The NRD is a PLL-synthesised communications receiver of the highest class featuring advanced radio technology combined with the latest digital techniques.

The new NRD 515 is full of performance advantages including general coverage, all modes of operation, PLL digital VFO for digital tuning, 24-channel frequency memory (optional), direct mixing, base-band tuning, etc. JRC's 65 years of radio communications experience will give you "the world at your fingertips".

The NRD 515 is but a single item from the JRC product range which extends all the way to full marine radio installations for supertankers.

NRD 515 HF RECEIVER / PRICE £1080.20.

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TEL 0629 2817, 2430
A familiar name, but a whole new receiver behind it. Building on all the excellent features of the SRX-30, including the drift cancelling system covering 500 KHz to 30 MHz, the selectable sidebands and automatic filter cancelling system; we now introduce the all new SRX30D which incorporates the suggestions made by our customers. Outstanding new features are:

- Extended coverage 200 KHz - 30 MHz.
- Digital readout in large green display units which give true unambiguous frequency information - even when you switch sidebands or use the clatter.
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- All new audio system which produces outstandingly good quality on the built in speaker, and is capable of driving external hi-fi speaker units for even better sound.
- All new IF filters with optimum bandwidth for mode in use. Automatic filter selection from mode switch.

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We predict that the SRX30D will be a landmark in low cost, high performance SWL receivers. Just consider how much you should pay for a receiver covering 200 KHz - 30 MHz with accurate digital readout, high performance USB/LSB/AM with switched filters; drift cancelling frequency synthesis; built in mains supply and built in speaker; high quality construction and advanced design - and so much more.

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£195.00 inc VAT, Sècuricor carriage £5.00.

UL1000

£39.50 inc. VAT

The UL-1000 is a new concept receiving station accessory and will help any keen listener to improve the performance of his station, particularly in the difficult conditions existing in the medium wave band (500 KHz-1.5 MHz).

The UL-1000 is a self-contained variable gain, tunable preamplifier suitable for use with various aerial systems. A particular feature of the UL-1000 is the use of a high Q loop filter for the 500 KHz-1.5 MHz band.

Carriage £2.00

COMPARING THE COST OF A TRIO
TR2300/TR2200GX WITH THE COST OF A POPULAR FAMILY CAR

<table>
<thead>
<tr>
<th>YEAR</th>
<th>TR2200GX/TR2300</th>
<th>POPULAR CAR</th>
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</thead>
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<tr>
<td>1976</td>
<td>£173.70</td>
<td>£2,108</td>
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<tr>
<td>1977</td>
<td>£173.70</td>
<td>£2,576</td>
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<tr>
<td>1978</td>
<td>£210.00</td>
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<tr>
<td>1979</td>
<td>£199.00</td>
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<tr>
<td>1980</td>
<td>£166.75</td>
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<tr>
<td>1981</td>
<td>£166.75</td>
<td>£5,256</td>
</tr>
<tr>
<td>1982</td>
<td>£166.75</td>
<td>£6,300</td>
</tr>
</tbody>
</table>

So the TR2300 now costs less than its predecessor did in 1978. Not only that, the TR2200GX of 1976 only had 12 channels where the TR2300 of today covers the full amateur band. To give some idea of how costs have increased over the same period we quote, in comparison, the cost of a popular four door family car.

So we rest our case - the TR2300 has to be, in today's market, outstanding value for money and, what is more, the TR2300 has an unprecedented reliability factor.

There is no need to talk of full 2 metre band coverage, the 1 watt of perfect transmitted signal, the fully comprehensive list of included accessories, carrying case, Nicad charger, 12 volt power cord, shoulder strap, hand microphone, collapsible whip antenna, reverse repeater facility, automatic tone burst, switchable frequency dial, consequent long life operation out in the field.

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TR2300 £166.75 inc VAT carriage £6.00

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This rig offers you all band coverage: true frequency readout on all modes; variable bandwidth and passband tuning; rugged, reliable 61468 valves in the PA; top quality both in construction and design; and, above all, the Trio reputation for giving you the best equipment at a reasonable price. Thousands of happy users worldwide will confirm that if you want total satisfaction, try the TS830S. Send for comprehensive details today.

**TS 830S**

£694.30 inc. VAT. Securicor carriage £5.00

A recent addition to the Trio HF range, and proving amazingly popular is the new TS530S. Designed as a "little brother" to the TS830S, the TS530S uses the same PLL system, same RF boards, same readout system and many other features of the 830 but without the variable bandwidth facility. You do, of course, have the famous Trio L.F. shift system for dodging the QRM.

We really believe that the TS530S is the finest mid price HF base station transceiver on the market and we would like the opportunity to prove it to you. Why not call us, or call in person to see and try out this super rig.

If you like to read lists of features, here about 160-10 metres including new bands: passband tuning on all modes; 61468 PA tubes for low intermod; low power tune up; digital readout shows true frequency at all times; VOX built in; CW sidetone speech processor; relays blanker; etc. etc.

**TS 530S**

£534.98 inc. VAT. Securicor carriage £5.00

For the keen mobile/portable enthusiast, the "no tune" solid state transceiver has proved irresistible, and the Trio TS130V is probably the best of the bunch. When the original TS120 was introduced, there were gasps of amazement at Trio's achievement in making a first class, HF rig in such a small size. With the advent of the TS130S, the mobile rig really comes to maturity. Imagine an 8 band transceiver with digital readout, I.F. shift, vox, speech processor, single conversion PLL derived receiver and transmitter, 100W output, red hot receiver - and all in a package you can carry on the palm of one hand. It's really a staggeringly small size. The unquestioned excellence of Trio design and manufacture shows in every aspect of the TS130S - why not see it and try it for yourself.

**TS130S.V**

£525.09 inc. VAT. Securicor carriage £5.00

**TS130V** £445.05 inc. VAT.

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- **IC200 case charger** £38.00
- **MMU 10W Booster** £49.00

**TRIO/KENWOOD**

<table>
<thead>
<tr>
<th>Model</th>
<th>Description</th>
<th>Price</th>
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<tr>
<td>TS830S</td>
<td>HF Transceiver</td>
<td>£700.00</td>
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<td>TS130S</td>
<td>HF Transceiver</td>
<td>£630.00</td>
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<td>TR8900U</td>
<td>Mobile</td>
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<td>TR8902L</td>
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<td>TR8700</td>
<td>VHF FM</td>
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<td>TR7800L</td>
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<tr>
<td>TR8000</td>
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  - **MB287 and CB800 Mobile** £270.00
  - **MB287 Mobile** £19.95
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# SHORT WAVE MAGAZINE

(GB3SWM)

**ISSN: 0037-4261**

**Vol. XL**

**MARCH, 1982**

**No. 461**

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**Editor:** PAUL ESSERY, G3KFE/GB3SWM  
**Advertising:** Charles Fursyth

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Articles submitted for Editorial consideration must be typed double-spaced with wide margins on one-side only of A4 sheets. Photographs should be tightly identified in pencil on the back with details on a separate sheet. All drawings and diagrams should also be shown separately, and all tables of values prepared in accordance with our normal setting convention — see any issue. Payment is made for all material used, and it is a condition of acceptance that full copyright passes to the Short Wave Magazine, Ltd., on publication.

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The unit requires only a DC power supply 9 to 13.8 volts to enable operation and this should be connected to the power socket located on the rear panel via the supplied plug.

To give this product appeal not only to the beginner but also the proficient operator we have incorporated six 'learning levels'. In this way it is a simple matter to become more and more proficient, even after passing the Morse Test. The six ranges are:

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A Z

Numbers Only:

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3) Fifty letters (five words)

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EDITORIAL

461st Issue of “Short Wave Magazine”

This issue marks the beginning of the fortieth volume of S.W.M., a landmark which all of us involved with the Magazine admit to feeling just a trifle proud of reaching. Just imagine it — twenty million words devoted entirely to Amateur Radio!

The majority of our readers are in the U.K. of course, but we have subscribers in most countries of the world as well — from Greenland to the Seychelles, from the Falkland Is. to Indonesia. That the present Magazine team has such a solid base with which to work is due almost entirely to Austin Forsyth, G6FO, whose vision and energy as Editor during its first 35 volumes established it as a leading amateur radio journal. G6FO was a believer in amateur radio journalism if ever there was one.

Since Vol. 1, No. 1 amateur radio has advanced and expanded dramatically in parallel with the astonishing developments in the field of electronics, particularly in the last ten years or so, and has now become a hobby of tremendously varied facets. Computers are coming increasingly into common usage, and to reflect this we shall be featuring articles on microcomputers in amateur radio in the course of this new volume.

On the other hand, there is also something of a move away from ‘black boxes’ back to home construction (which is where it all started). We shall be covering this too, with a series of articles for the novice constructor, including projects, written by an arch-expert of home-brew and frequent contributor to S.W.M., No prizes for guessing who!

Regular equipment reviews will be featured and, of course, we shall not be forgetting the SWL. There is more than a grain of truth in the view that ‘The real McCoy’ radio amateur starts as a short wave listener.

Nostalgia is a popular these days, and is as much a part of amateur radio as anything else. So from time to time we shall reprint selected and we hope, often amusing) items from the past 40 years of Short Wave Magazine.

In a nutshell these are some of our plans for the coming twelve months; together with our usual wide mix of technical articles, and regular features, they should provide plenty of interest and value to anyone whose hobby is amateur radio.

On a more serious note, this S.W.M. anniversary seems a good time to affirm that the original ‘spirit of amateur radio’ does live (though sometimes buried in the helter-skelter of technological advancement and competition for air-space) and must continue to do so: amateur radio has a distinct part to play in world stability. It is a role which can be exaggerated, but which must never be underrated.

Now — back to the drawing board, and MCC: we need as much feedback as possible on just what sort of a contest it should be in the future. So, club scribes, let’s have the consensus of opinion of your members; with so many clubs on our ‘books’ it really should be possible to arrive at a majority view!

Finally, in the next issue the winner of our annual article competition will be announced.
VHF BANDS
NORMAN FITCH, G3FPK

Awards News

two more readers have been elected to the two metres, QTH Squares Club this month. Certificate No. 16, dated Jan. 19, goes to Graham Taylor, G1JZF, (VM30b) from Cannock, Staffs., who has 103 squares confirmed. Trope, accounted for 89 squares, Auroral propagation for 11, Sparatic E for two, the remaining one being via meteor scatter mode. An s.w.l. since 1963, Graham was first licensed in Sept. 1979 as G8ZSE, then as G1JZF on July 2, 1980. The station now comprises an Icom IC-245E, Microwave Modules 100/5 amplifier and 16-ele. Yagi aerial, at 36ft. a.g.l. Although the QTH is 6500ft. a.s.l., the only good take-off is to the ESE through SW. VHF Century Club Certificate No. 344 was issued to Graham at the same time for 2m, activity.

Marty Jones, G8CQX, (ZM53e) from Lenington Spa, Warks., becomes 2m, QTHCC member no. 17. His 101 cards were for 90 tropo, 9 E and two A QSOs and all very neatly listed on a computer print-out. His present station consists of a Trio TS-700G and Electronic Development 100 watts amplifier, the '700 being preceded by a minTek preamplifier. The aerial is a Yonke 9-ele. Yagi at 34ft., the a.s.l. being 2550ft. Readers aspiring to VHFCC and QTHCC membership can obtain the rules for both, and an application form for the latter, by sending an s.a.e. to the "VHF Bands" address.

José M. Gené, EA3LI, now has 175 squares confirmed for his QTHCC No. 14. The appropriate sticker was issued on February 2.

Beacon Notes

The Lannion beacon, FX3THF, (V113d) has been back on the 2m, band for some weeks on 144.905 MHz but only running five watts, aimed towards Paris. The signal at G3FPK is rarely audible. From the Pyrénées, FX5THF, (AC08d) has been heard on 144.915 MHz. It was previously in the CW sub-band running 30 watts from a 1300w a.s.l. site. José M. Gené, EA3LI, has mentioned two more Spanish beacons on 2m. EA1VHF, in V59e, is on 144.8675 MHz and runs 20w. to a 5-ele. Yagi aimed northwest. EA6VIF is located on the Balearic Island of Ibiza by AY07j and is on 144.9175 MHz, also running 20w. to a 4-ele. Yagi beaming northeast. Both are on A1A mode, in the new jargon. EA1VHF should be heard fairly often in southern Britain.

From Brian Bower, G3C01, has come the welcome news that the Lerwick 2m beacon is back on the air on 144.965 MHz from ZU6SF. The Tx runs 10w. to a 4-ele. Yagi beaming NNE.

A new 23cm. beacon should be operating by the time this appears. It is G6BFRS on 1,296.85 MHz and is sited at Deep Cut Ridge, near Bagshot in Surrey at QTH locator ZL57J. It was sponsored by the Farnborough and District ARS and most of the building was done by Mike Hearsey, G8ATK, who wishes to record the Society's appreciation of the generous assistance, freely given, by many manufacturers and dealers. The beacon runs 5w. to a modified Alford Loop aerial. 120m. a.s.l. Keying is on F2A mode.

If a beacon cannot be heard, it is either due to poor conditions, something wrong with the receiver, or the beacon not being operational. An innovation with G6BFRS will be the opportunity to ring a telephone number to get a status report, in cases of uncertainty. This service will be available between 1700 and 0900 weekdays, and all the weekend. Should the beacon fail at any time, it will automatically telephone its keeper, G8ATK. Reception reports should be sent to G8ATK, (QTH). Later on, Phase 2 of the program will involve the transmission of telemetry from G6BFRS, of which more details in a subsequent month.

The Satellite Scene

Oscar 8 is reported by the A.R.R.L. as functioning well and back on the original schedule which is: Saturday and Sunday, Mode "J"; Monday, Mode "A" ORP; Tuesday and Friday, Modes "A" and "J"; Thursday, Mode "A" with Wednesday reserved for special experiments arranged through the A.R.R.L.

U-09 is still not fully operational and the next experiment due to come on was the CCD camera. The last thing will be the deployment of the 50ft. boom, with its 2.5 kg. tip mass, to provide passive stabilisation resulting from gravity gradient forces. This should maintain the -2° facet of the spacecraft pointing towards the centre of the earth. The HI beacon on 7000, 14002, 21002 and 29510 MHz will then be switched on and these will excite the 50ft. boom so the signals should be reasonably strong, inspite of the 100w. output power. The latest figures for the HI beacon were for the U-09 orbit were for orbit no. 1767 on Jan. 31 for which the equator crossing time was 1211 and +5.1 secs. GMT at 316.90°W longitude. The period quoted was 95.431092 minutes and 1.056 x 10^-4N, and the track separation, 23.863144 minus 2.7809 x 10^-8N in minutes and degrees respectively, and where "N" is the orbit number.

By contrast to the difficult-to-predict U-09 orbit figures, the six Soviet satellites, RS-2to8, are in very predictable orbits, with the "experts" only quibbling about the third or fourth decimal places. The two-to-three metre transponders in RS-5 through RS-8 do not seem to be on very much, with only RS-5, and RS-7 being heard for short periods when over western Europe. The telemetry indicates spacecraft temperatures in the order of 30°C and these are reflected by the figures of the "S" and "W" channels of the single letter frames. The "S" channel is the temperature of the regulator circuit, and the "W" channel the temperature of the heat sink of the 10w. Tx output transister(s), e.g. "5S2" means 22°C and "3W1" 31°C.

AMSAT-UK has made new arrangements for printing satellite calendars. In future, they will run for two months per issue, the next one starting on March 1. Members will be charged £7.50 for the whole year — i.e. six issues — post free. The price to non-members is £10. These calendars will cover 0-8, RS-5 through 8, a couple of weather satellites, but not U-09. There was a delay in printing of Oscar News No. 36, which will be three weeks later than planned. The AMSAT-UK net information remains as on page 671, last month. For full details of AMSAT-UK membership and services, send an s.a.e. to the Secretary, 94 Herongate Road, London E12 5EQ.

VHF Convention

Full details of the RSGB's VHF Convention were given last month. The only amendment is that advanced booking for the Convention, Exhibition and Buffet costs £7.50, not £7.00 as was previously advised. The Sandown Park Racecourse venue is on the north side of the A307 Portsmouth Road, to the west of the Scilly Isles roundabout. Access is easy and parking more than adequate.

Contests

The 144, 432 MHz and s.w.l. contest takes place over the Mar. 6/7 weekend from 1500 GMT for 24 hours and is a two section event; either Single Op. or Multi-Op. Details of the AGC/W-1L, 432 MHz CW Contest were given last month. It is on Mar. 20, 0900-2300 GMT. Two legs of the new 4m. QSOs are scheduled for Mar. 14 and 28, 1000-1200 local. (N.B. British Summer Time begins on Mar. 28.)

Contest haters will want to avoid the April 3/4 weekend. On the Saturday, the 1.296 MHz Trophy affair is booked followed by the 432 MHz Trophy and s.w.l. event the next day. The British Amateur Radio Teleprinter Group has chosen this same weekend for the new, three band VHF/UHF Contest, which is
from 1800-1200 GMT. A four hour rest period is mandatory and must be declared in the entry. Single-op. and Multi-op. sections, with portable operation allowed. Scoring at one point per kilometre on 1.296 MHz, and usual radial ring scoring on the other bands. Full rules from G8APB, 27A Thornt Lane, Four Marks, Alton, Hants., GU34 5XB.

Sporadic E
Sporadic E is not a headline topic in winter, but winter E's is known to 10 HF band operators. Such propagation was noted in the evenings of Jan. 10, 14 and 19, but only that on the 14th. has been reported to have affected 2m. 1W4SPW (EF35c) was running S9 for about ten minutes and was worked at 2042 by Bob Pinnell, G4KJN, in Ilford.

EA3LL, who is VHF Manager of the Spanish national radio society, U.S.R.E., has kindly sent a copy of his annual E's report which lists the QSOs made in the 1981 summer by many EA VHF operators. The "season" covered was from May 31st through Aug. 11th and lists some 1,600 QSOs. However, Jose points out that many people did not send in any reports. British Isles stations feature in the list on June 6, July 10, July 20 and August 11, the July 10 event being the most prolific. On that day, EA8XKS (SO73d) lists QSOs with G81DP, G3POI, G8RXK, G8VLL, G8NOQ, G8PDB, G4DEW and G8NW, between 1724 and 1950. Salvador does not confirm a QSO with G3KDY, reported in last August's "VHF Bands". John was dubious of it anyway: pity.

