Inside This Issue
GREENWELD Winter Supplement
16 page pull-out catalogue

Constructional
Build A Capacitor Checker

Reviewed
Vectronics VC300-DL Antenna Tuner and Icom IC-R7100 (with HF) Receiver

Fred Judd G2BCX
Looks Into Transmission Line And SWR Power Loss

Getting Started - The Practical Way
Special Offer, CB High & Low
Newsdesk '92, Club News, Maths For The RAE

And Much, Much More
Then why not choose the FT-5200 or FT-6200 dual band mobile transceivers. The detachable front panel can be easily mounted in a convenient location on the dashboard, while the transceiver body can be stowed under a seat or in the boot. For extra security, take the front panel with you, the transceiver is useless without it! So for extremely powerful communication capabilities with maximum user convenience and equipment security, face the facts and pick a Yaesu dual band mobile.

**FT-5200/FT-6200**

**Boot-Mountable High Power Dual Band VHF/UHF Transceiver**

- FT-5200: 2m and 70cms.
- FT-6200: 70cms and 23cms.
- 32 Memories:
  - 16 tunable memory channels for each band.
- Channel Steps:
  - 5, 10, 12.5, 15, 20, 25kHz.
- Removable Front Panels For Quick and Easy Installation.
- CTCSS Encode Built-In:
  - 38 sub-tones selectable from the front panel.
- Full Duplex Cross Band Operation:
  - Independant squelch and mixing balance, for simultaneous listening or transmitting.
- Independent TX/RX Frequencies:
  - Odd splits ok on any memory channel.
- Programmable Sub-band Limits:
  - For band scanning.
- Selectable Scan Skip:
  - For busy channels.
- Backlit DTMF Microphone.
- One-Touch Instant Recall:
  - Recall of CALL channels for each band.
- Priority Monitoring.
- Dual External Speaker Jacks:
  - One for each band.
- Built-In Antenna Duplexers: Standard feature.
- Reversed Masked Full Frequency LCD.
- 8 Level Automatic Display/Key Lighting Dimmer.
- Accessories Options:
  - FTS-22 (CTCSS Dual Decode Unit), FRC-4 (Pager Unit), DVS-3 (Voice Memory and Pager Unit), YSK-1L (6m Separation Kit Cable), SP-7 (External Speaker).

*Performance without compromise*
MARCH 1992
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Don't miss your flight to Dayton
Hamvention, see page 21 for more
details.

SPECIAL OFFER
See page 69 for another PW offer.
Save £20 on the Sadietta MM-99 Mobile Safety
Microphone

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Now the shop has re-opened, we can offer you full demonstration facilities, with spares and service back-up on all 'STANDARD' equipment. We are also main agents for KENWOOD, YAESU, ICOM, ALINCO, and on the commercial side many of the well known brands such as Communique, Cleartone, Maxon, plus marine mobile and portable equipment so the next time you want to re-fit your luxury cabin cruiser, give me a call!

73 'de NORMAN

<table>
<thead>
<tr>
<th>STANDARD EQUIPMENT</th>
<th>HAND HELD EQUIPMENT</th>
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<tbody>
<tr>
<td>C528 Dual band 144MHz/450MHz transceiver (angled charge)</td>
<td>£279.00</td>
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<tr>
<td>C150 VHF FM 144MHz transceiver</td>
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<td>C112 VHF FM 144-148MHz transceiver</td>
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<td>C168 VHF FM 144MHz minature hand held</td>
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<td>C468 UHF FM 450MHz minature hand held transceiver</td>
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<tr>
<td>CSX90/8 Dual 144MHz/450MHz transceiver**</td>
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<tr>
<th>C500 ACCESSORIES</th>
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<tr>
<td>CC100 Carry case C500 with CNB111 battery</td>
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<tr>
<td>CCLC150 Carry case C150 with CNB151 battery</td>
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<tr>
<td>CCLC280 Carry case C280 with CNB151 battery</td>
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<tr>
<td>CMNP111 Speaker microphone</td>
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<tr>
<td>CMNP110 Tie-pin microphone</td>
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<tr>
<td>CMNP115 Speaker microphone (small size)</td>
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<tr>
<td>CMNP111 Mobile bracket</td>
</tr>
<tr>
<td>CMNP105 Mobile charger for CNB150/151/153</td>
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<tr>
<td>CHP111 Headset with PTT switch</td>
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<td>CMNP111 Mobile bracket</td>
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<tr>
<td>CMNP113 Mobile charger for C500 battery</td>
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<td>C150AC Power cable for mobile use</td>
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<td>C1/200 Battery contact</td>
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<tr>
<th>C164/468 ACCESSORIES</th>
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<tr>
<td>CA050 Battery case</td>
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<tr>
<td>CA060 Heavy duty battery adapter</td>
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<tr>
<td>CA050 Mobile power cable</td>
</tr>
<tr>
<td>CA050 Charging lamp</td>
</tr>
<tr>
<td>C6L50 Mobile charger</td>
</tr>
<tr>
<td>CMNP150 C500 speakerphone</td>
</tr>
<tr>
<td>CMNP115 Headset beam mic</td>
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<tr>
<td>CMNP113 Tie-pin mic and earphone</td>
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<td>CMNP111 Mobile bracket</td>
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<tr>
<th>MOBILE/FIXED EQUIPMENT</th>
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<tr>
<td>CSB900 Dual band VHF/430 MHz mobile transceiver RX coverage 100MHz - 1GHz... £650.00</td>
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<tr>
<th>C5080D ACCESSORIES</th>
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<tr>
<td>CAW600 Dual microphone cable</td>
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<tr>
<td>CAW651 Two microphone extension cable</td>
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<td>CAW652 Two microphone extension cable</td>
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<td>CIN600 CTCSS tone squelch unit</td>
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<td>CT5000 CTCSS module</td>
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<td>CMNP200 Speaker intricate</td>
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<tr>
<td>CMNP150 Speaker microphone (small size)</td>
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<tr>
<td>CMA550 Headset beam mic</td>
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<tr>
<td>CMA550 Headset beam mic and earphone</td>
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<tr>
<td>CMNP111 Mobile bracket</td>
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</tbody>
</table>

The C528, the finest dual bander yet, is very much alive and kicking and is still in current production. It seems a pity to supersede it, but that's progress for you! The new model is on the board and we hope to have some advanced info soon. The first sample model for the Japanese home market will be made available in Japan roundabout August but the European version sample will not be available to us until Sept/Oct for evaluation and ordering against stock. Deliveries, if all is well, should be some three weeks later, so keep an eye on the ad and we'll keep you updated.

NORMAN

<table>
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<tr>
<th>C528 DUAL BAND HAND-HELD</th>
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Standard have done it again! You all know how popular the C500 is, well now here is their latest dual bander - the C528 (not to be confused with the Japanese only version, the C520). The European version has all the facilities that you want in a base station, let alone a handheld!

- Direct 13.8V in for 5 watts out
- Programmable offsets
- VHF 2.5W, UHF 2W with CNB151 Ni-Cad pack
- Coded paging function
- Dual displays
- Various scanning modes
- Power save function
- Programmable step sizes
- Multiple memories
- 144-146 VHF, 430-440 UHF
- 800-975 RX only
- Priority channel
- Separate volume and squelch controls for each band
- Tone squelch (option)
- 2m and 70cm
- 5 watts output
- Repeater function

400 EDGWARE ROAD, LONDON W2 Telephone: 071-772 5521 Telex: 298765
OPENING TIMES: 9.30am-5.30pm Mon-Fri. 10am-4.30pm Sat.
Normally 24hr dispatch but please allow 7 days for delivery

Practical Wireless, March 1992
Expanded Dual Bander

The new Kenwood TM-741E is a Multi-Band FM transceiver designed to meet the demands of the mobile radio amateur. The revolutionary design of the TM-741E provides dual band (144MHz/430MHz) operation, with the capacity of expanding to triple band operation by adding optional modules for 1200MHz, 28MHz, 50MHz.

Full Features, Ultra-Compact Design  ■ Optional Band Units (28MHz, 50MHz, 1200MHz) for Tri-Bander  ■ Easy-To-Operate, Easy-To-Install Detachable Front Panel  ■ High Power Output (144MHz: 50W, 430MHz: 35W), with a 3 Position Power Switch  ■ Independent Receive Function  ■ Multi-Function Scan  ■ Tone Alert System with Elapsing Time Indicator  ■ Dual Tone Squelch System (DTSS)  ■ Pager Function  ■ Clock Function  ■ Automatic Band Change Function  ■ Auto Power-Off Function  ■ Multi-Function Microphone Supplied

FM MULTIBANDER

TM-741E

LOWE ELECTRONICS LIMITED

Chesterfield Road, Matlock, Derbyshire DE4 5LE Tel: 0629 580800 Fax: 0629 580020

Barry (S Wales): 0446 721304 *Bournemouth: 0202 577760 Bristol: 0272 771770
London (Middlesex): 081-429 3256 Newcastle Airport: 0661 860418 *Closed all day Monday

Sole appointed UK Distributor for KENWOOD Amateur Radio

Full demonstration facilities at all Lowe Centres
**WATERS & STANTON**

**UK's LARGEST SELECTION OF HAM RADIO PRODUCTS**

**THIS MONTH! FREE 24 hour delivery on all orders over £100.**

Send for FREE Mega price list

**HF TRANSCEIVERS IN STOCK**

**YAESU – KENWOOD – ICOM**

<table>
<thead>
<tr>
<th>Model</th>
<th>Price</th>
<th>Description</th>
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<tr>
<td>FT-100</td>
<td>£149.00</td>
<td>1.5W dummy load, DC - 6MHz, Superb!</td>
</tr>
<tr>
<td>FT-100A</td>
<td>£145.00</td>
<td>3W dummy load, DC - 30MHz, Superb!</td>
</tr>
<tr>
<td>FT-100B</td>
<td>£150.00</td>
<td>6W dummy load, DC - 60MHz, Superb!</td>
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**GIMME UK STOCK! 12 MONTHS WARRANTY**

<table>
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<tr>
<th>Model</th>
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<tr>
<td>FT-1000</td>
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**Free 24 hour delivery**

**NEW MFJ ANTENNA ANALYSER £99.95**

Model MFJ-207 This self powered analyser will let you measure HF aerial resonance, 1.8-30MHz, and VSWR without the need for any transmitter power. Simply connect to coaxial cable to measure VSWR and resonance. Ideal for regular aerials and installation. Great club investment! £99 (£5.00). Digital Version £189.95

**TWO AMAZING HAM STORES**

Why not pay a visit to one of the oldest ham radio stores in the business? We have a superb range of goodies on display. Super deals for callers and amazing part exchange prices on your old gear. Our Hockley emporium (near Southend) is stacked out with premium items. Why not pay a visit to our Southend emporium (near Southend) for the latest in ham radio gear?

**HF MAST HEAD PRE-AMPLIFIERS**

<table>
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<th>Model</th>
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**MICROSET POWER SUPPLIES & LINEARS**

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<td>MFJ-704</td>
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<tr>
<td>MFJ-106B</td>
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<td>MFJ-106B</td>
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**New Products from Stock! 300W HF ATU**

The MFJ-495 ATU is a compact, 300Watt aerial matcher in one box. It will match balanced, unbalanced feeder, and single wires. A dual needle VSWR Power meter makes adjustment simple, and 1.8-30MHz aerial switch completes the package. 

**Stop press: New MFJ 20M QRP rig with 500Hz CW filter £179.95**

**Brand new MFJ-407B Electronic Keyer £99.95**

Model MFJ-407B is a budget price electronic keyer that is remarkable value. Operating from internal or external source it provides conventional or iambic keying at speeds from approx 5-50 WPM. Controls include tone, speed, weight and volume. (Needs paddle key).

**NEW AMERICAN HF LINEAR new £699.95**

<table>
<thead>
<tr>
<th>Model</th>
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<tr>
<td>AL-800X</td>
<td>£1099.00</td>
<td>AL-800X</td>
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**NEW! Global MKII Dip Meter 1.5MHz-250MHz**

Fully conforms to licence regulations for Waveband but has the advantage of being useful for much more including aerial testing and design work such as ATU's etc.

Send for FREE Mega price list

STOP PRESS: New MFJ 20M QRP rig with 500Hz CW filter £179.95
The DJ-X1 scanning receiver marks a major step forward in both design and performance. ALINCO engineers have applied the very latest technology to produce one of the world's most sensitive and compact handhelds. No other handheld has a similar performance or specification.

When you handle the DJ-X1 you will immediately appreciate its superiority to any other model. But then that's hardly surprising. Most of its competitors have either been around for several years or have simply undergone cosmetic surgery!

The DJ-X1 is a brand new design from start to finish. Micro electronic circuit boards mean greater reliability whilst leaving plenty of room for 6 long lasting internal AA cells. A revolutionary CPU design provides simple one touch functions that are both logical and easy to remember. And there's a wide range of optional accessories available too that will appeal to the professional user.

To obtain more details contact one of our dealers listed below or telephone us direct for the complete information on the most exciting scanner to be released from Japan for years.

“Probably the best performer”

“Certainly the best value!”

ALINCO STOCKISTS:

WATERS & STANTON ELECTRONICS
22 Main Road, Hockley, Essex. Tel: (0702) 206835
Noisy, crowded frequencies are about as productive as motorways in rush hour. Now, you can jump the queues and head for the wide, open spaces with the FT-650 from Yaesu.

The FT-650 packs substantial communications power in a streamlined, compact case. A flip out handle makes it the perfect portable, especially for those remote locations. The three frequency operation lets you win the battle of the bands on 6m, 10m, and 12m. The transceiver covers from 24 to 56MHz continuous on receive with a full 100W output. An optional power supply and desk mic are available for base station operation.

**DX-PEDITION SPECIAL**

Options:
- FP-22 Internal 240V AC P.S.U.
- DVS-2 Digital message storage unit
- XF455m CW filter 600Hz

\[ £1175 \text{ inc. VAT} \]

**HF EXCELLENCE**

Have you always wanted to stand out from the crowd? Well now’s the time to stand head and shoulders above the crowd with the FT-1000 and FT-990 HF transceivers from Yaesu, arguably the crown king and prince of all HF transceivers.

Designed with no expense spared, these transceivers offer exceptional performance combined with the ease of operation, a truly marvellous step forward in HF communications. The FT-1000 and FT990 feature the very latest in electronics and microprocessor technology to ensure a highly reliable and exciting-to-use transceiver for all modes of operation on the HF bands.

**FT-1000**
- Amateur bands Tx 160-10m.
- General coverage Rx.
- Dual independent Rx capability.
- Power output up to 200W PEP.
- Auto ATU and internal P.S.U.

**FT-990**
- Amateur bands Tx 160-10m.
- General coverage Rx.
- Power output up to 100W PEP.
- Auto ATU and internal P.S.U.
- 50 memories.
Look after your radio with AMCARE

Through AMCARE you can now insure for breakdown and/or loss/damage for your amateur radio equipment. Optional cover is available for loss/damage from unattended vehicle. Breakdown cover on its own is the best way to extend the warranty after the initial twelve month period at a very reasonable cost.

Full details available on request.

Scheme administered by Communications Support Ltd.

---

**SMC for all your accessories**

**MIDTOWER SERIES**
- P10 3 way base plate: £290.90
- PB10 3 way base plate: £290.90
- PR10 3 way base plate: £249.09

All towers except mobiles are available from stock. All are supplied with 12V head unit drilled to take G5065 bearing. Holding down bolts for IB and PB towers are available of £2.98 per set extra.

Alternative washers and head units are available at extra cost. Delivery is by quotation dependent upon distance.

---

**DAIWA POWER SUPPLIES**

The DAIWA range of power supplies is proving very popular for all types of applications, both for the professional user and the hobbyist alike.

From the smallest 9A continuous PS12025, via the extremely popular 24A PS304, to the top of the range 125A continuous PS40X. All the DAIWA range of PSU's feature variable voltage from at least 3-15V and switchable voltage 1 current metering. Both the PS304 and PS40X have a quieter lighter weight, convenient for powering your handheld radio. Also available from DAIWA are some good quality SWR/PWR meters and cox switches.

---

**STRUMECHE VERSATOWER STANDARD 16M20 SERIES**

- 16M20P5: £468.33
- 16M20P4: £468.33
- 16M20P3: £468.33
- 16M20P2: £468.33
- 16M20P1: £468.33

**HEAVY DUTY 16M20 SERIES**

- 16M20BP60: £583.43
- 16M20BP40: £468.33
- 16M20BP25: £377.85
- 16M20BP15: £277.35
- 16M20BP10: £187.35

---

**SWR METERS**

- CON: 1.8-150 MHz: £299.00
- CT10N: 150-200 MHz: £220.00

---

**LINEAR AMPLIFIER**

- LA308H: 2m 1.5-5W in 30-80W out: £159.95

---

**ALL POSTAGE PRICES ARE AS FOLLOWS:**

| A | £1.95 |
| B | £4.75 |
| C | £6.60 |
| D | £11.00 |
| E | £16.50 |

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<table>
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<th>Linears</th>
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<th>Linears</th>
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<td>HT100</td>
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<td>HT50000</td>
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**Transverters**

- HT100: 2m to HT200 
- HT200: 10W F.F. input: £220.00
- HT500: 10W F.F. input: £220.00
- HT1000: 10W F.F. input: £220.00
- HT2000: 10W F.F. input: £220.00
- HT5000: 10W F.F. input: £220.00
- HT10000: 10W F.F. input: £220.00
- HT20000: 10W F.F. input: £220.00
- HT50000: 10W F.F. input: £220.00
- HT100000: 10W F.F. input: £220.00
- HT200000: 10W F.F. input: £220.00
- HT500000: 10W F.F. input: £220.00
- HT1000000: 10W F.F. input: £220.00

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- **Rules:**
  - Up to £1000 instant credit, a quotation in writing is available on request, subject to status.
  - Yaesu Distributor Warranty: 12 months parts and labour.
  - Carriage charged on all items as indicated or by quotation.
  - Prices and availability subject to change without prior notice.
  - Same day dispatch wherever possible.

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**Practical Wireless, March 1992**
You will probably spend a great deal of money on your next radio - therefore it's essential you buy it from the right people...

...People who will help you with advice and information; People with knowledge and experience; People who keep a wide range of optional extras and accessories to tailor equipment to suit you; People you can trust; People who have a genuine desire to help you and who will look after you if things go wrong.

Here at KW we are confident we are those people. Who are we? John, G3HCH, is the older, taller slimmer one; Tom, G6PZZ is the shorter, fatter younger one. We look forward to meeting you.

DON'T FORGET

We have a constantly changing range of used equipment - all fully warranted and realistically priced. If you have something to trade or exchange - let's talk!

It's always a problem deciding what to advertise - we stock so much!

Here's a small selection from our range of antennas and accessories

- Cushcraft R5 £269
- Cushcraft R7 £369
- Cushcraft AP8 £192
- Diamond CP86 £209
- HS-VK5JR £222
- HS-WX1 £264
- HS-WX2 £263
- Global GDO £269
- MFJ-948 ATU £129
- MFJ-949D £149
- MFJ-901B £269
- MFJ-260B £235
- MFJ-207 £99
- MFJ-931 £79
- Coax switches £19
- Dummy loads £16
- Adonis FX-1 £55
- 2m ¼ + 6m ¾ mobile £16

Also in stock a wide range of shortwave receivers and VHF/UHF scanning receivers!!

OPENING HOURS:
MONDAY-SATURDAY
9.30am-6pm
(MON open 10am,
SAT close 5pm)
ICOM’s stand at the London Amateur Radio Show at Pickett's Lock, Edmonton will in effect be one large retail hamstore where you will be able to buy the ICOM rig of your choice. If you have not yet been able to visit either of our new Hamstores in Kent or Birmingham then a trip to Pickett's Lock is just what the doctor ordered.

On show will be ICOM’s full range of Ham equipment. ‘hands-on’ demonstration literature and friendly advice will always be on-tap on ICOM’s Stand S, Red Hall.

Here are just a few examples of latest models available at the show...

1. IC-2410E 144/430MHz Dual Band FM Mobile £625.
2. IC-R7100 25MHz/2GHz Wide Band Receiver £1120.
3. IC-P2ET 144MHz FM Handheld Transceiver £275.
4. IC-P2E 144MHz FM Handheld Transceiver £259.
5. IC-2SRE 144MHz FM Handheld Transceiver/Wide Band Receiver £425.

