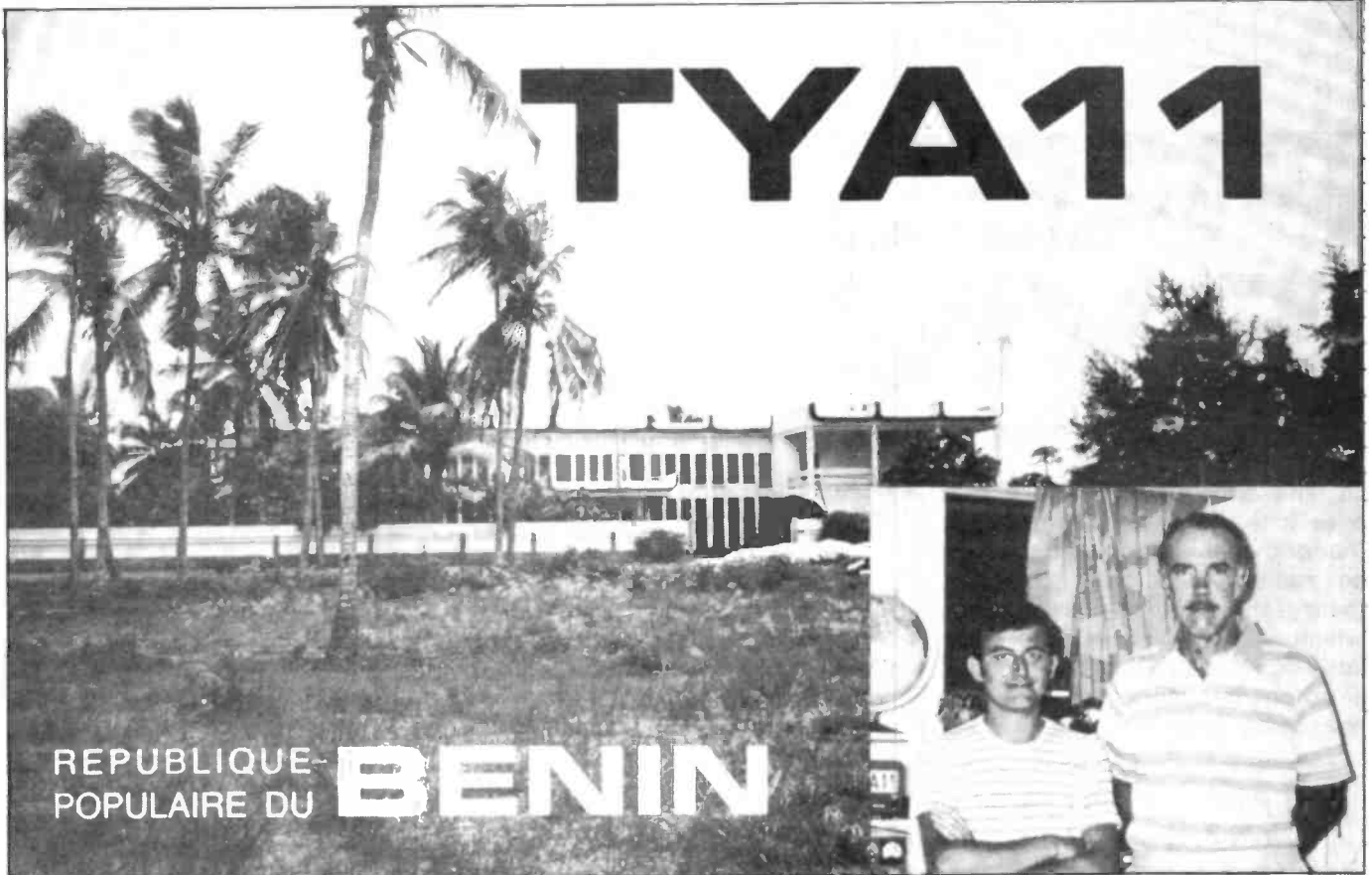
good front-to-back ratio, so such weird propagation effects can only be put down to the aurora. Hawk is one of Sweden's top contest operators and DXers and worked about 1100 QSOs, over 100 countries, and 32 of the 40 CQ zones in less than 48 hours and *just on 40 metres!*



Line drawing by I. Lewington

Old Road Bay, Montserrat WI.

Steve, G4JVG, was one of the operators of VP2MW in the October 1984 CQ World Wide contest.



It was a pleasure to meet Ghis, ON5NT, for the first time at the RSGB HF convention. Ghis has operated from some really rare countries, and used some weird callsigns, such as TYA11! Ghis is on the left with Jim Bullington, N4HX, on the right.

Market Reef

It was also Hawk who was one of the amateurs I accompanied to Market Reef last summer. Operating as OFOMA (the first time the OFO prefix has been used on Market Reef), OHONA, GM3YOR, G4EDG, SM5AQD and myself made about 22,000 contacts with 145

countries. This is a new record number of QSOs for a single expedition from Market Reef, and the high total is because we were able to run two stations simultaneously, 24 hours a day. We were very lucky with propagation conditions, with good short-skip sporadic-E on 10 and 15 metres

ensuring large numbers of European takers on both CW and SSB. We were also delighted to give what was obviously a new country for many Japanese amateurs, especially on 40 metres, where there was a good opening almost every single evening.

Full-colour QSLs have been printed, showing the operators (definitely not a pretty sight!) and our living accommodation, the lighthouse on the reef. Anyone who worked us, or SWLs who heard us, please send their QSLs to the expedition leader, Kee Eriksson, OHONA, SF-22430 SALTVIK, Åland, Finland, and please enclose an SAE and return postage, as Kee has many thousands of cards to send out. Please do not send QSLs for OFOMA to me, as I do not have the logs. However, I do have logs for my operations from Åland as OH0/G4JVG and would be pleased to hear from you. I would also like to receive your reports on what you have been working on the HF bands.

Please send letters to me: Steve Telenius-Lowe, 'Penworth,' Tokers Green Lane, Tokers Green, Reading, RG4 9EB.



Beginners Guide To FREQUENCY SYNTHESIS

Part 2

The only problem which may arise with the mixer synthesiser is that of the image frequency. As will be remembered from superhet theory, there are two frequencies which will mix with any local oscillator signal to produce the required IF output frequency, the unwanted one being known as the *second*

The counters are loaded with two different numbers, the A counter holding a smaller number than the B, and both are then started counting down. When the A counter reaches zero, the division ratio of the

the B counter with 5820. When we start the counters, the prescaler will perform the divide by 11 process 520 times, producing an output pulse each time; these pulses are fed to the A and B counters, each pulse causing the counters to reduce the count by one.

When the A counter has counted down to zero the 4 input NOR gate connected to its output will produce a 1, and this is fed back to the pin on the divider which controls the division ratio, thus altering the ratio to 10. The process continues until the B counter's output reaches zero, at which point the 4 input NOR gate on its output produces a 1, triggering the monostable to produce an output pulse which is fed to the phase detector and also to the reset pins on the counters.

Synthesiser Versus VFO

At the start of this article, I said that the frequency synthesiser was not particularly well suited to SSB use, and we now know enough about the subject to see why this should be so. We have seen that the synthesiser produces an output which can be set to any given multiple of the reference frequency, and it thus tunes in discrete steps.

This is ideal for channelised operation, as practised on 2 metre FM, since it is simply necessary to dial up the channel number and you're there, spot on frequency and with crystal stability.

On SSB, however, channelised operation is not the rule, for the simple reason that the number of channels would be too great to be practical; with channels 3kHz wide, there would be 316 of them in the SSB section of 2 metres, and whereas we can all probably work out in our heads where, say, S17 is,

In part 2 of this guide to synthesis Richard Davies, G3TDL, explains variable modulus techniques

channel or image. In the case we are considering, we find that, in addition to our 145.5MHz signal mixing with 115MHz to produce 30.5MHz, a signal at 84.5MHz will also work since $115-84.5=30.5$.

Thus if our VCO is capable of tuning to 84.5MHz it is possible that it will go to this frequency when the channel is changed rather than the wanted one. In fact, the control voltage will operate in the wrong sense for the image signal, so the VCO will not stay on 84.5MHz but will charge off to the bottom end of its tuning range and stay there! This sort of behaviour will not be a problem in amateur gear, where the required tuning range is limited, but may be so in professional applications.

The Variable Modulus Prescaler

This is yet another solution to the problem of operating at high frequencies. Until very recently its use was confined to professional equipment, but it is now starting to be found in amateur rigs. This system does not use a programmable divider as such but a prescaler with two different divide ratios, the output of which drives two down counters.

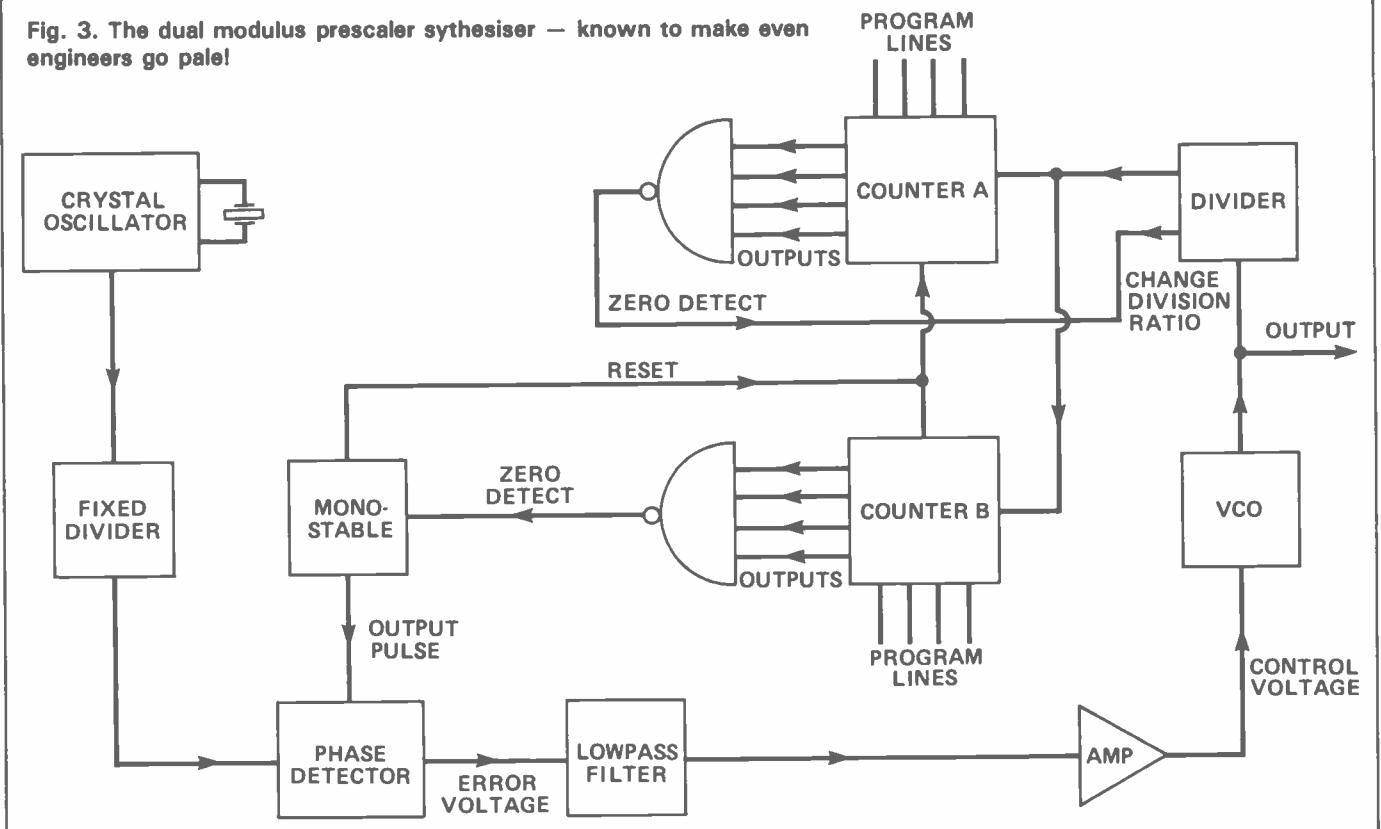
prescaler is changed and the B counter continues to count until it too reaches zero. It then triggers a monostable to produce an output pulse, resets the counters and starts again.

The system as described so far thus produces a regular series of output pulses at a fraction of the VCO frequency, the division ratio being determined by the numbers loaded into the two counters at the start of the process, and it is this pulse train which is fed to the phase detector and compared with the reference to produce the error signal. A simplified block diagram is shown in Fig.3.

To illustrate the process, let us consider again the problem of generating a signal on 145.500MHz. As we said earlier, we need to divide this frequency by 5820 in order to get to our reference frequency of 25kHz. A common type of variable modulus prescaler has division ratios of 10 and 11, selected by feeding a 1 or a 0 to a control pin.

It turns out that we can get our required division ratio by dividing by eleven 520 times, and by ten 10 times, since $520 \times 11 + 10 \times 10 = 5820$. In order to do this, we load the A counter with 5720 ($=520 \times 11$), and

Fig. 3. The dual modulus prescaler synthesiser — known to make even engineers go pale!



imagine being asked to QSY to channel 127! In any case, not everyone on SSB uses a synthesised rig. Thus VFO-type operation is the norm.

Furthermore, although a synthesiser will produce a signal with crystal-like stability, its frequency accuracy will depend on the frequency accuracy of the reference crystal, and the mixer crystals if a mixer type synthesiser is used. In amateur rigs there is generally a certain amount of tolerance in this and so, as anyone who has operated on SSB will have noticed, different rigs tend to have slightly different ideas as to their exact operating frequency!

Whereas on FM you can be up to a couple of kilohertz off channel without any adverse effect, on SSB it is necessary to be spot on. This is another reason why VFO operation is necessary for SSB, since you need to be able to compensate for the

other station's (and you own!) calibration error.

A synthesiser can be made to give an approximation to continuous tuning by using a very small step size. However, as shown above, reducing the step size worsens the phase noise performance, and unless the steps are made very small indeed (eg. 10Hz) we will only be able to get approximately on the other station's frequency; close enough to make his signal intelligible, but not to resolve him exactly. So we can see that the synthesiser is inferior to a VFO for this application in two ways. On the other hand, its frequency stability will be better than all but the best VFOs.

The main reason that synthesisers are almost universally used in modern amateur rigs, however, is their suitability for microprocessor control. Although it is possible to control an ordinary VFO with a microprocessor (as is done in the

QUAD FM4 hi-fi tuner), it is much more difficult than is the case with a synthesiser. To set a VFO to a given frequency it would be necessary to know the value of tuning voltage corresponding to that frequency; thus the microprocessor would need to look up the voltage required in a look-up table, produce the number corresponding to that voltage, and then pass this number through a D-to-A converter to produce the actual control voltage.

Having done this, we would still not be certain that we were accurately on frequency, since the voltage values stored in the look-up table would only be valid for a particular temperature! By contrast, all we have to do with a synthesiser is to enter the appropriate channel number into the programmable divider and leave the synthesiser to do the rest.

Epilogue

By now I hope that the manner in which a synthesiser operates is clearer than when we started! The aim of this article has not been to equip you to design synthesisers, but to give you an understanding of how they work so that if your rig starts playing up, you might be able to do something about it. I hope it's been useful!

"It says the box must be RF tight, not you've got to be tight!"



2m 'Poserphone'

ON TEST



Still looking for something to recommend to the other half as a Christmas present? Fed up of fumbling around with your mobile rig under the dashboard? Maybe you fancy an in-car crossband repeater . . . with the Kenwood

transceiver. This is unfortunately not possible when both transceivers are connected, neither is it possible to control both sets at the same time unless placing them in duplex mode, ie transmit on one and receive on the other.

The OK Yah brigade hit amateur radio with this rather neat remote handset for Kenwood mobiles. Chris Lorek gets out the green wellies and takes a closer look!

TM-221E 2m mobile reviewed in *July 87 HRT*, came the promise of a remote control handset that would do just that. As a crossband repeater cannot currently be used unless an emergency exists, we felt a quick look at what the RC-10 offers when controlling a TM-221E was in order.

Facilities

The RC-10 may be used to control either or both of the Kenwood TM-221E (2m) and TM421E (70cm) transceivers, and offers a backlit frequency display together with a numeric keypad for direct frequency entry or the control of ten memory channels — further buttons giving up/down frequency steps and scan mode initiation. Up/down volume buttons are fitted to control the main speaker volume, with a side-mounted three position switch controlling the earpiece volume. These volume buttons may be over-ridden by the main set rotary volume control if required by a handset mounted slide switch. A PTT bar controls transmit, and when the 'F' button is pressed in TX mode the set gives a 1750Hz toneburst for repeater access.

A microphone socket is fitted to the top of the handset cradle, this may be used to connect a standard fist mic or a purpose designed mobile mic when using a single

Advantages

Many people would like to keep their mobile sets hidden away to deter theft rather than placing them on top of the dashboard where the display and controls may easily be seen. This often means a large amount of eye travel between the set and the road ahead, not exactly helping improve one's safety on the road. A head-up display aids this greatly but the addition of head-up push button controls for frequency and volume change could be even more beneficial. By placing the RC-10 in such a position, one can immediately see the advantages.

As the unit appears not unlike a cellphone handset, the knowledgeable thief wouldn't look twice, as the ESN (Electronic Serial Number) permanently programmed into every cellphone makes stealing one absolutely futile. The transceiver itself may be permanently bolted out of sight, connected to a dashboard switched DC supply to deter the thief who knows that it isn't a cellular handset.

Repeater use

When linked to both transceivers, cross-band repeater operation is initiated by a double button press. Here, the sets are carrier operated, the squelch levels being set by two small presets fitted to the rear of the handset cradle.



When the squelch raises on one set, the other is placed into transmit mode, relaying the received audio and vice-versa. A transmit 'hang' time of three seconds occurs following squelch close, and a timeout of three minutes is employed.

This facility must of course be used with caution under our current licence conditions. Tempting as it may seem, it would be rather unwise to leave your car in a car park and go wandering off with a 70cm handheld, merrily chatting away on the local 2m channel. Having said that, if I were at the scene of a serious accident in mobile communication with a base station with a landline, I personally wouldn't have any hesitation in breaking my licence conditions if it would help injured people.

In Use

I coupled the controller to the TM-221E also supplied and busied myself programming the memories to my favourite channels. After driving off, I found individual memory recall very easy by simply

pressing the button of the desired channel. Reverse repeater needed a double button press, and I eventually programmed the input frequencies of my two local 2m repeaters into adjacent memory channels for quick checking, using VFO mode for simplex nattering. As there was no Memory/VFO mode or offset indicators on the handset LCD, it took a little getting used to before I knew where I was, this was eventually solved by pressing a single key and finding out what resulted if I was unsure.

At night, I found the LCD illumination a bit on the dim side, Kenwood could really do with brighter bulbs in there I feel. Likewise there is no illumination of the push button controls, but after a short while I found operation by 'feel' fairly easy although this does limit the unit's effectiveness somewhat.

The reported audio quality on transmit was excellent although on receive the earpiece audio was on the 'tinny' side and rather limited in its frequency response. Most users, myself included, would normally

use the main speaker for general reception.

Conclusions

The RC-10 could be very useful as a head-up display for one or two mobile sets, its use at night time is limited though due to poor lighting. The ability to select memory channels by a single touch is very useful, rather than cycling through several channels looking at a sets display each time until you find the desired operation frequency. Likewise, handset-controlled initiation of scan mode, toneburst and offset shift is extremely useful. It cannot however control two sets simultaneously in simplex mode, for example when scanning for activity one may select either 2m or 70cm frequencies but not both, a slide switch controlling the band change-over. Even so, for many users this could be just what they were looking for, maybe Father Christmas could be persuaded?

My thanks go to Lowe Electronics for the loan of the review equipment.

2m to HF 4 BAND TRANSVERTER



Want to use your 2m mobile as a multi-band HF rig? G3TWQ has the answer with this 160, 80, 20 and 10m transverter.

In August 1983, HRT published a design for a VHF to HF transverter by G4DHF which was modified the following December by G3WPO for operation on the LF bands. I do quite a lot of portable and mobile operating on the HF bands and the concept of a 2m multi-mode transceiver driving a VHF to HF transverter appeared to offer a lot of performance in a very small package. I was so impressed by the G4DHF design that I bought myself a FT290R and set about building a transverter.

However, as I began the project I realised that my requirements differed from those offered by the existing design in a number of respects — particularly for mobile use. To begin with I wanted four

band capability for 160, 80, 20 and 10 metres with a little more output power and I also wanted to dispense with the preselector control and have an integral VSWR indicator fitted. With this in mind I embarked upon the design described here, which consists of three PCBs (Low Pass Filter, transverter and 'bought in' PA) installed in a compact metal box.

Block Diagram — Receive Path

The block diagram (see Fig. 1) shows the basic layout of the transverter. If we follow the receive signal path starting at the HF antenna input, we can see that the incoming HF signals pass through the VSWR detector to a bank of low

pass filters. The appropriate filter is selected mechanically by means of a push button switch assembly fitted to the front panel which is also used to control the rest of the transverter. The output of the selected filter can then be switched so as to either pass through a 16dB resistive attenuator (to reduce receiver blocking effects) or passed directly on to the main transverter board.

On the transverter board (see Fig. 2) the incoming RF is fed to whichever band pass filter has been selected from the front panel. In this case the correct filter is not selected by direct mechanical switching but rather by means of diode switches which present high impedance paths in the 'off' state and a low impedance path when in the 'on' state. As a result, when the front panel push buttons are used to select a particular band, +12V is connected to the appropriate band pass filter diode network, bringing the filter into action.

Having passed through the band pass filter, the signals are fed to an SBL-1 double balanced mixer where they are heterodyned with the appropriate local oscillator frequency so as to produce an output in the 2m amateur band. As the transverter is designed to operate on four amateur bands, there are four separate local oscillator circuits, each being switched into circuit by means of diode switches operating in tandem with the band pass filters already mentioned. Finally, the output from the mixer is passed directly to the output socket of the transverter and on to the 'host' transceiver.

Transmit Path

In its transmit mode, the transverter essentially operates in the same way as on receive except that

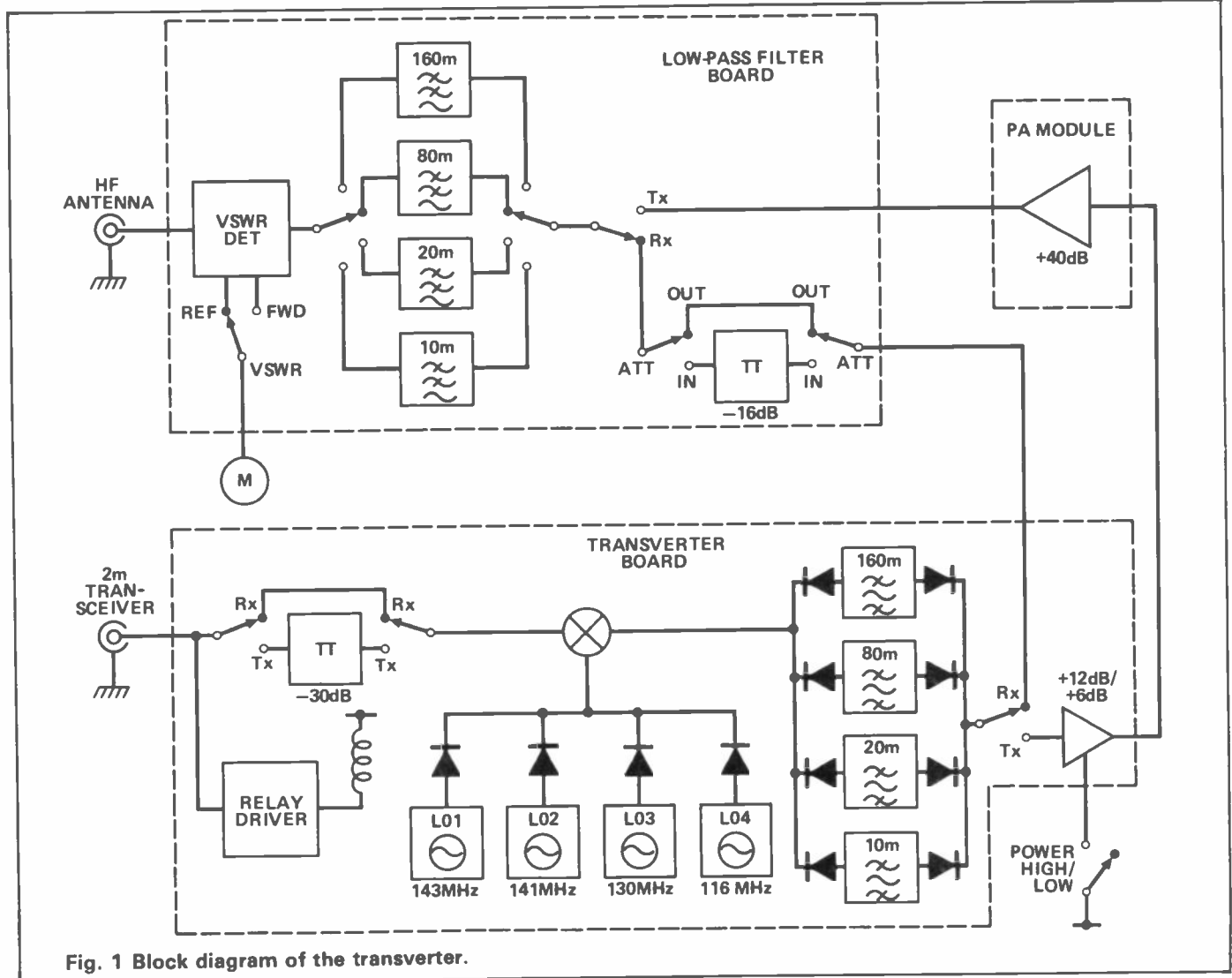
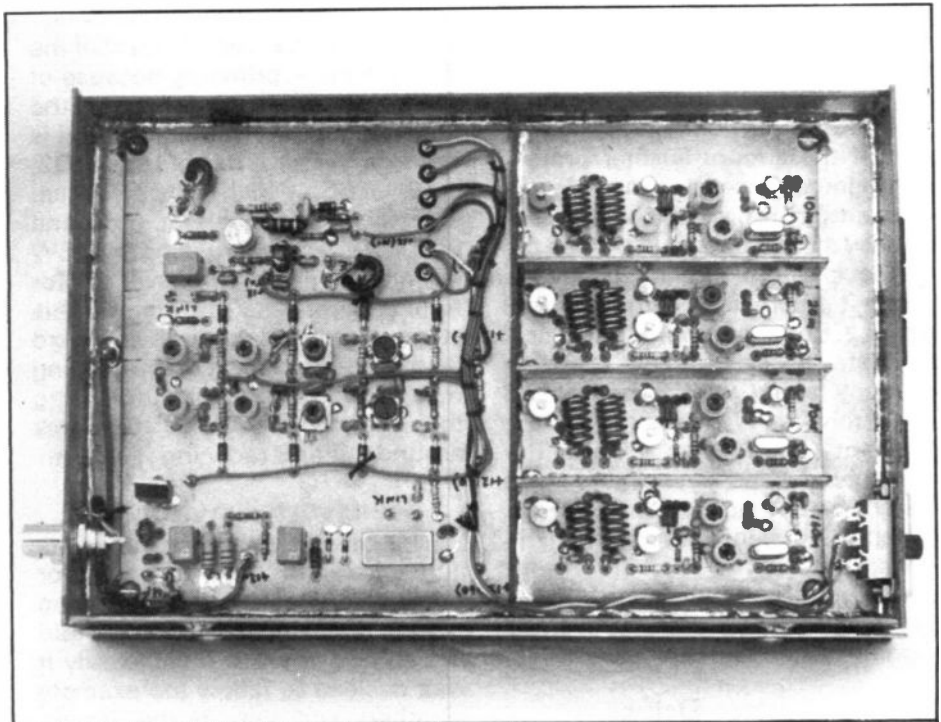


Fig. 1 Block diagram of the transverter.

the direction of the signal path is reversed. The central active component of the transverter, the SBL-1 mixer, determines the maximum input level of 2m RF from the transceiver by virtue of the fact that input levels in excess of -3dBm can lead to excessive levels of inter-modulation products being produced. This necessitates limiting the input level to the transverter to no more than 0.5W which is typical of the low power settings for a number of 2m multi-mode rigs. In addition to reducing the power consumption of the transceiver, use of low power also reduces the levels of 'unwanted' 2m signals — it could be rather embarrassing to be called on 2m whilst working 80m!

The incoming 2m RF is further attenuated by a -30dB resistive Pi network which is switched into circuit when transmitting, before the low level signal reaches the double balanced mixer. Note that



Detail of the main transverter board, showing the four local oscillator sections and the RF screening.

