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Practical Wireless

THE RADIO MAGAZINE

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Send any make of colour print film together with your cheque or postal order inside the Freepost envelope enclosed with this issue. Or fill in the coupon below and send together with your film and remittance in a strong envelope to: Practical Wireless Film Service, FREEPOST, Watford WD1 8FP. Half-frame films are welcome, and these are charged at double the full-frame price.

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*Rush me ____ album(s)

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Practical Wireless

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NEXT MONTH

AUGUST '85 ISSUE

AR UNDER COMPUTER CONTROL

The home computer has found many uses in the shack — this series shows you how to use it to control the modern general coverage receiver.

WHICH TRANSMATCH?

The original "Ultimate" Transmatch design featured in our QRP a.t.u.—can it be improved? Tony Smith provides the answer.

ON SALE 5 JULY

PW COMMENT

Vroom-Vroom!

THE VULNERABILITY of modern microprocessor-controlled circuitry to interference from strong electromagnetic fields (e.g. radio transmissions) has become notorious. Tales of petrol pumps at filling stations being sent berserk by CB transmitters, and more recently of vehicle engine management systems being upset by on-board or passing amateur or p.m.r. transmitters have been legion. Even the latest police motor-cycles have been having problems, we hear.

The folly of fitting all this logic circuitry into totally unscreened plastics boxes has been well-proved to everyone it seems, but the vehicle manufacturers.

Now, at last, a glimmer of hope. A report in the journal *New Technology* reveals that a £500000 government grant to the Motor Industry Research Association (MIRA) will go towards establishing a new £2 million electromagnetic compatibility (EMC) test laboratory where cars, trucks and coaches will be bombarded with signals in the range 10kHz to 1·28GHz whilst running on a "rolling road". An expensive way of discovering that putting the computer in a diecast box will cure its ills, but hopefully there will be other benefits too.

G3GSR

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☐ HF

I ENCLOSE £1 PLEASE SEND ME CATALOGUE & ANTENNA BOOK.

You don't need a 1750 Hz tone to gain access to the fastest mail order service for all radio amateurs and short wave listeners. With a copy of the LOWE ELECTRONICS catalogue and antenna book in the shack (send £1 for your copy) the best in amateur radio is quickly available.

LOWE SHOPS

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the 'Emporium' awaits you. Free street parking is available outside the shop.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

TRIO
TS830S

hf transceiver

The TRIO TS830S is for the operator who wants a dedicated amateur bands only transceiver, who is used to and wants a pair of rugged 6146B valves in the PA stage and who wants a compact rig which has its own in-built power supply. The TS830S is for the radio amateur who requires a rig capable of rising above today's crowded band conditions, a rig that has, as standard, the necessary features that will produce consistently good contacts where other lesser equipment would fail. The TRIO TS830S, a proven rig with an impeccable pedigree.

The TS830S covers on USB, LSB and CW the full amateur bands from 160 through to 10 metres.

Convenient to use, the transceiver has its own in-built power supply.

VBT (variable bandwidth tuning) enables the operator to, at will vary the IF filter passband width and establish optimum IF bandwidth relative to the interference being experienced.

The IF shift control allows the IF passband to be moved up or down in frequency without having to retune the receiver. Hence, an unwanted signal, present in the IF passband, may be attenuated significantly by moving the passband in the appropriate direction.

As the IF shift and VBT are independently adjustable they can, to advantage, be used together.

The tunable notch filter in the TS830S is a high-Q active circuit in the 455KHz second IF. Sharp, deep notch characteristics will eliminate a strong interfering carrier within the passband of the receiver section.

The RF speech processor in the TS830S provides added audio punch and increases the average SSB output power whilst suppressing sideband splatter Compression levels can be monitored and controlled from the front panel.

To cope with pulse type (such as ignition) noise, the transceiver has an in-built noise blanker.

For perfect listening, a tone control adjusts receiver audio frequency response to suit operating conditions.

Both RIT and XIT, transmitter as well as receiver incremental tuning are included to aid operating, XIT being a distinct advantage when calling a station that is listening 'off frequency'.

It is possible to monitor the transmitted audio in order to assess the effects of the speech processor, a most useful feature ensuring perfect signal reports.

TS830S amateur band transceiver .....£832.75 inc VAT, carr £7.00

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

the TRIO two metre base station, the TS711E.

Several weeks have passed since I took delivery of my own TRIO TS711E. The Japanese home market model has returned whence it came and I am using the version designed specifically for the UK market. The rig is perfection epitomised. For todays two metre operator any base station with less facilities and performance then the TS711E would be far from acceptable. The TS711E's receiver performance in sensitivity and in its ability to reject unwanted adjacent signals is outstanding. I'm not talking about test equipment figures though undoubtedly these will soon be published. My own on air operating with the rig has enabled me to hear what I previously couldn't.

The transceiver covers the 2 metre band from 144 to 146 MHz in FM, USB, LSB and CW modes. When switched to the auto position the rig correctly selects mode according to frequency, a great advantage to the blind operator. Simple up/down frequency shift is provided both on the transceiver front panel and microphone.

IF shift is available, an essential when considering todays crowded 2 metre band. For more penetrating transmitted audio when working DX speech processing can also be switched in.

The TS711E has two separate VFO's and forty channels of memory. Each memory remembers frequency, operating mode, simplex or repeater shift and whether or not a tone burst is to be included. Frequencies stored in memory can be readily transferred to either VFO A or B. The VFO can be either free running as for SSB or CW operation or electrically switched to a "click" stop where it changes frequency in 12.5 or 5 kHz steps. The two VFO's can quickly be put on the same frequency, an aid when checking the position of a strong adjacent signal with one VFO whilst remaining on your operating frequency with the other.

Frequency scan on VFO can be either between or outside user set limits. On memory the transceiver can either scan the entire memory contents or be instructed to look at those frequencies of a particular mode. The TS711E has a timed hold on an occupied channel.
Both priority channel and the immediate recall of your local net frequency are possible with the TS711E.

For those with failing sight or a blind operator the TS711E 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 upper side band etc.), other rigs just bleep but, when fitted with the VS1 optional board, a digitally encoded girls voice will announce both frequency and where applicable, whether the rig is switched to repeater shift.

TS711E 2 metres £831.77 carr £7.00

also on seventy, the TS811E.

TS811E/70 centimetres £964.97 inc. VAT carr £7.00

TS430S

The TS430S combines the facilities of a solid state HF transceiver with those of a general coverage receiver. It's the ideal rig for the radio amateur who not only wants to communicate with his fellows but also enjoys listening to the world. As an amateur band transceiver the rig covers top band to ten metres, as a short wave receiver coverage is from 150KHz to 30MHz. Operating on AM, FM, USB, LSB and CW the TS430S is extremely compact and, as such, is the perfect transceiver for mobile, portable or base station operation.
TS430S HF transceiver with general coverage receiver .....£769.50 inc VAT.

TW4000A

Taking into account the amount of activity on the 2 metre FM channels it is not surprising that many people have turned their attention to the wide open spaces of 70 centimetres. With the TW4000A, TRIO have produced a dual band FM transceiver that gives its owner the best of both worlds. Facilities include 10 memories, two VFO's, priority channel, full repeater operation, band scan and memory scan. In memory scan mode the rig can be instructed to look for either 2 metre or 70 centimetre signals. The transceiver produces 25 watt RF output on both bands and comes complete with mobile mount and microphone. For greater safety whilst mobile the optional VS1 board will announce frequency, memory channel and whether or not the rig is set on repeater shift
TW4000A dual band FM mobile. .....£536.51 inc VAT.

R600

For those who are banned from the house and have to operate from the shed at the bottom of the garden, why not consider an R600 to monitor the bands from the comfort of the fireside. No wife would forbid such an attractive looking receiver in the lounge, after all it could also be used to listen to *Women's Hour* The R600 is a basic receiver covering from 150KHz to 30MHz and having switched upper and lower sidebands, wide and narrow am and cw. It has a 20dB attenuator and a noise blanker fitted as standard. Operation is simple, select the mode of operation, turn the MHz dial to the correct band and, by using the VFO knob, tune to the desired frequency. The clear digital readout makes station selection simple. The TRIO R600, your passport to comfortable listening.
R600 general coverage receiver ..... £299.52 inc VAT.

LOWE ELECTRONICS

Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
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FRG 8800

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

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

FT 77

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FT 2700RH

Dual Band FM 2M and 70cms
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One piece diecast centre chassis
50(H)x150(W)x168(D) mm

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Synthesised Multimode Base Station
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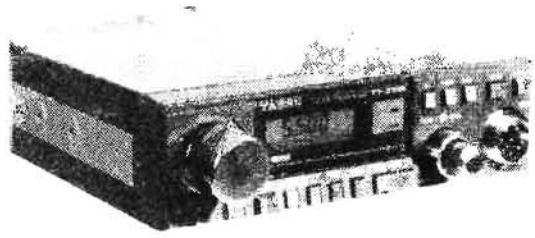
8 Bit Microprocessor Control
IF Shift/Width System
129(H)×334(W)×315(D) mm

Fully Synthesised 2M FM Transceiver
45W (RH), 25W (R) Power Output
Dual VFO's
Optional Voice Synthesiser
1MHz/25KHz/12½KHz Steps
10 Channel Memory
'+' '−' Repeater shifts with reverse facility
Memory Priority & Programmable Memory Scan
17 Function LCD Display, LED 'S' Meter
One piece diecast alloy chassis
(Fan assisted cooling on 45W model)
140(W)×40(H)×180(D) mm



FT 270RH

COMPACT 2M FM

Multimode 2M Transceiver
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Large LCD Display
Ten Memory Channels
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FT 290R

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ICOM

GREAT SETS..

Remember where you saw it first- the compact IC-735 HF Transceiver.

Here are just a few details to whet your appetite. The IC-735 is shown here with the SM8 desk microphone and PS-55 power supply.

- **Small, neat, compact radio**
- **100 Watts**
- **FM Standard**
- **General coverage Rx**
- **New clear LCD Display**
- **Memories, memory scan**
- **ICOM reliability**

See next month's ad for full specification.

IC-3200E

A new exciting set is the ICOM IC-3200E FM Dual-band transceiver (144-430/440 MHz). This is the smallest transceiver available.

The IC-3200E employs a function key for low-priority operations to simplify the front panel. LCD display is easy to read in bright places, showing frequency, VFO A/B, memory channel duplex mode and S/RF meter information.

Other features include a 10 channel memory able to store operating frequencies, Simplex or Duplex. A memory lock-out function allows the memory scan to skip programmed channels when not required. The IC-3200E has a built-in duplexer and can operate on one antenna for both VHF and UHF. Options include: IC-PS45 DC. power supply, HS-15 mobile mic, SM6 and SM8 desk mics. SP 10 external speaker and UT-23 speech synthesizer. A great future is predicted for the IC-3200E.

Soon to be announced..

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Tha

ICOM GREAT VALUE

IC-505, 50MHz A New Dimension for the U.K.

At last, permits are now available in the U.K for the 50MHz (FM) band. If you wish to use this less crowded amateur frequency the IC-505 SSB CW portable transceiver has already gained an excellent reputation world-wide.

The IC-505 features microprocessor frequency control, dual VFO's and 6-channel memories with memory scan. LCD ensures clear visibility even in sunlight. The 505 accepts a standard dry-cell pack rechargeable nicad battery pack (BP10) or 13.8V external power supply.

Standard accessory circuits such as split switch, noise blanker, squelch and CW break-in are incorporated in the 505.

Other accessories available include the EX-248 FM unit, BC-15 charger unit and the LC-10 carrying case.

All these features make the IC-505 a great transceiver that will enable you to operate on the 50MHz band, after all the rest of the world does!

You can get what you want just by picking up the telephone. Our mail-order dept offers you: free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Tel: 369464. Give it a visit, BCNU.

Authorised Icom dealers in the UK

Alexian Electronics Ltd. Edinburgh, 031 554 2591
Alyntronics, Newcastle, 0632-761002.
Amateur Radio Exchange, London (Ealing), 01-992 5765.
Amcomm, London (S. Harrow), 01-422 9585
Arrow Electronics Ltd., Chelmsford Essex, 0245-381673 26.
Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd , Bristol, 02217 2402.
Bredhurst Electronics Ltd , W. Sussex, 0444-400786
Dressler (UK) Ltd., London (S Harrow), 01-558 0854.
D W. Electronics, Widnes Cheshire, 051-420 2559.
Hobbytronics, Knutsford Cheshire, 0565-4040. Until 10pm daily.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321 632725
Radio Shack Ltd., London NW6, 01-624 7174
Scotcomms, Edinburgh 031 657 2430.
Tyrone Amateur Electronics, Co Tyrone, N. Ireland, 0662 2043
Reg Ward & Co. Ltd., S W. England, 0297-34918.
Waters & Stanton Electronics, Hockley Essex, 0702-206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

Cue Dee Antennas Special Offer!

CUE DEE antennas are designed to last for decades – the best possible aluminium alloy for this purpose is used (SIS 4212-06)

The booms are made of 28mm tubing with 1.5mm wall, with colour marks clearly indicating where to fit the elements. By using tubular boom and a synthetic guy wire on the long yagis, the windload is reduced by a factor 0.66 compared to using square shaped material for boom and guying.

The driver element is made of 12mm tubing and features a PTFE (Teflon) insulated gamma match which is pre-tuned at the factory and made for 50 ohm feeder with a PL 259 type connector. No further adjustments or power consuming balun needed. This matching system ensures a clean radiation pattern and transfers the power without losses.

The parasitic elements are made of 6mm solid rod and mounted to the boom with the aid of a CUE DEE element washer, boom to element part and a screw. This, together with our intelligible assembly manual, makes an extremely easy and solid assembly which assures the long life of a CUE DEE antenna.

2 metre Yagis.
4144A – 4 element, 8dBd gain £19.00.
10144 – 10 element, 11·4dBd gain £37.00.
15144 – 15 element, 14dBd gain £49.00.
Order now while stocks last.

IC-735 New Compact HF and R7000 VHF/UHF Receiver.

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Dept PW143 Reculver Road, Herne Bay, Kent.
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FOR FURTHER DETAILS PHONE **01-992 5765/6**

FRG-8800

AUTHORISED YAESU

FRG-8800. All band all mode Gen coverage receiver. 150kHz to 30MHz. Large liquid crystal display. 100Hz frequency resolution. S/SINPO "bar graph" type indicator. 21 button keypad. 12 internal memories and multi function scanner. AM, SSB, CW and FM. Wide and narrow bandwidths. All mode data/freq can be stored in mem's. Selectable AGC rates. Two 24 hr clocks. 8-bit CPU. Three scan modes. Yaesu CAT system comparable with most personal computers. Programme scanning.

FRV-8800 optional VHS converter (mounts inside) adds 118MHz to 173.999MHz coverage to the 8800 with full frequency readout.

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FOR THE LESS AMBITIOUS, why not try our DSB80 kit? A 2W + DSB or CW VFO controlled TRANSCEIVER kit for either 80 or 160m at a ridiculous £39.95 for a complete pcb kit – over 1000 sold to date! It has a very sensitive receiver and is ideal for beginners. Punched aluminium CASE and HARDWARE for the DSB80 at £25.95, and digital display at £29.50 – all three kits for £85.00.

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

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We also make a popular 2M FM Tx/RX kit – 6 channel crystal control at 1W RF o/p. Receiver at £39.50 and Tx at £34.50 ex crystals – both for £69.95. Optional PLL VFO available at £38.50.

OTHER KITS: DSB2 – enhanced version of the DSB80 for any single band 160-15m, DSB/CW 2W+ at £69.50 basic kit. SPEECH PROCESSOR – very popular kit at £14.65 to help get the DX! ALPHA – our 50W monoband SSB/CW Transceiver with case and display at £179.95. OMEGA – 9 band 100W multimode for the specialist constructor – write for details.

Why not join the ranks of satisfied customers building our Projects? All of our kits come with copious instructions, all components, pcb, wire, pots etc and many are designed for beginners. Our Products are used world wide and can help YOU get on the air. KITS are sent in 7-10 days but please allow up to 28 days for popular items. All prices include VAT and post. OVERSEAS – Europe use UK prices and Rest of World UK + 5% for carriage etc. CREDIT CARD orders can be left on our 24hr Answering Service. For our 40+ page CATALOGUE please send 50p in stamps. Kit Debug service available.

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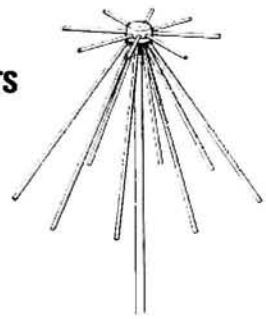

REVCONE

A superb quality 16 element all British made VHF/UHF broadband fixed station aerial.
Ideally suited to all scanners and other VHF/UHF Receivers.

★ Covers 50-500MHz ★

REVCO is a British company that has been manufacturing quality antennas for the last 25 years. Their products are made up to a standard, not down to a price and their wide range of mounts feature a high degree of interchangeability. The complete range is distributed by GAREX ELECTRONICS who have 20 years experience in VHF/UHF engineering and mail order.

MOBILE ANTENNAS ARE AVAILABLE
IN THE RANGE 27 to 950MHz

CHOICE OF MOUNTS

PERMANENT BODY MOUNTS:– Two systems are widely used by the Mobile Radio Industry.

(1) **The ½" mount** which requires a nominal ½" hole and access to the underside to secure the fixing nut. This base is suitable for all surface angles, including vertical but it is not recommended for locations where the underside is exposed to the weather, or for UHF. The feeder cable is terminated by tag plates. Available as types 2001 (feeder inner needs soldering), 2002 (feeder termination by grub screws) and 2003 (as 2002 but quick release).

(2) **The ⅜" mount** which requires an exact ⅜" hole but access to the underside is not necessary as the base assembly snap fits into the hole. Clamping the cable expands the collets and gives a secure fixing. Cable termination is co-axial and this mount is recommended for all frequencies including UHF. Assembly is easy because REVCO'S new TAPERLOK design has only two components for cable termination!

The whip system interface is a 5/16" UNF stud which can be used with a wide range of adaptors including the quick release. (The 2017 ⅜" mount uses its own special flush fitting loading coil instead of a 5/16" stud).

The **2005X** base is highly recommended as it is the easiest to fit and the most versatile. The cable termination is substantially waterproof.

⅜" snap-in mounts may not be suitable for vertical or near vertical surfaces when used with longer whips.

MAGNETIC MOUNTS:– The quickest and easiest temporary mount. A major problem with magnetic mounts has been their tendency to collect small metallic particles which can ruin car paintwork. It is almost impossible to completely remove these particles from ordinary mag-mounts but REVCO have overcome this problem by fitting their mounts with removable rubber boots which prevent the face of the magnet from becoming permanently contaminated. Particles are easily wiped away when the boot is removed from the magnet. REVCO use a specially coated ceramic magnet which minimises the rusting problem usually associated with ferrous magnets.

Any of the body mounts can be supplied in a magnetic version.

GUTTER MOUNTS:– A clamp assembly that is attached to the vehicle's gutter and is capable of carrying a body mount. Care should be taken when choosing a gutter mount as modern vehicles tend to have a light plastic moulding poorly attached to a meagre metal flange. As gutter mounts are fully exposed to the weather, the **2005X** base is recommended, as is the Quick Release system which allows the antenna to be removed for safe stowage.

BOOT LIP MOUNTS:– Another quick mount option that may be preferable to the gutter mount. Again the 2005 is top choice as its negligible below-body space requirement can cope with the restricted room inside the shell of a boot lip mount.

FIXED STATION ANTENNAS:– A purpose-made stainless steel bracket, complete with U bolts, is available to convert most of REVCO'S antennas for fixed station use by the addition of ground plane elements. Again, the 2005 is recommended. The assembly also contains a co-axial socket to allow attachment of the feeder. REVCO also has two specially designed fixed station antennas for VHF – the **2060** and the **2061** with adjustable ground planes (Hi and Lo band). These are particularly valuable for emergency use as only one antenna for each band need to be kept in stock. 2060 covers 120-180MHz and 2061 covers 60-120MHz.

SUNDRIES

2070:– PL259 to Hinge Adaptor. Allows the popular SO239 socket to be converted to take any REVCO hinge-whip assembly.

2071.– ⅜" UNF Male hinge adaptor. Converts the widely used ⅜" type of CB antenna base.

2072:– 5/16" UNF Female hinge adaptor. Fits the 2005X base allowing the use of any hinge whip assembly.

2073:– Quick release adaptor. Fits the 2005X base and mates with **2074.**

2074:– Quick release yoke. Fits 2073 or forms part of 2003 base and accepts any hinge whip assembly.

PLEASE SEND A LARGE S.A.E. FOR THE FULL LIST OF REVCO PRODUCTS

Visit the GAREX stand at mobile Rallies for special cash-and-carry discounts.

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News

CAST '85

At the International Cable and Satellite Television Exhibition and Conference, held at the NEC Birmingham in April, *Practical Wireless* staff had an unexpected visitor to the stand, in the person of Mr John Butcher MP, Parliamentary Under-Secretary of State for Industry, whose department has the responsibility for legislation covering cable and satellite television nationally.

Our photograph shows to the left of the foreground, Geoff Arnold G3GSR talking to Mr Butcher and his aide, with Elaine G4LFM behind the counter.

New Catalogue

The latest catalogue from Verospeed covering May to August 1985 is now available.

This extensive catalogue of electronics products lists thousands of items over hundreds of pages, with the vast majority illustrated with a photograph plus technical and price details.

Readers of *Practical Wireless* will find this catalogue most useful as Verospeed tell us they welcome small orders, on a cash-with-order basis, and they accept Access and Visa card business.

To obtain a free copy of the catalogue, apply to: *Verospeed, Stansted Road, Boyatt Wood, Eastleigh, Hants SO5 4ZY. Tel: (0703) 644555.*

RSGB QSL Bureau

A cry from the heart of G4VAA, QSL Sub-Manager for the G4VAA-VZZ series. He has 10 000 (yes, ten thousand) unclaimed QSL cards waiting for stamped addressed envelopes so that they can be despatched to their rightful owners, and other sub-managers are in a similar state. He hates the thought of throwing the cards away, but storage is becoming a problem.

So, you RSGB members, let your series sub-manager have some s.a.e.s and ease his problems.

On the Move

MCP Electronics Ltd. has moved to new premises "just a few steps away" from the previous address, but offering much more room for the considerable degree of expansion that this high technology stockist and distributor has experienced over the last couple of years.

The new address details are: *MCP Electronics Ltd., 26-32 Rosemont Road, Alperton, Wembley, Middlesex HA0 4QY. Tel: 01-902 6146.*

Ant Antennas

Ant Products, manufacturers of the well established Silver 70 and Tiger range of amateur radio antennas have appointed three major distributors of their products in the north of England, they are: **Greater Manchester and Cheshire**—Glenbond (Videotel) Ltd., 25 Stamford Street, Altrincham, Cheshire WA14 1EX.

South Yorkshire—Alan Hooker, 42 Netherall Road, Doncaster.

North Humberside—Hessle Communications, 4 Boothferry Road, Hessle, Hull.

A catalogue containing detailed information of the Ant Products Tiger and Silver 70 range of antennas can be obtained by sending 50p to cover postage, to: *Ant Products, All Saints Industrial Estate, Baghill Lane, Pontefract, West Yorkshire WF8 2HA. Tel: (0977) 700949.*

Mobile Radio Rally

The Elvaston Castle Mobile Radio Rally, organised by the Nunsfield House Community Association's Amateur Radio Group, will be held on Sunday, 9 June, starting at 10.00am, and admission is free.

Elvaston Castle is situated 8km south-east of Derby on the B5010 and talk-in will be available on both 144 and 432MHz via the special event station GB3ECR. Attractions will include over 90 trade stands, bring and buy sale, flea market, with arena events, demonstrations and children's entertainments, plus full on-site catering.

Further details from: *Hon. Sec. John Robson G4PZY, tel: Derby (0332) 767994 or Ian Cage G4CTZ, tel: (0332) 799452.*

World Radio TV Handbook 1985

The 39th edition of the *World Radio TV Handbook* has recently been published. Regular users of the handbook, which would include amateur radio operators, s.w.l.s, DXers, professional broadcasters of all categories, students, researchers and journalists, regard the handbook as their own personal "bible" of the international broadcasting business.

With over 600 pages crammed with information, the *World Radio TV Handbook 1985* costs £17.95 and is available through most good book shops or direct (p&p free) from: *Pitman Publishing, 128 Long Acre, London WC2E 9AN. Tel: 01-379 7383.*

AD Errors

The gremlins unfortunately got at two Amateur Electronics Ltd advertisements in our June issue. On page 67, the price of the FT-270OR dual-band transceiver should have been £559.00 inc. VAT. On page 69, the wrong photograph was included in the advert for the FT 270R/RH. Our apologies to readers and to AE for any confusion and inconvenience caused.

LOW-COST CRYSTAL TESTER

Most constructors will have a box of old crystals which they have acquired over the years. The problem is usually how to test them quickly and cheaply. This project will enable you to do just that.

by Martin Michaelis DK1MM

The circuit used (Fig. 1) is a crystal-controlled Colpitts oscillator based around transistor Tr1. This transistor can be any *npn* device with F_T higher than 300MHz. This will allow crystals up to 100MHz to be checked.

Using a variety of sockets to accommodate different crystal configurations the crystal under test is shown as XL1. With switch S1 in the TEST position the crystal should oscillate and the r.f. output can be checked at SK3. With S1 in the RES position the crystal is disconnected from the oscillator and connected to a resistor network between SK1 and SK2. In this configuration you can find out the resonance characteristics of the crystal.

Construction

The unit is built on a simple printed circuit board, details of which are shown in Figs. 2 and 3. If desired the circuit could be built on Veroboard as the layout is not critical.

The completed unit is housed in a small aluminium box which also carries the meter, controls and crystal sockets.

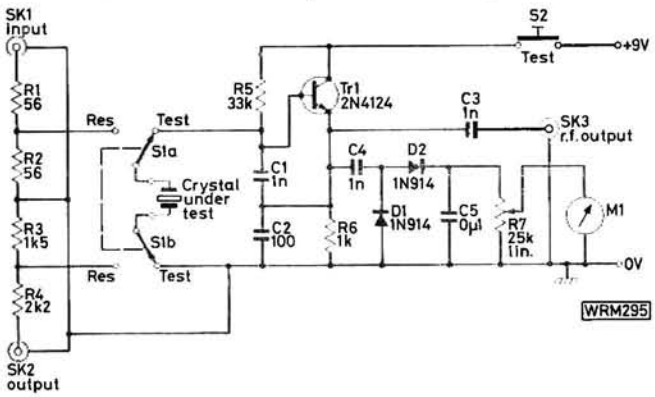


Fig. 1

Fig. 2

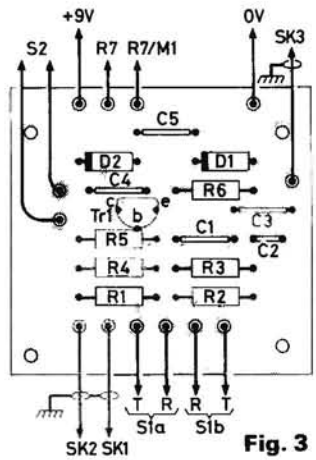


Fig. 3

★components

Resistors

¼W 5% carbon film

56Ω	2	R1,2
1kΩ	1	R6
1·5kΩ	1	R3
2·2kΩ	1	R4
33kΩ	1	R5

Potentiometers

25kΩ lin	1	R7

Capacitors

Disc ceramic

100pF	1	C2
1nF	3	C1,3,4
0·1µF	1	C5

Semiconductors

Diodes

1N914	2	D1,2

Transistors

2N2219 or 2N4124	1	Tr1 (see text)

Miscellaneous

BNC coaxial connectors (3); Panel-meter 300µA f.s.d.; Aluminium box 72 × 44 × 140mm; Min. toggle switch d.p.d.t.; Push-button switch s.p.; 9V battery and connector; Crystal sockets as required; Printed circuit board.

BUYING GUIDE

Readers should have no difficulty in obtaining components to build this simple project. Several of our regular advertisers can supply the components including a suitable meter and aluminium box.

Approximate Cost £10

Construction Rating BEGINNERS

Using the Tester

To find the fundamental frequency of a crystal connect a frequency counter or suitable receiver to SK3, switch S1 to TEST and switch on by pushing S2.

The tester can also be used as a frequency marker by using a known good crystal. The output from SK3 can be fed into the antenna socket of your receiver to give marker signals at the fundamental and its harmonics. As an example a 3·5MHz crystal will give markers at 3·5MHz, 7MHz, 10·5MHz and so on.

To measure the resonance characteristics of a crystal connect the crystal tester as shown in Fig. 4. The r.f. signal generator is connected to SK1 while a valve voltmeter with r.f. probe fitted is connected to SK2. (Of course any suitable high input impedance meter or oscilloscope can be substituted for the v.v.m.)

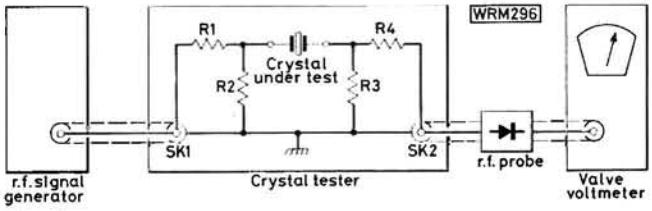


Fig. 4

Sweeping the signal generator frequency slowly up and down around the fundamental frequency of the crystal being tested will produce a peak and a null in the output from SK2. The peak indicates the series resonance of the crystal while the null shows the parallel resonant frequency. A typical plot of the output obtained is shown in Fig. 5.

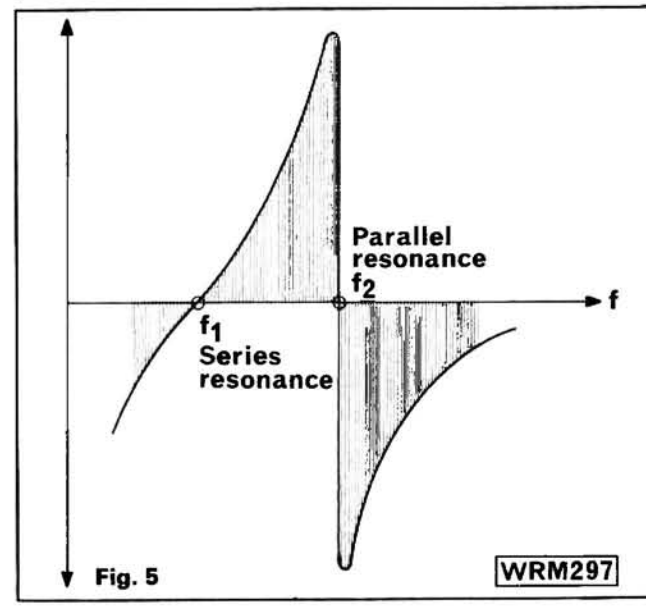


Fig. 5

References

Radio Communication Handbook RSGB
Radio Amateurs Handbook ARRL
SSB for the Radio Amateur. 4th Edition. ARRL *"Surplus Crystal High Frequency Filters"* by W3TLN and *"A Safe Method for Etching Crystals"* by W2IHW
73 Magazine Issue 10 1971 page 55 "A Crystal Tester" by K6VCI
QRV-Amateur Radio Issue 10 1973 page 555 "Prüf and Meβgerät für Schwingquarze" by DK1MM

PW RADIO PROGRAMS

In response to many requests from our readers we have, at last, produced two new Radio Program cassettes for the BBC–B computer, one of which is also suitable for the Dragon–32.

***PW* Radio Programs–6** (Side A for BBC–B and Side B for Dragon–32) contains two useful programs to ease the calculations involved in circuit design and transmission line design.

"COAX#" is a suite of programs, written for the Dragon–32 by D. R. Coomber G8UYZ and translated for the BBC–B by G8VFH, which enables you to calculate the essential parameters of a wide variety of transmission line configurations, e.g. coaxial, twin wire, square coaxial, trough line, etc.

"DESIGN#" is a translation from an original program written by S. Baynes G6OUN for the Spectrum. The program enables you to compute the values of components used in tuned-link output stages such as that used in the *PW* Dart transmitter.

Dragon–32 users should note that line 350 should be edited out after loading and this can be simply done by typing 350 ENTER then RUN ENTER.

***PW* Radio Programs–7** (BBC–B only) contains five programs aimed at the operator.

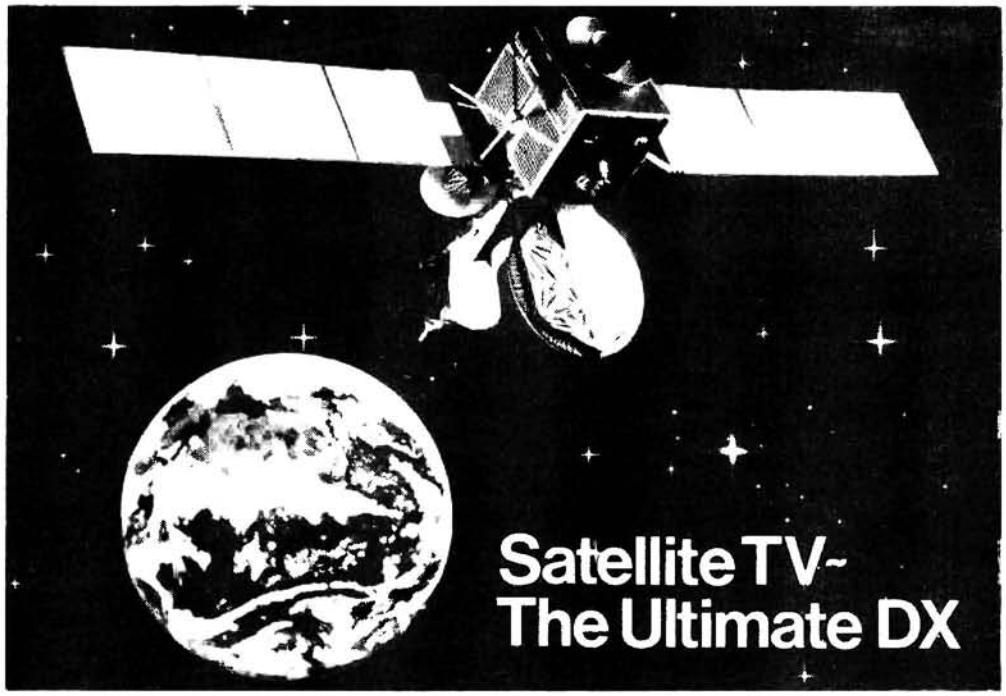
"UNILOC" is a Contest Scoring and Universal (Maidenhead) Locator program written specially for *Practical Wireless* by M. J. Richards G4WNC. This program will enable you to compute a Universal Locator from the latitude and longitude as well as the distance and contest score from your QTH.