The Muzhlo SB2M
Your scribe was in QSO recently with Trevor Talboys, G2ATK, who was using a Muzhlo SB2M 2m. transceiver. He confirmed he, too, had suffered from bad "spragging" which were caused by the tuning capacitor. However, he cured the trouble completely without replacing the component. All it needs is a more positive connection of the rotor spindle to the case of the set. He achieved this by fixing a sprung, metal wiper under this fixing nut and pressing onto the shaft. That apart, he reckons the SB2M to be a fine little transceiver.

Six Metres
Henry Wilson, EI2W, used to write to "VHF Bands" years ago, so it is good to hear from him again. He sent a sheet listing "firsts" from EI to many other countries on 6m., 4m., 2m. and 70cm., many of which he holds himself. During Cycle 21, EI2W made 3,020 QSOs on 6m. and worked 741 different stations on SSB, in all "W" call areas and in VE14. 45 U.S. states were contacted, as well as stations in 1K4, KV4 XE and SB4. EI stations do not now have use of the band.

Jean Louis Delport, ONL 646, sent in a "33 page log extract covering the period Dec. 16, 1979 through Nov. 25, 1981. Stations and beacon in 18 countries are listed; CS, EI, EF, FJ, HJ, L, K, KP4, KV4, PA, VE, VP2, V56, YV, ZB2, ZS3, ZS6, SB4 and 8P6. For listening, Jean Louis uses a Microwave Modules converter and Yaesu FRG-7000 Rs, the aerial being a ground plate, now.

Four Metres
Syd Harden, G2AXI, (Hants.) has got off to a good start this year, thanks to the contest on Jan. 17 and the first leg of the Cumulative on the 31st. The Aurora on the 31st. was a weak event with a few stations heard, but none worked. Frank Howe, G3KIJ, (Essex) was also on for the Jan. 17 event, his best DX being Jersey, Jersey, Jersey, Jersey, Jersey. Trevor Thorpe, G4FKI, (Essex) has 15 counties so far, including Norris, Staffs., Salop and Norfolk.

Another Essex reader is Leslie Rodney, G4JOI, who wishes that some of those who complain about pirates on 2m. and CB-eets on 10m. would try 4m., which suffers from neither. He operates mobile, roughly once a week in the evenings, and at weekends, between Cheilmsford and east London. Leslie has a Low Band Pye "Cambridge" on 70.26 MHz with a quarter wave aerial. The Tx part is unmodified but he has added a discriminator, so can copy FM callers who reply to his "QG" calls. D. Lewis, G4V4HN, (Gwent) is another new reader and took part in the Jan. 17 contest which provided G4JHF for a new country. An SSB QSO followed after the contest, the next best DX being G4ANT (Norfolk).

Two Metres
A recent note received from the B.A.R.T.G. suggests that Monday evenings are RTTY 2m. activity periods, but no times were suggested. EA3LL is now up to 21 squares worked with 186 confirmed. Quadrants. MS QSOs were completed with F6DKO (DIH), D8BOA (E), G4JII (ZL), DL3MBG (GI), G6NWG (IG) and F6ETI (YH). EI2W (WN6D) is now back on the band and can be found in 144.2 MHz most nights between 2030 and 2230 local.

The lift into Scandinavia did not quite reach Dave Sellars, G3PBY, in Devon on Jan. 13/14. A few weak QZs were heard on the 14th, and OZ22B (EQ) was worked at 2000, when G3CHN, who is not too far away, could not hear the OZ at all. On Jan. 31, between 1700 and 1800, GM4HLS and GM3WCS were heard weakly in the Ar. Another event the next day - 1945-2030 - found GM4CXM working GJ on SSB. Other GMs were called without success. Mike Lee, G3YVF, (Essex) added one new square via MS on Jan. 8 in the shape of UQ2GGC (LR) who has 100w. to a 10-ele. aerial. Mike thought he heard UA1ZCR in the Quadrants but, as the "D" series does not exist, OA3LJ reckons it must have been UA1ZCL, a well-known QRO station in Muurman, in RC square. If so, that would be a QRB of about 2,600 kms.

Roger Dixon, G4BVY, (Here. & Wors.) wrote for the first time including the activities of G4GFX and G4TS. He reports G4GFX having caught the lift on Jan. 14 and which produced QSOs with OZ1GIZS (FO), SM6KKX (GR), SM6CNH (FR), OZ1ASP (FP7), OZ4NIM (FP) and OZ9HN (FO), plus many PAs and DLs. Bryn Llewellyn, G4DEZ, (Essex) has now two 16-ele. Tonna Yagi aloft again and is already up to 18 countries this year. In the Feb. 1st In, he got OHOJN for a new country. The night of the 4/5 Feb. brought more AR contacts with SM4IV (HIT), SM6BN, LA6ZV (ET), SM6HAX (JT) and SM7VA (GT). Martin Adams, G4YA,
AMATEUR ELECTRONICS UK

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The Short Wave Magazine  
March, 1982

**TWENTY-THREE CENTIMETRES ALL-TIME TABLE**

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Based on administrative counties.

(Kent) also worked the OH10 on Feb. 1, and UR2QIT and UQ2QGF.

John Hunter, G3MIV (Bucks.) was on for the Quadrantids and worked two new squares, LA6HL (CT) and UA3LAW (PO). Other successes were IW3QF (GF), SW2BAI (LZ) and OZ2EN (HP) on Beethoven. Paul Turner, G4JUE (Essex) has regular MS skeds every Saturday with DJ1MS (GI), so far with 100% success, averaging 30 mins. Other MS QSOs include UQ2GCG (LR) on Jan. 7, for a new country; OK3AU (KI) on the 10th., LA9BM (EU) on the 26th. and LAX2 (CU) on the 29th. OK2LG (HI) was worked on the random CW QRQ on Jan. 31, and OK1KRG (GI) was worked on the random CW QRQ on Jan. 31. The problem is that he has been working so much that he can't find time to write up his results.

Chris Otley, G4CYA, (Sheffield) enjoyed the MS lift and told your scribe he worked some 30 OZs and 20 SMs and LAs. He has modified his 70m LK-202E by bypassing the bandpass filter on receive, removing the lossy core in the RF stage coil, replacing the RF and mixer devices by a BP960 and 1310K respectively.

Graham Taylor, G4JZF, (Staffs.) worked into SM and OZ on Jan. 13/14 without working anything new. FZEM/F (BE) on the 30th: was a new country, however. In the last few days, signals were weak on CW. The only one heard on SSB was GM8OPX. On the 31st event, a few more 1982 counties were netted, but GM6CFN (XQ) got away.

Jonathan Naylor, G3KLY, (Derbys.) has been a reader since 1976 and wrote for the first time. He was first licensed as G8TXQ in Oct. 1979 from a "hole-in-the-ground" OTH, but now operates from Witkworth Moor, (Z/NY3) 800ft. a.s.l. He has had a succession of rigs and the present set-up consists of a Yaesu FT101ZD, Europa transverter and 16-1/2 Tonna Yagi. He has been on the MS trail recently with DS5CH (GI) worked in the Quadrantids in three minutes. On Jan. 14, 102 PA, PA and PE stations were worked on FM, while SSB produced 14 PAs; 17 OZs; 2 SMs and 19 OZs; a DL and an F.

Terry Hackwill, G4MUT, has started to get TVI complaints after two years so has been curtailting his activity a bit in main TV hours until the problems are resolved, hopefully by next month. Paul Broadhurst, G4ANFD (Avon) is now on CW MS. The December Geniunus were disappointing due to a prolonged mains failure, then storm damage to the aerials. In the Quadrantids, skeds with 16WJB (HC) and H8GCE (KG) were completed, and OK2SL and YU3ES (GF) were worked on random CW.

Adrian Chamberlain, G6ADC, (Coventry) copied a lot of OZs on Jan. 14 and worked his first one, in EQ squares.

As the pile-ups grew and propagation faded, he became south and worked FI1GFT (2J) for another new country. In the southern lift on Jan. 30, many French stations were called, and AG, BE and BI squares were worked, but AD missed. Martyn Hunt, G4GJA, (Cambria) had his FT-221R in service, and asked for any work on the band. He has worked in some FM operation with a Trio TS-280. Fortunately, his father, G2MJ, came to the rescue with the loan of a Trio TS-702S, so that the table score is quite respectable. On Jan. 30, a "CQ" call was answered by F6DKW (HF12).

Graeme Caselton, G6CSY, (Kent) found the bandwide open on Jan. 13/14, with good GDX and the "usual crop of PDs". Many Germans were called to G and asking for 28cm. QSOs. All this copied on a halo aerial with the Yaesu FT-225RD. Mick Cuckoo, G6ECM, (Kent) now has an FT-221R which has worked four new squares in January. The next target is to replace the 8-ele. Yagi by a 14-ele. Paraboom. The Jan. 13/14 lift produced the best ever conditions to Scandinavia for Martyn Jones, G6CQX, (Warks.) who managed SSB QSOs with SM6KEG (GR) and OZs in EQ, FP and FF squares.

John, G8RZP, and Jackie, G8RZO, Brakespear (Kent) have been busy piling up the points on their new MS table. They are surprised to find the band open to QM on Jan. 14, when everyone was preoccupied working the OZs and SMs, and caught GI4KIG in London. Henry Hunter, G8SGG, operated —/A from near Reigate in Surrey and heard the FXST1/F beacon on Jan. 30. It was still audible at 0845 the next day. EA1QI and EA1ED were heard on the afternoon of the 30th., and AD square was the only one worked, leaving only five to get in France. He hopes to be able to put out a good signal into Co. Wicklow this summer and is surprised how many people have never worked into EI.

Ken Willis, GB8R, (Kent) had a near miss with UA3LAW but is encouraged to...
try again since this station has been worked by others in AL square. Successful MS QSOs were completed with SM1BLU (HK); OH5LK (NU); SM3UL (IV); 11ANP (EE); DL1MBV (FI) and YU1EU. The Jan. 14 troop brought OZ3GW and OZ/GDZ for another new square. FO. Several other OZs in EQ, and some SMs in GG and FR were also worked. On Jan. 30, Ken came on for his lunch time sked with G3CO to find the band open to Spain, and EA1TA and EA1QI, both in VD, were worked. Later a QSO with FQ/GPYP in XH provided another new square.

Neil Clarke, G8FYV, (IV. Yorks.) has got off to a good start. Things started to develop on Jan. 11 when EI6CL was heard, but the band really began to liven up by the evening of the 13th. when FG6JU (BK) was contacted, followed later by many PAs and some DLs on the 14th. By the evening, the band was still open to OZ and SM and brought QSOs with stations in EQ, EP, FR and FO. Neil, a keen student of weather maps, says that, at 2300 on the 14th, there was a 14°C temperature inversion at 2,200ft. This was caused by the warmer air from the south, brought up when the anticyclone moved to the east of the country, riding over the long-established cold air below.

By contrast, Arthur Breese, GD2HIDZ, reports all the continents in mid-January being worked by mainland stations as completely inaudible in the Isle of Wight. However, GD to-G conditions were excellent. In a "rare foray" on to 2m., GW4HBB heard DLs and SMs on Jan. 14 and worked OZ/EK1 at 1630 while repairing the 4m. gear. As observed from G3FPK, signals from OZ and SM were obviously much weaker than they were with east coast stations and those further north of London, inland, during this welcome lift.

The Ar signals in the London area on Jan. 31 were very weak. Another event was happened upon at 1915 on Feb. 1 and was still in progress at 2000. The GMs were quite strong at QTTs between 0° and 20°. On the 20th, VHF net at lunch time on Feb. 4, SM4JVE reported that an Ar had been in progress since 1145 in Sweden. While on 20m., Lars sent a string of dots on 2m. which were copied through a local signal at 1530, but then no more Ar signals were heard till the late evening when G3FPK worked SM4JVE (H1T) at 2336. The event was still on at 0030. Yet another, extensive Ar started on Feb. 6 around 1630, with many SM and GM stations on and some LAs. The QTTs wandered between about 30° and 35° and when GM3JU (WS) was worked at 1849, best reception was with the beam at 345°.

Seventy Centimetres

E12W advises he is QRV on the band, most nights from 2000 to 2200 on 432.2 MHz. G2AXI managed PA08JR on Jan. 13 and OZ9SL on the 14th. and has five, 1982 countries so far, G3PBV found the mid-Jan. lift frustrating with the various beacons pounding in, but with very little heard, and nothing worked beyond the Midlands. The OZs and DLs were inaudible in Newton Abbot. However, on the 30th, FIBIU in Bordeaux was contacted, and FIETM/P (BE) for a new square. G4BYS has 5w. to a 16w. aerial on the band and on Jan. 14, Roger's best DX was OZ11JF (HP75J). Also worked were OZ3GW (FO) and Germans in EN, FN and FO squares. On Jan. 30, he worked FIBIU and FIH1 (Z163d), while G4GPX got FIETM/P.

G4JIZ worked into PA and DL on the 13th. Jan. for the first time and the next day brought OZ with SM heard. On the 31st, in below-average conditions. G8DJV in Cornwall was worked. While the X4UFJ beacon in ZD square was heard on the 30th, no DX was copied. G4KX seeks skeds with ZK square and Dorset. As he is jobless at present, Jonathan has a lot of spare time so figures on building a 4CX250B amplifier soon. G4NFD used an MS test at the peak of the Quadrantids on Jan. 3 with DFTVV (LE) but, in over three hours, only got two pips and a single two burst. G6ADC got FIGHT to QSY from 2m. on Jan. 14th, for a welcome QSO. Apart from that, Adrian has found the band very quiet so far. G6C5Y can only listen on 70cm. so far but copied OZ and DL stations in the mid-Jan. lift. G8CXQ's best 70cm. DX so far was OZ11JF on Bornholm. Martyn worked several new PA and DL squares in the lift.

G8RZO and G8RZP worked a fair amount of stuff in January and would like some skeds with Tyne and Wear, and Northumberland. John Moxham, G8KBQ, (Somerset) uses a Trio TS-120V/MHM transverter combination running 10w. to a pair of 19-ele. ToeN Yoga at 65°, fed with LDF-4 Helax cable. He worked OZ1JIF for the first Danish QSO on Jan. 14th., and a number of PA and DL folk in CL, CM, CN, DN, EO and FO squares. An unusual one was GUZ2FRO on Sark. On the repeater scene, Nigel Blackmore, G8ARP, asks for funds for the proposed mid-Cornwall repeater, GB3HIB. He is QT7/R.

Twenty-three Centimetres

G2AXI worked PA2DOL, using 1/2w. on Jan. 13th. The next day brought QSOs with G80WR (Warks.); G8FRI (N. Yorks.) and G4FPX (W. Yorks.) G3PBV did not work anything in the mid-Jan. lift. Dave reports the reappearance of the ISW beacon over the Jan. 30/31 weekend, and that FIH1 now has 2w. to four, 23-ele. beams from ZH square. Using 20w. to a 15-over-15, wide out of a skylight, G8TXG worked PA0FRE (CL), DB9IU (DI) and DF9L (FO) on Jan. 14th. From Malvern (Here. & Worcs.).

Finale

That's all for this month. All your letters and claims for the April issue by Mar. 3rd. please — earlier if you can — and by Apr. 7th., for the May edition, to, "VHF Bands", SHORT WAVE MAGAZINE, 31 High Street, WLI WYN, Herts. AL6 9EQ. 73 de G3FPK.
Circuit Operation and Alignment of the Trio R-1000 Receiver, Part I

The Receiver General Arrangement and the Operation of the 'PLL' Frequency Synthesiser

J. L. Linsley Hood, C. Eng., MIEE, MIMC

The perennial problem of the superhet receiver, and this class contains virtually the whole of receivers used for serious communication purposes, is that of 'second channel' interference. By this is meant the breakthrough of unwanted signals twice the IF frequency removed from the desired signal frequency. In the case of the ordinary domestic AM radio, covering signal frequencies up to some 1700 kHz, the selectivity of the aerial circuit is entirely adequate to reject the unwanted signal 910 or 930 kHz removed from the tuning frequency. However, for communications receivers covering the spectrum up to 30 MHz and beyond, this would certainly not be the case.

In what I think of as 'first generation' communication Rx's, which held the field from the early '30s until they were progressively replaced during the late '50s and early '60s by more elegant designs developed to meet military needs during the last war, the standard solution to the problem of inadequate aerial stage selectivity was the 'double superhet', shown in schematic form in Fig. 1. In this, the second IF was 455 kHz or even lower, in some early Rx's this could be 110 kHz, as a cheap way of getting good selectivity without the cost of quartz crystal filters, while the first IF would be 2.6 MHz or above, to remove the 'second channel' some good way from the wanted signal.

This type of receiver has given sterling service — and still does, in the hands of some loyal followers, if the second-hand price fetched by old AR88's and HKO's is any indication — but has now, largely, been superseded by the 'second generation' designs using triple conversion, with a first IF in the 40-60 MHz region, and a compound, crystal assisted, drift-cancelling oscillator system based on the Barlow-Wadley 'loop'. The general layout of this is shown in Fig. 2, and is exemplified by the Yaesu Musen FRG-7 whose circuit I analysed in Short Wave Magazine in September and October, 1981.

Although this type of Rx can give excellent results, largely limited by aerial noise in respect of overall sensitivity, it does have the problem, by comparison with the early double-superhets, that there is no convenient way of ganging the aerial tuning and the second IF tuning together, so changing signal frequency is a two-knob operation, while changing wave-band is a 'four knob job'.

Although dual-gate MOSFETs, and other nice bits of contemporary hardware, have made the problem of getting a useful amount of stage gain in the 50 MHz region a fairly straightforward task, the use of this order of first IF frequency does have the snag that the oscillator frequency for the first mixer must lie in the range 50-80 MHz, and, even with the best bits of hardware available to us, will tend to drift in frequency. For those with long pockets (like the odd millionaire and diplomatic establishment), a solution to this problem has been around for some time, in the form of phase-locked loop 'synthesised' frequency oscillators, in which the first oscillator is entirely derived from a quartz crystal reference by means of a suitably chosen sequence of numerical dividers. For those who would like to know more about this approach, a good description is given in the Philips journal "Electronic Components and Applications" (Vol. 2, No. 2, Feb., 1980, pp 91-105). This general type of system is used in the excellent and widely used Racial RA-1772 receiver.