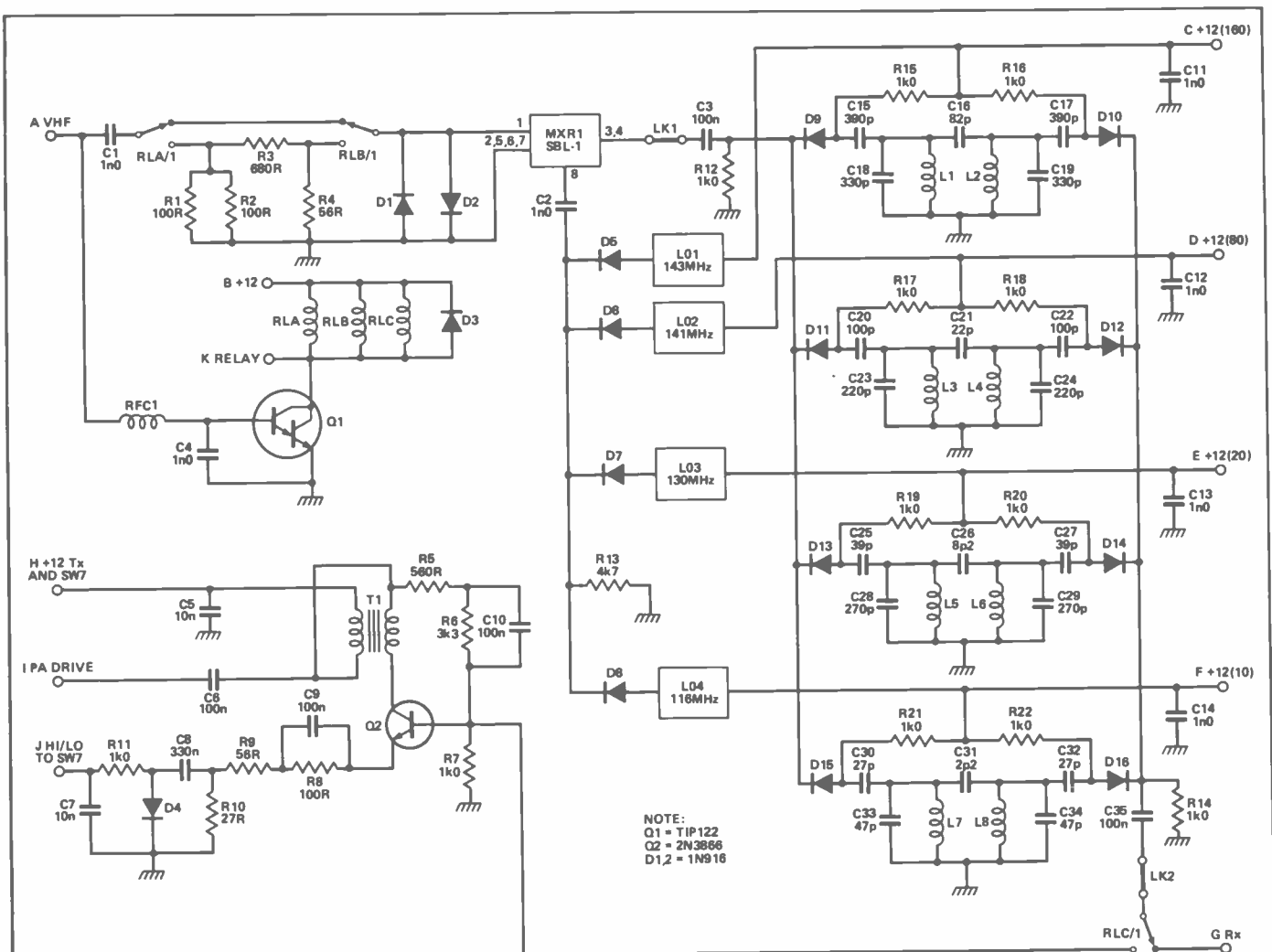


Fig. 2 Circuit diagram of the main transverter board, note that details of the local oscillator circuitry have been omitted for reasons of clarity.

only the first element of the pad dissipates much power (R1 and R2 in Fig. 2) so it is not necessary to 'beef up' all the components in this part of the circuit. Further protection against excessive input levels to the mixer is provided by two back to back diodes D1 and D2. Once the low level 2m RF signal reaches the mixer it is combined with the signal derived from the appropriate local oscillator so as to create a mixing product falling within the desired HF band. This is then passed to the relevant band pass filter. The switchable band pass filters used here are not as selective as the tunable version featured in the original design but are more convenient and in practice have proved to offer adequate unwanted signal rejection.

Transmitter Driver

The output from the filter section is not sufficient to fulfil the

1mW drive level requirement of the PA module — primarily because of the low RF levels used earlier in the mixer section — so amplification is necessary. This is carried out by Q2, a 2N3866 which gives switch selectable gain levels of 12dB and 6dB, the latter providing a 2.5W output from the transverter for tuning purposes. The gain of this stage is reduced when the forward bias on D4 is removed, introducing R11 into circuit and thus increasing the level of negative feedback around Q2 and reducing its gain.

Transverter switching

Initially, the transverter was built with an RF sensing system for Tx/Rx changeover, but following reports that the arrangement did not always operate satisfactorily it was decided to follow the example of others and simplify the design. The end result was the implementation of the direct switching system

where the current limited DC output voltage found on the FT290 antenna socket was used to directly drive a TIP122 darlington package (Q1) which in turn switched the transverter relays. As the DC level is only present when the rig is in transmit mode, problems associated with dropping out during SSB speech pauses are completely avoided.

PA Module

Homebrew purists may feel that the use of a bought in PA module is something of a cop-out, however the design of a stable and reliable PA is not always quite so straightforward as one might first suspect. This, coupled with a reluctance to re-invent the wheel, persuaded me that the use of a Cirkit PA module was the most sensible solution. This particular unit is capable of providing in excess of 10W over a wide frequency range (1 to 30MHz)

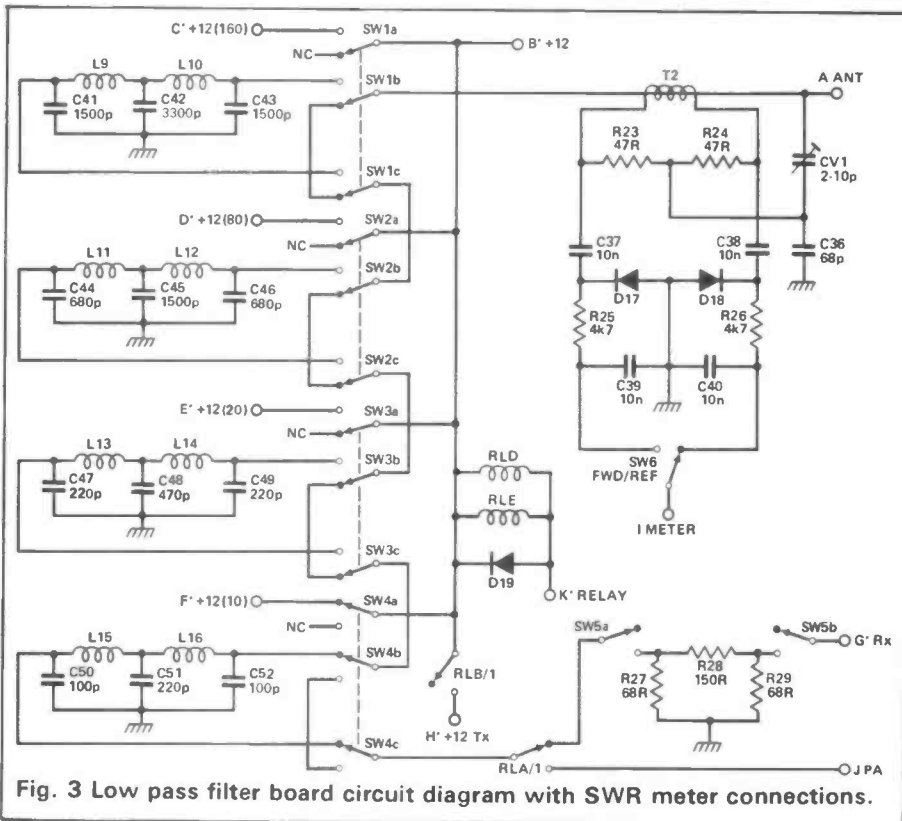


Fig. 3 Low pass filter board circuit diagram with SWR meter connections.

from an input level of only 1mW and has survived numerous open and short-circuit outputs. Only one modification has been made to the standard version and that is the removal of the on-board link between the output transformer centre-tap and the 12V rail. Instead, the centre-tap connection is taken direct to the +12V supply and the other end of the link connection wired to the transverter +12V Tx line. In this way the Tx/Rx relays do not need to switch high currents.

VSWR meter

As can be seen from Fig. 3 the VSWSR indicator is of a conventional design, employing a front panel mounted 100 microamp meter which gives a full scale deflection reading of about 10 watts. The circuit does not give a direct reading of SWR but measures the forward and reflected power levels

Next month, local oscillator design and project construction details.

Components List

RESISTORS

- R1, 2 100R, 1W
- R3 680R
- R4, 9 66R
- R5 560R
- R6 3k3
- R7, 11, 12, 14, 15, 16, 17, 18, 19, 20, 21, 22, 27a-d* 1k (16 off)
- R8, R34a-d 100R
- R10 27R
- R13, 25, 26, 38 4k7
- R23, 24 47R
- R27, 29 68R
- R28 150R
- R30 33k
- R31a-d* 330R
- R32a-d* 10k
- R33a-d* 2k2
- R35a-d* 220R
- R36a-d* 390R

All resistors 0.25W 10% unless otherwise stated

CAPACITORS

- C1, 2, 4, 11, 12, 13, 14, 53a-d, 54a-d, 56a-d, 60a-d, 62a-d, 63a-d 1n (31 off)
- C3, 6, 35, 9, 10 100n
- C5, 7, 37, 38, 39, 40 10n
- C8 330n
- C15, 17 390p
- C16 82p
- C18, 19 330p
- C20, 22 100p
- C21, 57a-d, 58a-d 22p (9 off)
- C23, 24 220p
- C25, 27 39p
- C26 8p2
- C28, 29 270p
- C30, 32, 55a-d 27p (6 off)
- C31, 61a-d 2p2
- C33, 34 47p
- C36 68p SM
- C41, 43, 45 1n5 Poly

- C42 3n3 Poly
 - C44, 46 680p Poly
 - C47, 49, 51 220p Poly
 - C48 470p Poly
 - C50, 52 100p Poly
 - C59a-d 6p8 (4 off)
 - CV1 21-10 trimmer
 - CV2a-d, 3a-d 2-22p trimmer
- All capacitors ceramic unless otherwise stated. SM = silver mica, Poly = polystyrene

INDUCTORS

- RFC1 5 turns 30swg on T37-12 core
- RFC2 5 turns 30swg thru ferrite bead
- L1, 2 8.2uH Toko
- L3, 4 119ANA5874HM
- L5, 6, 7, 8 5.6uH Toko
- L9, 10 113CNK1369HM
- L11, 12 0.45uH Toko style S18
- L13, 14 26 turns on T862 core
- L15, 16 19 turns on T68-2 core
- L17a 11 turns on T68-6 core
- L18a 7 turns on T68-6 core
- L19a 7 turns on T68-6 core

- L20a 160m
 - L20b 80m
 - L20c 20m
 - L20d 10m
- Toko 301-KN-0600
Toko 301-KN-0600
6 turns 18swg Enam wound on 1/16" drill, 1cm long
As L19, tapped 1.25 turns from earthy end
- Toko 301-KN-0800
Toko 301-KN-0800
6 turns 18swg Enam wound on 1/16" drill, 1cm long
As L19b, tapped 1.25 turns from earthy end
- Toko 301-KU-0800
Toko 301-KU-0800
6 turns 18swg Enam wound on 1/32" drill, 1cm long
As L19c, tapped 1.25 turns from earthy end

- L17d Toko 301-KU-0800
 - L18d Toko 310-KU-0800
 - L19d 6 turns 18swg Enam wound on 1/32" drill, 1cm long
 - L20d As L19d, tapped 1.25 turns from earthy ends
 - T1 6 turns bifilar wound on 0.5" dia ferrite core
 - T2 10 turns on 0.5" dia ferrite core
- All coils wound using 30swg enamelled copper wire unless otherwise stated

SEMICONDUCTORS

- Q1 TIP122
 - Q2 2N3866
 - Q3a-d, 4a-d BSX20 or 2N2369 (8 off)
 - D1, 2, 5, 6, 7, 8, 17, 18 1N916
 - D3, 4, 9, 10, 11, 12, 13, 14, 15, 16, 19 1N4007 (11 off)
 - ZD1a-d 10v 400mV Zener (4 off)
 - MXR1 Mini-circuits SBL-1 balanced mixer
- Note: D5 to D8 are part of Local Osc circuit

MISCELLANEOUS

- RLA, RLB, RLC, RLE, RLD Maplin Type YX96E or equivalent
 - XTAL1a Maplin Type YX97F or equivalent
 - XTAL1b 71.5MHz
 - XTAL1c 70.5MHz
 - XTAL1d 65.0MHz
 - XTAL1e 58.0MHz
- All crystals HC18/u. series resonant, fifth overtone type
- 1n feedthrough capacitors, 8 off
- SW1, 2, 3, 4 3-pole change over, interlocking, push-on, mutually cancelling independent push-on, push-off
 - SW5, 6 On/off slide switch
 - SW7 100uA FSD meter
 - M1

RADIO

Telecom 87

Telecom 87, which took place at the end of October, was the fifth in a series of World Telecommunications



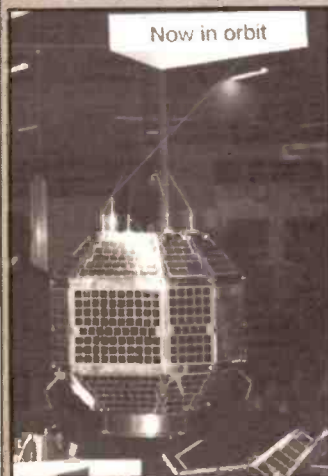
Rosella Ström, IIRYS at the IARU stand.

Exhibitions organised under the auspices of the ITY, and the second one to be held in Geneva.

The exhibition was held at the PALEXPO exhibition centre, just a stone's throw from Geneva Airport, and was attended by an estimated 200,000 visitors! — enough to fill every single hotel within 100 miles and force the Swiss authorities to open up their nuclear fallout shelters to accommodate those caught unawares.

Pretty Pricey

Spread over six halls, Telecom comprised some 750 exhibitors from 73 countries, showing a variety



Model of The Fuji Oscar 12 satellite.

of new developments from all areas of electronics, computing and telecommunication. In addition, seminars were held on a number of topics related to the

electronics industry, but you had to be either very rich or very dedicated to attend these, as admission charges ranged from SFr 150 (£60) for a seminar on networks to a staggering SFr 800 (£325) for the 'executive symposium'. Admission to the exhibition itself was a comparatively modest SFr20 (£8), with a 50% reduction on Saturday and Sunday.

Although primarily a trader fair, Telecom 87 had much of interest to the radio amateur and electronics hobbyist. The amateur radio movement was represented in the form of a large display in the foyer, set up by the IARU and staffed by an international team of volunteers including the IARU presidents Dick Baldwin, WIRU. The stand included a full-scale model of the Fuji Oscar 12 satellite, a working packet radio station and a computerised satellite tracking system, as well as a number of photos and exhibits illustrating the various aspects of the hobby. A large selection of books and magazines was also available for visitors to browse through at their leisure.

Seen . . .

The International Broadcasters' Pavilion, also in the foyer, included displays by the BBC World Service, Voice of America, Radio Netherlands and a number of other stations. Also represented was the EDXC (European DX Council), which is the umbrella organisation for short wave broadcast listeners' clubs throughout Europe. The Sony Corporation had managed to obtain some table space just outside the pavilion, and were showing off an impressive range of equipment including a portable radio which offered

grouping together the various exhibitors from each of the 73 countries taking part. One stand not to be missed was that of the Soviet Union — which included not only a sizeable display of amateur radio equipment, but also a working HF station, callsign HB9/UK3F, which was made up entirely of equipment made in the USSR. Unfortunately, the operator must have been at lunch when we visited the stand, but friends told us that they had spoken to him earlier, and were able to confirm that the station had been on the air.

Other items of interest



Detail of one of the transceivers on the USSR stand.

all the functional of the well-known ICF7600 series but was a fraction of the size. They were also demonstrating a complete weather-fax receiving station incorporated into a portable radio and an ICF7600 scale model — fully working, but many times larger!

. . . but not heard

The main exhibition was mostly organised by way of national pavilions — some of them quite sizeable —

to the hobbyist were the various stands displaying satellite equipment and short wave listeners also had an opportunity to chat to Radio Beijing staff in the Chinese national pavilion.

For those who are able to plan ahead, the next Geneva Telecom will be held in 1991 — but make sure you get your hotel reservations in before the end of the 1980s!

Report by Angelika, GOCCI and Nigel, GAIJF.



View of the Soviet amateur radio stand.



Men from MARS — first photo!

Well perhaps a little nearer home than the headline might suggest . . . Following their club elections the Midland Amateur Radio Society have notified us of their new club officials. Here we see Peter Haylor G6DRN being congratulated by the outgoing President Stewart Laing G80DT. An ideal opportunity to remind readers that the club meets on the third Tuesday of every month at the club HQ, Henstead House, Henstead Street, Birmingham and to mention that new members are always welcome. For further details contact Norman Gutteridge G8BHE on 422 9787 or write to him QTHR.

From our Foreign Correspondent

News from the Netherlands this month includes details of their 'surprise' new 50MHz allocation which will be available to all except novice licence holders from the 1st of March. Described as an experiment, which will last right through until the 31st of December 1992, the new facility allows CW only operation at power levels of up to 30W in the 50.000 to 50.450MHz band. Although four years does seem to be something of a protracted 'experiment', the individual operator must apply for permission to use the band directly to the Dutch PTT. Having done so the licence variation is then in force for one year, after which time the applicant presumably has to re-apply.

The USA has always had an unfortunate habit of allocating strange prefixes to the amateur population,

many is the time that a ham has been caught out by a supposedly 'exotic' call only to discover that it is yet another US oddity. This time the occasion is the bicentennial of the US Constitution and so the special prefix will be . . . you've guessed it — 200! Fortunately not everybody will be using the call from stateside, only a selection of pre-registered club stations.

Still on that side of the ditch, but from a bit further north, comes news of a special reciprocal licencing agreement between Canada and the USSR. As from November 1st last year until the end of the event reciprocal licences will be valid and third party traffic permitted for the 'Canadian & USSR joint polar bridge ski trek', not exactly *our* idea of a stroll in the country but it is interesting to note that 'glasnost' is even having an effect in the world of amateur radio.

The Millennium Birthday July 10 1988

This is the final event planned for the year and it is hoped to demonstrate amateur radio in emergency and portable conditions.

A special QSL card will be available via the IRTS bureau or direct upon receipt of 3 IRCs.

Dublin Calling . . .

The amateur radio operators of EI are planning great things for 1988, the reason being that 'Baile Atha Cliath' or Dublin as it is better known is celebrating 1000 years of its foundation as a city. To commemorate this Millennium a group of Dublin-based amateurs are organising three major events to run throughout the year the special event callsign EI1000.

St. Patricks Day March 17th 1988 For this, the most ambitious undertaking from an amateur radio viewpoint, an attempt will be made to make contact with the many towns and cities called Dublin around the globe (it is estimated that there are over 20!) using not only SSB but also with the help of Pre-arranged skeds to attempt to make visual contact in a world-wide amateur SSTV link-up.

This station again with the special call-sign will be located in Dublins main thoroughfare of O'Connell St. adjacent to the St. Patricks Day Parade. It is hoped to relay live SSTV pictures from the front window of a prestigious department store to the public outside. The station will be active on HF for the day.



New add-on for AOR2002

The Aircastle 2002 Scanner Computer is a stand alone unit which is designed to go between an AOR2002 communications receiver and virtually any home computer with an RS232 interface and capable of running a 'dumb terminal' program. The unit offers much faster scanning rates of up to 150 channels per second, 400 memories (1000 with RAM expansion option), individually programmed attributes for each memory and the ability to back-up data stored in RAM. There is an offset facility which permits monitoring of duplex transmissions, an extended frequency coverage and frequency step range and well as a scanner control language which can be used to create new features as required by the operator. A to D techniques allow measurement of signal strengths in up to 255 steps and other facilities include an extended priority channel monitoring system, a squelch operated tape recorder control together with optional features such as a Centronics interface to directly drive printers and internal RAM expansion of up to 16K.

The unit retails at £169.99 inclusive of VAT and p&p and can be obtained from Aircastle Products, PO Box 78, Bournemouth BH1 4SP. Tel: (0202) 581089.

80m MONOBANDER

REVIEW



Ever fancied a change from VHF/UHF mobile? Or do you have a favourite band and would like a stand-alone HF set, small enough to fit in your briefcase or rucksack as well as under your dashboard?

CW filter for the key-basher enthusiasts. Semi break-in CW keying is used, with an 800Hz side-tone generated. A receiver attenuator may be switched in to prevent strong-signal overload on

Sick of Two and would like to work the world from your car? One of the latest Tokyo monobanders may be the answer – Chris Lorek takes a look.

Tokyo Hi-Power, best known for their solid state linear amplifiers, have now brought out a range of HF monobanders that may fit the bill nicely. Luckily, the range was on display for the very first time at the Leicester show and we were able to come away with the very first 80m UK review model tucked under our arm.

Features

The Monobander series covers the HT-180 (80m), HT-140 (40m), HT-120 (20m), HT-115 (15m) and HT110 (10m) sets, all offering identical features apart from their frequency coverage of 500kHz, starting at the LF end of each amateur band, with two switched 1MHz ranges fitted to the 10m model.

Each set operates in SSB and CW modes, with 20W transmitter output power and a 'no frills' single-conversion superheterodyne receiver. The receiver normally uses a single 9MHz crystal filter for both SSB and CW, however there is facility for fitting an optional 500Hz

the 80m-15m sets, and on the 10m set this front-panel switch is used to control the frequency range. The frequency is controlled by a large rotary knob, which drives an optical encoder to control the synthesizer in 100Hz steps, the operating frequency being displayed using a large four-digit green LED readout with a further discrete LED for range indication on the 10m model. To prevent accidental frequency shifts, when mobile for instance, a 'lock' button disables the tuning knob when required.

Front Panel

On the front panel an On/Off/Volume control is accompanied by a rotary RIT (Receiver Incremental Tuning) control, this also having a click-stop in its fully anticlockwise position to disable the RIT. A four pin mic socket is fitted, together with 3.5mm jack sockets for a CW key and an external speaker whilst above these sockets is a backlit analogue meter displaying receive signal strength and relative transmitter output power.

On the back panel are the aerial

connector and DC power socket, and a 5-pin DIN socket with connections for 13.8V and 8V outputs on Tx and Rx, ALC input and ground. Four rubber feet are mounted on the bottom lid for base station use, and a hinged chrome metal bracket is fitted that allows the front of the set to be tilted upward if required.

The set measures 180(W) × 60(H) × 250mm(D), weighs 2.6kg, and comes supplied with a fist mic, a fused DC power lead with spare fuse, and an instruction manual. Optional extras stated in the manual include a mobile mounting bracket, an internal noise blanker to reduce ignition interference, an aerial tuner, mains power supply/extension speaker, and a matching 100W linear amplifier.

Impressions

The set is around the same size as the once popular Liner-2 mobile, and although larger than most current micro-miniature VHF/UHF FM sets it should still fit under the normal dashboard and leave enough room for your passenger's knees, which is more than can be said of many of the multiband HF mobiles on the market nowadays! The operating controls are very simple, lending themselves nicely to mobile operation.

However, the lack of some operating refinements such as memories, IF shift and so on, could limit its base station flexibility if you are normally used to these features. The set looks like a very nice piece of gear to take away on a boating or caravan holiday for instance, or even for a trip abroad to keep in touch with home from the hotel room — the set is very light to carry around.

On The Air

Reading the manual was not really necessary as the set was extremely simple to use, in fact the

literal Japanese-English translations could in some cases cause a little confusion, eg "In SSB mode, depends on low voice or high voice, and output will be change. But, even louder, output will not increase, and spurious will occur!" However, the manual certainly is useful in giving clear indications of internal adjustments, such as SSB mic gain, CW side tone level, carrier level and ALC adjustment, together with simple internal layout, block, and full circuit diagrams being included.

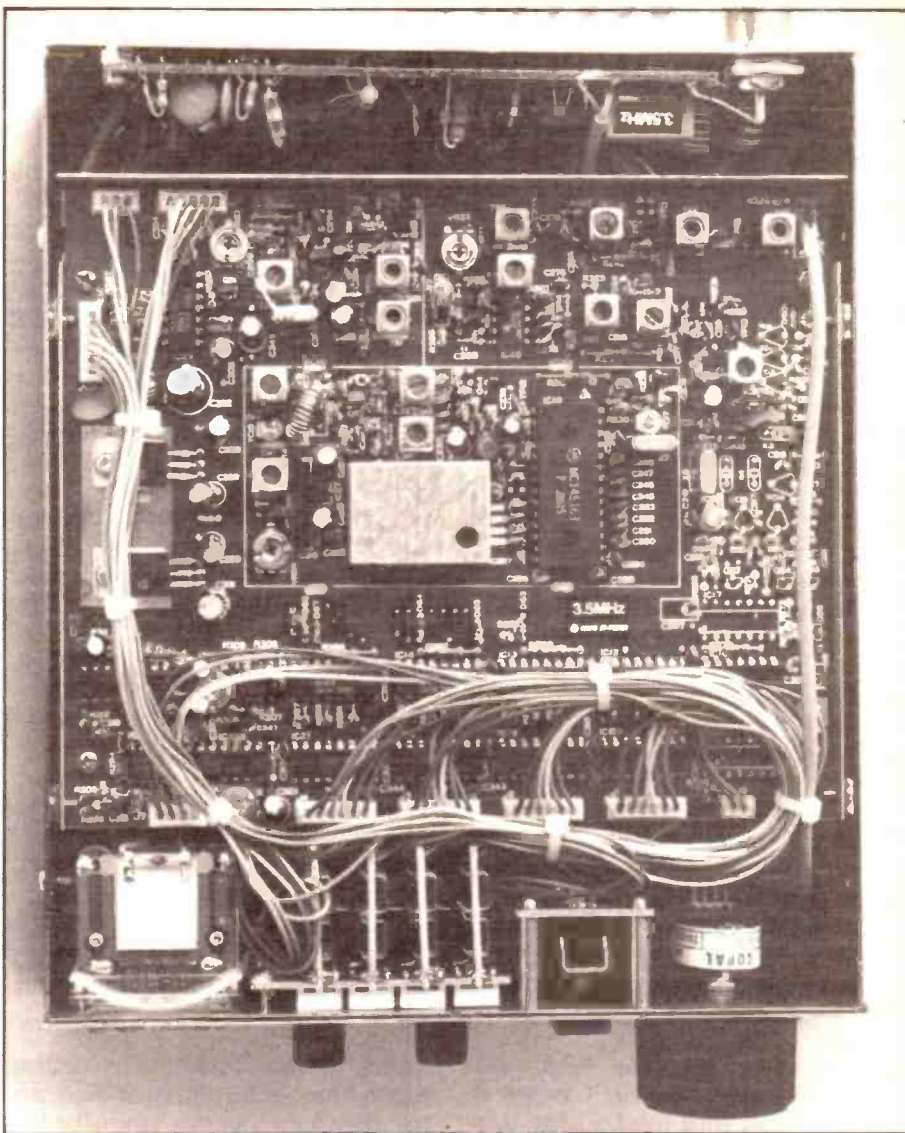
I first installed the set in my shack, coupled to the 80m trap dipole with its apex on the chimney of my two-storey house.

Switching on the set and power supply from 'cold' brings it up on 3.500MHz each time, a quick twist of the main tuning knob was hence required to set the frequency to my favourite part of the band. I found tuning normally occurred in 100Hz steps with 5kHz per knob rotation, however if the knob was rotated quickly using the finger hole, the rate increased to around 50kHz per rotation, allowing a fast QSY around the band. I found tuning relatively easy, but the 100Hz steps did not always allow me to get 'spot on' to the required frequency, and I sometimes resorted to placing the RIT in operation to obtain the correct beat note. Listening around at night on the SSB DX section at the top of the band was a bit of a strain on the ears due to the usual QRM noises, I felt the SSB selectivity was a touch on the wide side for this but then the set wasn't designed for DX chasing was it?

Strong Signal Performance

Switching the attenuator in and out made no difference to readability, showing the receiver front end certainly wasn't being overloaded. This surprised me as I would have thought the set wouldn't stand up to this strong-signal treatment very well, earlier mobile-type sets as well as some general coverage receivers I have tested have not coped without 10 or 20dB of attenuation placed in circuit. I found the S-meter was rather on the mean side — a quick tweak with a trimming tool would have been performed if I owned the set.

On transmit, good audio reports were received when using the first



Internal view from above showing digital board

mic supplied, even the slight echo from my relatively empty shack was commented on. I found that it was sometimes a struggle getting through on the 20W power output when calling some of the special event stations that achieved minipileups from award hunters. Do I really want a worked-all-haggis-farms certificate? QRP enthusiasts who enjoy a challenge may however appreciate the fact that it is possible to reduce the power down further if required, but as a beginner's set I believe the low power could be a limiting factor if coupled with quickly strung up, inefficient aerial systems. However it must be remembered that 20W is only around a couple of S-points down on the usual 100W+ power used, and I certainly didn't lose any QSOs through low power when operating from home.