The remaining four programs were all written by N. Dilley G8YBT. "DISTANCE" will give you the great circle distance and bearing between two points defined by their latitude and longitude. "ATV" provides two different colour test cards incorporating your callsign. One card is conventional while the second is a Union flag with callsign and QTH superimposed.

"LOGBOOK" should be self explanatory.

"SATRACK" is a comprehensive satellite tracking program. Any satellite, for which the orbital data is available, can be tracked using this program. Data for OSCAR 10 is provided with the tape and this can be updated using information published by AMSAT–UK or *Practical Wireless*. AMSAT–UK details can be obtained from 94 Herongate Road, Wanstead Park, London NE12 5EQ
enclosing an s.a.e.

PW Radio Programs–6 and 7 can be obtained from: *Practical Wireless Cassette Tape Offer, Department PWC1, ROCHESTER X, Kent ME99 1AA*. The price per tape is £3.75 including p&p and VAT.



Part 3 by Stephen J. Birkill* G8AKQ
The Satellites and Programmes

Having now examined satellites and their capabilities this concluding part provides guidelines for the would-be receiver constructor

Home-brew Trade-offs

While we have accepted a 12·5dB c/n for home use, commercial users, cable TV and (re-)broadcasters will demand higher video s/n, plus protection from rain fades, and may well specify clear weather c/n of 14 to 18dB with allowances for transponder end-of-life, antenna pointing error, and so on. These extra margins can soon add 6 or 8dB to the required G/T, demanding antennas in excess of the 3 metre size.

In contrast, the experimenter will want to see some kind of results with whatever antenna and noise figure are available to him. A home-brew waveguide mixer, using 1970s amateur 10GHz plumbing technology (Gunn or f.e.t. dielectric resonator oscillator, single-ended d.s.b. Schottky diode mixer in WG16) may be pushed to deliver a 10dB noise figure, and a surplus 1·2 metre dish with waveguide horn feed might achieve 50 per cent efficiency, giving a gain of 40dBi at 11·5GHz. The resulting G/T at some 5·9dB/K is 12dB shy of the value we have suggested for good picture quality, and at 0·5dB c.n.r. it will be difficult to resolve a picture at all behind the noise. But by narrowing the i.f. bandwidth it is possible to recover some of the missing information.

The use of pre-emphasis in f.m. TV means that, while deviation may be defined as 25MHz peak-to-peak, the low-frequency components of the video signal shift the carrier by only ±3MHz or so. Reducing bandwidth to as little as 6MHz can deliver a recognisable picture where previously there seemed to be only noise. A 0·5dB c/n in a 32MHz band becomes 7·8dB in 6MHz. Of course, all sound and colour subcarrier information is lost, and the gross truncation of bandwidth results in noise around vertical transitions and fine detail in the picture, but at least a picture can be seen. For a given carrier to noise density (c/n per unit bandwidth), a compromise would be chosen somewhere between these limits. My own experiments in the mid-70s used this technique to resolve with a 2·4 metre dish 4GHz INTELSAT signals intended for the 30 metre Standard A earth stations. A phase locked loop demodulator, operated with variable (below limiting) input level, gave effectively a continuously variable i.f. bandwidth in which to optimise c/n.

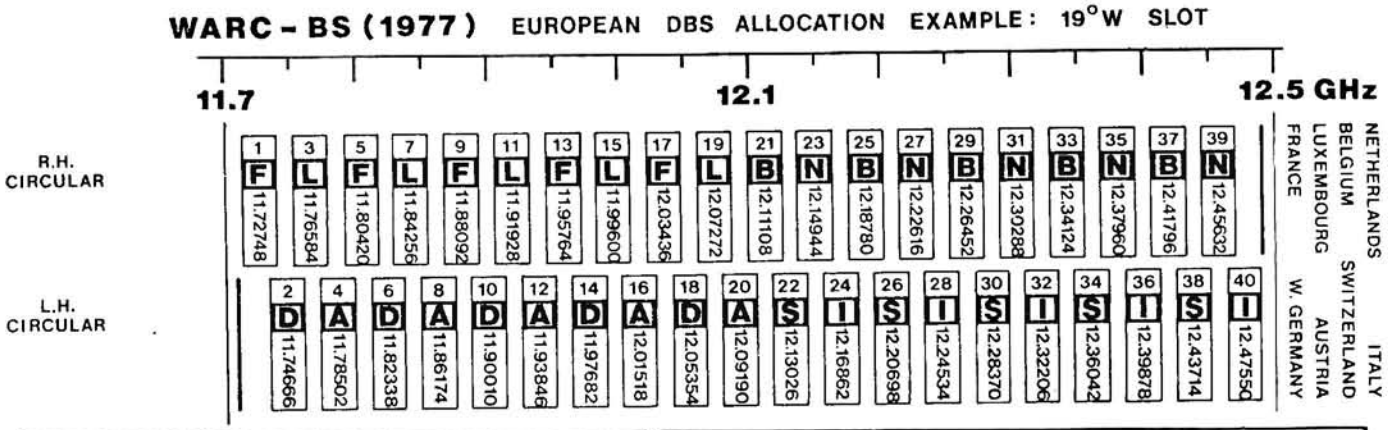
Suggestions for the Constructor

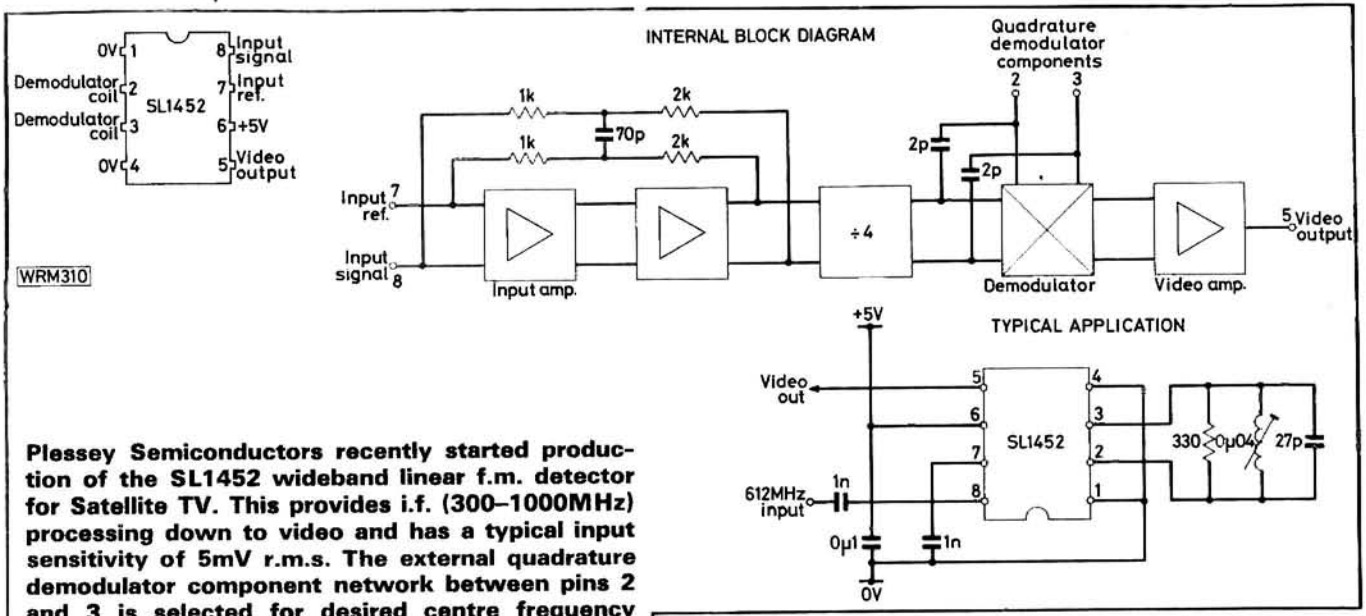
I feel *PW* readers will be a little closer to state-of-the-art than this, however. The ubiquitous Mitsubishi doppler oscillator/mixer module may be used as a front-end but with NEC and Mitsubishi GaAs f.e.t.s. of 2 to 3dB noise figure now available through amateur sources (the quieter ones are still rather expensive though), microstrip construction on low-loss ptfe board (such as Duroid) seems the obvious way to go. Achieving optimum performance over the full 750MHz band with the experimenter's limited access to microwave instrumentation may be a problem, but overall noise figures below 4dB should be well within reach. Taking into account antenna noise, a reduction of noise figure from 10dB to 3·5dB means a sensitivity improvement of 8·5dB (not 6·5dB—work it out), and the old 1·2 metre system is by then beginning to look quite presentable, delivering a c/n of 9·5dB on the ECS programme services.

The i.f. amplification, filtering and demodulation methods employed will depend upon your choice of second i.f. At u.h.f. a comb-line or interdigital filter can be used; at v.h.f. a lumped-constant filter of four or five elements will be necessary. Bandwidth of 25 to 30MHz is a good value to start with, if c/n performance is expected to be marginal. It is even possible to operate a p.l.l. demodulator without i.f. filtering, by careful control of the loop's drive level.

The baseband circuitry need not deter those experimenters unfamiliar with video techniques. The NE564 p.l.l. i.c. can be made to function as a wideband f.m. TV demodulator in the lower v.h.f. range (say 30 to 70MHz), as can several quadrature-type f.m. i.c.s—circuits have been published in *CQ-TV*, *Television* and other sources.

* *Mr Birkill is Technical Director, Satellite TV Antenna Systems Ltd.*





Plessey Semiconductors recently started production of the SL1452 wideband linear f.m. detector for Satellite TV. This provides i.f. (300–1000MHz) processing down to video and has a typical input sensitivity of 5mV r.m.s. The external quadrature demodulator component network between pins 2 and 3 is selected for desired centre frequency bandwidth

Don't attempt slope detection with an a.m. receiver without prior filtering and effective limiting—results will be disappointing. Video amplification requires only two or three transistors, or the NE592/µA733 may be used. A simple diode/capacitor d.c. restoration network will function as an adequate clamp, and sound subcarriers are most conveniently handled by tuneable upconversion to 10·7MHz, followed by an f.m. radio type of i.f./discriminator module. Remember the subcarriers are taken off the output of the video demodulator, prior to any low-pass filtering.

Finding the satellite should not be difficult. A home-made inclinometer (plumb-line and protractor) enables the antenna's elevation angle to be set with sufficient initial accuracy (±0·5°). The dish is then swept slowly in azimuth while the receiver is tuned, until signals appear. ECS F1 is powered full time with signals on both polarisations, and is ideal for system alignment. Having acquired the satellite, careful tweaking of azimuth, elevation and polarisation angle will bring the signals steeply out of the noise. The real problem comes when the family gets hooked on *Music Box* or movie channels, and commandeers the terminal!

Olympus, the joint EBU/Dutch TV pan-European channel, will operate via ECS F1 transponder 3.

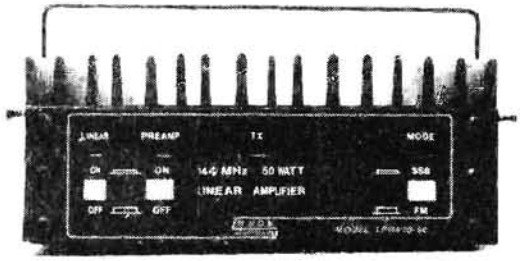
The Legal Aspect

At the time of writing (March), the extent of the proposed liberalisation is unclear, and a licence may or may not be available and/or necessary. Even with a legal framework in place to permit SMATV or QDBS reception from fixed-service (non-broadcast) satellites, the use (reception) of a programme service without the programmer's permission, even for no commercial gain, would constitute signal piracy or "theft of service". Permission to receive may be general, in the case of a service supported by advertising, or specific on payment of a subscription fee. It is inevitable that, in the course of time, the pay-programme providers will find it necessary to introduce scrambling (or some other security measure) in order to control access to their services and protect their revenue. ●

LITTLE AND LARGE

Little in Size, Large in Output

The New 'LP' Series



2m Mobile 50W Linear from B.N.O.S.

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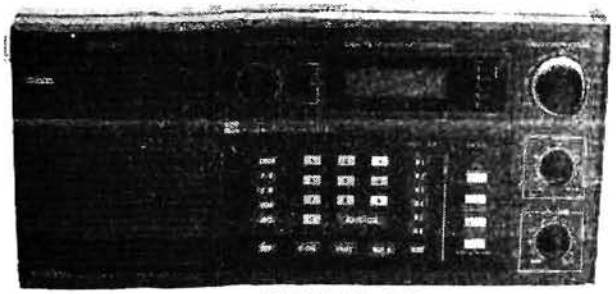

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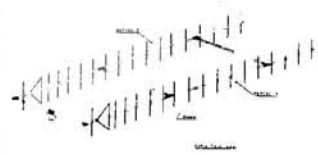
DELTA YAGI for 934
DTY-934

The DELTA YAGI is designed for the 934MHz (32cms) band, and NOT an adapted T.V. aerial.

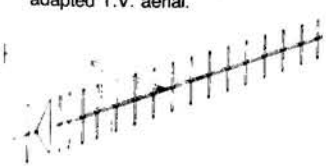


DTY £54.00

The DELTA TWIN YAGI is a pair of D.Y. 934 yagi arrays coupled by OUR co-phasing unit.

D.T.Y. aerial comes complete with co-phasing unit, spacing arms, and a clamp to fit up to a 2in mast.

Termination of the D.T.Y. is to an "N" socket.



D.Y. £20.00

D.Y. aerial comes complete with stand off arm and clamp to fit up to a 2in mast.

The DELTA FOUR (not shown) is four bayed and stacked DY18's, with phasing "UNIT 4".

Price complete is **£100.**

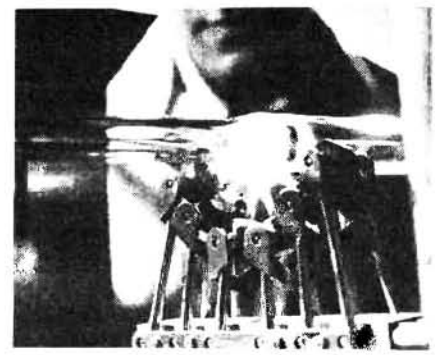
News

Queen's Award for BT

British Telecom Research Laboratories' work on optical fibres has won the Queen's Award for Technological Achievement.

The award recognises the development of singlemode optical fibres used in telecommunications. The fibres are more efficient, require fewer amplifiers along the route and reduce the cost of modernising the UK long distance network.

Telecom's optical fibres are produced in its research laboratories at Martlesham Heath, Suffolk, and the photograph shows the part of the process where the chemical ingredients are passed through a vacuum



in the hollow of a super-heated tube of silica wherein thin layers of the purest optical glass are gradually built up.

Nice one, BT!

Golden Jubilee Award

To celebrate its Golden Jubilee in 1985, the Ipswich Radio Club, in association with the Ipswich Borough Council and Arrow Electronics, will present a special Award Certificate signed by the President of the Club and the Mayor of Ipswich for contacts made during 1985 with Ipswich Club members and stations in the County of Suffolk.

Basically, only contacts made during 1985 will count for the Award, made on any amateur band by any mode of transmission, with contacts on bands above 1296MHz counting as double. The Award is also available to s.w.l.s.

For full details of the Award rules, send an sae to: *Alan Owen G4HMF, 102 Constable Road, Ipswich IP4 2XA.*

Radio Book Source

Interbooks, is a new UK company formed by Interproduct Ltd. to deal solely with the importation and marketing of books for the amateur radio operator and shortwave listener, and also to supply the trade.

The books come principally from Europe and the USA that are not normally available in UK book shops — many titles are included on their list.

The company has sole importation rights for Michiel Schaay's books, which include *Shortwave Facsimile Frequency Guide* and *Maritime Radio Handbook*. They are also marketing Joerg Klinenfuss's *Guide to Utility Stations 1985* and his other publications.

New titles are being added all the time so, to be put on their mailing list or to obtain a copy of their free catalogue, contact: *Interbooks, Stanley, Perth PH1 4QQ. Tel: Stanley (073882) 575.*

Morse Tests at Rallies

Depending on where you live, and if you are intending to upgrade your licence to class A, you will probably find that the growing facility of Morse Test stations at local rallies very useful.

At the following rallies the facility will be available: Elvaston Castle (it may be too late to book this one)—9 June; Longleat—30 June; Brighton—14 July; Welsh Convention at Blackwood—6 October; and the Leicester Exhibition—25/26 October.

Further details should be obtained from the rally organisers or from: *Mr. Gavin Williams, BTI Radio Station, Worston Lane, Highbridge, Somerset TA9 3JY.*

Shop News

An announcement made recently by Amateur Radio Exchange and Amateur Electronics Ltd., confirms that Amateur Electronics Ltd. of Birmingham has purchased the lease and goodwill of the shop occupied by Amateur Radio Exchange of London. Amateur Radio Exchange of London will continue to operate under the ownership of Amateur Electronics Ltd. of Birmingham, but both Bernie and Brenda will be available to Amateur Electronics Ltd. on a consultancy basis for continuity of the London business for a limited period.

Customers who frequent the London Shop can be assured that Amateur Electronics Ltd. will continue to offer the same policies adopted by the previous owners, offering good service and a friendly welcome to all callers.

This sale, of lease and goodwill, is for the London shop only and the Northern branch of A.R.E. will continue under the ownership of both Bernie and Brenda as before, managed by Peter Roberts G4KKN, and will trade as A.R.E. Communications. Under this banner they will continue to exhibit at rallies and exhibitions throughout the UK, and both Bernie and Brenda will attend at as many as possible.

Class B CW Permit

At the time of writing this piece (mid-April), over 6000 applications for "Notice of Variation" to the Class B licence, which allows c.w. operation over permitted bands, have now been processed by the RSGB.

This year-long experiment ends on 31 March 1986, however, Class B licence holders who have not yet applied, may make an application at any time, albeit the closing date for the experiment will remain the same.

To obtain the "Notice of Variation", simply send details of name, address and callsign, enclosing two 17p stamps to: *RSGB, Lambda House, Cranborne Road, Potters Bar, Herts. EN6 3JN.*

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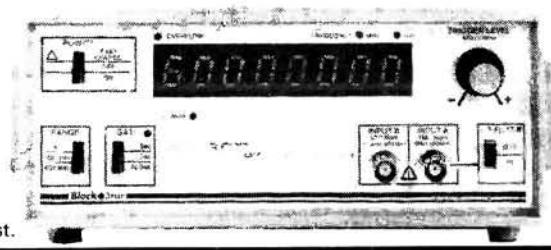

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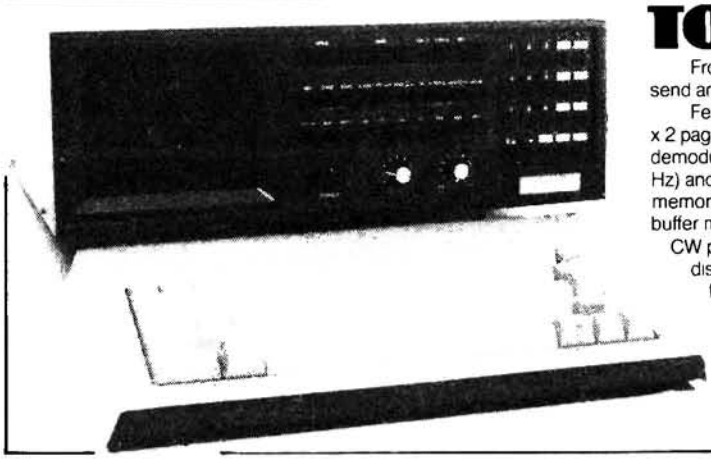

TONO FOR RTTY. 5000E

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

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

ICOM

Thanet Electronics Ltd
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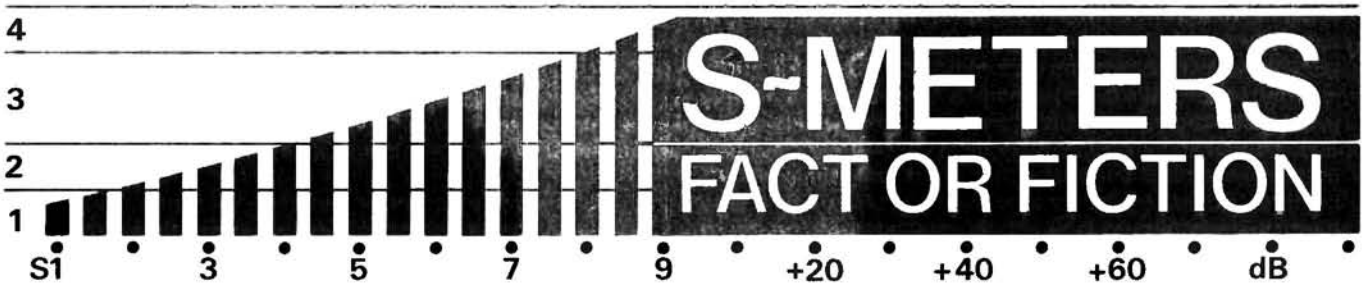
Geoff ARNOLD G3GSR



S-METERS
FACT OR FICTION

Reporting the strength of a received radio signal is often of interest, to let the distant station know how well he's getting out, or simply as part of a continuing reception record, for example.

Commercial operators use a 5-point scale, laid down in the Q-code "QSA":

QSA1: Scarcely perceptible
QSA2: Weak
QSA3: Fairly good
QSA4: Good
QSA5: Very good

Note that this is a subjective scale, in other words it depends on the operator's judgement, not on reading an indication on a meter scale.

Radio amateurs use a 9-point scale, the familiar S-rating, which has also been adopted by the CB fraternity who for some reason call S-points "pounds". Again, there is a subjective scale, though with nine grades it is always difficult to judge which one any particular signal warrants.

S1: Faint, signals barely perceptible
S2: Very weak signals
S3: Weak signals
S4: Fair signals
S5: Fairly good signals
S6: Good signals
S7: Moderately strong signals
S8: Strong signals
S9: Extremely strong signals

Most receivers and rigs intended for amateur use incorporate an S-meter, calibrated from 1 to 9 and then in decibels over S9, usually spoken of as "S9 plus 20" or "20 over 9" if the meter indicates S9 + 20dB, for example. But what does S9 mean in microvolts of signal?

Over 40 years ago, several receiver manufacturers tried to get a standard adopted, in which S9 represented 50μV at the antenna socket, and from one S-point to the next was a change in level of 6dB. It didn't catch on, probably because it is very expensive to design a metering circuit which is anywhere near accurate across several frequency bands, or from one receiver to another, even of the same model. The S-meter is normally driven from the receiver a.g.c. line, and the voltage level there will depend not only on the strength of the incoming signal but also on tuned-circuit alignment and tracking, component tolerances, transistor or valve gain, etc. And on whether you've turned the r.f./i.f. gain control to maximum!

Then in 1981, a similar scale was adopted as a Recommendation at the Region 1 Conference of the International Amateur Radio Union (IARU). Figures for S9 were 50μV for frequencies up to 30MHz and 5μV above 30MHz, though the now-fashionable method of specifying the signal level in decibels relative to a power of 1 milliwatt (in an impedance of 50 ohms) was used. A potential difference of 50μV across 50Ω produces a power of 73dB below a milliwatt, which abbreviates to −73dBm. For v.h.f. and above, the 5μV figure across 50Ω represents −93dBm. The interval between S-points on the IARU scale is again 6dB. The table shows signal levels corresponding to signal strengths from S1 to S9 +40dB, calculated on this basis for frequencies below 30MHz. For the higher frequencies, add −20dB to each figure in the dBm column and divide each figure in the voltage column by 10.

The Acid Test

How do modern receivers and transceivers measure up against this standard? Is there really any point (pardon the pun) in the heated arguments on S-meter readings one hears over the air or at the local radio club? To get some idea, I've looked back through the reviews of h.f. equipment that we've published in the past few years, and produced the graphs shown here from the lab test results. The first set of graphs is for S-meter readings plotted against signal strength, all at a frequency around 14·1MHz. The second set shows the variation in signal strength required to achieve an S9 reading on each h.f. amateur band. In each case, the solid straight line is the IARU standard, and the dots are the results for that particular piece of equipment.

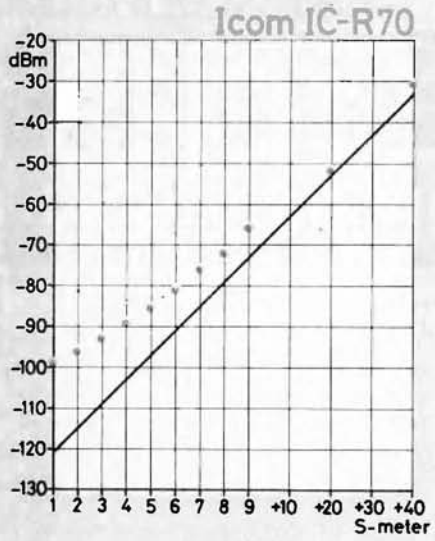
I must stress that each graph gives the results of tests on one sample only of the model quoted. We don't often get the opportunity to test more than one of each model, but where we have done, I've found the results vary quite a lot from one to another where amateur equipment is concerned. Comparing results of test measurements which have been published in other magazines generally supports this feeling. On the other hand CB rigs, which we usually test in pairs, have proved remarkably consistent for different samples of the same model. Presumably this is because the whole circuit design is for one frequency band only—a very much easier job.

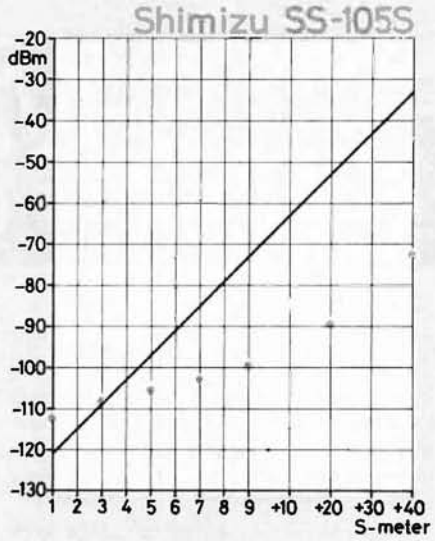
If you've got one of the receivers or transceivers covered in the graphs, please don't believe that you can apply our figures as a calibration curve for your set, and don't write to me saying our figures are all wrong if you've been able to check your S-meter calibration with an accurate signal generator. The figures aren't wrong, they're just different.

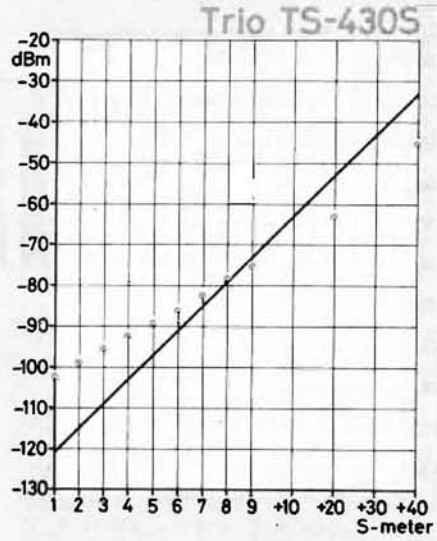
Fact or Fiction?

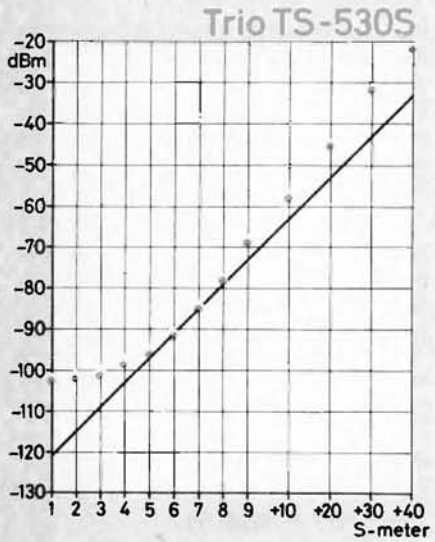
Well, you can form your own opinion from the graphs, remembering that each 6dB between a dot and the IARU standard line means an error of one S-point in the reading. When you consider the proportion of the price of each equipment that must be devoted to the S-meter circuitry, I don't think they're too outrageous. The Shimizu SS-105S

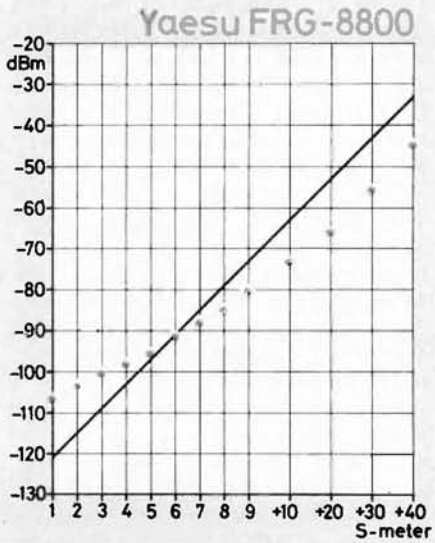
S	HF bands dBm (V over 50 ohm)
9 +40dB	−33 (5mV)
+30dB	−43 (1·6mV)
+20dB	−53 (500μV)
+10dB	−63 (160μV)
9	−73 (50μV)
8	−79 (25μV)
7	−85 (12·6μV)
6	−91 (6·3μV)
5	−97 (3·2μV)
4	−103 (1·6μV)
3	−109 (0·8μV)
2	−115 (0·4μV)
1	−121 (0·21μV)

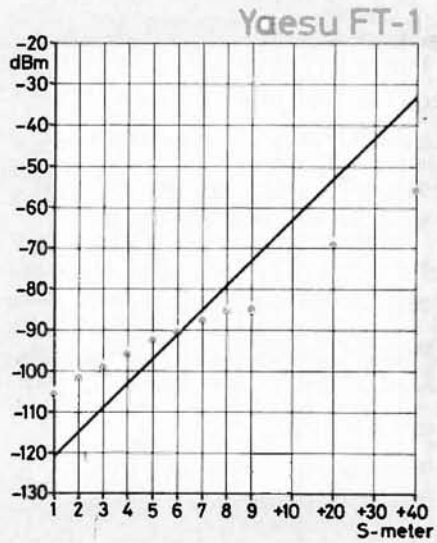


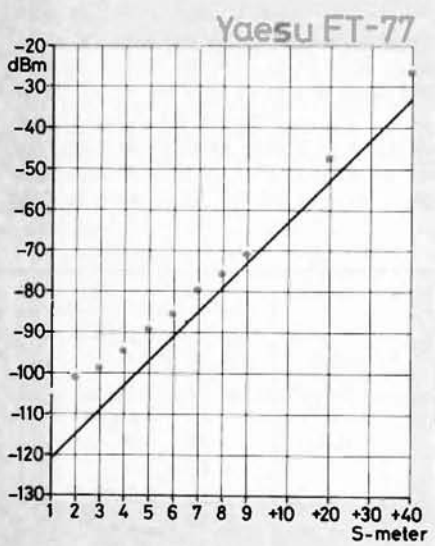


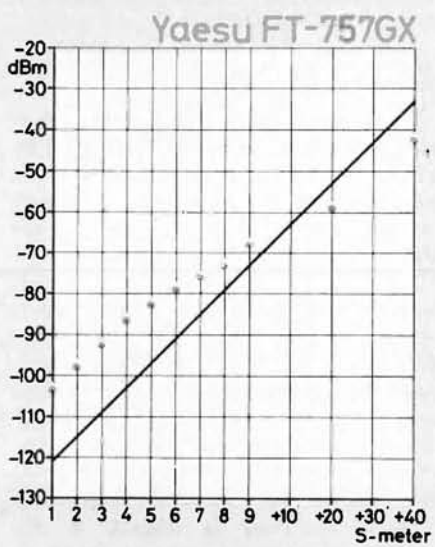


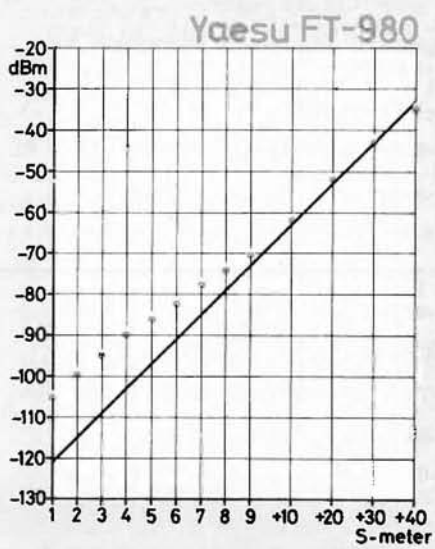








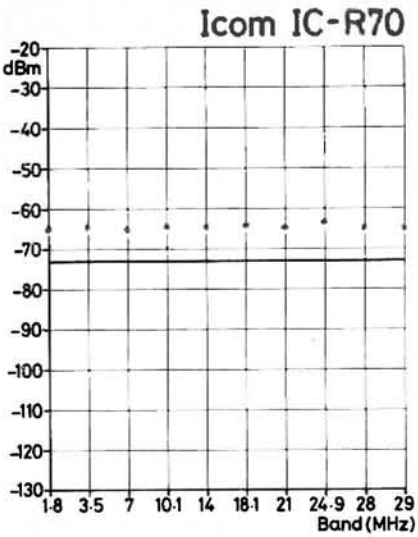


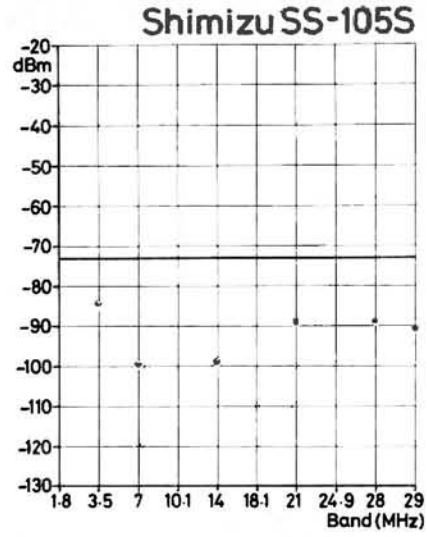


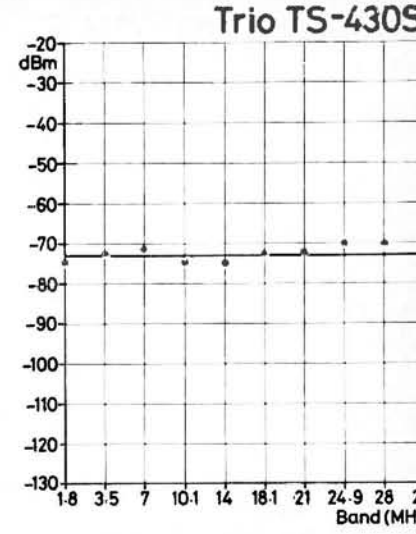
S-meter checks at 14·1MHz. The solid line is the IARU recommended scale; the dots show the actual input level required to produce the various readings

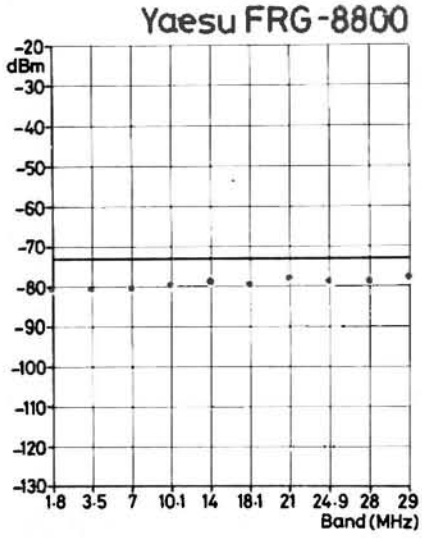
is a part-kit transceiver which I built, and the S-meter calibration control was set up on the basis that a signal that I judged subjectively to be an S1 just didn't move the meter needle off the stop, but anything stronger did. Hence it's rather different to the remainder.