The way in which a communications Rx would be organised, using a synthesised first oscillator, is shown in simplified form in Fig. 3. In this, because the first oscillator is now drift-free, the selectivity can be obtained, at least in part, in the high-frequency first IF stages, which meets the requirement that, for the best signal-to-noise ratio, the selectivity should be obtained as far as possible in front of the gain.

Completely 'quartz-crystal synthesised' VFO's are expensive, even with the advent of complex integrated-circuit phase-locked loop and divider systems, and this has meant that such receivers have been rather outside the price range of the average amateur. However, in the last year or two, techniques have been evolved for VFO's having an output frequency partially synthesised from a combination of reference frequency crystal oscillator and a stable, relatively low frequency, LC variable oscillator. A good example of this type of Rx is the very neat and straightforward, and deservedly popular, Trio R-1000, which gives whistle-free, single-knob, tuning over the 150 kHz-30 MHz range.

The Receiver Circuit of the R-1000

I have shown the circuit layout employed in this, in block diagram form, in Fig. 4. Although, ideally, the RF stages preceding the first mixer would be divided up into 30 separate bands, which could then be ganged to the main 'synthesised oscillator' tuning knob (shown in the diagram as the VFO at the bottom of the phase-locked-loop box), in practice the RF selectivity can be obtained, with only a small loss in sensitivity and s/n ratio, by the use of a group of six bandpass RF filter circuits covering, with the exception of the first, a two-to-one frequency ratio. These are switched in, as appropriate, by the main 0-30 MHz band-switch knob.

The incoming aerial signal from the band-pass input filter is amplified by a dual-gate MOSFET, followed by a simple FET buffer, and fed, along with the synthesised oscillator signal derived from the 'PLL' block, into a balanced mixer using a pair of dual-gate MOSFETs. The output from this, without further amplification, is taken through a 48.055 MHz bandpass crystal

![Fig.1 Schematic arrangement of traditional 'double superhet']
filter block, having a bandwidth of some 20 kHz, into a very nearly identical second mixer, where it is heterodyned with a frequency-stable signal derived from a 47.6 MHz crystal oscillator to give the second IF-455 kHz signal frequency.

From the second mixer, there is a choice of three switchable crystal filters giving bandwidths of 2.7 kHz, 6 kHz and 12 kHz respectively for CW/USB/LSB, narrow b/w and wide b/w AM reception. These are followed by a conventional 455 kHz tuned IF and a choice of straightforward diode or ring-modulator detection, depending on the type of incoming signal.

Two useful and effective additions to this part of the circuit are a separate noise-blanker amplifier, following the second mixer, which electronically disconnects the remainder of the IF amplifier in the event of a high amplitude incoming noise pulse, and the use of a pair of crystal controlled USB and LSB BFO's which, together with the very stable first VFO, give a very precise carrier injection frequency for suppressed carrier reception, and totally eliminate the annoyance of the gradual drift of voice pitch which inadvertently changes the incoming human voice into Mickey Mouse noises on less well designed instruments.

The final elegant touch in this circuit is a digital signal frequency display, which shows the whole of the tuned frequency, to 1 kHz accuracy, and gives an instant indication of the chosen band, and which can also be switched to operate as a standard digital clock when the receiver is not in use. Slightly to my regret this operates on a 0-12 a.m./p.m. basis, rather than the 0-23.59 time scale on which most British amateurs would log their calls.

Audio output is provided through a small built-in loudspeaker incorporated in the lid of the receiver box, fed by a single transistor pre-amp and an IC power amplifier. A standard phone jack is provided on the front panel, along with a 3mm. take-off jack for a tape recorder. Aerial, mains input plug, external 13.5 volt (car battery) and extension LS connections are provided on an angled panel at the rear. The angling of this panel is a thoughtful touch, typical of the conception of the receiver as a whole, and could well be copied — with advantage — by the manufacturers of Hi-Fi gear, to facilitate the changing of input connections.

**The Phase-Locked-Loop Frequency Synthesiser**

The operation of this part of the circuit is the thing which provides the crucial difference between this type of RX and the simpler designs which have gone before. As I mentioned above, fully synthesised, crystal derived VFO's have been available for some years in 'up-market', and expensive, communications receivers, but these have been rather out of the price range of the amateur. Receivers such as the R-1000 have become available as a result of a clever adaptation of this scheme, shown in the block diagram of Fig. 5. Unfortunately, even in a simplified form, this looks a very indigestible piece of circuitry, and needs a bit of background knowledge before it makes sense. I will try to explain.

The basic phase-locked-loop is of the general form shown in Fig. 6. This consists of a voltage controlled oscillator, whose output frequency is dependent upon the magnitude of some input DC control voltage. This control voltage is provided by a phase detector, some form of low-pass filter and an amplifier. The phase detector operates to give an instantaneous voltage output which is a function of the relative phase of the two input signals fed to it, and if these are dissimilar in frequency, this output voltage will vary from positive to negative and back again. What this means in practice is that the PID behaves as a frequency changer to give an output consisting of the input sum and difference frequencies. The sum frequency will always be present at the output, but if the input frequencies are identical the output voltage will be DC, either positive or negative, or, rarely, zero.
If the incoming frequency (f1) should momentarily coincide with the VCO frequency (f2), the resultant DC control voltage will cause the VCO to fall into frequency synchronism, and remain locked in frequency until the input frequency (f1) moves so far away that it is outside the frequency range possible to the VCO, due to limits on the swing of the control voltage. In this condition, the loop is said to be 'locked'.

The interesting possibility envisaged in the circuit of Fig. 6 is that if a frequency divider is interposed between the VCO and the input to the phase detector, the loop can be locked with the VCO running at some multiple of the input frequency. (This particular technique is employed in the MC1310 PLL stereo decoder, used in FM receivers, to generate a 76 kHz output signal from the 19 kHz pilot tone). A further possibility with a PLL of this type is that of the output of the VCO could be mixed with the output of some other oscillator, and the resultant sum or difference frequency selected by a suitable filter. This could make the VCO lock to the reference frequency plus or minus some other, variable, frequency and this is indeed the technique used in the Trio R-1000 to generate the synthesised oscillator output from a combination of crystal standards and a simple FET VFO.

Returning now to Fig. 5, one input frequency to the phase detector (IC8) is a 1 MHz square wave derived from the 10 MHz crystal oscillator (TR23, 24) by way of the frequency divider IC9. The other input to the PD is derived from one or other of the VCO's — depending on which has been switched into circuit — mixed with the signal from TR3 and then divided down by the 5-35 programmable divider built up from IC’s 4, 5, 6, and 7.

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**Fig. 4** Simplified schematic diagram of circuit of TR10 R1000

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**Fig. 5** Simplified circuit arrangement of Phase-locked loop frequency synthesiser
Since the operation of the phase-locked loop will be to try to force the voltage controlled oscillator to operate at a frequency which will allow both of those PD inputs to be 1 MHz — or, more strictly, will cause it to 'lock' at that frequency if its free running frequency is disturbed, for example, by an input control voltage switching transient — the output frequency of the VCO can be manipulated quite extensively. Since it is difficult to make the VCO operate satisfactorily over a very wide frequency range, the necessary 48-78 MHz span is divided between four largely identical units.

We can now consider, by way of an example, how the PLL circuit would operate if it was required that the receiver should be tuned to an input signal of 10 MHz. Since the first IF operates at 48.055 MHz, the necessary first oscillator frequency must be 58.055 MHz. If the other input to the mixer (IC3) is 42.055 MHz, the difference frequency will be 16 MHz, so that the division ratio of the loop divider must be 16 to give the required PD second input frequency of 1 MHz, which will hold the VCO in lock at the required frequency.

However, this 42.055 MHz signal fed to IC3 is itself the difference frequency between a 47.06 MHz crystal oscillator (used as the second mixer IO) and a 545.545 MHz tuned LC oscillator (the sum frequency is filtered out by F13) and is the result of an LC oscillator output of 5.545 MHz. If the LC oscillator tuned frequency is reduced to 4.545 MHz, the output of the mixer IC1 will increase to 43.055 MHz, which will force the frequency of the VCO (No. 2) to increase to 59.055 MHz, so that the Rx will now be tuned to 11 MHz. This means that the receiver may be tuned over a 1 MHz range by adjustment to the frequency of the VCO, and the only frequency drift in the system will be that due to this, so long as the outputs of the crystal oscillators remain stable in frequency.

An analogous calculation may be performed to discover the result of reducing the loop divider division ratio from +16 to +8, when it will be found that the VCO frequency will have been reduced from 58.055 MHz down to 30.055 MHz, giving an output frequency from mixer IC3 of 8 MHz and a receiver tuned frequency of 2.000 MHz. It can be seen from this that a total control of the first oscillator tuned frequency can be exercised by a suitable control over the division ratio (the MHz band switch on the front of the receiver) and the VFO frequency (the 0-1000 spread dial). Since in the Trio receiver, virtually all of the switching is performed by forward or reverse biased diodes, it is a simple matter to make the same ‘MHz’ control switch both the VCO, the division ratio, and the input signal bandpass filter, by merely channeling appropriate DC voltages to the various diode circuits.

In the second part of this article, I will look in rather greater detail at the actual circuit design of these several elements, and examine how the circuit design influences both the final performance and the necessary alignment procedures. It can be noted, as a matter of some curiosity, that the electrical circuit used in the Trio R-1000 is closely identical to that of the Yaesu FRG 7700 (with the sole exception of the internal configuration of the PLL units), that comments on either might well be assumed to apply to both. There are minor circuit differences between them, it is true, but to a first glance the major one seems to be that the Trio circuit is more neatly drawn!
smoothing circuit. Removing the lid and lifting the upper p.c.b. showed that pin 3 was the ground connexion and pin 5 the positive tag. No On/Off switch is incorporated.

Letters or figures are selected by a toggle switch adjacent to the Range push button. This latter selects letters only A-F, A-M, A-U or A-Z; figures only or all letters and figures by successive pushing of the button. The speech synthesiser tells you what you have selected. Group length is selected by another push button, giving options of one character, five characters, or fifty characters—ten groups of five—the choice being confirmed by a yellow LED. A further push of this button enables continuous morse to be sent.

The speed range provided is 2 to 20 w.p.m., in 2 w.p.m. increments. A toggle switch marked Low and High caters for 2 to 10 and 12 to 20 w.p.m. respectively. The actual speed selection is made with another push button marked Select Speed, the appropriate speed being confirmed by a red LED. At the 2:12 w.p.m. speed all the characters are sent at 12 w.p.m. with the space between each lengthened to achieve the overall lower speed. The two remaining controls are the Reset and Go/Stop push buttons.

The use of the MMS-1 is best illustrated by a couple of examples. First, the absolute beginner wishing to learn the sounds of individual letters. When switching on, the Morse Talker will announce the range it is on. Press the Range button until it tells you, "A to F," then the Select Length button to indicate "1." Switch the Select Speed toggle to "Low" and the associated button to, say, "4." To start the machine, push the Go/Stop button after which it will send random letters to A to F, one at a time in morse, followed by voice confirmation of each individual letter sent. This will go on indefinitely until the Go/Stop button is pushed again.

Second, the experienced operator who wants to practice receiving mixed figure and letter groups. Switch the Range toggle to "Figures" and the adjacent button until the voice says, "Zero to Zee." Press the Select Length button until it lights up the "50" LED. Switch the Select Speed toggle to "High" and the associated button until the "20 WPM" LED lights up. When the Go/Stop button is pushed, the Morse Talker will send ten groups of five characters at 20 w.p.m. taking about 35 to 40 seconds, followed by the voice reading out the message sent. This pattern will be repeated until the Go/Stop button is pushed.

The Morse Talker can be coupled to a tape recorder and for sending practice, a morse key plugged into the appropriate jack will enable the tone oscillator to be used. However in this mode, the speech synthesiser will not tell you what you have sent.

Conclusions

English users will have to get used to the synthesiser pronouncing the letter "Z" as "Zee," and it can be confused with "Vee." In the review model, the "Z" came out as "Tzee" and the "A to Z" range confirmation sounded like "A to Vee." The 2 to 12 w.p.m. LED did not function due to a diff component. No external control of loudspeaker volume is provided. The EPROM memory IC is plugged into a 24-pin DIL socket and a higher speed one can be purchased for speeds of 12 to 48 w.p.m. in 4 w.p.m. increments. The makers supply a new label for the front panel for this EPROM.

The MMS-1 is a fascinating product, ideally suited to someone wishing to learn morse on their own, by copying perfect keying. It would be a worthwhile purchase for a club running morse classes or for loaning to individual members. Microwave Modules Limited are to be congratulated on producing such an ingenious, British design.

N.A.S.F.

Since this review was written, the Company has brought out the Advanced Morse Trainer, model MMS-2 which now provides talkback of morse keyed into the unit by the user.
OVER the years we seem to have often commented on receivers, aerials, aerial tuners and so on, but apart from remarking that the operator is the critical part of the station, we don't seem to have discussed the arts and crafts of operating.

Operating itself can be broken down further still: on the one hand the art of extracting the signal from the receiver, using one's skill in 'driving' the rig; and on the other hand the logging and recording of the signal data for future use, whether that be for HPX or QSLing or whatever.

Looking at the business of driving the receiver, many of the old fashioned techniques are redundant with a modern receiver in the shack, because the problem (or the solution!) has been designed out. On the other hand, one is eternally amazed to find people listening in conditions of heavy QRM with AVC switched on, either CW or SSB. With an old-fashioned receiver like the HRO or AR88, one had to switch off the AVC before putting on the BFO, and indeed often the BFO 'on' and AVC 'off' functions were interconnected firmly by the use of a single toggle switch.

The technical reasons were two-fold. Firstly, the BFO would of itself act like a big signal and bias back the AVC and secondly, partly arising from this but for other reasons too, there was a tendency for the BFO injection to be cut back as far as possible, at the design stage. Almost all DX-ing was CW, with Phone operation through a rack of heterodyne whistles, and so AVC was little used on our bands — but receivers were almost always general coverage and AVC was assumed to be necessary for BC listening. Thus, you switched on the BFO, put the AVC off, turned down the RF Gain, and raised the AF Gain, after which you controlled the receiver gain by the use of the RF Gain control. Enter SSB, and a receiver designed like this was a pain-in-the-neck. Whence, the realisation that one needed adequate BFO, the Product Detector, and the invention of various AVC systems that would work well with the BFO on.

However, you can't completely design-out the QRM due to too many stations with not enough room. So — when taking CW on SSB under QRM conditions there is much to be said for cutting the AVC, insofar as the interference, static, ignition noise or whatever is probably controlling the AVC rather than the wanted signal. Even so, one must still consider the gain distribution within the receiver: if one is lucky enough to have RF Gain, IF Gain and AF Gain, then one would control entirely on the RF Gain until it 'runs out of steam', then turn to the IF Gain, and only lastly to the AF Gain.

Turning to the reception of CW Morse, the technique described was always used, but in the presence of an interfering signal close alongside, the BFO frequency could be adjusted; your man was centred down the IF, gains adjusted, and then the BFO turned to give a low pitch beat note. Why? Imagine two signals 100 Hz apart, and the receiver giving an 800 Hz audio out from the wanted signal. The QRM will thus be at 900 Hz (or 700 Hz if you prefer) and they will be hard to split. Turn the BFO down in pitch until yourchap is at 100 Hz, when the annoyed one either becomes 200 Hz or just a thump; in either case your wanted signal is seen by the brain as much further away from the QRM in pitch.

You are tuning the receiver to give your mind the best chance of separating that which the operator can't separate. The fixed BFO of today in such a situation limits the use of such a ploy.

What does it all mean in practice? Just this: it is always a good thing to have a simple receiver about the place, and to use it fairly regularly, just to be sure your brain can extract the most from the best receiver.


Letters

K. C. Duckworth lives at 7A Seven Acres, Wickford, Essex SS11 8JH. In his letter he says he has been given a Codar CR-70A receiver without any valves, which he wants to refurbish. Unfortunately, he has no data for the receiver at all, so if anyone could assist with a copy of the circuit, or even a valve line-up it would be of help in getting things sorted-out.

J. Doughty is now settled-in at the new home in Chesham, although as yet not much time has been available for SWL. One session resulted from the heavy snows of December: John couldn't get to work, so he switched on the receiver and instantly up came CR4AN for an all-time new one. Another new interest is in Top Band, where the receiver is picking up far more than was ever audible from the old place.

We turn next to J. Heffernan (Dublin) who is in need of the definition of a Prefix. A call-sign, such as, for instance G3SSW, is divided into two parts: the G3 is the prefix and indicates the country of origin, while SWM is the call-sign proper. Thus, while you may have heard several G3s, only one is claimable, but of course G3SSW is another claimable prefix, namely G3B. In a similar manner one GA3, one GM4, one GM8, one G13, one GI4 are all prefixes. In some countries, the number is a further indication of location, as in Australia or Italy. All of which leaves some 267 to be entered in the Ladder.

K. Cooke (Cardiff) comes up with a novel phony, in the form of "HN7HG" who was trying to work JAs but was rumbled as a phoney by an Italian station and told to get off the air — which he seems to have done. On a different tack, Kevin is doing a home-study course for the RAe which he is finding a little tough on his own; but some light relief and pleasure came in the form of the FAC certificate from JARL, for which the charge is now eight IRCs, or ten if airmail is required.

N. Jennings (Rye) wonders whether it is permissible to start again from scratch in the 1982 Ladder and run it alongside an entry in the All-Time. The answer to this has to be in the negative, simply because the Annual Table is intended to enable the new starters to compete with their peers; by the time 500 is reached it is reckoned that they know enough of the game to compete on level terms with the old-timers.

Next we come to Mrs. J. Charles (Colchester) who now has all the books for her attempts on the RAe, and says that with the help and encouragement of the BYLARA crowd and her own efforts she is determined to have her own call-sign in due course.