Going Mobile

To test the set in mobile use, I replaced my usual 2m/70cm dual bander aerial with the 80m G-whip. Many VHF operators believe all HF mobile whips are monster affairs, but G-whip is only around the same length as a 2m 5/8ths. The set was placed under the dashboard, with the essential in-line SWR meter placed on top of the dash. The reason for this is that the bandwidth of HF mobile whips is necessarily narrow (typically 30kHz between the 3:1 points on 80m in my case), and a large QSY means nipping out and quickly sliding the top whip section up or down to resonate the aerial. Together with other HF mobilers, I find a length of card, marked with resonant frequency corresponding to the top-section length a very handy tool (my thanks to Dave, GOGWO for this tip). As the

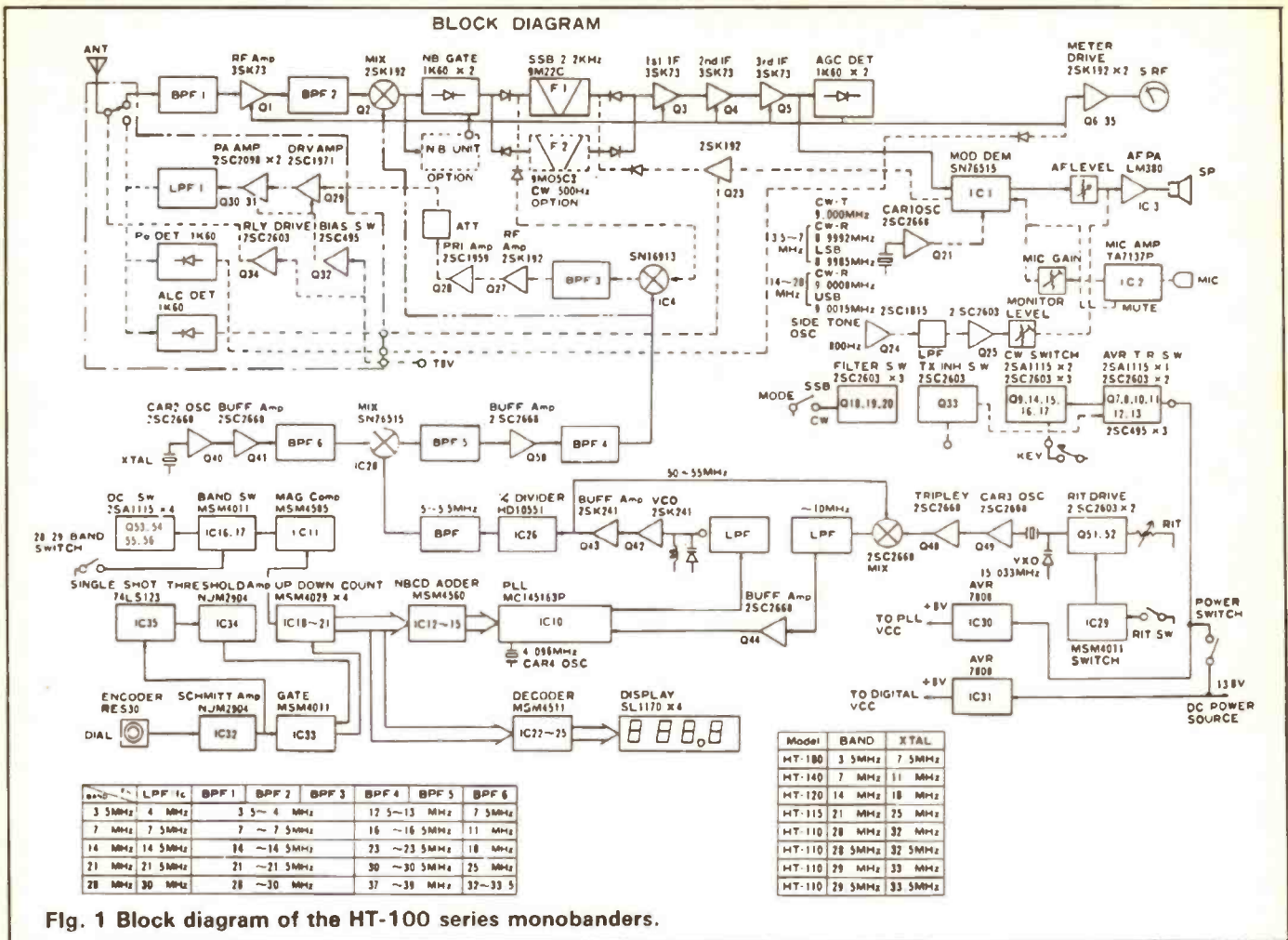


Fig. 1 Block diagram of the HT-100 series monobanders.

rig 'forgets' frequency whenever power is disconnected, I found it necessary to wire the DC lead to a permanent supply to prevent a re-tune each time I switched the ignition off.

Power Limits

In driving around, I found the large display was very visible, especially at night, and the controls easy to locate by touch alone. Due to the free-running nature of the tuning knob, I did sometimes find I accidentally knocked myself off frequency but soon learned to place the 'lock' button in as a matter of course after tuning. It would have been handy to have had Up/Down buttons on the microphone as the set is already tuned by up/down steps from the main knob, but each operator would have their own preferences I'm sure. Due to the relatively inefficient mobile whip (a full-size quarter wave on 80m being around 15 times the length) signal reports on both transmit and receive were down on that achieved from

home. It was occasionally frustrating to hear an S9 signal at night and to call in vain, but this would be less of a problem if, say a 20m version of the set were used. Even so, I would recommend the serious operator (apart from die-hard QRPers) to think about fitting a 100W linear, ex-CB broadband jobs for example can be bought secondhand for under £50.

I found reception of many daytime signals hampered by ignition interference, from my own vehicle mainly but also from the odd passing motorist. Various suppression techniques, including bonding everything in and out of sight (engine, bonnet, exhaust system etc) may of course be used to reduce this, but I did feel the optional noise blanker would have helped a great deal, this unfortunately was not available at the time of review. It was very nice though, on my fairly lengthy drive into work in the mornings, to listen to the various early nets and have the odd QSO with stations who I

could normally only work from home — it could easily become a habit with yours truly.

Delving inside

The set is constructed on a metal chassis using three main boards, all with discrete components fitted. One board houses the majority of the analogue circuitry, on the other side of the chassis is the digital synthesiser board, and on the rear is the main transmitter power amplifier with its transistors mounted directly onto the rear heatsink through a cutout in the chassis. On the front panel, four small sub-boards contain the display LEDs and their associated drivers and resistor arrays.

The accompanying block diagram shows the circuit arrangement, the receiver front end uses a 3SK73 dual gate MOSFET feeding a single gate 2SK192 FET mixer, the noise blanker option being inserted before the crystal filter to overcome the pulse-stretching effect that

would otherwise occur. On transmit, the double sideband signal is generated using an SN76515 modulator/demodulator, the LSB or USB signal as appropriate being selected by the crystal filter common to the receive path, mixed to final frequency and amplified to the 20W level, the PA using a pair of 2SC2098s in push-pull. The local oscillator uses a 2SK241 FET VCO controlled by a parallel-driven MC145163 divider/phase comparator, a passive loop filter being used to filter out the reference frequency.

Laboratory Tests

The excellent blocking results confirms that noted on-air, this shows the synthesiser to be contributing little in the way of wide-band noise to cause reciprocal mixing, this being possible where only a narrow band needs to be covered in use. The 3rd order intermodulation, where adjacent strong signals combine in the receiver to produce unwanted on-frequency interference was reasonable but not spectacular. The passband selectivity was better than I would have thought, this again was not widened due to synthesiser noise effects. On transmit, the higher order harmonics were well suppressed, and the two-tone tests showed the PA to be nicely linear. Once maximum PEP output had occurred overdriving the mic input in audio level to simulate shouting into the mic gave no visible degradation to the signal, showing the ALC to be effective.

When tuning across a steady carrier on receive, I noticed a slight 'twang' accompanying the normal 100Hz stepped melodic tones, suggesting a slight overshoot on the synthesiser. This led me to shake the set hard, sure enough a frequency wobble was evident showing the synthesiser to be a little slow. In use, this would show up under high vibration conditions as a wobble on both received and transmitted audio. Although no problems whatsoever were experienced when mobile in my car, drivers of rattly Land Rovers and the like may have to take care and use a resilient form of mounting for the set.

Conclusions

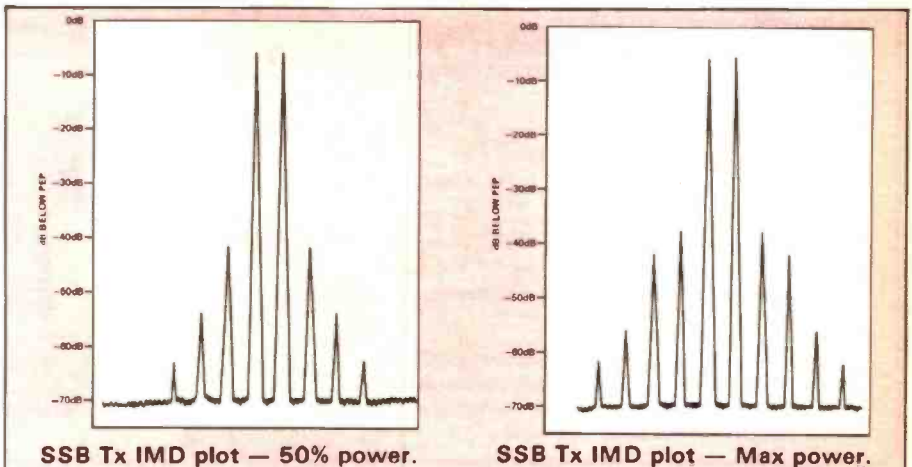
A lovely little set, bound to appeal to HF addicts who would like

to extend their activities outside their main station. As a beginner's set it may be useful as a 'stepping stone' to a multi-band multi-feature job, but in this case I would recommend using a linear amplifier in the first instance, as most HF bands are something of a ratrace and it's a fact of life that the low-power station normally suffers as a result.

The technical performance of the set is perfectly adequate for

normal ragchew purposes, but ensure that if you use the set mobile you don't vibrate it too much. It certainly makes a change being able to drive around, talking to the world when stuck in a traffic jam rather than listening to the local 2m mobilers also complaining about the traffic!

My thanks go to ARE Communications Ltd for the loan of the review equipment.



Laboratory Test Results: HT-180 Receiver

Sensitivity for 12dB SINAD; 0.320uV pd

Blocking: Measured as degradation of on-channel 12dB SINAD signal to 6dB SINAD by unmodulated interfering signal.

Spacing	Level	Spacing	Level
+50kHz;	108dB	-50kHz;	106dB
+100kHz;	109dB	-100kHz;	104dB
+200kHz;	110dB	-200kHz;	107dB

3rd Order Intermodulation Rejection: Measured as ratio difference in level required for 12dB SINAD.

Separation	Level
50kHz/100kHz	70.5dB
100kHz/200kHz	71.0dB

Image Rejection Measured as ratio between on channel 12dB SINAD signal and (+2 x 9.00MHz) giving 12dB SINAD; 83dB

Selectivity	
Level	Width
-3dB	2.11kHz
-6dB	2.37kHz
-60dB	4.82kHz

S-Meter Linearity		
Reading	Signal	ref S9
S1	0.31uVpd	-86.6dB
S2	0.95uV	-76.8
S3	2.65uV	-67.9
S4	5.85uV	-61.0
S5	17.6uV	-51.4
S6	55.0uV	-41.6
S7	225uV	-29.3
S8	1.15mV	-15.2
S9	6.60mV	0.0
S9+10dB	73.0mV	+20.9

Transmitter Tests

Tx Measured Power		
Supply	SSB PEP	CW
10.8V	16.8W	15.7W
13.8V	20.7W	18.6W
15.6V	22.2W	19.8W

Max current drawn; 5.34A

TX Harmonics	
Harmonic	Level
2nd	-45dBc
3rd	-45dBc
4th	-63dBc
5th	-64dBc
6th	-71dBc
7th	-73dBc

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packet radio from Kantronics.

KPC3...This KANTRONICS designed AX25 version 2 TNC features a built-in VHF and HF modem, full duplex operation and multiple connect facilities. The serial RS 232 port, combined with the enhanced generic command structure allows operation with any computer

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KAM...Combine VHF packet, HF packet, CW, RTTY, ASCII and AMTOR in one unit.

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1300HC frequency counter.

Small enough to fit into a shirt pocket, the 1300HC frequency counter brings easy and accurate frequency measurement well within everyone's reach.

The 1300HC uses a full 8 digit display, and measures to 1300 MHz, thus being ideal for amateur as well as all mobile radio bands including cellular.

The unit contains its own rechargeable NiCad battery pack which is charged from an external supply. The frequency counter can also be powered from any 9 to 12 volt dc supply, which charges the batteries as well.

The 1300HC has excellent sensitivity, and when used with the optional telescope whip, easily measures transmitter frequencies of mobile or handheld transceivers, even low powered "bug" devices. When used in conjunction with a simple "dip oscillator", the 1300HC makes checking tuned circuit or aerial resonance an easy task.

The high performance of the 1300HC frequency counter makes it an indispensable tool for every amateur, engineer or technician. Its small size makes it suitable for either shack or "on the move" use.

SPECIFICATION

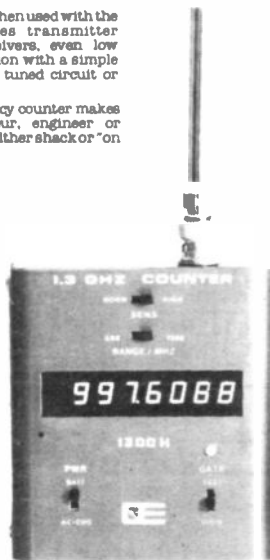
Range 1-1300 MHz
Resolution 100Hz at 2.5 sec. gate
1 kHz at 250 ms. gate
Display 8 digit 0.3" LED
MHz decimal point
Leading zero blanking
Gate times Fast, 250 ms
Slow, 2.5 s
Sensitivity
(typical) 1-10 Mhz... 10 - 180 mV rms
10-1000 Mhz... 3 - 80 mV rms
1 - 1.3 GHz... 10 - 180 mV rms
Accuracy
(typical) +/- 1ppm, +/- 1 count LSD
Aging 0.1 ppm/month (typical)
Gate indication Red LED during sampling
Input connector B.N.C.
Power connector Concentric. Centre pos.
Case Brushed anodised aluminium
Size 3.9H x 3.5W x 1D (inches)
Weight 265 g
Power supply Internal NiCad pack.
(supplied) or external dc source (option)
9

1300HC Handheld frequency counter

..... £138.00 inc vat, carriage £2.00

OPTIONS

PS18 AC mains power supply
..... £8.50 inc vat, carriage £2.00
HW06 Telescopic whip



..... £7.46 inc vat, carriage £0.50
GC18 Padded carrying case
..... £9.90 inc vat, carriage £1.00

HOKUSHIN aerials.

BASE STATION AERIALS

HSVK5...80 to 10 metres vertical, includes radials £218.00 inc. vat, carriage £8.00

HF5R...Radial kit for use with HF5 whip, mounted on chimney or gable end. £54.81 inc vat, carriage £8.00

GFV8...Two metre base station colinear, 6.5 dB gain, 3.1 metres high £54.92 inc vat, carriage £8.00

GFV8S...as above but 3 section colinear, 7.8 dB gain, 4.45 metres high £51.97 inc vat, carriage £8.00

GFV7...Seventy centimetre triple 5/8 base station colinear, 6.8 dB gain £45.59 inc vat, carriage £8.00

GFV720...Dual band (144/430 MHz) base station aerial. £45.68 inc vat, carriage £8.00

MOBILE AERIALS

2E...Two metres 5/8 whip, 3.4 dB gain, foldover base £14.56 inc vat, carriage £2.00.

2WE...Two metres 7/8 whip, 4.5 dB gain, foldover base £24.23 inc vat, carriage £2.00.

OSCAR430...Seventy centimetre triple 5/8 whip, 6.3 dB gain £27.72 inc vat, carriage £2.00.

OSCAR720...Dual band (144/430 MHz) whip ... £24.59 inc vat, carriage £2.00.

HS770...144/430 MHz diplexer for use with OSCAR720. £18.02 inc vat, carriage £1.50.

GSS...Gutter mount (requires RG4M cable assembly) . £6.26 inc vat, carriage £1.25.

RG4M...Cable assembly for GSS base, complete with SO239 and PL259 plug. £6.26 inc vat, carriage £1.00.

12B...Car wing mount with SO239 top and bottom. £5.73 inc vat, carriage £1.00.

HSTMB...Car boot mount including cable and PL259 £15.42 inc vat, carriage £1.50.

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45 watts on 2 metres, the TM221E. 35 watts on 70 centimetres, the TM421E.



The new **KENWOOD** and **TM421E** two metre and seventy centimetre **FM** mobile transceivers have been specifically designed to condense maximum performance and operating convenience into a compact package. Output power is 45 watts on two metres (**TM221E**) and 35 watts on 70 centimetres (**TM421E**). Receiver sensitivity matches the output power of the set and measures an amazing 0.14µV for 12dB SINAD (across 144-146). The figures are those given by Chris Lorek in his recent **TM221E** review published in the July edition of **HAM RADIO TODAY**.

Much discussion has taken place recently regarding 12.5 and 25 kHz spaced frequency channels on the two metre band. With the new mobiles channel spacing is not a problem. **KENWOOD** with their usual attention to detail have made the frequency step user selectable. The steps available are 5, 10, 12.5, 15, 20 and 25 kHz. Once programmed either microphone up/down button or the transceivers front panel knob can be used to step the transceiver across the band. Of course should it be necessary the selected step can easily be changed.

A new orange backlit liquid crystal display gives the transceiver an amazingly clear frequency readout that can be read in the brightest of sunlight.

The transceiver has all essential operating aids. There are 14 memory channels, each of which holds frequency, whether simplex or repeater operation is required and whether or not the tone burst is on or off. Scanning can either be memory with the ability to lock out unwanted channels or band with the scan limits set by the operator. The usual priority channel facility is also included to make sure that

no call is missed. As well as showing the operating frequency the display also indicates which of the facilities are being used.

Occasionally a piece of equipment comes along which catches the imagination: the **RC10** remote controller/handset for the **TM221E** and **TM421E** does just that. Designed to operate with either transceivers or link both together, the **RC10** looks more like a cellular radio car phone than a piece of amateur radio equipment.

In fact the **RC10** not only looks like a car phone, but as a speaker and microphone are built-in, operates as would a telephone handset. Easily mounted in any car, dashboard or transmission tunnel, the **RC10** controls all transceiver front panel functions with the exception of on/off and high/low power selection. The functions controlled by the **RC10** are volume, squelch on/off, frequency readout, keypad frequency entry, memory selection and frequency or memory scanning. Full duplex operation is possible when both transceivers are fitted.

From a security point of view it may even possible to mount the transceivers out of sight and only have the controller on view. Since most thieves now know that a cellular phone is not a saleable item, owning an **RC10** may be a wise investment!

Although I have not seen the **RC10**, I am of the opinion that it will do much more than I have already described. I suspect that it will be possible for the **RC10**, when used in conjunction with both 2 metre and 70 centimetre transceivers, to operate as a personal repeater. Parked at the top of a multi-storey car park and left unattended, I would not be surprised if you could not talk-in to the installation from another small handheld on 70 centimetres (say a **TH41E**) and have your transmission re-broadcast at a higher power from the good location on 2 metres. Any reply would be re-transmitted to you on 70 centimetres. Useful and ideal for staying in contact when wandering around town. Helpful also for **RAYNET** use.

Of course I may be wrong!

TM221E £317.30 inc VAT Carriage £8.00
TM421E £352.84 inc VAT Carriage £8.00

FREE

Send only £1 to cover postage and packing and we will send you, by return, a **FREE** copy of the new full colour **KENWOOD** catalogue which lists the features and specification of every model and accessory currently available. We will also include, **FREE OF CHARGE**, a copy of our general catalogue which, along with items to enhance your operating contains much useful information. Finally, we will add the latest edition of our price list.

the **TS711E** and **TS811E** PERFECT BASE STATIONS!



The **KENWOOD TS711E** two metre base station is perfection epitomised; receiver sensitivity and the ability to reject unwanted adjacent signals is outstanding. For the serious operator, any other transceiver is unacceptable.

Similar in specification and appearance to the **TS711E** but operating on seventy centimetres is the **KENWOOD TS811E**. When used along side the **TS711E**, the **TS811E** completes the ideal equipment line-up and provides the best possible access to the satellites for the **VHF/UHF** enthusiast.

The TS711E (TS811E) covers the two metre (seventy centimetre) band from 144 to 146 MHz (430 to 440 MHz). Operating modes are USB, LSB, CW and FM. When switched to the "auto" position the transceiver correctly selects mode according to frequency, a great advantage for the blind operator. Simple up/down frequency shift is provided on the front panels and also on the microphones.

Power output on all modes is 25 watts. For **QRP** operation the output can be reduced using a front panel control.

The TS711E (TS811E) has **IF shift**, an essential feature when the band is crowded during a contest. To help work **DX**, speech processing is also available.

The transceiver has two separate VFO's and forty memory channels. Each memory stores frequency, operating mode, whether simplex or repeater shift and if the 1750 Hz tone burst is on or off. The **VFO** can be either free running as for **SSB** or **CW** operation or electrically switched to a "click" stop for **FM** where it changes frequency in 12.5 or 5 kHz steps. Frequencies stored in memory can be readily transferred to either **VFO A** or **B**. Depending on how **VFO** was set when the information was put into memory ie. click stop or free running **VFO**, the rig is set the same when memory information is transferred. It is therefore possible to have **SSB** frequencies transferred with a free running **VFO** and **FM** channels with click stop. A great aid to operating! The second **VFO** can also be quickly put on the same frequency as the one currently being used, ideal when checking the position of a strong adjacent signal whilst remaining on your operating frequency.

Frequency scan on **VFO** can either be between or outside user set limits. On memory the transceiver can either scan the entire memory content or be instructed to look at those frequencies of a particular mode. The **TS711E (TS811E)** has a timed hold on an occupied channel.

Both priority channel and immediate recall of your local net frequency are possible with the **TS711E (TS811E)**.

For those with failing sight or a blind operator the **TS711E (TS811E)** is a dream come true; not only is the operating mode identified by the appropriate **CW** letter sent in tone (**F** for **FM**, **U** for **USB** etc.) but when fitted with the **VSI** optional board, a digitally encoded girl's voice will announce both frequency and, where applicable, whether the rig is switched to repeater shift.

DCS (digital code squelch) is also fitted to the **TS711E (TS811E)**.

TS711E £940.00 inc VAT Carriage £8.00
TS811E £1094.00 inc VAT Carriage £8.00
VSI £32.62 inc VAT Carriage £8.00

ALINCO ALD-24E

REVIEW



Have you ever thought about getting a dual band mobile rig but almost passed out when you saw the price tag? You may be in for a pleasant surprise with the Alinco, because at £449 it's certainly the cheapest one

changes to cover certain two-way radio allocations! The facia employs an array of push buttons and the number of functions are effectively doubled through the use of a 'F' button to provide a second function

The latest Alinco offering is the new 2m/70cms dual-band mobile. Chris Lorek dusts off the Rolls and gives it a spin!

I've seen — could it be worth a second look? Well *HRT* thought so, and here we go with the first UK review on a set that could be finding its way into one or two car dashboards very shortly...

Features

Readers of the Alinco ALR-22E review in *HRT Dec 87* will notice a certain feeling of *deja-vue*, because the operating features as well as the front panel layout are virtually identical. The set measures a small 140mm(W) x 47mm(H) x 175mm(D), and offers coverage of both 2m and 70cm with 25W output on high power and approximately 5W on low. Two digital VFOs are provided, each with independently selectable 12.5kHz or 25kHz steps which offer continuous coverage of 144-146MHz and 430-440MHz.

I'm told by the suppliers that for the nosey amongst us the receive ranges are expandable by diode link

for each. At the back of the set terminated flying leads are provided for the aerial, DC power, and microphone connections and a chassis mounted 3.5mm jack socket allows connection of an external speaker, this disabling the small internal unit fitted to the bottom lid.

Frequency control is performed either by using the main click-step tuning knob or by Up/Down buttons fitted to the fist microphone, 1MHz steps being controlled by set-mounted Up/Down buttons to get from one part of the band to the another quickly — or in fact from one band to another. For repeater working, as well as a push-button 1750Hz tone two programmable splits are provided, one stored in each VFO. The offset direction is selected by a push button which causes the set to cycle between +, -, and simplex settings. Reverse repeater checking is available by a two-button push to allow a quick

'listen on input' before attempting a simplex circuit.

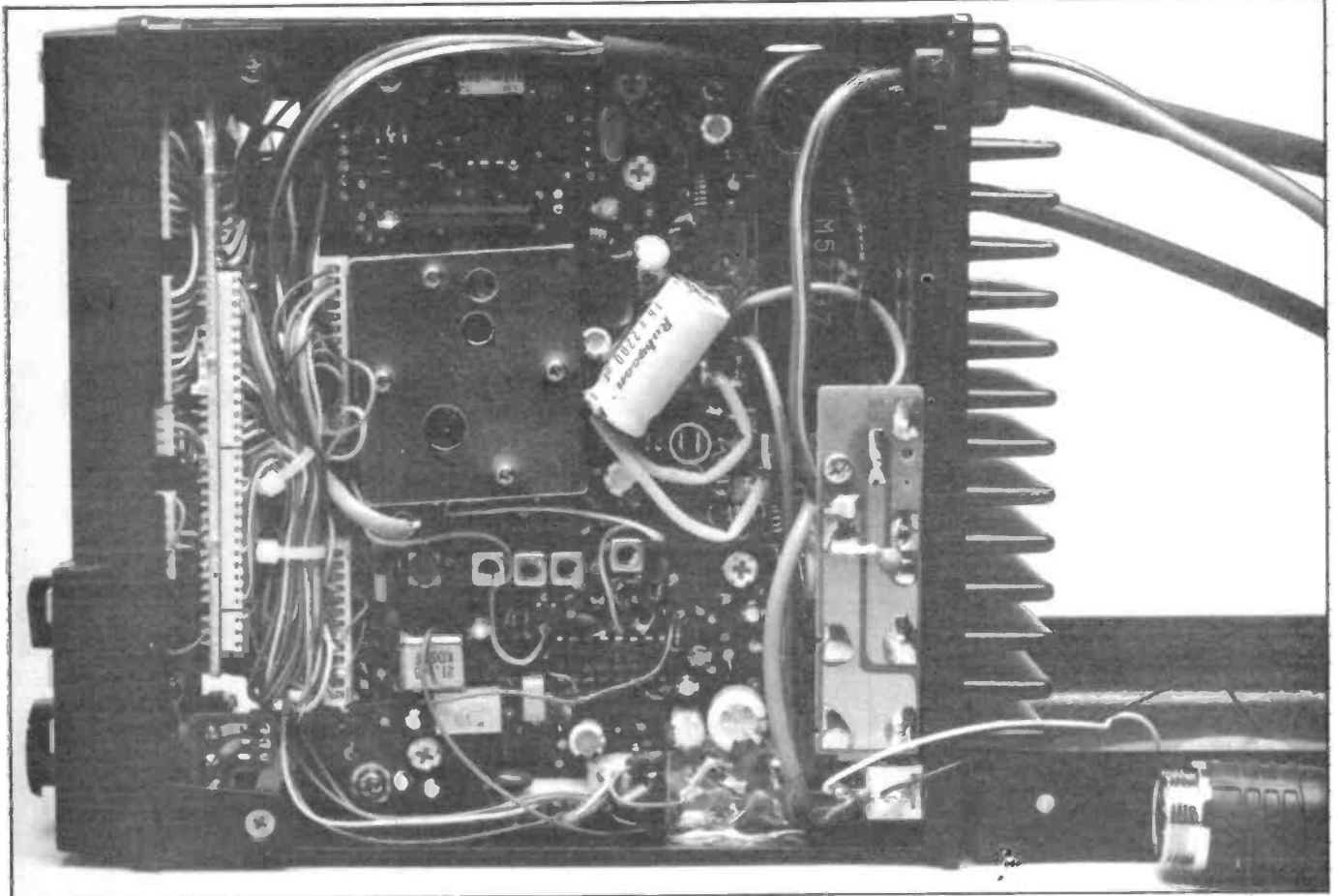
Cross-VFO operation is provided by a 'Dual' facility and this may be used for non-standard splits or, when different bands are programmed in each VFO, cross-band full duplex (ie simultaneous transmit and receive operation) is achieved — providing of course that you're not trying to receive a 70cm frequency that is three times your 2m transmit frequency! The set also features a built-in duplexer to allow a single-coax connection to one of the many twin-band aerials on the market. By using an external duplexer, one can of course use separate aerials if you wish.

The set comes supplied with a quick release mobile mounting bracket and mounting hardware, a fist mic, a fused DC lead with two spare fuses, an external speaker plug and an operating instruction booklet, this having a block diagram and a small loose sheet showing part of the circuit diagram.

Thanks For The Memory

A total of 21 memory channels are available, each storing frequency and any programmed offset. Selection of memory channels is achieved by a press of the 'MR' button, the facia mounted Up/Down buttons then stepping through the channels. Once a memory channel has been selected, it is possible to QSY from this by a twist of the main tuning knob or by operating the Up/Down buttons on the microphone, which retains any programmed offset held in the memory channel. Further presses of the set-mounted Up/Down buttons then take you to the next memory channel.

Each button press is accompanied by the usual 'bleep' so loved by microprocessor controlled rig designers, but you can save your ears by disabling this with a small top-lid mounted slide switch. A keypad 'Lock' feature, selectable by



The 2m section layout

a facia-mounted double button push may also be used to disable all the function keys apart from the PTT, preventing accidental frequency shifts while you're driving along at night fumbling for the squelch control.