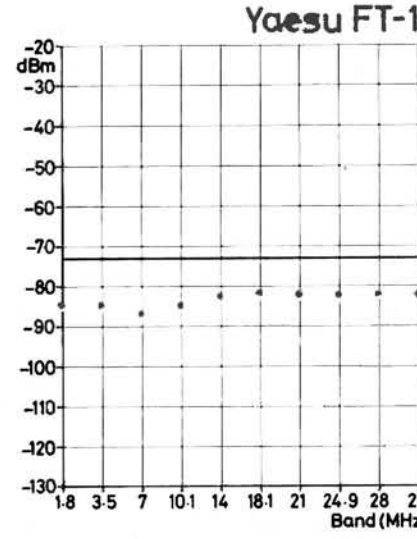
An S-meter is a useful instrument for comparative reports on equipment

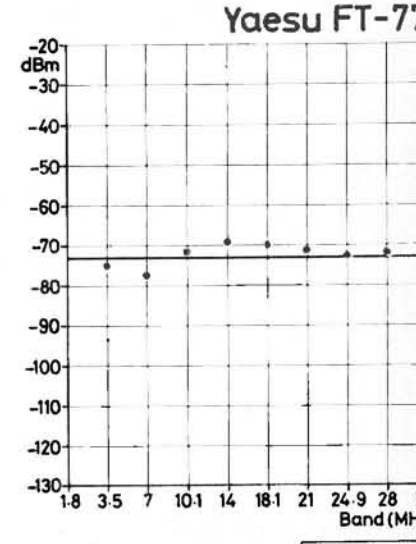




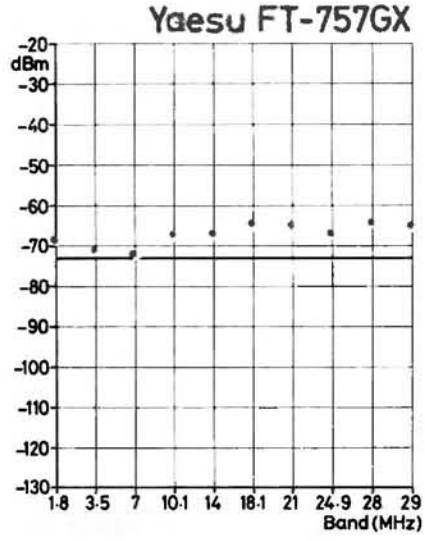


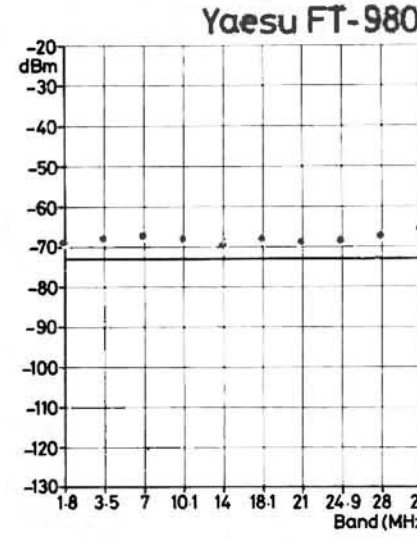






WRM294





Variation of S-meter sensitivity with frequency. Again, the solid line is the IARU recommendation; the dots the actual input needed for an S9 deflection on each band

changes, antenna adjustments, etc., assuming that propagation conditions are constant over the path from transmitter to receiver. There's no point though in trying to read more accuracy into the meter indications than is really there.

Greater accuracy needs at the very least a properly calibrated r.f. attenuator, which can be adjusted to return the meter needle to the same reading after each change in incoming signal level. The amount of the change is calculated from the alteration required in attenuation. This way, any non-linearity in the S-meter has no effect on the accuracy of the results.

A more sophisticated method requires a calibrated signal generator, tuned to the incoming signal frequency, which can be connected to the receiver antenna terminal in place of that signal and adjusted in level to give the same S-meter reading. Then, signal generator output level equals incoming signal level.

Or, of course, if you have a few thousand pounds to spare, you could always buy a proper measuring receiver, but that's another story! ●

PRACTICAL ATV TECHNIQUES

Part 5 by Allan Latham G8CMQ

Having stated in Part 4 that triplers should be considered obsolete I offer this month some practical advice for the would-be constructor.

Video and Sound Processing

Whichever method you use to generate r.f. you will need to do something with the video and sound before it gets to the free-running oscillator. The video needs pre-emphasis. The usual pre-emphasis filter network attenuates the lower frequencies so you will need some video gain before the filter. The sound stage usually consists of an op-amp to amplify the microphone signal, an audio pre-emphasis network and a 6MHz oscillator, frequency modulated by the sound. Because wideband f.m. sound is used this is a free-running oscillator. The video and sound sub carrier are both applied to the oscillator (at 430MHz or 1·3GHz depending on the method you use). Care must be taken to get the levels of video and sound right. Too little 6MHz and you will need a P5 picture before sound can be heard—too much and sound/chroma beats will spoil the picture due to the interaction between the 6MHz and the 4·43MHz colour sub carrier.

Refinements

On the tripling side it is possible to start at 430MHz and triple at a low level, e.g. 100mW and then amplify at 1·3GHz. There seems little, if anything, to commend this arrangement. Frequency locking is important in some areas (mainly commercial), for example an unattended repeater. The way to do this is to sample the r.f. and compare it with a standard either by division or mixing. The resulting error voltage from a phase comparator is amplified and filtered to remove the video and applied to the oscillator varicap, thus completing a phase locked loop. If frequency stability is part of the specification a lock indication signal will be provided to enable the p.a. stages and prevent an unlocked output occurring. This scheme will hold the "average frequency" constant, a more sophisticated system is needed to hold sync tips or black level at a set frequency. I have seen a commercial design for a nearby band which uses a high level oscillator (about 1W) and simply phase-locks this to a reference—however in this case the frequency lock is essential because without it the 1W oscillator would drift far too much. The straightforward approach of a stable low level oscillator followed by amplification is much more suited to amateur needs. If necessary frequency lock can be added later.

High Power

The only sensible way to generate high power on this band is by using valves, and the only range readily available to amateurs is based on the 2C39. This is a triode valve with connections to the electrodes made via rings, Fig. 5.1. These valves are always operated in grounded grid mode with the grid at d.c. ground. An arrangement to keep a constant positive bias on the cathode is needed. One side of the heater is joined to the cathode so the heater winding must not be earthed. Arrangements are needed to feed the heater through suitable r.f. chokes because the cathode is "live" at r.f.

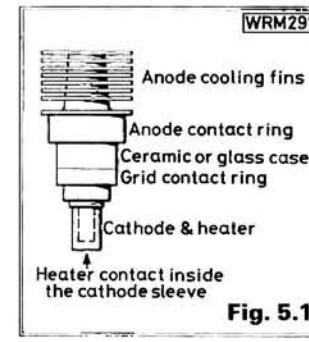


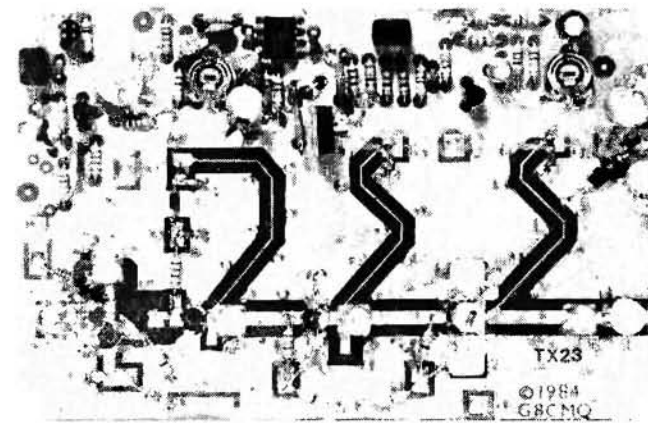
Fig. 5.1

This configuration in a suitable cavity will achieve about 50W out for 5W input—forced air cooling is essential. Two valves in a common cavity can achieve more than 100W output with 10W of drive. Before contemplating using this power level you should consider the alternative of putting a transistor TX at masthead.

Practical Triplers

Personally I would not recommend anyone to use the tripler method to get onto 1·3GHz but I know that many triplers are in existence—sometimes they can be found at rallies. Often the narrow band 1·3GHz enthusiast will have one from the old days before linear transverters were available. Some of these beasts will have been used to obtain 1152MHz for local oscillator injection or for high level mixing in transmitters.

Suppose you have one of these triplers and you want to use it for 1·3GHz ATV. You will want the maximum efficiency and you may also need to retune it—a good



The Solent Scientific "direct method" . . . video, audio and 12V d.c. in —1W of 1·3GHz f.m. ATV out. For those interested in QRO a matching 10W solid-state p.a. is also available

WRM306

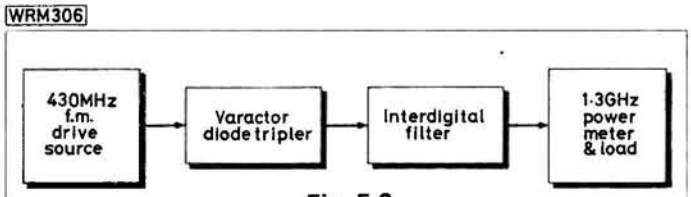


Fig. 5.2

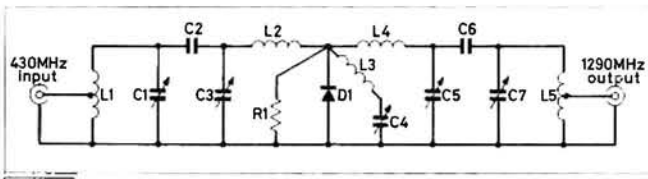
tripler can achieve 50 per cent efficiency but unless you have carefully optimised it 25 per cent is more likely. Before even considering modifications you will need an interdigital filter. This is a device containing three tuned circuits at 1·3GHz and a good example is described on page 9.20 of the *VHF/UHF Manual* (4th edition) from the RSGB. The reason you need this is that triplers produce a lot of energy on frequencies other than the third harmonic of the input—the fundamental and second harmonic are particularly strong. If you attempt to make any adjustments on the basis of the unfiltered output of a tripler you are in for some shocks—your licence doesn't cover 860MHz!

Those of you with access to a microwave spectrum analyser don't need me to tell you how to use it! Such a device will graphically illustrate why you should leave the interdigital filter in line for normal use, as well as for testing, Fig. 5.2.

To see how we can modify our tripler for more efficiency, let's look at how it works. The circuit of your tripler may not be quite like the circuit shown in Fig. 5.3 (and that may be one reason for the lack of efficiency) but this circuit demonstrates the principles. The diode D1 is a varicap diode specially made for this application. All diodes exhibit varicap properties to different degrees, i.e. their junction capacitance at zero volts and the rate of change of this capacitance as the volts change. In addition the losses in the "capacitor" will vary and it should also be remembered that parasitic properties, i.e. stray inductance, matter, too. If your diode was not recommended by the manufacturer for this job you may be lucky—then again you may not be! You can't go by type number either if you are using other than the correct diode—all 1N4007 diodes may perform the same way at d.c. (or 50Hz) but they will not all be the same at 1·3GHz.

The object of the input network L1, C1, C2, C3 and L2 (plus the diode reactance) is to couple as much 430MHz power onto the diode as possible. This will cause the diode capacitance to vary as the voltage across it varies at 430MHz. Tuned circuit L3/C4 (and the diode reactance) resonates at the second harmonic (860MHz). This provides a low impedance path through the diode at this frequency. The output network L4, C5, C6, C7 and L5 (plus the diode reactance) couple the maximum 1·3GHz power off the diode and into the output load. Resistor R1 provides a d.c. return path for the diode.

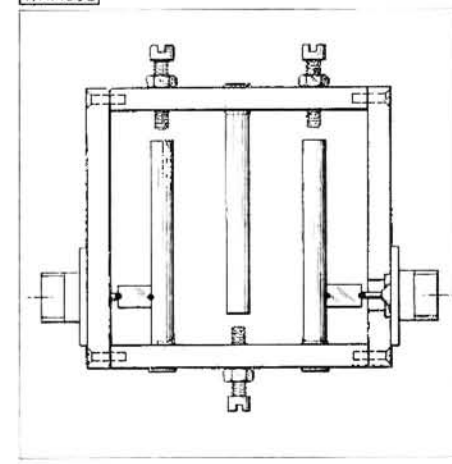
The presence of the second harmonic circuit reminds us that this type of tripler does not work in the same way as a valve tripler in class C, where the output tuned circuit is given a burst of power every third cycle and is expected to



WRM305

Fig. 5·3: Circuit diagram of the Varactor diode tripler described in the text

WRM302



A cross-section through an interdigital bandpass filter. The tuned λ/4 "finger" elements provide good harmonic rejection

"ring" enough to provide the harmonic power. In the Varactor tripler the second harmonic circuit (often called the "idler") is kept ringing by the presence of second harmonic energy generated by the varying capacitance of the diode. Second harmonic energy recovered in this way is available to mix with the incoming fundamental to produce accentuated third harmonic across the diode. Perhaps some mathematical reader can give a more in-depth explanation for us practical types—but suffice it to say that the idler circuit is extremely important—losses here will lower the efficiency.

What are the main causes of loss? First candidate must be capacitors, especially those working at 1·3GHz. Capacitor C6 is in the most critical position—if you are lucky it will burst into flames and self-destruct as you wind the input power up, thus confirming that lots of your efforts were being wasted by C6 converting r.f. into heat! I have found no commonly available component that is suitable for use at this position. Fortunately you only need a fraction of a pF and you can fabricate a suitable device by soldering a copper tag onto the body of C5 and bending it near C7 (or vice versa)—a tag measuring about 5mm × 5mm located within 1mm of C7 should do. Be careful that by doing this you do not unintentionally extend the tuned lines L4/5. You will have to experiment. Incidentally, if you use a capacitor to couple directly from the Varactor diode to the output circuit, Fig. 5.4 (e.g. *VHF/UHF Manual* page 9.19), you have almost no control over the match between diode and antenna—as well as having a lossy component at 1·3GHz. I strongly advise you to adopt the circuit arrangement of Fig. 5.3 instead.

Other capacitors can cause considerable loss. Capacitor C2 is in a highly stressed location due to the high r.f.

WRM304

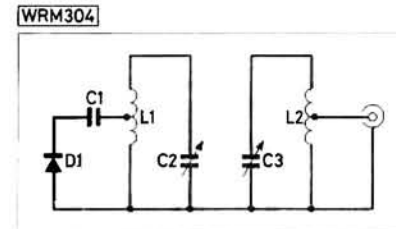


Fig. 5.4: (Above) The *VHF/UHF Manual* output arrangement mentioned in the text—L1 and L2 are close coupled.

WRM303

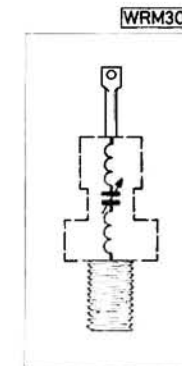


Fig. 5.5: Varactor diode with equivalent internal elements

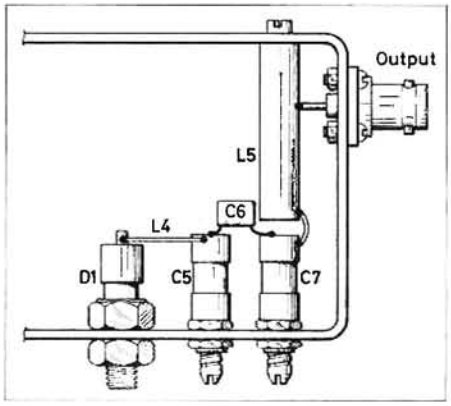
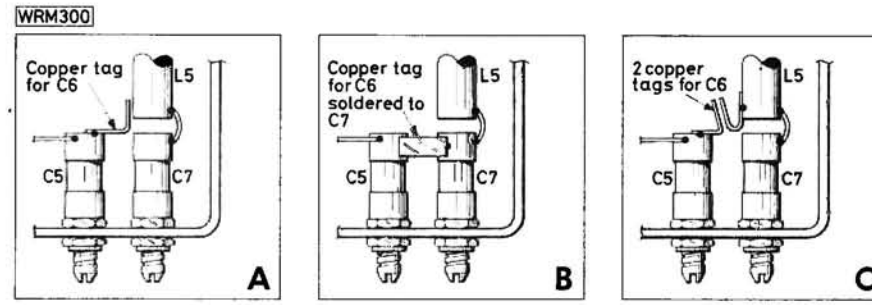


Fig. 5.6: Output circuit and alternative arrangements. Version A extends L4 and may be impossible to tune out with C5. B does not extend L4 much and C is possibly better still



voltages that are present and although not a major problem for losses it should be replaced by a homemade air-spaced one like C6, although a little larger. Both C5 and C7 (and to a lesser extent C4) tend to be lossy because of the frequencies involved. Variable ptfe capacitors or glass piston types are suitable, as are homemade airspaced ones, e.g. 5mm (2BA) screw into a 6mm diameter copper pipe. You will have to look out for all these at rallies—commercially available ones cost about £5 each and this will negate the idea of a cheap tripler. Some ceramic capacitors may be satisfactory but it is likely that they will cause problems. Variable capacitors C1 and C3 are not as likely to cause as much degradation as the others but beware—although the percentage loss is less at 430MHz the fact that you may be putting three times as much power in at 430MHz as you get out on 1·3GHz may cause unacceptable heat dissipation. Excessive heating of these capacitors may cause detuning and even more heating of the capacitors or electrical breakdown due to high s.w.r. Ceramic trimmers can self destruct this way but often the solder melts first! In short, for decent power levels you need ptfe here, too.

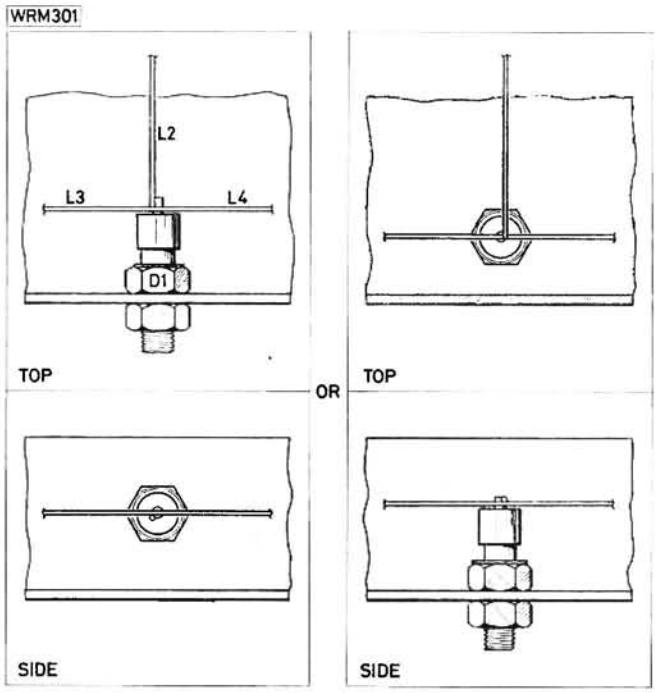


Fig. 5.7: The physical arrangement of L2/3/4 should minimise coupling; the above layouts work well

Alignment

Once you have removed the biggest losses you will need to realign everything. The first thing to do is to look at the connections onto the diode because if these are not arranged properly tuning can be a nightmare due to interaction between the tuned circuits. (This is present anyway to an uncomfortable extent so we must do what we can to minimise it).

The diode itself is a tiny piece of semiconductor inside the case and joined to the outside world by wires (i.e. inductances). It is impossible to avoid having some inductance common to the three primary tuned circuits, Fig. 5.5.

Connections to L2, L3 and L4 should be as close to the diode body as possible, e.g. 1mm, and should all join at the same point. The physical arrangement of L2–4 should minimise coupling. The layout shown in Fig. 5.7 has been found to be very good.

Now to begin alignment. Connect a source of 430MHz r.f. at about the 1W level through an s.w.r. meter into the input of the tripler. Set capacitors C1 and C3 to about the same value and adjust them together until a "kick" is seen in the reflected power. There is no point going further with the tuning of C1 and C3 for the moment. To align the 1·3GHz output circuit C5/7 you need a source of 1·3GHz r.f. (Catch 22 if ever there was!). Amateurs are generally very obliging and you should be able to find someone who can help. This source of r.f. should be clean—feed it through an interdigital filter then an s.w.r. meter and onto the output socket of the tripler. The s.w.r. meter need not be specially accurate. Tune C5 and C7 until a kick is seen in the reflected power. Now connect the tripler in its normal mode but with an s.w.r. meter between the 430MHz source and the tripler input. Connect the output via the interdigital filter to a power meter and dummy load. The power meter need not be accurate on 1·3GHz and a dummy load rated for lower frequency operation can be improved by feeding it through about 10 metres of thin "lossy" coaxial cable. Apply 1W of 430MHz r.f. and adjust the idler circuit variable C4 until some 1·3GHz output is seen—if you don't see any try a little more r.f. input, up to about 5 or 10W should be safe. If you still fail to see any 1·3GHz output carefully adjust the input circuit C1/3 for minimum s.w.r. (maximum forward power on the 430MHz meter) and try C4 again. If you still have no 1·3GHz output, then something is not resonating—probably the idler.

Once you obtain some output you can peak C5 and C7. At this stage you can increase the input power to the level you intend to use. Adjust C1 and C3 systematically—increase one and retune the other until maximum output

power is obtained on 1·3GHz. Input s.w.r. should be reasonable by now. Readjust the idler. Systematically adjust C5 and C7 in a similar way—increase one and retune with the other until you are sure you have found a true peak. One more time round readjusting the input, idler and output should be sufficient.

Finally, switch off the 430MHz source and wait for a few seconds—switch it on again and observe that the 1·3GHz r.f. reappears at the same level. If it doesn't you will have to detune one or more of the circuits and repeak the others and try once again. The reason for this appears to be some sort of hysteresis effect in the diode, creating two stable states in the same circuit at the same frequency.

Heatsinking

One thing to be said for triplers is that some diodes, e.g. BAY96 types, can take 40W of 430MHz and produce about 20W at 1·3GHz. That leaves 20W of heat to get rid of. If you intend to run at this sort of level you will need substantial heatsinking (or a steady supply of diodes).

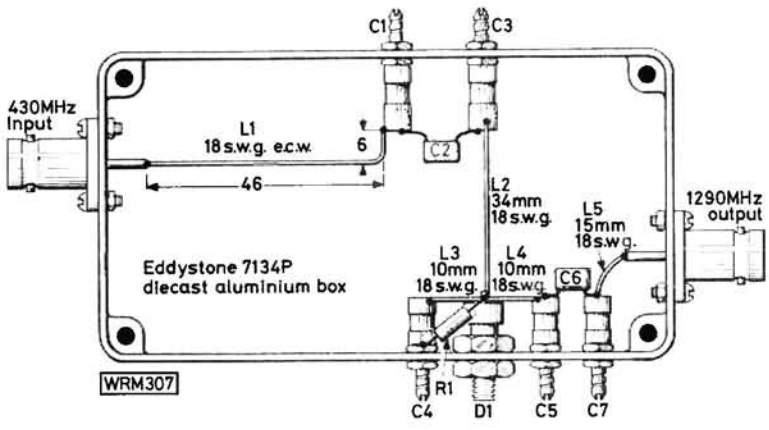
I hope this dissertation has not deterred anyone from trying to improve a tripler. Indeed if you follow the guidelines and obtain a good diode you will almost certainly meet with success.

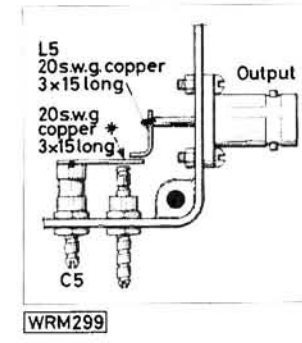
If you are setting out from scratch on 1·3GHz then the economics of 430MHz and tripler vs 1·3GHz direct are just about in balance. As transistor technology improves and the supply of Varactor diodes becomes more difficult, due to lack of commercial demand, the balance will swing more and more to direct r.f. generation at 1·3GHz.

Caution

In conclusion—a word of caution. High level microwave r.f. fields can cause heating effects in biological tissue (i.e. **YOU**). The effect of this heating can induce headaches at low levels of r.f. long before the heat is actually felt. Long term effects are believed to include blindness. Please keep well away from any antenna radiating even modest powers. The official safe figure is 10mW per cm² although other countries specify much lower levels. As for myself I prefer to keep **at least** 30m from the antenna. For a main station with an antenna well clear of obstructions, these cautions should present no problems. However if you go out portable do be aware of and careful with all your microwave energy.

This concludes Practical ATV Techniques for the time being. Your "practical" feedback is always welcomed—ATV activity reports please to Ron Ham. Watch out for further ATV articles in the near future. ●





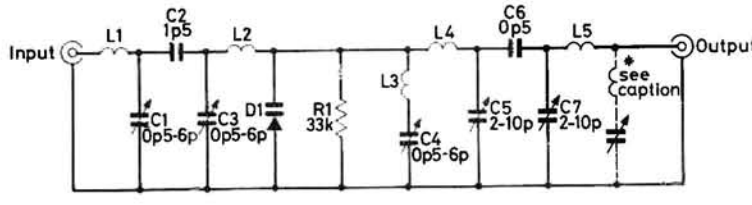


Fig. 5.8: A "practical" tripler from Mick Senior, G4EFO, of RMG/Sussex Repeater Group. Typical diodes are VBC 77J, BXY37D, BAY 96 or even several 1N4148s in parallel (for QRP). Martin Newell, G8KOE, recommends adding the 860MHz harmonic trap across the output (shown dotted). The alternative output arrangement above has been used by G0API and ensures low loss by using air dielectric "gimmick" components for C6/7

by S. Niewiadomski
Part 4

PW 'COLNE'

Direct Conversion Receiver

When all the boards for the *PW* Colne are completed, they should be carefully checked for solder splashes causing short circuits. Check also that all the polarised components, including the i.c.s, have been inserted the right way round.

Mechanical Construction

Details of the two brackets which have to be made are shown in Fig. 4.1. Bracket A forms the front wall of the v.f.o. enclosure and has 2C1 and its slow-motion mechanism mounted on it. Bracket B forms the side wall of the v.f.o. enclosure and also supports the r.f. amplifier board. The positions of these brackets in the case can be seen from Fig. 4.2. They are held in the case by 6BA screws and nuts.

The drilling details of the case are shown in Fig. 4.3. The prototype had a 20 × 15mm cut-out in the front panel through which the dial is read. If you intend to use a digital read-out for the frequency indication, this cut-out can be omitted. There is insufficient room in the case used for the prototype to accommodate a digital read-out so a separate unit could be built or a general purpose frequency counter used. No internal speaker has been included because this can result in microphony problems in a direct conversion receiver.

The slow-motion drive arrangement is shown in Fig. 4.2. By using two 6:1 reduction drives in series, a total reduction of 36:1 is achieved. In practice, these drives tend to have a reduction ratio of more than 6:1, so typically the total reduction can be more than 40:1. With a tuning rate as slow as this, no fine tuning control for the v.f.o. is necessary. The usual problem with this arrangement is that no tuning dial can be fitted because the front reduction drive prevents a dial from being fitted to the rear drive. The mechanism to overcome this problem is as follows.

The 6:1 reduction drive closest to 2C1 has a flange which rotates at the same rate as the rotor of 2C1. Disc B (shown in Fig. 4.4, along with the dial, disc A) transfers the motion of this flange outside the body of the front 6:1 drive so that disc A can be attached using lengths of 6BA studding. Disc A therefore also rotates at the same rate as the rotor of 2C1, so a dial can be drawn on disc A to give an indication of the received frequency.

Many materials are suitable for making discs A and B. Any rigid sheet material such as aluminium or brass can be used. The prototypes were made from unetched double-sided p.c.b. material, which is easy to work and takes rub-on lettering for calibrating the dial.

The reduction drive closest to 2C1 is mounted onto bracket A by two lengths of 6BA studding, whereas the front drive can only be attached by one length, to allow the studding connecting the two discs to rotate freely. If a drive with two fixing lugs is used in the front position, its lower lug must be removed.

Brass bushes are used to support the shaft of the front drive in the front panel and to hold disc A concentric with the whole mechanism by slipping on this shaft. As supplied these bushes are too long and so should be cut down so that no thread protrudes beyong the fixing nut.

When all the boards and mechanical details are completed, assemble the receiver using 6BA screws and nuts. Space the boards above their mounting surfaces using extra nuts on the screws. The order of assembly of the slow-motion mechanism, 2C1, bracket A and the 9MHz oscillator and frequency converter board is fairly critical and so is described in some detail here.

Mount the board in the case first and assemble 2C1, bracket A and the slow-motion mechanism out of the case. Set 2C1 to its mid-way position and set disc A with its bottom edge parallel to the bottom edge of bracket A. Push the front panel brass bush over the drive shaft and then pass the shaft through the front panel and locate bracket A over its mounting holes. Insert the fixing screws and loosely tighten the nuts. Fit the nut to the brass bush protruding through the front panel and tighten everything up, adjusting the position of bracket A to set disc A parallel to the front panel. If a knob is fitted to the tuning shaft it should rotate freely and smoothly.

Wiring up the Receiver

When all the boards and panel-mounted components have been fixed in the case, the connections can be made. The connections are shown in tabular form in Table 4.1, and diagrammatically in Fig. 4.3.

All r.f. signal connections should be made with miniature coaxial cable (such as RG174). Strip back the outer

insulation to reveal the braid, then expose the inner conductor and solder to the correct Veropins. Each length of coaxial cable is prepared at both ends as described after cutting to the correct length.

All d.c. connections and the volume control connections are made with single strand wire. Twist the pairs or triples of wire used for each connection together to give a tidy appearance. Four wires terminate on each of the power supply sockets (SK3 and SK4) and it is best to wrap a single turn of each wire around the tag and solder when all four are wrapped on. On the prototype unit, a rectifier diode D* in Fig. 4.3 (in fact, a Schottky diode, 11DQ04) was included in the positive supply between SK3 and the leads to the boards. This prevents any damage if the supply is connected the wrong way round. The slight voltage drop caused by the diode is immaterial in this application.