ANNUAL HPX LADDER
Starting date, January 1, 1981

<table>
<thead>
<tr>
<th>SWL</th>
<th>PREFIXES</th>
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<tr>
<td>P. J. Catterall (Chorley)</td>
<td>491 R. D. Newall (Bracknell)</td>
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<tr>
<td>D. McKenzie (Portadown)</td>
<td>392 R. K. Wooden (Staines)</td>
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<tr>
<td>G. Caste1n (Orpington)</td>
<td>378 N. T. P. Lewis (Staines)</td>
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<tr>
<td>J. Kirby (Cheltenham)</td>
<td>321 M. Evans (Llanbradach)</td>
</tr>
<tr>
<td>J. Heffernan (Dublin)</td>
<td>267 L. Ayres (Chalfont St. Giles)</td>
</tr>
</tbody>
</table>

This is the final listings for 1981. New Ladder starts January 1, 1982. 200 Prefixes to have been heard for a starting entry, heard since January 1, 1982. All score 500, transfer to the All-Time Table is automatic.
HPX RULES

(1) The object is to hear and log as many prefixes as possible; a prefix can only count once for any list, whatever band it is heard on.

(2) The /A and /AM suffixes create a new series; thus G3SWM, G3SWM/A and G3SWM/AM all count as prefixes, and where it is known to be legal, /AM also.

(3) Where a suffix determines a location the suffix shall be the deciding factor, thus W1ZZZ/W4 counts as W4. Where the suffix has no number attached, e.g. VE1AED/P SU, VE2U/P/SU, they are arbitrarily counted as SU1 and SU2 respectively, and the same holds good for similar call signs.

(4) When the prefix is changed both the old and the new may be counted; thus VQ4 and 5Z4 both count.

(5) The object is to hear prefixes not countries, thus there is no discrimination between say MP1-B and MP4K which count as one prefix.

(6) Only calls issued for Amateur Radio operation may be included. Undercover and pirate call signs will not be included, nor any MARS stations be claimed.

(7) Q2, Q3, Q4, etc., all count separately, as do GW2, GW3, GW4, etc., and in the same way K2, W2, WA2, all count separately even though they may be in the same street.

(8) Send your HPX list, in alphabetical and numerical order showing the total claimed score. With subsequent lists, it is sufficient to quote the last claimed score, the new list of prefixes, and the new total. Give your name and address on each sheet, and send to "SWL", SHORT WAVE MAGAZINE 31 High Street, Welwyn, Herts. AL6 9EQ, if possible to arrive before the SWL deadline for that particular month.

(9) Failure to report for two consecutive listings, i.e. four months, will result in deletion from the Table, although there is no objection to a "Nil" report to hold your place.

(10) Starting score 200. Phone Table is mixed AM/SSB, with a separate CW Table. No mixed Phone/CW Table, nor will AM-only or SSB-only entries be accepted.

(11) This will be based on those shown in the current "Radio Amateur Prefix-Country-Zone List", published by Geoff. Watts (see Advertiser's Index in any issue of SHORT WAVE MAGAZINE).

Our next stop is with J. M. Dunnet (Prestaigm) who cured his TV timebase hash mentioned last time by the simple expedient of changing the TV set to one of Continental origin, and by changing his aerial to a folded dipole for 14 MHz. Jim has discovered that a folded dipole fed with balanced feeder can be tuned on 7, 14, 21 and 28 MHz. Perhaps we should at this stage reiterate the comment that any arrangement of wire can be made to "work", provided only that one has a network which can produce the conjugate impedance to that which the aerial offers to the ATU, and this yields a situation where the aerial system is doing its best. Whether that "best" is good enough is of course a different question! Jim has also offered us an RTTY entry for the Table.

J. Hayes (Edmonton) wonders about QF1GNC/1, as this station was heard being called by a South African, and disappeared beneath the noise when his beam was turned towards ZS. We doubt if he is anything spectacular, and losing him as he turned the beam probably only indicates that there was a null to Edmonton when he was peaked in ZS.

Simply a list this time from G. W. Raven (London SE13) but we wonder that he asks for deletion of H1H0; that was just a double claim, or a more proper, on account of the H1H0N Navassa operation being disallowed by DXCC? Either reason is valid. Mrs. R. Smith (Stafford) has been away from the receiver while visiting son G8ERM in Dublin for Christmas, a nice warm holiday indeed. What a contrast to the English weather!

Now we turn to D. C. Casson (Earley) who questions K51—a valid one so far as we know and widely reported. Derek continues with his Morse and has now been allowed to put his hands to a key, but he fears that the pressure of work will prevent him from taking the test until March. We will keep fingers crossed for him.

D. McKinney (CO. Arranrig) has received his RAE pass, credits in both halves, passed the Morse, and become G4MXX—congratulations David. However, he still feels quite happy to be just a listener for at least part of the time—a view your old conductor would agree with.

An interesting question is asked by A. Blohm (Kielder Bridge) who was listening on Ten one Sunday afternoon, and was surprised to hear K2YBW working through a repeater to a JA0 and an OZ. The repeater id was WR2AID Setauket, NY, clearly copied, and the question is "How?" As the frequency was around 28.5 MHz, we suspect that K2YBW was listening to the local repeater while working into Europe; or, he may have been working through that repeater to another station who was patching him through a ten-metre rig. We doubt that there is any chance of it being a freak of propagation, especially as the signal from the repeater wouldn't be changed down to Ten by some spurious response or be carried across the Atlantic on 144 MHz. But, it is a bit startling to hear a two-metre repeater in the States pop up on Ten!

Obviously getting to be a keen constructor is J. Williams (Ramsey), the active aerial he mentioned last time is now built, but it appears to be more of an attenuator when switched on! However, fault-finding is now in progress, and there are a couple more projects on the way. By the look of the HPX entry, we suspect John has a home-computer in the shack as well and is keeping his scores in it.

Mrs. T. Purry (Blackpool) writes to say the RV has been got out of storage and is now working, so she hopes to make a few for the Table by next time.

B. F. Hughes (Worcester) was one of those who found his shack too cold for comfort and so found little time for listening. No hobby is worth getting cold for, we reckon, unless it involves strenuous activity.

R. Wooden (Stourbridge) has a final list for 1981, and wonders about 1982 entries. A new start is called for, but when the time comes when the 500 mark is in sight, any of the 1981 prefixes not appearing in the 1982 list can be added; and of course it doesn't matter how long you take for your 500. For the All-Time, any prefix heard since the re-start in 1946 counts, provided only that it was legal. We recall the remark in the March, 1946 issue that one of the things most needed in wireless is wire!

S. Foster (Lincoln) writes to say he is changing his job—we hope all goes well in the new one. For 1981, Stew totted up some 203 countries and 858 prefixes, not perhaps as high a score as in previous years but after all, one can be allowed to relax a bit after being an SWL for twenty years.

T. Kirby (Chesterham) is off the air for the moment while the roof is being repaired—that snow again? Tim is another who sounds to have a computer, as he refers to a program for keeping the HPX records.

E. W. Robinson (Burly St. Edmunds) sends in his 64th HPX list, and in the covering letter remarks sadly that the Phone operation on the new 10 MHz band during the first couple of days was a mess as bad as any he has seen on the band. We agree, and we hope they have all realised that CW and RTTY are the
HPX LADDER
(All Time Post War)

<table>
<thead>
<tr>
<th>SWL</th>
<th>Prefixes</th>
</tr>
</thead>
<tbody>
<tr>
<td>B. Hughes (Worcester)</td>
<td>2427</td>
</tr>
<tr>
<td>S. Foster (Lincoln)</td>
<td>2162</td>
</tr>
<tr>
<td>E. W. Robinson</td>
<td>1978</td>
</tr>
<tr>
<td>Mrs. R. Smith (Nuneaton)</td>
<td>1801</td>
</tr>
<tr>
<td>M. J. Quill (Worston-u-E)</td>
<td>1532</td>
</tr>
<tr>
<td>H. M. Graham (Chesham)</td>
<td>1435</td>
</tr>
<tr>
<td>J. Dunning (Shrewsbury)</td>
<td>1430</td>
</tr>
<tr>
<td>M. Cuckoo (Hepworth)</td>
<td>1398</td>
</tr>
<tr>
<td>G. W. Kennedy (London)SE3</td>
<td>1391</td>
</tr>
<tr>
<td>M. Rodgers (Harwood)</td>
<td>1351</td>
</tr>
<tr>
<td>N. Asker (Coventry)</td>
<td>1146</td>
</tr>
<tr>
<td>J. Doughty (Bolton)</td>
<td>1069</td>
</tr>
<tr>
<td>G. A. Davey (Bury St. Edmunds)</td>
<td>1044</td>
</tr>
<tr>
<td>D. C. Casson (Reading)</td>
<td>1036</td>
</tr>
<tr>
<td>J. F. Hobson (Ely)</td>
<td>1023</td>
</tr>
<tr>
<td>D. J. Williams (Wimbledon)</td>
<td>1023</td>
</tr>
<tr>
<td>L. Stockwell (Gray)</td>
<td>952</td>
</tr>
<tr>
<td>B. A. Payne (Leeds)</td>
<td>923</td>
</tr>
<tr>
<td>F. C. D. Barnes (Cardiff)</td>
<td>867</td>
</tr>
</tbody>
</table>
| M. N. W. Thornton    | J. Singleton | 790
| (Romford)            |              |
| (Skelmersdale)       | 704          |
| B. L. Henderson (Salisbury) | 687 |
| Mrs. T. Parry (Blackpool) | 662  |
| N. E. Jennings (Rye) | 658          |
| J. Hayes (Edenbridge)| 628          |
| J. Dunning (Prestatyn)| 627          |
| Mrs. J. Charles (Coventry)  | 589        |
| J. Cooke (Cardiff)   | 509          |
| P. Lincoln (Aldershot)| 507          |

Minimum Score for an Entry, 200 for CW or RTTY, 500 for Phone. Listings include only recent claims and are in accordance with HPX Rules. A "Nil" return is permissible in order to hold a place.

permissible 10 MHz modes.

J. Goodrick (Bognor Regis) wonders what TV timebase noise sounds like on the amateur bands — it is a rasping noise which appears every 16 kHz or so up the band. On a different tack John mentions hearing VK on 10 MHz on the first day and also hearing CH-ers using CW to work out.

H. M. Graham (Chesham) seems to have concentrated his listening mainly on 28 MHz. Maurice notes that the XEs are to be permitted alternative prefixes 6DS and 6JS as a commemoration of the fiftieth anniversary of the formation of the Mexican society. An all-time new one was Y11AS, and Maurice wonders whether he is genuine. At the time of writing there is no confirmation in the sense of a sight of a QSL, but all the indications are that the station is genuine enough. Marking back to the noise discussed last time around, Maurice seems to have tracked it down — an unoccupied house a couple of doors away which is still running the central heating as indicated by rotating windows steamed up at times. There is some confirmation of this in that the noise occurs less frequently as the outside temperature rises.

A new contributor is H. Bale (Cardiff) who has been an SWL for twenty years or more; having been made redundant, Harry finds his hobby a great help in passing the time. He has an FR-101D, Datong active filter, Sony 2001 and SX-2000N receivers Lowe UL-1000 ATU, a Moseley trap dipole and, for two metres, a Yagi beam at forty feet equipped with a rotator: plus a Sharp electronic tape processor which is used to switch the receiver on at a desired time even if Harry is not yet in the shack. Sounds a good set-up.

P. Lincoln (Aldershot) notes the new prefix for Zimbabwe, in the form of Z2/EJ heard, and also adds that he is equipped for SS/TV. As he remarks, SS/TV is rather vulnerable to QRM, and with another station on top of it in amount of filtering or returning will help. The problem, we suspect, is that often the interfering station doesn’t recognise a slow-scan signal for what it is and jumps to the conclusion that he is sitting on an intruder. This is a problem of recognition, and occurs also of course with RTTY, although the latter has been around long enough for most people to realise that RTTY is as likely amateur as an intruder. But, we have to agree, that’s not much consolation for a lost preture.

Our final contributor is L. Stockwell (Grays) who sends just a list to update his HPX, creeping even nearer to the magic 1000.

Nostalgia Corner

Having, it seems, whirled through our clip in short order this time, it might be of interest to readers of this piece to hark back to the first post-war volume of Short Wave Magazine. Your scribe’s piece in the March, 1946 issue was to do with a bench for the shack, and evoked the note that timber was available for domestic repairs to the value of £1 in any given month, more required a permit. In fact the bench in question cost some thirty shillings, giving a work-top of 6’ x 2’ 6” with two shelves above and one below.

In that same issue, we see A. A. Mawse offering several circuits for TRF receivers, although as far back as 1936 one could buy a superhet such as an HRQ if you could afford one. On 58 MHz which, with 28 MHz, was all that we had yet got back, the form was in many cases to use a super-regen, and there was some discussion of the disadvantages of having a beam(!). In that same issue we noted that Ally Pulley TV station was back on the air, sending a test signal only, on 45 MHz vision and 41.5 MHz sound, between 11.00 and noon, and 4.00 to 5.30 in the afternoon; and this was the only TV station in the country. On the aerials front, we note that it was felt that wartime radar experience would be going to influence design, and another note indicated the magnitude of losses likely to be incurred by the use of the popular twisted lampcord as feeder for a dipole. Polythene was a war-time thing and was not seen in our hobby until later in the year.

A complete current Prefix list showed such interesting things as YL for Latvia, G for England and the Channel Islands. China was XU and Tibet AC4, and the USSR had U, UE, and UK; all Ws were just that, with K being reserved for US territories while N and A weren’t for Stateside at all. There was a thing called the F-code used for reporting telephony quality, with F1 being unreadable F2 a perfect phone signal — and no self-respecting Phone operator rated the BBC as better than F8! Amateur licences started to be issued in January 1946, and from November 1945 there were stations to be heard from abroad — in such places as Saigon and Andaman Is. (the latter being represented by PRIVY at a seaplane base there).

And we are exhorted to realise that there will soon be 5000 amateurs in the U.K. and to consider the ways of dealing with the resulting QRM. Happy days!

Finale

Which is where we give you the deadline for next time, as March 18th, to arrive, addressed to your scribe, "SWL", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. Till then, keep on taking the tablets and hunting the Prefixes!

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Thanet Electronics

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AN RF NOISE-BRIDGE AND ITS USES

ANTENNAE MEASUREMENTS TO ENSURE ACCURATE MATCHING AND LOADING — READING OFF IMPEDANCE VALUES — FINDING AERIAL RESONANCE — BALUN EVALUATION — SWR READINGS

R. L. GLAISHER (G6LX)

This article first appeared in SHORT WAVE MAGAZINE for July, 1971, and is reprinted here as it is a contribution of lasting value — Editor.

The Radio-Frequency Bridge is a versatile measuring instrument that can be used to check, evaluate and adjust aerial systems, matching arrangements, transmission lines and other similar circuit elements. Operating on principles different from the reflectometer and fixed impedance SWR bridges, the RF measuring bridge will provide factual information about the resonant frequency, radiation resistance and other key parameters of an aerial and its associated electrical factors. In use it can be a great time saver as it eliminates much of the guesswork that is inherent in amateur aerial work. Although there are a number of professional RF impedance and reactance bridges, in general these instruments are much too expensive for amateur use. Additionally, they are not always suited to “active” type measurement techniques, where the bridge is used “on-line” to tune and adjust aerials in situ.

The Antennascope

The problem attracted the attention of Scherer, W2AEP, who felt that there was a need for a device that could be directly connected to the feedpoint of an aerial and show if the aerial was in tune and correctly matched to the feedline. Using a modified Wheatstone Bridge configuration driven by a grid dip meter, he developed a simple aerial test bridge, which was small enough to be used for “active” measurements. The circuit of the bridge, which W2AEP calls the “Antennascope”, is shown in Fig. 1. It will be seen that the bridge has an integral diode voltmeter to show when it is in balance.

Whilst the Antennascope is capable of most kinds of aerial measurements, it is not always an easy instrument to use, as the drive from the GDO has to be optimised at the frequency of interest. As the bridge and the null indicator are untuned, the bridge operating frequency is determined by the tuning of the GDO, and if the measurements are to be used the calibration has to be accurate to within 20kHz. For some kinds of measurement, it is necessary to adjust the bridge and GDO together (and perhaps also vary the coupling to keep the drive constant at different frequencies). Such a procedure seems to require more hands than an octopus has tentacles and can be highly frustrating, particularly when the bridge is being used to check a beam at the top of a tower and one hand is needed for self protection!

The Noise-Bridge

As will be seen from the block diagrams in Figs. 2(a) and 2(b), it is possible to use the bridge “other way round”, by driving it from an untuned signal source, and using a tuned null indicator to provide the frequency information. This kind of arrangement greatly simplifies matters as it removes all the problems associated with the use of the GDO. As a normal receiver can be used as a null detector, there is no limitation about the location of the bridge in relation to the detector, as they can be coupled together via any length of coaxial cable as required.

The writer first heard of the “noise bridge” during a discussion with the late Jack Ruddock, G8TS. After using a simple bridge driven by a GDO, he had replaced the bridge indicator with a transistor TRF receiver and had fitted a thermionic noise diode in place of the GDO. Although the system worked very well, it was cumbersome as three sets of batteries were required for the noise valve and receiver.

Quite independently of the ideas of G8TS, several versions of the noise-bridge have been described by workers in the U.S.A. These have all used a semi-conductor diode operating in an unstable mode to generate a wideband source of “white noise”. The drive is amplified and applied to the bridge via a special toroidal transformer having a flat response combined with unbalance-to-balance coupling over a wide frequency range. Most home-built versions of the noise-driven unit use a conventional bridge circuit with either a variable resistance or condenser in the measuring arm of the bridge. A typical bridge of this type was developed by WB2EGZ and described in Ham Radio for December 1970. As will be seen from Fig. 3, a zener diode is used to drive two untuned transistor noise-amplifiers which are coupled through a wideband balun to the bridge circuit. The null detector used with the bridge is a standard communications receiver that will tune the frequencies required.
The "Omega-T" Noise Bridge

A further development of the noise bridge technique was used in a commercially made bridge manufactured by the Omega-T Systems Corporation of Richardson, Texas, and available from Radio Shack Ltd., in the early seventies. This uses a carefully balanced quadrilateral-wound balun to combine the functions of the coupling transformer with the bridge itself (Fig. 4).