The operating memory frequency along with the current memory channel are shown on a large green-backlit liquid crystal display and a graduated bar-graph display along the bottom section of this gives an indication of relative receive signal strength and transmitter power output. Adjacent LEDs light to give indications of the receiver squelch state, transmit mode, and when 'Function' mode has been enabled.

Searching for Someone . . .

Memory channels may be searched for activity by a press of the 'Scan' button, the scan halting on an occupied channel and resuming either four seconds after the signal disappears or immediately on squelch close, depending on the setting of a small slider

switch on the top lid. An adjacent switch is used to alter the scan speed to either four channels or twenty channels per second and any number of memory channels may be inhibited from scanning whilst still allowing manual selection. Quick access to memory channels 1 and 2 is provided by a 'Call' button, a press of this transfers you instantly to channel 1 whilst pressing the 'F' button first gives you channel 2. In VFO mode, a programmed scan is available, the set searching for busy signals in the user-defined channel steps between the frequencies programmed in memory channels 20 and 21. If that's not enough, a 'Priority Watch' facility is available which samples a pre-defined memory channel for one second out of every six when operating in VFO mode.

Inner Thoughts

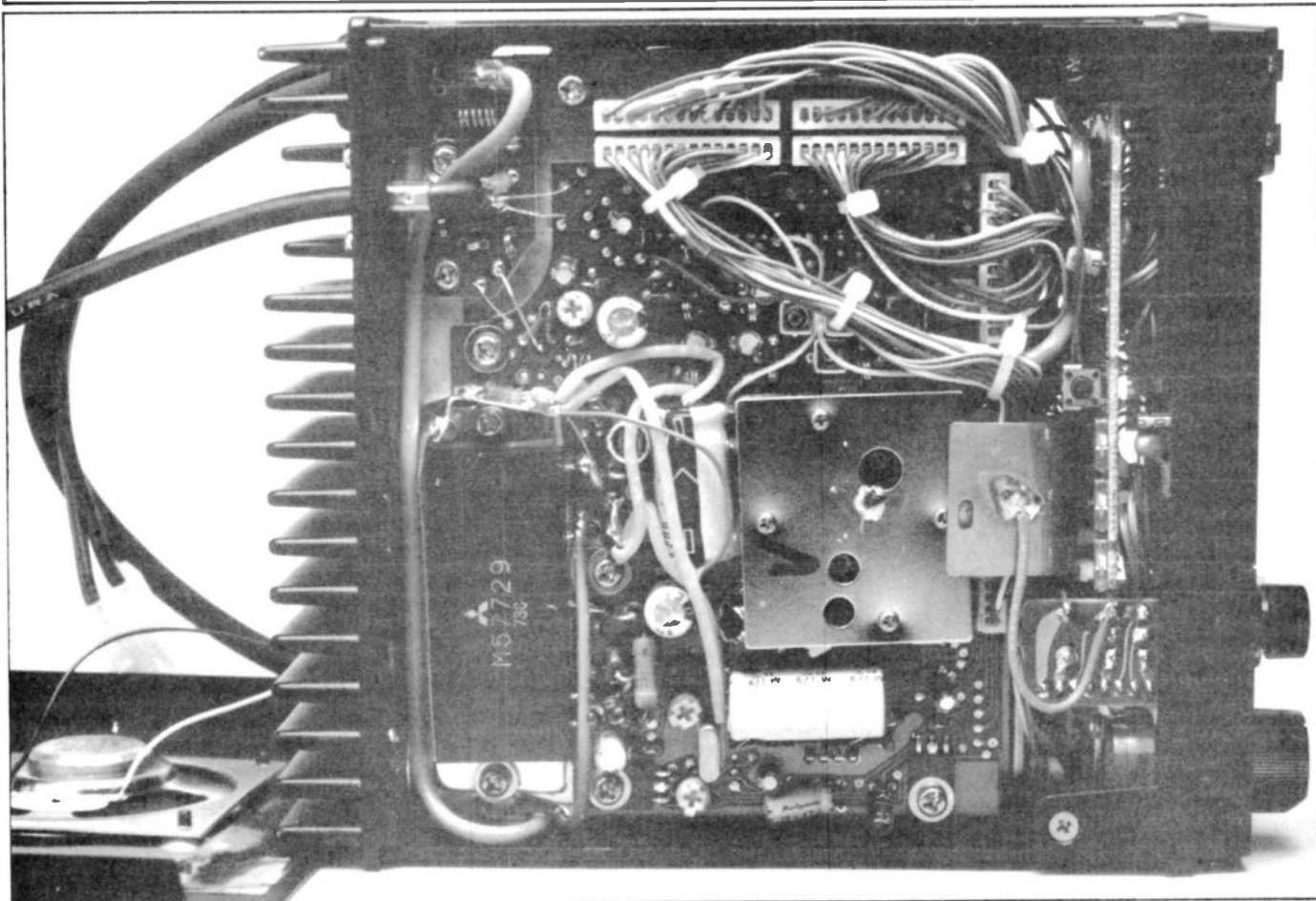
The set looks exactly like a slightly fatter version of the ALR-22E, and I can only echo my previous impressions of a small, smart set with a high-tech appearance. Its

size, together with the use of flying leads, would allow the set to fit into most nooks and crannies found in today's gadget-filled dashboards. The built-in duplexer would save the purchaser forking out another fifteen or twenty pounds for an external add-on unit, allowing a single unobtrusive aerial to be used on the family jalopy, or a quickly positioned magmount where the need arises. This, together with the quick-release mounting bracket, would provide for a quick getaway when the day's driving is complete and the set becomes a fixed station.

Again the operating booklet provided has no mention whatsoever of simple user adjustments, and does not mention any fault-finding information such as where to find and how to replace the memory back-up battery when it goes flat. I'm not a watch expert but even simple instruction leaflets for £1.99 watches show how to replace the battery, why can't transceiver manufacturers do likewise?

Inner Workings

The set is built on a diecast



The 70cm side of the Alinco's chassis.

chassis with the main RF boards for each band separated by a central moulding. This arrangement ensures mechanical rigidity as well as providing good screening and earthing, very important factors in a duplex rig such as this. The digital control circuitry is fitted on two smaller PCBs mounted on the front panel, to which the front panel controls and the small top-lid slide switches directly connect.

The accompanying block diagram shows that completely separate synthesisers are used under control from the MB88543 CPU, this allows each network to be tailored for the best performance possible as well as giving a full duplex facility. Each VCO is directly modulated by separate audio tailoring circuits, and the RF signal amplified to the 25W level before being PIN diode switched and fed to an on-board duplexer. This takes the form of low and high-pass filters so giving a wide bandwidth coupled with a reasonable degree of isolation. The receive signals are similarly split, being passed into a pair of separate front end amplifier

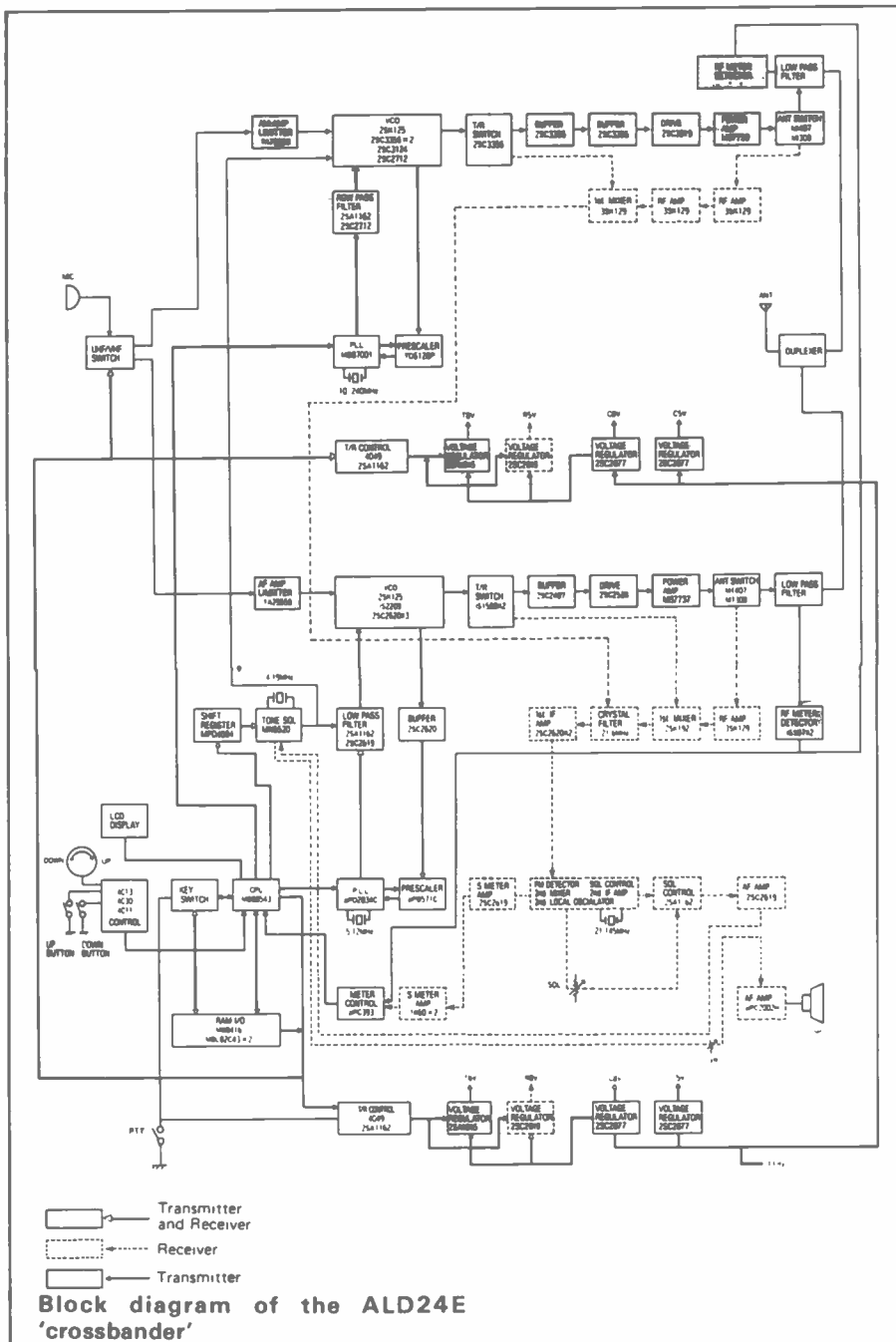
and mixer stages to achieve a common 21.6MHz intermediate frequency. A pair of monolithic dual crystal IF filters provide the initial selectivity before the signal is downconverted again to 455kHz by the ubiquitous TK10420 subsystem IC, cleaned up further using a ceramic filter, and finally demodulated down to audio.

In Use

Initial tests were done on the road, the set being positioned on top of the dashboard as well as under the parcel shelf on the driver's side. The first thing I noticed was the rather 'topy' receive audio from the tiny speaker, plugging in my usual external communications speaker gave little improvement but eventually my ears became accustomed to it. I programmed the 21 memory channels with my favourite repeater and simplex channels and set about on my usual long journeys into work as well as the odd cross-country jaunt. I found the frequency display very readable when viewed from above, both at night and in bright sunshine, however when

viewed from below whilst using the set vertically mounted between the front seats the display instantly becomes unreadable, so watch out.

After I had got used to the positions of the small, function buttons, I had no difficulty in operating the set by touch alone, only glancing at the display quickly now and then to check which frequency I was on. The microphone Up/Down buttons only control frequency and not the memory channel, but the set does have an advantage in that these can be used to QSY from any selected memory channel, I often found this very useful when searching for signals. What a pity there was no toneburst button fitted to the microphone, as I would certainly have found this more useful than the facia-mounted button when accessing the 'tone quickly followed by speech' boxes which don't accept a break in carrier. Transmitted audio reports were normally favourable if sometimes a little on the 'topy' side but "*Crisp and Clear*" was the norm rather than "*Sounds like you've got a sock up your nose*" report which I've had with other sets.



There was ample receive volume using both the internal and my larger external speaker, but I did notice a 'pop' each time the squelch opened or closed on low volume settings. When using the external speaker with its higher efficiency this was rather offputting, to the extent that I often just wanted to switch the set off. The suppliers of the review set informed me that they hadn't encountered this problem before, so maybe I just had a 'rogue' one or I'm possibly being very fussy!

During the review period I used a 90cm Welz EL-770 dual band as well as a 20cm Comet miniature

dual band aerial. I found the set operated perfectly into both of these, with similar signal reports to my 25w 2m and 70cm mobile rigs being given, showing both the internal duplexer and the general RF performance to be quite good. The S-meter though I found virtually useless, it was normally reading either full scale, zero, or varying wildly between the two extremes due to slight mobile flutter, not a lot of good.

I did find a better-than-average rejection of the Primary Band User signals, spaced 12.5kHz away from a couple of my semi-local repeaters around Northamptonshire, this

allowed me to hear the amateur repeaters in locations where I had been having difficulty due to adjacent channel blocking. When using the set from home into a chimney mounted fibreglass dual-band colinear, I managed one or two pleasant duplex contacts using the Alinco, providing I avoided 70cm receive frequencies near to multiples of my 2m transmit frequency. Again in normal use I encountered no adjacent channel problems, either on 2m or 70cm, which is very good.

Laboratory Results

The receiver sensitivity was fairly reasonable on both bands with the very good 12.5kHz adjacent channel rejection measured also confirming the results obtained in practice. I was a little disappointed with the poor 2m image rejection, however, this falling right in the middle of Broadcast Band II but in the frequency range presently used by non-broadcasters. A simple coax notch filter could improve this however if the odd problem does occur in future use. The S-meter range was, as found on-air, very limited indeed in common with many FM-only sets.

On transmit, the set was very clean in terms of harmonics and spurs and I drew the line at trying to measure better than 100dB down! As a final test, I transmitted 145.0MHz on high power into a 50dB attenuator whilst coupling the other end to my synthesised signal generator set to 435MHz, ie three times 145MHz. I found that I needed to increase the signal level by 59dB from the 12dB SINAD level to override the transmitted signal, showing that I could (if I really wanted) have a duplex contact with a nearby station on these two frequencies as well as any other 2m/70cm combination!

Conclusions

The set offers a good all-round performance at an economical price — I was in fact pleasantly surprised, and a such I'm sure it will be quite popular. It is very small, in keeping with many of today's midget rigs, but still relatively easy to operate by touch alone and you'd be hard pressed to find a car dashboard where it would not fit. However it may be a little too tall to place above the fascia to ensure minimum eye-

travel distance whilst driving — this aspect being far more important than the use of 'safety mics' or whatever. It comes from a lesser-known manufacturer than the usual 'big three' and because of this, plus the meagre user servicing information provided with the set, I would advise the purchaser to ensure a good service backup is available from his chosen supplier.

My thanks go to Waters and Stanton Electronics for the loan of the review transceiver. The suppliers also inform us that they now provide an info sheet showing deviation adjustment points etc.

General view of the rig complete with fist mic



Laboratory Results — ALD-24E

Receiver

Sensitivity Signal level required for 12dB SINAD	
Freq	Level
144MHz	0.148uV pd
145	0.143
146	0.135
430	0.164
435	0.183
440	0.182

Squelch Threshold Sensitivity	
Freq	Level
145MHz	0.087uV pd 4dB SINAD
435MHz	0.089uV pd 2.5dB SINAD

Harmonics/Spurii		
Harmonic	145MHz	435MHz
2nd	-78dBc	-91dBc
3rd	<-100dBc	<-100dBc
4th	<-100dBc	<-100dBc
5th	-93dBc	<-100dBc
6th	-95dBc	<-100dBc
7th	<-100dBc	<-100dBc
8th	-73dBc	<-100dBc

2m spurii at ±12MHz -82dBc
All other harmonics and spurii less than -100dBc

Adjacent Channel Selectivity Measured as increase in level of interfering signal, modulated with 400Hz at 30% system deviation, above 12dB SINAD ref level to cause 6dB degradation of 12dB SINAD on-channel signal

Spacing	145MHz	435MHz
+12.5kHz	42.0dB	41.0dB
-12.5kHz	56.5dB	55.0dB
+25kHz	66.5dB	62.5dB
-25kHz	68.0dB	65.5dB

Image Rejection Increase in level of signal at -43.2MHz to give identical 12dB SINAD signals

Freq	Level
145MHz	68.0dB
435MHz	81.0dB

Blocking Increase over 12dB SINAD level of signal 1MHz away to cause 6dB degradation in 12dB SINAD on-channel signal

Spacing	Band	
	145MHz	435MHz
+100kHz	87.5dB	73.5dB
-100kHz	87.5dB	74.0dB
+1MHz	103dB	86.0dB
-1MHz	103dB	87.0dB
+10MHz	108.5dB	100.0dB
-10MHz	104dB	101.5dB

Intermodulation Rejection Increase in level over 12dB SINAD level of two interfacing signals giving identical 12dB SINAD on-channel 3rd order intermodulation product

Spacing	Band	
	145MHz	435MHz
25/50kHz	66.0dB	71.0dB
50/100kHz	65.0dB	69.0dB

Maximum Audio Output Measured at 1kHz on the onset of clipping

Load	Output
3ohm	2.45W RMS
8ohm	1.45W RMS
15ohm	900mW RMS

Parameter	145MHz	435MHz
Peak Deviation	4.91kHz	4.79kHz
Toneburst Deviation	3.78kHz	3.48kHz
Frequency Accuracy (at switch on)	-50Hz	-30Hz

S-Meter Linearity				
S Level	145MHz		435MHz	
	S1	0.78uV pd	-6.6dB	1.29uV pd
S3	1.05	-4.0dB	1.68	-4.1dB
S5	1.25	-2.5dB	1.96	2.8dB
S7	1.44	-1.3dB	2.38	1.1dB
S9	1.67	0dB ref	2.69	0dB ref
S9+	1.89	+1.1dB	3.1	+1.2dB
S9++	2.17	+2.3dB	3.70	+2.8dB

TX Power and Current Consumption:				
Band	Power	Supply		
		10.8V	13.8V	15.6V
145MHz	High	24.5W/4.70A	28.5W/5.00A	28.9W/5.10A
	Low	6.90W/2.60A	7.00W/2.70W	7.10W/2.75A
435MHz	High	16.9W/4.30A	25.6W/4.95A	25.8W/4.90A
	Low	6.80W/2.65A	6.90W/2.70A	7.00W/2.65A

METRE WAVE

Every well equipped metrewave station today will include a sizeable and important 70cm element if it is to make maximum use of the available allocations. All you need to do is to sign a cheque for a 433MHz transceiver and antenna, and you have immediate access to the band. That was not always thus. Back in the Fifties things were very much more difficult!

Jack Hum, G5UM, looks back over one-third of a century to the early days of the "ultra highs"

Just how difficult it was to get on to 70cm the hard way (there wasn't a soft way) may be gauged from the fact that at that time a school of thought remained that only by using super-regenerative receivers and self-excited transmitters (SEOs) was it possible to effect a reasonably cheap and cheerful entrée to the band. There was for a time even a slice of the 420-460Mc/s allocation given over to these SEO requirements. It didn't stay long because SEO didn't stay long, for in spite of the technical difficulties the determination existed among the fraternity to persuade frequency-stabilised transmitters and converters to function at 70cm.

Note in the preceding paragraph the use of "Mc/s," the then current term used in the technical literature of the time. "Megahertz" hadn't come in back in 1953, around which year our story revolves. Other developments which "hadn't come in" included *proper* FM — not the inadvertent FM produced by self excited gear — and solid-state technology (the transmitter had been invented but UHF devices were a decade away). As for repeaters at 70cm, they were two decades away!

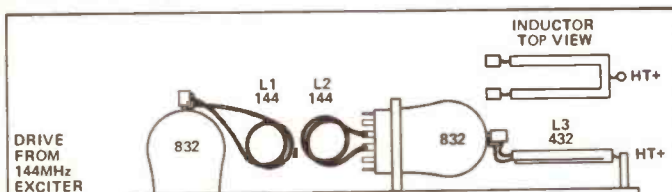


Fig. 1 The rudiments of a layout typically used in the Fifties to generate power at 432MHz. An 832 valve mounted vertically accepts 144MHz input from an external exciter and amplifies it to appear in L1. Another 832 disposed horizontally accepts 144MHz input in L3 across its twin grids and delivers multiplied output to L3, which is a U-shaped inductor cut to resonate at 70cm (usually about 2 1/2 in long). Another configuration favoured making L3 two separate strip lines tuned at the remote ends by a butterfly capacitor.

Power Triplers

For experimenters resolved to get going on 432Mc/s (that term again!) the most promising route seemed to be by the use of an 832 twin-tetrode, known to be a good performer at 144Mc/s but with merits unknown at 432. This valve had come across the Atlantic in great quantities during the war (only eight years before) as a popular final stage in the American radio-telephone equipments of the day used by the fighting services.

Before long the 832 could be had for as little as what was then known as ten bob (meaning 50p today) from many a war-surplus equipment dealer. Studying its characteristics, and notably its inter-electrode capacitances, those experimenters of the early Fifties wondered whether the thing could ever be persuaded to deliver RF in any quantities at 432. Persuaded it was, usually by the process of clobbering it with plenty of RF at 144Mc/s in the hope that it could be bludgeoned into tripling to 432. And indeed it was.

The limitations of the 832 at 432 became all too evident, but "... that's the best we've got" was the philosophy of the times. A characteristic mechanical layout which was favoured is shown in the sketch at Fig. 1. Utilising two 832 valves, it disposed one of them vertically on a suitable chassis to perform as a 144Mc/s amplifier, its anode inductor extending horizontally from it and close coupled with a similar inductor connected across the twin input grids of a second 832. This second valve was disposed horizontally and functioned as a power tripler, 144 in and (hopefully) 432 out. The magic moment came when an apologetic trickle of RF emerged from the tripler's twin anodes, just enough to light a flashlamp bulb.

When using the 832 it was important to allow for the different co-efficients of expansion between its glass bulb and the metal connectors attached to its top pins. If you didn't, there was a pop, followed by the tell-tale grey suffusion within the bulb to show that air had entered it. "You see a ham in mourning" was said probably more than once as an experimenter displayed a defunct 832 to a sympathetic spouse.

Help was at hand. It was called the QQV03/20. Like the 832 it was a twin tetrode, but immensely superior in its ability to loaf along safely at frequencies far above 432Mc/s. It too was "prone to pranging" via the metal to glass expansion, but before long it was improved by being given a sintered top that rendered it almost impervious to even the roughest wrenching that

might be applied to the pins by pliers. Not that knowledgeable hams would do such a thing, but less dedicated users might, and there was an increasing number of *them* around in the burgeoning professional mobile field where existed the primary purchasers of valves like the 3/20A. A ham had to think many times before he assigned the best part of a week's pay to one!

Like the 832, the new "Three Twenty" allowed the use of long-line inductors for tank coils, sometimes tuned in parallel but often tuned with a butterfly trimmer across the remote ends: you lumped less capacitance across the system and made the lines longer and more efficient if you did it this way.

Such developments virtually put an end to the use of SEO transmitters and super-regen receivers (though these remained in use for a while as an approach to microwaves).

Feeding and Care of Aerials

Having generated your 432Mc/s RF and amplified it via a 3/20 to a level of seventy-centimetric power hitherto unheard of, you were next faced with the problem of getting it to the antenna and away into space. This was not easy: the RF cables of the time came largely from the television aerial industry which at that time wasn't interested in frequencies much above 60MHz, although before long the cable industry was compelled to address itself seriously to the needs of the new TV broadcasting service about to start up around 200MHz (in the mid Fifties) but also to the increasing needs of the mobile industry.

Before this happened hams were faced with a very limited choice of co-axial cable suitable for their 432MHz band. Some of the ex-wartime stock could be pressed into service, but the widespread doubts among hams about the efficacy of low impedance coaxial cable was expressed in a considerable interest in open-wire feeders — yes, even for 70cm. But this, like the super-regen, didn't last long when better coax became available.

As for the aerial itself, there was much debate about the merits of stacked arrays (sometimes with reflectors to give them a measure of directivity) and of long Yagi designs.

Eventually, the Yagi won, although it induced in the minds of many the thought that if you put a lot of elements on it you would increase the range and maximise your hard-won RF energy. From this line of thinking grew the "super long Yagis" so much the fashion a few years ago but now less popular (a) because the few extra decibels they provide do not warrant their size and loading on the average amateur mast and (b) because the extreme directivity compels you to rotate yours much more than you would a smaller array that gives you more idea of what is happening off the sides.

The Self-Help Ethic

One third of a century ago ham radio aerials of whatever sort were home-built. So was everything else in a 70cm installation at the end of a feeder line. This self-help ethic had its lighter moments.

For instance, there was the enthusiastic who formed a queue of one outside a loudspeaker maker's factory knowing that redundant metal grilles were

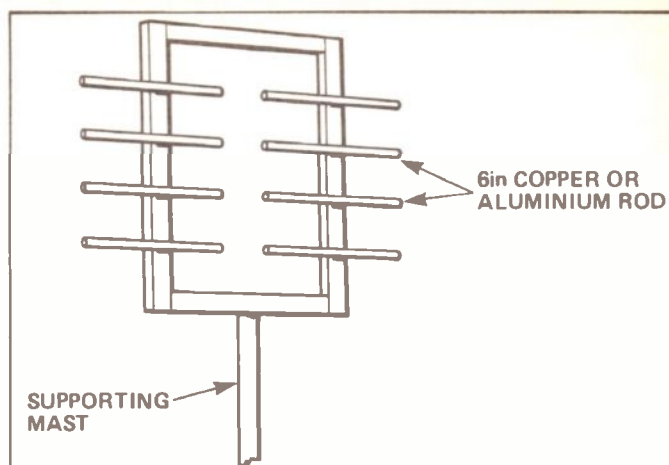


Fig. 2 The outline of the antenna system used in many 70cm stations a third of a century ago. Each element would be a quarter of a wavelength (6in) long supported from the wooden lath framework by small stand off insulators and interconnected to provide either 80ohm or 300ohm impedance according to the type of feeder available to the experimenter. Sometimes mesh reflectors would be added to give the assembly some degree of directivity but of course increasing its wind resistance. Rotation was usually provided by turning the mast, generally by hand.

often thrown out and could be had for the proverbial song, for use as mesh reflectors for aerials. He refused to be daunted when told by a professional electronics technician that he couldn't expect much more than 1db of gain if he did it that way.

Another experimenter who had heard of a peculiar device called the Kolster tank (it appeared to combine the advantages of lumped and cavity inductor) decided he would "go into production with it": he was in charge of an industrial model shop so had facilities in that respect. But the primary value of this device was to provide a good Q for super-regen tank circuits. When super-regens went out so did the Kolster tank. It ought to be added that a further death-knell to self-excited rigs was sounded when DX deep into the heart of Europe was reported by users of stabilised transmitters — and you couldn't work *that* with an SEO.

Yet another 7cm pioneer upon receiving a social visit from a professional electronics friend invited him to the shack to see the band in action. The professional took one look at the equipment the enthusiast had built and said: "I just don't believe it!" His disbelief turned to respect when a 70cm station 40 miles away came back to a CQ call and gave S9.

Many other examples of self-help in action could be quoted from those times. Underlying them all was the radio ham's traditional delight in attacking many an apparently intractable problem simply "because it's there," commonly called the Everest Syndrome. That ethic is still around today even though amplitude modulation and "keying the screen," common practices in the Fifties, and not heard of in the metrewaves of the Eighties.

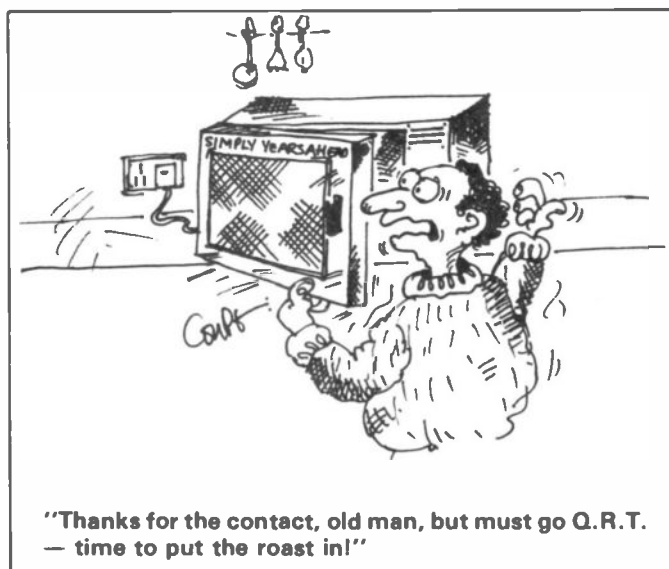
Only the most prescient of those days could forecast the onset of transistorisation and the emergence of devices capable of working well not only on 70cm but higher up still in frequency. Still, it was good fun and its pioneers would not deny today's operators the pleasure of using the band under almost idealised conditions. They do it themselves!