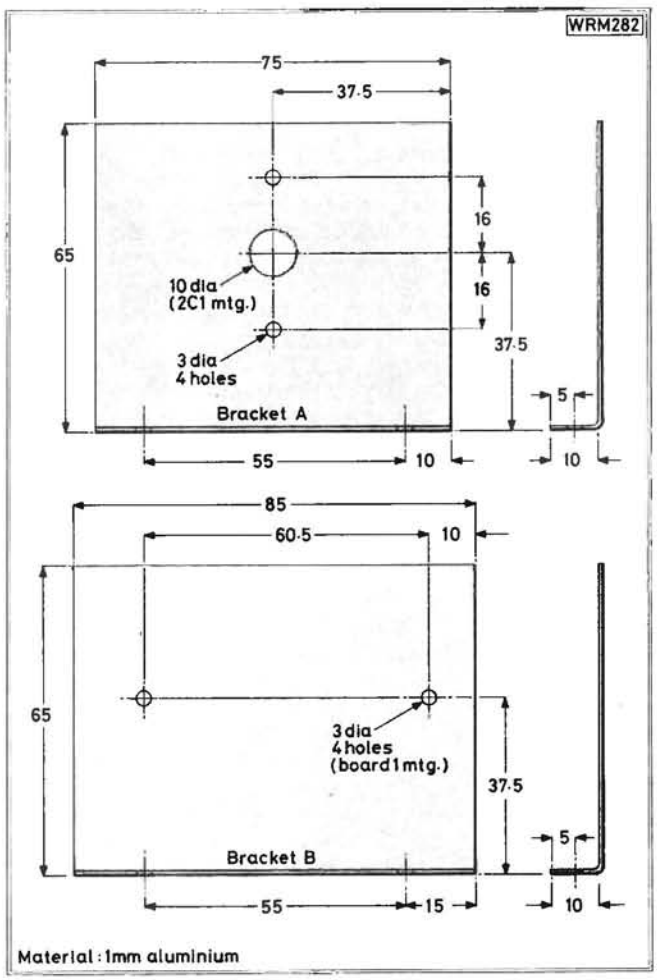
Testing and Alignment

One nice feature of direct conversion receivers is that they are generally easy to align, and this one is no exception. When all the wiring has been completed and carefully checked, connect a well stabilised 12 volt supply capable of about 150mA. If available, connect a milliammeter in series with one supply lead, with a f.s.d. of at least 150mA. Switch on the supply and check that the current is about 100mA. If it is greatly more than this, turn off quickly and recheck all the wiring and circuit boards.

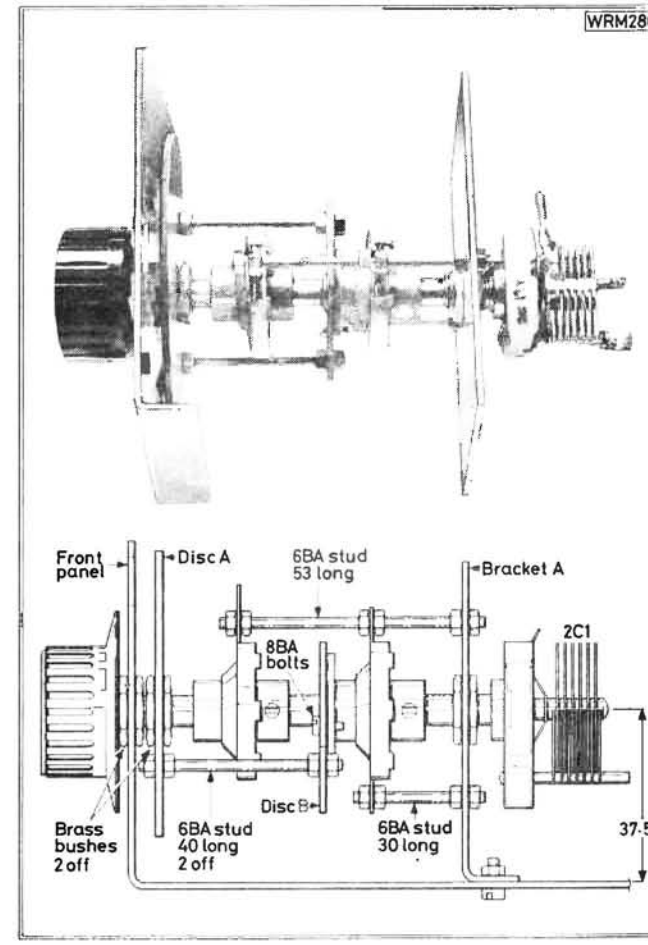
When all seems to be normal, with the supply current at about 100mA, check that the POWER l.e.d. lights. If it does not, it is probably connected the wrong way round. Despite any advice I might give here about methodical checking and alignment, you will probably want to plug in your headphones and have a listen. Go ahead; the chances are that you will hear some stations as the receiver is tuned, but it is very unlikely that the v.f.o. will tune exactly the correct range to enable the two amateur bands to be heard. So the first task is to set the v.f.o. correctly.

If an oscilloscope is available, monitor the output of the v.f.o. buffer, pins 2/3 and 2/4. Adjust 2R9 to obtain an output of approximately 500mV peak-to-peak. If an oscilloscope is not available, set 2R9 to about mid-position. To set the frequency range of the v.f.o. accurately, a frequency meter or a receiver (preferably with digital read-out) is required. Set 2C1 to have its vanes fully meshed (that is at maximum capacitance) and measure the frequency of the v.f.o. By adjusting 2C2 it should be possible to set the frequency to about 4·9MHz. Now swing 2C1 to minimum capacity and again measure the frequency. Ideally, it should be about 5·6MHz; if not, adjust the core of 2L1 until it is. Then go back to the lower frequency and adjust 2C2 and/or 2L1 for the lower setting. The ideal to aim at is about 50kHz overlap at the upper and lower frequencies, but this is not critical as the 36:1 reduction mechanism gives sufficiently slow tuning even with 100kHz overlap at each extreme. When the v.f.o. is properly adjusted, the 9MHz and frequency converter board can be checked.

The 9MHz oscillator should be checked first. Monitor the output of the oscillator on either side of 4C27. A 9MHz sinewave of approximately 1·5 volts peak-to-peak should be seen. Adjust the core of 4T1 for maximum signal. The tuning of 4T1 is quite flat, and does not make a great deal of difference. The exact fre-



◄ Fig. 4.1



▲ Fig. 4.2

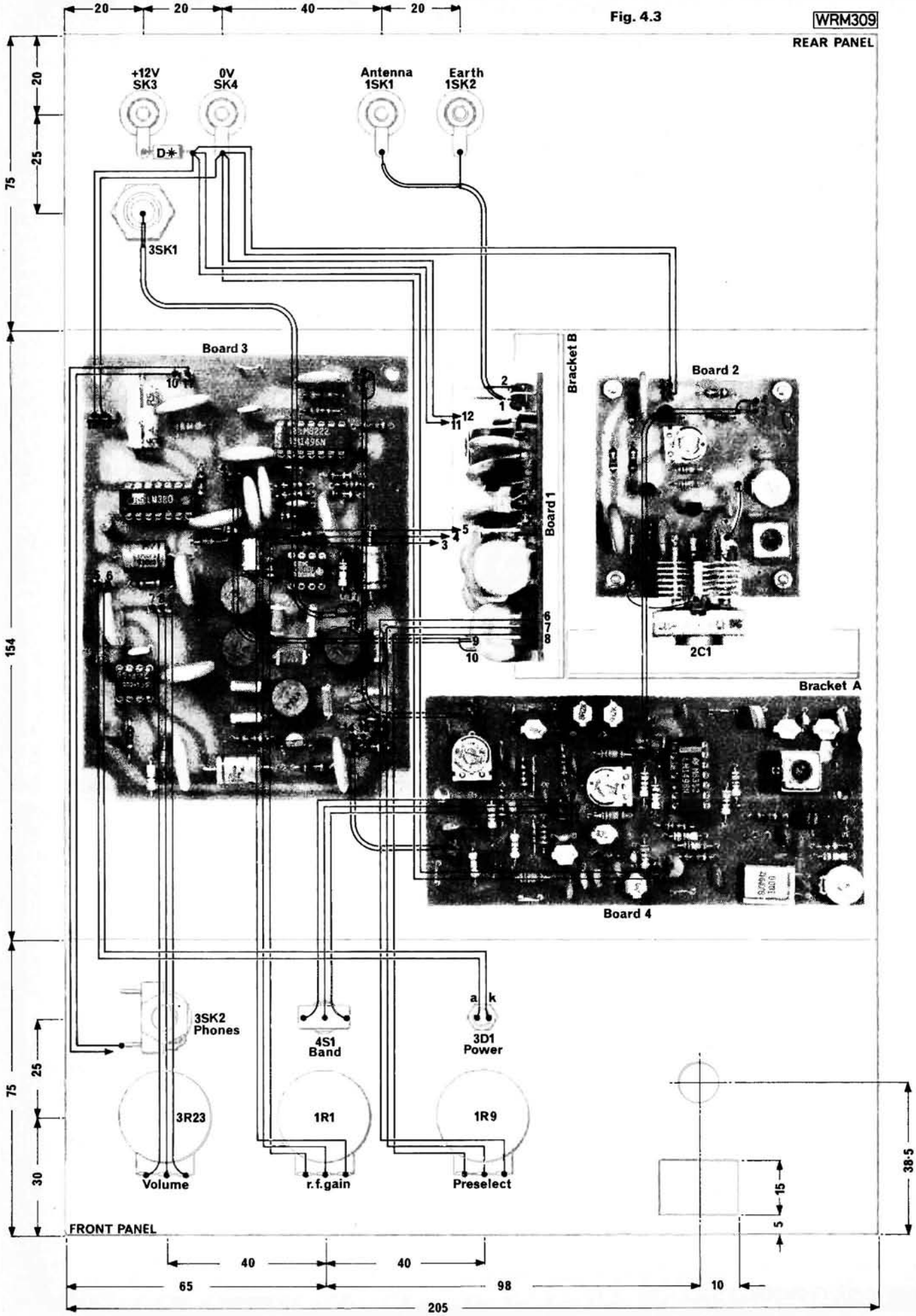


Fig. 4.4 ▶

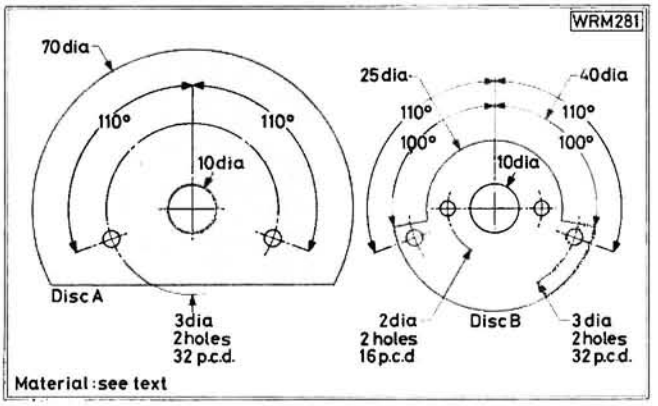


Table 4.1

	Board 1	Board 2	Board 3	Board 4	Chassis
Antenna	1/1				1SK1
Chassis/0V	1/2				1SK2
r.f. gain	1/3				1R1
r.f. gain	1/4				1R1 wiper
r.f. gain	1/5				1R1
PRESELECT	1/6				1R9
PRESELECT	1/7				1R9 wiper
PRESELECT	1/8				1R9
r.f. output	1/9		3/3		
Chassis/0V	1/10		3/4		
+12V	1/11	2/1	3/12	4/3	SK3
Chassis/0V	1/12	2/2	3/13	4/4	SK4
Detect. freq.			3/1	4/7	
Chassis/0V			3/2	4/8	
POWER			3/5		3D1 (A)
POWER			3/6		3D1 (K)
VOLUME			3/7		3R23
VOLUME			3/8		3R23 wiper
VOLUME			3/9		3R23
PHONES			3/10		3SK2
Chassis/0V			3/11		3SK2
5–5·5MHz		2/3		4/1	
Chassis/0V		2/4		4/2	
14MHz band				4/9	4S1
3·5MHz band				4/10	4S1
+12V				4/11	4S1
Detect. freq.			3/14	4/5	
Chassis/0V			3/15	4/6	
Counter output			3/16		3SK1
Chassis			3/17		3SK1 screen

quency can now be set to 9MHz (again using the receiver or frequency meter) by adjusting the 4C29. Check that the 9MHz signal and the v.f.o. output are reaching 4IC1 by monitoring pins 10 and 1 of that i.c. respectively. Because the filters at the outputs of 4IC1 have to be designed to be fairly broadband, no adjustments in this area should be necessary.

Now monitor the junction of 4D1 and 4D2. A signal of approximately 500mV peak-to-peak should be seen, which can be adjusted in amplitude by varying 2R9 on the v.f.o. board. When 4S1 is in the 3·5MHz band position, the signal at 4D1/4D2 junction should be 3·5–4MHz. When in the 14MHz band position, the frequency should be in the range 14–14·5MHz. At this stage, 4R7 can be set for minimum 9MHz content at the junction of 4D1/4D2. On an oscilloscope, this unwanted 9MHz component appears as distortion on the wanted signal: by rotating 4R7, a position should be found when the distortion is at a minimum. It will be found that this position is very near the mid-point of 4R7. In fact the wiper of 4R7 can be set at mid-point (or 4R6, 4R7 and 4R10 omitted altogether) if no way of monitoring this 9MHz signal is available probably without any worsening of performance.

The final adjustment on this board can now be made. Monitor the output of the buffer amplifier, pins 4/7 and 4/8, and adjust 4R22 for a minimum output of 800mV peak-to-peak on both bands. This adjustment must be made with the connection between pins 4/7, 4/8 and 3/1, 3/2 made (on the product detector board) because 3R3 loads the output of 4Tr2. The output from pins 4/5, 4/6 should also be checked if the frequency counter buffer has been built on the product detector board.

Having made all the previous checks and adjustments, signals should certainly be heard as there are no more critical adjustments to be made. If an r.f. signal generator is available, 3·75MHz and 14·25MHz signals can be injected into the antenna input and the cores of 1T1 and 1T2 adjusted until both frequencies can be peaked with 1R9. Check at this stage that 1R1 adjusts the output from the r.f. amplifier.

There are no adjustments to be made on the product detector and audio board. If a methodical check of this board is to be made, it is best to start by removing 3IC2 from its socket and injecting audio signals into the audio filter via pin 6 of the socket. The response of the filter can be checked by monitoring the source of 3Tr1.

The a.g.c. action of 3IC3 can be checked by monitoring its output while varying the level of the injected signal set to a fixed frequency (say 1kHz). Then move onto the audio output, 3SK1, to check the operation of 3R23 and 3IC4. An output of 8 volts peak-to-peak into a load of 8Ω represents a power of 1 watt.

When the receiver is working correctly and signals on both amateur bands have been heard (though not necessarily at the same time of day) the front panel and tuning dial can be labelled and finished. The front panel of the prototype (see the photograph in the heading) was rubbed down and labelled with rub-on lettering and then sprayed with clear lacquer. Experienced constructors will have developed their own preferences for finishing equipment.

The tuning dial can be calibrated by tuning the receiver across the range 3·5–4MHz at 100kHz intervals. Mark these points faintly on the dial through the front panel cut-out and then remove the dial. Lines and the corresponding frequencies can then be neatly printed onto the dial, remembering that the 3·5MHz mark also corresponds to 14·5MHz, 3·6MHz to 14·4MHz and so on. Again, spray the calibrated dial with clear lacquer to protect the lettering.

The dial can then be refitted and a thin sheet of Perspex glued onto the back of the front panel covering the cut-out.

Using the Receiver

As has been said many times before, the results obtained from any receiver depend greatly on the antenna used and the amount of practice and patience exercised by the user. Acceptable results can be obtained with a simple indoor antenna consisting of a few metres of wire draped around a room. Better results will be obtained with an outdoor antenna, which can range from a simple "longwire" mounted as high and as far away from obstructions as possible to a multi-element 14MHz beam. Many designs for suitable antennas appear in the *PW* publication *Wires and Waves*.

A great contrast is offered by the two bands covered by this receiver. In the daytime, 3·5MHz is populated mainly by nets of G stations "ragchewing" whereas 14MHz will often be open to the USA and other continents. In the evening 3·5MHz becomes active with many Europeans and signals from further afield. The 14MHz band may well be dead after dark. Stations in the USA can often be heard around 3·8MHz just before dawn. For obvious reasons, it is much easier in the winter to be up and listening at this time.

Detailed predictions of band conditions can be found month-by-month in the RSGB magazine, *Radio Communication*.

Resolving s.s.b. transmissions can be a little difficult at first. The slow tuning rate of this receiver makes obtaining the correct voice pitch fairly easy, but as with any direct conversion receiver, two tuning positions will be found where the voice pitch sounds correct. However, one position will result in garbled speech and it is then necessary to tune down through the signals until the correct position is found.

For 3·5MHz band use, the r.f. gain control should be set to near maximum, where it does not need to be advanced so far for 14MHz. When tuning around the bands, the preselect tune control should be set to the approximate position for the band in use and then peaked for individual signals.

It is worthwhile commenting on the performance of the audio a.g.c. used. After settling the volume control for a comfortable listing level, local and DX stations can be tuned in and heard at the same level without adjusting the volume control. No adjustment of the volume is necessary even when changing bands. This contrasts with the normal performance of direct conversion receivers where changes in the input signal level result in changes of the audio output and frequent adjustments of the volume control are necessary.

Design Variations

As with many receiver designs, there are many variations which can be tried to suit individual tastes or to make the design simpler and cheaper. Some ideas are discussed here.

A significant saving can be obtained by only operating on one band, 3·5MHz probably being the easiest. The crystal oscillator and frequency converter board can be omitted in its entirety. Connect the output of the v.f.o. buffer (pins 2/3 and 2/4) directly to the product detector input (pins 3/1 and 3/2). The tuning range of the v.f.o. will need to be changed to 3·5–4MHz. This can be achieved by adjusting 2C2 and the core of 2L1, but the value of 2C3 may need to be increased (220pF is a good starting value) to give better bandspread. The 7MHz band is another possibility, and 2C3 may need to be decreased in this case. It is not advisable to operate the v.f.o. much higher in frequency than 7MHz for stability reasons.

The 1·8MHz band could be covered by changing 2L1 to a KANK3426. Transformers 1T1 and 1T2 will also need to change to 154FN8A6438.

It is possible to omit the highpass section of the audio filter by not fitting 3C10, 3C11, 3C12, 3L1 and 3L2. A connection will need to be made from the 3C10 end of 3R17 to the junction of 3C12/3C13/3C14/3L3. This may result in an increase in the hum level of the audio output of the receiver.

The audio a.g.c. system, 3IC3, and associated components can be omitted and a connection made between 3C19 and 3R23. The loss in audio gain can then be compensated for by increasing the volume control setting.

A combination of some of the above modifications can be used as a way of building first of all a simple 3·5MHz receiver and then improving it as funds permit. ●

Swap Spot

Have records (classical music) and Polish magazine *Radioelecktronik*. Would exchange for Amateur Television Handbook Vol 1,2; *CQ-TV* and *Television* magazines 1980 onwards. Stanislaw Pazur, Tarnowiecka 3/35, 04-174 Warszawa, Poland. *X249*

Have Amerex stereo cartridge/radio player plus speakers. Also have Philips music centre plus speakers. Both items in working order. Would exchange for any ZX81 equipment or w.h.y. Mr Nicholas. Tel: 0983 292651. *X256*

Have Uniden CR2021 communications receiver, as new. Would exchange for signal R532 airband scanner or similar. Mr Ware. Tel: Redhill 66712 (Surrey). *X269*

Have FR100B amateur band RX in working order with manual. Would exchange for Heathkit SB400 or SB401TX in working order. Sharp. Tel: Swindon 826325 after 7pm. *X280*

Have WW-II receiver 250kHz-18MHz, also have C.M. Howes 14MHz (20m) receiver with circuit diagram. Both need slight attention. Would exchange for Yaesu FT-101E or similar. Iain, 21 Rathdown Park, Greystoives. Co. Wicklow. Tel: Dublin 874904. *X286*

Have Fluke 8022A digital multimeter, as new with case (never used Xmas gift) cost £100+. Would exchange for the following: SEM audio multifilter; Eastern Block f.m. receiver/tuner covering approximately 66-73MHz v.h.f. f.m. (or any means of tuning above 30MHz). Also have 10in b & w Sony monitor with external tuner box covering Bands I-III and u.h.f. with Band I-III pre-amp, u.h.f. tuneable pre-amp. Would exchange for offers (no amateur gear please). Write first—swapper collects. Mike Evans, 120 Loughton Way, Buckhurst Hill, Essex IG9 6AR. *X291*

Have Codar PR30 preselector, as new condition. Would exchange for Triband h.f. antenna, vertical or 144MHz colinear base or anything useful for amateur radio, w.h.y? Tel: 01-200 3825 (NW London). *X299*

Have assortment of USAF laboratory test equipment, radio receiver R-5032A ref: No. IOD/259VHF. Also have new AR-88 genuine S-meter. Would exchange for Empire/Stoddart RX, Panadaptor, w.h.y. in a RX. Bob Wright, 249 Sandy Lane, Hindley, Wigan, Lancs WN2 4ER. Tel: 0942 55948. *X307*

Products

Updated Micropatch

ICS Electronics Ltd. of Arundel, West Sussex, announce the availability of an upgraded version of their popular "Micropatch" a combined terminal unit and software package, designed specifically for the Commodore 64 and Vic 20 home computers, that incorporates AMTOR as standard.

Renamed the "MicroAmtor Patch", owners of these popular home computers have available possibly the cheapest and most reliable method of getting on the air with transmit/receive capability, of the data transmission modes—AMTOR, RTTY, c.w. and ASCII.

In addition to either a Commodore 64 or Vic 20, the only other equipment required is a transceiver and a 12 volt power source.

Both software and hardware are fully integrated into one package, which plugs directly into the expansion port of the computer. The terminal unit circuitry provides separate mark/space channel filtering together with a tuning indicator—phase lock loop demodulation is not used. Whilst the software program enables triple split screen, incorporates message handling, on screen time of day clock and operates with tape, disc and printer.

The "MicroAmtor Patch" combined unit costs £189.85 (inc. VAT @ 15%) plus £1.50 p&p and is available from: *ICS Electronics Ltd., PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.*

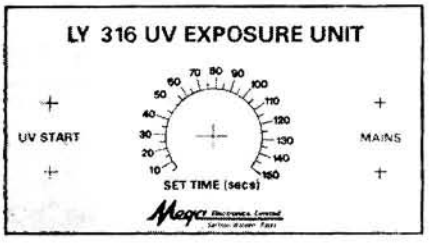
Low-cost Anodised Panels

We at *Practical Wireless* are very well aware that these days the radio amateur and electronics constructor demand that projects they build should not only perform well but must be presentable and have a highly professional finish as well.

The Gedakop System, from Mega Electronics Ltd., provides a speedy, low-cost and convenient method of producing multi-coloured, anodised aluminium panels, in approximately ten minutes.

No hazardous chemicals or processes are employed and the anodised (17 micron minimum) aluminium sheets are pre-coated with a UV sensitive photoresist, and are available in sizes that measure between 320 × 200mm and 1000 × 500mm in thickness from 0·125mm to 3mm. A range of 29 colour dyes also is available.

The process is quite simple: first, the positive working photoresist on the aluminium sheet is exposed to a UV light source through the opaque design on transparent artwork, and then developed by spraying with water to reveal an "open pore" aluminium image of the opaque design, which can then be coloured with any of the 29 dyes, to the user's requirement. A simple stripper removes unwanted photoresist or excess dye to display the coloured design set into an anodised aluminium surface, which if required, can be protected to various standards including permanent weather, scratch and chemical proofing by sealing in hot water only.



The system does not require expensive equipment set ups and small production runs or prototypes can be economically produced for between 5p and 9p per square inch.

Starter and Introductory Kits are available, as are further details of the Gedakop System, from: *Mega Electronics Ltd., 9 Radwinter Road, Saffron Walden, Essex CB11 3HU. Tel: (0799) 26626/21918.*

Professional Powered Breadboard

The new Model CDA–1 from Global Specialties is a UK-manufactured solderless breadboard unit with an integral triple-output d.c. power supply, which allows circuit designs to be easily built, tested and improved without the need to commit to soldered interconnections.

The breadboarding area on the CDA–1 includes 202 pairs of five common spring contacts each, plus 24 bus strips each containing 25 common contacts, allowing up to 27 14-pin integrated-circuit packages to be accommodated.

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The CDA–1 is housed in a strong metal cabinet with a sloping front panel, and all metal parts are earthed the meet the most stringent safety regulations. The unit incorporates fuse protection and an a.c. mains switch with a built-in pilot light.

The CDA–1 is available fully assembled at a cost of £99.50 (plus VAT), or in kit form as the CDA–1K at a cost of £89.50 (plus VAT) from: *Global Specialties Corporation, Shire Hill Industrial Estate, Saffron Walden, Essex CB11 3AQ. Tel: (0799) 21682.*

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DX-51	Rotary Dipole for 28,24,21,18 and 14MHz	100.05
DX-6V	10-80m Multi-band Vertical plus 30m	109.25
DX-31	Dipole 10/15/20m, 2Kw, p.e.p.	89.70
DX-32	2 element 10/15/20m, 2Kw, p.e.p.	138.00
DX-33	3 element 10/15/20m, 2Kw, p.e.p.	201.25
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Introducing Short-wave Listening

Part 5 by Charles Molloy

Receivers for DXing

If I had been writing about this subject, even until quite recently, I might have wondered where to start, which desirable feature of a DX receiver to highlight. Today there is no doubt at all. Digital readout is essential. Without it you do not know where you are or what you are doing. When I first connected an external digital frequency meter to my BRT400 valved communications receiver I just could not believe that I was able to read the frequency the set was tuned to, on a pocket calculator type display. I still get a kick when I tune-in a station in silence then turn up the audio gain and there it is. It works in reverse, too. An unknown broadcaster can be pin-pointed on the frequency spectrum with accuracy, which is half the battle with identification.

Receiver Performance

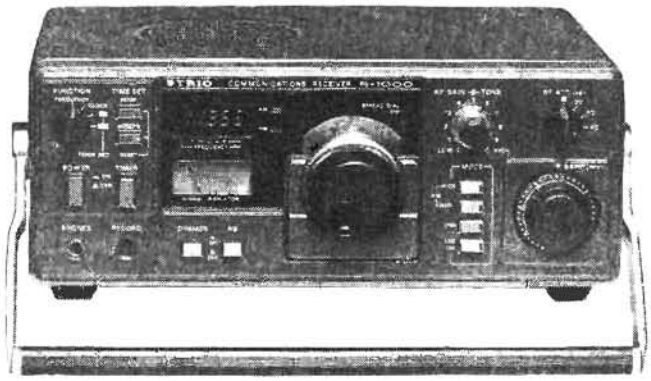
Although we can DX successfully using almost any receiver there will be occasions when we want to listen to a weak station amid heavy interference. It is at this point that the short wave programme listener and the DXer part company. The s.w.l. wants to hear the programme so the signal will have to be at entertainment level. The DXer will be satisfied if he identifies a station and is able to collect sufficient programme material to compile a reception report.

At a DX convention I attended some years ago a tape of outstanding 60 metre DX was played to a mixed audience. The DXers thought it was marvelous as they listened to noise, interference and strangled audio, the non-DXers could be identified by the expression on their faces.

If we want to listen to weak stations then we must have a sensitive receiver. At first sight this would seem easy to achieve, all we need is plenty of receiver gain (amplification). But there is more to it than that. High gain will just produce noise at the loudspeaker. This noise, generated by the receiver, is unavoidable although good design can keep it to a low level. Sensitivity, then, is quoted as the weakest incoming signal that will be louder than receiver noise by a specified amount, usually 10dB. This is called the signal-to-noise ratio S/N and is measured as (S+N)/N for convenience. The Trio R1000 for example quotes 50μV from 200kHz to 2MHz and 5μV from 2MHz to 30MHz. The FRG7 gives 2μV (as against 5μV) which means that it is slightly more sensitive. These figures are for a.m. (amplitude modulation) which interests us. You will get better sensitivity figures for s.s.b./c.w., the FRG7 gives 0·7μV for instance.

With an amplitude modulated signal there is a carrier (f kHz) which is the nominal (listed) frequency of the transmission. On either side of the carrier are the sidebands, each carrying the modulation or audio. If the modulation consists of a 5kHz audio tone then the two sidebands will be f−5kHz and f+5kHz. Similarly a 2kHz audio tone will provide sidebands of f−2kHz and f+2kHz. Channels on the s.w. bands are only 5kHz apart, much too close, so our receiver's selectivity has to be a compromise between a bandwidth wide enough to give acceptable audio quality and narrow enough to separate adjacent stations. A single bandwidth is not good enough for serious DXing. We want at least two, optional degrees of selectivity, WIDE and NARROW. My BRT400 has six, one of which is so narrow it can only be used for c.w.

The FRG7700 has three selectivity positions labelled W (wide), M (medium), N (narrow). The N position is quoted as 2·7kHz (−6dB), 8kHz (−50dB). This means that the sensitivity drops by 6dB as we move 1·35kHz away from the carrier (2·7÷2) and by 50dB (a large drop) at 4kHz. This response is alright for DXing. At W, the figures are 12kHz (−6dB), 25kHz (−50dB), which gives good audio quality in the absence of QRM. At N the selectivity would be described as 2·7kHz at the 6dB points.



Desirable Features

While digital readout, sensitivity and selectivity are the main features to look for in a DX receiver, there are a number of other desirable features which fall roughly into two categories. Those which affect performance and those that do not.

An r.f. gain control or an attenuator are used to reduce gain or the strength of the incoming signal respectively and are useful when listening to strong stations or when using a good outdoor antenna. Receiver overloading and some types of QRM can be reduced with these controls. A noise limiter or noise blanker can reduce static and electrical noise. Selectable a.g.c. alters the speed at which the receiver's anti-fading circuitry operates and is useful for dealing with different types of fading. A few broadcasting stations (more in the future) and many amateurs operate in the s.s.b. (single sideband) mode so it is useful to have this facility. Freedom from images (second channel interference) is not likely to be a problem with a modern multi-conversion set. The R1000 gives an image ratio "More than 60dB" which is acceptable. Older single conversion sets may have poor image rejection above 20MHz.

Features in the second category are headphone sockets (phones are very useful when DXing), tape recorder outlet, fine tuner, S-meter, clock timer, memory channels, time display, good frequency stability. The latter, though important for the programme listener is not vital for DXing where the operator is constantly adjusting the controls. All sets will, or should (like the FRG7) tune from 500kHz to 30MHz, covering the medium waves as well as the s.w. bands. The FRG7700 starts at 150kHz which includes the long waves. The Drake R7 covers 10kHz to 30MHz! Some receivers will operate on batteries as well as from the mains which is a useful feature for avoiding mains interference as well as providing the means to go portable in a caravan or boat, for example.

Which Receiver

The DXer is better catered for today than at any time since the passing of the valved receiver. One can purchase new, a receiver such as the FRG8800, which has clearly been designed with the DXer in mind. This is a recent development. It is difficult to imagine what sort of user the designer of one of its predecessors, the FRG7 had in mind. Certainly not the DXer, as the selectivity was more suitable for programme listening. This led to the ludicrous situation (in the United States) where one could purchase a selectivity modification kit along with the receiver, and at least one dealer would do the "mod" for you—on a new receiver!

A perusal of the adverts in *Practical Wireless* reveals, in descending price order, the NRD 515, Icom R71, Icom R70, FRG 8800, Trio R2000, FRG7700, Trio R600. You get what you pay for. It is worth noting that some of the desirable features offered, such as direct keyboard entry, programmable memories, band scan, will not produce any more DX. They are not gimmicks though and if you can afford them, life will be a lot easier for you. In contrast, the R600 is a neat, compact set that has the basic features required by the DXer yet should be acceptable in domestic surroundings.

A word about what is known in the United States as the Grey Market. You may find cut-price receivers on offer, which have probably been imported, quite legally, through unorthodox channels. These sets may not be covered by the maker's guarantee so it is worth enquiring about this before deciding if you really are getting a bargain. A well established dealer can be found again and will, with the importer, provide a back-up service.

Secondhand

There is quite a trade in secondhand gear, which is not surprising as modern receivers do not wear out. They can be ill-treated but signs of this are usually visible. With a private sale one must be sure that the set is in working order on all bands. This means an adequate opportunity to try it out, preferably at home for a day or two.

A secondhand receiver, one of those listed above or an immediate predecessor such as the R1000 could be a good buy. You will also find on offer representatives of a whole generation of the post-valve era starting with the Eddystone EC10 right up to the SRX30. Receivers such as the Realistic DX160, DX150, DX200, R300, DX302 come to mind. The best known is the DX160 distributed in the UK by Tandy and in the USA by Radio Shack. It is a single conversion job with a standard 455kHz i.f., b.f.o., product detector (for s.s.b.) antenna trimmer, r.f. gain, audio gain, fast and slow a.g.c., S-meter. It works from mains or battery and covers 535kHz to 30MHz plus 150kHz to 400kHz. Quite a good sensitive DX tool for the beginner. I use a hotted up DX160 with add-on digital readout (see my article in the April 1984 issue of *PW*) for general listening and a GEC BRT400 valved communications receiver as back-up when listening becomes difficult.

Valved Communications Receivers

It is clearly incorrect to suggest that modern receivers do not match up to their valved predecessors. If it were true then these old surplus sets would not have been replaced!