In operation, the bridge is connected to the receiver (null-detector) through coax. It is not necessary to prebalance the bridge, as is required with the Antennascope. The load (aerial or component under test) is connected to the bridge and the impedance dial set to mid-scale (50 ohms). The receiver is then tuned over the frequency range for which the aerial is designed. Looking for a null or a peak in the noise output, once this is found, the impedance dial is adjusted until the deepest null is obtained. By very minor retuning of the receiver and a further slight readjustment of the impedance dial, a complete null is possible. This corresponds to the bridge being in balance, and the resonant frequency and the radiation resistance of the aerial can be read off directly by reference to the receiver tuning dial and the impedance setting of the bridge. At the point-of-balance, the bridge has a high resolution factor (0.5 ohm or less), and will give better than 30 dB of discrimination. As will be appreciated, this gives a very sharp null, and a very small movement of the impedance dial at, or near, the point of balance will result in a large change of noise output.

In common with the Antennascope and other simple RF bridges, the noise-bridge will not measure reactance, nor show if any reactance present is positive or negative. Although at first sight this may appear to be a limitation, it is not as serious as it sounds, as for normal amateur aerial work reactance measurements are more likely to confuse, rather than help. If a large amount of reactance is present, it may be difficult, or impossible, to get a complete null on the noise-bridge (or Antennascope), and this kind of indication is usually sufficient to enable the necessary remedial steps to be taken to cancel, or reduce, the reactive component by the use of stubs or other similar devices.

The output from the noise generator and amplifiers in the Omega-T unit is more than sufficient over the whole of the operational frequency range fully to mask any unwanted signals being picked up on the receiver. This ensures that there is little chance of false indications, even if a local amateur happens to park on the test frequency.

The Omega-T unit has a measuring range from zero to 100 ohms, which is less than that of the Antennascope. As it stands, the range is adequate for use with 50 and 70 ohm coaxial and balanced feedlines. Later in this article, it will be shown how a quarter-wave line can be used in conjunction with the bridge to extend the measuring range to much higher impedances.

Practical Applications

The noise bridge can be used for a wide range of "active" and "passive" measurements and tests. Although the bridge is balanced with respect to the load connections, it can be used isolated from earth without modification to measure balanced loads.

The use of the bridge for general aerial work is made more convenient if a few simple accessories are provided. The first, the crocodile clips, is a short length of coaxial cable fitted with crocodile clips at one end and a coaxial plug at the other. The croc. clips should be of good quality with strong springs, as they may have to support the whole bridge while hanging at the feedpoint of an aerial in the air.

It is also helpful if a set of cables be made up to certain specific electrical lengths. For example, it is sometimes easier to keep the bridge on the ground when measuring a dipole or similar wire aerial which cannot be reached. This requires a feedline of exactly a half-wave (or multiple thereof) between the aerial and the bridge. A line of an electrical quarter-wave in length is also needed for certain kinds of measurements.

For example, if a 1/4-wave line is required for a 100MHz aerial, the length of the line is 6.25 ft.

**Table of Values**

<table>
<thead>
<tr>
<th>C1</th>
<th>0.001 µF</th>
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<tbody>
<tr>
<td>C2, C4</td>
<td>370 pF</td>
</tr>
<tr>
<td>C3</td>
<td>390 pF</td>
</tr>
<tr>
<td>C5</td>
<td>10 pF, 5%</td>
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<td>C6</td>
<td>3.3 mF, trimmer</td>
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<tr>
<td>R1</td>
<td>2.2K potentiometer</td>
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<td>R2</td>
<td>33K</td>
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<td>R3</td>
<td>470R</td>
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<td>R4</td>
<td>47R</td>
</tr>
<tr>
<td>R5</td>
<td>390R</td>
</tr>
<tr>
<td>R6</td>
<td>100R pot.</td>
</tr>
</tbody>
</table>

**Notes:** All resistors rated 1/2-watt. R6 to be best quality non-inductive carbon. R7, R8, high stability 1% carbon. C5 is 5% silver-mica and C6 can be Philips-type trimmer condenser.
Quarter-Wave Lines: A line of this electrical length will always reflect to its input terminals a geometric inversion based upon the line impedance, of what is connected across its output terminals. Thus if one end of the line is short-circuited, the other end will be a virtual open-circuit, and vice versa. It is this characteristic that can be used to check and adjust the length of quarter-wave line sections with the noise bridge.

The line is cut slightly over the electrical length (taking account of the velocity factor if known), and connected to the load socket of the bridge (Fig. 5a). The bridge is switched on and the impedance dial set to minimum resistance (zero ohms). The receiver is connected via a length of coaxial line (any length) to the bridge, and tuned to the frequency required. If the line is exactly an electrical quarter-wave at the test frequency (most unlikely), a null will be indicated by a substantial reduction of receiver noise. If this happens, then the bridge is in balance and no further work need be done. A failure to obtain a null at the test frequency shows that the line is of the wrong electrical length, and the receiver should be tuned until a null is found. If (as most likely) the null is at a lower frequency, the line is too long, and it can be progressively shortened (a few inches at a time), until the null corresponds with the desired operating frequency. If the null is found to be higher than the required frequency, the line has been cut too short, and it is necessary to start again.

On occasion it may be necessary to measure impedances that are above the range of the bridge. A quarter-wave length of the line is a convenient method of transforming this higher impedance to a more usable value. The characteristic impedance of the required matching section (linear transformer), can be calculated from the formulae: \( Z_l = \sqrt{Z_i \times Z_0} \) (where \( Z_l \) = line impedance, \( Z_i \) = input impedance and \( Z_0 \) = output impedance). Thus, to measure a load of 2000 ohms, a quarter-wave line of 300 ohms will transform this down to 45 ohms, which is within the range of the bridge (Fig. 5b).

It is possible to check the characteristic impedance of a quarter-wave line by using the bridge. To do this, a non-inductive terminating resistance is connected across the open end of the line, and the receiver is set on frequency. The impedance dial on the bridge is adjusted until a null is detected on the receiver. By using the previous formulae, it is possible to calculate the impedance of the line. For example, if the terminating resistance is 500 ohms and the bridge nulls at 50 ohms, the line has a characteristic impedance of 500 ohms. \((\sqrt{50} \times 500 = 500)\).

Half-Wave Lines: As a line of this electrical length (or a multiple thereof), will reflect its own terminating impedance, the length of the line can be checked in more or less the same way as for the quarter-wave line. To do this, the line is terminated by a short circuit — thus, when the length is correct, the receiver will show a null at the desired frequency, with the bridge impedance set at zero ohms (Fig. 5c).

Both the quarter and half-wave lines are used as coupling or matching sections for some of the aerial tests described below.

Low-impedance Centre-fed Aerials: If the centre of the aerial can be reached (e.g. a beam mounted on a tower which can be climbed, etc.), the bridge can be connected directly at the feedpoint in place of the transmission line (Fig. 6a). The receiver is set roughly on frequency and the impedance dial on the bridge
adjusted for a null in received noise. If the null is incomplete, the receiver tuning and impedance settings are altered until a full and deep null is obtained. The resonant frequency and radiation resistance can then be read off the dial settings. If the aerial parameters are incorrect the bridge can be left in circuit, and the lengths and matching arrangements optimised as required. An aerial of the trap multi-band type will provide separate nulls for each of the separate resonant frequencies.

It is often more convenient to keep the bridge on the ground and measure the aerial at its normal operating height. In such cases the bridge can be connected to the aerial through a feedline (of any impedance) cut to an exact electrical half-wave, or a multiple of a half-wave, using the procedure previously described (Fig. 6b).

It should be noted that some spurious nulls may be obtained when the bridge is being used to measure the parameters of the driven element of a Yagi or Cubical-Quad beam. These unwanted responses occur at the resonant frequency of the reflector (and director) and will be about 4–6% lower (or higher) in freqency than the driven element null.

Long-Wire Aerials: If the aerial is a resonant length (so many half-waves), the bridge can be connected at any point of maximum current, and measurements made in the same way as the low-impedance centre-fed aerials already described (Fig. 7a). If the aerial is centre-fed with tuned open-wire line, it is necessary to connect the bridge to the feedpoint via a matching section which will step-down the centre impedance to within the measuring range of the bridge (Fig 7b). The same arrangement is used to check other types of aerial that are fed at high impedance, or with tuned open-wire lines.

Very Low Impedance Aerials: The radiation resistance of shorted and loaded aerials (e.g., mobile whips) may be less than 10 ohms. It is sometimes difficult to obtain a satisfactory null at these low impedances and it can be advantageous to make the measurement at a higher impedance setting of the bridge. This can be done by "building-out" the load with a series resistance (Fig. 8). For example, if a 47-ohm resistor is used and the bridge reads 55 ohms at the null point, the actual load impedance is 8 ohms.

Baluns and Aerial Tuning Units: The input impedance, transformation ratio and frequency response of wide-band baluns can be checked by terminating the output connection of the balun with a non-inductive impedance (70 or 300 ohms as applicable), and measuring the input impedance over the frequency range required. Single-band bridge baluns, aerial tuning units and low/high pass filters may be measured in exactly the same way. Provided that the receiver (null detector) will tune to the TV frequencies, the noise-bridge is a very convenient tool to optimise the rejection frequencies of filters, stubs and other devices used for TVI applications.

Vertical Aerials: The characteristics of a vertical aerial or ground-plane can be checked by connecting the bridge between the base of the aerial and the earth system (or the radials). Short verticals as used for mobile operation, are usually very low impedance and the lead may have to be built-out with a series resistance before a satisfactory null can be obtained.

Measurement of SWR: Single instruments such as the noise-bridge do not have the capability of separating the resistive and reactive components that are present on a mismatched feedline. Provided the aerial is fed by a half-wave line (or multiple of a half-wave), the SWR on a line can be accurately calculated by measuring the impedance at the transmitter end of the line. For example, if the aerial is fed with 50-ohm cable and the measured impedance is 70 ohms, the SWR will be

\[ \text{SWR} = 70 : 50 = 1.4:1. \]

The same arrangement can be used if the measured impedance is lower than that of the feed-line. Thus if the bridge shows the null to be at 20 ohms,

\[ \text{SWR} = \frac{50}{20} = 2.5 : 1. \]

Other Uses

Whilst the noise-bridge is essentially an aerial instrument, it can be used for many other measurements of impedance at radio frequencies. It is a convenient means of determining the optimum input matching for receivers and converters (Fig. 9). It will measure series resonant circuits (within the 0 to 100 ohm range) and perform a number of other useful functions such as adjustment of pi networks, inter-stage couplings and many other tests that are not possible with other types of amateur test gear.
THE "WELLS" POWER METER
AN ORIGINAL METHOD OF MEASURING P.E.P. WITHOUT USING AN OSCILLOSCOPE
IAN KEYSER, G3ROO

LIKE the "Tunbridge" transceiver (Short Wave Magazine, Nov., Dec. 1981) the idea of the power meter was conceived when the West Kent A.R.S. asked me to give a talk on power measurement on CW and SSB. Measurement of CW power has been covered many times, but the problems associated with the measurement of SSB power have been sadly neglected.

The problem has always been to measure the peak voltage on speech peaks, and up to the present it has been necessary to use an oscilloscope to look at the RF waveform. However, it would be just as valid to measure the resultant waveform after detection, which would mean an instrument that was only required to work at audio frequencies. This considerably reduces the problem in designing the instrument; however, if a CRT is used the difficulty of high voltage supplies still exists.

The obvious solution was to use LED's to do the indicating, and a quick experiment with a pulse generator and LED's showed that a pulse of less than 0.1 ms gave a visible output. All that was required now was a system of lighting the LED's when a specific voltage was reached. Of course there are many devices now on the market that do just this, the 'line of light' drivers, but these suffer from the disadvantage that they either have linear scales, or log scales in 3dB steps. Neither of these scales is suitable for the purpose in hand, as a scale is required which is linear in 'power'.

This meant that a system had to be produced that could be programmed to the individual's requirements.

Method

The principle behind the 'line of light' system is that when the non-inverting input of an op-amp. becomes more positive than the inverting input, the output will go positive. If the inverting input is set at a pre-determined level, as the voltage in the non-inverting level passes the reference level the output goes high which can be used to light the LED. As the voltage decreases again and once more passes the reference level, the output will go low and the LED will extinguish. This can be seen in Fig. 1.

Here, three IC's are shown with an ascending voltage on each one and the inverting inputs all joined together: in this case IC1 output will go positive when the input voltage passes 0.5 volts, IC2 output will go positive as 0.7 volts is reached, and IC3 output will go positive as an input of one volt is reached.

Fig 1

The values of the resistors chosen for the reference voltage chain were such that the LED's lit up in the power sequence of: 0.5, 1.0, 2.5, 4.5, 7.5 and 10 watts. The values could, however, be recalculated to suit individual requirements. A more accurate unit could be made by using a longer string of LED's and drivers, and having the indication in steps of 0.1 watts; or to the other extreme, in 10-watt steps to the maximum legal limit.

The home-made dummy load used consisted of eighteen 220-ohm resistors in a series-parallel arrangement, immersed in a mustard tin of light oil. This dummy load has handled in excess of 100 watts at times, with only a slight rise in temperature. However, if one of these is made it is strongly advised that it is placed inside a second, much larger, container in case the boiling point of the oil is reached causing a violent rupture of the tin. Boiling oil is very dangerous and highly flammable, and one must be constantly aware of the danger.

In the rare case when one has an SWR of 1:1 (see Fig. 3) on the aerial feeder it is possible to connect the voltage divider of the detector circuit across the line and measure the power output to the aerial, though this reading rapidly becomes inaccurate as the SWR deviates from the ideal; however it is still useful as an indication of the voltage on the line.

Fig 2

When this was first tried it was discovered that there was a problem: although the LED would respond to 0.1 millisecond pulses, in practice this little 'flash' of light was easily missed. At first the solution seemed to be just to 'stretch' the pulse to give a brighter light, but this caused concern as the inclusion of a monostable on each output would add considerably to the cost of the unit. After a good deal of thought, the simple circuit of Fig. 2 was devised and the problem overcome. When the output of the IC goes positive, CR1 conducts, rapidly charging C1; when the output returns to zero volts the diode prevents the discharge of C1 through the IC, so it discharges through the resistor R1 and the base circuit of the transistor thereby turning on the transistor and lighting the LED. The LED will remain lit until the capacitor is discharged. The effect of this simple little circuit on the brilliance of the LED's is considerable and can easily be demonstrated by the temporary disconnection of the capacitor: the LED will now only light when the pulse is present.

Fig 3

The home-made dummy load used consisted of eighteen 220-ohm resistors in a series-parallel arrangement, immersed in a mustard tin of light oil. This dummy load has handled in excess of 100 watts at times, with only a slight rise in temperature. However, if one of these is made it is strongly advised that it is placed inside a second, much larger, container in case the boiling point of the oil is reached causing a violent rupture of the tin. Boiling oil is very dangerous and highly flammable, and one must be constantly aware of the danger.

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The Circuit

A sample of the RF voltage (Fig. 5) developed across the dummy load is taken by R1 and R2, detected by D1, and filtered by C1, R3 and C2. The resultant audio voltage follows very closely the waveform of the RF voltage across the load; this is passed to the non-inverting inputs of all the op-amps, in the meter circuit. The reference voltages for the inverting inputs are derived from the divider chain formed by R4 to R11; the preset RV1 is used to set the level of the voltages for calibration purposes.

The action of the ‘pulse stretcher’ circuitry has been covered earlier, only being necessary to add that the LED’s, D10 to D17, are arranged in a straight line through the front panel. These are rectangular-shaped devices and form a display 40mm. long.

Table of Values

<table>
<thead>
<tr>
<th>Power (W)</th>
<th>Voltage across 5% R A (peak)</th>
<th>Ratio of Voltage on Resistor chain</th>
<th>% Error</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.5W</td>
<td>7-0</td>
<td>7-0</td>
<td>0</td>
</tr>
<tr>
<td>1W</td>
<td>10-0</td>
<td>9-68</td>
<td>-3-2</td>
</tr>
<tr>
<td>2W</td>
<td>14-14</td>
<td>14-59</td>
<td>+3-2</td>
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<tr>
<td>3W</td>
<td>17-32</td>
<td>17-27</td>
<td>-0-3</td>
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<tr>
<td>4W</td>
<td>20-0</td>
<td>19-95</td>
<td>-0-25</td>
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<td>5W</td>
<td>22-36</td>
<td>22-19</td>
<td>-1-0</td>
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<tr>
<td>7.5W</td>
<td>27-38</td>
<td>27-1</td>
<td>-1-0</td>
</tr>
<tr>
<td>10W</td>
<td>31-62</td>
<td>31-27</td>
<td>-1-1</td>
</tr>
</tbody>
</table>

* Assuming resistors and op-amps perfect.

If 5% resistors are used, accuracy should be within 10%.

Setting-Up

This is very simple, all that is required is a variable voltage source and a meter. As the unit is DC coupled throughout, it is only necessary to apply a DC voltage which corresponds to the RF peak voltage (see Fig. 4) and set the preset until the LED which corresponds to that power just lights. Then change the voltage to another setting, and the LED’s should indicate the correct power.

If this is not the case, first check the voltage down the chain R4 to R11, these should be in the ratio:

0.7 : 0.968 : 1.459 : 1.727 : 1.995 : 2.219 : 2.71 : 3.12

The simple way to check this is to measure the voltage at the

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continued on p. 44
CLUBS ROUNDUP
By "Club Secretary"

As the pile of reports seems to get bigger each month, so it becomes necessary for clubs to be sure we get regular up-dating. Yours may be a club who make their programme as they go, but if you don't write, we don't know whether your club is dead or alive, or has moved Hq, or changed Hon. Sec., because the last chap (the one on our records) has moved to Timbuctoo — point taken?

The Mail

A pile of daunting size this month, so — here we go. Aeron, Brentford & Chiswick make their home in the Chiswick Town Hall, High Road, Chiswick; on March 16 G3WCY will be giving a demonstration of slow scan television.