RADIO Tomorrow

- 1 Jan** Sutton & Cheam RS: Natter night.
- 4 Jan** Todmorden DARS: Construction competition.
Sheffield ARC: 'Open Forum' (brainstorming session).
Firth Park Pavilion, Firth Park Road, Sheffield 5.
Meetings start at 8.00pm.
(RAE & Morse between 7.00pm & 8.00pm).
- 5 Jan** Fylde ARS: AGM.
Delyn RC: Informal Meeting.
Rugby ATS: New Year natter night.
Chester DRS: AGM.
Wakefield DRS: Night on the air.
- 6 Jan** S Bristol ARC: Cine film evening.
- 7 Jan** Bredhurst RTS: Talk 'Phase Lock Loops' by Steve G8NVH
Yeovil ARC: Talk 'Contest Operating' by G3GC
Salop ARS: Equipment bring and buy.
Horsham ARC: Talk 'Planning applications' by G3UDU.
Vale of Evesham RAC: Slides 'A year in the life of VERAC' by Martin G6TRS The Round of Gras, Badsey. 7.30pm. Info — Mike G4UXC on Evesham 831508 or Peter G6JNS on MBX 219999979.
East Kent RS: Old-timer panel. 7.30pm. Parkside Lodge, Kings Road, Herne Bay. Info from Drian Didmon, G4RIS. Whitstable 26042.
- 8 Jan** Itchen Valley ARC: Talk 'A low cost panoramic receiver' by Andrew G4XZL.
Wimbledon ARC: 'Bring & Test Your Own Equipment' Herbert Rd, Wimbledon, London SW19 Info from David Love (0737) 51559.
- 10 Jan** Sunderland ARS: Sale of Surplus Equipment. Porcupine Park, Queen Alexandra Rd, Sunderland. Doors open at 11.30am; viewing at 12pm and auction starts at 12.45pm. Bar refreshments available. Talk in on S22. More details from Nigeln, Marston, G0ASM on (091) 5288079.
- 11 Jan** Atherstone ARC: Club night.
Sheffield ARC: Talk 'That's China' by Tony Whitaker (G3RKL).
Firth Park Pavilion, Firth Park Road, Sheffield 5.
Meetings start at 8.00pm.
(RAE & Morse between 7.00pm & 8.00pm)
Info from Alan Pemberton, G0ILG (0742) 395 287.
Hambleton ARS: AGM. Details — Ken Shearman, G1XLZ (0609) 775478.
- 12 Jan** Rugby ATS: Construction corner.
Keighley ARS: Natter night.
Wakefield DRS: Debate.
Workshop ARS: Natter nite.
Verulam ARC: Talk 'Standing Waves' by Gerald Stauncey, G3MCK. 7.30pm. RAF Association HQ, New Kent Rd, Off Marlborough Rd, St. Albans.
- 13 Jan** S Bristol ARC: Bring & Buy.
Wirral DARC: AGM.
Willenhall DARS: CW night. 8.15pm. Cross Keys Inn,, Ashmore Lake Rd, Willenhall, W. Midlands. Info — Dave Jackson, G0 EGG (0902) 734475.
Farnborough & DRS: Film Night by G4MBZ. 7.30 for 8.00pm. Railway Enthusiasts Club, Harley Lane, Farnborough. Further details from Tim Fitzgerald (G4UQE) on Camberley 29231.
Southgate ARC: Talk 'The History of Satellites' by Richard Limebar (G3RWL).
- 14 Jan** Edgware DRS: AGM.
Yeovil ARC: Talk 'Producing Aerial Gain' by G3MYM.
Bredhurst RTS: Construction & natter night.
Salop ARS: Special event station GB2SSJ on air (Salop Silver Jubilee).
- 15 Jan** Sutton & Cheam RS: Talk 'Air Spaced Capacitors' by Malcolm Kirk (G4XMK).
Coventry ARS: Committee meeting.
Firth Park Pavilion, Firth Park Road, Sheffield 5.
- 18 Jan** Todmorden DARS: Natter Night.
Bredhurst RTS: Slide competition with Parkwood Photo Society.
Sheffield ARC: Committee meeting.
Firth Park Pavilion, Firth Park Road, Sheffield 5.
Meetings start at 8.00pm. (RAE & Morse between 7.00pm & 8.00pm).
Hambleton ARS: RAE Course Details — Ken Shearman, G1XLZ (0609) 775478.
Delyn RC: Informal meeting.
Wakefield DRS: Mastermind.
Halifax DARS: Talk 'RAYNET' by David Holdsworth (G8COG).
Fylde ARS: Informal evening.
- 19 Jan**



- Workshop ARS: Return Quiz Night — Maltby ARS.
20 Jan S Bristol ARC: HF Activity Evening.
- 21 Jan** Yeovil ARC: Talk 'Moonbounce' by G3MYM.
 Vale of Evesham CAR: AGM 8.00pm. The Round of
 Gras, Badsey. Info — Mike G4UXC on Evesham
 831508 or Peter G6JNS on MBX 219999979.
 East Kent RS: Natter Night. 7.30pm. Parkside Lodge,
 Kings Road, Herne Bay. Info from Brian Didmon,
 G4RIS. Whitstable 26042.
- 22 Jan** Coventry ARS: Talk/Demo: 'Packet Radio.'
23 Jan Wakefield DRS: Annual Dinner.
25 Jan Atherstone ARC: Informal at The Bull, Witherley.
 Hambleton ARS: Fault Finding by Tony Nicholson.
 Details — Ken Shearman, G1XLZ (0609) 775478.
26 Jan Keighley ARC: AGM.
 Wirral DARC: Surplus equipment sale.
 Wakefield DRS: Talk 'Stateside' by G1FOC.
 Itchen Valley ARC: Talk 'Wireless from the beginning'
 by Peter G3CBU.
- 27 Jan** S Bristol ARC: Club Project — construction evening.
28 Jan Yeovil ARC: Natter night.
 Bredhurst RTS: Construction & natter night.
 Salop ARS: HF night on the air.
 Edgware DRS: Informal — station on the air.
29 Jan Bredhurst RTS: Christmas dinner & dance.
- 31 Jan** Belle Vue/Norbreck Radio Rally. Norbreck Castle
 Hotel Exhibition Centre, Queens Promenade, North
 Shore, Blackpool. Show opens at 11 am. Admission
 £1, Senior citizens 50p, under 14's free. Trade
 stands, bring & buy, ample free parking, bars &
 restaurants, RSGB Morse Tests (book in advance
 with RSGB). Talk-in on S22 and SU8. Further
 details from Peter G6CGF on 051 630 5790.
- 1 Feb** Todmorden DARS: AGM.
 Hambleton ARS: RAE Course. Details — Ken
 Shearman, G1XLZ (0609) 775478.
- 2 Feb** Rugby ATS: Night on the air.
 Wakefield DRS: Night on the air.
 Workshop ARS: Video night — 'Electromagnetic
 Wave'; 'The Electron's Tale'; Thin Film
 Microcircuits.'
- 4 Feb** Yeovil ARC: Talk 'A Simple Shortwave Receiver'
 by G3MYM.
 Bredhurst RTS: Talk 'How to Use a SCOPE' by
 Bernie Bowden GOENN.
 Salop ARS: Talk 'Model Steam Engines' by GOEBD.
 Horsham ARC: Talk — 'How linear is your linear?' by
 G3WZT.
 Vale of Evesham CAR: Skittles, The Round of Gras,
 Badsey. 7.30pm. Info — Mike G4UXC on Evesham
 831508 or Peter G6JNS on MBX 219999979.
 East Kent RS: KANGA products introduce their
 amateur radio kits. Dick Pascoe, GOBPS & Ian
 Keyser, G3ROO 7.30pm. Parkside Lodge, Kings Road,
 Herne Bay. Info from Brian Didmon, G4RIS.
 Whitstable 26042.
- 8 Feb** Atherstone ARC: RSGB film.
 Hambleton ARS: RTTY by Barry Wilkinson. Details —
 Ken Shearman, G1XLZ (0609) 775478.
- 9 Feb** Rugby ATS: Constructors corner.
 Keighley ARS: Natter night.
 Wakefield DRS: Club project — introduction.
 Willenhall DARS: Junk Sale.
 Workshop ARS: Natter nite.
- 10 Feb** Farnborough DRS: Talk/Demo: 'Packet Radio' by
 G3RRA. 7.30 for 8.00pm. Railway Enthusiasts Club,
 Harley Lane, Farnborough. Further details from Tim
 Fitzgerald (G4UQE) on Camberley 29231.
 Willenhall DARS: Junk Sale 8.15pm Cross Keys Inn,
 Ashmore Lake Rd, Willenhall, W. Midlands. Info —
 Dave Jackson, GOEGG (0902) 734475.

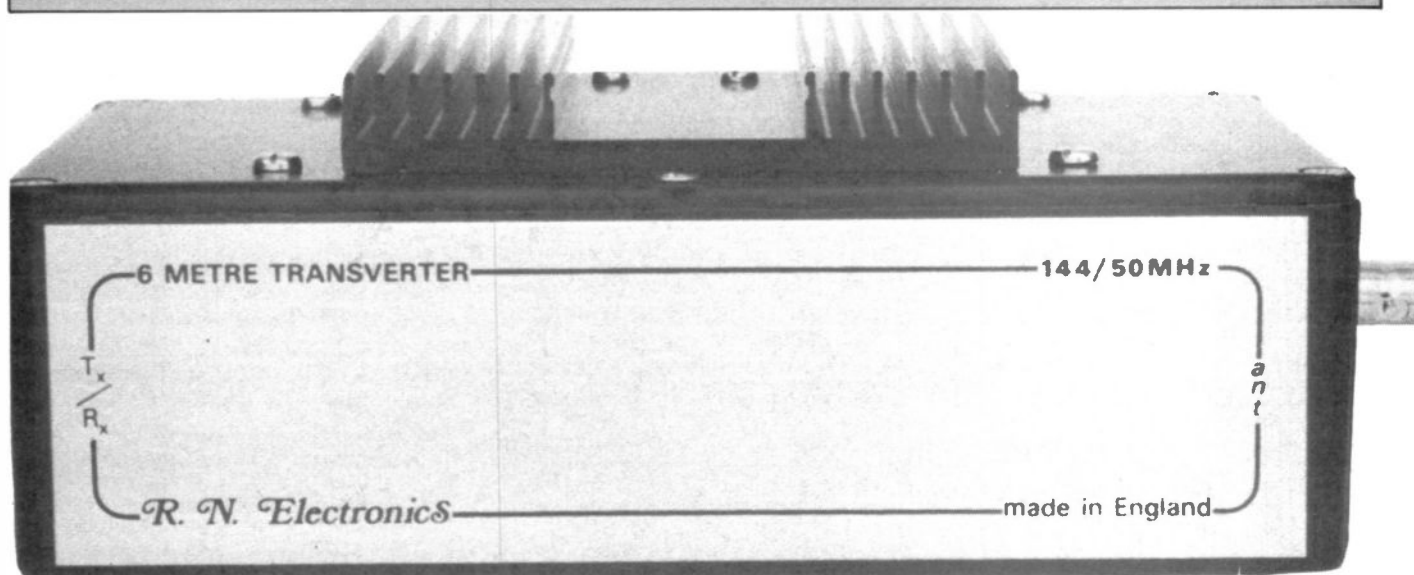


- 11 Feb** Bredhurst RTS: Construction & natter night.
 Salop ARS: Natter night.
 Edgware DRS: Talk 'Computer databases & and
 application' by G4IUZ.
- 12 Feb** Wimbledon DARS: Surplus Equipment Sale.
 Herbert Rd, Wimbledon, London SW19. Info from
 David Love (0737) 51559.
 Itchen Valley RC: Mort G3JZV Manual Telegraphy or
 CW.
- 15 Feb** Todmorden DARS: Morse activity evening.
 Halifax DARS: Junk sale.
 Hambleton ARS: RAE Course. Details — Ken
 Shearman, G1XLZ (0609) 775478.
- 16 Feb** Workshop ARS: Talk 'The history of amateur radio' by
 Bill Parry (Founder member).
- 18 Feb** Salop ARS: Talk 'Leadmines' by G4ZZP.
 East Kent RS: Natter Night. 7.30pm. Parkside Lodge,
 Kings Road, Herne Bay. Info from Brian Didmon,
 G4RIS. Whitstable 26042.
- 19 Feb** Sutton & Cheam RS: Talk 'Commercial antennas &
 feeders' by John Tranter.
- 22 Feb** Atherstone ARC: Night on the air.
 Hambleton ARS: Talk 'Satellite Operations' with
 Wilf Walker & Brian Anderson. Details — Ken
 Shearman. (0609) 775478.
- 23 Feb** Keighley ARS: Talk 'Ten metres' by G4YDI.
 Workshop ARS: Natter nite.
- 24 Feb** Farnborough DRS: Talk 'Instrumentation' by G3HEJ.
 7.30 for 8.00pm. Railway Enthusiasts Club, Harley
 Lane, Farnborough. Further details from Tim
 Fitzgerald (G4UQE) on Camberley 29231.
- 25 Feb** Bredhurst RTS: Radio Rally Briefing.
 Salop ARS: HF Night on the air.
 Edgware DRS: Talk 'Patents for everyone' by G3SJE.
- 26 Feb** Wimbledon DARS: Meet the committee evening.
 Herbert Rd, Wimbledon, London SW19. Info from
 David Love (0737) 51559.
 Itchen Valley RC: Talk 'Voyager Satellite'
 by Dick, G6LQ.
- 27 Feb** Bredhurst Receiving & Transmitting Society. Third
 Rainham Radio Rally. 10am. Special event station
 GB4RRR. Parkwood Community Centre,
 Deanwood Drive, Rainham, Kent, Gillingham.s,
 Trades, bring & buy, refreshments, raffle. Admission
 50p. Talk in on S22, SU22, 28.5MHz. Details — Bob
 Mullett, G1LKE (0634) 362154 or MBX Prestel
 819991488.
- 29 Feb** RAE Course. Hambleton ARS: AGM. Details — Ken
 Shearman, G1XLZ (0609) 775478.

CONTACTS CONTACTS

Aberdeen ARS	Don	04876251	Lagan Valley ARS	Jim, G14TCS	0846 682474
Abergavenny & NH ARC	GW4XQH	0873 4655	Leeds DARS	G1EBS	0274 665355
Aberporth ARC	GWODPR	023987 274	Leighton Linslade RC	Pete Brazier	052 523 270
Aire Valley RS	G6NPT	0532 44597	Lincoln SWC	Pam, G4STO	0427 788356
Alyn and Deeside ARS	GW4RKX	0244 660066	Lothians RS	Robin	0506 890177
Amateur Radio & CC	Trevor	04895 81032	Louth DARC	G1IZB	047286 595
AMRAC	Phil, G6DLJ	0703 847754	Loughborough ARC	Philip	0509 412043
Armagh & Dungannon DARC	J. A. Murphy	0861 522153	Lough Erne ARC	Bill	0365 24905
Atherstone ARC	Roy	0203 393518	Loughton DARC	G4FKI	0525 714591
Axe Vale ARC	Bob	029 74 5282	Macclesfield DRS	G1NUS	0625 24534
Ayr ARG	GM3THI	Ayr 42313	Maidenhead DARC	John	0628 28463
Barking RES	R. Woodberry	01 594 4009	Maidstone YMCA ARS	GOBUW	0622 30544
Barry College RS	John	065679 710	Maltby ARS	Keith, G1PQW	0709 814135
Basingstoke ARC	Dave	07356 5185	Mansfield ARS	G4GYU	0623 27257
Bath DARC	G4UMN	Frome 63939	Medway ARTS	Tony	0634 578647
Biggin Hill ARC	GOAMP	0689 57848	Midland ARS	G8BHE	021 422 9787
Borehamwood Elstree ARS	Tony	01 207 3809	Mid Sussex ARS	G0GMC	07918 2937
Braintree ARS	Pub Sec	0376 28714	Mid Ulster ARC	Sam	07622 22855
Bredhurst RTS	Kelvin GOAMZ	0634 376991	Mid Warwickshire ARS	G4TIL	0752 690435
Bridgend DARC	Dave	0656 723508	Milton Keynes DARS	Mike, QOERE	0234 750629
Brighton DARS	Peter	0273 607737	Morecambe Bay ARS	G4ZJL	0524 52042
Binstead ARS	Douglas	Ryde 67665	N. Bristol ARC	Alan Booth	0272 690404
Bristol ARC	G4YOC	Bitton 4116	N. Cornwall RS	J. West	0288 4916
Bristol (Shirehampton) ARC	Ron Ford	0272 770504	N. Staffs ARS	G6MLI	0782 332657
Burnham Beeches RC	G6EIL	0628 25720	N. Wakefield RC	Steve	0532 536633
BT (Reading) ARC	G4MUT	0734 693766	Newbury DARS	G3VOW	0635 43048
Bury RS	Allan	0204 706191	Newport ARS	GW6ZUQ	02912 6867
Cambridge DARC	D. Wilcox	0954 50597	Norfolk ARC	Andy	Norwich 610874
Chesham DARS	Liz	09278 3911	Oswestry DARC	Brian	0691 831023
Cheshunt DARC	G4VMR/G4VSL	092084 250	Peterborough RES	Peter	G4PNW QTHR
Chester DRS	Dave	0244 336639	Plymouth ARC	G4SCA	0752 337980
Chichester DARC	C. Bryan	0243 789587	Pontefract DARS	Colin, GOAAO	0977 43101
Clacton ARS	Reg	0255 430466	Poole ARS	GOEQV	0202 674802
Chiltern ARC	Ron, G3NCL	0494 712020	Preston ARS	George	0772 718175
Clifton ARS	RA Hinton	01 301 1864	Reading DARC	Steve, G4YFB	Reading 867820
Conwy Valley ARC	GW4KGI	0745 823674	Rhyl DARC	GW1PLI	097 888 621
Coulsdon ATS	Alan	01 684 0610	Salisbury RES	Neil	0980 22809
Coventry ARS	Bill, G3UOL	0203 414684	Salop ARS	Simon	0743 67799
Crawley ARC	Jack	0293 28612	Sheffield ARC	John	Sheffield 581766
Darenth Valley RC	Sec	0322 63368	Shefford DARS	Alan, G4PSO	Hitchin 57946
Dartford Heath DFC	Pete	0322 844467	S. Bristol ARS	Len Baker	0272 834282
Denby Dale DARC	G3SDY	0484 602905	S. Cheshire	Chris	07816 73185
Derwentside ARC	G1AAJ	0207 520477	S. Lakeland ARS	G4VKE	0229 65359
Donegal ARC	E13BOB	074 57155	S. Manchester RC	Dave Holland	061 973 1837
Dorking DRS	John	0306 77236	S. Tyneside ARS	G4XWR	S. Shields 543955
Droitwich DARC	G4HFP	0299 33818	S. E. Kent (YMCA) ARC	John	0304 211638
Dudley ARC	John	0384 278300	Southdown ARS	P. Henly	0323 763123
Dunfermline RS	GM0DYD	0383 413440	Southampton: See Waterside.	Dave	0992 30051
Dunstable Downs RC	Phill Morris	0582 607623	Southgate ARC	G4MLW	0924 409739
Eastbourne EARC	G1BRC	0323 29913	Spenn Valley ARS	G6EDA	0438 724991
East Kent ARS	Stuart	0227 68913	Stevenage DARS	John Walker	0642 582578
East Lancashire ARC	Stuart	0254 887385	Stockton DARS	Mel	061 224 7880
Edgware DRS	G4IUZ	0707 65707	Stockport RS	G3ZOM	K/ford 288900
Exeter ARS	Roger Tipper	0392 68065	Stourbridge DARS	M. Goodrum	0449 676288
Fareham DARC	Alan, G3CCB	0329 288139	Stowmarket DARS	A. Riley	051 430 9227
Farnborough DRS	Mr Taylor	0252 837581	St Helens DARC	John	01 657 0454
Felixstowe DARS	G4YQC	0473 642595	Surrey RCC	B. Hancock	0795 873147
Fishguard DARS	Bernard	0348 872671	Swale ARC	Peter	0823 75973
Fylde ARS	F. Whitehead	0253 737680	Taunton DARC	Tom Crosbie	0952 597506
Galashiels DARS	GM3DAR	0896 56027	Telford DARS	Keith, GOBTU	0730 66489
Glossop DARG	G4GNQ	QTHR	Three Counties ARC	Alan	0392 881569
Gt. Lumley ARES	G4MSF	091 4693955	Tiverton SWRC	G1GZB	070 681 7572
G. Peterborough ARC	Stan	0733 69822	Todmorden DARS	Ian	0380 830383
Halifax DARS	D. Moss	0422 202306	Trowbridge DARC	Paul	Evesham 831508
Harpenden ARC	G1BJC	05827 2455	V of Evesham RAC	Ian White	Abingdon 31559
Harrow RS	Tony	01 861 0419	V White Horse ARS	Gerry	St Albans 52003
Hastings ERC	Dave Shirley	0424 420608	Verulam ARC	G4NPM	0795 873147
Haverhill DARS	Rob Proctor	0787 281359	Wakefield DRS	G4VRY	0532 820198
Havering DARC	GOBOI	04024 41532	Warrington ARC	Paul, GOCBN	0925 814005
Hillingdon ARC	Howard, G6SII	01 561 2917	Waterside SWC	Bernie Lyford	0703 893937
Hornsea ARC	Richard	0401 62498	Welland Valley ARS	J. Day	0858 32109
Horsham ARC	Paul, G4YFY	0403 87 404	Welwyn Hatfield ARC	Kevin, G4WLG	0707 335162
Inverness ARC	Brian	0463 242463	West Kent ARS	B. Guinnessy	0892 32877
Itchen Valley RC	G1IPQ	S'oton 736784	Westmorland ARS	G. Chapman	0539 28491
Keighley ARS	G1IGH	0274 496222	White Rose ARS	G4ATZ	0937 842790
Kidderminster DARS	Tony	0562 751584	Wigston ARC	G6HAJ	Leicester 403105
Kingston DARS	G3ODH	Epsom 26005	Willenhall ARS	G4LWI	0902 782036
			Wimbleton DARS	George	01 540 2180
			Winchester ARC	Gordon	0703 772191
			Wirral DARC	Peter	051 677 7376
			Wolverhampton ARS	Keith	0902 24870
			Worcester DARC	D. Batchelor	0905 641733
			Workop ARS	G4ZUN	0909 486614
			Wythall RC	G1MEE	0546 824705
			Yeovil ARC	Eric Godfrey	Yeovil 75533
			308 ARC (Surbiton)	Bob	01 391 0788

RN ELECTRONICS TRANSVERTER



Got an FT290 or similar and want to get onto 6m without breaking the bank? A deluxe solution would be to buy a separate rig for the band, alternatively for those on a tighter budget you could plug a transverter in line and still retain all the operating features of your main rig, then

£135 and £172 respectively for those who, like myself, dread the thought of chassis bashing.

A-Transverting We Will Go

For those new to the concept of a transverter, it is simply a 'black

performance of your main set, further circuitry in the transverter can usually only degrade the RF performance of your system; whereas separate rigs are purpose designed to give the best performance possible within a pre-defined budget.

Why trade in your trusty 2m multi-mode when you can get on 6m for just over £100? Chris Lorek, G4HCL, takes the latest 6m transmitter for a try-out.

instead of working the UK you could be working the USA. Now that 6m is open to all amateurs without many of the restrictions imposed in the early days, several users of the band have been enjoying transatlantic contacts taking place, puzzling the boffins who said 'it couldn't be done.' Even DX signals from countries such as Botswana and Antigua have been present on the band, is your appetite sufficiently whetted yet? Then read on...

If you've £105 to spare you could get the ready-built RN Electronics 2W pep transverter PCB to put into your own case, possibly building and painting the outer to complement your main set. A 25W pep add-on amplifier PCB is available at £47, and fully boxed 2W and 25W units are also available at

'box' placed in line with your main rig which gives you a fixed frequency translation, or more simply a 'shift' between two amateur bands. In this case, you transmit on 144MHz and get 50MHz out, 145MHz in gives 51MHz out and so on, likewise on receive — but of course in reverse!

Linear operation means SSB in gives SSB out and FM in gives FM out, so in effect many of the facilities your main rig such as modes, memories, IF shift and so on are translated onto the other band. The disadvantage of course is that your main rig is tied up driving the transverter so you can only operate one band or the other but not both at the same time. Also because the cleanliness of the receive and transmit signals are limited by the

Offerings

The boxed 25W transverter was supplied for review to allow tests to be made on the complete arrangement, however many of the electrical features are common to both the low power and uncased options. The transverter operates from a nominal 13.8V DC power supply, drawing 4A maximum for the 25W version. The unit is suitable for use with 2m transceivers having between 0.5W and 3W pep RF output, an optional attenuator being available (at £22) for use with 10W 2m transceivers. The manual states that the unit may be modified if required to operate with input powers down to 1mW, real QRP drivers!

The frequency coverage is 50MHz-52MHz, corresponding to an IF of 144MHz-146MHz. A low noise BF981 FET front end gives a claimed noise figure of less than .25dB and a typical conversion gain of +6dB, with a -6dBm input inter-

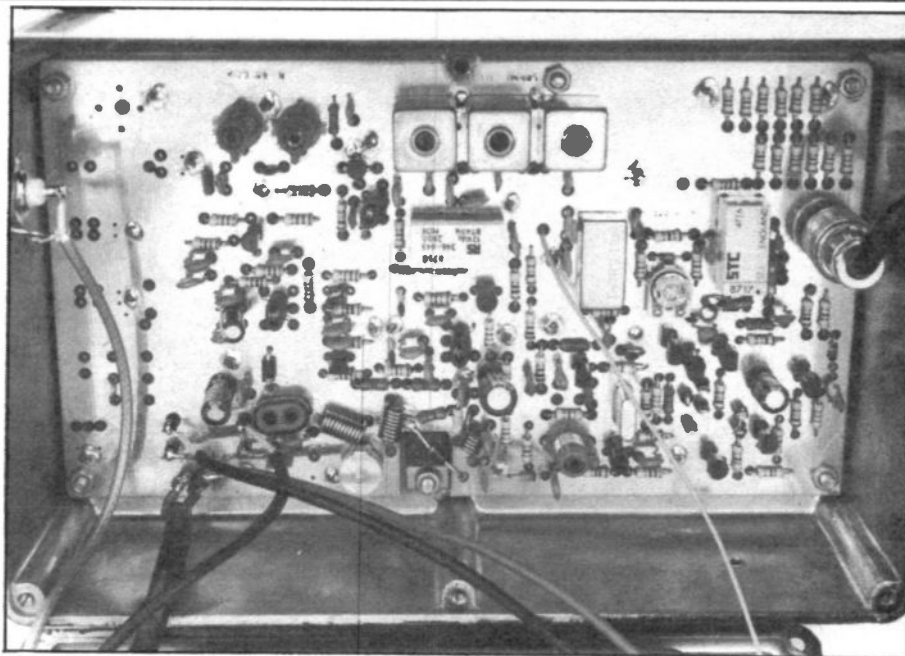
cept point. On transmit, the all-important suppression of the second harmonic, falling in the middle of Broadcast Band II, is claimed as being better than -70dBc , with other surplus outputs being suppressed by at least 60dBc to save you having unwanted QSOs with, say, business radio users at 194MHz . No less than five modes of Tx/Rx switching are allowed for with simple internal link changes, these being carrier (RF) derived with a fixed hang time of approximately 0.5sec , carrier derived with no hang time, DC voltage on coax inner on Tx, DC voltage on coax inner on Rx, and an external contact to OV on transmit. The instruction manual also gives details of component additions required to give a variable hang time, and interfacing details to allow use of the transceivers giving OV on transmit with 12V on receive from their accessory connectors.

The cased unit comes supplied with a 550mm long flying coax lead terminated with a PL259 plug to connect to your 2m transceiver, and a chassis mounted BNC socket for the 6m aerial connection; a 700mm long twin mains lead is provided for the DC supply.

Impressions

The transceiver is presented in a black painted case with a brushed aluminium printed front panel, and a glance at the internal photograph shows that a high standard of PCB construction has been employed. However the thing that I took an instant dislike to was the unfused mains-type power lead used. I have seen mains-type leads used on commercially produced 13.8V linear amplifiers, and I feel that this could lead to confusion regarding operating voltage. For the sake of saving a few pence, I feel this really lets a professional product down.

Having got that off my chest, I'm glad to see that several forms of DC Tx/Rx switching have been provided for. By simple link changes, one can automatically control the transverter using sets such as the Yaesu FT290R Mk1 or the Icom IC202S by using their coax inner switch voltage, with no extra switching leads being required. For users of other sets with suitable accessory sockets, a few minutes with a soldering iron will result in a DC switching lead. 'Hard' DC



Internal view of transverter and PA compartment

switching such as this allows a faster transmit/receiver change-over, as well as being essential if data transmission, SSB or CW is being used.

In Use

Apart from link changes to vary the Tx/Rx switching method, the only setting-up needed involves adjusting the internal drive potentiometer to match the main transceiver drive power. In the absence of a pep reading RF wattmeter, the instructions suggest that the potentiometer be initially set fully anti-clockwise, its most sensitive position, then rotated clockwise until the output power falls by $10\text{-}20\%$ as shown on an external SWR bridge. This will ensure the final PA is operating in its linear portion, and is in fact the method I have previously suggested for setting up a 6m amplifier drive sensitivity level (*HRT Sept 86*).