HERNE BAY

Unit 8, Herne Bay West Industrial Estate, Sea Street, Herne Bay, Kent CT6 8LD
Telephone: (0227) 741555, Fax: (0227) 741742

BIRMINGHAM

International House, 963 Wolverhampton Rd, Oldbury, West Midlands B69 4PJ
Telephone: 021 552 0073, Fax: 021 552 0051
VHF/UHF HAND PORTABLE TRANSCEIVERS

TH2E 2m FM hand portable transceiver with PB10 battery 229.00
TH2E 2m FM mini hand portable with PB10 battery 239.00
TH4E 2m FM hand portable transceiver with PB10 battery 259.00
TH4E 70cm FM mini hand portable with PB13 battery 269.00
TH7E 2m/70cm FM dual band hand portable transceiver. PB10 battery 355.00
IC-Z2E 2m70cm FM hand/portable including Nicad 359.00
IC-Z2E 2m FM hand portable including Nicad/charger 259.00
IC-Z2E 2m FM hand portable with keypad entry + stairs 299.00
IC-Z2E 2m FM portable, keypad entry + stairs 219.00
IC-Z2E 2m FM hand portable + wide band RX 425.00
IC-P2E 2m FM hand portable including Nicad/charger 259.00
IC-P2ET 2m FM hand portable including Nicad/charger + stairs 279.00
IC-2SE 70cm FM hand portable including Nicad/charger 269.00
IC-2SE 70cm FM hand portable including Nicad/charger + stairs 279.00
IC-2SET 70cm FM hand portable keypad entry STN 316.00

VHF/UHF TRANSCEIVERS

TS956S0D HF transceiver with auto ATU, all filters, DSP, S502 2995.00
TS956S0D HF transceiver with auto ATU 2390.00
TS956S0AT HF transceiver with auto ATU 1655.00
TS860S0 HF transceiver without ATU 1475.00
TS945AT HF transceiver with auto ATU 1375.00
TS945S0 HF transceiver without ATU 1275.00
TS860S0 HF transceiver with 6 metres (50W) 1395.00
TS146S HF transceiver without ATU 800.00
TRC70 HF transceiver for commercial use 1169.13
IC-7E1 HF all band, general coverage receiver, built-in ATU and PSUs, scope 4590.00
IC-7E2 HF all band, general coverage receiver, built-in ATU and PSUs 2500.00
IC-7E2A HF all band, general coverage receiver, built-in ATU and PSUs 1355.00
IC-7E5 HF all band, general coverage RX. 12V 949.00
IC-7E7 HF all band, general coverage RX. 12V 1015.00
IC-7E7C HF all band, general coverage RX. 12V 779.00
FT1100 All mode HF transceiver, general coverage dual receive 2995.00
FT990 All mode transceiver, general coverage, mains PSU, auto ATU 1899.00
FT890 All mode transceiver, general coverage receive 1075.00
FT680U All mode transceiver, general coverage RX, c/w internal ATU 1250.00
FT747GX General coverage receiver, ham bands transceive 689.00
FT767GX General coverage receiver, ham bands transceive 1689.00

VHF/UHF ANTENNA COUPLER

HF-250HF 250W High power HF Coupler 1110kHz - 2GHz receiver CRT display 4080.00
HF-150HF 150W High power HF Coupler 4080.00
HF-225HF 225W High power HF Coupler 4080.00
HF-300HF 300W High power HF Coupler 4080.00
HF-375HF 375W High power HF Coupler 4080.00
HF-500HF 500W High power HF Coupler 4080.00
HF-665HF 665W High power HF Coupler 4080.00
HF-875HF 875W High power HF Coupler 4080.00
HF-1250HF 1250W High power HF Coupler 4080.00

SMALL WAVEFORMS

IC-RAE 70cm FM hand portable + wide band RX 445.00
IC-RAET 70cm FM hand portable including Nicad/charger 275.00
IC-RAET 70cm FM hand portable including Nicad/charger 259.00
FT282 2m handy c/w FNB28 229.00
FT76 70cm handy c/w FNB28 229.00
FT411 TX, RX, RX synthesised 2keq 2M/FN17 Nicad 499.00
FT811 TX, RX synthesised 70cm keypad c/w FNB17 229.00
FT111 TX, RX synthesised 23cm c/w keypad FNB17 369.00
FT470 TX, RX synthesised 2M + 70cm keypad 499.00
FT415 2m keypad handy c/w PR22 & FNB28 279.00
FT115 70cm keypad handy c/w PR28 & FNB28 295.00
DJ-S1E 2m FM 2.5W 41 memories + drycell pack 179.00
DJ-T1E 2m keypad 2.5W 41 memories + AIR RX 39.00
DJ-S4E 70cm FM keypad dial 2W 12V-5W 249.00
DJ-S60E 2m/70cm FM 2W dual display/watch 329.00

RECEIVERS

R5000 High performance communications receiver 9250.00
R2900 HF general purpose communications receiver 5490.00
IC-R9000 100kHz - 2GHz receiver CRT display 4000.00
IC-R7100 25-2000MHz receiver 11250.00
IC-R1100 Wideband receiver 5100.00
IC-R72E General coverage receiver 6590.00
IC-R72F General coverage receiver, with back-up battery 6890.00
IC-R71E General coverage receiver 6750.00
IC-R71F Hand portable receiver 3405.00
FG5800 Receiver 0.15-30MHz AM/CW/SSB/NBFM 665.00
MV7-7000 200kHz-1300MHz WFM/NFM/AM 289.00
Anico DJ-X1 hand-held scanner 10kHz-1300MHz WFM/NFM/AM 269.00
AR1200 New hand-held receiver 500Hz to 1300MHz 269.00
AR1500 New hand-held scanner, 500Hz-1300MHz, approx. 300MHz. WFM/NFM/AM/SSB 289.00
AR3300A New handheld receiver with RS232. 765.00
AR3300A New handheld receiver with RS232. 100Hz-200MHz, all modes 765.00
AR2000 Base/mobile receiver with SSB, 500kHz-600MHz and 1000Hz-1300MHz with built-in Nicad 395.00
HF-150 HF communications receiver, 30kHz-30MHz, USB/SB/CW 329.00
HF-225 HF communications receiver, 30kHz-30MHz, USB/SB/CW 429.00
AMS/FM (optional) 229.00
R599 Anrider receiver, 40 memories with scan and search 129.00

DISCONE

SKYSCAN V1060 discose 25-1300MHz 49.95
SKYSCAN V1080 desktop discose 42.95
SKYSCAN mag mount mobile scanning aerial 24.95

ATWO-WAY RADIO  AMATEUR RADIO  AUDIO VISUAL  SALES & SERVICE
Communications Centre (Photo Acoustics Ltd.)

Spend up to £1,200 instantly with a Photo Acoustics Ltd. credit charge card
Part exchange welcome, ask for Kerry G612F or Andy G4YOW
Retail showroom open Monday - Friday 9.30 - 5.30, Saturday 9.30 - 4.30
Goods normally despatched within 24 hours. Please allow 7 banking days for cheque clearance. Prices correct at time of going to press - E&OE
DUAL DISPLAY
£49.95
Autoranging. Large display plus 32-segment bargraph. Data hold, range control, diode and continuity check. Measures to 1000 VDC, 700 VAC, 10A AC/DC, resistance to 30 megohms. With moulded rubber holster. Requires 2 "AA" batteries. 22-167 ...... £49.95

COMPACT AUTORANGE
£29.95
Autoranging. Features diode-check, auto polarity. Easy-to-read LCD display, low-battery indicator. Measures AC/DC volts, DC current and resistance. Fuse protected. Requires 2 "AA" batteries. 22-166 .................. £29.95

MINI DMM
£22.95
Mini DMM. With built-in test leads. Measures 1000 VDC, 750V AC, 200mA DC current. Resistance to 2 megohms. Built-in transistor checker NPN/PNP hFE, 1.5 and 9v battery checker. Requires 9v battery. 22-9022 .................. £22.95

Tandy

INTERFAND U.K. Ltd., Tandy Centre, Leamore Lane, Walsall, West Midlands WS2 7PS
Tel: 0922 710000

ALL THE ACTION AS IT HAPPENS!
WHO WANTS TO PLAY THE GAME AT PICKETS LOCK THIS YEAR?

1991 Pickers Lock was the first AMATEUR RADIO SHOW MARTIN LYNCH attended. To date, it still rates as one of the most successful events for my company. Gone closing time, people were still queuing to buy good clean used equipment from me. Since then I've acquired all the "BRAND NAMES" as an authorised retailer. Therefore, in addition to the wealth of second hand guaranteed equipment, I can now offer all the latest products with back up from the manufacturers themselves. This year's exhibition will be an even BIGGER success – I have lots more to offer – in terms of choice AND even better prices. Come along and visit the event of the year for Amateur Radio – Myself, Valerie, John and Chris are in the RED HALL, STAND R, opposite ICOM UK. SEE YOU THERE!!

YAESU

FT1000
The greatest HF transceiver will be on show – don't miss it!

YAESU

FT767GX Series II
Last year I was offering this excellent set with 2 and 6 metre modules at a special price – I can't be doing it again!!

YAESU

FT736R
Who bought, in 1991, an FT86 with 6m included for a daylight price then? NO! Come along and see me!

YAESU

FT470R
Just a few left at a very special price. Dual band handle, comes with nicads and charger.

YAESU

FT26/76/415/815
Yaesu's latest handles all available for free grouping (demonstrations by Valerie at no extra...)

YAESU

FT990
This one will also be on sale and working – MEGA deals on trade-ins or outright buys.

YAESU

FT890
Help! I can't keep up! With or without ATU I cannot get enough. FT757GX queue owners here.

Kenwood

TS850S
With or without ATU, this has proved a favourite – I have more in stock! Bring your old FT850 and see what we have!

Kenwood

TS450S
It's a winner and it really is better than the old TS440. Bring your along for trade-in and I'll show you.

Kenwood

TM741E
My seven pages of modifications for this one helped sell even more – only from MARTIN LYNCH

ICOM

IFC2W
Outsells all other dual banders – see why on the MARTIN LYNCH stand.

ICOM

ICR7000HF
50kHz-2GHz
Takes over from the old ICR7000HF – see PW for the excellent review and see it demonstrated by Chris Parnell – the originator of the HF conversion.

ICOM

ICR7100HF
50kHz-2GHz
They work well – very well and have proved to be ultra reliable – see for yourself the superb engineering in these two handles.

ALINCO

DJFIE/S1E
Unbeatable miniature pocket scanner – with FREE NICADS and CHARGER only at PICKETS LOCK!!

ALINCO

DJX1E
Miniature air band/marine hand scanners. Offered with nicads and charger.

AOR

AOR1500
The only hand held scanner with ssb facility fitted as standard. In stock!

AOR

AOR2000
Comes complete with all accessories at a special show price!

AOR

AOR2800/2500
Fantastic value base/mobile scanner with all mode capability. Great trade-ins.

AOR

AOR3000A
Latest version of the ultimate "AOR". Unbeatable prices on this one – but make sure it's a "UK" approved model!

ACCESSORIES
A full range of accessories will be carried at the show. Pop along and see me.

USED EQUIPMENT
FOR THE LARGEST INDEPENDENT RETAILERS LIST OF SECOND HAND EQUIPMENT IN EUROPE, PHONE OR CALL AT THE STAND. THERE IS SO MUCH FOR THE SHOW, I HAVE MADE A BOOK OUT OF IT!!

12
Practical Wireless, March 1992
Over the Christmas holidays I had a home-brew extravaganza. I didn’t really have any choice, because as luck would have it, all my h.f. band equipment developed faults which required spares I didn’t have in stock! So, it was a case of ‘out with the soldering iron’ and building some simple rigs to get back on the air.

I thoroughly enjoyed myself, and it was a change from watching too much TV over the holidays! I rediscovered the joys of getting a really simple rig ‘on the air’. I also managed to restart work on several long delayed projects, including a valve h.f. c.w. only transceiver. I started building this project before my eldest daughter (she’s 15 this month!) was born!

**Chaotic Shack**

My shack is at one end of our garage. It’s rather a chaotic shack, and I don’t have a lot of space. In previous homes, I’ve usually taken over the whole garage, as well as having a shack in the garden. This time however, the high cost of a new shack has curbed my desires somewhat. Despite being limited to a rather small working space, I’m pleased to say that the workshop is fully equipped. It’s also quite cool in the summer and it has a very good bench and storage facilities. I’ve also fitted the workshop out with an earth leakage circuit breaker and an isolating transformer.

The isolating transformer is always used when I am working on a newly-built mains powered project, or when an item of valved equipment is being repaired or tested. During the past months, this transformer (I bought it at a rally about 10 years ago!) has proved its worth on two occasions. The first was when my Eddystone 750 receiver decided to develop a fault on the secondary side of the mains transformer. The second occasion was when I dropped the partially completed valved transceiver from the workbench, onto a mains lead.

**Worthwhile Protection**

The heavy weight isolation transformer provides worthwhile protection. The poor old Eddystone 750, which I had used continually for almost 30 years, developed a mains transformer fault, that led to the chassis becoming live. This happened when I was investigating an intermittent short-circuit on the h.f. line, which turned out to be a faulty (originally fitted in 1949) de-coupling capacitor. The other problem turned out to be much more of a disaster. This was because when I dropped the valved h.f. transceiver from the edge of the workbench, on the way down it fell on to the mains lead running to a battery charger. The edge of the chassis, with the weight of the mains transformers behind it, sliced and chafed through the cable’s insulation several times. This exposed both the live and neutral conductors in various places.

Fortunately for me, I would have been safe either way. If the battery charger had been plugged into the mains, the earth leakage circuit breaker would have operated, isolating the supply. As it was, I had the battery charger plugged into the isolation transformer, and apart from a slight ‘tingle’ when I touched the chassis, I was unharmed. It was quite a surprise to see how much damage was caused by one item of equipment falling only a metre or so.

**Important Considerations**

The incident in my shack drew my attention to several important considerations for safety in the shack. The first was that you should always have an earth leakage protection device (a double-pole type is essential for full safety) and used if possible, in conjunction with an isolation transformer. These two safety precautions will go a long way in helping to avoid possibly lethal electric shocks. Although isolation transformers aren’t cheap...what price can buy back your life?

An added advantage is, that when you’re operating your main station via an earth-leakage circuit-breaker AND an isolation transformer, you can quite safely earth your equipment via your own ‘ground’ system.

**Chassis Damaged**

My problems didn’t end with the mains cable being cut. The partially-built transceiver chassis was damaged in the process. Various items were bent, and several variable capacitors had to be scrapped and the Eddystone 898 dial suffered by having its front dial plate damaged. Worst of all though, was the complete ‘mangling’ of the Electroniques front end unit. The tuning capacitor of this (now rare) STC-made unit was beyond repair.

As I’m an avid collector of spares, I was able to replace the tuning capacitor from a partially stripped-down valve Eddystones front end. Unfortunately though, I still need a 1.6MHz i.f. transformer for the unit. But I’ve no doubt that there are one or two un-used Electroniques front ends around. Can anyone help me out, so that after 15 years, I can finish the job?

**Can You Help?**

My own need for the spares for the Electroniques front end, reminded me that we often receive letters from readers with the request ‘Can You Help?’ Very often they’re asking for help to locate difficult components, information or specific parts for obsolete equipment, and we find room to print them as often as we can (see page 28). After all, P W places high priority on home construction, and I don’t want anyone to feel as frustrated as I did when I dropped my partially-built rig!

So, in future, we’ll publish your requests as soon as we can. However, although we want to help you, we’ll have to be strict and limit the service to requests for help, advice and specific components only. ‘Bargain Basement’ is available for everything else for a very modest charge.

Please make your request as short as possible, with your name and a telephone number if possible. Enclose a large s.a.e., and we’ll forward any letters if you don’t want your full address published.

Best of luck home-brewwing, don’t drop your gear on the floor, keep a clean and tidy shack and do use an earth-leakage protection device and an isolation transformer. It’s for your own life’s sake!

**Good Read**

The entire P W team is working really hard to provide you with a good-value read every month. We’ve managed to keep the cover price unchanged for over two years, but now you will have noticed our cover price has risen.

I’ve no doubt that readers will understand that many aspects of the economic situation are beyond our control, and that we’ve delayed the price increase as long as possible. We have also kept the increase in price as low as we can and for the time being I’m pleased to say that subscription rates remain the same.

In return, you can be sure that in the coming months of 1992, P W will be bringing you some excellent constructional projects. We’ll also be providing some very good reading in the easier-to-read format, combined with our much improved printing, paper and production standards.
Dear Sir

Sometimes we acquire articles which we cannot identify, may I suggest you run a “What is it?” column in Practical Wireless.

The idea is that readers can send you particulars of the unknown items for identification either by PW staff or by readers. Possibly some items will spark further correspondence on history, theory and application, etc.

John Davis

Bexhill-on-Sea
East Sussex

Editor’s reply:
Excellent idea John, send in those unusual items readers.

(photograph only please, the lift in Enefco House couldn’t manage to carry a large vintage induction coil!).

Dear Sir

We often see letters in the amateur radio press complaining about the RSGB. At the last election, there were four vacancies for ordinary members. If we deduct, from a total of 13518 votes cast, the ‘invalid’ ones, and those used on the zone C election, and if we assume that each ballot paper used its four votes, then we find that around 3300 members of the RSGB were prepared to take the trouble to vote.

That is something like 10% of the membership. Thus, we may say 90% of the membership can’t be bothered to vote. By extrapolation, 90% of the moans one hears as an RLO or when one is on the RSGB stand at a rally, must come from people who DIDN’T VOTE at the AGM, despite being given all the data, the form and the return envelope! You could argue that they are too lazy, (or too tight-fisted) to buy a stamp!

In future, whenever this particular RLO receives a query, he is going to start by asking whether the person voted at the last election!

Paul Essery

GW3KFE

Newtown

East Sussex

Dear Sir

I am a regular reader of Practical Wireless and have been for many years, and have built many of your projects. Some have not received the final touch, i.e., incomplete front panels.

I would like to finish the job, but require some front panel signs, and wording. I know that many years ago I purchased a number of panel signs, but I’m not sure where from, it may have been PW, but I can’t remember for sure.

I need dial signs and wording such as radio-amplifier, input, a.e., ‘phones, speaker, etc. But as some of the panels I have are a bit on the rough side, I don’t think the transfer signs, which are transferred by rubbing are suitable. I need the type where the backing is removed and the signs are self-adhesive. Do you know any possible supplier?

A. J. Simmonds

Bexleyheath

Kent

Editor’s reply: Apart from the mechanically embossed self-adhesive labels, done with a handheld machine, I don’t know of any suitable labels of this type available nowadays. There are many projects that could benefit from this sort of marking. Can readers help?

Readers are reminded that we want your letters with memories of PW. The letters will be used in the October Diamond Jubilee issue (published September 10).

Don’t forget also, to send in your nominations for the PW ‘Elmer’ award. (See PW January issue for full details).
Dear Sir
I am writing to say how much I enjoy reading the many articles in Practical Wireless. Now, with the new design, I look forward to future copies in this, your Diamond Jubilee year.
I have read Practical Wireless from the very early 1960s. As a school boy, I used to read the many articles and adverts on the ex-Government surplus equipment. Like most school boys of the day, I was limited by the cash available, (obtained from my part-time job) as to what equipment I could purchase. I had a 19 set, as new, from John’s Radio of Bradford for around £2.10s (£2.50), those were the days!
I have seen 19 sets with a price tag today of over £100! A far cry from the early 1960s.
I welcome more articles on kit building and some of the kits that are available. Over the years, I have built up some of the many kits that were available, such as the famous Heathkit range, and others and I agree with the views found in the article ‘Kit Building Special’ in Practical Wireless January issue.
I must also say that when the Heathkit company were in the amateur radio market, they weren’t cheap. But their assembly instructions and drawings were second to none, and the components of a very high quality.
I enjoy reading the reviews on modern transceivers, and I would hope to see more articles on some of those lovely old valve communications receivers and transmitters, such as the Eddystone receivers, along with articles on the surplus military equipment.
Some years ago in PW, there was a series called ‘Going Back’ by Colin Riches and Arthur Dow. It might be that other readers may have the information to be able to supply enough information for a future series?
I enjoy ‘Competition Corner’, and I am glad you accept photo-copies, as I do not like cutting my magazines about. I have entered every “Wordsearch” competition and enjoy doing them, please carry on!
To finish on a final note, I like the better quality paper and extra colours, I look forward to receiving my next copy of Practical Wireless, I wonder what its 60th year will bring?
Andrew Humphris
Hampton Magna
Warwick

Editor's reply: Thank you for your letter Andrew. My first transmitter-receiver came from a PW advert too! I was never keen on the 19 set (mind you they are quite collectable now!), but preferred the 18 set. Perhaps that’s why I’m such a keen 7MHz operator nowadays! I’m looking into the possibility of doing a series of ‘mini reviews’ on ‘classic’ rigs, once I have found a reliable supply of equipment to review. We have to remember that older rigs will be helping newcomers to get on the air for a long time to come.