Now we have A.R.M.S. who are a group devoted to all aspects of mobile operation, here and overseas. All the details from the Hon. Sec. — see Panel.

At the time of writing, the Aylesbury Vale group have just had their AGM, so no doubt an update will turn up soon. They foregather usually at Elmhurst Youth Centre, Fairfax Crescent, Aylesbury, on the last Tuesday of the month.

The Barking club are open four evenings a week, while the Basingstoke meeting is on Tuesdays at the Pelham Centre, Pelhams, Basingstoke. The Basingstoke meeting is on Thursdays and nights.

Barry College of Further Education are based at Weycock Cross annexe, next door to the Zoo, where they are to be found every Thursday. On a different tack, they have a Mobile Rally down for May 23, 1982 at Barry Memorial Hall.

Now B.A.R.T.G. and that means you are on RTTY (or thinking about it), either transmitting or SWL, with an old style machine or a super-modern all-electronic set-up. For the details, contact the Hon. Sec.; he is in the address panel in the body of this feature.

There is bound to be a good turn-out for the March Basingstoke meeting on 17th, as they are running a junk sale. They forgot to tell us where, but our card-index says Chineham House, Popey, Basingstoke.

At Bournemouth, the Hq is at Kinson Community Centre, Pelhams, Milham Road, Kinson, Bournemouth on the first and third Fridays; on March 5, G3MCP will be talking about repeaters.

The plan at Brighton seems to be to meet on alternate Wednesday evenings at 47 Cromwell Road, Hove, with a programme for most dates, albeit there is the odd Natter evening. Details from the Hon. Sec. — see Panel.

Next we have Bristol City RSGB group, where they have their booking at Queen's Building, Bristol University, on the last Monday of the month. They have a programme out to July, but seem to have a blank March. Possibly there will be some reference during the March session to the dates for the 1982 Longleat Rally for which they hope great things; in this their Jubilee Year. Details from the Hon. Sec. — see Panel.

There will be a demonstration of new equipment on March 2 for the Chelmsford group to enjoy, at Marconi College in Arbour Lane.

March 4 and 19 are the dates for the Cheltenham gang; the first date being the annual Construction Contest, and the last a Natter; and both are to be held at the Old Bakery, Chester Walk, Clarence Street.

We have a note from Cheshunt to notify us of a new Hon. Sec. — see Panel. As for the programme, on the 10th to Chesham's Whitehill Centre, on any Wednesday to find out!

The lad from Cheshunt believes in turning on the charm to get the best write up on his club. They are at Church Room, Church Lane, Wombourne, every Wednesday, and for March that means natter evenings on 3rd, 17th, and 31st: a talk on portable operation by G8LNM and G8COH on 10th, and a junk sale on March 21.

The Chichester newsletter shows March 1 and 15 for the bookings at the Spitfire Social Club at Tangmere, but no programme date. For this, contact the Hon. Sec. — see Panel for his vital statistics.

The Chiltern club newsletter contains a very interesting piece on the VHF National Entry last year, drawing some logical conclusions as to what, where and why things should be done before this year's entry. The basic idea was to look at points-per-contact overall, and on each band, including any not used, and then to look at the percentage the club were on each band down the list and overall. Arranging this data, the group decided that they needed a rig on 70 MHz and better reception: on 144 MHz as first priorities. To revert to "Clubs", the gang have March 31 down for an illustrated talk on his station by G3KLT; this is the at the John Hawkins' furniture works, Victoria Street, High Wycombe, off the main Oxford Road.

Every Friday evening the Chiftern types head for the New Cross Inn, between New Cross Road and Clifton Rise, London, in increasing numbers. Of these Fridays the March 19 date is set aside for G8DDW and a Video Evening.

Out into East Anglia now to Colchester; it is SS/TV on March 4, and on March 18 "Down at the Council Something Stirs" — we hope it's not dangerous! The venue is Colchester Institute, Sheepen Road, Colchester.

An annual treat for the Conwy Valley group is the visit of Dr. David Last; the Hon. Sec. says everyone is looking forward to this, on March 11, at Green Lawns Hotel, Hay View Road, Colwyn Bay.

The March meeting of Cornish boasts the title "Slide, Sound, Sink" and G4MSV will unravel the mystery at the SWEB Clubroom, Pool, Camborne.

Crawley have the second Wednesday in each month at Trinity United Reformed Church Hall, Ilfield, for a speaker or films, or whatever; and on the fourth Wednesday an informal is held at a member's home. Details — the Hon. Sec., at the address in the Panel.

Looking at the Cray Valley newsletter we find they are booked in on March 4 for a surplus sale and 18th for a natter evening, both being held at Christchurch Centre, High Street, Eltham.

The last of the 'Cs' most months is Crystal Palace and here we find they have the third Saturday evening booked at Emmanuel Church Hall, Barry Road, London SE22. Details for March aren't to hand, probably due to postal delays and the railway enquiry charge.

Up to Derby now, and their Hq is at 119 Green Lane, where they have the top floor. March 3 is a bring-and-buy, and 10th sees G3JZT talking about his recent trip to Malawi. G3YOW takes over on March 17, to talk about and demonstrate microphones. On March 24 they have their AGM, and they round off on March 31 with a talk by G8TUS on the history of aero engines.

New

We have a first note from Derweniside just formed, with their Hq at the R.A.F.A. Club in Sherburn Terrace, Consett. Co. Durham. They are to be found there on every Monday evening, and they would not only welcome visitors but also seek for contacts over the air. More details from the Hon. Sec. — see
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On the Hertford now, and the AGM falls between the time this is written and the time you get it to read, which of the club members for the meeting, the programme against March 5; on March 18 there is an informal matter evening. Both are down to be at the club Hq at the Civil Defence Hq, County Control, Gaol Street, Hertford.

The Hertford club wish to remind you to come and be found at the West Park Recreation Centre, Walton Street, Hill. Other details from the Hon. Sec. — see Panel.

At Ipswich you are required to search for a pub called "Rose and Crown," which lies on the A-150 Norwich Road at its junction with Bramford Road. Try the second and last Wednesdays for sure, and usually most other Wednesdays. They also have a very good newsletter, with technical articles, local chat and details of most of the clubs within range of Ipswich.

If you want to know what goes on in amateur radio in El-land, you should be in touch with T.I.T.N.S.: they have details of most of the local activity, the latest being new clubs in Comerara and Lisnaveen. As the Hon. Sec. has had to resign due to pressure of other work, the name and address in the Panel is but temporary until a new officer is appointed.

Things are changing a little in the Isle of Wight: they still forgetter at County Hall, Wooton Bridge, near the Sloop Inn, but are now putting up a programme of events, and have Tuesdays as operating nights while Fridays are chat nights.

Another group on the lively kick is at Lincoln; you find these chaps at the City Engineers Club, Central Depot, Waterside South, Lincoln, where they are on March 10 for "confessions of a Press Photographer" and on 24th for a session on self-testing and operating, the QRA Locator, Forward. Last, but not least, May 9 is down for the Hamfest at Lincolnshire Showground.

Midweek celebrate their 60th Anniversary this year, and G6NU, the founder, is still a very active member. For details of the club we must refer you to the Hon. Sec.

If you are in the region of Melton on the first Thursday in the month you should look out for the Royal Ship Hotel in Dolgellau, where you will receive a Welsh welcome; March 4 is a talk by Derek Whitehead.

A change of activity appears in the Melton Mowbray programme against March 19 — a first D/F Hunt, organised by G8RY. Start at 7.30, and the Hq is at the St. John Ambulance Hall, Asfordby Hill, Melton Mowbray.

Another mention of a Mobile Rally comes from Mid-Ulster, where they have one all set for May; details on this and the club from the Hon. Sec. — see Panel.

Now to Mid-Warwickshire where the programme is to assemble on the first and third Tuesdays at 61 Emscote Road, Warwick; unfortunately our programme data is for last month, so for the rest either pay a visit or contact the Hon. Sec. — address in the Panel.

At the Northwich club, the Hq is at Crone Community Centre, Telegraph Lane East, Northwich, March 3 is a talk by television, April 11 and 19th there is an informal and a Morse class. March 17 is down for Decca people to come and talk about radio navigation. Informal plus Morse covers March 24, and on 31st there is a Surplus Equipment Auction.

**Another New One**

This is North Wakefield, who have the base at Carr Gate Working Men's Club on Thursday evenings. During March we note on 11th a talk about wartime radio by G3JESP, and on 25th a talk on RHIF by G3HCW. In addition they have a "Pea and Pie Supper" on March 18. More details from the Hon. Sec.

Yet another new one is the Hunley-Cullam Repeater Group, and their GB8OC proposal will be a godsend to two-metre reception up there. For details, contact the Hon. Sec. — see Panel.

Right back down to the south-west now, to Plymouth where, apart from the Mobile Rally on May 30, at Tamar Secondary School, Plymouth Bridge, they have their regular sessions on March 1st for a session of "fun and false", to be followed on 15th by a talk on Aerials by G3VPL. Finally, March 29 is down for an Activity Night.

More mileage, this time, up to Pontefract where they have tape-recorder by G6JCJ on aerials, and radio aurora by G2FKZ down for March 4 (what a double bill that would be, especially live), while on March 18 they have a visit to Radio Aire, and on Sunday, March 14 they have a Component Fair at Pontefract Community Centre with talk-in on S2. The normal venue is at Carlton Community Centre, where the club has the top floor.

Next we have an important one, in R.A.I.B.C., who do so much to help and to bring in the invalid and blind folk who are interested in our hobby. If you know of someone who ought to be a member, do the needful — and in addition become a supporter or a representative yourself.

The Royal Navy group is a very popular one, with members all over the world; they have associates from the Merchant Navy and from overseas navies, too. Our Editor says they reckon it's money well spent — enough said!

At St. Helens they have a place booked at the Conservative Club, Boundary Road, St. Helens. Here they are to be found on March 4 for a surplus sale, 11th for a quiz, and social evening with the Liverpool club, 18th for a talk on HF mobile operating by G3YNJ; finally, on March 22 they have a visit from Amateur Radio Exchange, who will be talking and demonstrating.

Now to Silverthorn, gathering on Fridays at Friday Hill House, Simpsons Lane, Chingford. Nice and easy to get to, to mention! However, we don't have the latest programme: we suspect they were overcome by their success with the recent visit from the Scots Whisky people! For the rest, we have to refer you to the Hon. Sec. — see Panel.

Southampton will be on Wednesday evenings at the Toc H, Little Oak Road, Bassett, Southampton; they usually have a station on the air, but on March 10 they have G4BDQ on talk about aerials.

One of the busy clubs is at South Birmingham where the rooms are at West Heath Community Association, Hamstead House, Park Road, West Heath, are in use on the first Wednesday in the month for a talk; March 3 is not yet finalised at the time we write. There is a session every Thursday evening putting the HF gear on the air, and on Fridays it is the turn of the VHF types, the constructors, the CW learners, and the plain matterers.

**Deadlines for "Clubs" for the next three months**

- April issue — February 26th
- May issue — March 26th
- June issue — April 30th
- July issue — May 28th

Please be sure to note these dates!

**Date Change**

The formal meeting of the Midland group has now been changed to the third Thursday of each month instead of the last but one. The Hq is a place of their own, at 294A Broad Street, Birmingham, which faces the Repertory Theatre. Looking forward a little they remind us that the Drayton Manor Rally is at the usual place and on April 25.

Over to Mid-Sussex and Marie Place Centre, Lewlands Road, Burgess Hill. The routine is to get together on the first and third Thursdays according to our records, but is open to some doubt. A call to the Hon. Sec. for the latest should do the trick, at the address in the Panel.
The Southdown venue is the Chasely Home for Disabled Servicemen, Southciffe, Eastbourne, and they are booked in on the first Monday of the month. For the March details, we have to refer you to the Hon. Sec. — see Panel.

The Dover area is served by the club called South-East Kent YMCA and, not surprisingly they have an HQ at the YMCA in Leybarne Road, where you may find them on any Wednesday evening, while on Mondays there is an RAE and Morse class. March 3 is a matter, March 10 is a talk on communication computers by G4JOV. March 17th is a junk sale, March 24th a series of ten-minute talks, and on 31st they end the month with the Construction Contest.

Pressing on, we come next to Southgate, at St. Thomas Church Hall, Prince George Avenue, Oakwood, and their usual date of the second Thursday in the month. More details from the Hon. Sec. — see Panel.

Next come Stevenage and British Aerospace Plant 'B' (the locals probably still think of it as Hawker Siddeley Dynamics) on the first and third Thursdays of each month.

Stirlingshire have their coverage area centred on Falkirk, where they have a meeting on the first Tuesday in each month; all the details from the Hon. Sec. — see Panel.

The T.S. Terra Nova, HQ of the Surrey group, is at 34 The Waldrons, South Croydon, and the locals head there on the first and third Mondays of each month. March 1st is down for a surplus equipment sale, and on 14th there is a surplus books and magazines sale.

Although we haven't a report as such for Sutton & Cheam, we can tell you that they have their 34th Annual Dinner on March 27 at "The Woodstock" in Sutton. Tickets from L. Sandell, G8XHB, 19 Mount Park, Carshalton, Surrey, telephone 01-647 8399.

G4FZJ's first visit to Swansea, in fact, and here we find them 'at home' on the first and third Thursdays at the Lecture Room N. 4th Floor, Applied Sciences Building, Swansea University. They also mention their Rally on April 25, details of which can be obtained from the Hon. Sec.

Swindon go primarily in to give their Rally date of May 18, at Park School, Marlborough Road, Swindon. For more details of the club, try the Hon. Sec. — see Panel for his details.

The Thames Valley champs are all to be found at the Dittons Library Meeting Room, Waters Road, Thames Ditton on the first Tuesday of the month. For more gen, contact the Hon. Sec. — see Panel.

Turning to the Radio Club of Thanet, we find they are based on Birchington Village Centre, where they assemble on alternate Friday evenings. March 12, we are told, is a Construction Evening.

Off to the west now, and Torbay. The locals here have a weekly meeting on Friday evenings, and in addition a 'proper' one on the last Saturday evening of every month. For all these, the place to home on is Bath Lune, at the rear of 94 Belgrave Road, Torquay.

Not so long ago, Vernon moved the HQ for their main meetings to Charles Morris Memorial Hall, Tyttenhanger Green, Tyttenhanger, near St. Albans; and now we find the venue for the informals has changed 100, as the R.A.F.A. have a new place in New Kent Road, St. Albans, just behind the old R.A.F.A. building. For all the dates and details we refer you to the Hon. Sec. — see Panel.

On to Wakefield, and here, on March 4 they have a visit to Pennine Radio studios, followed on 23rd by the IBA film called "Tale of a Tower". The HQ is at Holmfield House, Denby Dale Road, Wakefield, where they have booked Room 2.

Having publicised the desire for a club in Watford a few months ago it is nice to hear that the seed grew into a good healthy group based on Christ Church, St. Albans Road, Watford, where they are in the Small Hall. It should be noted they now have the first and third Wednesday evenings each month. So, March 3 is an informal, and on March 17 G8NF will talk about the history of VTR.

Not so new is West Kent, where it would be an odd month when they were absent from the pile of reports. Their base is at the Adult Education Centre, Tunbridge Wells on the first and third Fridays of the month. At the time of their letter both were still to be finalised as to programme, so for that we refer you to the Hon. Sec. — see Panel.

The Wimbledon group are to be found at the St. John Ambulance Hall, Kingston Road, Wimbledon, on the second and last Fridays of each month. For the latest state of play, why not look them up?

Witral have the first and third Wednesdays booked in an Minto House School, Birkenhead Road, Hoylake. Thus March 4 will be a film night, and on 18th G3CSG will bring and demonstrate his new home-brew HF transmitter.

For various reasons the March meeting at Worcester was still open when they posted their letter to us. We can say that something will be happening, regardless, on the first Monday, at the "Old Pheasant", New Street, in Worcester. The 'April' meeting has been brought forward to March 29, for the Construction Contest. The club is now on a good upswing, and the HQ getting a bit crowded; so you may find them at the Oddfellows Club, some 100 yards away. If in any doubt, check with the Hon. Sec.

To Yeovil now, and Building 101 in Poundon Camp. March 4 is down to G3DSS to talk about receiver 'midfives'. Then, on March 11, there is a club 'propagation research project' to be talked about, and on 18th G3MYM and his direct-convertor receiver will be on show. Finally, March 25 is down for a matter.

Which leaves us only York details to mention; they are held up in the United Services Club, 61 Micklegate, York, where they are to be found on every Friday evening (except the third one of each month).

Finis

Deadlines to arrive are in the 'box', and all your contributions should be addressed to your scribe. SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. All the best for now!

Mobile Rallies — March/April 1982

March 14, Pontefract & District A.R.S. Components Fair at the Carleton Community Centre, Pontefract, from 11 a.m. talk-in on 2m (S22), on-site parking, licensed bar, refreshments, bring-and-buy. RSGB publications, emphasis on build-your-own. Details from G4AAQ, QTHR (0977-710711 or 0977-7910711). April 25, Swansea A.R.S. Mobile Rally, in the Patti Pavilion located 1 mile from Swansea City Centre on A4067 Swansea-Mumbles road, 10.30 a.m. to 5 p.m.; trade stands, bring-and-buy, bookstall, licensed bar, refreshments. S22 talk-in. Further details from Roger Williams, GW21SH. tel: Swansea 404422. April 25, Drayton Manor Mobile Rally (organised by Midland A.R.S. and Stockton-on-Trent A.R.S.), at Drayton Manor Park, Tamworth. Staffs. located on A449, well signed and with easy reach of M1, M5 and M6, from 11 a.m., talk-in on 2m and 70cm, trade stands, Raynet, refreshments, family attractions. Further details from N. Gutteridge, G8BHE, QTHR (021) 422 9787.

The Northern Amateur Radio Society Association will be holding its annual Exhibition at Belle Vue, Manchester on April 4. Full details appear in their display advertisement elsewhere in this issue.