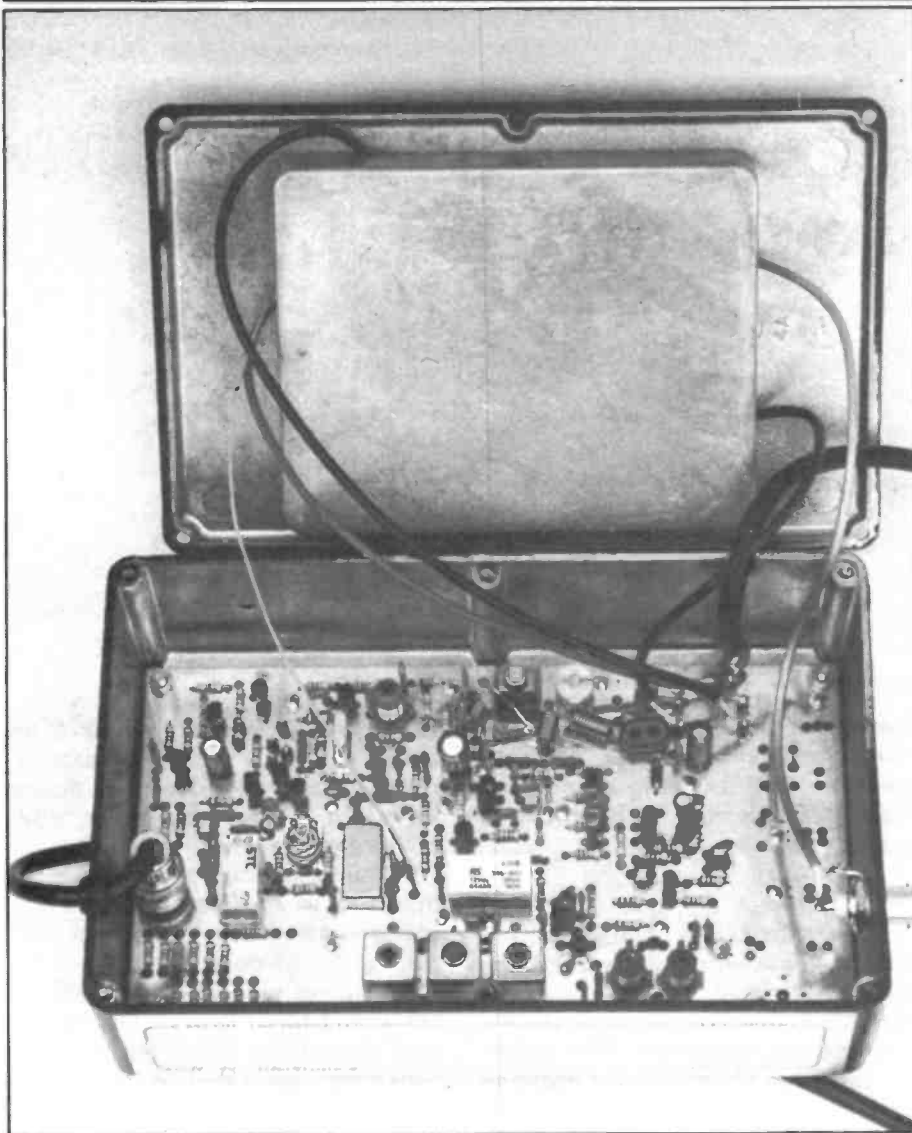
As supplied, the amplifier was set up to give 25W output for just over 2W input, so as my 2m driver output level was accurately set I proceeded to get on the air. To test the transverter, I used my FT107M/FTV107 multimode system using the 2m and 6m outputs, the 2m output being fed to the RN transverter with its output going to the aerial via a two-way coax switch. The other switch port was fed with the main set's 6m output, allowing a fast changeover to take place between transverter and 'direct' 6m

working to allow a comparison to be made. I used a variety of aerials, right down to an indoor wire dipole as might be used by many newcomers to the band.

The first thing I noticed was an increase in receiver noise as the transverter was switched on, connecting an outdoor aerial well in the clear of surrounding electrical QRN increased the noise level again very slightly. An indoor aerial, in the proximity of TV line timebase emanations and the like, increased the noise level rather more, showing the ultimate sensitivity of the system was mainly limited by external noise and not by the transverter noise figure, hence you wouldn't need a masthead preamp unless your feeder was very lossy.

As would be expected, in listening to weak beacons such as GB3NHQ I found no difference in readability between the RN transverter coupled to my 2m rig and the normal 6m input with the coax switch changed over. I did find a slight increase in S-meter reading due to the receive gain of the transverter, and with no signal the meter needle hovered around the S1-2 mark.

On transmit, I quickly grew tired of using the RF switching facility, but more so than other transverters and linear amplifiers as the RN model seemed to need a bit more of a 'kick' of RF before it switched over, causing the odd syllable to be lost at the beginning of overs or after a



Close-up of PA heatsink mounted on top panel

pause in speech. The internal relays however were very quiet in operation, and did not detract from my QSOs, but the serious operator would certainly employ 'hard' switching. I received no reports of

'splattering' or distortion on my speech which is very good, showing the PA to be nicely linear.

One problem sometimes encountered when using a transverter is strong unwanted 2m signals

being received when operating with the transceiver in line, with even the odd QSO resulting! Testing the RN transverter showed that even the local 2m operators in line of sight of my QTH were inaudible with the transverter plugged in, whilst by unplugging the transverter and leaving my 2m coax unterminated I could sometimes hear these 2m signals coming through, showing there was very little leakage indeed in the units circuitry. In all, a very good on-air performance.

Insides

The transverter is constructed in a diecast alloy box chassis, the majority of the circuitry being on a large double-sided PCB with the transmitter power amplifier housed in an RF-screened compartment fitted to the lid, the PA transmitter being bolted to a finned heatsink. On receive a 6m bandpass filter feeds the BF981 dual-gate MOSFET amplifier, its output being taken via a further bandpass filter to an SBL-1 diode ring mixer block. A 94MHz crystal oscillator operating from a zener diode stabilised supply is used to feed the local oscillator port of this mixer block, the resultant output passing via a 3dB attenuator and changeover relay to the 2m transceiver aerial connection.

On transmit, the RF is sensed by a diode detector feeding a transistor switching arrangement, a further circuit performing the coax inner DC switching input sensing, with the outputs driving a pair of changeover relays through a further bipolar transistor switch. The transmit input passes via a relay switched RF power attenuator and onto the 3dB attenuator and ring mixer common to the receive path, a further PIN diode controlled variable attenuator at this point providing a Tx gain control.

This arrangement unfortunately means that if transmit drive were applied to the transverter with no DC supply connected, the mixer could be fed with 1.5W of 2m, which would probably cause its untimely demise. The output of the mixer is passed through the 50MHz bandpass filter (again common to the receive path) while its output passes through a further relay to the transmit linear amplifier stages where the signal is amplified to the final RF power level.



"P.A. cooling here no problem . . ."

Laboratory Tests

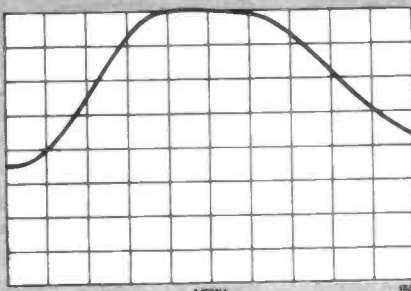
The receive conversion gain was measured at +4dB maximum and testing with a signal generator and spectrum analyser showed the unit had an excellent bandpass response with very little passband ripple, I was very impressed. Attempting to measure the 2m leakage was almost impossible as it was so low, the bandpass filtering in the transverter was certainly doing its job. The 1dB compression point showed the transverter strong-signal handling to be fairly reasonable — the use of a ring mixer mainly limiting this. There are several active FET mixers around with far better performance but these suffer from the expense of having greater circuit complexity.

On transmit, in checking the output spectrum I could only detect the 2nd harmonic above the -90dBc level, the fourth harmonic was just visible above the -92dBc noise level, all other nasties were below this. Closing in on the 2m leakage by narrowing all the test equipment bandwidths down showed this to be suppressed by -98dBc, which is excellent. The PA linearity was very good at 50% output power, and still good at 25W pep-overdriving the input by 3dB gained around 1dB in output power but caused the higher order SSB sidebands to sharply increase in level.

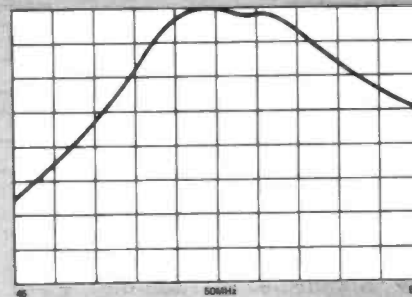
Conclusions

The first thing I must say is that the transverter is not idiot proof, due to the lack of protection such as a DC fuse, the input circuit arrangement, and a lack of Tx ALC and high SWR power reduction, which means that users must be aware of what they are doing. Provided the instructions are followed closely however, a very good performance should result. I was pleased with the simplicity of use, especially the provision for several forms of Tx/Rx switching. The general RF performance was very good and the out-of-band suppression in particular was excellent. For the selling price of the basic PCB, I believe it will fill a well-needed gap in the market, and for those who would like a ready boxed unit the tested 25W version would also represent good value for money.

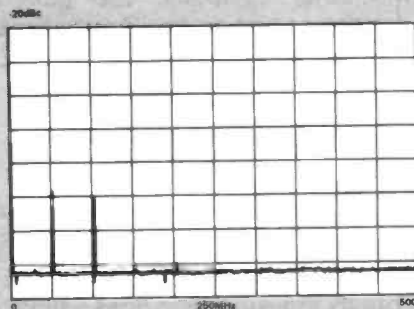
My thanks go to RN Electronics for the loan of the review transverter.



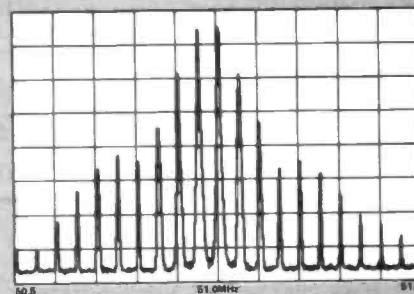
RX Bandpass Response, 140MHz-150MHz



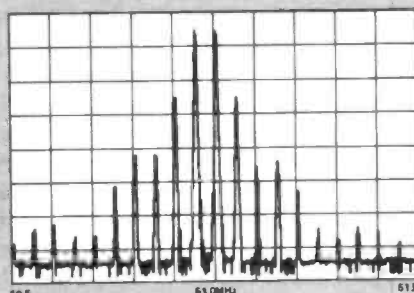
TX Bandpass Response, 45MHz-57MHz, measured out of saturation



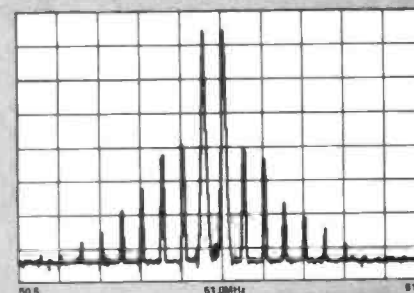
TX Spurious emissions, Note: 51MHz fundamental notched by 78dB, noise level at -92dBc



SSB IMD, 12.5W pep output



SSB IMD, 25W pep output



SSB IMD, 30W pep output

Laboratory Results

Receive path	
RX Gain (Peak)	+4.0dB
Bandpass ripple	Within 1dB
Bandwidth	See plot
1dB Compression point	-16dBm
Calculated noise figure	2.4dB
145MHz Rejection	-94dB
Translation Frequency Accuracy	Within 100Hz
Transmit path	
Maximum carrier output	30.5W (3.45A current drawn at 13.8V)
Gain flatness	See plot
Harmonic Output Levels	2nd -71dBc 3rd <-90dBc 4th -90dBc
All other spurious up to 1.8GHz	<-90dBc
145MHz Leakage	-98dBc
RF Switching Sensitivity	430mW
SSB Linearity	See plots

The 5% Column

The main activity of most YL clubs is the production of a magazine, usually every two or three months. The magazine is regarded as a means of keeping members in touch with each other, so it contains items of personal news as well as details of YL contests and awards, news of other YL clubs and some general

activity for most YL clubs. The American YL Club, YLRL, now organises no less than five different contests – most of them, unfortunately, "YL only," which makes them somewhat unpopular with the rest of the amateur population. As for other contests, the general pattern seems to be "Anyone may

contests, they seem a lot more friendly, informal and relaxed. It seems that YLs take contests with a pinch of salt, and participate in them in order to have fun, not in order to win. Although reports and serial numbers get thrown around just as often, YLs will usually find time for a quick word – and it's amazing how the odd "nice to speak to you again" or "give my regards to..." can make all the difference to the general feel of a contest.

Angelika Voss, G0CCI, takes us on a tour of the latest '5% news,' introduces a few contests with a difference and has a go at YL critics!

entertainment in the form of articles about DXpeditions, rallies and other activities connected with amateur radio. On the whole, the contents of YL magazines tend to be mostly non-technical – there may be the occasional feature about propagation or operating procedures, but constructional articles tend to be rare. It should be stressed, though, that YL magazines are intended as magazines for radio amateurs, not just for women, and that contrary to rumours, their pages are *not* filled with knitting patterns and cake recipes!

Contests

Contests are another important

participate – YLs work anyone, OMs work YLs only." While some clubs – notably the American ones – tend to go for full-blown all-band marathons, the smaller groups – including BYLARA and the Dutch YL Club – have opted for short contests with operation restricted to just one or two bands. The Dutch contest is 2m only (who needs HF in such a tiny country!), while the BYLARA contest, held over two 3-hour periods on a Thursday evening and Saturday morning respectively, has separate VHF and HF sections, with HF operation being limited to small segments of the 80 and 40m bands.

One nice thing about YL contests is that, compared to other

Useful dates

Three contests coming up in the winter months will be the BYLARA Contest on February 25th and 27th, the three-hour German YL Contest on March 14th and, before that, the Midwinter Contest, organised by the Dutch YL Club (DYLC) on behalf of a consortium of four European clubs, with a CW section on Saturday January 9th and a phone section on Sunday January 10th. Unfortunately, the future of the Midwinter Contest is somewhat uncertain at the moment due to internal problems within the DYLC, but I expect that these will have been resolved by the time you read this.

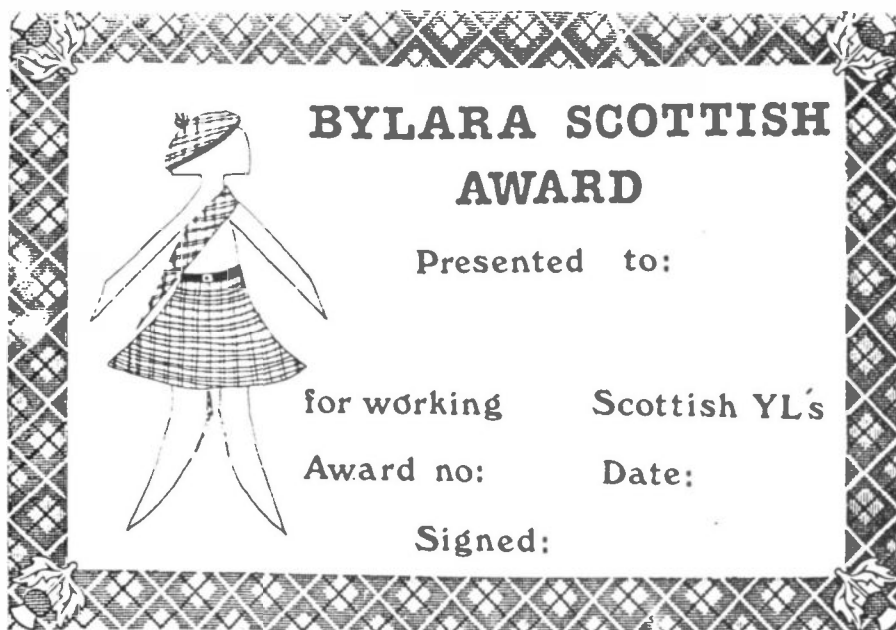
For those wishing to take part in any of these contests – full details are available from me, at the address given below.

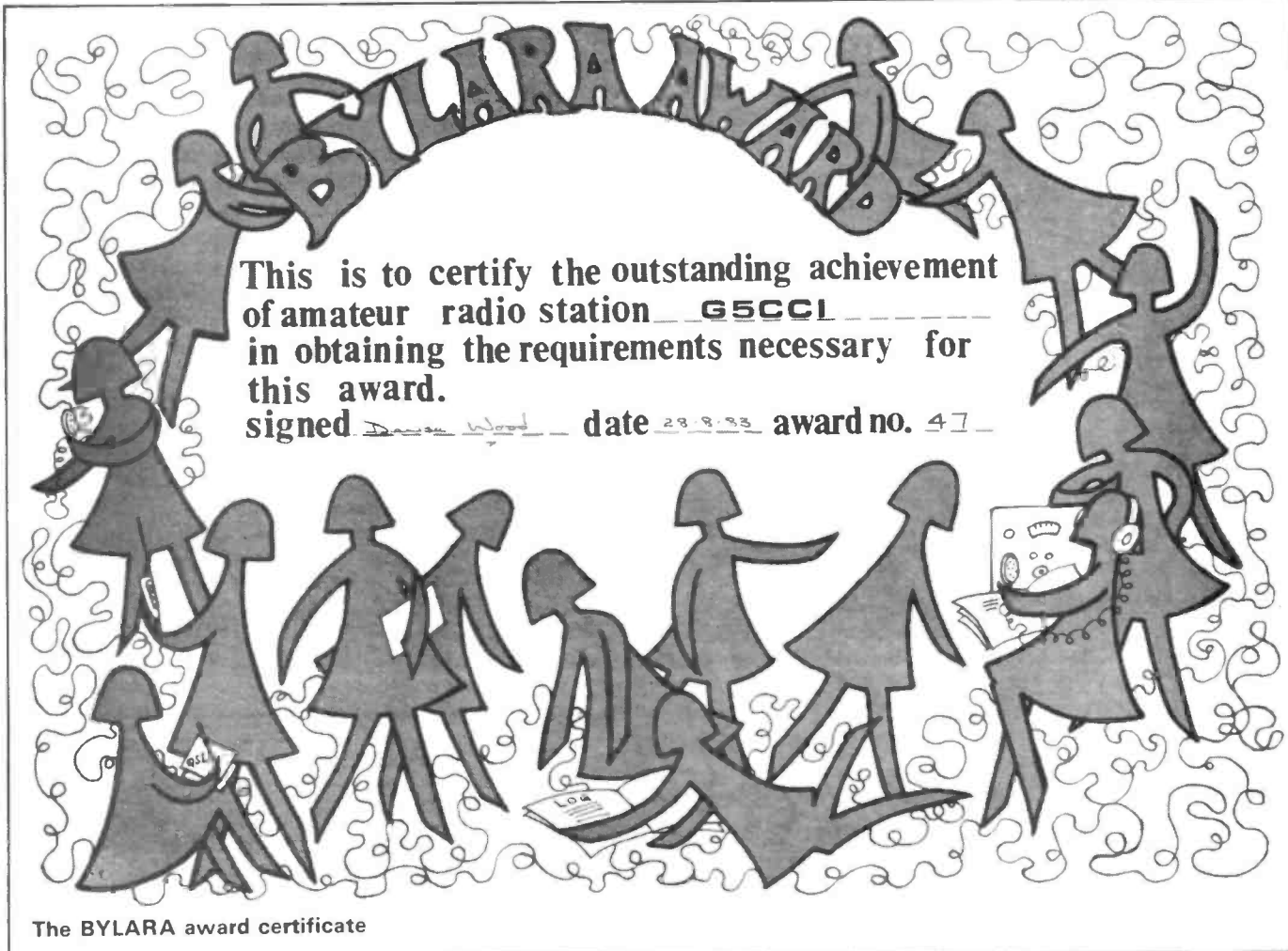
Awards

A number of awards are available for working YL stations – a directory published in 1985 lists no less than thirty-nine, ranging from the prestigious YL DXCC (available on the same conditions as the "ordinary" DXCC award, but for YL contact only), down to local awards requiring QSOs with a specified number of YLs from a particular town or region. Some awards prove more of a challenge than others and one of these is the Grandmother Award which requires contacts with ten grandmothers! With this award there is also a special endorsement for working operators who are *great*-grandmothers.

A YL award for the new year is the "YL Year 1988 Award,"

The Scottish BYLARA award





The BYLARA award certificate

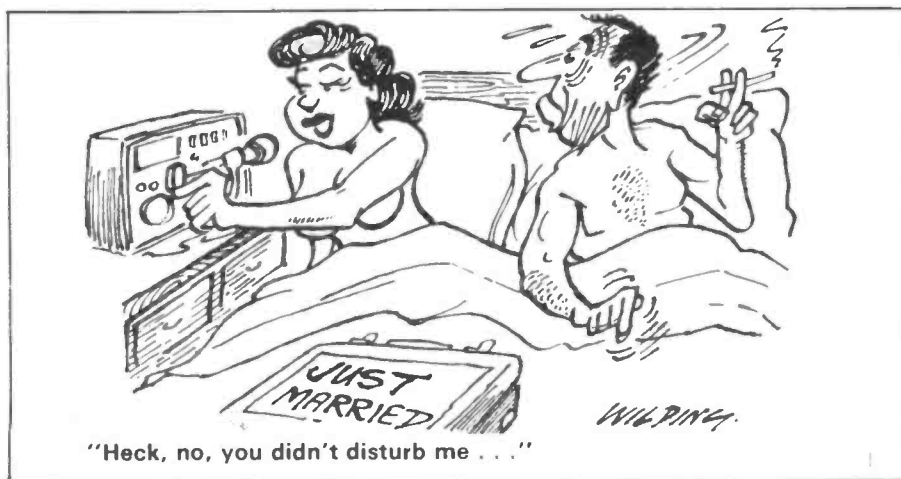
sponsored by the Dutch section of the international award hunters' club, DIG (which apparently stands for the group's German name, Diplom Interessen Gruppe). For this award, applicants must obtain 88 points by either working 8 YLs during each of 11 months, or working 11 YLs during each of 8 months. Special bonus points are gained for working YLs on February 29th, and these may be used to make up for QSOs missed during other months. As you can see many of the awards are aimed at *enjoying* the hobby rather than starting a QRO rat race! BYLARA now sponsors two awards, the original BYLARA award which requires contacts with 15 members (10 for applicants outside Europe), and the newly-launched Scottish YL award for working BYLARA members north of the border.

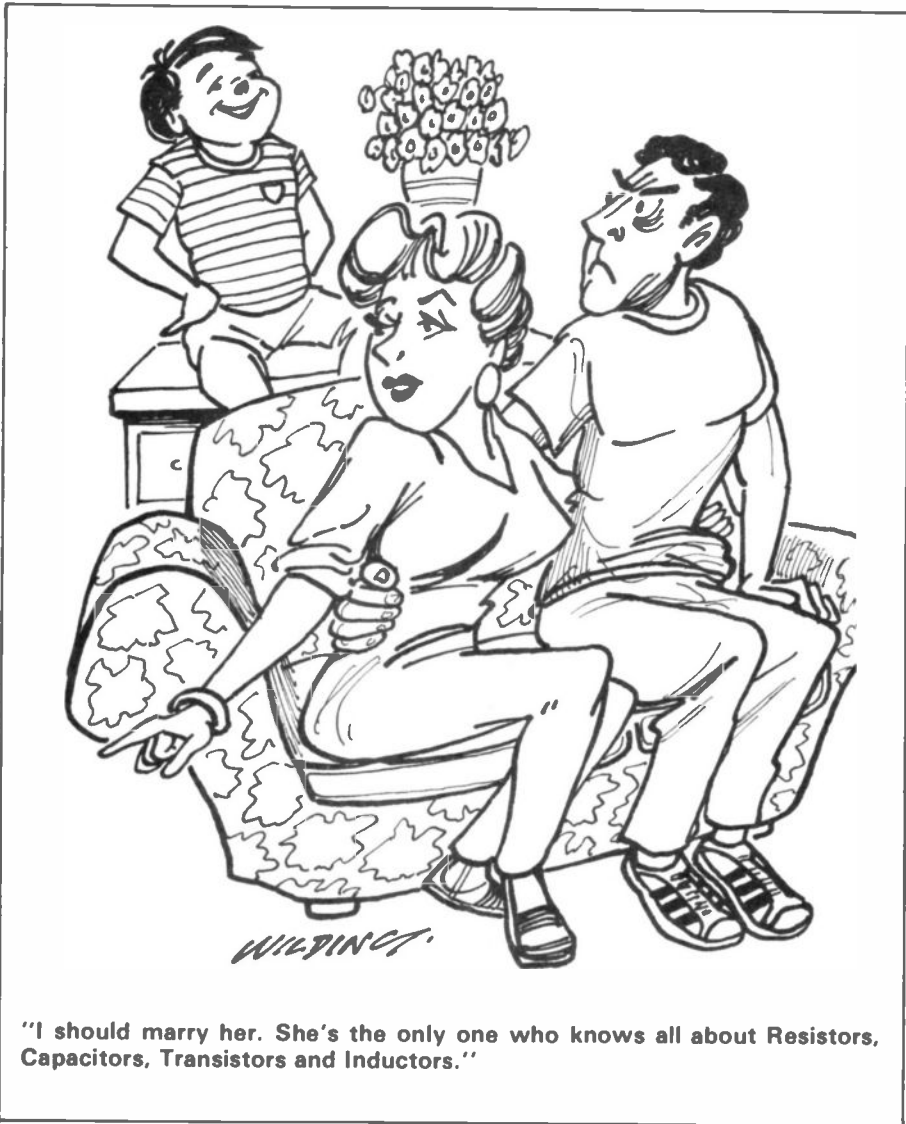
Meetings

In addition to publishing magazines and sponsoring contests and awards, most YL clubs also

arrange members meetings. In some cases, these can be major events - conventions of the American YL Radio League regularly attract in excess of 100 people, and the 30th anniversary party of the Japanese YL club last September was attended by visitors from as far afield as Thailand and the USA. By comparison, BYLARA meetings have been fairly small and informal affairs so far, often taking

the form of impromptu gatherings at rallies rather than organised meetings. Annual General Meetings are normally held at rallies too - although the specific venues have ranged from a proper lecture room at the VHF Convention to a group of chairs round the BYLARA stand, and have included a boiler room at Leeds and a glorified cupboard at Birmingham NEC!





"I should marry her. She's the only one who knows all about Resistors, Capacitors, Transistors and Inductors."

common besides being radio amateurs. There are clubs for those who share a common profession or affiliation to a military organisation, for amateurs who share the same ethnic origin (the Ex-G Radio Club), for those who have other hobbies in common, and even for people who have been licensed longer than others or who hold more than a certain number of awards! No one has ever suggested that there is anything strange about organisations like RAFARS or the Radio Amateurs' Old Timers' Association - so is there really anything wrong with an organisation which brings together radio amateurs who are female?

Closing stages

There is always a good deal of cooperation amongst YL clubs and operators and I would especially like to thank Louisa Sando, W5RZJ of CQ YL for allowing the use of the historical material which appeared in the last '5% Column.' Also here is a reminder of the YL asked times for 80m: Mondays at 1915 local time around 3.688MHz for the BYLARA net and Wednesdays at 2000 local time around 3.65MHz for the European YL net. Both of these nets are open to all and new voices are always welcome.

Divisive BYLARA?

Talking to people at rallies, I sometimes get asked why I chose to become involved with a YL club and a comment frequently heard is something like: "Isn't it all rather sexist?" Some people have gone so far as to say that YL clubs are harmful to the spirit of amateur radio, as they seem to be segregating female amateurs from male ones, thus creating barriers where there shouldn't be any.

To some extent, such criticism may be justified - or it would be, if people decided to join YL organisations instead of becoming members of their national society or local club, which fortunately, is not usually the case. The majority of BYLARA members also belong to the RSGB and many are actively involved in local clubs or other organisations such as RAYNET.

A YL club is simply a group of people who have one more thing in

Same Box - Different Town

Please note that, although the box number for correspondence has not changed, the postal town has. As always comments, queries and contributions are always welcome but please enclose an SAE if you would like a reply. The address is: PO Box 49, Manningtree, Essex. CO11 2SZ.

YL CONTESTS - WINTER 1988				
Date	Title	Time (GMT)	Mode	Bands
9th January	Midwinter Contest	0700-1900	CW	3.5-28MHz
10th January	Midwinter Contest	0700-1900	Phone	3.5-28MHz
25th February	BYLARA Contest	1900-2200	Phone	3.5, 7, 144, 432MHz
27th February	BYLARA Contest	1000-1300	Phone	3.5, 7, 144, 432MHz
14th March	DL YL Contest	1900-2200	Phone	Mostly 3.5 & 144MHz

TRICKS WITH THE 3/10

One of the most versatile VHF valves ever to be invented is the QQV03/10 twin tetrode, variously known as the QQE3/12 in its Dutch derivative, the 6360 and the TT24 (all are identical). All require 12.6 volts heater

But first of all, what of the availability of this particular valve, and isn't it rather passe to dabble in valve circuitry in this day and age of almost universal transistorisation? Answers to both doubts are:

Jack Hum, G5UM, talks about a well-known and versatile VHF valve and its uses — including a rarely seen push-push doubler circuit.

potential — 6.3 volts if you parallel the heater sections, plus an HT power supply unit for delivering 300 volts at around 100mA. Pin connections for the valve are shown in Fig.1.

The 'Three Ten' may be utilised as a power amplifier in a VHF transmitter or as a frequency multiplier in various configurations. It has even been known to operate in audio applications, when it will deliver ten hefty watts to a loudspeaker system.