Queries
We will always try to help readers having difficulties with a Practical Wireless project, but please note the following simple rules:
1: We cannot give advice on modifications to our designs, nor on commercial radio, TV or electronic equipment.
2: We cannot deal with technical queries over the telephone.
3: All letters asking for advice must be accompanied by a stamped, self-addressed envelope (or envelope plus IRCs for overseas readers).
4: Make sure you describe the query adequately.
5: Only one query per letter please.

Back Numbers & Binders
Limited stocks of many issues of PW for past years are available at £1.65 each including post and packing.
Binders, each holding one volume of PW are available price £5.50 each (£1 P&P for one, £2 for two or more).
Send all orders to the Post Sales Department.

Subscriptions
Subscriptions are available both for the UK and overseas. Please see current issues for the latest prices.

Wallis and St. Mary's
Bristol

Editor's reply: Yes, as you probably saw Mr. Morrall, we did publish a d.c. receiver design in February PW, as promised when we published the companion ‘Challenger’ transmitter. Although we have recently published simple designs and projects, we’ve had some more advanced projects in the last year. We strive to keep a ‘balanced’ issue, and aim to have at least two constructional projects each month. This year we will present several, more advanced projects, including an interesting idea for v.h.f. Finally, I must say that we do seem to have a good response to the beginner and intermediate level projects. Perhaps more readers would like to respond, and tell us what they’d like to see in PW, do we listen you know?

R. Morrall
West Midlands

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Services
We are delighted to receive your letters, but do try to keep them short. It helps us, and makes it easier to get more letters in!
Frankenstein Fan(g)s On The Air

It's a frightening but true fact, that both British and American people seem to be fascinated in the Frankenstein and Count Dracula stories. Despite the terrible tales of Vlad the impaler, well-known for skewering inept DXpeditions, the Wiesbaden Amateur Radio Club, DA1WA, held their first expedition to Castle Frankenstein in 1990, with a follow-up in 1991.

The group, and they claim they are completely sane, are returning to the ancient (and very creepy) castle near Darmstadt in 1992. Once they have the key and they are safe inside the castle, the door is locked!

They intend to be on the air from July 31 until August 1/2. The founding 'fiend' of the group is Robert Kipp DJ0PU (NR8V), accompanied by friends Mathias Poier DLSZBM (NY8M) and Scott Scmith DA1SC (N4WQE). Between them the group will be operating all modes (including digital modes) during the DXpedition.

Further details about the event, and the blood-red souvenir QSL card depicting the castle and Frankenstein himself, are available direct from the dungeon of Robert Kipp DJ0PU, Hugelstrasse 25, D-6070 Langen, Germany.

RSGB Presidential Installation 1992

Despite the umbrella, it doesn’t rain all the time in Ireland! Radio amateurs from all over the United Kingdom, Northern Ireland and Eire, attended the installation of Terry Barnes GI3USS, as RSGB President for 1992. Terry was installed during a ceremony in Bangor, County Down on January 11 and the 200 or so guests present at the celebration dinner, remained dry on the outside at least!

Accepting the Presidential Chain of Office from the retiring President, John Case GW4HWVR, Terry Barnes made his acceptance speech. The speech confirmed his intention to improve communications between radio amateurs, and re-organise the RSGB's council for greater efficiency, with more meetings than before, and a more business-like approach. To this end, despite living in Northern Ireland, the new President stated that he intended to have an office at RSGB headquarters, and would be there every week.

Among those attending the ceremony in the imposing Council Chamber in Bangor Castle, set above the seaside town, were the Mayor of North Down, Councillor Leslie Cree, and his Mayoress. Other guests supporting the well-known and popular new RSGB President were: Doctor Tom Rea EI2GP, President of the IRTS, the National Society for the Republic of Eire, Dick Ganderton G8VFH, Editor of Short Wave Magazine, and Rob Mannion G3XFD, Editor of Practical Wireless.

Sheltering under the RB2-11 size umbrella, presented by Martin Shardlow G3SZJ from Derby, were (left to right) The Mayor of North Down, Councillor Leslie Cree, President of The IRTS Doctor Tom Rea EI2GP, RSGB President Terry Barnes GI3USS, and Chairman of the Bangor & District Amateur Radio Society Stewart Mackae GI4OCK.

Although the umbrella kept the rain away, it proved to be ineffective against English weather! Everyone returning to the UK mainland had an interesting journey home as airlines struggled to cope with the fog-bound Heathrow and regional airports. However, this did not detract from the excellent hospitality, good food and 'traditional' Irish beverages that had been freely dispensed by the host amateur radio communities over the weekend. The occasion certainly left at least one visiting journalist with much food for thought and less pre-conceived ideas on Ireland and its people.

The Antique Wireless Newsheet

Subscription details for the Antique Wireless Newsheet are £6.00 for 12 issues UK and £7.00 for 12 issues overseas via airmail (including Eire). Further details from:
The Vintage Wireless Company Limited
Tudor House, 20A Cossham Street
Mangotsfield, Bristol
Avon BS17 3EN.
Tel: (0272) 565472.

Please send in all of your news items to Sharon George at the editorial offices.

BBC Daventry - The End Of An Era

The final scheduled transmissions from the historic BBC h.f. transmitting station at Daventry, Northants, will take place on Saturday 28 March, when the current winter schedule ends. Most of Daventry's transmissions will be transferred to Woofferton, Shropshire, which now has surplus capacity with the reduction of Voice of America broadcasts.

There will be a final closing ceremony around midday on Sunday 29 March, when one of the transmitters will carry a special transmission, followed by an official switching off. Many BBC staff started their careers at Daventry, and a large number have been invited to the closing festivities.

The station has been on the air for 67 years, and to mark the occasion, a special amateur radio station, GB67XX, will operate on the h.f. bands for a few days after the closedown, using some of the large antenna arrays formerly used by the broadcast transmitters.

The BBC will still retain buildings on the site at Borough Hill, housing the mobile transmitter maintenance team, transmission department stores, and the BBC tape service unit. The club station, GB67XX, will move to the site from the BBC Club in Borough Hill, housing the mobile transmitter maintenance team, transmission department stores, and the BBC tape service unit.

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Encouraging Audiences for BBC World Service In India

New evidence confirming the continuing high level of listening to BBC World Service in India, has just been published.

Two recent surveys, one in urban India and the other in the north eastern state of Bihar, show that there is a large audience for broadcasts from London.

In the urban study, the BBC had a regular audience (people listening at least once a week) of 7.2% of all adults, more than ten million people. In the troubled state of Bihar, a separate study showed how listeners turn to the BBC when their need for reliable information is most acute.

The urban figure was obtained as part of the Indian National Readership Study, a massive survey carried out in 1990 by two leading Indian market research agencies which covered almost all of urban India. The BBC was second only to Sri Lanka Broadcasting Corporation amongst foreign stations, and well ahead of other international radio stations, such as Radio Pakistan (5.6%), Radio Moscow (1.3%) and Voice Of America (1.1%).

The Bihar study covered all parts of the state and was carried out in March and April this year, as part of the BBC's own continuous programme of specially designed media research in India. The research coincided with regional political unrest, the general election campaign and the end of the Gulf War. At this time, listening levels were much higher than found in the urban India study - a fifth (20.7%) of adults, more than ten million people. In the troubled state of Bihar, a separate study showed how listeners turn to the BBC when their need for reliable information is most acute.

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By the way, now is the time to be planning your activity for this year’s QRP contest (the 10th anniversary event), which is on Sunday 21 June 1992 - look out for details on the contest and special prizes in PW soon.

Solder Station Special Offer

Ungar, the soldering and de-soldering specialist, has announced a special offer based on its ESD-safe, electronically-controlled 2110 solder station.

Not content with simply providing a value-for-money package (normally at just under £80.00 for a high performance station, tip leakage below 2mV, ceramic 60W 24V heater for rapid heat-up and recovery, adjustable temperature, soft, cool-grip handle, etc), Ungar have decided to make their 21100 available on a three-for-the-price-of-two basis, for a limited period only.

Pay for two Ungar 2110 solder stations and Ungar will send you three.

Write to Ungar first for full details, but act quickly, as the offer won’t last forever.

Enquiries about Ungar's solder station special offer should be made to:

Ungar, Eldon Industries (UK) Ltd., Clifton Road, Sheffield, S6 5AB., Tel: (0482) 814914.

Children In Need

Six young amateurs from Old Swinford School in Stourbridge, have raised over £135 for the recent appeal for Children In Need. A sponsored radio event was held using the special event call GB2OSH, and many bands were used during the day, with at least two contacts with other fund-raising stations. The average age of those transmitting was 15 years, and all were B licensees operating under the care of Clive Williamson G4IEB, who is a teacher in charge, and the holder of the school callsign G4CVK.

This was the fourth year that funds have been raised for this charity, and brings the grand total to over £400. The activity was an opportunity for three student Novice amateurs, Simon, Michael and Mark, to log and operate the station giving the two minute greetings message. These three boys are at present awaiting the results of their December Novice exam.

The school has been operating on amateur radio for 22 years and enters several contests, as well as running special event stations for school open days and JOTA. Needless to say, all these activities have lead to many past pupils gaining their radio 'ticket', and a well-equipped shack is located in the main teaching block topped by a variety of antennas.

Their DXCC was gained in 1988, and since then the main operating areas in the last few years has been computer operated RTTY. Since September, several pupils have been attending Morse classes, and one other is awaiting the results of the recent RAE.

For the future, the society would like to try some satellite working and are looking for someone in the West Midlands to give them some help.

Clive Williamson on (0384) 392006.

Practical Wireless, March 1992
PRIZES
First prize winner can choose either a one year PW subscription or £20 worth of vouchers for the book service.

The two runners-up can choose from either a six month PW subscription or £10 in book vouchers.

Safety in the shack! This month's theme. See 'Keylines'.

Circle the 12 differences, fill in the form below and send your entry to PW Publishing Ltd., March 1992 Spot The Difference Competition, Eneco House, The Quay, Poole, Dorset BH15 1PP. The Editor's decision on the winner is final and no correspondence will be entered into. Closing date is Friday 27 March 1992.

Name ...
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Please note that we do accept photocopies for this competition, but you still have to send in this corner flash with your entry as proof of purchase. Good luck.
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For improved performance, wide band reception, 25 to 1300MHz. Comes complete with protective rubber base, 4m RG58 coax cable and BNC connector. Built and designed for use with scanners.

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Most dipoles only have horizontal elements and this is the reason that they are not ideal for use with a scanner. Most of the transmissions that you are likely to receive on your scanner are transmitted from vertically mounted antennas. The Sky Scan V1300 discone has both vertical and horizontal elements for maximum reception. The V1300 is constructed from best quality stainless steel and aluminum and comes complete with mounting pole. Designed and built for use with scanners.

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- 450 R slotted feeder, per metre: £0.50 P&P: £0.10
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- URM76 50R coax, per metre: £0.40 P&P: £0.10

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- T15: 21MHz traps 1kW (pair): £39.90 P&P: £2.50
- T20: 14MHz traps 1kW (pair): £39.90 P&P: £2.50
- T40: 7MHz traps 1kW (pair): £41.90 P&P: £2.50
- T80: 3.5MHz traps 1kW (pair): £41.90 P&P: £2.50

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- RX-100 noise bridge: £69.95 P&P: £2.50
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New receivers from AOR.

The research and design team of AOR has been very busy in the preparation of exciting new models for 1992 and onwards.

The AR1500 is a hand-held wide band receiver featuring SSB as standard, many said it couldn't be done! Coverage is from 500kHz to 1300 MHz with no gaps. Channel steps are programmable in multiples of 5kHz and 12.5kHz. Modes available are NFM, WFM, AM and SSB (USB, LSB & CW with the BFO switched on). Many features have been carried across from the popular and reliable AR2000 receiver but fitted into an even smaller cabinet. The AR1500 truly has to be seen to be believed. There are 1000 memory channels and the usual AOR collection of search, lockout, priority etc. Power is from an internally fitted NiCad pack or from an external 12V DC source. All accessories are provided to enable you to switch on and start listening. All this from a small cabinet of approx 170mm (H), 55mm (W), 45mm (D) excluding projections except aerial. The weight is a mere 345g with NiCads fitted.

The AR3000A is a follow-on from the highly acclaimed AR3000. Many major improvements have been implemented at the request of enthusiasts. The tuning control is now ‘free running’ to provide a smooth feel for SSB/CW, x10 buttons have been added to make step size faster and more convenient. All information is contained on the LCD instead of a separate status LED indication. The AR3000A has a switch on the rear panel to enable/disable operation. Memory clear and full microprocessor reset functions are available from the front panel. The re-writing of microprocessor firmware using an even more efficient language has further increased scan and search speeds.

There are more new products on the way including ACEPAC3-A, WX2000 facsimile decoder/printer, WA5000 active aerial etc. Please send a S. A. E. (34p) for further details on these exciting new models and the AR2000, AR2002, AR2800, AR2500, DA3000, ACEPAC3 etc.

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February 16: The Welsh Mobile radio rally will be held at the Barry Leisure Centre, off Holton Road, Barry, South Glamorgan. Doors open 10.30am and 10am fordisabled visitors. There are 15 stands, Bar & Buy, refreshments and free parking. Swimming pool available. Talk-on S22. GW44RS. For further details, contact Peter GWBBAB on (0656) 789552.

February 23: The Kidderminster & DARS rally will be held at the Here Cheshire School, Hebburn Road, Kidderminster, Worcs. Doors open 10am. GAJTL. Tel: (0384) 894019.


February 29: Tyneside ARS have arranged a new venue for their annual radio show in the world. This year there will be held at the Harry Centre, off Holton Road, Barry, South Glamorgan. Doors open 10am. Upper Wick Country Fair, the location being on the M5. Free parking. Two halls of trade stands. Bar & Buy and mobile snack bar. Further displays and full refreshment facilities in the club room bar, which is to open throughout the day. Doors open 10am. Talk-in on S22. More details from G4T5W, Mid-Davon Rally, PO Box 3, Tiverton, Devon.

March 22: Pontefract & DARS have their annual Compos Fair & Spring rally at Carleton Community Centre, Carleton, nr. Pontefract. Doors open 11am to 4.30pm. Admission by prize draw. Talk-in S22. Entry 50p. Details from G30DE on (0977) 670067 or from G3AOO (0977) 641301.

March 28: Bournemouth Radio Society's 5th annual Amateur Radio, Electronics and Computer Sale will be held at Kinison Community Centre, Pelhams, Milhamds Road, Kinison, Bournemouth. Doors open 11am. Admission is 50p, including a prize draw ticket. Light refreshments available. Talk-in on S22. For further details of table bookings, etc., contact Vic GB4KX on (0202) 353593 evenings after 6pm.

April 5: The Launceston 6th amateur radio rally will be held at Launceston College. Doors open 10.30am. Maggie. Tel: (0409) 212197.


April 26: The Bury Radio Society are holding their annual rally/Hamfest at 'The Castle Leisure Centre', Bolton Street, Bury, Lancashire. Details from Laurence Jones G4KL7 on 061-762 5308.

May 4: Dartmoor Radio Club rally is to be held at St. Pauls Church Hall, Yelverton. Doors open at 10.30am. Free parking, usual traders, refreshments, Bar & Buy. Details from George Spray on (0882) 953885.

May 17: The 35th Northern mobile radio rally will take place in the flower Show Hall at the Great Yorkshire Showground, Harrogate, north Yorkshire. Showground opens 10am, doors open 10.40am. Talk-in on S22. Bar & Buy, bar and cafeteria. Free parking and loads of stands. Entry and parking of Wetherby to Harrogate Road. Separate arrangements for visitors off Hockstone Wood Road. Details from Mike GMKMK on (0423) 564553/570753 or Fax (0423) 209992 or 0G7ZYM.

June 7: The Northampton Radio Club will again be holding their Radios Computer & Electronics rally at the rear of the 'Red Lion' public house, 500 yards from junctions M45 westbound, A14 and M1. This year there will be four rooms instead of stalls, as they have booked an extra field just for parking. Doors open 10am. Pub and cafe open all day. Talk-in on S22 and on GB3NH (RB3) and 1.933MHz. All enquiries to Paul Yeung on (0322) 412768.

*June 14: Royal Naval ARS have their annual mobile rally at HMS Mercury, Nr. Pettsfield, Hants. There will be dozens of trade stands; a Bar & Buy; flea market; radio-controlled power boats and trains; local radio clubs and repeater groups; children's rides and amusements; vintage fire engine; TV detector van; icers and refreshments; arts and crafts' exhibition; two grand raffles; spectacular arena displays and other attractions, making this a great day out for all the family. Talk-in on 144 and 430MHz, free parking and picnicking, free admission for children, adults depend on guide dogs. For full details, contact Cliff Harper G4JRJ, 34 Neva Road, Bittersone, Southampton SO2 4JF. Tel: (0703) 957469.


June 28: The 35th Longleat amateur radio rally. Details from Shaun GBVPJ on (0225) 673898.

June 28: The Bromsgrove ARS will be holding their second Mobile Radio Ham rally and Car Boot Sale at the Longleat Holiday Village, the location being on the A46 on the M1, junction 24. Doors open 11am. Access from M6, junction 23 eastbound. Details from Philip G4F5SD on (0484) 644627.

DAYTON '92 is the biggest amateur radio show in the world. Reserve your seat now...we really don't want to leave you behind!

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**SO DON'T MISS THE DAYTON '92 HAMVENTION HOLIDAY!**

Last year's trip to Dayton '91 was a resounding success, and readers have clamoured for more. So, here we are again, with your personal invites to you and fly with us to Dayton Ohio, home of the Hamvention. Enjoy yourself at the biggest amateur radio show in the world. Reserve your seat now...we really don't want to leave you behind!

Five Nights In Dayton

The Dayton '92 holiday starts at Gatwick airport on Wednesday 22 April, when we fly to Charlotte in North Carolina. After changing aircraft in Charlotte, we fly straight into Dayton. When we arrive, accommodation is no problem, as we'll be staying for five nights in the Day's Inn in the heart of downtown Dayton.

Our stay gives you plenty of time to explore the giant Hamvention and many of the local attractions.

We'll be returning home via Charlotte on Monday 27, but we can also arrange extended stays and there's even a special extra holiday in Florida available to tempt you further!

Marvellous And Cheap

Food in the USA is marvellous, and so cheap! There's so much to see, do and eat during the trip, plus of course all the many radio bargains. If the family would like to come, make sure they do, as there's so much for everyone on this trip.

The cost of this superb opportunity is £579.95 per person. But don't worry, you only have to pay out £75 now to reserve your seat, with the balance payable before departure.

Want To Know More?

If you want to know more, you can call Roger Hall G44NT on 071-731 6222, for further information, or anytime during the day, evening or weekends. Alternatively, you can call PW's Hamvention Holiday, Bob Mannion G3XFD, during the day Monday to Saturday 10am to 6pm on (0202) 678558. Rob led our party on the Dayton '91 trip, and he'll be glad to talk about the trip, the excellent food holiday, and the wonderful time everyone had at the Hamvention. You'll be able to join him again and enjoy the fun of the '92 trip, if you book now!

Send your cheque for the £75 deposit to: Dayton '92 Hamvention Holiday, The Publishing Ltd, Eneco House, The Quay, Poole, Dorset BH15 1PP.
Tuesdays are Lecture/Talk nights and other Tuesdays are general natter nights with the club’s ‘new’ rigs on the air. Current interest comes from Colin Foulkes ‘The Lair’, 5 Pinewood Crescent, Holcombe Brook, Ramsbottom, Bury BL6 3XE. Tel: (0208) 883212.

Bradford ARC meet 1st Tuesdays, 7.30pm at Marcon College, Arbour Lane, Chelmsford, Essex. More details from Roy & Ela Meryr G3PMX & G8GEM. 1 High Houses, Massey Road, Great Waltham, Essex CM3 1EL. Tel: (0494) 360545.

Bede Valley RC meet 1st Thursdays, 7.15pm at The Studio, Penrhos Road, Colwyn Bay, Clwyd. March 5 is a talk by John Lawrence G3MRF on ‘Digital Amateur Radio’. For further details, contact Meryl Jones GW4NML, 72b Princes Drive, Colwyn Bay, Clwyd LL29 8PW. Tel: (0452) 530725.