More mobile rally dates will appear in the next and subsequent issues. If you have not yet notified us of your rally, now is the time to do it! Send the information to our Club Secretary, marking the envelope "Mobile Rally". And don't forget, we are always pleased to receive photographs of rally events for possible publication.
BASICS FOR THE S.W.L.
AND R.A.E. CANDIDATE,
PART IV

SUGAR-COATED THEORY

Inductance and Capacitance in Parallel

With the ideas of last time now well and truly bedded-in (hopefully!), we turn to the situation where we have a circuit of inductance and capacitance in parallel, as sketched out in Fig. 1.

Now consider an AC voltage impressed across this circuit—clearly the current in the capacitor and the current in the inductor are each 90 degrees out of phase with the applied voltage, one leading, one lagging the voltage, regardless of the frequency. We assume, of course, perfect: L and C. Thus the currents are in opposite phase to each other, and the current taken from the supply will be such that the supply will “see” the difference between the two currents. The proportions of these two currents will depend on the frequency, and the size of the inductor and the capacitor. \( X_L = 2\pi fL \) and \( X_C = 1/2\pi fC \).

Sweep the applied voltage up and down in frequency: the current in the inductor will fall with increase of frequency, and the current in the capacitor will rise with increase of frequency. Whatever values our inductor and our capacitor may have, there will be some frequency at which \( X_L \) and \( X_C \) are equal, and at that frequency the currents in inductor and capacitor are equal and in opposite phase. As far as the supply can tell, no current is flowing at all, but we can guess that the currents are still there and in fact flowing from coil to capacitor and back again. At this frequency, the circuit looks, to the supply, like an open-circuit. This situation is called parallel resonance.

Below the resonant frequency the generator sees the circuit as a capacitor, since the capacitive current more than cancels the inductor current; and above resonance the supply sees the circuit as an inductance by a similar argument. Turn now to Fig. 2.

L and C in Series

Here we have \( L \) and \( C \) in series. This time we will have a current, and the voltages will therefore be leading and lagging by 90 degrees. As we saw before, so, in a way, it is again; the voltages partly cancel each other as we sweep through the frequency range with the supply AC voltage. At some time in our sweep, we will find \( X_L = X_C \), and at this frequency the two voltages cancel, and the supply detects a short-circuit into which it is trying to supply enough current to “see” some voltage. Again, we observe, the frequency at which this occurs depends on the values of \( L \) and \( C \). This frequency is called series resonance.

Notice, any combination of \( L \) and \( C \) will display the resonance effect at some frequency, and that frequency will be found at the point where \( X_L = X_C \). Clearly this is a useful discovery—we may choose to diverge: a frequency from one circuit to another by application of the principle of parallel or series resonance. A useful property indeed!

Resonance

Perhaps a closer look at resonance is indicated and, in particular, at the vector diagrams associated with Figs. 1 and 2. A vector can be defined as a quantity having direction as well as magnitude, and is represented as a line whose length and direction are both significant properties.

Look at Fig. 1 for a moment. Let us arbitrarily decide that our “reference” will be a line travelling horizontally from left to right across the figure. Since we are looking at a parallel tuned circuit, the common factor regardless of frequency will be the voltage—there is current coming out of the supply terminals, it is going to split between the inductor and the capacitor anyway. So... we draw our vector of voltage \( V_L \) and make its length proportional to whatever voltage we have. Going back to our current, that in the capacitor is going to lead the voltage by 90° and so we can show it going vertically upwards from the origin. (Which means we've picked a convention to say that the vector leading is drawn anticlockwise to the one it leads by the angle of lead, and it has length in the same proportion to the current it portrays as the voltage vector does to the voltage.) Since the current in the inductor lags the reference voltage, by a similar argument to that above, we can deduce it should go downwards vertically from the origin and its length should be proportional as before to the amplitude.

Looking at Fig. 1 more carefully, in the light of what we have just learned, \( I_L \) and \( I_C \) are in anti-phase, and so to some degree they will cancel each other out; as we have drawn Fig. 1, we can deduce that, at the frequency we chose for measuring the bits for the vector diagram, the circuit looks to the supply voltage as a pure capacitor! If now we change the supply frequency such that \( L \) became larger than \( C \) we would have a network of the form of Fig. 1 but looking to the supply as a pure inductor. "Curiouser and curiouser", as Alice so rightly remarked. If we tune around a bit, we will be able to find the point of resonance, and if then we draw our vector diagram, we shall find that \( I_L \) and \( I_C \) are of equal amplitude. So at every portion of the cycle at this frequency \( I_L \) and \( I_C \) will cancel each other out, at least so far as the "outside world" can see; but we know there are currents that they can only be rushing from \( C \) to \( L \) and back. Looking at it from the supply point of view, it has put forth voltage, and no current flows, so the supply decides it is looking at an open circuit.

If we now turn to the series case at Fig. 2, we can say to ourselves that current is the reference this time, and so we draw the current vector horizontal and of length proportional to the current, whence rise (and fall) the voltage vectors as shown. Once again the network will look, as we vary the frequency, like pure inductance (how it is drawn in the figure) or like pure capacitance, depending on which voltage vector is biggest. Should both voltages be equal, again we will have resonance; to the supply, all the current it can dish out seems to result in no voltage so it decides it is seeing a short circuit.

Towards Practicality

Perspicacious readers will have noticed that so far all we have done is to explain the same two phenomena by the use of two different concepts—and we still don't seem to have come down to the reality of a practical circuit! Why? We have already agreed that we can't make a perfect component—in Part II of this series.
So perhaps we should think about a real tuned circuit, which will have resistance in the coil and the connecting wires, and less obviously some losses in the capacitor which are essentially resistive, varying with the type and dielectric material in the construction.

Considering the series circuit, it seems reasonable to assume that we can lump all the resistive elements together and draw L, C, and R all in series. No sweat there. However, the parallel tuned circuit doesn’t look quite so easy, as we can see by looking at Fig. 4. There is some resistance in the coil and some in the capacitor, so we need a transformation which will turn the practical circuit into the equivalent at Fig. 4(b), where the losses are considered as a single, relatively high, value of resistance shunted across a pure parallel tuned circuit; this is known as the ‘dynamic resistance’ of the tuned circuit, \( R_p \).

In general terms we can look at a coil, and give it a ‘goodness’ factor by comparing its resistance with its resistance at a given frequency, and calling the result ‘Q’ — for a coil, \( Q = 2\pi f L / R \). Likewise we can look at a capacitor and say its \( Q = 1/2\pi f CR \) — but in the practical case the capacitor \( Q \) is usually far higher than that of the coil. Anyway, the value of \( R \) we are going to use will be the value measured at frequency \( f \) (which won’t be the same as the value you can measure with a DC ohm-meter!)

Perhaps we should now stop worrying about LC circuits and explain why the resistance of a piece of wire rises as we increase the frequency applied. If we measure with DC (the DC bridge, the \( A/W \) on its ‘ohms’ range, or similar) the current flowing in our piece of wire flows equally through all the cross-section of the wire, just as one would expect; but as we start to use high-frequency AC to do the same measurement (an AC, RF Bridge), the current does not distribute itself evenly through the cross-section, but tends to concentrate on the outer part of the wire — the aptly named ‘skin effect’. This effect, at lowish frequencies, can be mitigated by the use of the special stranded wire having each strand insulated from each other and known as ‘Litz wire’.

(At HF, pre-War amateurs would use copper tubing for their PA tank coils, and at 144 and 432 MHz modern amateurs start to think in terms of silver-plating their coils; while at 1000 MHz and upward, gold plating of cavities is common, as in aircraft SSR transponders, all in the cause of keeping the resistance as low as possible at the design frequency and hence the Q high).

Measurement of ‘Q’ is done commercially by the use of a Q-meter, but it is a bit out of amateur territory. We just wind the best coil we can and if it’s too sharp in tuning, we stick a resistor across to ‘damp’ it down to the desired Q.

Reverting to Figs. 3 and 4 for the moment, look at the vector diagrams associated. We agreed that a vector had a length and direction defined. Since resistance shows alternating voltage and current in phase, the diagram must show this. At Fig. 3 we have series L, C and R, and there will be a small (we hope!) component of voltage in phase with the current; we show it exaggerated in the drawing. The resultant of \( V_L \) and \( V_R \) is obtained by completing the rectangle, and the diagonal is the result we would see if we had the gear to measure it; the voltage resultant, \( V_{AC} \), is no longer at 90°, and the degree to which it misses 90° is a measure of its fall from perfection. The same goes for a capacitor but to a lesser extent.

We must note, however, that the voltage and current vectors of resistance can be used all the same Ohms Law to give an indication of the resistance of the ‘short-circuit’. Turning to Fig. 4, our vector of current through the resistance and the vector of voltage give, through Ohms Law, the resistance of the ‘open-circuit’. Which is \( R_p \), our friend of a few paragraphs ago. If we look at a text-book, \( R_p \) is given as being equal to \( L/C \), where L and C are in henries and farads, and \( r \) is the ‘effective series resistance’; so assuming the coil is the source of all the losses, \( R_p = Q x 2\pi f L \). Obviously \( R_p \) is of great interest in our simple case at the resonant frequency of the network.

That’s it for this time! Next time we’ll try and explain to you why all this waffle about ‘tuned circuits’.

to be continued
Letters to the Editor
The views expressed here are not necessarily those of the Editor, nor should they be taken to represent any particular SHORT WAVE MAGAZINE policy.

Dear Sir — I would be more impressed by G8ADD’s comment on my letter if he showed some evidence of having read it properly. His comments about sarcasm are misplaced: I was actually serious.

The point is simple. Amateurs are licensed. This means they are permitted by lawful authority to do certain things which the general populace is not permitted to do. As lawful authorities permit this operation on the fulfillment of certain conditions, and retain the power to revoke the licence or to change its conditions at any time (wide clause 12) it follows that no talk of rights is of use.

The issue is not one of how many people use the Morse Code (and it is a far greater number than Mr. Carter imagines); it is not a matter of anyone “earning the status quo” (which I should have thought a contradiction in terms). It is simply a matter of a common piece of sloppy thinking — which I had hoped not to find among amateurs.

Indeed, the second letter from G8SUH and friends is vastly encouraging. I wish G8SUH success with his Morse Test and good fortune on 70MHz. That band has long been a problem, and subject to special regulations just because it is not a WARC allocation, and therefore entirely within the control of the Home Office. At one time was a restriction on the use of the band within 50 miles of Jodrell Bank, there is a power limitation of 50 watts, and a further special restriction in the licence. I agree that the Home Office is ungenerous about this band, but my guess is that the RSGB does not think that it is the most promising ground on which to fight. If I remember rightly, it was originally allocated only for the duration of the International Geophysical Year in 1958, and was 200 KHz wide, so really we are not doing that badly still to have it with a bit extra.

One final thought — would the CB lobby have been so successful had there not been the prospect of a big new opening for a pretty saturated market in consumer electronics? That kind of economic carrot does not exist to tempt the Home Office to open 70MHz to Class B licencees — and that is where any analogy with the CB experience must fail.

Rev. J. L. Marshall, G3HKH

Dear Sir — Please spare us from any further puerile emanations from G8ADD.

If he is such a good connoisseur of CW as he professes, why on earth doesn’t he take the plunge and take the test?

As for the DC bands, at least I can construct from my junk box a reliable 10-watt transmitter, and with a key and a piece of wire make enjoyable communication over thousands of miles! Can he better that with QRO gear and a multi-multi element beam?

The passing of the Morse test is no whimsy, but an international requirement. So, OM, whilst you are waiting for Mother Nature to stir up a few asteroids, here is one old dinosaur on the DC bands using his pump-handle to enjoy communication far and wide.

F. C. Richardson, G3MYX

Dear Sir — The Daily Mirror for 4th January ran an article on the problems of obscene language on CB radio, from which the following is an extract: “Teams of special investigators are swinging into action to stop obscene callers... the crude and foul-mouthed have become a problem... many of them believe they are safe from detection. Out to prove them wrong are the men from the Radio Interference Service of British Telecom, “and we will not hesitate over prosecuting these people” said a Home Office spokesman.”

If indeed the H.O. is taking such keen action over CB, why has the situation on the amateur bands been allowed to go on for so long? I refer to the continuing saga of the repeater jammers with their foul comments and noises, plus all their other rubbish, which I would have thought to be in direct contravention of regulations — but apparently without any action being taken against them. It would also seem that the authorities do not take any action even when offenders are known or reported.

Why should CB have special treatment? Amateurs also pay a fee so the amateur should be afforded the same service from the Home Office. What is the RSGB doing to press the Home Office for action?

While this problem lies mainly with repeaters, in some cases Simplex QSO’s leave a lot to be desired and with the influx of ex-CB operators the problem can only get worse if a good example is not set at the start.

M.R. Perry, G8AXX

Address your letters for this column to “A Word in Edgeways”, SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ.

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juncture of R11 and R4, and adjust R41 for a reading of 3.12 volts; then all the other voltages will follow down the chain.

If all is satisfactory here, the fault is almost certainly within the limiting resistors R12 to R27; these should be all new resistors of the same make and rating, so that they are at the same rate.

Conclusion

Not only has the unit been very useful in setting-up new transmitters, but also, when the detector divider circuit R1 and R2 is coupled across the feeders to the aerial, it gives an indication of transmission. It can even be used to see if the transmitter is being overloaded; firstly, ‘overlake’ the transmitter to see which is the highest LED illuminated, and then ensure that this LED is not lit up in use.

Components: All the components for the “Wells” can be purchased from Ambit International Ltd., 300 North Service Road, Brentwood, Essex; a suitable case can be supplied by H. L. Smith, 289 Edgeware Road, London. The whole prototype was built and boxed, using new components, for less than £10.

Correction

The un-labelled components in Fig. 2 of “Ben — The Little Transceiver for Ten”, Part I (January issue, p. 602) are R22 and C38. Also, C6 was omitted from the Table of Values on p. 602 and equals 220 pF.
"G9BF CALLING"

MANY years ago, S.W.M. featured series of pukka gen articles by G9BF. newcomers to CB and private mobile radio networks. Priced at £29.32 inc. VAT, full information is available from the manufacturers, Datong Electronics Ltd., Spencer Mills, Mill Lane, Bramley, Leeds LS15 3HE.

Daytona 4096
Selective call transceiver
made in U.K.

The latest Daytona product is "Codecall", and pictured here. It is a selective call device, allowing immediate access to over 4000 independent codes via three 16-way panel switches, adding selective calling facilities to any existing transmitter with no modifications required to the set. Each pocket-sized "Codecall" can both send and receive a specially coded audio signal. At the transmitter no direct connection is needed as the unit is placed close to the microphone and the signal acoustically coupled; thus any Tx can be used. At the receiver, "Codecall" plugs into the external speaker jack thereby silencing the receiver; when, and only when, the correct code is received the unit emits a loud "beep-beep" sound to alert the user. As well as its amateur radio applications, "Codecall" can be used with CB and private mobile radio networks. Priced at £29.32 inc. VAT, full information is available from the manufacturers, Datong Electronics Ltd., Spencer Mills, Mill Lane, Bramley, Leeds LS15 3HE.

"Short Wave Magazine" is the only periodical freely available from newsagents throughout the U.K. which is devoted exclusively to the pursuit and interests of Amateur Radio.
COMMUNICATION and DX NEWS

E. P. Essery, G3KFE

THE current rail strike seems to be exercising some effect on the mails, and so it is probably the case that the odd letter to us has not arrived; so — if your letter isn’t written in this month, that is the reason why.

Perhaps now we should turn to the matter in hand; our bands and the doings thereupon. As the nights shorten so the bands begin to stir from their winter hibernation. This sunspot cycle seems to have been quite flat-topped in nature so far, but it seems likely that we are going to see a fall away before the end of the year. So, let’s have fun while we can!

10 MHz

A nice band, this, with some 30 countries noted so far; but what it’ll look like with all the WS and JA’s using it is another matter; but best to meet that challenge when it happens. Those countries who do not have the band are on occasion to be noted operating cross-band to 14.070 MHz or thereabouts.

G3ROO (Church Whitleaf) has built a second ‘Tunbridge’ rig for this band, CW only, and has two watts of output to put into his 150-foot; this combination has made it to some 12 countries, including ZL4MD, VK2AVA and OY2J. The rig is now gone to G2ACG.

Next we have a fugitive from VHF bands in the form of G3FFK (Purley) himself, who loaded up the IC-730 into a half of a TA33 driven element by way of an LAR HF Omni-munch, the TA33 piece being mounted as a vertical at five feet up, and with radials for the 14/21/28 MHz band. Apart from the locals, Norman managed G6ABA, W6QL/BR1 and a rather shaky VK3JM — but the last one was made with most of the radiating part of the aerial buried in snow which can’t have helped. Heard but not worked included other VK/ZA, VP8ANT, 8P6KY and VK3AQOU.

G4GCB (Belper) runs an ‘S.C.D.’ to a trapped dipole of 160 feet length, and fed with Woolworth lighting flex, no ATU, and an AR88D on the receive side. The rig runs three watts input and so far has managed QSO’s with G3SES, DF5TV and F6GFL/M, all during the late afternoon.

Next comes G4KMK (West Wickham) who has an FT-7 when he is A, and an IC-720A at home; the latter is fed to 110 feet of wire sloping down from 15 feet to just four feet at the far end and used on all bands. The result was a collection of contacts with Gs, GM3JZK and OX1CS; the latter was lost under a pack of Gs. On the heard-only side, VK2ADA.

Our next contributor is G2HKU (Shepphey) who has recently had an operation to his right thumb; with the XYL also plastered-up after the mishap noted last time, they have now only two hands between them. Naturally, this has put a damper on activity, but Ted does mention CW QSO’s with VK3AUQ and G6ABA.

We must now return to the ‘Tunbridge’ rig of G3ROO’s, and G2ACG (Dover). Dick rates the little rig highly, and runs it into a QSKV aerial; he also notes what a fine band this is turning out to be, with some of his inter-G QSO’s lasting happily for an hour or more of ragchewing. He notes ZL2UW, LZ1JW, OESHM, H89JC, H89NL, G31IV, QY7ML, LA2JE, DJ3RK, F8RZ, LASW, GM1HBT, GJ3EML, OZ3LF, LA3KBA, OK2QX, DL4AT, DJ3YC, G3CS, G3KG, G3NSK, G3FE, G3QZ, H98BEU, and others. As Dick so rightly says, there are plenty of QSO’s to be had with QRP.