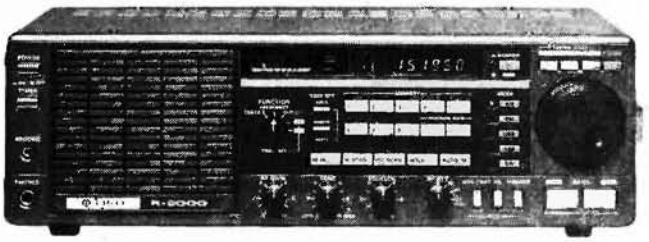
What is true is that one can obtain a valved professional communications receiver for a tiny fraction of the cost of a new one. There are snags though. Apart from size and weight, most of these old sets are bulky and heavy, and the reliability is low. Valved receivers get hot, high voltages are used and components made some 30 or more years ago are not so reliable as modern ones. It is not just fault liability. Valved receivers can stray away from peak performance gradually and they really should be checked for alignment now and again. I do my BRT400 annually. Nostalgia is all very well, though there are a few like myself who think it more exciting to look forward than back. Old valved communications receivers are not a good buy for the non-technical broadcast band DXer whose only interest in them would be as a cheap method of getting going on the short waves. Much better to look for a DX160!

Handling a Receiver

Be adventuresome, unorthodox, try anything. You are unlikely to damage your receiver no matter how you adjust the controls or even if you connect a very long antenna to it, unless of course you live close to a broadcasting station. Overloading may produce unpleasant sounds but the receiver won't mind.

For example, a noisy background due to static is usually dealt with by switching on the noise limiter. Who would guess that noise can also be reduced by adjusting the bandwidth? Listen to a noisy background on its own and adjust the selectivity from wide to medium and then to narrow. The noise will decrease as you do so. It works on the same principle as a large window letting in more light than a small one.

The r.f. gain/attenuator control puzzles many. It reduces overloading with strong signals but you can with care reduce genuine QRM on occasion. When listening to a strongish signal you may be troubled with an annoying weaker station. Turn down the r.f. gain and you may end up with a much weaker signal clear of QRM. If you are listening with narrow bandwidth then speech may be poor



but the quality will improve if you detune slightly on either side of the carrier. If there is strong QRM as well then detune away from it. The improvement may only be marginal but every bit helps. Try the a.g.c. FAST/SLOW switch in either position if there is fading, readability can be improved this way.

Recently I purchased a rather complicated audio filter and was intrigued by the instruction that came with it—*"Keep using it under different conditions until you get the best results with your receiver. The more you use it the more useful it becomes."* One could say the same about operating a communications receiver. The controls are there to be used—Use them!

New Books

HOW TO PASS THE RADIO AMATEURS' EXAMINATION
Edited by George Benbow G3HB. Published by RSGB
91 pages, 183 × 245mm. Price £3.42 including postage to non-members
ISBN 0 900612 68 1

Launched at the Leicester Rally this book is intended as a guide to those wishing to attempt the RAE.

Unlike many of the other books around this one explains a little about the format and type of exam the candidate will have to face. In Chapter 4 it goes so far as to reproduce the City and Guilds Answer Sheet that has to be filled in.

Other topics covered are how to tackle multiple choice papers, mathematics needed for the RAE and preparing for the RAE itself. The rest of the book, some 71 pages, is taken up with sample multiple choice questions. Of course, the answers are on page 90. There are nine separate sample exams, each having paper 1 on Licensing conditions and Transmitter Interference and Paper 2 on Operating Practices, Procedures and Theory.

SECRET WARFARE
by Pierre Lorain, translated by David Kahn. Published by Orbis Publishing
185 pages. Price £7.99
ISBN 0 85613 5860

Through my museum connections, when I came across this book first in 1983 it was in French, but now it has been translated. Its a hard back book packed with gen about the variety of technical equipment used by the clandestine operators of WWII. It is summed up under the main title with the words, "The Arms and Techniques of the Resistance".

Chapter 3 called "Communications and Secret Radio" covers direction finding, frequency ranges, propagation and the transmission of signals in some detail. Some of the now famous sets as the Mk XV transmitter and receiver, the Paraset transceiver, the Polish transceivers AP4 and BP3, the SOE suitcase sets to mention but a few are covered by good readable text. Some of the circuits appear in Chapter 8.

Apart from the technical side of the radio equipment the whole book, with its other chapters dedicated to the special aircraft modified and used for the work, codes and cyphers and a variety of weapons, is an eye opener and a wonderful reference work for the historian.

R.H.

Radio Wave

Part 6 by F. C. Judd G2BCX

"Just before noon on 24 November, 1946, a test transmission by W1HDQ, West Hartford, in the state of Connecticut, USA, resulted in a frantic: 'I'm hearing you on 50 megacycles', from G6DH at Clacton-on-Sea in Essex. The first v.h.f. transmission across the Atlantic had been made." (*ARRL VHF Manual*).

Although it is generally accepted that radio waves at frequencies higher than about 50MHz are not normally propagated by the ionospheric F layer, there are certain anomalous ionospheric conditions that may allow this. The **normal** mode of propagation at v.h.f. and u.h.f. is referred to as "space wave" although the more commonly used but slightly erroneous term is, "line-of-sight" since the normal path of propagation is directly through the lower portion of the earth's atmosphere. The space wave mode allows greater distances of communication than can be obtained with ground wave propagation which, even at much lower frequencies, results in high level absorption of the waves by the ground over which they travel.

On the question of anomalous modes of propagation, it has hitherto been thought that sporadic-E (Es) had been the means of v.h.f. propagation over very long distances and at frequencies as high as 200MHz but there is now some doubt about this. It has also been thought that radio waves in the frequency region 25 to 30MHz, which includes the CB radio and the 28MHz (10m) amateur bands, are at times propagated over fairly long distances by anomalous tropospheric (upper atmosphere) conditions, although sporadic-E has also been considered as an alternative mode for the same frequency region. In fact, modes of propagation at frequencies from about 25 to 50MHz, other than ground wave, or due to ionospheric F layer reflection during maximum eleven year sunspot periods, have been a subject for investigation and may continue to be for some time[1].

The Space Wave

The best known anomalous propagation mode for v.h.f. and u.h.f. over fairly long distances and which occurs quite frequently during the summer and autumn, is due to certain tropospheric, or near earth atmospheric conditions, popularly known by v.h.f. and u.h.f. enthusiasts as a "lift condition". Aside from creating chaotic situations with repeater stations operating on the same channels, **tropospheric propagation** to give it its rightful name, also provides the opportunity for some real "simplex" DX operation on v.h.f. and u.h.f. There are other modes of v.h.f./u.h.f. propagation and these will be dealt with in due course. When weather conditions are "normal" which means it is probably raining and there are several low pressure regions and cold fronts queuing up over the Western Atlantic, then v.h.f. and u.h.f. propagation distances are more or less "line-of-sight", or horizon to horizon, the actual working range depending largely on the heights of respective transmitting and receiving antennas and to some extent on the e.r.p. from the transmitting end.

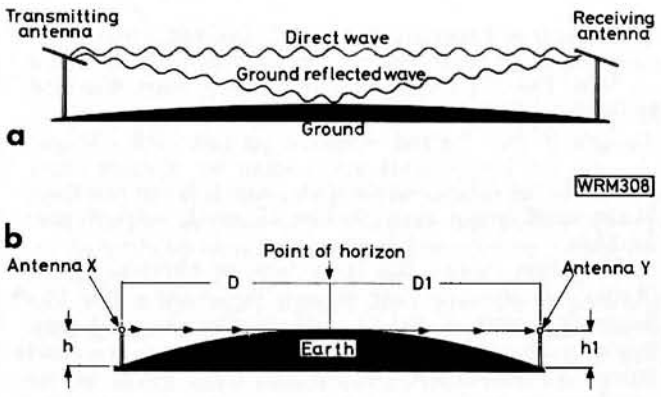


Fig. 6.1: (a) A v.h.f./u.h.f. wave may reach a distant antenna via reflection from ground to combine with the direct antenna to antenna signal (see text) (b) Horizon to horizon distance versus height of transmitting and receiving antennas (see text)

First let us examine this mode from a more general point of view, i.e. when the transmitting and receiving antennas are within horizon distance from each other, as illustrated in Fig. 6.1(a). Here the wave takes two paths, one direct from transmitting to receiving antenna, the second being via a path to ground from which it is reflected to arrive at the receiving antenna where it combines with the direct wave. Although the angle of reflection from ground is the same as the angle of incidence, the difference in distance between the two paths may result in the direct and reflected waves arriving at the receiving antenna either completely in or out of phase, or partially so. A similar effect can occur when a transmitted wave is reflected from some conducting obstacle near the path of transmission (steel frame building for example). The effect is also common with transmissions from mobiles although in this case some of the variation in signals, usually called "mobile flutter", may be attributed to screening by conductive obstacles along the path of transmission as well as changes in ground contour along the route, e.g. hills and valleys.

Line-of-Sight Distance

As far as v.h.f. and u.h.f. propagation is concerned the term "line-of-sight" is not strictly true even though the illustration Fig. 6.1(b) might suggest this. The atmosphere near to earth tends to bend a propagated v.h.f./u.h.f. wave so that it remains closer to the surface of the earth and therefore does not follow a perfectly straight line course from antenna to antenna. This increases the horizontal distance of propagation normally referred to as "radio distance". With a transmitting antenna X as in Fig. 6.1(b) at "H" metres in height, the radio distance to the point of horizon can be obtained from:

$$D\ (km) = 4{\cdot}125\sqrt{H\ (metres)}$$

As an example antenna X is 20m high so the distance D to the point of horizon will be:

$$4{\cdot}124\sqrt{20} = 18{\cdot}4km$$

However, the total distance from antenna X to antenna Y at the same height as X, will be 2D or D + D1 which is 36·8km.

The chart in Fig. 6.2 gives a range of "optical" and "radio" distances for different antenna heights. Whilst this assumes a perfectly smooth terrain over the whole path, much greater distances are frequently covered even with antennas at low height. The reason? In addition to the normal bending as described, a wave may be diffracted sufficiently to further follow the curvature of the earth resulting in propagation distances greater than the theoretical horizon path. However, to make full use of near earth or space-wave propagation and to cover the greatest possible distances, it is important that antennas for v.h.f. and u.h.f. are always as high above the ground as possible. Ground that is also high above sea level is an added advantage of course. Tests carried out from a glider flying at a height of about 900m and with a pilot using a small low power hand-held transceiver resulted in perfect communication with a ground station at a distance of 400km. The antenna used at the ground station at a height of about 9m was the Ring-base omni-directional model featured in the October 1982 issue of *PW*, but modified for the v.h.f. aeronautical band.

Repeater stations operating at v.h.f. and u.h.f. nearly always have the antenna sited as high as possible and often at locations where the ground height is well above sea level in order to ensure the largest possible area of coverage.

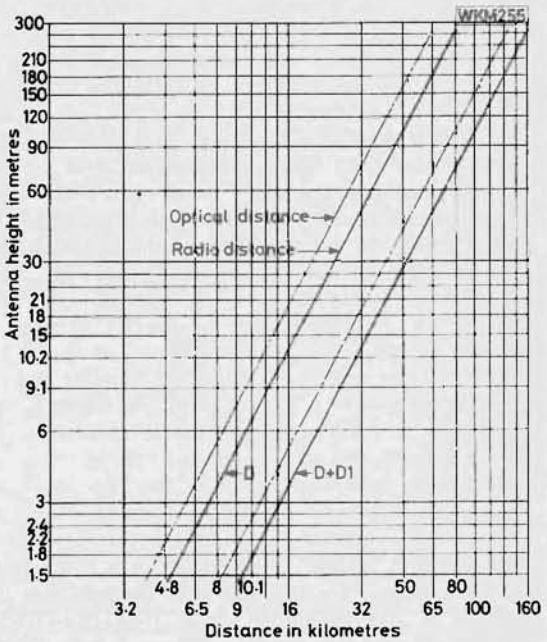


Fig. 6.2: Optical and radio distance related to antenna height. D = distance of antenna to point of horizon. D + D1 = distance between two antennas at equal height

Angle of Radiation and Polarisation

The importance of low angle radiation from antennas used for v.h.f. and u.h.f. operation has been stressed often enough as the only way of ensuring that as much radiation as possible is directed toward the horizon. Radiation at high angles, relative to a line toward the horizon, can pass over a distant receiving station antenna although when certain tropospheric conditions prevail, refraction may bend the wave back to earth. Although the polarisation of a transmitted wave generally remains constant during its travel it can become changed partially, or even completely, from vertical to horizontal, or vice versa and tests carried out by the author have proved this to be the case. Typical variations obtained from four different transmitting stations each using **vertically polarised** antennas and located at different distances from the test location, are illustrated in Fig. 6.3. The antenna used for measuring changes in

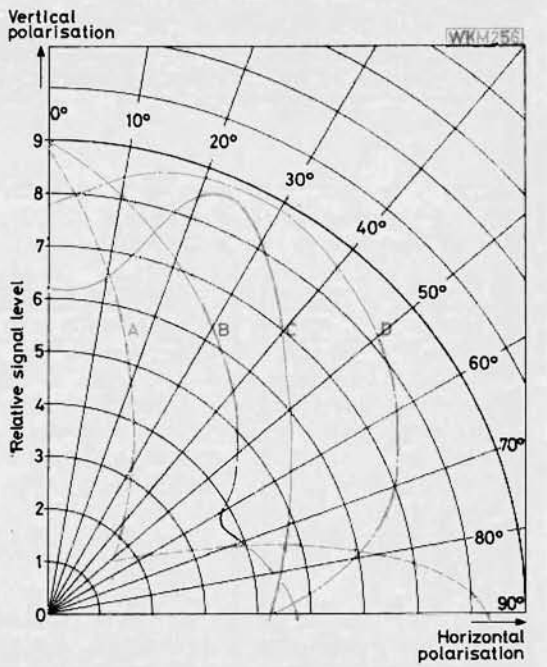


Fig. 6.3: Variations in polarisation from four stations each using vertically polarised antennas (see text)

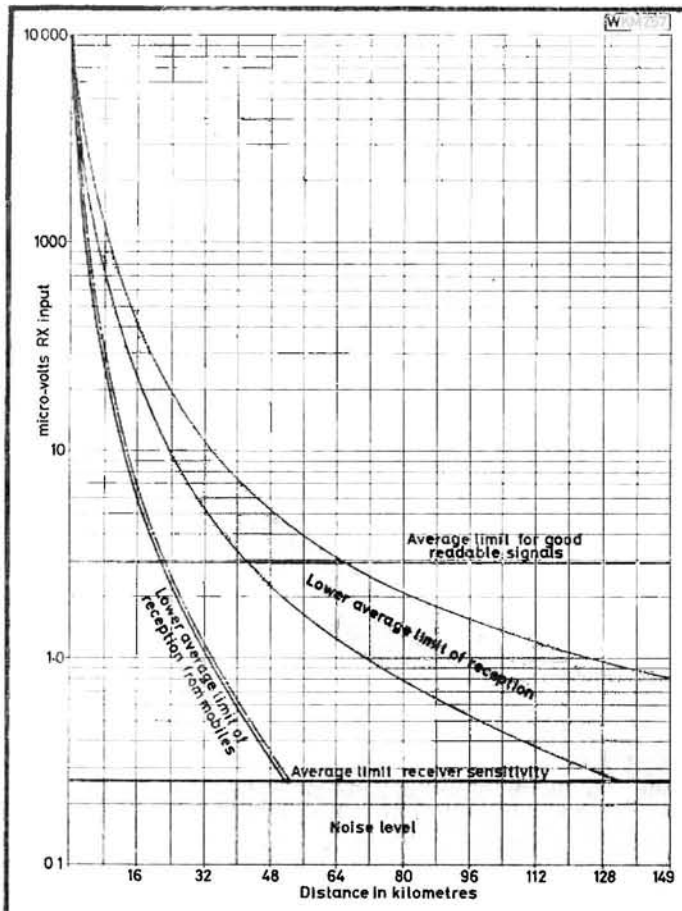


Fig. 6.4: Average signal level versus distance; fixed station to fixed station and fixed station to mobiles. Note: Distance may be limited by receiver sensitivity, transmitter power and type of antenna in use. Curves relate to vertically polarised transmissions

polarisation could be turned from fully vertical to fully horizontal by a constant-speed motor linked with a pen chart recorder. Maximum signal level reference is 9.

Beginning with station (A) the polarisation changes rapidly from vertical with a drop in signal to nearly zero at 45 degrees and then changes to fully horizontal (90 degrees) with a maximum level of 9 again. Signals from station (B) begin to show some horizontal polarisation from about 60 degrees. Station (C) which incidentally was a 144MHz band repeater at a distance of about 90km did not give maximum signal until the receiving antenna polarisation was changed by 23 degrees. Station (D) is giving maximum signal with polarisation at 25 degrees after which it continues to fall smoothly, as it should, but there is still a fairly strong amount of horizontally polarised signal at 90 degrees. At this point the signal should have been virtually zero.

Ground Path Distance and Attenuation

It is difficult to predict, with any certainty, maximum ground path distances for v.h.f. and u.h.f. operation but generally speaking they will be greater over flat terrain. Those with locations high above sea level have some advantage of course but only when there is relatively low ground along the path of transmission. Unless antennas (transmitting and receiving) are substantially high, working distances in and around heavily built-up areas may be severely limited because of attenuation and screening by large buildings. Ordinary brick buildings and large wooded areas directly in the path of v.h.f./u.h.f. transmissions cause considerable attenuation especially when the antennas in use are vertically polarised[2].

Large numbers of signal strength measurements made over different kinds of terrain have been averaged as in Fig. 6.4, to give some idea of possible signal level versus distance between fixed stations using **vertically polarised antennas.** Also included in Fig. 6.4 is an approximation for mobile to fixed station operation. Much depends of course on the type of antenna(s) used, transmitter e.r.p., receiver sensitivity and the "country" between stations. Note that the graphs in Fig. 6.4 relate only to normal propagation conditions, i.e. when there is no anomalous condition prevailing such as tropospheric lift.

Horizontally polarised transmissions suffer far less attenuation due to conducting obstacles along the path of transmission thus resulting in greater signal strength at distance especially when tropospheric conditions prevail. Those who experience tropo-lift will find almost everyone using horizontal antennas whether for f.m., c.w. or s.s.b.

[1] *The VHF-UHF Manual* edited by G. F. Jessop. RSGB.
[2] *The Two Metre Antenna Handbook* by F. C. Judd. Newnes Technical Books.

PW REVIEW

YAESU FT-209RH 144MHz f.m. Transceiver

I recently evaluated the current contender for the smallest handheld transceiver—this review is all about the probable candidate for the most programmable.

Weighing in at a shade over 0·6kg the Yaesu FR-209RH is a highly sophisticated 144MHz f.m. transceiver capable of full band coverage and providing a very extensive range of control options, all contained in a 168 × 65 × 34mm package. Visually this model follows closely the traditional handheld layout with the bulk of the operating controls and the readout mounted in the front panel. A close examination of the keypad reveals 20 soft rubber actuators, each printed with either letters or numerals — these refer to their "primary" functions/commands. Printed above all but the yellow coloured F key are descriptive legends which indicate the commands available in the secondary and "advanced" function mode—more about this area later.

Directly above the keypad an analogue meter provides signal strength/relative power out and battery state details, in conjunction with an associated slide control switch. Frequency display and special function information is presented on a horizontal l.c.d., the frequency readout section employing 6mm high segments.

Top deck features comprise a 50Ω BNC antenna socket. HIGH/LOW r.f. output switch and separate rotary control knobs for squelch and volume. External mic and phone sockets are also found on top together with VOX enable and sensitivity selector pushbuttons—used in conjunction with the optional boom mic and headset. Side mounted p.t.t. pressel, toneburst and display light switches complete the external control features.

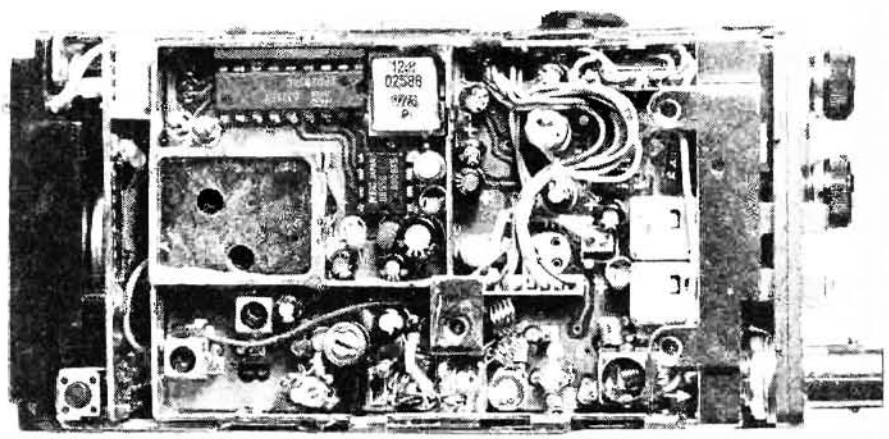
Turning next to the receiver section it is apparent that the FT-209RH features conventional, but sound, r.f. technology. Following the incoming signal path, low-pass filtering is provided before the diode TX/RX changeover switching and 2SC3356 bi-polar first r.f. amplifier stage. Bandpass filtering precedes the 2SC2620B mixer, which again is a bi-polar device. A dual-conversion superheterodyne arrangement is employed with the first i.f. occurring at 10·7MHz, local oscillator injection being derived from a low noise p.l.l. synthesiser. After 10·7MHz filtering down-conversion to 455kHz and processing to audio is accomplished by the well established MC 3357p i.c., which also provides the S meter drive and a superb, positive cut-off, low hysteresis squelch control. The resulting audio is fed to the internal 8Ω loudspeaker from an i.c. audio amplifier quoted to be capable of 450mW at under 10 per cent distortion and found to be adequate for most environments.

Our lab tests indicated that the receiver section r.f. sensitivity, measured at 12dB SINAD amounted to 0·17μVp.d. with the minimum muted squelch threshold occurring at 0·175μV. A signal level of 1·1μV was needed to open the fully advanced squelch. Selectivity figures of ±7·5kHz at −6dB, ±15kHz at 60dB, were readily achieved and will be found to be more than adequate for the existing 25kHz channelisation. At the 450mW level audio distortion was measured at 1·6 per cent—a very respectable figure and in fact an audio output level of 850mW could be achieved at 10 per cent distortion.

The TX section once again follows an established format with the synthesiser's v.c.o. being modulated at half final output frequency, the buffered output being doubled and bandpass filtered before feeding a three-stage discrete p.a. The review, model, with the RH suffix and fitted with the FNB4 Nicad pack is capable of 5W across the band (0·75W low) and at this level more closely matches the receiver's sensitivity.

Deviation of the review sample was found to be 4·5kHz maximum when using the internal 2kΩ electret microphone, peaking at 3·5kHz with the 1750Hz toneburst. Frequency accuracy from switch-on was within 300Hz, with negligible drift after a five minute period on transmit. The r.f. output as viewed on the spectrum analyser revealed no discernible products occurring at levels above −60dB relative to full output at up to 1·3GHz.

I opened up this review with the



The screened r.f. deck of the FT-209RH. The c.p.u.s. are located on a separate p.c.b. mounted behind the keypad

comment that the FT-209RH was in the "most programmable" category and it is this area of control option flexibility that sets it apart from preceding handhelds. The incorporation of two 4-bit c.p.u.s and associated RAM (powered from separate on-board Lithium battery), provides a very large number of operating possiblities, many of which have previously been confined to much larger base station devices.

Basic level keyboard commands, allow input of frequency digit-by-digit or recall of any one of 10 pre-programmed memory channels—the latter when summoned contain all offset details. Scan UP DOWN keys if held down for one second will maintain scan of either the memory channels or the complete band (12·5 or 25kHz steps). The memorise key (M) will input the displayed frequency into a memory location if preceded by a channel number—without this the numbers of channels containing data are briefly displayed below the dial frequency. Similarly the memory recall key (MR) will retrieve any of the memory channels or the last selected, depending on the mode in use. Invalid channel numbers (or non-recognised instruction) are greeted with a brief Err display and a resumption of the previous state.

After keying in a frequency on the keypad the dial mode (D) key is pressed to enter the displayed data (which can be given ±600kHz standard repeater or any alternative in-band split and reversed by use of the shift key) into the c.p.u. If this key is pressed while receiving on a memory channel operation will shift to the last frequency used in the dial mode, offering in effect an eleventh memory function. Two remaining primary function keys allow the instant recall of memory channel 0 and activation of the priority monitor. This facility samples the last selected memory channel at short intervals, producing a "blink" on the l.c.d. of the appropriate channel number. If a signal appears that is strong enough to open the squelch operation automatically shifts to the priority frequency. All keys can be disabled by use of a sliding keylock switch.

The compact but accessible multi-function keypad of the FT-209RH

Finally the clear error (C) key, which can be used in the event of a programming event occurring that did not induce the c.p.u. to produce an Err display, or to quote the (would you believe humorous?) appropriate phrase in the 36 page handbook "This key is thus provided in respect to Murphy, for those elite operators who find themselves prey to his laws, or those disciples of his who dedicate themselves to finding ways to befuddle microprocessors. If in doubt, press this key." Ah So?

Once the primary level controls have been mastered the secondary, advanced level (F button activated) functions can be called upon. These are comprehensively covered within the operating manual and allow selected memory scanning with masking (channel skip), deleting, limited band coverage (between any two defined memory frequencies) and programmable step scanning, which allows the step size to be altered, in multiples of the basic 12·5/25kHz channel steps, i.e. using the "2" key in conjunction with basic 25kHz step would provide 50kHz steps (×2).

In addition to the primary function priority scanning facility the advanced level function provides multi-channel sequential priority scanning for activity, whilst operating in the (normal) dial mode. All conventional scanning modes can be enabled to pause/hold on clear or busy frequencies and be manually overidden by the keypad or p.t.t.

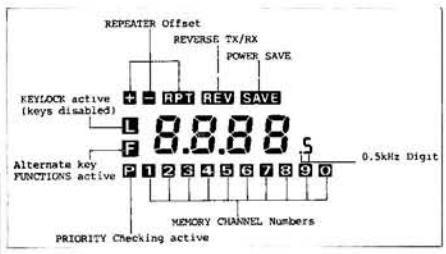
Finally the FT-209R incorporates a power saving function which allows it to monitor a frequency for activity whilst drawing less current than is required for normal "squelched" operation. Activating this facility removes power from all circuits, except a timer and the display, for a programmable interval. The l.c.d. displays SAVE and frequency data in this mode. Between SAVE intervals the receiver is powered for 300ms intervals and if activity is detected normal operation is resumed. Should the detected carrier drop for longer than five seconds the SAVE function will resume automatically. SAVE mode duty cycle is set at 1:2 (300ms receive/600ms SAVE) but can be increased to a maximum of 1:10 (3s SAVE) via the keyboard.

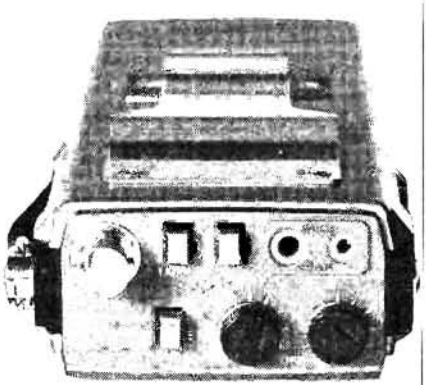
You may well conclude from the preceding description of the programmable facilites that the FT 209RH is a relatively complex item! This is certainly true but the essential controlled routines are readily mastered and after a period of familiarisation the advanced level functions also fall into place. To quote once again from the operating manual ". . . the FT-209RH itself is no doubt capable of more combinations of functions and shortcuts than can be described herein . . we encourage the adventurous operator to experiment with alternative programming techniques and to pass on their discoveries to others'.

Thanks for the loan of the review sample FT-209RH go to **South Midlands Communications Ltd, S.M. House, Rumbridge Street, Totton, Southampton SO4 4DP or Tel: 0703 867333.** The current price of the FT-209RH (5W) handheld transceiver, complete with FNB4 Nicad pack is £280 inc. VAT and carriage.

John M. Fell

Top-deck controls and details of the available l.c.d. display elements. The European version of the FT-290RH limits coverage and display characters to 144–146MHz





Club secretaries and PROs should send me any calendars of forthcoming events so as to avoid unnecessary correspondence yet ensuring maximum coverage of their clubs activities. Remember that six weeks notice is required for specific dates. The forthcoming deadlines are given at the end of the feature.

Abergavenny & Nevill Hall ARC GW4GFL: J. B. Davies GW4XQH on (0873) 4655 is the new secretary of the club which meets Thursdays at 7.30pm in the Pen-y-Fal Hospital, above the Male Ward 2, with regular code classes in addition to normal activities.

Acton, Brentford & Chiswick ARC G3IIU: George Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3. Next meeting on Tuesday June 18 will include a demonstration of member's equipment, at the Chiswick Town Hall, High Road, Chiswick, London W4.

Alyn & Deeside ARS GW3TZR: G. C. Cook GW4RKX on (0244) 660066. A new entry for the column, meeting "alternate Mondays" Venue is the Shotton Social Club, Shotton Lane, Shotton, Deeside at 8pm. There is a treasure hunt on June 10 and a junk sale on the 24th. A d.f. hunt is scheduled for July 8. Summer recess is from July 28 to August 31.

Antrim & District ARC GI4SIW: Brian Sheepwash GI4KIS, 204 Donore Crescent, Antrim, is the new sec of the club meeting in the back room of the Railway Bar. Sadly low in members the Antrim Carnival in June with special event station GB2AAD should help to swell the membership.

Aylesbury Vale RS G4VRS: Cathy Clark G1GQJ, 9 Conigre, Chinner, Oxon. "Alternate Tuesdays" at 8pm, Haydon Hill Community Centre, Dickens Way, Aylesbury. Work it out from Tuesday June 11 when there is a junk sale.

Biggin Hill ARC G4RQT G6TBH: Ian Mitchell G4NSD on (09598) 376. Third Tuesdays at 8.30pm. St Marks Church Hall, Biggin Hill, Kent. June 18 is down as a lecture on performance and measurement of h.f. equipment.

South Bristol ARC G4WAW: Len Baker G4RZY on (0272) 834282. Wednesdays at 7.30, the Whitchurch Folk House, East Dundry Road, Whitchurch, Bristol. The subject of the talk on June 12 is c.w. operation by G3XED, the US and county squares by GW3CDH on the 19th, GB2WFH open day at the club venue on the Sunday, June 23. July 3 has a lecture by G4SQQ/G4KUQ on QRP equipment construction.

Bromsgrove & District ARC G3VGG: Norman Westwood G4NYH on Bromsgrove 73847 is new sec and there is also a change of venue to the Avoncroft Art Centre, second Friday of the month plus constructional meeting on the fourth Friday.

Cheltenham ARA G5BK: Tim Kirby G4VXE on (0242) 36723. At the Stanton Room, Charlton Kings Library, Cheltenham, first and third Fridays. Moonbounce operation by G4ASR is the subject on June 7. G3TSO will deal with mobile operation on July 5.

Cheshunt & District ARC G4ECT G6CRC: Roger Frisby G4OAA on (0992) 464795. Every Wednesday at 8pm, the Church Room, Church Lane, Wormley, but on June 12 it will be portable operation on the 144MHz band on Baas Hill Common. The club constructional contest figures on the 26th aided by G4ZCX.

CLUB NEWS

Compiled by Eric Dowdeswell G4AR
Reports to: Eric Dowdeswell,
57 The Kingsway, Ewell Village,
Epsom, Surrey KT17 1NA
PLEASE MARK "CLUB NEWS"

Chester & District RA G3GIZ G8GIZ: Alan Warne G4EZO on Chester 40055. Every Tuesday except the 1st Tuesday in the month at the Chester RUF Club. Vicars Cross, Chester, at 8pm. G3EON deals with a 21MHz converter design on June 11, barbecue and rig-on-the-air on the 18th with p.c.b. photo etching by G8OJQ on the 25th. Special event station GB4CSB is celebrating Chester Scouts 75th birthday, at Eaton Hall July 5/7.

Colchester Radio Amateurs: F. R. Howe G3FIJ on (0206) 851189. Meets at the Colchester Institute, Sheepen Road, Colchester, at 7.30pm. On June 13 G4OAD talks on the Danbury repeaters and the 27th is members' radio construction competition.

North Cornwall RC: John West G6ICW on Bude 4976. First Wednesdays at 7.30pm, the RAOB Club, Camelford. On July 3 G4DGU will talk and demonstrate gear for 10·3GHz.

Coulsdon ATS G4FUR: Alan Bartle G6HC on 01-684 0610. Second Monday and last Thursday of the month at St Swithin's Church Hall, Grovelands Road, Purley, Surrey, at 8pm. Monday June 10 is an open evening presenting many aspects of amateur radio, while Morse tuition takes place on the 27th.

Coventry ARS: Robin Tew G4JDO on Coventry 73999. Every Friday at 8pm, Baden Powell House, 121 St Nicholas Street, Radford, Coventry. There is a visit to IBM on June 7, a Top Band d.f. hunt on the 28th and nights on the-air the other Fridays. A treasure hunt and barbecue is scheduled for July 5.

Denby Dale & District ARS G4CDD G8KMK: G. Edinburgh G3SDY on (0484) 602905. Meets Wednesdays at 8pm in the Pie Hall, Denby Dale.

Devizes & District ARC G4WIK: Peter Greed G3MQD, 18 Nursteed Park, Devizes, Wilts. Every Friday at 8pm, the Devizes Football Social Club. Formal evenings on first Fridays and social events on the third.