Cornish RAC meet at the Memorial Hall, Perranwell Station, Perranwill, nr. Truro, 7.30pm. For further information, please contact Mr G. Bate, 9 Tresithney Road, Carharrack, Redruth, Cornwall TR6 9ZQ. Tel: (0209) 360048.

Barnsley & District ARC meet Mondays in the radio club room and sharers, at the rear of the Darton Hotel, Station Road, Darfield, Barnsley. For further information, ring Ennie G4LUJ on (0226) 716329.

Bedford & District ARC meet Thursdays, 8pm in the Allen Club, Hurst Road, Bedford. More details from Gavin Carmichael, 15 Evesham Court Avenue, Bedford MK41 7AJ. Tel: (0234) 356600.

Bradford ARC meet 2nd & 4th Thursdays, 8.55pm at the Polish Ex-Service Club, Sheepbridge Road, Bradford, West Yorkshire. February 13 is Display & Discussion - bring your homebrew equipment, the 27th is a Quiz night and March 12 is a social evening. Charles Bolt G4ACX on (0247) 496569.

Braintree & District ARC meet 1st & 3rd Mondays, 8pm at the Community Centre, Victoria Street, Braintree. M. Andrews, 22 Ar芝麻 Grove, Braintree, Essex CM7 5UJ. Tel: (0376) 27431.

Brighton & District ARC meet 1st & 3rd Wednesdays, 7.45pm at the Roast Beet Bar, Brighton Racecourse, Elm Grove, Brighton. More details from Harold Lunden G3WJR, 17 Tongeran Drive, Brighton, East Sussex BN1 5UJ. Tel: (0273) 501100.

Bromsgrove & District ARC meet Fridays at Avoncroft Arts Centre, South Bromsgrove, Worcester. February 14 is Question & Answers (Team). More details from Joe Poole G3MRC on (0562) 710010.

Bromsgrove ARC meet at Licky End Social Club, Alcester Road, Burton, Bromsgrove. Mr D. Edwards G4ZWR, 2 Mason Close, Headless Cross, Redditch, Warcs B97 5DF. Tel: (0531) 546075.

Bury & District ARC meet Tuesdays, 8pm in The Mosse Community Centre, Cecil Street, Bury, Lancashire. 2nd
7:30p on 'The Norfolk Dumpling'. The Live stock Market, Horsham. February 19 is 'Science For All' by Arnold Tomalin G3TPB, the 20th is an informal talk on 'The Simple HF Antennas & ATUs' by Stuart Lane G3XVO and the 11th is a 'Real Radio' evening. Jack Simpson G3JKQ, 36 Parkside Drive, North Bristol.

North Bristol ARC hold their meeting at the S.H.E., 7 Brearly Crescent, Nottingham. Brian G0LJH on (0450) 616257.

Nottingham ARC meet Thursdays, 7.30pm at the Sherwood Community Centre, 439 Bramcote Road, Nottingham. February 13 is a series of mini-talks on 'Receivers', the 20th is a WAB Activity and Construction evening, the 27th is a talk on 'Construction'. This radio club has an open meeting on the 5th and the 12th is a talk on 'Packet Radio For Beginners' by a beginner and an expert.
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Practical Wireless, March 1992
Getting Started - The Practical Way

We've already built an audio oscillator in this series, in the form of a multivibrator. The value of the multivibrator lies partly in its signal which is rich in harmonics. This means the output signal can be heard over a wide range, even as high as radio frequencies (r.f.).

As an audio oscillator, the square wave produced by the multivibrator is, to say the least, an unpleasant sound. But don't worry, we're going to build another audio oscillator, and this one will be capable of producing a pleasing audio tone. It will have a variety of applications, and one obvious idea, is using it to produce a tone for a Morse practice oscillator.

**Phase Oscillator**

The oscillator this time, will be of a type called a phase shift oscillator. The diagram, Fig. 1(a), shows a representation of a signal, in the form of a single cycle of an a.c. waveform. The shape of the signal is that of a sine wave.

The diagram in Fig. 1(a), is in the form of a graph. The amplitude (amount or strength of the signal) is represented by the height and depth scales, with the diagram 'moving' along in time. Mathematics students will already know them as the X and Y axis.

The signal rises from zero to the maximum positive value, then back through zero, to the maximum negative value and then back to zero. This is called a complete cycle.

Again, readers with a little mathematics training will see that the angle of the signal changes in degrees, from 0 to 90° at top, then 180° at the half cycle point, 270° at full negative, and then 360°, completing the 'circle'.

I'm not going to delve into a.c. theory here, but if you're not sure of the techniques, there are many excellent textbooks dealing with the subject.

**Editorial note:** The well-known Common Core series of books Basic Electricity, and Basic Electronics, have particularly good graphics and text explaining a.c. theory. Most libraries still have this series available. The *PW* reprint *Passport To Amateur Radio* (available from the Book Service) also covers basic theory very adequately and at a very modest price.

**Two Signals**

The diagram in Fig. 1(b), shows what happens if there are two signals of the same frequency, and one lags slightly behind the other in time. We could measure this difference in time, but it is usual to measure it in degrees of angle.

The relationship between the two signals is called the phase. Phase is another word for time, and no doubt you know that we talk about the various 'phases of the moon', when the times for the various 'shapes' (crescent, half and full) are discussed.

Phase, in electrical terms, is measured in degrees, which naturally means that a phase degree is 1/360th of a cycle. In Fig. 1(b), the signal A leads the signal B by 90°. Their phase difference is then said to be 90°.

In Fig. 1(c), the phase difference between A and B is 180°. For those who enjoy mathematics, there are plenty of text books which will explain this further. However, for those of you who hate mathematics, I can only suggest you bear with us, as this simple little excursion into theory will help you understand how our oscillator project works.

**In Phase**

We've already found out that if a signal is fed back from the output to the input of a suitable circuit, in-phase, it can be made to operate as an oscillator. The diagram, Fig. 2, shows a circuit often known as a phase-shift oscillator.

The transistor in the circuit is arranged in what is called the common emitter configuration. The collector goes to the ground end of the circuit.

This arrangement of a transistor gives an output signal that is 180° out-of-phase with the input signal. All we need to do, to make the transistor oscillate, is to add another 180° of phase shift.

**Seemingly Complex**

If you look carefully at the seemingly complex arrangement of resistors and capacitors between the collector (output) and the base (input) of the transistor. On closer inspection, you'll see in fact that it's really quite a simple circuit.

The circuit can be considered as two 'T's formed by C1, C2, R1 and R2, R3, C3 either side of ground. This is a filter design known as a twin-T network.

---

Fig. 1(a): A representation of a signal, in the form of a single cycle of an a.c. waveform. The shape of the signal is that of a sine wave.

(b) This shows what happens if there are two signals at the same frequency, and one lags slightly behind the other in time. The difference could be measured in time, but it is usual to measure it in degrees of angle.

(c) The phase difference (see text) between A and B is 180°.

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This month the Rev. George Dobbs G3RJV takes a look at shifting phase, oscillation and sending Morse code before winding up with the completion of the two part Oscamp project.

---

Practical Wireless, March 1992
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Practical Wireless, March 1992
The circuit's job is to change the phase of the output signal by 180°. This, when added to the phase change produced by the transistor, provides a 360° phase-shift between the output and the input.

The output signal is changed by the 'extra' 180° to allow it to go back into the input with a phase change of 360° (one full cycle). This action places the output signal back in-phase with the input signal, thus causing the circuit to oscillate.

**Frequency Of Oscillation**

Because the in-phase oscillation only occurs at one frequency, the frequency of the oscillation is controlled by the values of the twin-T network. The values here provide a pleasant sound just below 1kHz.

With careful choice of R4 for an individual transistor, a very good sine wave signal can be produced. The value of 10kΩ is a compromise, which appears to suit most examples of the BC183 transistor.

The output is taken from the centre of half of the twin-T network by the capacitor C4. A variable resistor, R5, allows you to choose a suitable output level.

**Good Workhorse**

I'll put a word in on behalf of the BC183 transistor. It's a good 'workhorse' and reasonably priced device. However, take heed, and don't directly substitute the BC183L transistor which may seem to be suitable, whereas in reality isn't!

This is because although electrically identical, the BC183L version has a different lead-out arrangement. Because of this, the two transistors are not interchangeable without altering the placement of the leads in the circuit layout. The BC183A, B or C are all fine for this circuit, but please remember to avoid the BC183L version.

**The Layout**

The layout for the oscillator circuit using 'perfboard' is shown in Fig. 3. The layout was derived by using the 0.1in graph paper and pencil method outlined in the last part of this series.

The layout has been arranged with plenty of space for ease of construction. Pads have been included to allow leads to go to a front panel-mounted level control, R5.

The diagram, Fig. 4, shows the layout for a p.c.b. The diagram illustrates the copper track side.

**Simple To Build**

The circuit is very simple to build. With the exception of the transistor, there are no polarised components to worry about which is the correct way round on the board.

Even the capacitor types are not critical. I used the cheaply available disc ceramic types. The level control, R5, is a linear track carbon composition potentiometer.

After building the board, and checking the component placement and soldering, it may be bench tested. This is done by applying the output to a pair of headphones, or even a small loudspeaker.

Testing in this way will not provide a very good match to the circuit, but it will produce an audio output to show that the board works.

A 9V PP3 size battery will provide a suitable supply for the oscillator board. A simple on-off switch, can be added. The output goes to a suitable socket, and I used the common and inexpensive 'phono' socket for this purpose.

**Ideal Companion**

The oscillator makes an ideal companion for the audio amplifier built in the last month's 'Getting Started'. Together, they can provide a useful piece of test bench equipment, which will produce an audio signal, and amplify an audio signal.

The two units can be used together to make a pleasant tone generator, which can be used for Morse code practice. As you've probably noticed, many Morse practice oscillators produce an unpleasant rasping tone. This one doesn't, and it can be used for hours without listener stress!

**Aluminium Box**

I built the Oscamp project into a Minffordd aluminium box, type A25 76 x 140 x 38mm. The method is a little odd, in that the top of the box is used as the front panel, and both boards are mounted along one side of this section.

The front panel is very simple. Both the oscillator and the audio amplifier have three front panel mounted components. Each has an on-off switch, wired to the same PP3 battery.

Each unit has a potentiometer control. There's a volume control for the audio amplifier and a level
control for the oscillator.
Both units have a phono socket. One is for the output of the oscillator and the input of the audio amplifier. A small, (50mm diameter) loudspeaker for the audio amplifier completes the front panel.

Using The Oscamp

The completed Oscamp can be used as either an audio signal source, or a test bench audio amplifier. These are both useful in their own ways.

By connecting the oscillator to the amplifier, an audio tone is produced in the loudspeaker. As I’ve already suggested, it then makes a fine Morse practice oscillator.

To use the Oscamp as the Morse code practice unit, all we have to do is connect the output of the oscillator to the input of the audio amplifier. The phono sockets are designed for screened leads.

To ‘key’ the unit as the Morse oscillator, we only need to join, and interrupt, the centre connections on the phono sockets. The ground return lead is then made through the box.

Switches On

Obviously, both switches must be on to power the boards. The oscillator level control and the amplifier volume control will both vary the output from the loudspeaker. Which do we use? The answer is both of them!

If the oscillator overloads the amplifier, the tone will be less pleasant. However, if the amplifier is turned up too much, the internal noise of the amplifier will produce a hiss over the tone.

Like many things, the answer is compromise. A little bit of oscillator, and a little bit of amplifier and you’ll soon get the hang of it.

Anything else to bear in mind? Well, the answer is yes. Use a good Morse key, practice a little everyday, get the receiving right before you begin to send, etc., and you’ll do well. Have fun using your Oscamp, and I’ll see you next time.

PW

---

Can You Help?

Ken Llewellyn of 1 Heol Nant Castan, Rhiwbeina, Cardiff, Wales CF4 6RP, needs some help in repairing a 'global clock' by Union Electronics. It is a silver globe with tiny lights, which indicate cities, and below the local time is showing.

He cannot recall where he has seen this clock advertised, but has certainly seen it in more than one magazine. Now, a fault has developed and his local clock repairers are unable to repair it. He would like to know the address of the UK agent or service people, and would be very grateful if anyone can help.

Mr Gordon Harris, 31A Sea Road, Bexhill-on-Sea, East Sussex TN40 1EE, needs some help in trying to locate a component to replace one which is damaged in his ‘Nova Pal’ radio and direction finder.

It has been suggested that he use a potentiometer (the damaged component) with a 2-way switch and incorporate a second 2-way switch mounted separately. This can be done, but he would much prefer to find a replacement for the existing component which incorporates the two 2-way switches, but this is difficult to find. Can anyone help?

Harold Orriss, 7 Parkwood Avenue, Wivenhoe, Colchester CO7 9AN, is looking for a valve manual that went with the Taylor valve tester, series 45. He will gladly refund any costs incurred.

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Shopping List

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<th>Semiconductor</th>
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<th>Miscellaneous</th>
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<tr>
<td>Single-pole on-off miniature toggle switch, PP3 type battery connector, (suggested) Minfordd aluminium box type A25.</td>
</tr>
<tr>
<td>Sources: All the parts are common and may be obtained from most component traders. The BC183 (and other parts) available from Marco Trading, The Maltings, High Street, Wem, Shropshire SY4 5EN. Tel: (0993) 32763.</td>
</tr>
<tr>
<td>Suitable case from Minfordd Engineering, Sun Street, Ffestiniog, Gwynedd, Wales LL41 4NE. Tel: (0766) 762572.</td>
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Practical Wireless, March 1992
The Vectronics VC300-DL Antenna Tuner

Ron Stone GW3YDX, had heard about the Vectronics antenna tuner and was very interested in reviewing it. So, we thought it would be a good idea for Ron to take a look at this Canadian product, and share his thoughts with readers.

The Vectronics VC300-DL antenna tuner is imported into the UK by ICS Electronics. The tuner was previously marketed by AEA as the QT-1, but is now imported directly from the manufacturers as the VC300-DL. Having previously reviewed the MM-3 'Morse Machine', in PW a while ago, I was very keen to have a look at another product available from ICS.

The tuner duly arrived. It was well packed in a stout cardboard box, and came complete with a 10-page owner’s manual.

I have had quite a few antenna tuning units pass through my hands over the years, so I have had a lot of practice in using them. However, for the purpose of this review, I would aim at ‘pretending’ I was a complete novice in the art of using antenna tuners. In this way, the value of the user-manual could be properly tested.

Variety Of Antennas

I had a variety of antennas available for the tests. They ranged from 144MHz verticals, to h.f. beams and verticals.

In addition to the usual antennas, I also erected a GSRV and a 40m ‘long wire’, to see just how well the VC300-DL would match my various rigs to these old ‘favourites’.

The unit was reasonably sized, measuring 89 x 264 x 239mm. The physical construction of the VC300-DL has been well thought out, with all the controls clearly labelled, and easy to use.

The internal impedance matching circuit consists of a T-match network. This is used in conjunction with a tapped inductor, and series variable capacitors on the transmitter and antenna sides of the inductor. There is also a dummy load facility, and the makers provide indication of both r.m.s. and p.e.p. on the meter.

Dual Meter

The meter, can be illuminated by supplying 12V a.c. or d.c. to a connector at the rear. It’s of the dual type, and the double-movement instrument displays forward and reflected power.

The meter is switchable to 300W forward, 60W reflected or 30W forward and 6W reflected simultaneously and an additional v.s.w.r. scale. The v.s.w.r. is indicated where the two needle pointers cross on the meter scale.

An output selector switch is built-in, and metering is provided irrespective of its setting. The selectable options are as follows:

1: Selects ‘straight through’ to one rear panel-mounted SO239 connector. This output would be used with antennas that require no matching.
2: Selects ‘straight through’ to additional SO239 connectors, marked ‘Coax 1’ and ‘Coax 2’, or to connector ‘Coax 1’ and ‘Coax 2’, via the internal impedance matching circuitry. This would be useful, if for instance, a dipole that has been cut for one end of 3.5MHz, and the occasional use of the other end of the band was required.
3: Selects and connects the matching network to a single wire antenna or one fed via a balanced feeder, such as a G5RV. A 20m long wire could be a reasonable direct match to 50Ω on 3.5MHz, but if it was used as a half-wave on 7MHz, a high impedance would be presented to the transmitter, and a matching network would be required.
4: Connecting into a dummy load. There’s a rather nice little trick they’ve used here, in that the dummy load option can be selected at either end of the rotating switch limits. This saves time, and a lot of unnecessary switch contact wear.

The rear panel connections are SO239 type connectors to the transmitter output and coaxial antenna feedlines. Banana-type jack plugs (screw or plug-in) are provided for wire terminations. Additionally, there are connectors for the 12V d.c. for the lamp illumination, and also an earth (ground) post.

Interestingly enough, I found that the instructions didn’t give any guidance on the use of the earthing post. This is surprising, as when an end fed wire antenna is used, radio frequency interference (r.f.i.), can often be reduced and tuning eased, by the connection of a counterpoise A4 wire to an earth-post.

Operation Quite Easy

Operation of the tuner was quite easy, although I found I needed a steady hand on 28MHz. This was because the tuner controls weren’t equipped with slow-motion drives.

I found that the user manual was clearly written, and the suggested setting of the controls was a
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Practical Wireless, March 1992

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Table 1. Comparison table showing both the measured power output with the a.t.u. by-passed in 'straight through' mode, and in use to match the load, with the resulting insertion losses.

<table>
<thead>
<tr>
<th>Frequency</th>
<th>Straight Through</th>
<th>Using Tuner to Match Load</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.9MHz</td>
<td>10W</td>
<td>8.7W</td>
</tr>
<tr>
<td>3.6MHz</td>
<td>100W</td>
<td>90W</td>
</tr>
<tr>
<td>7.1MHz</td>
<td>100W</td>
<td>93W</td>
</tr>
<tr>
<td>14.2MHz</td>
<td>100W</td>
<td>93W</td>
</tr>
<tr>
<td>21.3MHz</td>
<td>100W</td>
<td>92W</td>
</tr>
<tr>
<td>28.6MHz</td>
<td>100W</td>
<td>86W</td>
</tr>
</tbody>
</table>

useful guide when I tuned an antenna for the first time. This information would be particularly useful to anyone unfamiliar with antenna tuning units.

I tested the tuner into nearly all the antennas at my QTH. Using a transmitter on 1.8MHz, the a.t.u. matched a 10m length of coaxial feeder with a 70MHz dipole on the other end, to 1:1 v.s.w.r. quite adequately, and coped with the maximum legal output on the band without any strain!

After that little excursion, the more usual types of antennas were tested, and the transmitter matched into the load. With patience, I found that all the antennas could be tuned to a 1:1 v.s.w.r., as indicated on the VC300-DL, and on the internal meters on the rig. The user guide had space so that the settings, once they had been found, could be recorded for future use.

**Power Losses**

The next test I carried out, was to see how much power was lost in the matching circuit. To carry out this test, I connected an external power meter in the line between the VC300-DL and a 50Ω dummy load.

I measured 100W into the load using the 'straight through' position for 'Coax I' and the output then run via a matching network, tuned for an indicated 1:1 v.s.w.r. on the a.t.u.'s meter. The results I obtained are shown in Table 1.

Metering of both the r.m.s. and p.e.p. levels was accurate to 7%, using a calibrated external reference (but see my comments on p.e.p. readings later).

Although the measured losses in Table 1 may appear to be significant, at worst they are actually only fractions of a dB, and are unlikely to be noticed when you're on the air. However, if the transmitter is working into a poor match for a transistorised p.a. (particularly), protection circuitry is likely to limit the r.f. power output.

**Older Equipment**

Some older equipment, fitted with a transistorised p.a., will automatically protect and limit output to 30W or so, from around 100W in the presence of a 3:1 s.w.r. A power reduction of that level, is around 4dB. That's the best part of a 5-unit, and it probably would be noticed on the air. However, if you'll probably realise the benefit of having a tuner, if the load is likely to be a significantly mis-match to the p.a. output impedance.

Even quite good broadband antennas, such as my TH7DX, which is rated for 'below 2:1 v.s.w.r. over the entire 28MHz band', cause my TS930 to dismantle the meter and gently bend the needles to the p.a. output. It provides an extra safeguard, particularly if you are using antennas that are mismatched to your transmitter output. It is a firm method of fixing the meter face. This isn't good practice, so I had to dismantle the meter and gently bend the needles until clearance was adequate. This operation demands a steady hand, and some knowledge of meter movements to avoid further damage. It also probably invalidates the guarantee!