The QQV03/10 is in plentiful supply if you know where to look. You do not need to purchase your 3/10 new, as prices tend to be a bit on the high side. With the rally season in full swing, search out old radio-telephones going for a song, peep inside them and if you track one down that includes one or more 'Three Tens' snap it up. While you are about it try to obtain at least two samples in accordance with that

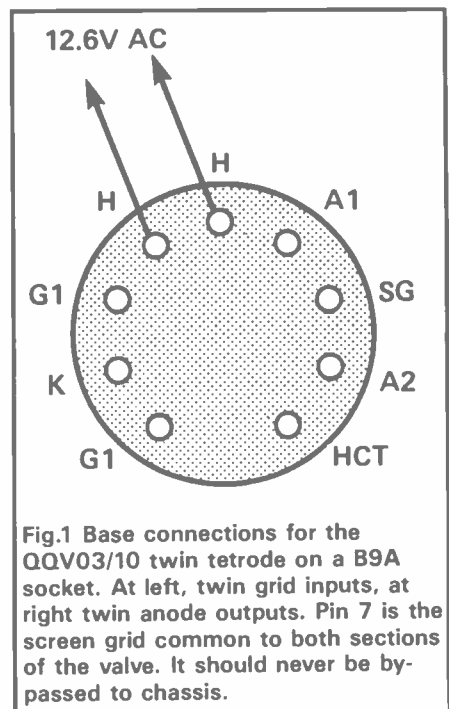


Fig.1 Base connections for the QQV03/10 twin tetrode on a B9A socket. At left, twin grid inputs, at right twin anode outputs. Pin 7 is the screen grid common to both sections of the valve. It should never be bypassed to chassis.

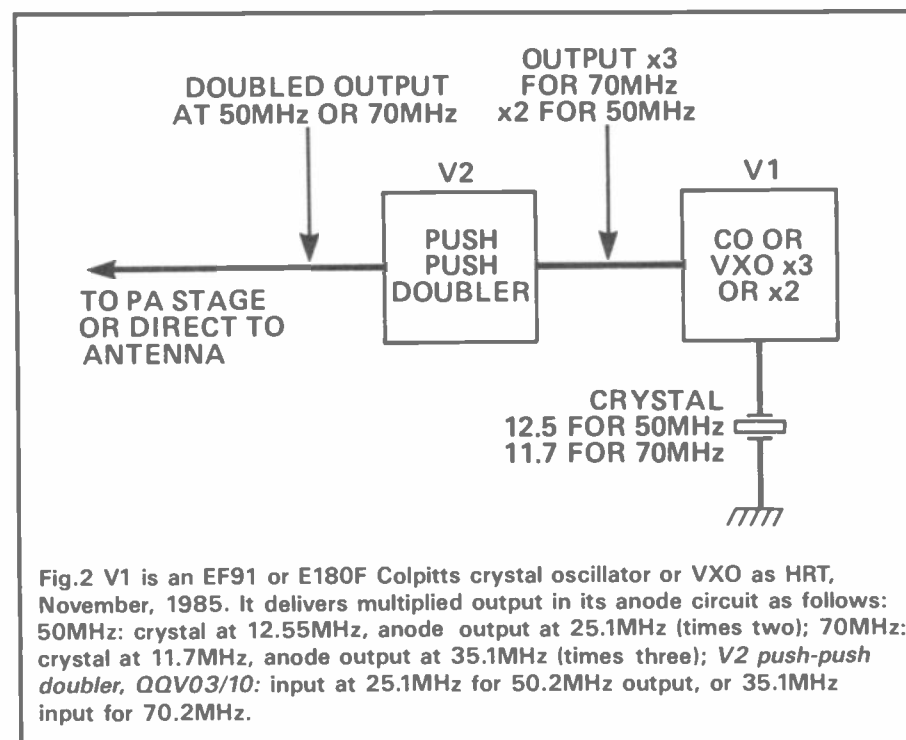


Fig.2 V1 is an EF91 or E180F Colpitts crystal oscillator or VXO as HRT, November, 1985. It delivers multiplied output in its anode circuit as follows: 50MHz: crystal at 12.55MHz, anode output at 25.1MHz (times two); 70MHz: crystal at 11.7MHz, anode output at 35.1MHz (times three); V2 push-push doubler, QQV03/10: input at 25.1MHz for 50.2MHz output, or 35.1MHz input for 70.2MHz.

well known law that if you have two of everything you will never need the spare, but if you don't, you will.

Valve circuitry; it still has much to offer the constructor in spite of the sway of the transistor (perhaps because of it: see next paragraph!). For one thing, there is the little matter of 'visibility': you can readily see what you are doing when you go about wiring up a valve circuit. For another thing, there is the valve's inherent ruggedness: you need to be really hamfisted to ruin it. Unlike the transistor — the fastest fuse known to man — a valve will stand an enormous amount of punishment before it goes blue in the electrodes and finally expires. Then there's the very important factor of:

Docility; valve RF circuits are easier to stabilise than transistor ones. Many an amateur-built transistor PA unit has been consigned to oblivion (or the garbage can) simply

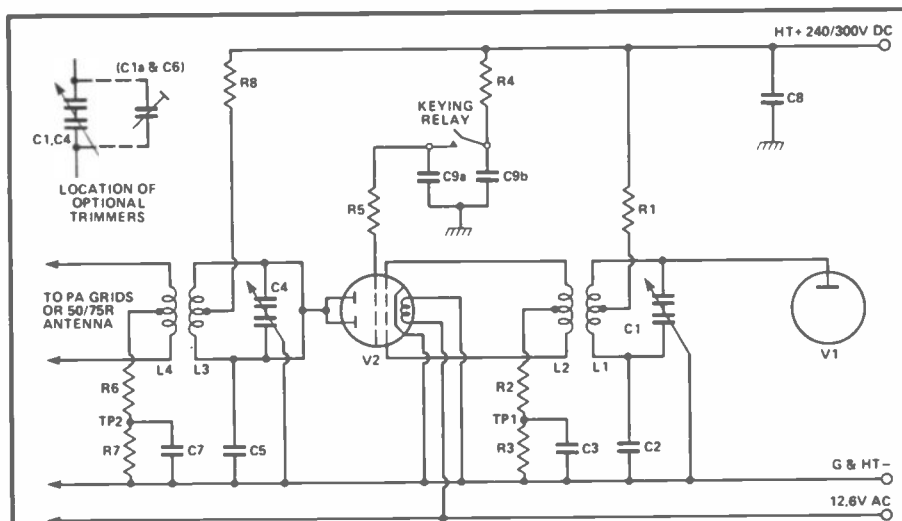


Fig.3 How a QQV03/10 push-push doubler delivers output at either 50MHz or 70MHz. Valve V1 is a conventional Colpitts crystal oscillator or a VXO using a 12.5MHz crystal for 50MHz or an 11.7MHz crystal for 70MHz, anode inductor L1 tuned to second harmonic for 50MHz or third harmonic for 70MHz. Output is symmetrically balanced by C2 to give symmetrical input to the twin grids of the 3/10 via L2. The output of the 3/10 doubler is balanced by C5 to give symmetrical input into a following load, which may be either a PA stage or antenna.

on account of the constructor's inability to tame it and his reluctance to face the design and fabrication of the elaborate tank circuit filtering, essential to render the device sanitary and free from spurious products.

A Good PA

The searcher for Three Tens at rallies will doubtless unearth some of those early hybrid PMR transceivers that utilised solid-state devices in their earlier stages and a 3/10 in the final, designed at a time when transistors capable of providing today's high levels of RF had not been developed. In such equipments the 3/10 found a ready place as a 'natural' PA in spite of the fact that a high voltage generator would be needed to run it.

In amateur applications too, the Three Ten is a natural. For instance, it would substitute admirably for the 3/20A specified in the 'Simple Sender for Six' described in HRT in November 1985, although RF output would be slightly down. In this application the valve will deliver, for only a quarter-of-a-watt of drive, something like 14 watts of RF energy in a 50MHz or 70MHz transmitter design.

Having referred to the 3/20A and the 3/10 in the same paragraph, it is important to emphasise that the former is generally easier to tame than the smaller 3/10 simply because layouts incorporating the 3/20 have grid input circuits and inductors well removed from anode output units, separated by the screening of the chassis on which the 3/20A sits.

This advantage does not occur with the QQV03/10, all of whose pins, inputs and outputs, are close together around its B9A periphery. If grid input inductors can see the anode output inductors, self oscillation will ensue and the constructor may be momentarily puzzled why his new built sender continues to indicate output when the crystal is pulled out of the socket of the crystal oscillator stage!

So a good solid screen across the base of the 3/10 then, high enough to blank off input from output inductors, and well earthed down to chassis.

Given moderate care in the construction of such a PA unit the experimenter should experience no problems from what after all is a

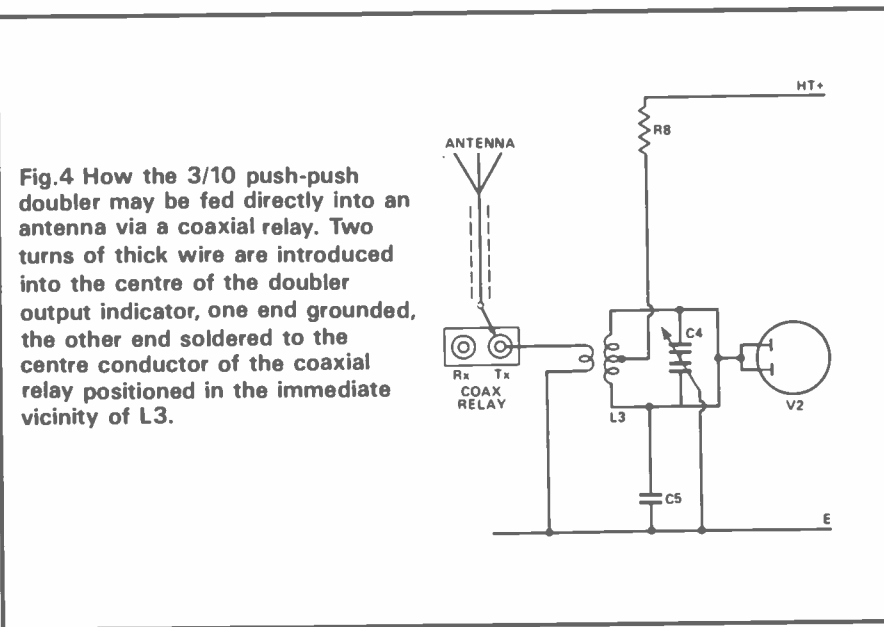


Fig.4 How the 3/10 push-push doubler may be fed directly into an antenna via a coaxial relay. Two turns of thick wire are introduced into the centre of the doubler output inductor, one end grounded, the other end soldered to the centre conductor of the coaxial relay positioned in the immediate vicinity of L3.

ALIGNMENT PROCEDURE

1. Select required harmonic developed in L1 by V1 by adjusting C1 for maximum drive indicated at TP1 (Test Point 1), probably 0.3 to 0.5mA.
2. Adjust C4 to resonance at 50MHz (or 70MHz as required) as indicated by maximum current indicated on a milliammeter connected to TP2 (Test Point 2).
3. Insert iron dust core into L4. If drive indicated as TP2 increases, squeeze turns closer together, because L4 has not been made big enough.
4. Insert brass core into L4. If indicated drive increases this means that the coil is slightly too large: increase spacing between turns until maximum drive at TP2 is achieved.
5. Finally, maximise the coupling of L2 with L1 and L3 with L4 until maximum current is achieved at TP2. This could be 2mA or more.

NOTE: At all times check that the correct harmonic has been selected in L1 and L2, and in L3/L4 by using an absorption "RF sucker".

fairly 'trad' configuration. Now on to something much less 'trad':

Ever Tried 'Push-Push'?

Now to the first bit of unusual circuitry referred to in the introduction. It is a *push-push* doubler, where input is applied in push-pull to the twin grids of the 3/10 but output taken from the strapped anodes. The amount of RF punch to be obtained from this method is considerable, and one is constantly amazed that few amateur transmitter designs have advocated it.

The push-push doubler's efficiency arises from the fact that it receives two 'thumps' of RF into its own two grids and combines these to deliver one massive thump from its paralleled anodes at twice the frequency.

The block diagram in Fig.2 shows how a push-push doubler may be driven by a conventional variable crystal oscillator or by a straight crystal osc. For 6 metre operation the *second* harmonic of a 12.5MHz crystal is extracted from the oscillator anode circuit and applied to the push-pull grid input of the QQV03/10, while for 4 metre operation the *third* harmonic of an 11.7MHz crystal is extracted. The paralleled anodes of the 3/10 then provide output at 50MHz or 70MHz as required. Strapping the anodes of the 3/10 will unbalance the circuit, simply because its twin, normally push-pull configuration is push-pull no longer. To render the push-push output symmetrical the small capacitor C5 in Fig.3 balances everything up again.

The output yielded by the push-push doubler may now be applied to whatever final stage the constructor

COMPONENTS LIST

RESISTORS

R1, R8	220R, 1W
R2	68k, ½W
R3, R7	680R, ½W
R4	220, 2W
R5	68k, 2W
R6	22k, ½W

CAPACITORS

C1, C4	Split-stator min variable. Non-critical value (eg four fixed and five moving vanes)
C1a, C6	8p Phillips concentric trimmer (only used if needed)
C2, C5	5p
C3, C7	1000p feedthrough
C8	1000p, 500V
C9a, C9b	100p, 450V

INDUCTORS

L1, 2	30 turns, centre-tapped, 18swg enamel, close wound on ¼" former
L3, 4	20 turns, centre-tapped, 18swg wound on ¼" former

has in mind, such as a QQV03/20A. *But it need not be applied to a final stage at all:* instead, it can be fed directly to an antenna to give a two-valve sender for either band, representing almost the ultimate in small size using valve circuitry as it could easily be accommodated on a chassis measuring no more than 6" by 2". It will furnish two or three watts of output, which, used with a reasonable beam aerial, will provide UK-wide coverage in the CW mode.

A two-turn indicator introduced into the centre of L3 will take RF power to the aerial, as shown in Fig.4, and the aerial changeover relay derives its 12V DC supply from the 12.6V AC heater rail via a small rectifier. And as for CW, where to key? Why, in the screen lead to the

push-push doubler, via a keying relay, remembering that this lead is 'hot' to HT. To render it 'cold' to RF, suitable small by-pass capacitors are included either side of the keying relay.

Other Applications

Rather more conventionally, the QQV03/10 may be employed as a tripler, as follows:

For the 4 metre band:

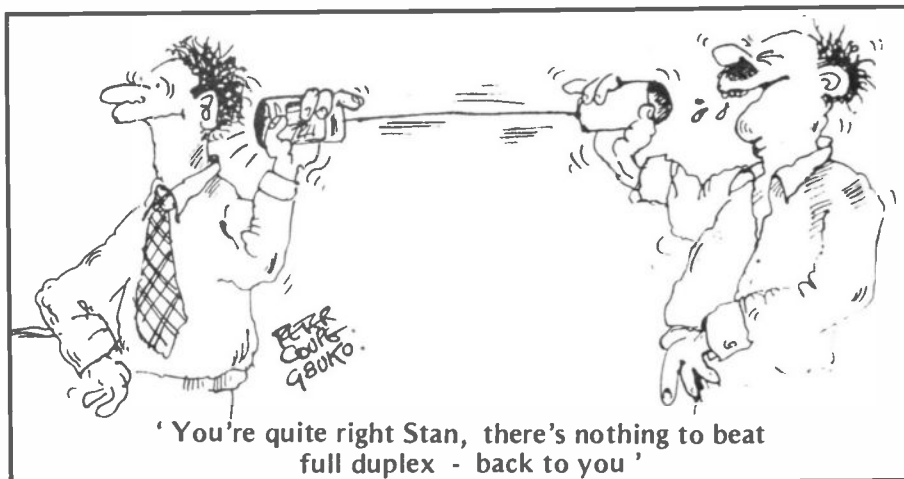
VXO or CO, 11.7MHz crystal input, 23.4MHz anode output. 3/10 tripler, 23.4MHz input, trebled output at 70.2MHz.

For the 6 metre band:

VXO or CO, 8.35MHz crystal input, 23.4MHz anode output. 3/10 tripler, 16.7MHz input, trebled output at 50.1MHz.

This ubiquitous valve will also function as an oscillator — at least, one half of it will. Most constructors would regard this as rather a waste of a good 'bottle' when something much more modest (and less thirsty) such as the EF91 or E180F would do equally as well.

Yet a rather elegant transmitter arrangement for those with 'Three Tens' to spare (admittedly not many persons!) would be to use three of them in a row, the first as a variable frequency crystal oscillator, using one half of it, the second as a push-push doubler or push-pull tripler, and the third as the final power amplifier. Just something to think about!



Free Readers Ads!

FOR SALE

934 NPR with Les Wallen mobile Collinear £300. FRG7 excellent condition £125. Stevie Castleford, 0977 510663.

ROTATOR and Contoller plus alignment bearing all unused. Hirschmann type 250. \$45.00 includes postage. Phone (Antrim) 084 94 63850.

FTV107R Transverter with 2 metre module £150 o.n.o. GMISYWQTHR. Tel: 0475 34357.

REALISTIC Pro-2003 programmable scanner covering 68-87, 88-107, 108-136, 138-174, 410-512MHz with fifty memory channels. Excellent condition £130, or exchange for HW9 or Argonaut 515. Phone GMO CNP on 0383 822206 evenings.

10 WAY Pye charger for pocket phone 70 type nicad's £10 add p+p if not collect. 3 nicads for above HH 1 at £5, 2 at £8, 3 at £10 p+p paid. Antennae for 440/470MHz one for PF70 handheld one for PF70 body mount. Write: Robert 2, Box 3, Tranent, EH33 2JZ. These items are remains after my house break-in!

REALISTIC Pro32 200 channel programmable scanning handheld receiver VHF/UHF as new boxed £190. Ring Allan 0228 41166.

DUAL Band Base/Mobile 2m/70cm Multimode comprising FDK Multi 750E, FDK Expander 430 and matching FDK mains power supply, 1W/10W, Scanning, Duplex etc., etc. Boxed and in new condition, used for two weeks only. Genuine reason for sale, £350 or might exchange, HF gear? John 08482-314.

HF Station FT 77 Fule Models 80 MTTU 10MT F.M. Nobbun C.W. £395. Ten Tec H.F. ATU £55. Jay Beam TBI Bander £40, all for £460 or split. Phone David Gicur 0282 37768, buyer collects or swap for Gen. Coverage radio.

EDDYSTONE EC10 for sale £10, working. Buyer collects, 10 Ravenglass Avenue, Maghull L31 6BZ.

REALISTIC Pro 2008 VHF/UHF Scanner Receiver. 240V, 12Vdc, excellent condition, instructions, £100. 0384 72968 (West Mids).

HANDHELDS 2 metres Yaesu FT207NC1A charger, Yaesu FT208, NC8 charger, Yaesu FT202, 6 channel, Belcom LS20XE charger, Icom IC2E extras, Communications Receiver Eddystone 640 1.5 to 31MHz TCS 12 Tx/Rx Station, Receiver R209 (Army) G40FO. Tel: 01-949 2317.

FOR SALE FT290 Mk1 in mint condition c/w case 2.2Ah nicads strap and mobile mount. Boxed very little used, never mobile, £250 o.v.n.o. G6TFC QTHR. Telephone 0204 - 651183 after

5pm during week.

SMALL Printer will work with BBC, Dragon uses plain till roll paper 24 characters wide £15 plus p+p. Tel: 0582 581229.

KW204 Transmitter pristine order almost like new. Manuals carriage insurance paid UK £230 o.n.o. Wide 2.5mm spaced capacitors 300pF £12.50 each. Wanted H.F. Linear, KW107, KW228. Z. Match, Tuners. Tel: 0229 89635, Cumbria anytime. MORSE Tutor first time pass Drae £30, plus postage. Computer terminal VDU plus keyboard ICL 7500 Series, Marconi CR100 both as seen £25 each, buyers collect. Peter 0243 573462 evenings, wanted FT707, FT757 or TS430S for mobile no rubbish please.

BELOM LS102 Frequency Readout AM/FM USB LSB 26-28MHz - mint condition and original boxing - only second owner from new - asking price of £160. Phone Tony 0978 75435 or write T. Corbett, Sunnyside, New Road, Coedpoeth, Wrexham, Clwyd, N. Wales.

30FT 3x10ft. Tower £75, Capco 3000 ATU £175, 4.1 Balun £10. All o.n.o. R. A. Rowlett, 16 Welbourne Gardens, Bedford MK42 0NQ. Tel: Bedford 44506 evenings and weekends.

KW Ten-Tec 580 Delta HF transceiver with matching 12 volt 25 amp P.S.U. £495 DX302 Gen. Coverage Receiver v.g.c. £125, Welz SP200 £75, VR3 Tri-Band Vertical £35, MML144/25 £40, ATU 10 to 80M £75, AR40 Rotator £50. Tel: 01-804 2400, ext. 341 days, ask for Gary or (0438) 721995 after 6pm.

ACORN Electron, Disc Drive, Printer, Joysticks, Tw30 Tape Recorders plus one interface T2P3 Disc ROM with Disc Database Discs and Tapes Manuals and Leads, boxed, good condition £280 o.n.o. Phone Nick 0543 360372 evenings.

FOR SALE Yaesu FT7, 10W mobile, very good condition, manual, mic, 28-29MHz Xtals £240 o.n.o. Trio 35MHz Dual-beam Scope, X1/X10 Probes, manual £300 o.n.o. Codar T28 Rx 160/80m £40.00. Ring Glenn 0884 41208, after 6pm please.

PANASONIC DR31 32-band receiver LW, MW, FM and double superhet SW to 30 MHz, LED digital frequency readout, mains or 12v battery, S-meter, PLL synth., wide/narrow bandwidth selector, £125 o.n.o. 01-959 7715.

SALE Yaesu 8800 receiver £300, SPC 300 ATU £90, FRT7700, ATU £20, 12v PSU, £10 VHF Omni match £10, SP102 Speaker £60, Telereader 670E £100, buyer inspects and collects. Roger Bradford 670329.

YAESU FR-50B Ham Band Receiver Handbook Ext. Speaker, h/phones v.g.c. £65 o.n.o. Tel: Norwich 44990.

LOWE SRX30 Receiver with ATU, headphones 0.5 to 30MHz AM, CW, SSB £120. H. Plaice, 24 Mill Gardens, Blackpill, Swansea SA3 5AX. Phone Swansea (0792) 403362.

BRAND New Kenwood TH205E full 12 months agents guarantee £160.00 Datong Morse Tutor D70, £40.00, Trio TR2200G, good Nicads and case, Xtalled S19, S20 £55.00 all plus postage. Large quantity LM346N offers, large quantity 20mm x 5A, 3.15A fuses offers. Rotherham 554665.

ICOM IC-R7000 Receiver (25-2000MHz), £699. Brother BP-30 colour graphic writer, £95 o.n.o. Brother EP-43 personal Dot-Matrix (24 x 18) Thermal printer, £85 o.n.o. All items are boxed in mint condition with their manual. Tel: Nick (07356) 4111 extension 6176. 08:00-16:15 hours, weekdays.

COLLECTORS item. Philips Communication Receiver, ext German Airforce World War Two, Turret Tuner, 12 Valves many original with Luftwaffe Symbol. Shortwave only, Five Bands (Three - Twenty metres) 240v PSU working needs tuning unique £250. Phone John 0252 510063 evenings.

FOR SALE Grundig Satellite 1400 professional global receiver, 6 short wave bands, BFO digital readout, mint condition, boxed ideal receiver for new shortwave listener, £100 o.n.o. Ring Terry 0924 828955 evenings.

934MHz Uniace 400 mint condition. Still boxed plus 10 element beam £195. Tel: 0752 345784.

ICOM IC730 HF Rig 100W £400 plus Muter TVVF 144a 2m Transverter 28MHz IF superb £165, also 4CX250B 70cm H/brew Linear PSU £150 19 Ele, 70cm Tonna Yagi unused £15 P+P extra will split the lot £585. Conrad G6ZTU 0226 91196.

FOR SALE Philips D2935 World Receiver 7M LW MNAM SSB Keyboard or Manual Tuning £100 or exchange for 9 Pine Set Mems, Yaesu 770 on Crusader X. B. Collins, 5 Railway View, Macfin, Ballymoney, Co. Antrim, N.I. BT53 66ZU.

FRG7 General Coverage Rx good condition incl. manufacturer, instructions. Digital Frequency, Readout Mod. fitted, £125. Phone 0225 65131 evenings.

COLLECTORS: ZC1 Mk2 Transceiver, believe New Zealand version of Army 22 Set. Quite good condition and appearance. Phone 08677-2300.

PANASONIC RF3100 receiver covering 150KHz - 30MHz, full Digital readout, includes USB/LSB Narrow and wide AM, plus FM 88-108MHz, 240V AC or International Batteries, bargain £125, call Jeff 01-907 0140.

SELL: Tubes from German Wehrmacht (WWII), never used,

originally boxed. Phone: Belgium 03-480 4151.

TRANSVERTER Microwave Modules 432/144RS complete with MMR 7/3 Attenuator for 3W in IE, FT29)OR 10W output just returned from microwave modules for complete overhaul £100. J. Beam 38 EII/70cm aerial complete with fixing bracket & UR67 cable £20. Tel: Littlewick Green 2453. QTHR, G8 KOM. D. J. Hanson, 42 Choseley Road, Knowl Hill, Reading, Berkshire RG10 9YT.

SHACK Clearance various pieces of valve equipment including Avo Valve characteristic meter, variable power supplies 500V and 1000V/10A, Signal Generators, Solartron L/C meter all very cheap plus lots of bits free. Phone Paul 01-733 0665.

BEARCAT DX1000 Direct Access Digital Communication Rx 10KHz-30MHz AM/LSB/USB/CW and FM 24 hour/2 time zone Quartz Clock 10 channel memory see March '87 Ham Radio Today for review £260 o.n.o. Tel: Colin Melton, Mowbray 0664 64287.

PYE Pocketfone PF2 UHF 70cms, Xtald, RB4, RB14, RB15, plus spare SU8 xtals, SPKR/Mic, base charger with two sets of Nicads, 12V D.C. Power Lead, Base/Mobile aerial patch lead, box of spare 5p mic. Parts & Plugs, £55 o.n.o. Tamworth (0827) 58003.

SANYO SL-C7UB Betamax V.C.R. with I.R. remote control, needs new heads hence £50 or exchange. W.H.Y? R209 MkII ex-Army Rx, 1-20MHz 12 volts £35. 4164 Rams £1 each. Dymar Lynx A.M., H.B. 10 channel 15 watts £30. Star M5 UHF Unmodified £35. Watford 0923 224752.

TRIO 9130, 25W Multimode in good condition and complete with original packing £375. Phone 0905 620041 anytime.

FOR SALE Steeplestone radio MBR7 MW, LW, FM, MB, Air, Two, Shortwave bands ideal for beginner cost £60.00, except £25.00 still eight months guarantee, thank you. T. Goodhall, 9 Greggshall Crescent, Lincoln, Lincs. LN6 8AQ. Tel: Lincoln 41223.

FOR SALE Avanti Moonraker, 4 Element beam, dual polarity, good condition. Offers or W.H.Y. Old but working single beam oscilloscope model 1045K £25.00 o.n.o. Write R. Bradford, 6 Eastcliffe Square, Caythorpe, Grantham, Lincs. Tel: 0400 72159 9am to 4pm ask for Rob.

FDK725X Two metre FM rig 30W, Heatherlite Mobile Safety Mike to suit same, 5/8 Whips and gutter mount, ideal mobile set-up scans from Mike, dual VFO, easy to operate when mobile and built like a brick out-house! £155, 01-247 6097 daytime thanks.

YAESU FT707 HF Transceiver, FM Board fitted, excellent mobile rig for only £395. Contact Don on 0305 779028.

HOWES CTU-25 ATU, maximum 25W 1.8-30MHz aluminium case, £12.00. Oldham Carefree, maintenance free rechargeable lead acid 12V, 6A battery, £11.00. R.S. Constant-Voltage acid battery charger, £31.00. All as new, o.n.o. prefer buyer collects or postage extra. 021-777 6086.

TRIO TS430S £700, AT230 ATU £170, YK88CN, YK88SN filters £30, 430FM unit £30, LF30A filter £25, Diawa Keyer with key £52, FT708 £175, 70cm Colinear £30, FT727 £399, TR2500 £160 all complete as new and boxed. Tel: Bob G4RWH 021 747 8784 anytime.

FT77 c/w MMB11 mobile mount, Datong processor, desk microphone and FP700 PSU £575. MMT 144/28 TUTOR £70. G-Whip Flexi-Ten Mobile Whip with all Coils £30. Kenpro KR400RC Rotator £90. TET HB23m 2 Ele Triband beam £90. Phil GW4REX, QTHR 0222 625702.

KF430 70cm Transceiver 12 channel 11 fitted, 10 watts £90. **SAIT VHF, FM Marine Transceivers** 156-162 MHz, front missing one working £100, unmodified £75. **CTVR 46MHz** 40 channel FM transceiver modifiable 50 MHz £75. Wanted **TMS1000 CPU** for Azden **PCS2800**, and any mods. Watford 0923 224752.

FOR SALE Sinclair 2X Spectrum + Computer with datacorder also Technical software CW RTTY tape Jet Electronics and Sarab Systems Nite-2 Filters all boxed nearly new £200 the lot. Phone 0282 815224.

3 ELEMONT Tri-Bander Jaybeam, Hygain 18VT Vertical 5 Bands, Frequency Counter HF + VHF with probes - LAR, ATU, new Kenwood 2 metre handheld TH2156. Yaesu FT902 as new, Scarisbrick 880 345.

MUTEK TVHF230C HF TVTR plus Howes ATU £280 o.n.o. Welz SP220 PWR meter £50. Datong Speech Processor for FT290R £50. All boxed and v.g.c. G14TAJ QTHR 09603 23339 evenings.