Droitwich ARC: Gordon Taylor G4HFP on (02993) 3818. Special event station GB2PWB (Prince William's birthday) will operate during June from the QTH of G4PQZ and from the site near to the BBC masts at Droitwich on June 15/16. Normally meets on second and fourth Mondays at Scout HQ, Union Lane, D'wich, next to the railway station, at 8pm.

Dunstable Downs RC: Phil Morris G6EES on Dunstable 607623. A trip to the Mullard laboratory is planned for June 30 with the 21st devoted to NFD planning. Normal venue is Chews House, High Street South, Dunstable, Beds, starting at 8pm.

Edgware & District RS G3ASR: John Cobley G4RMD on Hatfield 64342. Second and fourth Thursdays at 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx. G4RMD will deal with RTTY on the BBC computer on June 13, with VHF NFD briefing on the 27th.

Exmouth ARC G4HOB: Des Thompson, Four Winds, 131 St Johns Road, Exmouth, Devon, "alternate Wednesdays" which makes it June 19 and July 3, at the 6th Exmouth Scout Hut, Marpool Hill, Exmouth.

Farnborough & District RS: Peter Taylor G4MBZ on F'boro 837581. Meets at the Railway Enthusiasts' Club, Access Road, off Hawley Lane, F boro. On Wednesday June 12 G8CKN will deal with v.h.f./u.h.f. antennas, with a preview of VHF FD on the 26th.

Fylde ARS: J. Whitehead G4CSA on Lytham St Annes 737680. Meets at the Kite Club, Blackpool Airport, first and third Tuesdays at 7.45pm. Note club's equipment construction competion on July 2

Gordano AR Group: John Davies G3LJD, 273 Down Road, Portishead, Bristol. Fourth Wednesdays of each month at 8pm, The Ship, Redcliffe Bay, Portishead. A d.f. hunt is planned for June 26.

Grimsby ARS G3CNX: George Smith G4EBK on Grimsby 887720. Venue is the Cromwell Social Club, Grimsby, at 8pm, second and fourth Thursdays. There will be a d.f. hunt on June 20 and G1EMS will talk on guide dogs on the 27th. A computer night is scheduled for July 4.

Havering & District ARC G8HRC G4HRC: D. St J. Gray G1HTQ on Hornchurch 41532. Meets at Fairbytes, Billing Road, Hornchurch, Essex. On June 12 the acknowledged expert G5RV will lecture on h.f. wire antennas. Entry by ticket only. A d.f. hunt is down for the 19th.

Hilderstone RS: Annette Penfold G0BEX on (0304) 812723. Friday meetings at 7.30pm. at the Hilderstone Adult Education Centre, St. Peters,

Don't forget the 1985 *PW* 144MHz QRP Contest

16th June 0900–1700GMT

Contest rules appeared in your June *PW*

Broadstairs, Kent. RAE tuition and practical projects with QRP a special interest.

Holyhead & District ARS; Mrs B. Anziani, c/o 12 London Road, Holyhead, Anglesey, Gwynedd. This newly-formed club has a couple of dozen members so far and welcomes more. Meets "alternate Sundays" at 7.30pm, the Forresters Arms, Kingsland Road, in Holyhead. Code instruction is under way among other activities. RAYNET activity is also envisaged. Contact sec for meeting dates.

Hornsea ARC G4EKT G6EKT: Norman Bedford G4NJP on (0262) 673635. Meets at the Mill, Atwick Road, Hornsea. G4EEV will chat on data transmission on June 12 and there will be an RSGB film on the 19th. Contest operating and logging will be the subject on the 26th.

Ipswich RC G4IRC: Jack Toothill G4IFF on (0473) 44047. A treasure hunt has been organised for June 12, otherwise it's second and last Wednesdays of the month at the Rose and Crown, 77 Norwich Road, Ipswich, at 8pm. The club room is detached from the public bars so juniors, and others, are most welcome.

Isle of Man ARS: Anthea Matthewman GD4GWQ on (0624) 22295. Note a change of meeting spot which is now at the Howstrake Hotel, Harbour Road, Onchan, at 8pm on Monday evenings. Informal meetings take place on Tuesdays at the Peveril Court Hotel, Ramsey, and on Thursdays at the Tynwald Inn, St Johns, on Fridays at Perwick Bay Hotel, Port St Mary.

East Lancashire ARC G3NTJ G1ELC : Stuart Westall G6LXU on (0254) 887385. First and last Tuesdays of the month for formal and informal meetings respectively, at the Conservative Club, Cliff Street, Rishton, at 7.30pm. On June 25 the talk will be on Japanese "Morse" code. Note the club d.f. hunt on July 2.

Lincoln SWC G5FZ G6COL: Pam Rose G4STO, c/o City Engineers Club, Central Depot, Waterside South, Lincoln, is also the club's meeting spot on Wednesdays at 8.15pm. June 12 is a night on-the-air and a d.f. hunt plus barbecue is slated for the 16th, which is a Sunday. There will be a junk sale on the 26th. It is hoped to arrange official BT Morse tests at the club on June 19 and July 17 for club members and any others who can attend to take the test.

Loughborough AR & Electronics Club: Jim Smith G4DZL, c/o Top Floor, Brush Social Club, 18 Fennel Street, L'boro. Which is where the club meets on Fridays at 8.30pm with the constructors group also there on Tuesdays from around 7.30pm. Junk sale on June 7, h.f. night on-the-air on the 14th, plus d.f. hunt on the 21st starting at 8pm.

Maidenhead & District ARC: R. A. Fowler G3IQF on Marlow 6421. This is the new club PRO, the club meeting first and third Tuesdays of the month at the Red Cross Hall, The Crescent, Maidenhead, Berks. Lectures are scheduled for June 6 and July 4.

Mansfield ARS: Angela Fisher G1DZH, 5 Maunleigh, Woodhall Park, Forest Town, Mansfield, Notts. Angela is the new secretary of the club which meets first Friday and third Tuesday at the Victoria Social Club, Princess Street, Mansfield.

Plessey Christchurch ARC: Geoff Longman G6WQU, c/o Plessey, Christchurch, Dorset, BH23 4JE. Details are a bit sketchy of this newly-formed club that is now open to outside amateurs. A fully equipped shack is offered and the Plessey Sports & Social club is nearby. Meetings expected to take place on the first Thursday of the month. A call on S20 to G6WQU/P from 7pm onwards may help you find the spot on meeting evenings.

Rhyl & District ARC GW4ARC GW1ARC: Melfyn Allington GW1AKT on Nantglyn 469. Highlight for June is the talk by the Rev. George Dobbs G3RJV on QRP operation, starting at 7pm. The club meets at the Mona Hotel, Market Street, Rhyl, on the first and third Monday normally at 7.30pm. A d.f. hunt is down for July 1 and Basil O'Brien G2AMV speaks to the club on the 17th, the subject being the RSGB.

Rossendale Valley ARC: Lee Standley G1EIU on (0706) 214411. Lee is new secretary of the club which meets at the Bishop Blaize Hotel on the A56 in Rawtenstall, Rossendale, Lancs, every Thursday at 8pm.

Skelmersdale & District ARS G4SME G6TKY: Gordon Crowhurst G4ZPY on (0704) 894299. New secretary for this club which was originally the Skelmersdale RC, also a new venue which is the Beacon Park Golf Club at 8pm on Thursdays.

Skelmersdale Radio, Electronics & Computer Club: Joe Singleton G4WJR, 3 Willow Drive, S'dale, Lancs. Formed earlier this year the club still seeks new members. Meets at the Royal British Legion, Liverpool Road, S'dale, at 8pm on Wednesdays.

South Manchester RC: D. Holland G3WFT on 061-973 1837. Fridays and Mondays at 8pm, the Sale Moor CC, Norris Road, Sale. June 21 is the mid-summer night's d.f. hunt and the Region 1 RSGB rep will be in attendance on the 28th.

Spen Valley ARS G3SVC: Tim Clough G4PHR on Mirfield 499397. Thursdays at 8pm, the Old Bank WMC, Mirfield. There will be a junk sale on June 6 and a summer social evening on the 20th.

Stratford upon Avon & District ARC: David Boocock G8OVC on S upon A 750584. Second and fourth Mondays at the Bearley Radio Station in the control tower at 7.30pm. June 10 is still a talk by a rep of BT on radio QRM, and note the visit to the BBC Training Centre will be on Tuesday, June 25, with no meeting on the Monday. July 8 will be devoted to RTTY and AMTOR by G3WHO. Advance notice that as from September 9 a new meeting spot at the Baptist Church, Rayton Street, S upon A but more of that anon. There are no meetings in August.

Stroud ARS G4SRS: P. R. Gainey G1DCT, Prencott, Harley Wood, Nailsworth, Stroud, Glos. Formerly the South Cotswold ARS this group now meets at Nelson School, Stratford Lodge, Stroud, with next meetings on June 12 and 26 both Wednesdays. Code classes, lectures and operational club station.

Sutton & Cheam RS: Alan Keech G4BOX, 26 St Albans Road, Cheam, Surrey. Third Friday at 7.30pm, the Downs LT Club, Holland Avenue, Cheam. On June 21 the return inter-club quiz with the Coulsdon club, then off to the Longleat Rally on Sunday, June 30.

Thornton Cleveleys ARS: Liz Milne G4WIC on (0253) 821827. Liz is the new secretary of this group which meets at 7.45pm at the 1st Norbreck Scout HQ, Carr Road, Bispham, Blackpool, although these premises will be closed during June, for repairs. So, instead, there are visits to Blackpool Airport on June 3 and 17 and to the Wireless Workshops, Police HQ, Hutton, on June 12 and 27.

Three Counties ARC: Ralph Hodgson G3TBT on Passfield 368. The Railway Hotel, Liphook, Hants, Wednesdays at 8pm. It's on-the-air night on June 26 and note that a rep from *PW* will talk on Antennas on July 10.

Torbay ARS G3NJA G8NJA: Brian Wall G1EUA on Teignmouth 78554. The club is settling down in its new HQ at the ECC Social Club, Ringslade Road, Highweek, Newton Abbot, where it meets every Friday and last Saturday of the month. G3YLJ will give a talk on aircraft construction on June 29.

Trowbridge & District ARC: Gerry Callaghan G4SPE on (02214) 4532. The new night for this club is the fourth Tuesday of the month at 8pm, the Southwick Village Hall, near Trowbridge, Wilts.

Verulam ARC: Hilary Claytonsmith G4JKS on St Albans 59318. Second and fourth Tuesdays at the RAF HQ, New Kent Road, off Marlborough Road, St Albans, at 7.30pm. Contesting will be the subject for Al Slater G3FXB on June 25.

North Wakefield RC: Steve Thompson G4RCH on Morley 536633. Meetings held at Carr Gate WMC, Lawns

Lane, Wakefield at 8pm. There is a lecture on June 13 and d.f. hunt on the 20th. Advance notice of a chat on AMTOR by G3PSM on July 11.

Mid-Warwickshire ARS: Carol Finnis G4TIL on Southam 4765. Second and fourth Tuesdays at 8pm, at 61 Emscote Road, Warwick. A d.f. hunt is down for June 11 and a chat on the G5UM awards on the 25th. Another d.f. hunt takes place on July 9. No meetings on July 23 or in August.

Welwyn Hatfield ARC: Dave Fairbank G0AII on W.G. 26138. First and third Mondays at 8pm, the Knightsfield Scout HQ, W.G. City. This new club is seeking new members and all are welcome.

Wimbledon & District ARS G3WIM G8WIM: George Cripps G3DWW on 01-540 2180. Second and last Fridays of the month at the St John's Ambulance HQ, 124 Kingston Road, Wimbledon, London SW19, at 8pm. General activity and code tuition evening and there is a junk sale on June 14.

Winchester ARC G3ZPT: Bob Stone G4FPC on Winchester 64747. Every Third Saturday at 7.30pm, the Log Cabin, Stockbridge Road, W'chester. On June 15 a talk on antennas will be given by G4CEW. There will be no meetings in August.

Wirral ARS G3NWR: Cedric Cawthorne G4KPY on 051-625 7311. In the Parish Hall, Heswall, first and third Wednesdays at 7.45pm, with possible talk-in on 144·725MHz. A technical lecture is on for June 19 and on July 3 a sale of surplus equipment.

Wirral & District ARC G4MGR G8WDC: Gerry Scott G8TRY on 051-630 1393. Second and fourth Wednesdays at 8pm, Irby Cricket Club, Mill Hill Road, Irby, Wirral, with other Wednesdays devoted to drinking and waffling at local hostelries. June 12 has a talk by RSGB's Regional Rep G3XSN and there is a d.f. hunt on the 26th for the Eileen Medley Challenge Cup. Book in by 7.50pm for an 8pm start from the Heswall lay-by. The annual barbecue is on July 3 on Heswall shore.

Wolverhampton ARS G8TA: Keith Jenkinson BRS84269 on (0902) 24870. Every Tuesday at 8pm, W'hampton Electricity Sports & Social Club, St Marks Road Chapel Ash, W'hampton. A discussion for all on "How I came into amateur radio" on June 11 plus, on the 18th, a demo of RTTY and AMTOR by G1DIL. June 15 is the first night-on-the-air from the new HQ.

Yeovil ARC G3CMH G8YEO: Eric Godfrey G3GC on (0935) 75533. Thursday evenings at 7.30, the Recreation Centre, Chilton Grove, Yeovil. G3MYM deals with cosmic radio noise on June 13 and with sines and cosines on July 4. G3GC delivers the third part of his series on computers on June 20.

Forthcoming copy deadlines are as follows:

Cover Date	Copy Deadline	Covering events for
September	June 15	August
October	July15	September
November	August 15	October

Kindly Note

On the Air Indicator — May 1985

The arrangement shown in Fig. 2 for muting the stereo outputs of a radio cassette has raised some questions from readers.

1. The relay contacts RLA1 and RLA2 must be "normally-closed". This will usually mean using the "rest" contacts of a changeover set.
2. Though it is usually safe to open-circuit the output from transformerless audio stages, this will spell disaster for a radio/cassette player with an output transformer driving the loudspeaker. Should you want to use the circuit with such a design, use changeover relay contacts to replace each loudspeaker by a 4Ω or 8Ω dummy-load resistor (wirewound of a suitable wattage rating) when the relay operates.

Multiple Choice, January 1985

In Question 4-3, regarding the amplitude of an f.m. carrier, the answer given was that the carrier amplitude remained constant with modulation. Several readers have written to point out that the amplitude of the **carrier frequency component** changes with modulation, as power is transferred into the sidebands. In fact, at some values of modulation index (the ratio of frequency deviation to modulating frequency) the carrier component disappears entirely. These are known as "Bessel Zeroes". The total power contained in the carrier and sidebands is constant, and the f.m. signal as viewed on an oscilloscope has a constant amplitude.

At the technical level of the RAE syllabus, it is sufficient to think of an amateur f.m. transmission as consisting of a carrier varying in frequency at the rate of the modulating audio, but it is worth noting that actually it is mathematically much more complicated than this.

ON THE AIR

AMATEUR BANDS

Reports to: Eric Dowdeswell G4AR, 57 The Kingsway, Ewell Village, Epsom, Surrey KT17 1NA.
Logs by bands in alphabetical order.

by Eric Dowdeswell G4AR

Steven and John Goodier, G4KUB and G4KUC respectively, used to be regular contributors to this column. They have now published an excellently produced World Wide Countries Check List for the h.f., v.h.f., u.h.f. and Satellite Bands. Each prefix is followed by a line of squares which can be ticked off for all bands from the 1·8 to 28MHz band, and the satellite bands, and including the new WARC bands. The book is A4 size when opened out. Individual states of the USA, Canada and Australia are also given. The countries index shows prefixes and continents and page reference.

For the v.h.f./u.h.f. enhusiast there is a European check list for bands from 50MHz to 1·3GHz. The check list is available from A. Goodier, 35 Rose Lane, Marple, near Stockport, Cheshire, for £2.50 plus 50p p/p.

DX Bands

Bob Parsey of New Malden, Surrey, runs an FRG-7700 and complementary a.t.u. fed from a 60m-long wire, running north and south. Only s.s.b. catch of note on 1·8MHz was RA9CQW but on 3·5MHz he found A92EB (QSL KOLST), J28EB (QSL POB 2417, Djibouti), OE3HGB/YK, Z21EV, 8P6GG (QSL N4CTC) and 9K2SA FM5WD (QSL W3HNK) turned up on 7MHz amid the BC QRM. On 14MHz just D44BC (QSL POB 36 Mindelo) and VP8LP. The 21MHz band came alive long enough to log A4XRS, A92D (QSL G4VIE), DL7AH/3X, N2BA/VP2M, TU4BR, VE3KFE/4U on the Golan Heights with cards to VE3PET, and VQ9CK (QSL WB3CQN), 9J2TJ (QSL POB 28, Chisekesi).

First log from **Tom Blamey** (Tonyrefail, Mid-Glam) shows he used a Trio R600 and Amtech 200 a.t.u. with a wire in the loft. Around 3·8MHz he logged KC4CT on Navassa Island for a rare one, and KT5B/YV1. Up to 14MHz and TI2CC, ZB2BU and 7X2LS.

Phil Dykes G4XYX in Poole, Dorset, spends his time playing around with a.t.u.s to improve the performance of his W3EDP antenna plus making a QRP transceiver for the 10MHz c.w. band. He is also thinking of starting a local QRP group. He found several DX openings on 28MHz like PY, LU, TI and W4 but only managed to work SM4JWI, SM0OWX, SP6CIK and OK2BTI with his QRP 10W of s.s.b. and dipole antenna 5m high.

In Irvine, Ayrshire, **Paul Lawless GM4PGV** writes in for the first time to say he is building the *PW* Teme transceiver. The TX side is being used with his TS530 transceiver and a W3DZZ antenna, working numerous Gs on 7MHz with 2W of c.w. On h.f. with 50W of c.w. Paul worked JH8JYV and NB0V on 14MHz, plus the "usual crop" of VEs and Ws on c.w. in the afternoons. Nothing but Euros have been heard on 21MHz.

In Leiston, Suffolk, **Dick Stanbridge BRS31879** has a Trio R2000 and AT1000 a.t.u. with a Datong active antenna, finding just RL7GBR on 1·850MHz c.w. plus OX3KM on 3·5MHz s.s.b. J37XC turned up on 10MHz c.w On to 14MHz and S83H, D68AZ on c.w. plus H33IA and G4DUW/DU2 (QSL POB 518, Makati, Manilla) on s.s.b. The 21MHz band produced only VQ9NC and 3B8FP (QSL POB 164, Curepipe) on s.s.b.

Melvyn Dunn BRS86500 of Grimsby has a Realistic DX160 receiver and a 40m-long wire finding OD5AS and OD5HM on 14MHz s.s.b., both QSL to POB 121, Tripoli, Lebanon. Better signals on 7MHz produced 6W6JX (QSL POB 200, Kaolack, Senegal), 9Y4BA, CO2JA, HW4MU (QSL FD1HWB), VP9CB and HG4OQ, while the 3·5MHz band showed up with 5N8ALH, TZ2XN, 9K2DZ, D44BS, J37AH, 4X4UH and ZC4AB.

Bill Williams of Gloucester runs an FRG-7700 and matching a.t.u. from a 20m-long wire logging 4Z4OZ, 8P6GG, NP4P, PY4ZZ and a good one in VK6AW, all on 3·5MHz s.s.b. The 14MHz only came up with HL1ATJ, VK4AG, VU2GMC and YB0AV.

The FRG-7 receiver of **Matthew Probert** of Basingstoke, Hants, is being supplemened by an HRO which "devours 3·5MHz commercial QRN for breakfast" as he puts it, often out performing the FRG-7. The crystal filter of the HRO has a peaked response rather than the conventional bandpass characteristic with a very pronounced "single signal" effect useful for notching out QRM. The antenna is now a 9m vertical with top loading wires, fed with coaxial cable. The log from Matthew shows J37AH, K7EII, PZ9JS, VE7DGJ, W2KW/KV4 and ZB2EO on 14MHz s.s.b.

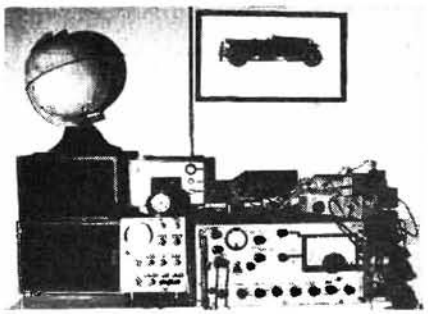
Nice to hear from **Brian Fields** of Billingham, Cleveland, for the first time, also known as G4XDJ, who is a QRP addict. He has 1W out from his *PW* Severn transceiver into a half-wave dipole 7m high. The c.w. brought contacts with EU2C, SM6OTO, EA2CR, FE3ND, YU3CKL, IK1AIR, UR2RLR, 7X2HUB, SM0GRC, SP4ELP, OH1AA and EU1Q near Leningrad, all on 7MHz. Best contact was with DL3BAA/M out for a walk with 10W of c.w.

Norman Henbrey of Rye, E. Sussex, has been under the weather of late with little time for DXing but with his FRDX-400, FRG-7700 and a.t.u. he logged OA4ARQ on 7MHz s.s.b. plus A4XRS, T2ADF and 9M2ZF on 14MHz. Just VQ9CK for a good one on 21MHz and VK2NN on s.s.b. on the 10MHz band, which by general agreement is intended only for c.w. The VK was working a G station!

A nice report from **David Richardson** of Paston, Peterborough, where he uses an FRG-7 and a wire 20m long. His first Top Band DX was T77V, but on to 3·5MHz and A71AD, D44BS, HI8RJR, HW4KR, 7X2LS, 8R1RBF, with, on 7MHz CM8GV (QSL POB 1, Havana), CO7HC and FM5CD. On 14MHz it was just KL7Y for a fairly rare one, so on to 21MHz, active for a change with A4XRS, J28EB, VQ9NC (QSL WA4MQW), VQ9YR (QSL KA4SPA), VU2DDT and VU2GI, YC3II, 5Z4PR and 5Z4WD with QSL cards to DF9BV. All these were using s.s.b. but David promises some c.w. logs before long. CW logs are always most welcome but are almost non-existent at the moment.

As always, intending contributors to this column can obtain a sample log sheet from me for the price of an s.a.e., making monthly reports that much easier. With the change in seasons the h.f. bands are also showing signs of changing conditions with the higher frequency bands more in evidence while the approaching minimum of the solar cycle is having little effect at the moment.

If you have a poor location for DXing for one reason or another, why not try going mobile in your car? Like **Dave Chambers** of Epsom, Surrey, **G4SYT** who has a Kenwood TR430S and a "G-Whip" loaded quarter-wave up on the car's hatchback, running around 80W. So far he has worked over 90 countries on the h.f. bands with this set-up. Recently, Dave found 21MHz open and went on to Epsom Downs and worked three PYs, two LUs plus VQ9YR on Diego Garcia, together with N2BA/VP2M on Montserrat. From the same location a week later he worked CX4HS, and ZD7CW on St Helena and "the greatest prize of all" the research ship *Discovery* GB4DIS/MM just leaving the Weddell Sea in Antarctica, while many fixed G stations were unable to make contact. As Dave says, "Follow my example and take to the road"!



H. Holdsworth of Leigh-on-Sea, Essex, is a long-time reader. The valved RX comes from a 1963 issue of *PW*. The converters on top right are also from *PW* and the homebrew oscilloscope is topped by a 144MHz band receiver. Our 75-year old d.i.y. enthusiast even homebrewed the two speakers

General

The Jersey ARS has recently instituted a new award, the Worked All Jersey Island award for contacting, or hearing, all 12 parishes of the island. The certificate will, hopefully, be countersigned by all the operators concerned. All modes of operation count or it may be endorsed for one or more particular modes. The award costs 6 IRCs and details can be obtained from Awards Manger JARS, POB 338, Jersey. The parishes mentioned are St. Helier, St Peter, St. Saviour, St. John, St. Lawrence, St Brelade, St. Ouen, St. Clement, Grouville and Trinity plus St. Mary.

With the advent of the new c.w. facility for Class "B" licensees I had half-expected a fair increase in c.w. activity on the 144MHz band, with the G6 and G8 gang very busy improving their fists before going for the code exam necessary to get on to the h.f. bands. Since April 1 I have not heard even one such G6 or G8 on the busy 144MHz band! I understand that one or two locals have been active, so I must have missed them. I'm wondering if the whole business was an April Fool's joke after all!

If you were wondering what those GV special event stations were all about, they were issued for groups or clubs celebrating VE-Day, for seven days from May 5, on the 40th anniversary of the occasion.

Those contemplating taking the RAE in 1986 should note that the exam will only be held in May and December next year, the March exam having been discontinued as from then. The RSGB says it will continue to run centres for the RAE both in Derby and in London.

The RSGB's *Council Letter* mentions that amateur licences are now being issued officially in Turkey, the first to TA1A, the secretary of the TRAC, previously known to us as TA1UA.

OBITUARY — Charles Molloy G8BUS

Readers of *Practical Wireless* will be saddened to hear of the sudden death on April 11 of Charles Molloy G8BUS, our medium-wave and short-wave broadcast bands correspondent.

Trained as a telecommunications engineer, Charles worked abroad for several years and was an associate member of the IEE. Interest in the medium waves began when a schoolboy in the mid-1930s, after constructing a receiver for domestic use. He later turned to the short waves after building a one-valve receiver from a design by F. J. Camm in *Practical Wireless,* and became a regular s.w.l. while living in the Middle East.

Charles began writing for *PW* some twenty years ago, with a series of articles on WWII communications receivers. His contributions on his favourite topic, broadcast band DXing, began in January 1969, and were always full of interest for the beginner or the more experienced listener. His current series, *Introducing Short-wave Listening,* will unfortunately end with Part 5 in this issue.

We extend our deepest sympathies to his widow Mary and his family in their loss.

MW BROADCAST BAND DX

Would all readers please send their much-appreciated reports to our new m.w. correspondent, Brian Oddy G3FEX, Three Corners, Merryfield Way, Storrington, W. Sussex RH20 4NS.

Transatlantic DX

Paul Logan from Lisnasken in Co. Fermanagh in Northern Ireland followed the advice he was given in the May issue of *PW*, and tried listening before sunrise.

He started listening at 2300 on April 5 using his portable Shirasuna XF900 receiver. Patience was rewarded and at 0035 he heard WMRE in Boston on 1510kHz, this was followed at 0105 by WCAU in Philadelphia on 1210 and finally at 0120 he logged WBAL in Baltimore on 1090. When he returned to the receiver at 0500 he found the band full of Spanish and Arab stations. At 0550 he logged CKYQ on 610kHz and CJYQ on 930, so the effort seems to have been worthwhile.

Simon Hamer, New Radnor, has sent in an impressive list of transatlantic DX using the Grundig S1400 receiver. As RTE-2 in Eire was off the air (usually it is on 612kHz) Simon was able to hear CKYQ, New Foundland on 610kHz. Other loggings were CBGY on 750, WHAS 840, WHN 1050, CBA 1070, WNEW 1130 and also Radio Globo and CKCW fighting for predominance on 1220.

Other DX

Another reader who uses a Grundig receiver is **Margaret Sadler**, Leeds, and she uses a Satellit 1400SL. At 1939 on March 21 she heard Deutschland Funk 1296kHz, Manx Radio (1368) appeared on the band at 1845 on the 24th and AFRTS (1145) at 2300 on April 7. As for QSL

cards, Manx Radio on the Isle of Man sent their QSL card confirming Margarets report in just 21 days.

"One of the main attractions of radio listening for me is to be able to do so much with so little," says **Richard Eames** of Altrincham. He uses an ITT Pony a.m. receiver and reports regularly hearing stations like Norddeutsche Rundfunk II on 929 kHz early in the mornings and Oesterreichische Rundfunk on 1461kHz late evenings.

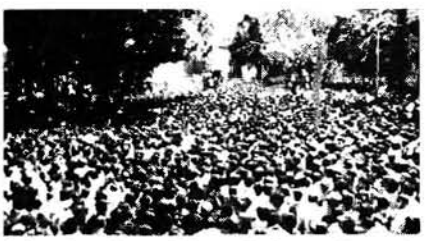
Over in Northern Ireland Paul Logan seems to spend plenty of time listening around the m.w. bands. He heard Radio Essen on 1053kHz at 2300UTc, Radio Renascena (Portugal) on 927 at 2325, Commercial Lisboa on 1035 at 0100 and Radio Antalya on 891 at 0455. It is easy to see why Paul says he is pleased with his first receiver.

Local Radio

On the local radio scene **John Parry**, Anglesey heard a variety of stations mostly above 1250kHz. Among those in his log were Radio Nottingham, Radio Stoke (1503kHz), Radio Merseyside (1485) and Radio Cumbria. John uses a Sommerkamp FT-ONE in conjunction with a 40m dipole, ends strapped together, feeding the receiver via a modified Yaesu active antenna, the FRA-7700. "Using this system really brings the signals in but it's important not to overload the receiver," says John.

Paul Logan managed to log quite a few local radio stations, both IBA and BBC. Again most of his listening was done between 1800 and 0100UTC. He logged BBC Radio Manchester on 1458kHz at 1800, Cumbria on 756 at 1900, Clyde at 1151 on 2245 and Newcastle 1458 at 0056. IBA stations heard include Saxon on 1251kHz at 2015, Tayside on 1161 at 2200, Wyvern on 1530 at 2300, Invicta Sound at 1242 at 2325 and Hereward 1332kHz at 0100UTC.

RAIBC member **William Lee**, Anglesey, wrote in and tells of the QSL cards he has received of late from "local" radio stations, these include BBC London, Sheffield, Devon, Manchester and Bristol. A good selection of cards over a wide area too.



Islamic Republic of Iran Broadcasting QSL card sent in by Fred Carter

North America

A report from **Roger Bunney** has some interesting news for m.w. DXers. There are now four different a.m. (medium wave) stereo systems in operation across the continent, three of these require dedicated i.c. decoders whilst the fourth system—Kahn/Hazeltine—will operate on standard a.m. equipment, though two similar receivers are required. From the DXing viewpoint in Europe the Kahn system will allow skywave reception in stereo given reasonable group fading conditions but, obviously with a varying sideband propagation situation (selective fading), results will be less perfect. DXers in the States have successfully received and DXed a.m. stations via night-time skywave, so there is no reason why European enthusiasts shouldn't share in this relatively new broadcasting technique.

NA Stereo Stations

Canada
Vancouver CKLG, Saskatchewan CHAB, Edmonton CHED, Calgary CFFR, CKXL, Winnipeg CKY, Hamilton (Ont) CHAM, Toronto CHUM, Halifax (NS) CJCH.

USA
Anchorage KFQD, Portland KKSN, San Francisco KFRC KNBR KOIT KIQI, Los Angeles KHJ KRLA KABC KMPC, Tijuana XTRA KTNQ, Phoenix KOY, Salt Lake City KSL KRGO, Ogden KJQ, Minneapolis KTCR, El Pasco KKMJ, Eugene KUGN, Las Vegas KLAV, Houston KLAT KKBQ KYOK, Bryan WTAW, San Antonio KTSA KEDA, Dallas KAAM, Kansas City KMBZ, Corpus Christi KCCT, Ft. William Beach WNUE, Orlando WDBO, Rapid City KOTA, New Orleans WQUE, Birmingham WSGN WATV, Ft. Myers WINK, W. Palm Beach WIRK, Charleston WCSC, Atlanta WQXI, Tampa WRBC, Huntsville WAAY, Orangeburg WSOL, Johnson City WJCW, Greensboro WBIG, Charlotte WBT, Toledo WSPD, Utica WTLB, Miami WGBS, Roanoke WSLC, Washington DC WMAL, Lynchburg WLVA, Bloomington WJBC, Chicago WGN WMAQ, Cincinnati WKRC, Richmond WRVA, Philadelphia WFIL, Staunton WKDW, Grand Rapids WOOD, Baltimore WFBR, Wilmington WAMS, Syracuse WSYR WHEN WOLF, Wilks Barrie WNAK, Long Island WHLI, New York WNBC WQXR WABC, Bangor WZON, Boston WHUE, Westport WMMM, Springfield WMAS, Willmantic, WILI, Worcester WFTZ, New Haven WELI, Hartford WTIC.

Mexico
Mexico City XEOY, Guadalajara XHEL.

Kahn can operate in a stereo format as follows, two a.m. radios are tuned to the appropriate station. One radio is tuned slightly h.f. of the nominal carrier (right hand) and the other is tuned slightly l.f. of nominal (left hand). Practice obviously makes perfect but it does work! A decoder i.c. is available for Kahn for single receiver use but the twin radio technique equally works well. There are over 100 stations operational in North America and the listing indicates callsigns and approximate areas though these are not arranged in any specific order, m.w. enthusiats can establish frequencies and likely candiates for reception.

Australia permitted a.m. stereo as from 1 February 1985 and currently Sydney stations 2UW and 2CH are transmitting a.m. stereo.

The other three systems Harris, Magnavox and Motorola use a multiplexed a.m./p.m. signal that require a decoder i.c. Motorola in particular has been cited as giving unstable stereo in fading/interference situations, resulting in a fluctuating stereo centre—the announcer for example is in motion between left and right!

We would be delighted to hear from any m.w. enthusiasts resolving a.m. stereo from stateside and hear of readers observations.

Radio Stations in Eire

In the May issue the question of the local radio stations in Eire was raised. Replies, further information and comments have arrived from a few readers which may help to clarify the situation.

First the official stations, sent in by Paul Logan, Radio Na Gaeltocht (Donegal) on 963kHz and it transmits programmes in Gaelic, then there is RTE 1 and 2 that transmit on 567 and 612kHz respectively.