**Conclusions**

The VC300-DL is a useful device, especially if you are using antennas that are mismatched to your transmitter output. It provides an extra safeguard, particularly if you are using equipment with a solid state p.a.

The tuner switching arrangements and the internal dummy load is especially flexible. The VC300-DL is also 'user-friendly', as is the well-written and useful owner's manual.

Power handling capabilities are unlikely to be a problem whatever transceiver is used, neither is the final antenna load likely to be a problem. The a.t.u. also appears to be capable of handling 400W p.e.p. output into reasonable loads, despite its 300W rating.

Only minor problems were noted with the review unit, and I would buy one myself. There is also a cheaper version available. This model, the VC300 tuner, has no dummy load or meter illumination fitted.

**Constructional Comment**

On the constructional side, perhaps one or two comments won't be out of place. For example, I noticed that the SO239 antenna connectors and the internal earthing connections to the case, used rivets rather than nuts and bolts.

Although the a.t.u. provided a secure enough fixing on the new tuner I reviewed, rivets have a habit of eventually working loose, and they would need a periodic check to stop any problems.

When the unit was in use, I found that the p.e.p. metering didn't have a peak-hold facility. As a result, normal speech would give an indicated 50W or so for a true 100W p.e.p., as measured on an oscilloscope, and this could be misleading. Only a prolonged 'WAATALO', spoken into the microphone on my rig provided a 100W p.e.p. indication on the meter.

Although the a.t.u. is generally well-built, the meter is only held in place by one internal bracket on the rear of the assembly. Moving coil meters are delicate instruments, and a firmer method of fixing would be better.

In fact, the meter had been shaken up in transit from the USA, as during the test period, there were several occasions when the meter needles got stuck, at the point where they intersect, due to inadequate clearance between the two pointers.

I found this rather annoying, and the only way to clear the fault was to rap a fingernail against the meter face. This isn't good practice, so I had to dismantle the meter and gently bend the needles until clearance was adequate. This operation demands a steady hand, and some knowledge of meter movements to avoid further damage. It also probably invalidates the guarantee!
Antenna System Losses

Part 1

The notes and charts that follow, apply to any antenna using a 50 ohm coaxial cable transmission line but no antenna tuning unit.

An ideal antenna system is one whereby the transmission line has no loss. In other words, the antenna offers no attenuation, and the antenna input impedance exactly matches that of the transmission line and which, in turn, matches the output impedance of the transmitter. See chart 1, Fig. 1.

The reflection coefficient will therefore be zero, and the standing wave ratio (s.w.r.) measured at the transmitter output to transmission line will be unity. (ratio 1:1). * All the power from the transmitter will then reach the antenna.

Impedance Mismatch

If an impedance mismatch exists between the transmission line and the antenna, then some of the r.f. energy reaching the antenna will be reflected. * See chart 2, Fig. 2.

The reflection coefficient will assume a 'finite' value, which means that the load resistance (R) (the antenna) will be greater or less than the transmission line impedance (Zo). In this case, the s.w.r. increases, so the 'measured ratio' (at the transmitter) will be higher than 1:1. ALL r.f. power, reflected from the antenna, then re-enters the transmitter and is absorbed. This reflected power is lost to the antenna.

Attenuation Factor

All transmission lines, and especially coaxial cable, have a nominal attenuation factor proportional to the frequency of operation. Any r.f. power from the transmitter (and reflected power) is therefore attenuated.

This attenuation factor will be N dBs, according to the total length of line in use, and the frequency at which the system is being operated. The r.f. power thus attenuated, is also lost to the antenna.

Remember that: Power dissipated by resistive and other losses due to the antenna itself is not radiated.

Performance Evaluation

The data charts are simple to use, and will provide the foregoing and other information, without you having to resort to complex mathematics. But do remember that: The information provided by the data charts assumes that no a.t.u. is employed.

* To make full use of the data charts, the following information is required.

* (a) The total attenuation in dBs for the full length of coaxial cable (transmission line) in use at the frequency of operation.

* (b) The s.w.r. as measured at the transmitter output. If a linear amplifier is used, it is assumed that the s.w.r. meter is connected between its output and the transmission line.

* (c) The r.f. power output from the transmitter and/or the linear amplifier (if used).

* (d) Antenna gain (if any) in dBi (dBi means dB gain referenced to a dipole).

Obtaining Performance Factors

Using the information I've already provided, in conjunction with the data charts, the following antenna performance factors can be obtained:

* Percentage of power supplied by the transmitter available at the antenna for radiation, when the s.w.r. is greater than unity (1:1) and the total transmission line (coaxial cable) attenuation is greater than 0 dB.

* The s.w.r. at the antenna itself (for the above conditions).

* The effective radiated power from antennas having N dB gain over a dipole (less the power lost by s.w.r. and cable attenuation).

* Conversion: Percentage power to power in watts.

* Conversion: dB watts to actual power watts, or vice versa.

* Reflection coefficient (Chart 1).

---

Fred Judd G2BCX, like everyone else, has had to deal with the problems associated with matching antennas, and overcoming s.w.r. difficulties. However, with an experienced guide like G2BCX passing on his experience, a complex subject is made easier to understand for those of us who are interested, but daunted by the theory.
Using The Charts

The charts are used as follows:

* Chart 1: As described in introduction.
* Chart 2: Percentage of r.f. power available at the antenna for radiation. First step - find the s.w.r. as measured at transmitter or linear amplifier output. Then find the total coaxial cable loss in dB. From these, you will be able to find the percentage of power from the transmitter available at the antenna. (Example on chart). * Power in watts from percentage = transmitter x % power/100.
* Chart 3: Examples of total loss (dB) for commonly used coaxial cables and lengths. Total length may be to nearest 0.5m. Note: The cable attenuation from approximately 20MHz down, may be taken as 0.5dB for a total length not more than approximately 12. (M)UR76 is included to show high loss at v.h.f. Data: Other cables and frequencies from manufacturers.
* Chart 4: Total power radiated from an antenna with directional gain. This could be any form of beam antenna, or collinear system and taking s.w.r. and coaxial cable loss into account, but assuming no loss due to the antenna itself. From Chart 2, determine the total power (in watts) at the antenna.

From Chart 4, find the antenna gain (dBd) and then the power gain (opposite column). Multiply power at antenna in watts by the power gain. For example: The s.w.r. is 1.2:1. The cable loss is 1dB. Percentage of the power at the antenna is 78.4%. Transmitter power output is 15W and power at the antenna is 11.76W. Antenna gain is 6dBd. Power gain is 4. Power radiated (assuming no antenna loss) = 11.76 x 4 = 47.04W and this is also known as effective radiated power (e.r.p.).
* Chart 5: Power at antenna in dBW. The amateur radio transmitting licence schedule issued by the Department of Trade and Industry, gives the r.f. power allowed for the various amateur bands in "dB Watts". Some operators may find this confusing, particularly when they are trying to determine the r.f. power available at the antenna as effective power to be radiated (e.r.p.) in actual watts or, for certain bands, in dBW.

Chart 5 gives dBW from 10 to 40 and related power in watts. This chart will convert:
(a) Transmitter power output in actual watts to dBW, or vice versa.
(b) Effective radiated power (e.r.p.) in actual watts, or in dBW, from an antenna with a gain greater than unity, in other words, greater than 0dBd.

Worked examples:
1: Transmitter r.f. power output = 100 which = 20 dBW.
2: The above r.f. power (100W) reaching the antenna after losses due to s.w.r. and cable attenuation, has been verified as say 79% or 79 actual watts (9dBW). The antenna has a directional gain of 12dBd, which is a power gain of 15.85 (round-up to 16). We assume there is no antenna loss, in which case, the e.r.p. = 79 x 16 = 1264W (1.264kW) or approx: 31dBW.
3: Frequency of operation 145MHz. The total r.f. power from the transmitter plus linear amplifier = 60W. The s.w.r. = 1:1, cable loss = 1dB. The power at the antenna = 79.1% or 47.6W (round up to 47.5W). Beam antenna directional gain is 16dBd, so the power gain is 39.81 (round up to 40). We assume no antenna loss, in which case the e.r.p. = 47.5 x 40 = 1900W (1.9kW) or approx: 33dBW.

Chart 6: This shows that the s.w.r. measured at the transmitter is always lower than the s.w.r. at the
antenna, when a mismatch exists between the transmission line and the antenna. This is because the reflected power from the antenna is attenuated by the transmission line, before it reaches the transmitter.

In other words the true s.w.r. would be that measured at the antenna (example provided on the chart).

The chart indicates that high s.w.r. at the transmitter and high transmission line loss, could mean a very high s.w.r. at the antenna. Note: With no cable loss the s.w.r. measured at the transmitter and the antenna would be the same.

For some h.f. and v.h.f. antennas an a.t.u. is employed. To help in this situation, I'm preparing additional data charts for this combination, and these will appear in Part 2.

**Fig. 6: Chart 6 (see text).**

---

**Whistle-Killer**

How many times have you found an interesting signal, buried in the midst of an annoying whistle? If only the whistle could be made inaudible without affecting the signal itself this would make listening so much more pleasurable. This was a problem I set about trying to solve.

I based my experiments on the Wien Bridge shown in Fig. 1. To understand how it works, assume we make resistor R1 the same value as R2, and capacitor C1 the same value as C2. At one frequency, the signal at point C (referenced to ground) would be in-phase with the input signal (referenced to ground), but with only 1/3 of the input signal level (also referenced to ground). At all other frequencies the phase and output level change. As this output signal is in-phase with the input signal, the network appears as if it were resistive, but only at this frequency. If we were to arrange a resistive divider (R3/R4) to have the same ratio, then with reference to point D, point C would have no signal difference (but only at this frequency). So, to get rid of the whistle we change the circuit values to match the whistle frequency, and take a signal out between points C and D. This means keeping point D at signal ground.

**Major Disadvantage**

This circuit has one major disadvantage. That is, that we already have a signal ground (point B). Putting in another signal ground would short out R4 and render the circuit useless. How can we overcome this problem?

**Difference Only**

The circuit of Fig. 2 is one answer that is simple to make and it works. We only want the difference between the signals, and so I used an old audio transformer to isolate the points from ground, but still allow the signal difference to be extracted. The transformer is one I found in an old radio, with about a 10:1 ratio. This reduces the loading on the output terminals, reducing the whistle to a minimum without much change to the other frequencies.

I fitted the switch S1 to allow the circuit to be by-passed when wanted. I also changed the resistors R1 and R2 (of Fig. 1) to a dual gang 100kΩ variable type (R1/2 of Fig. 2). This change allows the filter frequency to be altered for best effect. Combining R3 and R4 (of Fig. 1) into variable resistor R3 (of Fig. 2) allows the rejection depth to be altered.

Peter Jones
Fownhope
Hereford

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Where We Stay
During our holiday in Friedrichshafen, we will be staying for four nights in what is considered to be the best Hotel in town - The Buchorner Hof Hotel. Roger Hall G4TNT, has examined the Hotel Bar (very closeby), the rooms, and eaten in the restaurant, and he says it's certainly very luxurious.

The only minor problem is that most of the rooms are doubles. In this case, they really mean rooms with double-beds, not twin-beded rooms! This means that this trip is more suitable for couples, and so we can encourage more husband and wives or girlfriends to come. We have organised a couple of day excursions for the Friday and Saturday. One trip is to the beautiful Island of Mainau, famous for its flowers and topiary, and the other is into the heart of the Black Forest, the home of the cuckoo-clock. Both trips will provide delightful days out.

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A Simple Capacitor Checker

If you ever do any constructional work, even if it's only to build the occasional kit once in a while, it is always a good policy to make some checks on the components. You may ask why this is necessary, but although a bit of time is needed in building the unit, it avoids building faulty components into a project. Even if the project you're building doesn't work well, at least you'll know that the capacitors will be okay!

Easiest Items

The easiest items to check in a circuit are the resistors and capacitors. To check resistors, the Ohm's range on a bench-type multimeter is usually good enough, at least for commonly used values.

Testing capacitors is however, not quite as easy, but the circuit I've come up with provides an easily-built project. It's accurate enough for most jobs and with today's high prices in mind, can be built for a very low cost.

The Circuit

The circuit, Fig. 1, has few components. It uses an i.c., six capacitors, a similar number of resistors (most of these are variable types) two diodes and a moving-coil meter.

As we all know, meter movements don't come cheap and if your funds are low, a multimeter can be used instead, provided it can be switched to a full-scale reading of one or two milliamps.

The manner in which the circuit works isn't difficult to understand. A capacitor will not pass direct current, but on the other hand an alternating current will flow 'through' a capacitor, and a fairly simple rule-of-thumb exists.

If the value of a capacitor is fixed, the current passing through it depends on the frequency involved. The rule is that if the frequency is raised, the flow of current is increased too.

This effect works in the opposite direction too, in that providing the frequency remains the same, the greater the value of the capacitor, the more the current will flow.

Integrated Circuit

Now it's time to turn to the main circuit, Fig. 1, which is based on a 4011 i.c. Two gates, IC1a and IC1b, are used to form a simple oscillator.

One of five fixed frequencies is used, and they are selected by S1a and 1b. The square-wave that's produced (we'll consider it as being a.c. for this application) is taken through a third gate, IC1c, which functions as a buffer. This form of oscillator can be classed as a 'sure fire' type, and no trouble is likely to be found.

From pin 10 of the 4011, the square-wave is passed through the 'unknown' (the component to be tested) capacitor. Two diodes, D1 and 2, serve to rectify the square-wave to produce enough current to deflect the 1mA full scale deflection (f.s.d.) meter.

Stabilised Supply

When I built the prototype unit in the usual 'lash-up' form, it was powered from a stabilised power supply unit with a variable output. I soon noticed that even if the voltage was changed by even a fraction of a volt, the reading on the meter also altered.

Because of this, I thoroughly recommend that the unit be powered from a fixed voltage, stabilised supply. (Note: the author recommends that a 10V stabilised supply be used, but on our prototype we found that a fixed, 9V stabilised supply was adequate, provided this was to be the normal level. The important point to remember with this project, is that once the tester has been set-up at chosen working voltage, you must keep to that voltage, if you are to obtain meaningful results. Editor).

Assembling The Project

When you're ready to begin assembling the project, I suggest the following approach, as it will save you a lot of time and bother.

It's good policy if C1, 2 and 3 are 1% tolerance types (silver mica types). Others, such as C4 and 5 can be 5%, or failing that, even 10%.

You'll also need the same value capacitors, excepting the 10pF, but including a 1µF. These capacitors will be used in the final setting-up of the tester.

The pre-set variable resistors can be of any type that you've got handy. However, you will find that the larger types are easier to adjust than the smaller versions.

[Diagram of the circuit]

Construction

Even if you're only an occasional home-brewer, a basic capacitor checker is a most useful piece of equipment to have in the shack. John Cushing G3KHC, describes this simple project which can help you check all those 'bargain' components.
A Few Tips

To help you, I’ve got a few tips and hints to pass on. To start off, two ‘ways’ (5 and 6) of S1a and S1b can be wired together, as a five-way, rather than a six-way is needed, although you have to buy a six-way type!

Any wiring associated with C5 and 4, running to the switch, is best kept rigid. It should also be kept away from other wiring as much as is practical in your chosen layout.

Similarly, the wiring leading to the terminals for testing Cx (the unknown capacitor) should also be rigid and arranged so they are apart from other wiring. The un-used section of IC1, should be arranged, as shown in the supplementary circuit (top right) of the main circuit diagram, Fig. 1. This is done, so that the gates are not left ‘floating’, to avoid any problems.

Setting Up

When you’ve finished the building, there remains the job of setting-up the unit. To start the setting-up, set S1 so that C5 is in circuit, and then place a 1µF capacitor across the capacitor test terminals.

Switch on, and set the variable resistor, R6, so that the meter reads f.s.d. Next, you should try capacitors of less than 1µF across the capacitor test terminals, noting the reading on the meter as you do so.

Don’t worry for the moment, if the meter doesn’t indicate exactly what you expect. This may happen because you may be using components with a tolerance of 10% or even 20%. It may also be that all the errors add to each other, producing an odd reading.

This problem can be avoided if you can get the use of a good quality capacitance and resistance bridge. With the help of the bridge, you can measure some capacitors and pick some with close values.

Next, you should switch to use C4, and place a 0.1µF across the test terminals and set the variable resistor, R5, to give a f.s.d. on the meter. To further test the unit, you can place any odd capacitors across the test terminals, and compare the results with known, good, components.

You can now complete the setting-up procedure by selecting C3 in conjunction with R4, with a 0.01µF across the test terminals. Next it’s C2 in conjunction with R3, with a 100pF across the test terminals. The setting-up finishes with the selection of C1 and the adjustment of R2 with a 100pF capacitor across the test terminals.

Boxed Up

The finished project can now be boxed up in any way that’s convenient. Using the capacitor checker is easy enough, it’s just a matter of placing a capacitor across the test terminals, switching the power supply on, and changing the setting of S1 if necessary.
There's a possible objection to this method, as you may find the meter needle trying to wrap around the end stop! Meters don't like this, you may find the meter needle trying to wrap around the end stop! Meters don't like this, you may find the meter needle trying to wrap around the end stop! Meters don't like this, you may find the meter needle trying to wrap around the end stop! Meters don't like this, you may find the meter needle trying to wrap around the end stop! Meters don't like this.

Set S1, so that C5 (the 0.1µF capacitor) is in circuit. Make a reading, by switching on your power supply as before. Then you can switch through the ranges provided by C4, 3, 2, or 1 as necessary.

The last part of the construction is to make a scale to suit a pointer knob attached to S1. The scale should be marked 0.1µF, 0.1µF, 0.01µF, 1000pF and 100pF. (Note: The PW prototype's switch, shown in the photograph, is not marked in this way and has a range number instead, Editor).

All Finished

When the project is all finished, you can go through your junk box and use up those capacitors, especially all those with indistinct markings! You'll find it's a handy little unit which should be obtainable, and this is good enough for many applications.

---

**SHOPPING LIST**

<table>
<thead>
<tr>
<th>Resistors</th>
</tr>
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<tbody>
<tr>
<td>Carbon film 5% 0.25W</td>
</tr>
<tr>
<td>12kΩ</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>R1</td>
</tr>
<tr>
<td>Resistors variable (see text)</td>
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<tr>
<td>47kΩ</td>
</tr>
<tr>
<td>5</td>
</tr>
<tr>
<td>R2, 3, 4, 5, 6.</td>
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<table>
<thead>
<tr>
<th>Capacitors</th>
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</thead>
<tbody>
<tr>
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<tr>
<td>10pF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>C1</td>
</tr>
<tr>
<td>1nF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>C2</td>
</tr>
<tr>
<td>10nF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>C3</td>
</tr>
<tr>
<td>0.1µF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>C4</td>
</tr>
<tr>
<td>C5 Mylar or disc ceramic type</td>
</tr>
<tr>
<td>0.1µF</td>
</tr>
<tr>
<td>1</td>
</tr>
<tr>
<td>C6 Mylar</td>
</tr>
</tbody>
</table>

**INTEGRATED CIRCUIT**

4011

**SEMICONDUCTORS**

1N4482

---

**STOCK CRYSTALS**

<table>
<thead>
<tr>
<th>CRYSTALS FOR 2 METRES</th>
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<tbody>
<tr>
<td>HC35 2500 FOR ONE CRYSTAL OR 2 FOR TWO</td>
</tr>
<tr>
<td>TX CRYSTALS</td>
</tr>
<tr>
<td>11-22MHz 5 &amp; 450pF</td>
</tr>
<tr>
<td>X2 CRYSTALS</td>
</tr>
<tr>
<td>11-22MHz 5 &amp; 450pF</td>
</tr>
<tr>
<td>X3 CRYSTALS</td>
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<tr>
<td>11-22MHz 5 &amp; 450pF</td>
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<tr>
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</tr>
<tr>
<td>X15 CRYSTALS</td>
</tr>
<tr>
<td>11-22MHz 5 &amp; 450pF</td>
</tr>
<tr>
<td>X16 CRYSTALS</td>
</tr>
<tr>
<td>11-22MHz 5 &amp; 450pF</td>
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**MADE TO ORDER CRYSTALS**

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<th>FREQUENCY RANGE</th>
<th>PRICE</th>
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<tr>
<td>1.5 TO 2 MHz</td>
<td>£7.00</td>
<td>14 TO 15 MHz</td>
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</tr>
<tr>
<td>2.0 TO 3 MHz</td>
<td>£7.50</td>
<td>16 TO 17 MHz</td>
<td>£0.50</td>
</tr>
<tr>
<td>3.0 TO 4 MHz</td>
<td>£5.50</td>
<td>18 TO 19 MHz</td>
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</tr>
<tr>
<td>4.0 TO 5 MHz</td>
<td>£6.00</td>
<td>20 TO 21 MHz</td>
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</tr>
<tr>
<td>5.0 TO 6 MHz</td>
<td>£7.50</td>
<td>22 TO 23 MHz</td>
<td>£0.50</td>
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<td>6.0 TO 7 MHz</td>
<td>£8.50</td>
<td>24 TO 25 MHz</td>
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</tr>
<tr>
<td>7.0 TO 8 MHz</td>
<td>£9.00</td>
<td>26 TO 27 MHz</td>
<td>£0.50</td>
</tr>
</tbody>
</table>

---

**REFERENCES**

- Enquiries to Peter GMOFCI on 0294 72253
- Cunningham and District ARC
- The Magnum Leisure Centre
- Harbourside, Irvine, Ayrshire
- Tel: 0602 280267
- Radio Amateur Supplies
- 3 Farndon Green, Wollaton Park, Nottingham NG8 1DU
- Off Ring Rd., between A52 (Derby Road) & A609 (Ilkeston Road)
- Monday: CLOSED Tuesday-Saturday 10.00 am to 5.00 pm
- Tel: 0602 280267

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Practical Wireless, March 1992
Mathematics For The RAE

Misprint Error

A misprint appeared in the January 1992 issue of the column. On page 52 of that issue, about two thirds of the way down the left hand column was the formula:

\[
\frac{1}{R(C-D)} = \frac{1}{100} + \frac{1}{270}
\]

Then below that, under a paragraph that began "Use a calculator to convert the fractions....", was the working out. In this line, the first figure was wrong. The value '0.001' (one thousandth) should have been '0.01' (one hundredth). The answer was correctly shown as 0.0137, but this line should read:

\[
\frac{1}{R_{\text{total}}} = 0.01 + 0.0037 = 0.0137
\]

Our thanks go to all those eagle-eyed people (and over the holiday too!) who found and told us of the error, especially our many young mathematicians. (Our apologies for not spotting the misprint. Editor).