Top Band

G2HKU notes that his Top Band is cluttered from 1.800 to 1.815 MHz with assorted nav-aid devices which he thinks are unlikely to be audible inland; the latest appears to be Decca on 1.815 MHz. However, that does not stop the odd QSO; PA0PN on SSB, plus OK1DV, DJ2MM, UK2BBC, and DL1KX.

D. A. Whitaker (Harrogate) mentions that his brother G3IW, together with G4IWH and G3BBD went off to Scotland for their annual bash in the CW WW 160 contest; their effort was from south-west Scotland as /P. The band was none too lively on the first day to the U.S., but did pick up a bit on the second day. The group reckons the star turn was the QSO with VP8ANT, but they did book in KV4FZ, NW2A, UT5AB/ULF, 4X6UJ, E8B, EA9, and C3. David adds that his own researches into the band have not been very eventful; during the Phone Contest very few Ws were to be heard, and the best pickings were RD6DNE and RH8KAK for a couple of new countries on the band.

G4AKY (Harlow) has a superb QTH from a propagation standpoint, although he suffers as most of us do from the RF pollution in urban areas. His Top Band activities have shifted emphasis somewhat, with the early mornings before work now being used instead of the previous late-night effort. However, the list still contains 26 countries. Perhaps the star turn for him was 1ROU and 1ROONU, for the first time ever Italian Top Band operation, the permit was for the special (UNICEF) operation and for that particular weekend only (QSL to 10XJ). Of the rest, we must pick our best, to include UL7, UJ8B, UJ9, UA1AMM — the first time Dave has broken into UA0 which is a very difficult path — VE1AXT, VO3MEA, an assasment of WS from W1, W2, W3, W4, W5, W8, W9, O1ORJ, ZB2EO, 9H1HH, OY7NL, 4X4NJ, EA9EU, OH16NG, VP8ANT, NPM4, plus lots of QSO’s on CW, while SS in was used to EA2JG, and E25ET. KV4FZ and UA1DGC were in the gateway list, while ZS4CS, Z6DDO, 9L1SL, 4U2WT, and EL2FY were noted as being on Top Band but missed.

Finally on the subject of Top Band, G6KR (Hertford) waxes poetic on that somewhere daft slip-up in the December piece over clock and longitude minutes; but he adds that there is no doubt that to work DX on this band, attention to the aerial and earth does help a lot, both to obtain plenty of radiation but also to aim at RF in the desired direction.

Forty & Eighty

Lumped together this time to make way for the two bands already mentioned. G2JN (Peterborough) notes his CW QSO on Eighty with ONSLUM, while the latter was haring down Motorway E3 at 70 mph; another eighty-metre CW QSO of interest was with SM6JXV/MM aboard the tanker Taerman on not far out of Kiln on the way to Norrkoping, Sweden.

From Chelmsford, G4LDS says he listened to the early-40 metre net — GW4BLE and co. — working DX that Chris couldn’t even hear, which he takes as a clear indication that the LF aerial is too low. This in due course will be remedied by taking it up to a point just below the TA33, which lives atop a 60-foot tower.

Our next note is from G4GMZ (Congleton) who is still operating the paintpot rather than Mike or key, but there were the odd moments in the shack. Fortey had the usual clutter of European QRM, and G4GMZ notes that a QSO with G4TLZ at 1½ miles was marginal with 30 watts SSB. Turning to 3.5 MHz and QRP, CW raised G2CNN. GM3BHT near Glasgow.

G4KMK operated both from home and WA, where the ‘aerial’ in use was the central-heating system, used without an earth, matching by way of a Joymark and running between 5 and 7 watts from an FT-7. This set-up netted GUSMR, G1JFD, G4JSB, GJ3WY, G4MLQ, G-BYA, GW3NNE, all at around 1000z.
and lots of EUs in the evening. The common factor on both ends of each QSO was amazement at the quality of reports exchanged! Back home, the IC-720A and sloping wire were used in the late evening on 3.5 MHz to work YUJVQ, IA2FCA, GM4TVW, DIHAX, and 12RKE, while the 7 MHz lunch found YUJX1Y, DIJAM, and YCV2DL.

A long list of calls is noted by D. A. Whittaker with times. 7 MHz SSB signals were picked up from CE6COR, TG9AL, HG6CE, FKCR, H11H2, VK6TC, CN8BCO from 0700; an hour latter came CO1FR, V71ig, VK9NS, W6KGF/PZ1, ZL40YA, HC1INEA, 6D5ZSA, LUS2I, 6YS2D, P39EE, then an interruption for work, normal service being resumed at around 1700 with A22BW, D68AM, and VU2DPK. Then 1600z gave 6W8DY, Z21EY, Z21IL, EU2RAK, YBOWR, TR8DX, 12GCA/SN3, and CN8AM. At 1900, VK, SV, CN8, A7, EA, TSTI, UH8, and ZDIYHW; a break for the evening and back on from 2200, to hear DUBJF, HL1JY, 4J0U1N, FM77WS, ZP2CCG, COBRT. From 2300 we note VPSWJR, OY2J, UP6FJ, JX6BA, YG5AG, HP3FL, HK6OFB, and OZ7GI/SN9. Nighting found T12VVK and at 0300 there was ST5CJ. Turning now to Eighty, Dave noted M1V at 0200, and at 0500 there was CN8CO, TG9AL, and a couple of HXs. At 0600 V2AN, W6KGF/PZ1, T12FGR, T21V2R, and FM10GA. At 0700 6W8FAR, J6LMO, ST5CJ, and 6D5SOX; at 0800 there was 8R1RBF, FKCR, and SW1DJ. Now, we don't think any reasonably bright reader -- and you are all bright! -- will take long to pick up the point, which is simply that a change in operating time from evenings only is well worth trying.

**Points**

Quite a few this time and we must start with G4ICQ who writes to say he is getting a great wave of QSLs for a "ZC4KC" who calls himself Monty; he works lots of SSB contacts to U.S. around 21.292-21.392 MHz and gives G4ICQ as the QSL route. G4ICQ says he knows nothing at all of this station, so we appear to have a Phoney.

G3WUX and G3XGZ both contacted your scribe to say that they are going to be on. Points in the measles between June 8-22, signing GB2GOU on all bands 60-10 metres, operation being equal with five watts for around two hours each day.

G3DRE writes to advise that he has started a service named BRAAGIS, to assist blind radio-electronics enthusiasts with details of any "audio gimmicks" to enable them to pursue their interests; and of course to ask any experimenter to pass on any ideas they think may be useful in this connection. G3DRE will keep a central file, the circuits all being described by him in narrative point-to-point. Any blind person asking for help and forwarding a cassette will then be able to receive a recording of any data or information from the central file, or any possible source. Perhaps we could start by mentioning that G3WUX in the previous paragraph is a blind operator who makes most of his own test gear and tune-up aids. G3DRE is not in any way wishing to pre-empt the efforts of the existing organisations to help the disabled, but adds his idea on top, at his own expense and personal contribution to the Year of the Disabled. He is at 69 Prospect Road, Bradway, Sheffield S17 4JU, telephone 0742 369119.

G3MOXX sends a quick note to enclose the details of the EUCW Fraternising QSO Party, this year being run by the G-QRP Club. The dates are 19-20 June, and all the details can be obtained from GM3OXX — QT1R. Logs to George Burt, GM3OXX, 1/5 Essendene Terrace, Clemiston, Edinburgh, EH4 7HD, to reach him by July 30. There is an SVL section to this Party as well.

Now a cry for help! ZL2ARR was once G3YQV and in fact started as an SVL with a one-valver from Rushden, Northants. Tom lived in Prospect Avenue, and he used to hear a chap, believed about 14-mile away, who used 40m and AM from a site on the Whellingborough edge of the home and QTH; later there was a personal QSO. Seven years later still he QSO’d with a chap on the other side of Rushden, in 1966, but both calls were lost. Tom would dearly like to hear a bit of either of these, or even from any other station in Rushden, on either CW or SSB. He can be contacted, as follows: T. House, ZL2ARR, 14 Kenwyn Terrace, Newtown, Wellington, New Zealand. And, we’d be interested to know how this works out.

We have a letter from the International Amateur Radio Society Inc., PO Box 9990, Glendale, California, USA, regarding the revival of the late K66X’s Certificate Hunters Club. Scott Douglas, K7BSB, is now running the revival, but with, he says, a change of values to bring it more into line with today’s ideas. The Directory of Certificates and Awards is available from the same address. K7BSB says he would like to hear from all those who were involved in the earlier C-3C, FHC and other divisions.

The Medway club write to advise they are celebrating their Diamond Jubilee, and that an Award will be available for HF and VHF. Seems they have an HF station signing GB2MDJ operational February 21-March 20 and two other periods still to be notified. Between February 21 and November 28, you have to pile up 60 points, with a Medway club member counting for 8 points and a QSO with the GB2MDJ up to worth 12 points. There is also a VHF version of the Award. We suggest that you get in and work ‘em, while you await a reply from GH1H4U who is the Award Manager — he is QT1HR — with all the details on both Awards. A pity we didn’t get enough warning to mention this last month.

Now the thermo-American Contest; this is down for the last full weekend in May each year for working the following countries: CE, CO, CP, CR, CT, C9, CI, DU, EA, HC, H1, HX, HK, HP, K4, LU, OA, PY, TG, TI, TX, YN, YV, ZP, 3C and their dependencies in the DXCC lists. All bands 160-10 metres, work a station once per band for QSO or multiplier points, and total score is QSO times multiplier points for the above countries. Send to Box 262 Granollers, Spain by July 15. Last year’s winner was HI-A3HI, with G4KTH seventh.

**“CBXN” deadlines for the next three months**

- **April issue** — March 4th
- **May issue** — April 1st
- **June issue** — May 6th

Please be sure to note these dates

BARTG’s Spring RTTY contest over the weekend of March 20-22 will be known to all the ‘printer buffs; if you haven’t the details by you, write to Ted Double. G8CDW, 89 Linden Gardens, Enfield EN1 4DX — and no doubt you could get a membership form for BARTG at the same time.

On the same weekend there is the ever-popular Bermuda Contest. W/VE stations can work V19, DIs, and UK stations and vice-versa, once per band and mode. Exchange RS(T) and county, state, province or DOK, or VP9 parish. Score 5 points a QSO except that UK stations are worth seven to other competitors. Multiplier is the number of WPs worked on each band 3.5-28 MHz. The Big Prize is the trophy presented at the Bermuda Society’s Annual Dinner, for which round-trip transport and hotel accommodation is provided. Entries to be received by May 31, at Radio Society of Bermuda, PO Box 275, Hamilton, 5, Bermuda.

**Ten Metres**

G4JZW (Knutsford) can start this section: Tony notes how the bands has been opening earlier and closing later as we have drawn into the longer days; this meant that he could scramble the quick QSO before work, and again when he got home. The TS-820 and two-element Quad made SSB contacts to F6Q1/BRI, 6W8AR, 912BO, 91N1BMK for the first QSO of 1982 (and, hopefully, a good one). AX1CH, A97T, A9XP, DU1RD, E16DT. HI9DC,
was using ten watts to on EA8TL, TU2LH, C53AP, VE3EQF, HB9BVL/5N0, 9J2TJ, K6HPT QSOs with 1982. HC4JL, and the band has hour round noon -opened again by the time the next piece comes.

The RS3-RS8 satellites have changed things a bit: 29.3 to 29.5 MHz has always been allocated to satellite activity, but only 29.3-29.4 has ever been in general use. The Russians have changed all that as their satellites are spread out: the telemetry and down link frequencies are: 29.321, '331, '341, '360, '401, '430, '411, '452, '533, '501, and '502 MHz while the general transponder down link range is 29.41 to 29.510 MHz. U-J-9 has his beacon on 29.510 MHz.

G3NOF (Yoroi) hasn't been any too active of late, due to family bereavements and the waiting-time for parts ordered, and when he has managed a pep at the band it seemed none too good, a view shared by some local SWLs. While other EU's were heard working them, Don heard nothing from VK/ZL or the Pacific; for an hour round noon the band was good to PY-HK and the Caribbean isles, and the North Americans appeared from 1100 to 1930. The W5s were only heard for a short time around 1600 but only weakly; the band has on occasion faded out at 1700 and re-opened again around 1830 for a while. SSB QSOs for G3NOF were with C33CL, C6AHI, DL2GGV/YV5, EA9JV, HC1JL, HR1HJ, J2DL, J3AA, J3RM, VK9NYG, W5AG, W6Y1B/36D, ZH2GR, ZC0BC (Annobon DX-pedition) and BP6OR.

At G3LDS the period was notable for QSOs with ZL2AIZ, V6SDT, FY7KRU who came back to a CO, YV6AUZ. K6IPT who is ex-G3AT, J2DL, H9DBVI/S50, 9J2TJ, a long chat with V3EJQI, R91EZ, VK-AMO, V56HH, ZP5LAI, and for a new one, HK9EFM, EA8TL, TU2LH, C53AP who will be on as C5BAAP, ST5RR for another dipole and 9G, then 3EUAN/1 who was using ten watts to an indoor dipole. G3MJ2 mentions just one contact, a CW one with N2CUT for the first QSO of 1982.

G4NKM operated from the home place with 100 watts and raised a few 'test' calls atop the CB-ers; but from the location the central-hearing system aerial found, on SSB, RA3DIW, UA3APK, RP2BFW, UB5GBQ, YO2B, UT5YV, and KA4CVC, while the CW mode accounted for RI3CD, UK6AF, YU6ZCV, UAJAAP, UA3IF, RI7PKY, U2MKBQ, RI6MWA, and YU1PFL. Power: 5-10 watts from the FT-7.

21 MHz

G4NKM/A used an indoor 14 MHz dipole in the living room, with a Joymaster ATU to the FT-7, and managed QSOs with SM3HZA, I4UHI, and W4QVT. From the home station, 9G1OJ, EA3AGD, S5s, WB1HHS, KAI, and Y7HI, not to forget SM6YF/M who answered a CW QSO QRQ call when Steve was running about five watts; G4NKM wonders just how a CW operator can cope with mobile operation on the move.

Now G4NIZ who noted VK4AKJ, his first VK4, and thought this was great guns with just 40 watts to a dipole, till the VK came back and admitted to just two watts! Just before this one a QSO with UA1LE, with a marked echo and flutter in both directions, around 0820z.

At G4LDS, the lists are clearly marked 28 and 21 MHz, because we got them a bit skewed last time round! He offers RA9, UL7, BNOQYU (QSL via JE1MHD), and was called by 5N8AS and 5V1H. Then the end-year session which brought W6Y1B/36D, J6LOU, VK9XW, an assortment of Ws, and nearer and further UA signals. The 1982 effort started well on January 1, with 9N1BMK (after waiting 80 minutes while the chap worked through the EU countries), DF4SU/P/ST2, 9G1JZ who said he was the best EU signal to be heard, and then a call from ZS6ACI. A "CO Pacific" on January 2 raised KA6CMD/K12 on Guam, but he had heavy QRM from callers — while G4LDS was beaming Pacific and saying where he wanted replies, he was called by UBS, UK5, C71, YO, and some others!

On now to G3NOF, where a few JAs were noted on the short path, but not very strong, around 1000; the Ws weren't so good either, but Don made SSB contact with CP6EL, FG7X1, HKBBVN, R1IO, JW51J, KP5BO, 1US31, PSF9Y, W7KL and 3C0AG on Annobon. G3KP/3 turned up an unusual prefix with CGMC, for a Centenary event at Moore Jaw. Otherwise it was CW, and EM7CD, FP8HI, J3ABA, V05ME, and 2Z2ARM in the REF contest.

Twenny

This is still the place where most of the DX transaction occurs, but it sometimes seems to be more like an audio garbage-dump. This is reflected in the mail; for instance G3NOF says tersely "I have done nothing on this band!"

Twenty for G3FPK was somewhat coloured by the racket going on, but he did raise a couple of new countries in ZK2AD and ZL3PO/C; and an odd one was ED9IPF on Melilla. For the rest, FP8HL, J3ABA, a couple of PAs in Monaco and W6QI/BH1. One of the 'trolly noises' would seem to have been an RTY signal, wobbling a bit and splurging all over the bank.

G2HKU has had his own good reasons for inactivity, but he did manage to keep up his ZL skeds, on SSB with ZL3FV and ZL3RS.

G4NKM remarks that he couldn't help calling I9HWU, as his English sounded so good — he turned out to be from London and ex-G3BSW. The only other QSO on this band to be noted is with DL0SB.

Xtal Ball

This is a useful station accessory; gazing into it (with some small help from DXNS and Y7DXB), we notice the Annobon DX-pedition seems to be well patronised, and that the XEs are using 6D5, 6E5, and 6F5, in place of XE1, XE2, and XE3 respectively.

We hear that C9 will be active, thanks to a short stay by SM10KX for a couple of weeks, and 5M2FHZ who will stay for nine months.

At the time of writing, it is understood that the KF10/CO6X QSLs will hit the fan around the middle of February, but to date no word from ARRl on the DXCC status of this one. Incidentally, he is talking of a possible attack on Heard with 1995S, although the latter hasn't commented on this.

After all the flapdoodle over Navassa, one can't help XI DXFare hoping to activate this, sometime around mid-March; being the target. Another one to possibly be available is Cocos - Keeling, where VK5OT says he will be on signing VK5YT up until mid-March.

Tristan will have a new operator about the time this reaches the mails, with ZD9B; and it is understood ZD9BU will stay and help him set up shop. As he is not used to amateur activities, although he is a commercial operator, it is expected that his early activity will be in nets.

If you have been sitting on a 9U5JM QSL awaiting the word, you can hang them in to ARRL for DXCC credit; all 9U5JM QSLs are OK.

End

We seem to have come to the bottom again; the next dates are in the "box", and the address as always, "CDXN", SHORT WAVE MAGAZINE, 34 High Street, Welwyn, Herts. AL6 9EQ. And, of course, we can always do with more reporters, both new chums and OTS's, hopefully the mails will be back in order again by the time the next piece comes to be written so that everyone is included. Meanwhile — all the best, and tix for listening!
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- Ring Price, Cawood (075786) 641.
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