ICOM IC735 mint condition, only used for TVTR £780. Mutek TWF 144A 2M TVTR 28MHz I.F. £180. Drae 24A P.S.U. £80. Dressler D200C 150W 2M SSB/CW Amp Int. P.S.U. £150. G1JOU QTHR. Tel: Dartford (0322) 75275.

SAIT VHF Marine FM Transceiver 156-162MHz. 25 watts O/P, Semi Duplex, Front and Control Logic Missing, Hence £75. Same but full Duplex £100. **KF430 UHF FM Transceiver** 12 channel, 10 watts O/P £90. Hy-Gain 5 8795, 26-28MHz, Converts 10 £150, Watford 224752.

YAESU FT757GX + FP757HD + Hand mic all in new condition, still has 7 months guarantee, only used as a receiver never been used as a transmitter, must be seen cost £1295.00, quick sale £850. No offers. Phone Terry

232-2331 night, 247-435 64208 days.

YAESU FRG9600 Scanner 60-905MHz as new with original box, with PA4C A.C. Adaptor £375 o.n.o. Ilfracombe 63455.

KW600 Linear Amplifier new condition, with leads, manual brand new spare 572B P.A. valve £240.00. Buyer inspects and collects. Bencher Keyer Paddles as new £50.00, carriage paid. **G3HID**. Tel: 0278 - 782511, Somerset QTHR.

KENWOOD TS120S used mobile, in good working order £250. R1000 general coverage Rx £200, excellent condition, **G4GIR QTHR**. Tel: 0525 403431 Extension 3226 0800 to 1600 GMT Ask for Mr I.C. Frith.

SUPERSTAR 2000 C.B. Radio 200 channels 25-965 to 28,000 built in five Digit frequency counter, perfect working order, excellent condition, one owner from new, with box standard mike and mounting bracket, suitable 10 metre conversion etc. £150.00. Phone Selby 618586.

FOR SALE Tristar 777, SSB, CW, AM, FM ideal ten conversion 4 element beam Avanti PDLLI (offers) wanted FC707 FC700 or other ATU W.H.Y. must be in good nick. Ask for Cliff on Aylesbury 658115.

WANTED Hallicrafters 5/10 Receiver must be in good working order have FR8800 one year old perfect what offers? R. Hastie, 41 Elm Grove, Drive, Dawlish, Devon EX7 0EY. Phone Dawlish 862918.

YAESU FT102 FM/AM, SSB Filter, new Gen. Elec. valves, YM35 Mic, with FV102 external digital memory VF), full technical manuals, v.g.c. £650 o.n.o. **G4UVQ QTHR** 0462 674437.

PF5 Pye Handheld complete with Whip, two rechargeable Ni-Cad packs and charging unit in v.g.c. condition. Send postal order for immediate despatch for £48.00 to: Moshin Dharas, 225 Redmile Walk, Welland Estate, Peterborough PE1 4UR.

ICOM IC210 2m 1-10 watt FM base station and base ½ over ½ Collinear £175. Icom ICB1050 10m FM with Xtal filter £30 or exchange for HF multimode multiband radio, Stalker 9 AM FM SSB 10M excellent sideband audio £70 Aswell Ginzs Telford 607542 after 6 p.m.

FRG7 mint condition £140. Tel: 0202 604806.

FT208 2 metre, handheld, speaker nick, soft case, hard case, spare nicad pack, headset, £185. **G6DHY Calne** (0249) 812329 evenings.

HAM Major converted to 28.05MHz to 29.74MHz in five bands, AM, FM, USB, LSB, Modification also includes Tx and Rx fine tuning. No external mods used. inc. P&P, mike and box £110. Contact G4XIV not QTHR. Tel: 0904 792208 after 8pm.

FOR SALE Yaesu FT726R fitted with 6M 2M 70cm and Satellite modules, complete with nic, manual and box £750 or exchange for FT221R plus Mutek front end and cash adjustment. Ring 0453 811454 after 6pm. **M-M432/144 Transverter** (re-

cent works overhaul), 3 watt attenuator, Jaybeam MBM 48/70 aerial £90 consider Meon 50/144 in PX. **G8GZC QTHR** 04606 4376.

FOR SALE, Valves, 500 boxed unused, half any advertised price, 6V Octals, 12V Octals, UX based types, also, 35V, 50V, 25V Rectifier types and output valves. SAE for lists. Wanted fair priced. Swan Transceiver, valved or S. State. Mr. A.E. Jeffrey, 42 Dennis Road, Padstow, Cornwall PL28 8DF.

FT101E FC301 absolutely mint used literally once. Phone 0406 370575 £350 and £150 respectively.

FT227R excellent FM mobile £120. Bargain for SWL BC348 wartime H.F. receiver. Just sling a wire out the window and hear Hams all over the world. £40. Parmeko 50 watt valve amplifier £15. Electric sewing machine £25. Derek 01-657 0716, evenings.

ZENITH Super Deluxe Trans-Oceanic portable, model L600 chassis 6L70 complete with operating guide, circuit diagram, full working order, superb specimen, collectors item? Offers Invited. Telephone 0483 576542.

YAESU FRG9600 very good condition, complete with power supply unit and discone Antenna £275. The Lot. Buyer Collects. Tel: (0202) 576485.

FOR SALE Trio R-2000 with Converter boxed etc. £350 o.v.n.o. (0642) 700117 evenings weekends.

FOR SALE ten large inductor coils in original case. From 0.2ph. to 5mH offers S.E.A. for full details. P. Hardy, 16 Margaret Street, Beaumaris, Gwynedd, N. Wales.

ICS/AEA CPI Computer Catch RTTY/CW terminal unit, plus G3WHO driver ROM for BBC £130. Jaybeam 015/1296 23cms Yagi (new) £30. Wanted Kenwood/Trio TL922 H.F. Linear in good condition. Phone Paul G4XHF (0293) 515201.

FOR SALE FC 700 Yaesu A.T.U. £85 o.n.o. **GW30SV**. Tel: 09913 233.

YAESU FRA7700 Active Antenna £30 **FRT7700 A.T.U.** £30 Lymington (0590) 682633.

FOR SALE FT290R Nicads charger ¼ Y Whip Spare mic, Alinco Linea Amplifier £290 o.n.o. Peter G3JX 0908 642398.

TRANSVERTER: Microwave Modules 144/28R, Pristine condition, boxed with manual, £175, ½ Wave 2M Vertical Mag Mount, £8. Ham Master 4200 base Mic £10. Exchange possible. W.H.Y.? Phone: 0491 (South Oxon) 36720 evenings and weekends.

SONY ICF 2001, boxed with manual, mains with Sony PSU 150KHz to 30M AM+FM SSB direct entry. Memories etc. £100 o.n.o. Super Star 2000 mint, will convert to 10 metres £110 o.n.o. Telephone 228 4835.

C5800 Standard 144MHz Multimode Mobile Transceiver 25 watt output USB/LSB FM, CW, fully operational good condition

complete boxed with service manual leads up/down microphone etc. List price £500+ Bargain £300. No offers for less QRK accepted. Telephone Woking (04862) 23506 Now!

FOR SALE Icom R71E H.F. general coverage receiver in new condition, £275 only, selling due to illness. Mr. Turner, 35 Melborn Drive, Darwen, Lancs.

MICROWAVE Modules Transceiver 144/28R 25 watts as new £200, 432/144 10 watts ditto £95 very little used. **G4DDO** (Vince) Phone 0778 422795.

934M/H Two Commtel Transceivers. Crest Pre-amp, SWR meter, Nevada Colinear antenna, 21 element Yagi antenna, transceivers £230.00 each o.n.o. pre-amp £50.00. Antennas both £60.00 o.n.o. Telephone G2BJT 061-427-2332.

AMT-2 Software by I.C.S. for Commodore 64 including cartridge, interface lead, overlays and instruction book, probably the best software package for RTTY Amtor CW and ASCII £25 or exchange. What have you? Telephone Rotherham (0709) 554665.

FRG7700HF Receiver, 150KHz-30MHz, all-mode, integral clock-timer, numerous other features, **FRT7700 Tuner**, both excellent condition and boxed, bargain at £225. **SX200 Scanner** (VHF/UHF) 26-88 108-180, 380-514 MHz AM/FM, 16 memories, Band/memory scanning, immaculate condition, £180. Tel: Nottingham (0602) 606429.

HAVE 2 Realistic Multimode Rigs including LSB/USB 120 channel, also 2 H/Held 40 Ch. +4 Ch. all suitable conversion 10MT sell all or swap 934MHz base station. Also Chinnon Super 8 Sound Cine Camera fade in/out, time lapse mint + case any offers or W.H.Y.? 0734 793073 anytime.

YAESU FT757GX with Mod. Mobile Bracket, base, mobile microphones £600.00. **Low SRX30** general coverage receiver 500KC-30MHz very good condition £80.00. **AVO** eight £40. **Dick G0BPS** 0303 76171 after 3pm.

FOR SALE FDK700E Mobile two meter no Mobile Mount also Wetherlite Micro Phone £150. Telephone Portadown (0762) 337900 after 6pm.

AMSTRAD CPC Rom Board includes Protexxt Prospell Utopia Odd Job £50 or will split also 2K buffer for Epson Mx Rx Fx Series Printers fit inside Printer £20. Phone Anthony EI6DT (Dublin) 0001 947552.

300W - Plus H.F. Linear wanted. Anything considered, Homebrew OK. All offers replied and acknowledged. Tel: G0HFF 0209 7414342 QTHR.

FRG7700 Gen/Cov Rx, Memory, FRA7700 active Antenna, Phones, Instruction Manual, Maintenance Service Manual. £240. Phone Burgess Hill 42122.

TS4305 FM Board AM Filter, Amtor Mod. £650 Yaesu FTV107R Transverter with 2 metre unit. Wired to suit 430 £150 Both perfect G01MK 029922-279 Clows Top. Wanted QRP Tx/Rx and 2 metre FM set. **FOR SALE** AR2002, 25-530 800-1300 £380. Northwich 44670.

FOR SALE Super Star 2000 converted 10 metres 28-30 SSB-CW £135. Northwich 44670.

WANTED FT101ZD FT902DM must be in good condition. No mods. Northwich 44670.

TRIO TS 520 HF SSB Trangeer 80m-10m service manual v.g.c. £350 o.n.o. G4KFJ QTHR. Tel: 061 344 5484.

PANASONIC DR29 portable receiver. FM, LW, MW and 3 SW bands 3.2MHz to 30MHz continuous. BFO tuning meter and RF gain. Digital readout. £45. 0372-63311 weekends.

FT290R c/w Nicads charger MBM Mutek Mod. Case Manual £265. Maldon, Essex 783203.

YAESU FT-209 with case FNB-3 FBA-5 v.g.c. boxed £150. G8BHD QTHR. Tel: 0322 68091.

TRIO 9130 in good condition, complete with accessories and original box £335. SSB 24cms local oscillator mixer 500MW out for Oscar Sats. (Needs separate P.A.) £135. Jaybeam 015/23 23cms Yagi (New) £30. Phone Paul G4XHF (0293) 515201.

FRG7 mint no mods, £140. Tel: 0202 604806.

FOR SALE Rolland SH101 keyboard, hardly used cost £200. Want £150.00 o.n.o. Tel: 0443 205317 after 6.00 p.m.

ICOM HF IC701 Tx/Rx 10-160 metres, 100 watts, IC701 PSU speaker, IC SM2 Desk mic. £600. John Scott, 11 Edenbridge Road, Newton Heath, Manchester M10 6UP.

COLLECTORS' ITEM? Eddystone Communications Receiver Type 640. Works well. Sensible offers only to Geoff Collins, 2 St. Mary's Villas, Battle, East Sussex, TN33 0BY. Phone 04246 2228, buyer collects.

TRIO R2000 Receiver, mint, list £695, asking £425. Phone John Nottingham 0602 227083 manual and circuit diag. inc. J. S. Smith, 41 Crofton Road, Attenborough, Nottingham NG9 5HW.

RANGER AR-3500 Mobile 10 metre Multimode 28-30mc/s Digital readout AM, FM, LSB, USB, CW, 8w FM 25w SSB lovely rig, hardly used, cash needed, urgently, hence £385. Phone Les 08926 65183 evenings Crowborough.

REGENCY MX unwanted. Phone 0476 4200 Scanner. Present (as new) 67698 after 6.30 p.m.

FOR SALE Valves QV05-20(3), KT88 (6), 812M (1), TY2-125(3), 19" Monitor Pye b/w, Wanted QST Magazine back issues. Phone Wokingham (0734) 782236.

SOLARTRON scope CD1400 dual beam in good order £70. Frequency meter glann LF7 vernier type 0.3GHz to 1GHz

£75. Tel: 04608 447.

FT902DM. TRX. HF mint condition. Boxed, DC Converter, Built in Keyer, Memory Unit, with SP901 SPKR. Sell or exchange for FT757GX, must also be mint. All offers considered. Tel: Steve Halifax (0422) 51852.

YAESU FT980 £1399 or direct exchange for FT757GX Mk1 or II + FP757HD + FC757AT MD1 Optional. Tel: 0256-882-486.

EDDYSTONE EA12 mint £70.00 o.n.o. Advance Oscilloscope OS25B mint £40.00 5MHz trace, Ultra Radio LMS mint, backlite £10.00.

FOR SALE 32 foot tiltover mast complete with ground post and heavy duty aluminium tubing good condition ready to take away price £150. Or will exchange for radio gear of comparable value in good condition, Phone G4KPB 0204 75345.

TRIO 3200 70cm FM portable transceiver, fully X'talled, Nicads, charger, case, etc., very good condition, £115 o.n.o. Possible exchange for HF transceiver GIXGE. Tel: 0482 833448.

ROTATOR AR40 for sale. Good condition complete with approx. 12 metres 5 core cable £60. GAMTA QTHR. Tel: 0235 27128.

934MHz Uniace 400 mint condition, still boxed, plus beam, bargain £195. Tel: 0752 345784.

FOR SALE Eddystone communications receiver, model YYOU/2 covers 160 mics to 500 mics in five bands ideal coverage of military airbands v.g.c. £75, AM, FM, Free Delivery. Tel: 0222 487299.

SELLING communications receiver, Yaesu FRG 7700 plus memory facility, and matching ATU. Little used, good condition, £285. Tel: 651 (Croydon) 0861.

TRIO T5520 HF SSB TXCUR 80m-10m plus service manual, v.g.c. £360 o.n.o. G4KFJ. Phone 061 344 5484.

FOR SALE 3 World War II communication receivers 2 Pye MW, LW, SW £25 each, o.n.o. IR1115 with power supply £30 o.n.o. All in working. Order buyer collects. Eddystone Model 830/9 Receiver £100.

FT208R 2 Metre hand held transceiver, excellent condition, complete with speaker Mike NC8 power supply quick charger two battery packs, £150. Also YH Head Set with Boom Mike Switch etc. for above £20. Phone Roy 0983 408232 Sandown, Isle of Wight.

50MHz Transverter 2m IF 500mw output £65. PAOLPE 23cm Transverter 100mw output, needs Xtal, and connectors £30 or swap, part exchange D.F.M. or W.H.Y. wanted, Connectors for Cellflex LCF 1/2" Coax. Tel: 0226 296108.

YAESU FT707 HF Transceiver for sale, £300. AM/SSB, CW/N/W. Call Newbury (0635) 33073 evenings.

934MHz Transceiver, Reftec MTR934, good working order, makes usual noises but perfect when warmed up. Always gets

excellent reports "wouldn't know it was a Reftec" etc. Bargain at only £95.00 o.v.n.o. Call Martin Smith 0625 873209 (Poynton, Cheshire).

934MHz Reftec Mk2 Crestbyte Preampifier AP104/2. PA7E Base Colinear, Twin 18 Ele Yagi £220 o.n.o. Tel: John 01-841 2376 buyer collects.

ICOM IC28E Compact 2m/FM TCVR 25W includes receiver coverage 138MHz-174MHz latest model mint £250. JVC G71P Colour Camera Electronic Vietfinder 6x200M Auto-Iris Macro Filter AC Adaptor Ext. Cable Plugs padded case suitable any Video mind £195. BL40X 80/40M Trap Dipole £20. G410F. Tel: 01 722 7040 QTHR.

FOR SALE SX2000 Scanner UHF, VHF offers £140. Superstar suitable for conversion £100. Amtec ATU300 offers. Tel: 0283 221870.

WANTED Concord 3 Ham International up to £140 or your price. Also Nato 2000 £120 paid. Phone 0283 221870.

DIAWA Search 9 2 metre Monitor Receiver VFO + Xtals £30 o.n.o. Tamiya Rought Rider Car with Hi Power Nicad Power Unit with 2 channel Digital proportional radio controller all in good condition £90 o.n.o. Street, Somerset 47019.

FOR SALE: RTTY/CW Reader "CWR 600" with connecting cables, excellent condition £100.00. Sony Single Point Stereo Dynamic Microphone F99T £15.00. VHF/UHF Antenna 60-600MHz "Archer" SA1001 £15.00. Tel: (evenings) 01-891-2349.

SCANNER JIL SX200N 26-88MHz, 108-180MHz, 380-514MHz AM/FM, 16 memories, two speed scan rate, switchable scan delay. Complete with telescopic antenna, PSU 12V DC Lead, Mobile Magmount Antenna, Manual & Box all in v.g.c. £120.00. Tel: Southampton (0703) 476609 anytime.

2M FM Mobile 5/25 watt output, 3 memories, Listen on input, scanning mic, good condition £130 o.n.o. Tel: 0742 465145.

COMPLETE Amateur radio station. 757 Transceiver, 757 automatic tuner, 757 heavy duty power supply, Mossely Three element TRI Bander Beam, Coax, Switch Boxes, 10 metre verticle antenna, wire antenna, £950. G4ZNB. Rochdale 524602. Evenings, Weekends only.

FT7676X HF Transceiver, mint condition, original packing and manual, one year guarantee remaining. £1265 o.n.o. Phone Paul 0892 35830 (Evenings).

FOR SALE Yaesu FT901DM with External VFO + SPKR £750. HF5V + Vertical 80-10 metres with radial kit £120. New Diawa NS660 Pep Metre. 1.5kw £90. CAP Co 1.5kw SPC 300 ATU £120. Contact Phil on 0642 - 580536.

70CM TRIO 3200 FM Transceiver, fully X'talled, Nicads, Case, Charger, D.C. Cable, Packing etc., very good condition, £115 o.n.o. or exchange for HF Transceiver, GIXGE. Tel: 0482

838448.

ICOM IC120 23cm FM inc. Yagi £250. Hitachi GP4D colour video camera £50. MML432/50 linear £95. Marine Scanner £45. Signal R357 Handheld Airband £25. CTE 767 10M Linear £30. JVC GRC1 Camcorder inc. Tapes £350. Jim G4XRU 0903 690415.

TRIO TR7800 with scanning mike, memories, mobile mount, boxed, £150. TR7500 mobile 2 metre rig £100 boxed. Also two hand helds, Icom IC2E Boxed with Charger & Speaker Mike £125. Yaesu FT203R £130. All plus post or collected near Manchester, - G4NXW 0706 224617.

FOR SALE, FT902DM Transceiver comes complete with SP 901 external speaker, dynamic microphone and brand new set of 6146B final tubes. All items in mint condition will sell as one complete unit for £600. Changing to general coverage transceiver.

10 METER Multimode covers 28.05MHz to 29.7MHz in 5 bands. No external modifications to case used, £110.00 inc. Post. Daiwa Electronic Keyer DK-210 13.8V or Internal 9V-PP3 £50.00 inc. post and battery. Tel: G4XIV not QTHR 0904 792208 after 8pm please.

FOR SALE Rascal RA17 Receiver in good working order and very clean front panel £175 please Tel. Steve on 0254 - 823305.

FOR SALE FT208R 2 metre hand held transceiver charger + Nicads with spare nicad, complete with box and manual £140. Ring George 01-859 4879 or QTHR.

FOR SALE Due to invalidity FDK 2700 VHF all mode two meter rig plus transverters HC280 and HC220 in diecast box plus home built regulated power supply for transverters with switching from rig £300. Phone Geoff 0603 715423 anytime.

DRESSLER ARA 500 active antenna 50 to 1300MHz Gain 17dB good condition £100 + Postage. Zenith Audio Speech Processor give away price £15.00, Plessey Type 72 Switches 3 Bank 3 Pole 30 Way £15.00 for seven all letters answered include phone No. and I will contact you. G.P. Martin, 24 Collingwood Close, Worle, Weston-s-Mare, Avon BS22 9PQ.

YAESU FT757GX HF TCVR and FC757AT auto ATV both very little used, £850 the pair. Tel: 01 514 5998 anytime.

SALE MML 144/100S £80. Mutek TUUF 50C 2M to 6M £70. Magnum 4 Transverter 10M to 4M 200W Max £50. 2X81 Keyboard Video O/P, £20. G4GEW QTHR 07375 54388.

MULLARD QV06/40A valves 4 brand new original packing, current value £40-£50 each, will swap for 2 metre gear 934 equipment or will sell G3FWD 0902 782404.

SCANNER Realistic Pro 2021 latest model cost £220, unused present £150. 52 Chatsworth Road, Bitterne, Southampton,

Hants SO2 7NJ.
FT290R Nicads Charger plus 1/4Y Whip and spare mic, also Alinco Linear Amplifier ELH230D £290 o.n.o. Peter G3JXR.
JVC GXN5E Video camera, Panasonic recorder, separate tuner/timer, 2 batteries, 2nd charger, date titleing, I.R. Remote, carrying cases, boxed with manuals. Mint condition £560 o.n.o. The Lot. Value over £1800. Phone 0734 793073 anytime.

DSB80 80 metre QRP DSB/CW Transceiver £30. Two metre FM six channel receiver £30. Both brand new WPO Communications kits still in boxes. Phone Wayne 01-561 1076.

FOLDED Dipole 60 to 80MHz with Co-Ax cable. Free to good home. TYSOE 543. G.P. Lovelock, Shambles, Whatcote, Shipston-on-Stour, Warwickshire CV36 5EF.

FOR SALE FT 720RV £100.00. 13.8DC Power Supply £20.00. RO250 Rotator £25.00. VH55 £15.00. YO148 £14.00. PF/R/T SU8 £10.00. PFIR RB14. £5.00. G5/2m £5.00. Magmount and 1/2W £5.00. Gutter Clip 1/4W £2.50. YW3 £5.00. SA450 £5.00. T30 dummy load £2.00. All o.n.o. Telephone 0733 - 238653 after 5pm.

FOR SALE QQV0640 Valves two (2) New £30 and Vidicon Camara Tube 1 inch New £10. As these are fragile, buyer collects, cash only please. G8NCZ. Ring Ware 871677 even at night, I've got a phone by the bedside lan Ruddock, 54 Woodcroft Avenue, Stanstead Abbots, Herts. SG12 8JQ.

KDK 2030 2 metre FM 5/25 watts mobile mount included £150. Tel: Doug on 0462 711722.

QRT Shacil clearance: Yaesu FC757AT automatic A.T.U. £250I Yaesu FP757HD heavy duty power supply £165I Realistic Pro 32 200 channel programmable scanner £210I Scarab terminal unit, hard and software for Spectrum RTTY/SSTV/CW. Many other items and magazines. Gordon Jackson 01-907 2253.

CODAR T28 Rx BFO.160.80. Codar PR30 RF Preselector £40. Tel: 0787 280259.

WANTED

WANTED: Retired Cornishman welcomes correspondence and information about shortwave reception. Has made his own set years ago - only now has leisure and would like to construct receiving (Transmitting) set. Andrew (Mr.) & Llanthwy Road, Newport, Gwent NP9 4JR.

RACAL Solid State, receiver required, modern type preferred. Prompt payment. Phone after 4pm 0277 823434. Brentwood, Essex.

WANTED Sony ICF2001D, Phillips P2999, Panasonic RFB600LBE or RF3100LBE or similar, mint. 122 Sevenfields, Highworth, Wilts, SN6 7NQ.

WANTED Manual Circuit Diagram for JVC HR3300EK Video and Sharp VC7300H Video. Photocopy OK, Send price required. Bob Hearn, 70 Herbert Road, High Wycombe HP13 7HN. Tel: 0494 29868.

WANTED Pye A200 RF amp for conversion to 2 metres must be unmodified and operating in the 105 to 108MHz band as shown in HRT April 87. Phone Mark G1YEF on 051 644 8196 after 6 p.m.

WANTED United States listings 1985/6 and Foreign listings 1985/6. Mr R. H. Mills, 48 Lady Bank, Birch Hill, Bracknell, Berkshire RG12 4BH. Telephone Bracknell 412239 after 7pm. Callsign G8CQC.

FOR SALE 1982 United States listings and Foreign listings 73s. Ray Mills 48 Lady Bank, Birch Hill, Bracknell, Berkshire RG12 4BH.

WANTED Yaesu FRG7. Tel: 09952 3988 BOB GIZKY.

WANTED Codar AT5 transmitter any condition working or not details please to G4BUU, 123 Old Lane, Beeston, Leeds LS11 7AQ, Yorks.

YAESU Wanted FV901DM external VFO YO901. Phone (0703) 844832.

WISH to borrow copies Ham Radio Today, March 1986 and December 1983. Full postal costs paid. G4PRI QTHR. R. Walker, 161 Long Lane, Hillington, Uxbridge, UB10 9JN.

WANTED Urgently Icom IC202 and Icom IC402, your price paid in cash, can collect or pay postage. Martin G41YA. Phone Sittingbourne (0795) 21207 anytime.

WANTED Japan radio pre-selector NFG505. MS7 Speaker, AUX7 board and RRM7 Modules for Drake R7A. Non working Hammarlund HQ180A for spares. Telephone 0875 52317 evenings and weekends.

WANTED Manual or photocopy's for Yokuto Denski FM 144-10 SX II 2M Rig. GIVIZ, Alan Hemenway, 69 Sixth Avenue, York YO3 0UR.

WANTED AOR2001 Scanning receivers in good original condition. Telephone Steve GIXSA. Tyneside 091 2661127 evenings/weekends.

WANTED for Heathkit SB300RX one 404-202 CW Filter 400 CPS, One 404-201 3.75RC/S AM Filter FL3. Telephone 41468 Ballymena. Exchange 0266.

STILL wanted FT75 Handbook, Circuit Diagram. Photocopy acceptable. Appropriate costs, refunded. R. Cashmore, 65 Michaelston Road, Culverhouse Cross, Cardiff CF5 4SX. Tel: 0222 593057.

WANTED HR05R Tuning Knob RA1 H/Kit 5 meter or complete chassis, fair price paid. R. Jackson, 126 King's Lane, Ballykelly BT49 9JY, N.I. 05047 65841.

ICOM IC251E preferably with Mutek front end required urgently, also Mutek 50MHz Transverter, good prices paid. Phone Steve 021 443 4389.

WANTED two metre base or mobile rig FM or Multimode must

be in mint condition, prefer Trio Yausa or Icom, full details please. T. Leeman, 123 Old Lane, Beeston, Leeds LS11 7AQ.

WANTED Rx's R.1000 by Trio or JR310 Preferable 1.8-2.00 mc/s by Trio. Tel: Peter 0642 - 456327 day Cleveland.

WANTED very cheap 2 metre synthesised FM mobile looks unimportant. Ring Clive on 01-560-8792 after 6.30pm.

WANTED: Yaesu FRV7700A VHF Converter and memory unit for FRG7700 Receiver. Tel: (0305) 820970 weekdays, (0272) 325012 weekends.

WANTED FRG7700 Rx memory not essential. For sale Microwave Modules Transverter MMT 144/28 £80. And Yaesu YC-221 Digital Display for FT221 £30 o.n.o. or exchange for 2 metre receiver.

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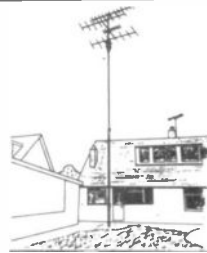
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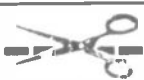
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LOWEST PRICES FROM
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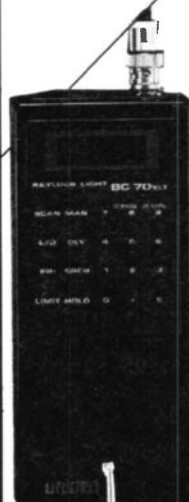
Handheld scanning receiver with 10 memories. Covers: 66-88MHz, 136-174MHz, 406-512MHz

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Power 500W
8 Element High Quality

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SSE DISCONE

RX ANTENNA
70 - 500 Mhz With 3 Elements

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- ★ Linear all Mode Operation
- ★ Straight Through Operation when Turned Off
- ★ Ultra Low Noise Receive Preamp - Front Panel Selectable
- ★ Equipped with RF VOX and Manual Override
- ★ LED Status Lights for Power, Transmit & Preamp on

FEATURES

- ★ 25 watts TX output
- ★ GaAsFET RF stage
- ★ Transmit ALC circuit
- ★ 13.8V DC operation
- ★ Repeater shift (Simplex, Normal, Reverse)
- ★ High level double balanced receive mixer
- ★ LED bargraph power output indicator
- ★ RF VOX - adjustable delay - PTT override



FEATURES

- ★ 100 watts Output Power
- ★ Suitable for 1 or 3 watt Transceivers
- ★ Linear all Mode Operation
- ★ Straight Through Operation when Turned Off
- ★ Ultra low noise receive preamp - front panel selectable
- ★ Equipped with RF VOX and manual override
- ★ LED status lights for power, transmit & preamp on



FEATURES

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