Before getting down to this month's business, how did you get on with the problems in the last issue? The problems weren't that bad now, were they?

From last month you'll remember that with resistors in series, the voltage is shared (between the resistors), but the current is the same (as there is only one way through the circuit). But when resistors are in parallel the current is shared instead (and the voltage is the same for all parallel resistors).

Resistors In Parallel

Let's look at the diagram of Fig. 1. Here you can see that the resistors R1 and R2 are in parallel (side by side). You will see that at point A, the total current (I₄) has a choice of paths. Some of this current will flow through R1 (I₄R₁), and what is left will flow down through R2 (I₄R₂). At point B of course these partial currents (I₄R₁ and I₄R₂) recombine to form the total current (I₄) again. Mathematically we can say that I₄ = I₄R₁+I₄R₂ (the total current, is the addition all of the partial currents).

But how do we find out how much goes down each leg? and how to work these currents out. You might like to refer back to Ohm's law triangle on the page 43 of the February '92 issue.

The easy part is that the voltage is the voltage across both resistors. From the triangle:

\[ V \]

IR₁ = \[ \frac{V}{R₁} \]

and similarly IR₂ = \[ \frac{V}{R₂} \]

From these two simple equations, we can work out the numerical relationship of I₄R₁ to I₄R₂. The voltage V appears on top of both equations, so we can ignore it, or replace it with the value I for this relationship. This relationship is the reciprocal of their respective resistance values, and is independent of the total current flowing in the circuit. But more of this later.

Practical Figures

As we normally do, let's put in a few simple figures to make it easier. Let's assume that R1 is 1kΩ and R2 is 2kΩ. If V is 10V then I₄R₁ is 10mA \((10V/1kΩ)\), and I₄R₂ is 5mA \((10V/2kΩ)\).

Notice that I₄R₁ is half of I₄R₂, and R2 is twice the value of R1. Just for confirmation of this relationship, let's look at the value of current if R2 were to be 5kΩ.

From the Ohm's law triangle again, \(I₄=\sqrt{V/\text{R}}\) \((10V/5kΩ)=2mA\). This fits well with the rule, as five times the resistance gives one fifth of the current.

Practical Ammeter

The current sharing effect of resistors in parallel is used to great effect in instruments, which can be capable of measuring currents of up to several hundred amperes. We will content ourselves with a more modest level.

Let's assume we want to measure a current (I₄) of 1mA, but only have a meter with an f.s.d. of 50µA. Let's also assume that the internal resistance \((R_{\text{im}})\) of the meter is 5kΩ.

Look at the diagram of Fig. 2, this is the circuit of our simple current meter. It consists of the microammeter and a parallel resistor, \(R₅\), that 'shunts' the major part of the current away from the meter. It is the total current of 1mA, which we want to measure. This must be split into two parts, \(I₄₅\) (50µA maximum through the meter), and 950µA (I through \(R₅\)).

The voltage, \(V\), (across the meter and \(R₅\)) is 0.25V (I*R₁). So if \(I₄₅\) is 950µA, what value must \(R₅\) have to give this value of p.d.? In doing the calculation I have rounded the answer obtained to two significant figures.

\[
R_{\text{shunt}} = \frac{0.25V}{950\mu A} = 263.16\Omega
\]

Easier Method

There is an easier method of calculating \(R₅\), and it depends on the relationship of the currents and resistances that we discovered above. The bypass current \(I₄₅\) is 19 times greater than the meter f.s.d. We can use this fact to calculate \(R₅\) almost directly. This is easier than having to find the voltage across the meter first.

If \(I₄₅\) is 19 time greater than the meter current, then the \(R₅\) must be 19 times smaller than \(R_{\text{im}}\). Let's put that in figures to make it easier.

Divide 5kΩ (\(R_{\text{im}}\)) by 19 and the answer is 263.16Ω. This is the same value that we calculated above, by the longer method.

Continued on page 47

This month Ray Fautley G3ASG carries on with the subject of Ohm's Law. On the way he explains what happens to circuit currents when resistances are combined in parallel.

\[
R_{\text{shunt}} = \frac{0.25V}{950\mu A} = 263.16\Omega
\]

Fig. 1. Resistors R1 and R2 are in parallel, the total current flowing is shared between them.

Fig. 2. Theoretical circuit of an ammeter. See text for an explanation.
This month, 'Quaynotes' takes an in-depth look at the Midland 77-104 27MHz CB transceiver.

The very compact Midland 77-104 27MHz transceiver, caters for the 40 channels (MPT 1320) CB band. It's an ideal size for mobile operation, especially if space in the car is limited, as it measures only 170 x 115 x 30mm.

For mobile installation, the transceiver, Fig. 1, is supplied with a mounting cradle. It can be removed from this in a jiffy, and as it's so small, it can be put in your pocket when you leave the car. If someone 'nicks' the car...you'll still have your CB rig!

Clear Terms

The instruction booklet for the 77-104 tells you in clear terms, backed up with plenty of useful illustrations, all you need to know about installing and operating the equipment. It also includes notes on ignition and other electrical noise suppression techniques.

The booklet also covers the various factors that can effect the 27MHz band’s working range. Simple fault-finding is also covered, and the book provides useful information on UK channels, etc.

Base Station

The Midland 77-104 can of course be used for base station operation, using an external 13.8V d.c. power supply. The Nevada CTE HQ30 will do this job for you, or the rig will work quite adequately on a 12V car battery supply.

Nominal radio frequency (r.f.) output power of this rig is 4W, transmitting with frequency modulation (f.m.) on 40 channels within the frequency band 27.60125 to 27.99125MHz.

Essential items supplied with the rig are a twin lead, in-lined fused d.c. supply cable, and a handheld microphone with a press-to-talk (p.t.t.) switch.

Antenna connection and entry is on the rear of the unit, via a PL230 socket. There is also provision, via a switch, on the rear for reducing power by 10dB (an effective reduction of 10 times). Reception by the way, is not effected by this facility.

Panel Controls

Channel selection is by front panel controls. If you continuously rotate the main channel selection knob, you'll eventually get up to 40, and then pass on to 1 again, without having to reverse the control.

The channel in use is well indicated by large green (and bright) l.e.d. (light emitting diode) figures. Immediately below the channel indicator, is a row of four 'bar' type red l.e.d.s that light up according to the strength of a received signal. In other words, all four red l.e.d.s light up for a 5-9+ signal, and

Relative Signal Level

<table>
<thead>
<tr>
<th>Distance from Base</th>
<th>Signal Level</th>
</tr>
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<tbody>
<tr>
<td>0</td>
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</tr>
<tr>
<td>1</td>
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</tr>
<tr>
<td>9</td>
<td>9</td>
</tr>
<tr>
<td>10</td>
<td>S9+</td>
</tr>
</tbody>
</table>

During transmission all the l.e.d.s light up when the normal 4W of r.f. output power is used, and the s.w.r. (standing wave ratio) is down to an acceptable level.

The audio volume and squelch controls, next to the DIN socket for the microphone, are of the dual shaft type, as commonly found in hi-fi amplifier use. The inner knob operates the on-off switch and controls the audio volume, and the outer knob adjusts the squelch level.

On Air Tests

The 77-104 was tested on air first for base station operation. For this part of the test, I used a Centre-loaded antenna approximately 4m high.

The countryside around my house is fairly flat for approximately 16km or so. Contacts were made with other fixed stations at distances up to 14km, with received signals being well above the ambient noise and lighting at least one l.e.d.

Numerous mobiles were worked, with readable signals both ways over distances of 8km or so, depending on the ground contours. Of course, these distances would have been considerably increased if the base test antenna had been higher.

However, it's sufficient to say that the transceiver gave a good performance for the conditions I used for the tests.
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Publicly published containing 100s out of print, old and collectable wireless and TV books, magazines etc. Send your first class stamps for next copy of £2.50 for next six issues.

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AA2 ACTIVE ANTENNA for 150kHz to 30MHz

The HOWES AA2 is the active antenna to use for general coverage HF reception. Broadband performance that does not tail off at the higher frequencies. The neat, compact answer for those with limited space, holiday use, mobile operation etc. Two selectable gain settings, local or coax powering (12 to 14V) IP3 >30dBm. Easy to build and much liked by customers!

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Northants NN11 6PT
Tel: (0327) 60178

AA4 ACTIVE ANTENNA FOR SCANNERS

The HOWES AA4 gives full coverage from 25 to 1300MHz in a neat compact package. The antenna is only just over 16 inches long, and is designed to be the answer to space/visibility problems for home or portable operation. A low noise microwave IC is used as the active element! This "high tech" approach gives good performance with a low parts count, making construction straightforward. Reviewed in the November '90 Short Wave Magazine. Excellent performance in a small space!

AA4 KIT: £19.50
Assembled PCB modules: £26.90

SP44 BROADBAND PRE-AMP

The HOWES SPA4 is a low noise IC pre-amp covering 4 to 1300MHz for use with wideband passive antennas (dipoles etc). If signals tend to be rather week in your area, then the SPA4 could be just what you need!

SPA4 KIT: £14.90
Assembled PCB modules: £20.90

NEW! ADD-ON DIGITAL READ OUT

The new HOWES DF4 Digital Frequency Display adds "Digital Readout" to analogue type receivers and transceivers. If you own an RST7, FT101, TS520, etc., then we had you in mind when we designed this kit. You can even add digital readout to a surplus WW2 receiver, or domestic broadcast set.

The DF4 can accommodate any IF frequency offset, VOX that tune normally or "backwards" - all with a resolution of 100Hz. Versatile indeed! A small buffer module for easy connection to the radio is included in the kit. Why not give me a ring to discuss its use with your rig, or send an SAE for more details?

DF4 KIT: £29.90
Assembled PCB modules: £59.90

PLEASE ADD £1.20 P&P to your total kit order (£3.00 for hardware).

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72 & 73 from Dave G4KQH, Technical Manager
Mobile Tests

For mobile tests, I used a typical base-loaded magnetically-mounted 27MHz whip at the car roof centre. I didn’t have any difficulty with the antenna loading, or obtaining minimal s.w.r., and as the car was already ignition and alternator suppressed, there were no problems on that score either.

Mounting a CB transceiver in the most convenient place for safe operation, can present a problem in some cars. The ideal position is in front and a little to the right of the driver. It can be either above or below the dashboard, depending on space.

Placing the rig in the position suggested, allows the microphone to be held in the right hand without its cable being overstretched. It also helps to stop the cable getting caught up with the steering wheel shaft, brake or gear levers.

Field Strength Trials

Several test runs during field strength trials, showed that readable signals could be recorded at the base station (with the antenna I mentioned earlier) from distances of 6 to 10km, along different routes with different ground contours, etc. A typical record of signal strength versus distance obtained from my tests, is shown in Fig. 2. The record clearly shows the effect of changing height along the route. By the way, on test the bar type I.e.d. S-meter on the rig indicated received signal level as follows: One lit = 41.1V, two lit = 20µV, three lit = 300µV, all four lit = 600µV or more. In other words S-9+, or you may prefer the CB term ‘wall-to-wall’!

My thanks go to Nevada Communications of 189 London Road, North End, Portsmouth, Hampshire PO2 9AE, tel: (0705) 662145, for the loan of the test transceiver which is available from them at £69.95 including VAT, plus £3.45 post and packing.

That’s the lot for now. Next month I’m going to take a look at the problems encountered with s.w.r. Cheerio!

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Mathematics for the RAE. Continued from page 43.

Testing Time

Let’s have a few questions to help you to digest this month’s lesson, and I shall be using the diagram of Fig. 3 for these problems.

i) I have a meter of 1mA f.s.d. and internal resistance (R_{int}) of 100Ω. I wish to measure a current (I_t) of 10mA. work out the value of R_s needed to do this?

ii) Using the same meter (f.s.d. of 1mA and R_{int} of 100Ω). If 1mA is 0.10, what is the maximum current (I_t) that would be equivalent to f.s.d on the meter?

iii) An unknown meter has an R_{int} of 100Ω and R_s is 0.01Ω. The total current, I_t, was measured as 1A at full scale deflection on the meter. What is your estimation of the f.s.d. of the meter itself? (Hint look upon it as I_{R2} in the diagram of Fig. 1).

iv) Look at the diagram of Fig. 4. It shows a small ammeter, consisting of meter M1 (R_{int} 100Ω and 1mA f.s.d.), and several parallel resistors which may be switched in individually to give differing values of I_t. Calculate what each resistor has to be if;

a) with R_a selected, I_t is to be 10mA
b) with R_b selected, I_t is to be 100mA
c) with R_c selected, I_t is to be 500mA
d) with R_d selected, I_t is to be 1A

Answers next month, see you then!
The Icom IC-R7100 wide-band receiver is now available in a modified version to cover the h.f. bands. As it sounded interesting, we asked Tex Swann G1TEX, to try the receiver on behalf of PW.

Icom IC-R7100HF Receiver

"How do you feel, about reviewing a v.h.f. receiver that's been modified to cover h.f. Tex", asked the editor one morning. Eager to try almost any equipment out, I agreed at once, and then settled back to await its arrival.

When the receiver arrived a few days later, I was absolutely amazed at the weight of this small, table-top receiver. The IC-R7100HF only measures 241 x 94 x 240mm, but it weighs in at a little over (a staggering) 6kg. That, for those of you who aren't metricated yet, is just under a stone in weight, and it's the first indication of just how much is packed into this set!

This particular Icom receiver may be a table-top design, but there will be no chance of sweeping it from the table, or dislodging it! It stayed firmly, and solidly in place (wherever it was) throughout the period I had it on review.

General Description

I'll start by providing a general description of the receiver, before looking at it in greater detail. As I have already mentioned, the IC-R7100HF is deceptively heavy, but it has very clean lines and looks very good anywhere.

The designers have put a lot of thought into their work. There's even a front 'leg', which folds out to tilt the facia to the correct angle for table-top working.

On the right-hand side of the well laid-out front panel is a calculator-style key pad. A large rotary-type knob controls the frequency, and this was mounted to the right of the centre panel, under a nicely laid out, and well lit I.c.d. screen.

At the bottom of the front panel, there are a series of switches controlling scanning functions (more of this later), the clock timer and h.f. up converter. The power, noise blanker/a.f.c. and attenuator switches are ranged together on the left-hand side of the control panel. Audio level and squelch controls are set under a large S-meter, and along with the headphone socket this completes the front panel controls.

Back Panel Facilities

On the back panel, there are almost as many facilities. These consist of a.c. and d.c. power sockets, two antenna sockets and an earthing point.

There are also six small 3.5mm jack sockets which make available such things as: line audio output, a tape recorder control signal and the 10.7MHz i.f.

As you would expect, there is an external speaker jack socket, along with a computer control jack. Finally, there's an a.g.c. control socket for connection to an optional TV-R7100 unit. This unit is a TV decoder add-on.

Key-pad Entry

The frequency may be selected by either key-pad entry, or by operation of the large, smooth-acting rotary tuning knob. On the large back-lit I.c.d. screen, the frequency was displayed, to a resolution of 100Hz.

Towards the right-hand side of the main display, the memory in use is shown. There are 900 of these, available in nine banks of 100!

When choosing the frequency from the key-pad, I had only one criticism. The keys are rather close to the rotary knob. I think that many left-handed people may find some of the operations involving simultaneous key presses difficult.

Memory Facility

The memory facility stores the frequency, mode and the step-rate in use at the time of selection. On recalling a memory, the frequency may be immediately changed by rotation of the tuning knob.

I found this feature very useful, when I set up the various calling channel frequencies on the amateur bands. I found I could then change rapidly and accurately to any band, so that I could listen around.

There are 18 other memories, set aside as 'scan band edge markers'. When displayed, the markers have the middle digit replaced with a '13' ('0P1', '0P2', etc.).

Nine pairs of frequencies may be entered. The chosen frequencies may then be used as scan limits, in any of the five scan modes.

Memories 800-899 are special. They hold the frequencies where there is activity, when the receiver is in auto-memorise mode.

Put simply, the rig is set to scan, and as a frequency is found with activity on it, that frequency is entered into one of the 800 series...
memories. After each save, the memory counter is incremented to the next memory. This can be a great help for finding out what the active channels are, on 144MHz let’s say, when you’re active from a holiday location.

**Five Forms**

As I’ve already briefly mentioned, there are five forms of simple scan available. These basic methods can then be combined to form more complex forms to suit the situation. The five modes are as follows:

**Simple scan**: the frequency is incremented from the frequency held in the active lower band edge marker. The action continues, until the frequency would end up being above the upper band-edge marker. The receiver then returns to the lower edge frequency, and repeats the procedure.

**Auto memorise**: As above but as each channel is checked for activity, it’s placed into memories in the range 800-899. Only one mode may be in use at any one time.

**Memory scan**: Frequencies contained in all the active memories are scanned. No account is taken of the mode in use on that frequency.

**Selected Scan**: Only memory locations using one mode are scanned. So, all f.m. channels may be scanned, or all a.m., etc. Other modes are not used.

**Window scan**: I wasn’t sure about this method until I tried it out! It’s actually a guard band ‘watch type’ of scan. The frequency in the ‘back window’ is the guard frequency, while the operator is listening to the channel shown on the display.

All the methods of scanning I’ve described, are available on many different scanning receivers from different manufacturers. However, what makes the IC-R7100HF different is that the facilities may be combined.

To help illustrate this technique, I’ll tackle it the following way. I suggest that you imagine you’ve become ‘fed up’ listening to a band of frequencies, in the hope of hearing something.

The combining feature now comes into play, when you make this band of frequencies the ‘back window’, and pick out another channel. It could be, for example, your local f.m. broadcasting station.

When you set up the required watch period ratio, and start it going, the receiver scans the ‘back window’ channels at regular intervals, listening for activity before returning to the local station’s frequency.

**Up-Converted HF**

What sets this rig apart from the crowd, is the up-converter fitted to allow frequencies below 25MHz to be received. For this facility, there’s a separate phono-type socket on the back panel for an h.f. antenna.

The phono socket is brought into operation when the dimmer switch is pressed. The dimmer switch itself has been remarked ‘HF’, with a small sticker-type label.

Due to the recent nature of the modification, only a typed note was available as instructions. This proved more than adequate to operate the rig itself, but gave no indications of the specifications (see separate table in Fig. 1 for specifications).