Richard Eames has some information on the other stations and says they are still completely illegal and subject to random police raids and equipment confiscations. "The Irish Government has, I believe, made known its intention to regularise the situation in the near future, so possibly some of these stations may disappear," writes John Parry.

Many thanks to all the readers who helped make the situation clearer.

SW BROADCAST BANDS

Following the sad death of Charles Molloy, would all readers please send their much-appreciated reports to our new s.w. correspondent, Brian Oddy G3FEX, Three Corners, Merryfield Way, Storrington, W. Sussex RS20 4NS.

Radio RSA

We have received a schedule from Radio RSA which lists the English Language Broadcasts. They transmit programmes in nine different bands ranging from the 21·5MHz band (13m) to the 3·3MHz band (90m). Programme times are:

Time (UTC)	Target Area	Frequencies (MHz)
0200–0256	USA and Canada	5 980, 6·010, 9 615
0300–0426	East, Central & Southern Africa	3·230, 4·990, 5·980 7·270, 9·580
0630–0730	West, East, Southern Africa, UK & Ireland	7·270, 11·900, 15·220, 17·780
1100–1156	Central, East, West Africa, UK & Ireland	15·220, 17·785 21·535
1300–1556	Central, East, West, Southern Africa, UK, Ireland & Middle East	9·585, 15·220, 21·535
2100–2156	West Africa & Ireland	7·270, 9 585, 11·900

The address for details of the English Language Broadcasts is: Radio RSA, English Service, Box 4559, Johannesburg 2000, South Africa.

DX Heard

Margaret Sadler RS87397 from Leeds has sent in an impressive s.w. log for most days between March 21 and April 14. Her receiver is the Grundig Satellit 1400SL and uses the telescopic antenna for her s.w. bands DXing

Radio Afghanistan was heard on 9·665MHz at 1900, Radio Yugoslavia on 6·100 at 2000, Radio Kiev on 6·020 at 1900, Radio Syria on 12·085 at 2025 and KYOI on 11·900 at 1530—all in the month of March. The broadcasts heard in April were just as good, Vatican Radio on 11·742 at 1445, Voice of Turkey on 9·560 at 0002, Radio Beijing (China) on 11·860 at 0100 and Radio RSA on 21·535 at 1230 are only a handful of the stations Margaret heard.

In New Radnor, **Simon Hamer** was also busy with a Grundig receiver, the 1400S and an a.t.u. placed above the set complete with a 22m long-wire antenna, with earth. On April 6 he heard RUV Iceland on 9·859MHz at 2001 "booming in with English football results".

Radio Beijing schedule sent in by Fred Carter

Radio Nederland Publications

The following publications are just some of those available, free of charge, from Radio Nederland. They cannot accept requests for more than 5 different leaflets per letter. If you are interested in any leaflets please state clearly which ones you require by name.

Receiver Shopping List: A consumer guide to choosing a short wave receiver. Sets are listed in price order and other details given include a brief description of facilities offered and address of manufacturer. An indication of current prices for most countries, where known, is given.

Booklist: The title, a brief review, price (if known) and retail outlets are noted for each book. Included in the lists are publications, periodicals and tape recordings useful to the s.w.l. Various listening guides are also mentioned.

Infodutch: This stands for Information of Direct Use To Computer Hobbyists. It lists various software sources for the most popular machines. Details of computer bulletin boards are also given.

Give Your Antenna Some Air: This gives all the details necessary for constructing and siting a variety of different antennas that can be used for s.w.l.ing.

Radio RSA schedule

Writing Useful Reception Reports: This covers how to send a good reception report to an international short wave broadcasting station

Latin American DXing: This fact sheet has advice on how to write a reception report to a station in that part of the world. Simple letters in Spanish and Portugese, plus some useful tips are also included.

DXing Indonesia: A degree of skill is needed to log and verify small short wave stations in this part of the world. This leaflet gives advice and includes a sample reception report in Indonesian.

The address for the publication is Media Network, Radio Nederlands, PO Box 222, 1200JG, Hilversum, Holland.

Other Useful Publications

Dial Search: Available from George Wilcox, 9 Thurrock Close, Eastbourne, East Sussex BN20 9NF. This contains a map of the British Isles and Northern France and another of Europe and the Mediterranean, which pin-point some 300 transmitter sites enabling listeners to take bearings. It also gives a frequency list of m.w. and l.w. UK stations and a v.h.f. list for the British Isles.

International Listening Guide: Available from DX Listeners Service, c/o Bernd Friedewald, Merianstrasse 2, D-3588 Homberg, FRG-West Germany, it costs 8 IRCs. The listening guide contains sections covering external and home services in English with times and frequencies, a survey of World News and a list of DX programmes.

QSL Survey: Available from EDXC, PO Box 4, St Ives, Huntingdon, Cambs PE17 4FE and costs 50p. The survey lists 17 questions regarding broadcasters thoughts on QSLs and also gives the replies received from 42 international broadcasters.

Tropical Bands Survey: Published annually by Danish Short Wave Clubs International and is available to non-members for 7 IRCs. Send to, DSWCI, Tavleager 34, DK-2670, Greve, Strand, Denmark. The survey lists stations in frequency order giving power, location and times of transmission. Stations are also placed in the following categories: often reported, regularly reported, seldom reported, not reported but known to be active, possible inactive, seasonal frequency.

International Mailing List: Available from DX Listeners Service, c/o Bernd Friedewald, Merianstr 2, D-3588 Homberg, West Germany and costs 2 IRCs. It contains the full postal addresses of some 300 stations or broadcasting organisations active on the short waves.

International Programme Guide: Available from DX Listeners Service, c/o Bernd Friedewald, Merianstr 2, D-3588 Homberg, West Germany and costs 8 IRCs. The guide lists the English programmes and regular features of some 100 international broadcasting stations that are on the air daily. Times are quoted in UTC, target areas are indicated and adjustments are made for summertime where appropriate.

VHF BANDS

Reports to: Ron Ham BRS15744, Faraday, Greyfriars, Storrington, West Sussex RH20 4HE.

by Ron Ham BRS15744

Throughout this modern world, millions of people operate some form of radio equipment as part of their daily routine. For most of the time, whether it is broadcast programmes, a radio telephone or even those regular QSOs on the amateur bands, reception is loud and clear. However, there comes a time, at best for just a few hours and in extreme cases for several days, when this normality is shattered. Programmes fade, the voices become distorted and for reasons, other than a fault with the equipment, that are beyond human control. To understand this better, it is important to accept that once a signal is emitted by a terrestrial radio transmitter, it must travel through the complex gaseous atmosphere which surrounds the Earth. Natural disturbances, in a variety of forms, do often occur within the atmosphere and, for a time, can deflect, reflect, hinder or enhance the normal paths of such signals. That readers, perhaps unfairly, is putting a complicated subject into a nutshell. One only has to glance through a few of the highly technical and well researched books about the propagation of radio waves, to realise just how many factors are involved and that we, with our limited space, can only scratch the surface of an event by reporting what actually happened, rather than trying to pinpoint the precise cause

Briefly, radio signals in the h.f. bands are propagated via the ionosphere and in the v.h.f., u.h.f. and s.h.f. bands, via the troposphere. The former can be influenced by the behaviour of the sun and the latter by changes in atmospheric pressure, temperature and the prevailing local weather.

I believe that most readers are keener to know more about the DX resulting from a disturbance rather than the exact cause. With this in mind, I try to strike a balance between the two that will help the beginner to understand the event and give adequate information for the experienced operator under each of the following headings. I would appreciate your opinions on this one readers.

Solar

"The sunspots at the end of February were seen again at the end of March, but my suspended magnetometer has not been very active," writes **Ron Livesey,** Glasgow, the auroral co-ordinator of the British Astronomical Association. He added that the Boulder observatory reports isolated activity between March 16–20 and on 23. "With solar activity at present levels, it's hard to avoid the feeling that we are at minimum, although I know it's predicted for 1987. The cycle has often looked more like 10 years of late and we are almost 5½ years since maximum," writes **Ted Waring,** Bristol. He comments, "Who knows?, we might see an upturn by the end of 1986." I hope we see something before then Ted, my solar radio charts have been bare too long, hi! Both Ted and **Cmdr Henry Hatfield,** Sevenoaks, observed the spots at the end of March. While Henry, using his spectroheliosccope on the 31st located two filaments, **Patrick Moore,** Selsey, was lucky with clear skies and able to observe them almost daily from March 30 (Fig. 1) to April 4.

Reports of a quiet auroral glow and arc at 2100 and 2230 on March 13 and 17 respectively were sent to Ron Livesey by the Meteorological Office at Wick and another correspondent, **H. A. Snip** PA3BWY, a Radio Officer on the Dutch weathership, *Cumulus*. He stresses the importance of amateur radio operators identifying auroral reflected signals and making full use of the event, while it lasts, to measure beam headings of incoming signals.

Auroral reflected signals are identified by their tone, for instance, c.w. sounds like a low pitched rasp and s.s.b. like a distant ghostly whisper. Do keep in mind, that whatever the geographical location of the transmitter, its signal is reaching you via an aurora so you should start with your beam in a northerly direction and slowly turn it east and west of north until maximum signal strength is found. It is this beam heading that is important in your report and when added to other such reports, it is possible for the size and movement of the event to be plotted by the auroral co ordinators. Reports are welcomed by Charlie Newton G2FKZ, QTHR, the IARU auroral co-ordinator.

The April issue of *Solar News*, published by the London Solar Committee, contains descriptions and block diagrams of four types of radio telescope as well as reports of solar activity during the first quarter of this year and useful tables for the period May to August inclusive. The LSC's radio section now has 16 members and it is their intention to develop this area of amateur astronomy and combine the efforts of both the visual and radio astronomer. *Solar News* costs £3 p.a. including post or specimen copies at £1, available, with details of membership, from Bert Chapman, Brindles, Mill Lane, Hooe, Battle, East Sussex, TN33 9HT. Every bit of information and each observation is vital to our better understanding of the influence that the sun has over our radio communications.

Henry Hatfield, using a home-brew receiver with a ferrite rod antenna, monitors the signal from the v.l.f transmissions of MSF Rugby and has found that maximum amplitude swings usually occur between sunset and midnight. Since his experiments began last November, Henry has noted from his readings, a variation of signal strength in a 30/31 day cycle. "I wonder what it is on the sun that varies with that frequency?", asks Henry and suggest that it might be due to the rotation near the poles. However, he is continuing this fascinating study and both Henry and I would be pleased to hear about other work that readers are doing in this particular field.

Although the 28MHz band was generally quiet throughout the period of this report (March 15–April 14) a few short life openings did occur. The one on March 24 may have resulted from solar activity associated with the sunspots observed at the time by Patrick Moore, Fig 2.

"There was an excellent opening on March 24, starting about 0900 with only Hungarian stations on the band, but became very lively later with most of Europe coming in and the last signals I heard were from Finland and Poland," writes **Gordon Pheasant** G4BPY, Walsall. He also received signals from stations in Spain on the 28th and April 5 then both Austria and Italy on the 10th. In Winchester, **John Coulter,** using an FRG–7, logged signals from north and south America on March 18, then Austria, Germany and Hungary during the morning of the 24th At 1140 on the same day, **Fred Pallant** G3RNM, Storrington, heard signals from Czechoslovakia, Finland and Germany During the morning of the 25th Fred logged ZS3KL and ZS6CDJ, at 1323 he heard both Sweden and the USSR. To complete the day at 1515 he heard 5T5RG sounding like an echo chamber.

"It is interesting to note the peculiar behaviour of the spectrum these days," writes **Bill Kelly**, Belfast. At times during March he heard European amateurs at the lower end of 28MHz, but it didn't coincide with the reception of beacon signals.

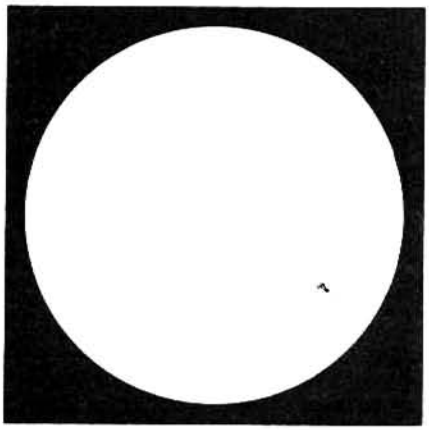


Fig. 1

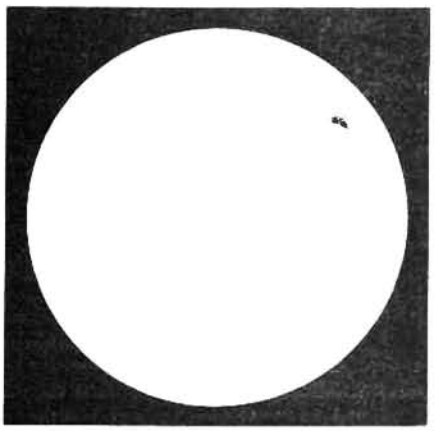


Fig. 2

North London Communications Ltd

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C7900	New slim fully synthesised 70cm 10W Mobile with 5 memories, scanning, 10MHz coverage and digital read-out etc	279.00 (2.00)
C58	2M FM/USB/LSB and CW Portable with 1W RF Power and tuning down to 100Hz	319.00 (2.00)
CMB8	Mobile mounting cradle for C58 with all connections for antenna power etc., built in	27.50 (0.75)
CPB58	A 25W linear amplifier for C58 that bolts underneath the CMB8	79.95 (2.00)
CLC8	A carrying case for the C58 — with flap over top for added protection	8.50 (0.75)
C12/230	Charger for the C58 when Ni-Cads are used	7.75 (0.75)
C110	Synthesized 2M, 2watt hand held 144-148MHz	179.95 (1.50)
CLC110	Carrying case for C110	7.50 (0.75)
CSA110	Base charger for CNB110 high power Nicad pack	35.00 (1.00)
CNB110	High power Nicad pack	35.00 (0.75)

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AR1002		42.50 (2.50)

YAESU

		P+P
FT980	Transceiver General Coverage RX Amateur TX	1650.00 (—)
FT757GX	General Coverage Receiver, Ham Bands Transceiver	829.00 (—)
FC757AT	Automatic Antenna Tuner	290.00 (2.00)
FP757HD	Heavy Duty Power Supply 100pc Duty F.M. Service	200.00 (1.50)
FT77	Transceiver 8 Band Mobile Multimode 100 Watts	479.00 (2.00)
FP700	Base Station External Power Supply/Speaker	170.00 (2.00)
FC700	Antenna Tuner	119.00 (1.50)
FRG7700	Receiver 0.15-30MHz AM/CW/SSB/FM	385.00 (2.00)
FRG7700M	Receiver C/W 12 Channel Memory	455.00 (2.00)
FRT7700	Antenna Tuner/Switch	49.85 (0.75)
FRG8800	Receiver 0.15-30.0MHz AM/CW/SSB/NBFM/ (WBFM) Memories	559.00 (—)
FRV8800	Converter 118-175MHz	90.00 (2.00)
FT270R	Transceiver 2M, FM, 25W Synthesized	349.00 (2.00)
FT726R(2)	Multimode Multiband base station c/w 2M	869.00 (2.00)
FT290R	Portable Transceiver 2M 2.5W Multimode synthesized	349.00 (1.50)

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CH20N	2 Way Coax Switch 1KW "N"	41.90 (1.50)

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IC751	All Band AM, FM, SSB, CW and General Coverage Receiver 32 Memories	1299.00 (—)
IC745	All Band SSB, CW, AM (Rx only), General Coverage Receiver 16 Memories	899.00 (—)
IC-R70	General Coverage Receiver 0.1-30MHz	629.00 (—)
IC-R71	General Coverage Receiver 0.1 30MHz with Keypad entry, 32 Memories	729.00 (—)
IC-AT100	Auto 100Watt Automatic Antenna Tuner	329.00 (2.00)
IC-AT500	Auto 500Watt Automatic Antenna Tuner	459.00 (2.00)
IC271E	Multimode Base Station, 25W, 32 Memories	729.00 (—)
IC290D	25W Multimode Mobile, 5 Memories, Scanning Mic	479.00 (1.50)
IC27E	25W FM Mobile, 9 Memories, Multi function display	379.00 (2.00)
IC2E	Synthesized Hand Portable 1.5Watts	199.00 (1.50)
IC02E	Synthesized Hand Held, Keypad Entry LCD Display	269.00 (1.50)
IC4E	Synthesized Hand Portable 1.5Watts	259.00 (1.50)

METRES

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SWR25	Twin Meter SWR/Power/Field Strength 3.5-150MHz	16.50 (1.50)
TAL172	Single Meter Professional SWR/Power	37.89 (1.50)
T435	Twin Meter 144/432MHz SWR/Power 20W/120W	44.95 (1.50)
SP300	1.8-500MHz 20W 200W-2KW Power/SWR Meter	129.00 (1.50)
SP380	1.8-500MHz 200W Dash Mount	69.00 (1.50)
SP15M	1.8-160MHz 5W 20W-200W Power/SWR Meter	49.00 (1.50)
SP10X	1.8-500MHz 200W Pocket Size	34.00 (1.00)

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MK705	Squeeze Keyer	29.75 (1.00)
MK702	Manipulator key on marble base	29.75 (1.00)
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ECC84	0.60	EY81	0.65	SP61	1.80	5U4G	0.75	6F12	1.50	12AV6	0.95
ECC85	0.60	EY86/87	0.60	TT21	32.20	5V4G	0.75	6F14	1.15	12AX7	0.65
ECC88	0.80	EY88	0.65	TT22	29.50	5Y3GT	0.95	6F15	1.30	12BA6	0.90
ECC189	0.95	EZ80	0.70	UABC80	0.75	5Z3	1.50	6F17	3.20	12BE6	1.25
ECC804	0.90	EZ81	0.70	UAF42	1.40	5Z4G	1.45	6F23	0.75	12BH7	3.00
ECF80	0.85	GM4	5.90	UBF80	0.70	5Z4GT	1.45	6F24	1.75	12E1	18.95
ECF82	0.65	GY501	1.30	UBF89	0.70	6/30L2	0.90	6F33	10.50	12J5GT	0.55
ECF801	1.05	GZ32	1.05	UCC84	0.85	6AB7	0.70	6FH8	12.50	12K7GT	0.70
ECH34	2.25	GZ33	4.20	UCC85	0.70	6AC7	1.15	6GA8	1.95	12K8GT	0.80
ECH42	1.20	GZ34	2.75	UCF80	1.30	6AG5	0.60	6GH8A	1.95	12Q7GT	0.60
ECH81	0.70	GZ37	3.95	UCH42	1.65	6AH6	1.15	6H6	1.60	12SC7	0.65
ECH84	0.80	KT66	10.95	UCH81	0.75	6AK5	0.65	6JU6	5.85	12SH7	0.65
ECL80	0.70	KT88	18.40	UCL82	0.95	6AK8	0.60	6J4	1.35	12SJ7	0.70
ECL82	0.75	ML4	2.80	UF41	1.35	6AL5	0.60	6J4W4	2.00	12SQ7	1.45
ECL85	0.80	ML6	2.80	UF80	0.95	6AL5W	0.85	6J5	2.30	12SQ7GT	0.85
ECL86	0.90	N78	9.90	UF85	0.95	6AM5	4.20	6J5GT	0.90	12Y4	0.70
EF37A	2.15	OA2	0.70	UL84	0.95	6AM6	1.50	6J6	0.65	13D3	2.80
EF39	1.50	OB2	0.80	UM180	0.90	6AN8A	2.50	6J6W	0.90	13D5	0.90
EF80	0.65	PCL82	0.95	UM84	0.70	6AQ4	3.40	6FH8	17.80	19AQ5	0.85
EF83	1.75	PCL84	0.90	UY82	0.70	6AQ5	1.30	6K7	1.45	18G3	11.50
EF85	0.60	PCL86	0.75	UY85	0.85	6AQ5W	2.20	6JE6C	5.50	19G6	8.50
EF86	1.25	PCL805/85	0.95	VR105/30	1.25	6AS6	1.15	6JS6C	5.90	19H5	39.55
EF89	1.60	PD500/510	4.30	VR150/30	1.35	6AT6	0.90	6KD6	5.50	20D1	0.80
EF91	1.60	PFL200	1.10	X66	0.95	6AU6	0.60	6L6M	4.60	20E1	1.30
EF92	1.50		2.80*	X61M	1.70	6AV6	1.25	6L6GC	3.70	20P1	0.65
EF95	0.65	PL36	1.10	Z759	19.00	6AX4GT	1.30	6L6GT	1.95	25L6GT	0.95
EF96	0.60	PL81	0.85	Z749	0.75	6AX5GT	1.30	6L18	0.70	25Z4G	0.75
EF183	0.80	PL82	0.70	Z800U	3.45	6BA6		6LD20	0.70	35W4	0.80
EF184	0.80	PL83	0.60	Z801U	3.75		0.70/1.20*	6Q7G	1.30	85A2	1.40
EF312	0.75	PL84	0.95	Z803U	16.00	6BE6	0.60/1.20*	6SA7	1.80		2.55*
EFL200	1.85	PL504	1.00	Z900T	2.45	6BG6G	1.60	6SG7	1.50	807	1.60/2.40*
EL32	1.10	PL508	2.40	1A3	1.40	6BJ6	1.30	6SJ7	1.50	813	19.32
EL34	1.80/3.50*	PL509	5.80	1L4	0.50	6BQ7A	0.85	6SK7	1.40		69.50*
EL37	5.20	PL519	5.80	1R5	0.80	6BR7	4.80	6SR7	4.60	8298	24.00
EL82	0.70	PL802(SE)	2.95	1S4	0.60	6BW6	6.20	6SL7GT	0.85	832A	8.90
EL84	0.80	PY80	0.70	1S5	0.65	6BW7	1.80	6SN7GT	0.80	866A	3.80
EL86	0.95	PY81/800	0.85	1T4	0.65	6C4	0.50	6SQ7	0.95	86SE	6.25
EL90	1.00	PY82	0.65	1U4	0.80	6C6	0.55	6V6G	1.50	931A	19.80
EL91	6.50	PY88	0.60	1X2B	1.40	6CH6	8.20	6V6GT	0.95	954	1.20
EL95	0.80	PY500A	2.10	2X2A	2.50	6CL6	2.75	6X4	0.95	955	1.20
EL504	1.70	QQV03/10	5.95	3A4	0.70	6CW4	8.50	6X5GT	0.65	956	1.20
EL509	5.85		10.10*	3AT2	2.40	6CX8	4.60	6Y6G	0.90	5763	4.80
EL519	6.90	QQV03-20A		3B28	12.00	6CY5	1.15	6Z4	0.70	6060	1.95
EL821	8.20		27.50		19.50*	6D6	1.50	9D6	2.90	6080	5.30
EL822	9.95	QQV03-25A		3D6	0.60	6F6	1.60	11E2	19.50	6146	6.80
ELL80(SE)	2.80		36.50	3E29	19.00	6F6GB	1.10	12A6	1.00	6146B	6.80
EM80	0.85	QQV06/40A		3S4	0.60	6F7	2.80	12AT6	0.70	6360	2.85
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Propagation Beacons

We must never underestimate the value of the amateur radio beacon service, especially at times like these when the bands are so quiet. Briefly a beacon is a low power radio transmitter, strategically sited and providing a continuous signal, periodically interrupted with its own identifying callsign, on a fixed frequency The reception of a beacon signal, depending on strength, suggests that the path between its QTH and yours is open and there is a good chance of a QSO, or of hearing other stations in that direction.

In Holland, **Chris van der Berg,** logged signals from the 144MHz band beacons in Belgium ON4VHF 144·985MHz on March 12 and 13, and Wrotham GB3VHF 144·925MHz on March 12 and April 7. I received a steady 539 signal daily from GB3VHF throughout the period of this report. Both of these reports are typical for a period when the atmospheric pressure was generally below 30·0in (1015mb), Fig. 3, and not the ideal conditions for DX in the v h.f. bands.

Although John Coulter had little to report on 28MHz, he did listen out for the beacons around 14·100MHz He logged OH2B, 4U1UN and 4X6TU almost daily between March 15 and April 12, ZS6DN less frequently, CT3B on a few days and W6WX on March 17 only "Heard nothing at all from the 28MHz beacons between March 10 and April 9," writes Henry Hatfield. "Herewith the bleakest month ever," comments **Ted Owen**, Maldon, who only heard the South African beacon Z21ANB for a few minutes on April 2. Bill Kelly logged the Norwegian beacon LA5TEN, at 1030 on March 19 and reports weak signals from the German beacons DK0TEN and DL0IGI at 1315 on the 17th and strong at 1100 on the 24th.

Gordon Pheasant also heard the German beacons during the mornings of the 23rd and 24th and logged the beacons in Cyprus 5B4CY and South Africa ZS1CTB, ZS6PW and Z21ANB on the 26th. "Good day on April 1, logged Z21ANB at 1820, later than usual, plus PY2AMI and LU1UG very weakly and both DK0TEN and DL0IGI via back scatter from the south west," writes Gordon. He also heard the German beacons again by this means at 1816 on the 9th and via sporadic-E between 1200 and 1500, with signals up to 589, on the 10th. Between 1900 and 2000 on April 1, **Filip Rogister** ON1BRL, Overyse, feeding his receiver with a home-brew 6-element Yagi, some 18m a.g.l. heard signals from the beacons in Adelaide Island VP8ADE and South America LU1UG, LU4FM and PY2AMI. Chris van den Berg notes that the beacons he heard on March 30 and April 7 were mainly in the South African direction.

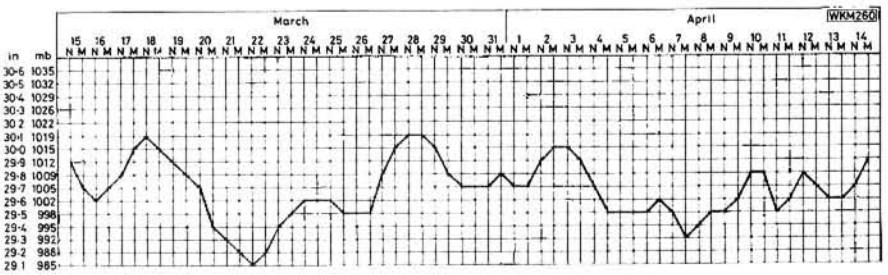

Fig. 3 ▲

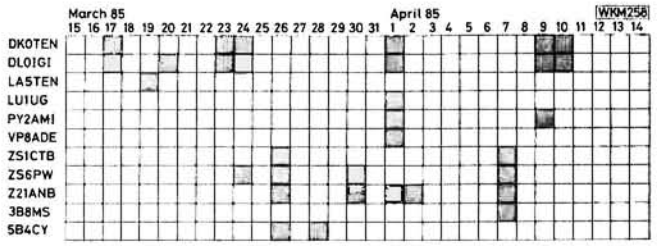

Fig. 4 ▶

It is interesting to see the concentration of South African beacon signals reported between March 24 and April 2, a period when sunspots were present! My thanks to John Coulter, Bill Kelly, Ted Owen, Gordon Pheasant, Filip Rogister and Chris van den Berg for their logs which I used to prepare our monthly 28MHz beacon chart, Fig. 4.

Tropospheric

Although not the whole story, a good indicator for a tropospheric opening is the changes in atmospheric pressure and I have found, over many years, that when the barometer is reading well above 30·0in (1015mb), there is a good chance of an opening around the point in time when the pressure begins to fall. To help readers who wish to compare their v.h.f. logs with the atmospheric pressure, we publish a monthly chart, Fig. 4, based on the slightly rounded readings, taken at noon and midnight, from the master chart on my Short and Mason Barograph. By comparison, the figures taken from Ted Owen's barometer, in Maldon, for the period are similar to mine with a peak of 1022 mb on March 18 and a low of 991mb on April 8. **Harold Brodribb** finds the weather chart in his daily newspaper a useful guide and I am always pleased to have your reports and ideas on this subject.

In March, Bill Kelly with the help of a good friend, Fred Hull, installed a colinear antenna for 144MHz and he can now normally hear signals through the repeaters in the Isle of Man GB3GD R1 and Ireland EI1DK RO, EI3DAR R3, EI7CS R4, GB3NI R5 and GB3WT R7. On the subject of repeaters it may not be generally known by my non-amateur readers that the prime object of the repeater network, which now spans the UK, is to enable mobile operators and users of small hand portables to communicate more reliably over greater distances while they travel. However, during a tropospheric opening DX stations are often heard because the repeater inputs are sensitive to signals farther away and their outputs have a much greater range, but all gets back to normal when the opening subsides.

"Not an interesting month," comments Harold Brodribb, St Leonards on Sea and reports that even the French stations in Boulogne and Lille, reasonably local to him, were almost inaudible between March 24 and 28. Although conditions did not improve during the first two weeks in April, he did hear signals from a Belgian station at Egem around 100MHz on the 3rd and 4th. During a short opening on March 20, I logged Dutch and French stations and a few "warbles" between 87 and 100MHz. While using the radio section of my Plustron TVR5D on the South Downs at 1630 on April 3, I also heard French programmes around 100MHz.

At 1300 on April 14, **Graham Powell,** Pontypridd, had his Grundig 1400SL and telescopic antenna, tuned to 103MHz and heard Radio Gwent, he then tuned down to 102·7MHz where he has previously received Radio Mercury. He then left the set running on this frequency and at 1303 a voice appeared from the noise saying, ". . . IRN News . . . now a look at Viking weather . ." and in a few seconds it had gone. "In my five years DXing, I have never heard such a short signal, which was fair quality while it lasted, or from such a distance north of my QTH," writes Graham.

TELEVISION

Reports: as for VHF Bands, but please keep separate.

by Ron Ham BRS15744

Sometimes I am asked, "what is the appeal of long distance television reception?" My answer is, first there is the sheer fun of receiving pictures from other countries and secondly, the fascination of watching signals, from relatively great distances, fighting for predominance on a particular channel, as the prevailing atmospheric disturbance ebbs and flows. The TVDXer may wait for some while before a sporadic-E or a tropospheric opening produces the goods, but when the big one comes along, believe me, it is well worth waiting for. Although many of the events are similar, they each have their own character and pictures can come from different countries and at different parts of the bands during the start, the peak and towards the end of an opening. To sum up, the subject can be exciting when conditions are right and you do not need expensive equipment, only patience, to take part.

Report From India

Between 1920 and 1955 last September 24 **Major Rana Roy**, India, watched football from Dubai and a religious programme in Arabic on Band I. The signals faded and returned again at 2000, when Rana saw the programme highlights of the week. The clarity of the reception is shown in Fig. 1. During another sporadic-E disturbance at 1430 on October 26, he received a Chinese test card, Fig. 2, and some captions when the programmes started. At 1840 on January 8, Rana watched a documentary film about north America from Dubai and a drama programme from another Arabic station on the same channel. Weak signals were again received from Dubai on January 29 when he watched a programme of songs for about fifteen minutes in the early evening. Rana has also had his fair share of tropospheric DX in Band III At 1030 on November 27 he saw part of the test match between New Zealand and Pakistan, Fig. 3, on Ch. 8 from Rawalpindi. On December 30 at 2215, he watched singers, Fig. 4, from a transmitter at Bahawalpur which relays programmes from Lahore. "There were weak tropos from Pakistan a number of times," writes Rana, but a real good one came up at 0930 on March 1 when he received pictures from Lahore TV on Ch. 5, Faislabad TV Ch. 6, Rawalpindi Ch. 8 and Bahawalpur Ch. 10. The signals were so strong that the Schools TV, being transmitted by his local station was overpowered by television pictures from Pakistan. During the event Rana took photographs of an announcer on Lahore TV, Fig. 5, and election results, Fig. 6 and a station identification, Fig. 7, from Rawalpindi TV.

"The weather is strange these days all over the world, We have been having dust storms followed by rain with wind velocities of 120km per hour, which has brought the temperatures down so that it is actually pleasant instead of hot which it should be during April. The storms damaged one of my Band III antennas so I have put up another with 24 elements while I repair the damage," writes Rana. He adds, "All this bad weather has brought in fairly good tropo conditions, when we normally have no tropo openings at all. Hence we have been watching Pakistan TV during March and even April." It's an ill wind . etc., Rana.

Band I

By the time you read this the 1985 sporadic-E season should be under way and I can tell from the tone of your letters that you are all ready for the off. However, at the time of writing there are reports of those few short lifts that usually precede the main event. **Simon Hamer**, New Radnor, received test cards from Germany ARD Grunten on Ch. E2 48·25MHz and Italy RAI on Ch. IA 53·75MHz on March 17. He saw Basketball from Spain RTVE on Ch. E3 55·25MHz, at 1315 on the 24th, test cards from Austria ORF on Ch. E2 at midday on April 1, Austria on Ch. E2 and Poland TVP on Ch. R1 49 75MHz, on the 5th, Poland

Fig. 1

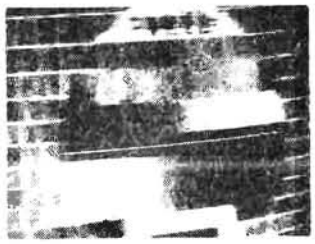

Fig. 2

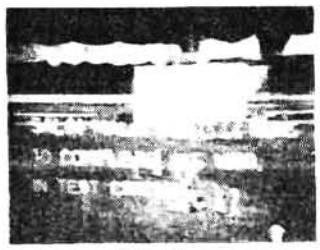

Fig. 3

Fig. 4

Fig. 5

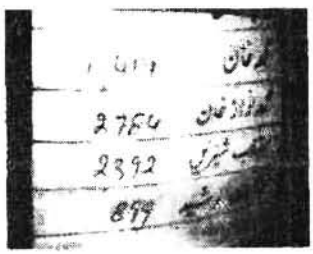

Fig. 6

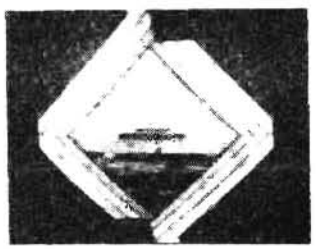

Fig. 7

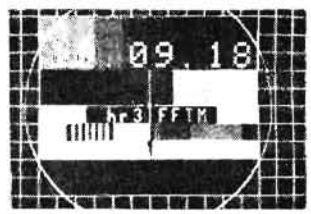

Fig. 8

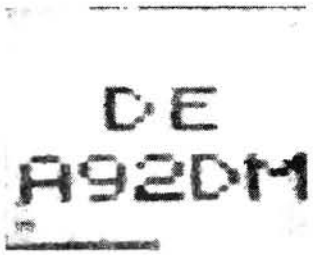

Fig. 9

Fig. 10

Fig. 11

Fig. 12

on Ch. R2 59·25MHz, on the 7th and programmes from Sweden SVT during the evening of the 8th. Simon also noted many bursts of picture on Ch. R1, caused by meteor pings on March 19.