**Simple Instructions**

The instructions for the h.f. operation were really simple! They only tell you to set the ‘HF’ switch ‘in’, and add 100MHz to the frequency you wish to listen to when using the keyboard entry method.

I found that the modification worked well overall, and signals in the h.f. band were clearly heard, displayed at their actual frequency. The 144MHz band was shown as ‘14...’ on the display when on h.f. Due to the short time I had with the IC-R7100HF, and not having a suitable antenna, I had to erect one quickly!

**Lively Band Conditions**

Once I had my antenna up, the receiver showed that band conditions were lively. Because of this, I made frequent use of the built-in 20dB attenuator, to reduce the level of the very strong signals in some parts of the 6-10MHz range.

It was in the 6-10MHz range that I found the only real problem with the IC-R7100HF. Even on a.m. (narrow) mode, some signals seemed to occupy far more of the band, than I used to find on my old RA17 receiver. On these very crowded frequency bands, i.f.s with a better shape factor are needed to minimise this problem.

**Dynamic Range**

At times, the dynamic range of the rig seemed to be exceeded, causing spurious signals to be received. I also noted evidence of some cross-modulation. In this situation, an antenna tuning unit (a.t.u.) would prove very useful, to provide a little more rejection of unwanted signals.

I should mention that the cross-modulation, is not a complaint specific to this very fine receiver. It’s a problem all equipment manufacturers face, when they’re designing and building equipment which has to cover a very wide frequency range.

When using this receiver above 25MHz, it is recommended that you use the standard antenna input.
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Price Breakthrough

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TH77 ........................................... £395
TH27 ........................................... £239
TM741 (New Model) ..................... £759
Lowr HF225 ................................... £429
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TS450 Inc. ATU .............................. £1385

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MVT7000 ........................................ £289
AOR3000 A new model .................... £765
AOR2000 ........................................ £269
AOR1500 New model SSB ................. £P.O.A.

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AOR3000 A new model .................... £765
AOR2000 ........................................ £269
AOR1500 New model SSB ................. £P.O.A.

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RSGB 50
Practical Wireless, March 1992
The rear panel of the IC-R7100HF clearly demonstrates the many facilities provided on this receiver.

Summary

Although I only had the receiver for a few days, and didn't have much time to 'play' with it, I thoroughly enjoyed the experience. It was simple to use, and the lack of information about the h.f. side in no way spoiled my pleasure using the rig.

I found the IC-R7100HF easy to use, and the 40-page A4 size user manual was also simple to understand and had many illustrations to help the reader.

The set, although weighty, is nice to use, and has a very solid appearance. The Icom IC-R7100HF's strength lies in the 25MHz to 2GHz range, in which it is excellent. It was well up to the quoted specification on the v.h.f./u.h.f. range.

The receiver has only a few minor 'funnies' on the h.f. bands, but none of these spoilt my listening. However, it needs some help to achieve the best on the crowded h.f. bands (a problem shared with many wide frequency range receivers and the use of an a.t.u. is advised on h.f.).

Altogether, and with everything I've mentioned taken into account, I liked the IC-R7100HF and would very much like to be the proud owner of this version.

My thanks for the loan of the review model go to Martin Lynch G4HKS of the Amateur Radio Exchange Centre, 286 Northfield Avenue, Ealing, London W5 4UB, tel: 081-566 1120, who can supply the IC-R7100HF with h.f. modification at £1120, plus £10 carriage and VAT.

Specifications

<table>
<thead>
<tr>
<th>Frequency covered</th>
<th>50kHz-1999.999MHz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tuning step rate</td>
<td>100kHz, 5, 10, 12.5, 20, 25 and 1MHz. Plus 1MHz steps with the 'MHz' button active.</td>
</tr>
<tr>
<td>Intermediate frequencies</td>
<td>Triple conversion for s.s.b. a.m. and f.m. (n)</td>
</tr>
<tr>
<td></td>
<td>Double conversion for f.m. (w)</td>
</tr>
<tr>
<td>1st i.f.</td>
<td>778.7MHz (all modes: 25-512MHz)</td>
</tr>
<tr>
<td></td>
<td>226.7MHz (all modes: 512 to 1025GHz)</td>
</tr>
<tr>
<td>1.025GHz</td>
<td>Crystal converter in use above</td>
</tr>
<tr>
<td>2nd i.f.</td>
<td>10.7MHz (all modes) available on the back panel.</td>
</tr>
<tr>
<td>3rd i.f.</td>
<td>455kHz (not wide band f.m.)</td>
</tr>
<tr>
<td>Bandwidths</td>
<td>Specified</td>
</tr>
<tr>
<td>Mode s.s.b.</td>
<td>2.4kHz at -6dB</td>
</tr>
<tr>
<td>Mode a.m., f.m. (n)</td>
<td>6kHz at -6dB</td>
</tr>
<tr>
<td>Mode a.m., f.m. (w)</td>
<td>15kHz at -6dB</td>
</tr>
<tr>
<td>Mode f.m. (w)</td>
<td>150kHz at -6dB</td>
</tr>
<tr>
<td>Spurious signals</td>
<td>-50dB</td>
</tr>
<tr>
<td>Sensitivity</td>
<td>Specified 25MHz to 2GHz</td>
</tr>
<tr>
<td>s.s.b.</td>
<td>&lt;0.2µV for 10dB S/N</td>
</tr>
<tr>
<td>a.m.</td>
<td>&lt;1.6µV for 10 dB S/N</td>
</tr>
<tr>
<td>f.m. (w)</td>
<td>&lt;1µV for 12dB SINAD</td>
</tr>
<tr>
<td>f.m. (n)</td>
<td>&lt;0.35µV for 12 dB SINAD</td>
</tr>
<tr>
<td>Frequency stability</td>
<td>Specified over 0 to 50°C</td>
</tr>
<tr>
<td>Modes available</td>
<td>Both sidebands (noise blanker available)</td>
</tr>
<tr>
<td></td>
<td>Narrow and wide band (noise blanker available)</td>
</tr>
<tr>
<td></td>
<td>Narrow and wide band (a.f.c. available)</td>
</tr>
<tr>
<td>Memories Main</td>
<td>900 in nine banks of 100. These store frequency, mode, step rate in operation at the time and the 'skipped on scan' flag. Nine pairs of scan band edge markers.</td>
</tr>
<tr>
<td>Physical</td>
<td>241 x 94 x 239mm (w,h,d)</td>
</tr>
<tr>
<td>Dimension</td>
<td>6kg</td>
</tr>
<tr>
<td>Weight</td>
<td>better than ±1.5kHz</td>
</tr>
<tr>
<td>Electrical</td>
<td>better than ±5 p.p.m.</td>
</tr>
<tr>
<td>Audio output</td>
<td>better than ±10 p.p.m.</td>
</tr>
<tr>
<td>Power</td>
<td>100-117, or 240V a.c. or 13.8V d.c. (1.5 to 1.9A on 13.8V d.c.)</td>
</tr>
<tr>
<td>Antenna connections</td>
<td>50Ω 'N' type for 25MHz to 2GHz</td>
</tr>
<tr>
<td>Temperature</td>
<td>May be used -10° to 60°C</td>
</tr>
</tbody>
</table>

Practical Wireless, March 1992
Radio Facsimile Terminal WX-2000

The WX2000 is a stand alone radio facsimile terminal designed to produce hard copy images from various facsimile services including weather charts, maps, news media and even satellite pictures from NOAA, GOES and METEOR etc. The WX2000 simply requires an input: FM1900+/-400Hz 0.7V/600 Ohm; AM 2400Hz 0-1V/600 (B/W) or 16 (B/W) selectable. Paper width: A4 (210mm) x 30m. Audio Printing method: Thermal line printer 8 dots per mm. Printing scale: 2

AR1500

The AR1500 is a hand held wide band receiver featuring SSB as standard, many said it couldn't be done! Coverage is from 500kHz to 1300MHz with no gaps. Channel steps are programmable in multiples of 5kHz and 12.5kHz. Modes available are NFM, WFM, AM and SSB (USB, LSB and CW with the BFO switched on). Many features have been carried across from the popular and reliable AR2000 receiver but fitted into an even smaller cabinet, the AR1500 truly has to be seen to be believed. There are 1000 memory channels and the usual AOR collection of search, lockout, priority etc. Power is from an internally fitted NiCad pack or from an external 12V D.C. source, all accessories are provided to enable you to switch on and start listening. All this from a small cabinet of approximately 170mm (H), 55mm (W), 45mm (D) including projections except aerial. The weight is a mere 345g with NiCads fitted.

AR3000A

The AR3000A is a follow on from the highly acclaimed AR3000. Many major improvements have been implemented at the request of enthusiasts. The tuning control is now ‘free running’ to provide a smooth feel for SSS/CW, 10 buttons have been added to make step size faster and more convenient. All information is contained on the LCD instead of a separate status LED indication. The RS232 facility has a switch on the rear panel to enable/disble operation. Memory clear and full microprocessor reset functions are available from the front panel. The re-writing of microprocessor firmware using an even more efficient language has further increased scan and search speeds.

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3) Serial number of equipment.

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Practical Wireless, March 1992
Reflections

This month, Ron Ham starts off by inviting us into his office, before taking a look at how meteorological conditions affect Band II.

While writing my columns, my office radio is usually tuned to either BBC Radios 2 or 4, and especially the science programmes, or I have a tape playing a brass band or some country and western music. The former is the Band II section of a YOKO TV8M (v.h.f./u.h.f. TV receiver) and the latter is a Sharp WQ-T238 portable stereo.

With very few exceptions, my musical favourites are limited to Sousa and Dolly Parton respectively! For convenience, the YOKO sits on a shelf immediately above my Amstrad PC2286, therefore it is fed, via a coaxial cable, from an outside dipole, thus screening out any 'twittering' noises picked up from the computer at such close range.

Fig. 1, Ron Ham's Short & Mason barograph, indicated 1046mb, midday 3 March 1990.

Band II French Opening

The radio was in use while I was preparing this column during the evening of December 6, when suddenly, French broadcasts began pounding in on top of the BBC and ILR stations in parts of Band II. This was caused by a tropospheric opening. Conditions were right, the weather was cold and clear, the outside temperature was 31° 'F' and falling and my barograph indicated a very high pressure of 30.6in (1069mb). Not quite as high as the 30.9in (1046mb). Not quite as high as the outside temperature was 31° 'F', but the weather was cold and clear, the outside temperature was 31° 'F' and falling and my barograph indicated a very high pressure of 30.6in (1069mb). Not quite as high as the 30.9in (1046mb).

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Tropospheric

My writings often associate openings in the v.h.f. and u.h.f. bands, to changes in the atmospheric pressure as recorded by the Short & Mason barograph, Figs. 1 and 2, that sits on the mantelpiece in my office. I have used this particular instrument for over 30 years, and in that time it has frequently shown, that when the atmospheric pressure is high, a tropospheric opening is most likely to begin shortly before the pressure starts to fall.

The difference between a barograph and a barometer is that one has enlarged mechanics. This is so that it can push a pen across a moving paper chart. An ordinary barometer usually has just a single aneroid to swing a pointer around a fixed outer scale. Both are normally calibrated within the range of 28.0 to 31.0in and/or 950 to 1050mb.

"For the last few days a high pressure area has been stable over Ireland and Britain, giving good trop reception all over," wrote Des Walsh (Ballinhassig) on December 4. Des uses a Pioneer tuner and has a variety of antennas, including a modified 4-element Yagi which gives him good results in the upper region of Band II. On the 4th he logged several stations from France and two from Germany between 95 and 106MHz. Simon Hamer (New Radnor) found Band II wide open on November 22 and 23 when he logged stations from Belgium, France, Germany, Holland, Ireland, Poland and Scandinavia.

VHF Propagation

Fig. 2. The Short & Mason, showing winding key in drum.

Like Des and Simon, many radio enthusiasts are interested in signals that exceed their normal range due to some form of disturbance within the earth's complex atmosphere. One area of the radio frequency spectrum that can give great satisfaction to DXers lies between 26 and 106MHz. In Figure 3, it is well used and is ideal to study such modes of propagation as auroral and ionospheric reflection, meteor-scatter and tropospheric ducting.

The reason why this area is so interesting, is that within this range there are three amateur bands, 28, 50 and 70MHz, the CB allocation, around 27MHz, two f.m. radio broadcast bands, 68-73 (East-European) and 87.5-106MHz (international), Band I television, 40-68MHz (no longer used in the UK) and Band II television used in Eastern Europe and the USSR.

My colleague 'Quaynotes' tells me that there are 40 CB channels between 26.965 and 27.405MHz (CEPT) and another 40 for the UK between 27.601 and 27.991MHz. Despite their low power, transmissions on any of these CB channels can be heard up to 1500km away while an intense Sporadic-E disturbance is in progress.

They can be heard in the same way that the East European television channels R4 and R5 can be heard in the UK, in other words 'mixed up' with 'local' programs in Band II. The vision and sound frequencies of Chs. R3 (77.25/81.75MHz), R4 (85.25/91.75MHz) and R5 (93.25/99.75MHz) are indicated by the dotted lines on the top right of Fig. 3.

Early VHF Sets

Fig. 3: Approximate bands.

One of the first tuneable v.h.f. communications receivers, which

<table>
<thead>
<tr>
<th>CB</th>
<th>A</th>
<th>TU</th>
<th>A</th>
<th>TU</th>
<th>CHS</th>
<th>R3</th>
<th>R4</th>
<th>R5</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>26, 27</td>
<td>28-30</td>
<td>40-45</td>
<td>50-55</td>
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<td>70-75</td>
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<td>90-95</td>
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<td>Radio Band II</td>
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was originally used by the US Navy during WWII, is the Hallicrafters S27. These receivers covered approximately 19 to 140MHz in three bands. A photograph of this set can be seen on page 25 of the BBC publication The Secret War, by Brian Johnson, in the first section devoted to ‘The Battle of the Beams’. Your public library may have a copy of this most interesting work.

The S27 and another version the S36 were in great demand on the surplus market in the late 1940s, and are sought after by some collectors today. During the early 1950s, Eddystone produced the 770R, and a few years later the R216 was designed for the military.

Over the past 40 years I have used and serviced all three of these receivers and some are still in use, but, by today’s standards they are all a bit ‘dead’ and leave a lot to be desired. However, a wide-band TV pre-amplifier works wonders at the front end.

Each receiver is a superhet with intermediate frequencies in the 5MHz region. The S27 has three acorn valves in its tuning, the directly heated valves. Therefore it is essential that the proper power unit, Fig. 5, and interconnecting lead is used to deliver the correct high and low tension voltages required to drive the set.

The mains voltage selector and 1.4V 1t. potentiometer (upper left and lower right respectively) must be set correctly in conjunction with the meter and test switch (top right and bottom left respectively), on the front panel of Fig. 5. The receiver itself has five useful ranges, 19-30, 30-46, 46-68, 68-101 and 101-157MHz, each spread over about 2.5m of film strip scale.

The tuning is aided by the 1 and 5MHz crystal calibrator (top right, Fig. 4). For instance, to work around 50MHz, the user would switch in the 5MHz crystal and align the cursor (below dial on the right) and the 50MHz mark on the main dial (large knob) to the centre of the 5MHz carrier. The 1MHz marker can then be used to check the 49 and 51MHz points. When finished, the calibrator must be switched to the off position before the set will work. A close study of the left side of Fig. 4, will show the positions of the dial-light dimmer, i.f. band-width selector (30 or 120kHz), the mode switch and the grid controls. Because of the very strong signals received during a sporadic-E opening, this set is ideal for tuning through the range suggested in Fig. 3.

**Observations**

Last month I told you about the ‘stop press’ report I had received from Ron Livesey (Edinburgh), who is the auroral co-ordinator for the British Astronomical Association, about the great aurora on November 8. Since then the following information has come my way. “Enjoyed that Northern Lights spectacular on the evening of November 8,” wrote Simon Hamer who added, “the night sky was lit up in a glowing red.” At 2320 Simon tuned his DXTV gear and found auroral distorted pictures from Ireland’s ‘RTE’ and several European stations.

When aurora was present, I have heard a rough ‘bubbling’ in place of the signal when the R216 was tuned to the sound or vision frequencies of such stations. Ron Livesey received reports of ‘glows’ overnight on November 2, 5, 6, 11, 13, 28 and 29, ‘rays’, on the 3rd, 9th, 14th, and 19th, ‘active forms’, on the 16th and 18th, ‘corona’, on the 4th and 8th, and ‘all sky’, on the 1st. Although the majority of these events were reported from Scotland, the ‘arc’ on the 10th, the ‘glow’ on the 11th and the ‘rays’ on the 19th were seen by an average of 3 observers from England.

Gordon Foote (Didcot) heard the German beacon, DKOWCY, on 10.144MHz, give auroral warnings on November 1, 8, 9, 10, 16 and 17. Doug Smillie (Wishaw) reports weak auroral reflected radio signals on November 15, 16, 17, 20 and 22 and strong on days 1, 8, 9, 19 and 21 and Tony Hopwood (Worcester) detected A-A signals on days 1, 4, 8, 9 and 19.

We know that the sun was active during the middle of November, and in addition to aurora Fred Pallant (Storrington) tells me that the 28MHz band was almost dead on the 9th and 19th and Gordon Foote found it “particularly bad” on the 19th. While the upper atmosphere region was disturbed throughout the morning of the 13th, Simon Hamer received smeary, multi-image television pictures from Australia on 46.172MHz and New Zealand on 45.25MHz and Dubai, Iran, Malaysia and Thailand on CH E2 (48.25MHz).

**Solar And Magnetic**

During November Ron Livesey, using a two inch refractor telescope and a 4in projection screen, located three active areas on the sun’s disc on days 5, 6, 15 and 29, four, on days 1, 7, 11, 14, 19, 27 and 28, seven, on the 9th and ten on the 2nd. Although high cloud and haze hampered his observations, Cmndr Henry Hatfield (Sevenoaks), using his spectroheliograph, located three sunspot groups on the 13th and 15th and 11 filaments on the 15th and 21st.

In addition to his own November observations with a ‘jam jar’ magnetometer, Ron Livesey received reports of magnetic storms being recorded on days 1, 2, 4, 8, 9, 11, 16 to 22 inclusive and 29 and 30 from Tony Hopwood, Karl Lewis (Saltash), David Pettitt (Carlisle) and Doug Smillie.

**Check Your Logs**

My thanks are due to Geoffrey Harris (Sturminster Newton) for sending me some of the information he gathered about the intense solar activity during the first 15 days of June 1991. He reports that the period was “marked by no less than five X-12 solar flares and one X-10 flare.” Of particular interest is the X-12 from the region of a sunspot on the eastern limb which commenced at 1509, peaked at 1529 and faded at 1614.

The X-ray flux, measured by the GOES-6 and 7 satellites, exceeded $10^6$ watts/m$^2$ in both the 0.5-4.0 A and 1.0-8.0 A bands.

“This was therefore a ‘local daytime’ flare, with strong Type II and Type IV radio waves. It was also the largest flare of this cycle since the X-15 flare of October 1989,” said Geoffrey. He added that a sudden change of magnetic field was recorded at Hartland around 1530, violent bursts of radio noise were recorded in Sevenoaks between 1505 and 1515 on 136MHz and between 1500 and 1520 on 1297MHz and a spray from the sun out to 0.5 solar radii was observed. Although I could not use all of Geoffrey’s interesting report, this should be enough encouragement for you to re-open your radio logs and take another look at the afternoon of June 1.

**Meteor ‘Pings’**

Simon Hamer saw brief bursts (‘pings’) of pictures, via meteor trail reflection, at 1230 on Ch. R1 (49.75MHz) on November 21 and on Ch. E2 at 1830 on the 23rd.

**Cheerio for now!**

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**OSCAR-10**

Peter DB2OS, reports that in December he found AO-10 randomly switching from its 145.812MHz general beacon, to the upper edge engineering beacon and to 'L' mode, where very strong signals were in evidence. To his amazement, he found that he was able to command the satellite successfully. Peter placed the Mode B beacon to plain carrier, and the associated transponder on again, to give excellent results.

Graham VK5AGR, found that although at times there was no sign whatsoever of the beacon(s), the transponder was fully operational. He therefore now countermands the previous advice of not using the transponder if the beacon is f.m.'ing. He also proposes that in future users should use AO-10's 'B' mode transponder, whenever it is found to be available to support meaningful transponder operations. Some clues to the best times are given by the following table, where the ALON, ALAT, squint angle and percentage of solar cell illumination are given to a calendar date.