Neil Purling, Hull, also saw "pings" of a football match on Ch. E2 at 1225 on the 24th. **Tony Palfreyman** received Russian test cards on both Chs. R1 and R2 for about 2 minutes on March 23. On the 24th **Gordon Pheasant**, Walsall, using a Plustron TVR5D, watched a man playing a mouth organ on Ch. E2 at 1037. Later he saw a checkerboard pattern appear a little lower in frequency which could have been from Italy on Ch. IA. Gordon also received signals on Ch. R1 at 1328 on the 25th, test cards from RTVE on Chs. E2 and E4 62·25MHz, at 1220 on the 28th, Poland on Ch. R1 at 0950 on the 29th bursts from Grunten at 1250 on April 3 and Yugoslavia JRT Belgrade at 1203 on the 10th. **Mick Scrivener**, Sutton, and Gordon Pheasant have added new Waltham and JVC receivers respectively to their stations ready for the current sporadic-E season.

I logged a burst of test card from Poland followed a little later by a long burst of a newsreader on Ch. R1 early on March 28. Several stations coming up together, with Poland predominant, on Chs. E2/R1 were seen at 0800 on April 4, as well as short lived pictures on Ch. R1 at 0817 on the 9th and strong bursts of test card from Czechoslovakia RS-KH at midday on the 13th.

SSTV

In Co. Down on March 24, **Davey Waugh**, using a Panasonic DR48 receiver, 20m long wire antenna and the Scarab/Spectrum combination, received SSTV signals on 14MHz from stations in Finland, France, Germany, Poland, Sardinia and Spain. He also saw the captions, "VERY NICE VIDEO", "MY QSL 100%", "I HAVE NO PROBLEM COPYING YOU", "DE I1CEL", "TNX GOOD LUCK", plus pictures of a 2-element beam, two YLs and an OM.

"SSTV can be a hit and miss affair with the bands unused for hours and then several stations start transmitting and it's a case of tuning up and down to try and catch the best of each," writes **Peter Lincoln**, Aldershot, who often leaves his Tandy DX-300, tuned to 14·230MHz, monitoring for SSTV signals. I do the same on Saturdays and when the musical tones of the signals appear, I make the final tuning adjustments and set the tape recorder running. I am sure newcomers to this mode have found out just how critical the tuning can be. During the month prior to April 10, Peter received a new station for him, A92DM, Fig. 9, when in QSO with IC8POF. Peter, using a Volker Wrasse SC-140 after his receiver for SSTV also received 16 seconds black and white pictures, Figs. 10 and 11, from another regular on the bands, I3XQW.

Among the signals received in Germany by **Allan Sancto** DD5FM/G6BWH, was GJ4TAF, Fig. 12, while in QSO with a station in Norway. **Richard Thurlow** G3WW, March, reports having two-way 8 seconds QSOs with EI3EDM, IC8POF, LZ20V, SP8PIX, 4 stations in the USA and ZS6CDJ, 24 and 48 seconds colour QSOs with EA5FIN and several 72 seconds Robot colour contacts with A92NH and W6KZL on 14MHz.

Between March 15 and April 14, mainly at weekends on 14MHz, I received SSTV pictures from I8GMG, IC8POF and YU1FU, logged the captions, "HOW COPY ME", "QRZ SSTV CONTEST", "PSE KK", "TNX FER CALL RSV 599" and "MY NAME IS FILIPPO". I also copied part callsigns, due to heavy QRM, from stations in France, Germany and Italy.

Tropospheric

"The month has been very poor for DXTV," writes **Harold Brodribb**, St Leonards-on-Sea, although at 0800 on April 1 he did receive pictures from French stations at Caen and Rouen in Band III, by rotating his Yagi antenna, but that was his lot. I logged weak pictures from Canal Plus at 0744 on March 19 and a test card from Belgium, BRT on Ch. E10 at 1640 on the 20th and **Tony Palfreyman**, Sheffield, sent a photograph of a German test card, Fig. 8, that he received during an opening earlier in the year.

SPACE & SATELLITES

Reports to: Pat Gowen G3IOR, 17 Heath Crescent, Hellesdon, Norwich, Norfolk NR6 6XD.

by Pat Gowen G3IOR

Phase IIIC/D Development

The AMSAT-DL satellite planning meeting that took place on March 9 has brought about some exciting new ideas for the next Phase III satellite, which may be Phase IIIC modified, or a quite new and distinct Phase IIID.

Whilst the fundamental structure will be similar to OSCAR TEN, additional end-of-arm deployable solar-panels offered by AEG-Telefunken (see Fig. 2) will increase the available solar-power by some 20 per cent, and feeding more battery cells will be able to provide some 500 watts of power. These will also help to improve the antenna pattern, as the effective enlargement of the spacecraft, in terms of wavelengths at the operating frequencies, will produce an enhanced "ground plane" reflector, giving greater efficiency with fewer side-lobes. This will permit the Mode "L" downlink power to be increased to 250 watts output, giving a much-improved 436MHz signal over the current OSCAR TEN spacecraft. The uplink required at 1269MHz would be only some 500 watts e.i.r.p., e.g. 10 watts transmitter output to a 15dB gain antenna, which is at least 10dB better than the present Mode "L" demand.

Whilst the "store and forward" memory may be dropped (see last month's column) it is now proposed to fly a single channel Mode "L" packet radio experimental transponder called "RUDAK", an acronym for Regenerative Umsetzer fur Digitale Amateurfunk Kommunikation, which requires no translation. This is being planned and built by DK1YQ, DB2OS, DL3AH, DJ5KQ and DJ4ZC to provide a multiplex-access channel at the edge of the passband with the International AX25 protocol standard giving a phase-shift keying 400 bit/second downlink (like the current OSCAR TEN beacon) from a 2400 bit/sec uplink. Whilst stations are not employing the channel, then general information will be computer-read onto the downlink channel to provide a regularly updated bulletin board.

Additionally under consideration, on the proviso of IARU approval, is an uplink from 144·440 to 144·480MHz to place a downlink in the Mode "L" band starting from 436MHz so that those without 1269MHz uplink facilities can communicate in the common downlink passband.

DARC has given 250 000DM to help fund the bigger 200kg advanced spacecraft, and the money recovered from the insurers of OSCAR TEN will also be placed into the funds, but some 75 000DM more is being sought from International funding to permit the realisation of the launch, with a lot of time also needed to bring the project to fruition.

RS Developments

RS-9 and 10 continue under ground test at Kaluga awaiting integration, but despite some slight 28MHz sporadic-E activity producing signals from UC2, UA2 and UP2, they were not heard in the UK. UA3CR reports that RS-9 will be further equipped with a recently built 435·395MHz beacon, which will provide 2 watts of output power to a ground-plane antenna. It is now almost certain that separate launches will be provided for the satellites, with the first still planned for December this year, although a delay is always possible.

Leo Labutin UA3CR further reports that the "ROBOT" and CODESTORE facility of RS-10 will be improved by the inclusion of two memory boards, each with a capacity of 250 Morse characters to give the ability of the re-transmission of two separate and distinct lengthy messages.

Despite the ailing battery of RS-6, our regular reporters **Bill Kelly, John Coulter** and **Chris van den Berg** all verify regular reception, as they do for RS-7 and 8, and even the venerable RS-1, which continues to send corrupted telemetry whilst in sunlight.

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SP220 — £59
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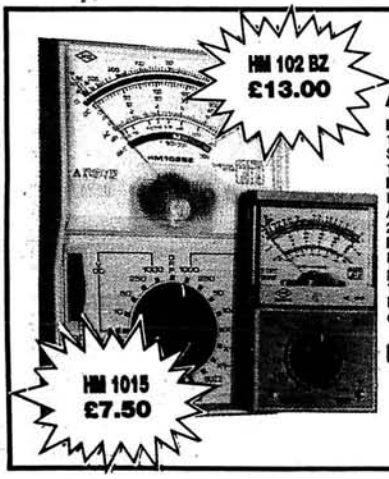

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Satellite DX

Due to surf, the Clipperton Group were unable to land on XF4, and had similar initial problems at FO8XX, which delayed their operation to the time when Europe and Clipperton Island lost the mutual access path. Few new DXCC Countries have appeared on the satellite scene other than 8Q7AV on the Maldive Islands and GB0AUK from the Isle of Man.

Super-DX Satellites

John Branegan GM4IHJ reports that strange signals are being picked up by the special plasma receivers of both *Voyager 1* and *2* on 3kHz. Whilst it is possible that these signals emanate from Pluto or Neptune, it is far more likely that they were seeing the Heliopause, the collision of the Galactic wind and the solar wind, e.g. the constant stream of particles escaping from our sun At the time of the first detection, *Voyager 2* was in the plane of the planets, heading out for a 1986 rendezvous with Uranus, whilst *Voyager 1* was in the same general plane but heading upwards already 2500 million kilometres out from the sun. When *Voyager 2* has passed Uranus, it will be detoured to intercept Neptune, whilst *Voyager 1* will leave the solar system com pletely with no stops along the way, passing the 6000 million kilometre mark in 1991 John points out that it is clear, contrary to popular belief, that there is more than one big patch of "nothing" between our outermost planets and our next nearest star in Centaurus.

Alternative Satellite Modes

A question that often arises regarding the use of the satellites is that of what modes of transmission may be used. In the earlier satellites, when both battery power and bandwidth were very limited, the use of f m . RTTY, SSTV and a.m. were discouraged, due to their continuous carrier requirements unnecessarily exhausting the available power prematurely, and also giving a continuous attenuation due to the steady a l.c. level actuated at the transponder. The approved modes were c.w. and s.s.b., as these are not only more efficient in terms of weak signal communications, but also are modes where the actual carrier is on for only some 30 per cent of the use time, thus optimising communications with minimum battery demand.

The latter day satellites are far more protected, as the current "RS" series command themselves off if the battery falls to a pre-determined level, whilst the Phase III design incorporates computer control coupled with close monitoring to regulate activity periods to solar power available. Thus, experimental use of other modes is possible despite the limitations of the particular mode employed, on the usual proviso that the bandwidth is limited, and that the power employed does not produce a downlink signal greater than that of the 145·810MHz beacon.

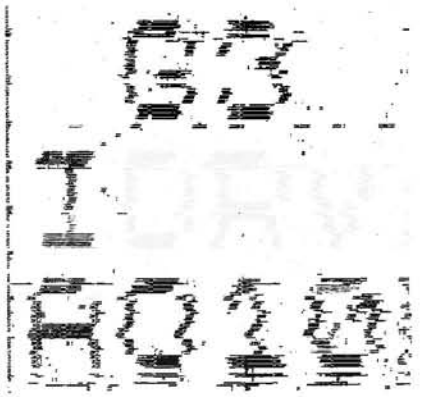

Fig. 1: SSTV callsign block transmitted through OSCAR-10 using ON5KN Spectrum program and no interface unit

Despite the signal return delay, **Colin Richards** 9M2CR has proved "AMTOR" to be very effective. Packet Radio using phase shift keying has been found to be highly effective also. "Hunt and Peck" RTTY is **NOT** recommended, as the carrier is idling for most of the time producing low communications efficiency. For similar reasons (plus the inherent poor signal to noise ratio) a.m. is not encouraged, whilst wide-band f.m is very much to be frowned on due to the requirement of such huge bandwidth in the limited passband.

Your author has recently experimented with SSTV at times of low satellite usage, the results of which can be seen by Fig. 1. 400W e.i.r.p. were used to produce a downlink at 145·895MHz, which whilst not giving the ideal definition desirable for a good picture, produced a reasonable block callsign identification out of the noise. As AMSAT is very keen to encourage experimental techniques on the satellites, input from users of other modes would be of great interest.

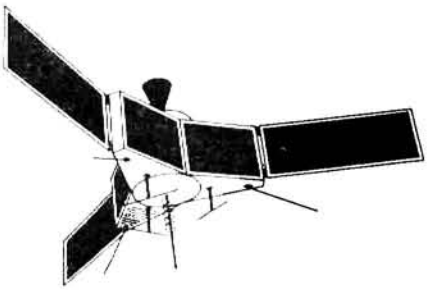

Fig. 2: Configuration of Phase III C/D showing the additional end-of-arm solar panels for extra power production

Satellite	OSCAR 10
Epoch Year	85
Epoch Day	68·44296679
Inclination	26·1408
RAAN	149·3526
Eccentricity	0·5988192
Arg. of Perigee	354·4281
Mean Anomaly	1·2336
Mean Motion	2·05857202
Drag/Decay	$-7{\cdot}5\ E^{-7}$
Epoch/Orbit No.	1307

In response to readers' requests, next month we shall try to cover what results and propagation might be expected from the forthcoming h.f. satellite using 21 and 29MHz, which may help many more than the present five holders to achieve Satellite DXCC.

Satellite	RS 5	RS7	RS 8
Date	15 March 1985	15 March 1985	15 March 1985
Time (H/M/.M)	0838·02	0844·60	0919·83
Asc. Equator Crossing (°lat)	306·47	312·73	327·63
Drag Factor (decay)	$4\ E^{-8}$	$4\ E^{-8}$	$4\ E^{-8}$
Mean Motion (Orbits per day)	12·05056679	12·08690953	12·13564026
Increment (°W per orbit)	30·01573185	29·92588942	30·06874579

RTTY

Reports, as for VHF Bands, but please keep separate.

by Ron Ham BRS15744

"With the ever increasing interest in amateur data communications, particularly AMTOR, RTTY and Packet Radio, it has become evident that there is a real need for speakers to give talks to radio clubs on these topics," writes **Ian Wade** G3NRW. He tells me that the British Amateur Radio Teleprinter Group have set up a "Databank Register" and club secretaries are invited to get details by sending an s.a.e. to Ian at 7 Daubeney Close, Harlington, Dunstable, Beds. LU5 6NF.

BARTG are holding their annual rally at Sandown Park, Esher, Surrey, on August 25 and prospective exhibitors are requested to contact the rally manager, Peter Nicol G8VXY, 38 Mitten Ave, Rubery, Rendal, Birmingham B45 0JB, as soon as possible.

Peter Glover, Wimbledon, has added a Codemaster CWR610E to his FRG-7 communications receiver for RTTY. During the month prior to April 10, **Peter Lincoln,** Aldershot, found some RTTY DX. It was mainly the late afternoons when he received signals from the east coast of the USA. He also copied the ARRL newsbulletins a few times and logged stations from Alaska KL7HPR, Lebanon OD5NG, Philippines DU7EV and the USSR UZ0CWW and, like me, found plenty of Italians on 14MHz. Peter's report, along with my own log has been used to prepare the list of countries received, by RTTY, between March 15 and April 14, Fig. 1.

There was a predominance of German stations on both the 7 and 3·5MHz bands and with ME, HB9s and Gs were runners up respectively. The only RTTY signal I logged on 21MHz during the period was LU4EGE, whose signal came up suddenly at 1915 on March 23, when he was working a W4. One interesting item was the greeting 73, made up of zeroes, standing 10 characters high, seen at 1030 on March 30. "Never give up hope of a rare QSL card," writes Peter Lincoln, who sent a report to a DX RTTY station in September 1982 and received a reply on 10 April 1985. Is this a record, readers?

Looking at Fig. 1, it is good to see that stations from Alaska, Argentina and Australia, in addition to Canada, Japan, Philippines and the USA were logged, especially at a time when band conditions were not too good. I found two distinct periods of activity and I am sure there were more, the first began at 0920 on March 23, when in about ninety minutes I logged ten international prefixes, EA9, HA, I, LA, LZ, OH, OK, UB5, YU and 9H1 on 14MHz and the second came in sixteen minutes during the evening of the 24th, when I copied three VEs and two Ws. I wish I could have spent longer at the rig on each occasion but these events usually occur when other engagements are pressing. However, I did catch the QSO between Andy Stafford G4VPM and FE6FLB, which I reported in our May issue and have since learnt that it was Andy's first RTTY contact on 144MHz. At his home in Paignton, Andy is equipped with an FT-102 for the h.f. bands and a transverter for the v.h.f. and u.h.f. bands feeding his signals into a 2-element Tribander, 11-element Yagi and 19-element Tonna antennas respectively and is building equipment for 10GHz. Andy plans to be operational on h.f., 144MHz, 430MHz and possibly 10GHz, from Guernsey between June 30 and July 15, so keep a look out for him, readers.

Country	Prefix	Band (MHz) 3.5	7	14	21
Alaska	KL7			X	
Australia	VK			X	
Austria	OE	X	X		
Argentina	LU				X
Azores	CT2			X	
Balearic Is.	EA6			X	
Belgium	ON	X			
Brazil	PY			X	
Bulgaria	LZ		X	X	
Canada	VE			X	
Canary Is.	EA8			X	
Ceuta & Melilla	EA9			X	
Czechoslovakia	OK		X	X	
Denmark	OZ	X			
England	G	X	X	X	
Finland	OH			X	
France	F	X	X	X	
Germany	DF/DJ/DK/DL	X	X	X	
Greece	SV			X	
Holland	PA	X			
Hungary	HA			X	
Italy	I		X	X	
Israel	4X4			X	
Japan	JA/KA			X	
Lebanon	OD			X	
Malta	9H1			X	
Norway	LA	X		X	
Rep Philippines	DU			X	
Poland	SP	X	X	X	
Portugal	CT1	X	X	X	
Rumania	YO			X	
Sardinia	ISO			X	
Scotland	GM		X		
Scicily	IT9			X	
Spain	EA			X	
Sweden	SM	X	X	X	
Switzerland	HB9		X		
Trinidad	9Y			X	
USA	K/N/W1-9			X	
USSR	UA/UB/UT/UZ			X	
Yugoslavia	YU		X	X	

Swap Spot

Have new unused Avo 8 Mk 2. Would exchange for valve type short wave receiver, or Avo valve characteristic meter or w.h.y. W.E. Stedman. 133b Lynton Road, Bermondsey, London SE1 5QX. *X185*

Have pre-war radio gear. Would exchange for e.h.t. panel, working or not, for Marconi TF1330 'scope, or complete set any condition. Also wanted manual for Cossor 1035Mk2A 'scope. A. Keys, Mill Lane Farm, South Somercotes, Louth, Lincs. *X199*

Have Sanko XL400S 8mm sound camera and Sanyo SHV2000 portable 8mm sound projector with built-in screen. Would exchange for h.f. linear or 430MHz base station. G4NJP. QTHR. Tel: 0262 673635. *X200*

Have complete OM outfit, OM10, 50mm, 28mm, winder 2, T20 flash, carry bag and cases, Kenlock tripod, 70/210 compact zoom etc. Cost £500 new. Would exchange for ICR70 or w.h.y. for shack. Can collect. N. Millar, 7 Rose Walk, Brookside, Bromham, Bedford MK43 8NB. *X209*

Have complete ATV station Fortops RX/TX, monitor, cross hatch, character generator, 50W linear, two cameras (value £350). Would exchange for h.f. set of w.h.y. Graham G6LMG. Tel: Amergate 6159. *X211*

Have TR9130. Would exchange for TW4000A. David Rickwood G6UDM. Tel: 0902 783338. *X217*

Have Pentax SV camera with F2 lens. Would exchange for general coverage communications receiver. Tel: Maidenhead 29233. *X222*

Have Minolta X700 + 50mm, 28mm, X2 Macro converter, flash and handgrip, filters, tripods, gadgets bag etc. Would exchange for 144MHz multimode TX/RX or AOR2001 receiver or good h.f. RX or w.h.y. J. Mullen. Tel: Dalgety Bay 822206 (Fife). *X237*

Have SX200N scanner in mint condition, under one year old. Would exchange for AR2001 scanner with cash adjustments. Brian. Tel: 0624 823816 between 6.30 and 7pm. *X240*

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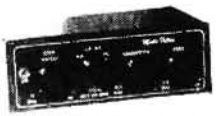

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Make	Model	Size	Watts	Ohms	Price	Post
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GOODMANS	HIFAX	7½×4¼in	100	8	£34	£2
GOODMANS	HB WOOFER	8in.	50	8	£13.50	£1
WHARFEDALE	WOOFER	8in.	30	8	£9.50	£2
BAKER	WOOFER	12in.	80	8	£25	£2
GOODMANS	HPG/GROUP	12in.	120	8/15	£35	£2
GOODMANS	HPD/DISCO	12in.	120	8/15	£33	£2
H+H	DISCO/GROUP	15in.	100	4/8/16	£48	£4
GOODMANS	HP/BASS	15in.	250	8	£74	£4
GOODMANS	HPD/BASS	18in.	230	8	£87	£4

DISCO CONSOLE Twin Decks, mixer pre amp **£145.** Carr £10.
Ditto Powered 120 watt **£199;** or Complete Disco **£300.** Carr £30.

MAINS TRANSFORMERS — Price Post
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LOW VOLTAGE MAINS TRANSFORMERS £5.50 each post paid
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LPM 432-3-50	70cm, 3W in, 50W out, preamp	197.00	(2.50)
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FS300H	1.8-60MHz 20/200/10W	53.50	(1.50)
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WELZ

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SP350	1.8 500MHz PWR/SWR	79.00	(1.50)
SP400	130-500MHz PWR/SWR	89.00	(1.50)
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T435	144/432 200 W	49.35	(1.00)

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FDK RX40	141.00-180.000 MHz	159.00	(2.00)

Icom Products

IC751	HF Transceiver	1299.00	(—)
IC745	HF Transceiver	899.00	(—)
IC735	New HF Transceiver	P.O.A.	(—)
PS15	P.S. Unit	145.00	(4.00)
PS30	Systems p.s.u. 25A	297.85	(—)
SM6	Base microphone for 751/745	40.25	(1.00)
IC290D	2m 25w M/Mode	479.00	(—)
IC290E	Low Multi-Mode Mobile	449.00	(—)
IC271E	2m 25w M/Mode Base Stn.	729.00	(—)
IC271H	100W version of above	899.00	(—)
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IC27E	25W FM mobile	379.00	(—)
IC45E	70c 10w FM	345.00	(—)
IC47E	25w 70cm FM mobile	469.00	(—)
ICBU1	B/U Supply for 25/45/290	29.90	(1.00)
ICR70	General Coverage Receiver	629.00	(—)
ICR71	General Coverage Receiver	723.00	(—)
IC02E	2m H/Held	269.00	(—)
IC2E	2m H/Held	199.00	(—)
ML1	2m 10w Linear	79.95	(2.00)
IC4E	70cm H/Held	259.00	(—)
IC04E	70cm handheld	279.00	(—)
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IC3	Carry Case	5.50	(1.00)
ICBP3	Std Battery Pack	27.50	(1.00)
BP5	High Power Battery Pack	52.80	(1.00)
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DC1	12v Adaptor	13.75	(1.00)

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SLNA 145sb	Preamp intended for 280	29.90	(1.50)
GLNA 432e	70cm Mast head preamp	149.90	(2.50)
RPCB 144ub	Front end FT221/225	79.90	(1.50)
RPCB 251ub	Front end IC251/211	84.90	(1.50)
BBBA 500u	20-500MHz Preamp	34.90	(1.50)
GFBA 144e	2m Mast head preamp	149.90	(2.50)
SBLA 144e	2m Mast head preamp	89.90	(2.50)
RPCB 271ub	Front end for IC271	89.90	(1.50)
TVHF 230c	2M-FM Transverter	334.90	(5.00)
LBPF 144v	Bandpass Filter	22.40	(1.50)
LBPF 432u	Bandpass Filter	22.40	(1.50)
TVHF 50c	6M	199.90	(2.50)
GLNA 433e	70cm Pre-amp	79.90	(2.50)
TVHF 144a	2M Transverter	239.90	(2.50)

Datong Products

PC1	Gen. Cov. Con.	137.40	(1.50)
VLF	Very low frequency conv.	99.90	(1.50)
FL2	Multi-mode audio filter	89.70	(1.50)
FL3	Audio filter for receivers	129.00	(1.50)
ASP/B	r.f. speech clipper for Trio	82.80	(1.50)
ASP/A	r.f. speech clipper for Yaesu	82.80	(1.50)
ASP	As above with 8 pin conn	89.70	(1.50)
D75	Manual RF speech clipper	56.35	(1.50)
D70	Morse Tutor	56.35	(1.50)
MK	Keyboard morse sender	137.40	(1.50)
RFA	RF switched pre-amp	33.90	(1.50)
AD270-MPU	Active dipole with mains p.s.u.	51.75	(1.50)
AD370-MPU	Active dipole with mains p.s.u.	69.00	(1.50)
MPU	Mains power unit	6.90	(1.50)
DC144/28	2m converter	39.67	(1.50)
PTS1	Tone squelch unit	46.00	(1.50)
ANF	Automatic notch filter	67.85	(1.50)
SRB2	Auto Woodpecker blanker	86.25	(1.50)

CW/RTTY Equipment

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Tono 550	Reader	329.00	(2.50)

MICROWAVE MODULES

MM2001	RTTY to TV converter	189.00	(2.00)
MM4001	RTTY terminal	269.00	(2.00)
MM4001KB	RTTY term with keyboard	299.00	(2.00)

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BY1	Squeeze Key, Black base	53.95	(1.50)
BY2	Squeeze Key, Chrome base	69.95	(1.50)

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HK704	Up down keyer	19.95	(1.50)
HK705	Up down keyer	15.49	(1.50)
HK706	Up down keyer	16.96	(1.50)
HK708	Up down keyer	14.95	(1.50)
HK802	Up down solid brass	86.30	(2.00)
HK808	Up down keyer	39.95	(1.50)
MK704	Twin paddle keyer	13.50	(1.50)
MK705	Twin paddle keyer marble base	25.65	(1.50)

KENPRO

KP100	Squeeze CMOS 230/13.8v	82.50	(2.50)
KP200	Memory 4096 Multi Channel	169.50	(2.50)

Yaesu

FT1	HF Transceiver	P.O.A.	(—)
FT980	HF Transceiver	1650.00	(—)
SP980	Speaker	79.95	(2.00)
FT77	Mobile HF Transceiver	479.00	(—)
FP700	PSU	170.00	(5.00)
FC700	Tuner	119.00	(2.00)
FT77s	10w. version	449.00	(—)
FMU77	FM Board for FT77	28.35	(1.00)
FT757	HF Transceiver	829 00	(—)
FC757	Auto A.T.U.	290.00	(2.00)
FP757HD	Heavy Duty PSU	200.00	(2.00)
FP757GX	Switched Mode PSU	180.00	(2.00)
FL2050	Linear Amplifier	115.00	(2.00)
FT290	2m M/Mode Port/Transceiver	349.00	(—)
FT290	With Mutek front end fitted	379.00	(—)
FL2010	Linear Amplifier	69.00	(1.00)
MMB11	Mobile Bracket	31.45	(1.00)
NC11	Charger	11.50	(1.00)
CSC1	Carrying Case	5.00	(1.00)
YHA15	2m Helical	7.65	(1.00)
YHA44D	70cm 1/2wave	10 19	(1.00)
YM49	Speaker Mike	20.30	(1.00)
FT230	2m 25w FM	269 00	(—)
MMB15	Mobile Bracket	14.55	(1.00)
FT203R	NEW 2m H/Held/C/W FNB3	225.00	(—)
FT209R	NEW 2m H/Held/C/W FNB3	269.00	(—)
FT208	2m H/Held	209.00	(—)
FT708	70cm H/Held	189.00	(—)
MMB10	Mobile Bracket	8.80	(0.75)
NC9C	Charger	9.60	(0.75)
NC8	Base/station Charger	64.80	(2.00)
PA3	Car Adaptor/Charger	18.00	(1.00)
FNB2	Spare Battery Pack	24.90	(1.00)
YM24A	Speaker Mike	23.75	(1.00)
FT726R	2m Base Station	869.00	(—)
430/726	70cm Module for above	295.00	(2.50)
FRT7700RX	A.T.U.	49.85	(1.50)
MH1B8	Hand 600 8pin mic	17.65	(1.00)
MD1B8	Desk 600 8pin mic	74.75	(1.00)
MF1A3B	Boom mobile mic	19.95	(1.00)
YH77	Lightweight phones	15.70	(1.00)
YH55	Padded phones	16.10	(1.00)
YH1	L/weight Mobile H/set-Boom mic	15.70	(1.00)
SB1	PTT Switch Box 208/708	18.00	(1.00)
SB2	PTT Switch Box 290/790	17.25	(1.00)
SB10	PTT Switch Box 270/2700	17.25	(—)
QTR24D	World Time Clock	34.50	(1.00)
FF501DX	Low Pass Filter	31.45	(1.00)

NEW MODELS

FRG8800	HF Receiver	559.00	(—)
FRV8800	Convertor 118-175 for above	90.00	(—)
FT703	70cm H/Held	P.O.A.	(—)
FT709	70cm H/Held	P.O.A.	(—)
FT270R	2m 25W F.M.	349.00	(—)
FT270RH	2m 45W F.M.	399.00	(—)
FT2700R	2m/70cm/25W/25W	559.00	(—)

Power Supplies

DRAE			BNOS		
4 amp	40.50	(2.00)	6 amp	58.00	(2.50)
8 amp	63.00	(2.50)	12 amp	99.00	(3.00)
12 amp	86.50	(3.00)	25 amp	148.00	(4.00)
24 amp	125.00	(4.00)	40 amp	296.00	(4.00)

Aerial Rotators

9502B	3 core Lighter Duty	69.50	(2.00)
AR40	5 core Medium Duty	115.00	(2.00)
KR400	Med/H Duty	109.95	(2.50)
KR500	6 core Elevation	139.95	(2.50)
KR400RC	6 core Medium Duty	132.50	(2.50)
CD45	8 core Heavy Duty	189.95	(2.50)
KR600RC	8 core Heavy Duty	189.50	(2.50)
HAM1V	8 core Heavier Duty	299.00	(4.00)
T2X	8 core Very Heavy Duty	365.00	(4.00)

Switches

Sigma	2 way SO239	14.49	(1.00)
Sigma	2 way 'n' Skts	19.95	(1.00)
Welz	2 way SO239	22.95	(1.00)
Welz	2 way 'n' Skts	41.90	(1.00)
Drae	3 way SO239	15.40	(1.00)
Drae	3 way 'n' Skts	19.90	(1.00)

Miscellaneous

DRAE	Wavemeter	27.50	(1.00)
T30	30W Dummy load	8.05	(1.00)
T100	100W Dummy load	35.20	(1.00)
T200	200W Dummy load	42.55	(1.50)
CT300	300W Dummy load	69.00	(2.00)
DRAE	2m Pre-set A.T.U.	14.50	(1.50)
ALTAI	KDM6 Dip Meter	68.60	(1.50)
TAU	SPC3000 HF Tuner	349.95	(5.00)

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Right-angle pcb mounting rotary switches: 1P12W – FT56L; 2P6W – FT57M; 3P4W – FT58N; 4P3W – FT59P. All £2.95 each.
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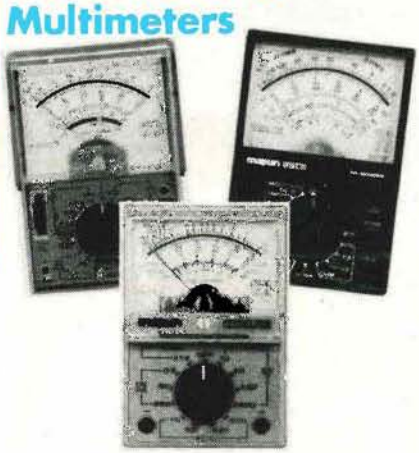
Driver chip for motor: SAA1027 ONLY £3.75 (QY76H).
★SAVE★ 1 Kit containing everything you need: motor, SAA1027, data sheet and passives ONLY £13.35 (LK76H).

Is it a turtle? Is it a robot? Is it a buggy? Yes! it's Zero 2.

- May be used by any computer with RS232 facility.
- Stepper Motor controlled.
- Half millimetre/half degree resolution.
- Uses ordinary felt-tip pens.
- Built-in 2-tone horn, line-follower. LED indicators.

The Zero 2 Robot is the first truly micro robotic system available and remarkably it costs less than £80. Complete kit (only mechanical construction required) £79.95 (LK66W).
Full details of power supply and simple interfacing for BBC, Commodore 64 and Spectrum, in Maplin Magazine 15 price 75p (XA15R).

More Choice In Multimeters



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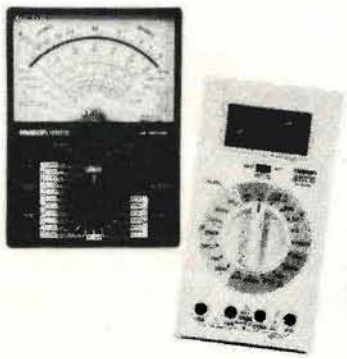

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