<table>
<thead>
<tr>
<th>DATE</th>
<th>ALON</th>
<th>ALAT</th>
<th>SA</th>
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</thead>
<tbody>
<tr>
<td>Sat 01 Feb</td>
<td>315.7</td>
<td>14.4</td>
<td>06.0</td>
<td>98.5</td>
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<tr>
<td>Sat 07 Mar</td>
<td>311.9</td>
<td>14.3</td>
<td>65.0</td>
<td>42.3</td>
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<tr>
<td>Sat 11 Apr</td>
<td>306.0</td>
<td>13.9</td>
<td>68.9</td>
<td>36.0</td>
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<tr>
<td>Sat 09 May</td>
<td>304.8</td>
<td>13.4</td>
<td>45.8</td>
<td>69.7</td>
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<tr>
<td>Sat 06 Jun</td>
<td>301.7</td>
<td>12.8</td>
<td>20.4</td>
<td>93.8</td>
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<tr>
<td>Sat 27 Jun</td>
<td>299.3</td>
<td>12.2</td>
<td>01.1</td>
<td>100.0</td>
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</table>

The OSCAR-10’s omni-directional antennas still appear to be in use, so the best squint angle is closest to 90°, with good results ±15° of that ideal position, when signals are quite strong if the satellite is within 20 000km.

**OSCAR-11**

Greg Jones G8/DS1VD, reports that a new version of the Forth diary software is now in operation on UO-11, which has usually been noticed when users were looking for its successor FO-20.

**OSCAR-12**

Contrary to all expectations, FUJI-OSCAR-12 can still be frequently heard, and the satellite support such ventures, you may send your donation to him at 6170 Downey Avenue, Long Beach, CA 90805-3865, USA.

John also reports that some pretty exciting DXCC countries are now active on AO-1, including E9MHI, KH2/WIYRM, VK9ND and VP7/VJCZ. Future DXpeditions are being planned from AP/PA3EON, HS0, J2, JA3OQP/ JD1, KP2, UH8, UI8, VP2V, V3, VR6, ZC4SAT, 9G/KD6KOQ and 3D2/KO8R.

**OSCAR-13 DX**

John Fail KL7GRF/6, runs a OSCAR-13 DX fund which accepts donations, which are then used to provide equipment hardware, funding, QSL costs and general support to get some of the rarer DXCC locations onto the satellite. Already BY1PK, CE0ZZZ, D68GA, FP/VE1KM, KH8/K6EML, PJ2BR, VQ9CQ, 401FS, SV7/G, 9L/WH3Q and 9M6KT have been activated. Future support is now under consideration for DXpeditions to Belize and Pitcairn Island. If you wish to

**OSCAR-14**

The Cosmic Ray Effects and Dosimetry Experiment on UoSAT-3 saw a significant 'Forbush' cosmic ray decrease, followed by a large solar flare late last year. Those wishing to monitor the satellite’s data on this radiation, may use the CPE/TOE software available on UO-14 itself, which also holds files on the CREDO experiment. The data may be plotted using the SPLOT program.

Dave Hulatt G4WFQ, and a large number of 9600 baud UO-3 enthusiasts, report severe difficulty in accessing the system, as access often impossible for days on end. Some think 'alligator' users are on the input, whilst some suspect that powerful amateur f.m. signals 'known to be illegally using the space band' are causing the problem.

The difficulty experienced may equally be brought about by the ever increasing popularity of the satellite and growing congestion due to the sheer number of stations all competing for use, particularly when the satellite is over Europe.

Geoff Ward G0/K8KA, reports that since April last year 288 callsigns have been logged, 94 stations, usually log in each day, and that an average of 45 files are uploaded daily. These files total 350, each averaging 2.7 MegaBytes, and they usually stay aboard for five days.

**OSCAR-15**

Nothing whatsoever has been heard of, or from, OSCAR-15, the second UoSAT spacecraft that went aloft with ARIANE, UoSAT-4 and the microsats. It now has to be assumed that this spacecraft is lost for all time.

**Continued on page 58**
A few problems have been evidenced with the microsats. Several times they’ve ‘crashed’ and had to be reloaded. Many users report difficulties in establishing reliable packet communications links with PACSAT-OSCAR-16, WEBERSAT-OSCAR-18 and LUSAT-OSCAR-19 with their 4W downlink transmitters, while they experience few problems in copying FUI-OSCAR-20’s 1W downlink signal.

It is believed that the BPSK transmitters on AO-16, WO-18 and LO-19 suffer from random phase noise. James Miller G3RUH, has found peaks of ±2° on occasions with ±10° RMS scatter typical from all these satellites, and this random phase-noise is noticeable by using an oscilloscope placed on the output of the downlink receiver. If the horizontal sweep of the oscilloscope is adjusted to produce the ‘eye diagram’, zero-crossings of the transmitted waveform can be seen bouncing randomly around the pattern, when it should be remaining constant at the zero level. When FO-20’s transmitted waveform is examined, it shows clean BPSK, with carrier shift of either 0 or 180°, and nothing else.

It appears that the microsat BPSK phase noise, might be the result of a transmit synthesised oscillator design deficiency, or alternatively the result of poor BPSK modulator carrier suppression. Whatever the cause, this transmitted phase noise reduces the received signal-to-noise ratio. The demodulator’s effectiveness is reduced by the difficulty in regenerating a ‘clean’ BPSK local carrier from the noisy input signal. That also degrades the phase detector’s output signal-to-noise ratio, so further reducing the effectiveness of the BPSK demodulator.

A further reason for difficulty in copying packets from AO-16, WO-18 and LO-19 is the fact that these spacecraft transmit their AX.25 data on a continuous basis, while FO-20 remains lightly loaded, and it spends lots of its time transmitting the ‘01111110’ AX.25 flags which the terminal node controller uses for frame synchronisation. Increasing the number of flags transmitted, helps keep the receiving TNC synchronised with the transmitted AX.25 packet frames. Experiments are now underway with raised-cosine transmissions from the various PACSAT spacecraft. They are being used to determine whether shaping the AX.25 modulating waveform increases the downlink signal-to-noise ratio.

**OSCAR-17**

The DO-17, better known as ‘DOVE’, is still functioning and is in good condition. However, we must wait for the uploading and checking out of the software, that will eventually permit its voice to speak to the many patiently waiting to hear it.

**WEBERSAT WO-18**

The WEBERSAT’s impact detector has been gathering data almost every week since the beginning of August. It’s also been collecting and sending WOD on channel numbers 25, 27, 28, 29, 2A and 35 to provide solar array currents and +Y array temperatures. Pictures are also being taken and are sent when power, currently providing between 0.9 and 1.2 watts permit.

**LUSAT LO-19**

The LUSAT LO-19 microsat has its BBS is operational, but the earlier scheduled Friday experimental days, using the rapidly Doppler shifting c.w. beacon, now seem to be missing.

**Kazu JJ1WTK, reports that**

FUI-OSCAR-20 now operates a regular alternating schedule between Modes JA and JD. It’s still cooling down. Users report low activity, but excellent results on both its analogue and digital modes.

**SARA**

The debate on ‘SARA’ continues. While Joe Kasser, AMSAT-UK telemetry head, John Brangean GM4HJU, myself, and many scores of others are quite convinced of its rightful and desirable status as an amateur satellite in an amateur band for the use of amateurs, others, such as AMSAT-UK Secretary Ron Broadbent G3AAJ and IARU satellite co-ordinator nominee Freddy de Guchteneire ON6UG seem convinced otherwise. They still maintain that SARA is an intruder into the 145MHz amateur space band.

M. S. Reda NOBML, of Maple Grove Minnesota wrote to state that by my justification and comparison of SARA with the other similar satellites, I lose my defence of it. He points out the FCC Rule Book (ARRL) which specifically bans broadcasting satellites, and that the earlier UoSATs, BADR-1, DO-17 DOVE, WO-18 WEBERSAT and such, which do not support two-way amateur communications ARE in fact broadcasting, and are thus illegal. He writes “It (SARA) is NOT an ‘amateur’ satellite. It is a transponder between a sun-girdling planet to scientific experimenters on earth. Neither the planet nor the scientist is a radio amateur.”

**Daniel ON1KVE of BELAMSAT, the Belgian AMSAT Organisation, writes to say that he has been very busy. Also he says he has received a great quantity of messages and queries regarding ‘SARA’, which he is unable to answer individually. He says “In co-operation with the SARA team in Paris, our group has decided to make a little book about SARA. This book will be terminated for the end of January and will contain all the information about this satellite, the reception of data, the telemetry details, and so on ...”.

**Worked MIR**

Ray Soifer W2RS, worked U5MIR on S22 145.550MHz F.M. voice while simultaneously hearing his packet operation. Observers in parts of the world other than Europe also report that U4MIR and U5MIR have both been operating at the same time on different frequencies. Whilst we know that the new 25W Icom-24-AT rig and the original 2.5W FT-290 are both in now use, the problem of the single MIR 144MHz external antenna arises. It has to be assumed that Sergei and Alex are now using the 143.625MHz v.h.f. communications antenna for amateur radio also. Other than direct communications whilst over Europe to the TsUP command station near Moscow, 143.625MHz is little used now, as political
change and the ensuing economic recession cuts have meant the withdrawal of many of the communications boats around the world, and more use of the global TDRS like chain of geostationary satellites.

The cosmonauts seem to have suddenly discovered the tuning knobs on their transceivers, as they have been coming up to make QSOs on all sorts frequencies. Ray W2RS, worked them on 145.500MHz, G3MFQ and I worked them on 145.550MHz, whilst both KB2E and N2KPC made a QSO on 145.900MHz. They apparently adapt rapidly to the three different IARU Region band plans met every thirty minutes as they orbit our world. Although 145.500MHz is in wide use over North America, over Europe, where it is the S20 calling channel, they have yet to be heard. On behalf of AMSAT, Ray W2RS asked Boris UW3AX, to pass on a request not to use the 145.800 - 146.000MHz Space Band.

Rip WA2LQQ, reports that he was planning to visit Musa, U2MIR, now UV3AM, who is in hospital suffering from what appears to be a latent effect of his long-term weightlessness, i.e., a recurrent inflammation of the joints. He was responding well to treatment and was expected to be home within a few days where he would enjoy a period of convalescence. If anyone wishes to send a 'get-well' card to Musa, post it to Vern Ripontella WA2LQQ, PO Box 177, Warwick, NY 10990, USA. Rip frequently visits Moscow in the course of his work, and will deliver your greeting personally to Musa.

Eddystone Users Group

Eddystone Users Group is a specialist club for Eddystone radio enthusiasts. There's a regular club newsletter packed with much to interest the keen Eddystone enthusiast. Details from W. E. Moore, Moore Cottage, 112 Edgeside Lane, Waterfoot, Rossendale, Lancs BB4 9TR.

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After an enjoyable stay in Washington DC, first with Jack and Andrea Colson, then with Dick Daniels, we flew to Seattle in Washington State. After a seven hour flight, we landed, in what seemed like normal English weather, dull with some drizzle.

We were met at the airport by Dick and Beverley Bendicksen. Dick and Beverley visited me in 1962, so this was to be a 'return' visit. Although we hadn't met since 1962, we've kept skeds on h.f. regularly.

Dick and Beverly are thoroughly enjoying their new life. Retired now, they both worked for AT&T, one of the largest telephone companies in the USA. Dick N7ZL, pictured in Fig. 1, has his shack in the basement, spending most of his time working via satellite from his Seattle home. His system is so well set-up, that with no trouble at all, I kept a daily sked with Pat G3IOR via OSCAR 13.

Dick uses the packet network to provide him with the latest 'Kepsets' for his tracking program. Having been involved with digital communications for a living, it now holds little interest for him, so this is Dick's only use of packet radio. With the 'Instant-track' software, it is possible to have the data automatically loaded into the tracking program.

In Seattle, we visited a few amateur radio shops, meeting some of the locals. One day we travelled out to Lynnwood and met Mike Lamb N7ML. Mike gave us a conducted tour of AEA, including a close look at their new products. I think the price of these items will necessitate a win on the football pools in the UK! However, the tour was very enjoyable and the range of test and measurement equipment was very impressive.

On our last day in Seattle, a Sunday, we were up at 5am to catch the ferry from Seattle to Bremerton on the Kitsap peninsula. From there we drove north, crossing the Hood Canal using the new floating bridge.

Our eventual destination was Marrowstone Island in Puget Sound. Dick and Beverley have their summer home there. They found a super location on the edge of the bluff, overlooking Puget Sound. Dick has erected a three element tri-bander beam about 10m or so above ground. It certainly works quite well, in spite of its lack of height.

**Farewell To America**

After an enjoyable last barbecue, we drove to Port Angeles, where we boarded a ferry, and said farewell to Dick, Beverley and America. Two hours later we landed at Victoria, Vancouver Island Canada, where we were met by Fred VE7PL, and his XYL Jean. This last week was spent sight-seeing on Vancouver Island.

We found time to visit Brent Ewing VE7BD, one of the keen DXers of the Victoria Club. His shack is shown in the photograph of Fig. 2. Outside is a 65m rotating tower with stacked beams for 14, 21 and 28MHz. There's also a 7MHz beam and some v.h.f./u.h.f. Yagi antennas at the top. All of this at a very attractive location overlooking the Saanich Inlet.

One very interesting visit, was to the Dominion Astrophysical Observatory just outside Victoria. This was on top of what I thought was a mountain, I was informed, that it wasn't strictly speaking a mountain! Whatever it was or is, with the excellent site and the 1.8m mirror, observations are taken each night. With state-of-the-art optics, information is gathered on Binary Stars, Dark Matter, Black Holes and Quasars.

On the Saturday of our last week, we went our separate ways. Of course there was an amateur radio meeting that day. It was 'Ham Happenings', a day of meetings, seminars and buying and selling equipment. Organised by the Victoria Amateur Packet Radio Association (VAPRA), the event started at 10am with an introduction by Larry VE7DIE. Larry, the secretary of VAPRA, is shown at work on a repeater in Fig. 3. These commercial repeaters, designed for remote sites on mountain tops, have to be
able to withstand temperatures as low as -50°C. The antennas have to be dug out of the snow on occasions too! There are 87 VE7s members of VAPRA, a few from W7, SP5TAO and myself!

After Larry’s opening speech, Glenn VE7GCT, pictured in Fig. 4, gave a talk on ‘Getting Started In Packet’. Glenn is manager of Rogers Cablevision, where VAPRA hold all their meetings.

Paul Johnson VE7DHM, who had been welcoming everybody at the door, gave a talk on using personal mailboxes. Paul, shown in Fig. 5, is the treasurer of VAPRA, so I guess he was after membership fees before they had a chance to buy anything!

As mentioned earlier, Brent VE7BD (Fig. 6) is a DXer and together with Fred VE7PL (Fig. 7) they gave a talk about setting up and using a DX cluster. This raised a lot of interest, since then, Fred has set up a mini-cluster with the latest version of the MSYS system.

Then, Doug Collinge VE7GNU and George Farris VE7FRG (Fig. 8) gave a very interesting demonstration of 56kbaud linking. Using full-duplex file transfer, it seemed as fast as using the computer on its own. Several of these high-speed links are now working in Canada.

**UK Packet A Joke?**

There was disbelief, when I gave a talk on the packet scene in the UK. They fell about laughing when I told them of the system we have over here. Notices of variation (NOV), site clearances, single-channel working on 144MHz, etc.

I’d been told that the system they have in the USA and Canada was superior, but it wasn’t until I saw it for myself, that I could understand quite why. They don’t have any of the encumberances we have, nor do they have to apply to use a frequency for any packet operation. If they stay within their band-plan, they can operate as many channels as they need.

On 144MHz they have at least a dozen frequencies in use. I saw a similar number on 430MHz. Full-duplex repeaters are common-place, together with frequency-hopping, like cellular radio, all helps to avoid collisions and contention.

I admit that they have double the band-space we have, and channel-spacing is 20kHz, but their network is not bogged down in the way that ours is.

Our holiday ended in Vancouver, from where we flew back to reality! If you do get across there for a holiday, you will be made most welcome by the locals, and if you do go, pay a visit to Butchart Gardens, a fabulous place. It’s like paradise on earth.

Packet is probably the most rapidly expanding area of the hobby in the Americas, and changes are being made all the time. But by self-discipline, and self-regulation they are keeping things in order. This is the way it ought to be here too, with more channels being available, not to mention better frequency planning.

If you feel this way, then please write in support of this with your ideas to Neil Lasher G6HIU, 40 Farm Road, Edgeware, Middlesex HA8 9LT, and let him know. He needs the feedback, or evidence of support for extra channels, so DO IT! Don’t leave it for the other chap to do, or until tomorrow, please do it now.

73 and Happy packeting, Roger G3LDI @ GB7LDI or OTHR. Tel: (0508) 70278 if you have any news.
The UK's biggest, brightest and most readable monthly magazine for the radio enthusiast.

The February issue, now on sale at your newsagent, is an Airband Special. Its 84 pages are packed with interesting features for the airband enthusiast, including Air Traffic Control in the UK, DXing Non-directional Beacons, HF Airband Communications and Aero Radiobeacons. On top of all this Godfrey Manning's monthly Airband column appears as usual.

Of course, we have not forgotten those readers who have other listening interests. As well as all the regular columns - Scanning, Propagation, SSB Utility Listening, DXTV Roundup, LM&S, Amateur Bands Roundup, Satellite TV are some of them - there are articles on Televisions for the DXer, the conclusion of the Navtex series and a full review of the new Drake RAE Communications Receiver. The Junior Listener page caters for the younger enthusiast and there is also the lively Letters page.

Everyone should be reading Short Wave Magazine - including you!

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LAKE ELECTRONICS
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The 1.8MHz Band

Just as the 1.8MHz band section report was being completed, I heard, via the DX News Sheet, that the YUs on Top Band now have more privileges; they now have phone c.w. between 1850 and 1915kHz, as well as the existing allocation between 1810 and 1850kHz.

Unfortunately, my rig has been lost in QRM, callers who forget their own callsign, and other such manifestations.

Another one whom seems doubtful is QRM, callers who forget their own callsign, and other such manifestations.

The 7MHz Band

On 7MHz, G4ITL (Harlow) notes the frequent use of 500kHz on 14MHz, but NOT on this band - almost every time he tries to have his regular sked with G4XJL, there is QRM, callers who forget their own callsign, and other such manifestations.

Just one for Ted G2HKU on this band, by way of a c.w. contact with G2ZPT.

At Angie GOHGA, the half-sized 6SRV was enough to hook up with RL3U/U33AQ, UA9AKV, UA8XK, W2DW, KI7G, RYO, plus lots of smaller fry.

And another 'just the one' merchant is John G3BDQ, who mentions HY2Z/UA4DFS as his only catch on 7MHz.

New to Eric G3LPS in Blackburn (last time I seem to have inadventently transposed him to Blackpool!) is Eric's c.w. merchant, confining himself very much to 7MHz. Thus, his pickings for this month included UI8Z, RL5D/UW9YY, 6W5/K3PIK, RHQA, AASDX/MM off the Pacific side of Y and bound for J69, WASAUE, N8B7U, W1ZQ, 4X1MM, K2POHHEZ, EAS/NS6R, ZK2FX, ROL, in CO.VV, 6V6U, JW6XW, 3CM, 6JX, RH0E, LU4FM, TKSC, VP3L, PJ8A, BPAZ, NF4A, NL7G, SUXM, HBA, 721A, C4Z, T1C, 707T, E6E, E89E and UZ00WA. Post-context, UA0SSA, W7SX5, K8DC, the first two long-path W6s of the season, around 1500Z on November 30.

**The 28MHz Band**

On 28MHz, G4ITL tried a Delta loop element which he reckons is the best antenna he has ever had. On this band recent contacts for Bernard included (c.w.) LUS5ON, LUEPN, KBS4AVW, KSP0PV, 2J2BO; PG5D (s.s.), and s.s. with LUFJFD, 9DSTE, PJ8AD, EA1FBJ/MM off the Ivory Coast.

Looking at the list from Ted G2HKU we find he used the main rig big time with W2M5SL, K4L8SK, KC6LST, K6NHC, USAGM, 4CVG, UA9AJ, VQ2BK, ZY5EF, W3QPL, W3BGN, K1AR, ZS6BCR, 4P4W, CS6GQ, 4CS6GMYW, 4WJX, K2GAR, 4W4/JK1PK, JSAAJA, VEAFM, KUJO, W1HK, KXQ, W8B, WB6KFRK, N4DR, W7ST, while the q.r.p. netted W2JAR with just four watts.

Ann G0HGA offers her c.w. with CS6GQSWX, CS6N7Z, HKSM, P4J7N7, WA6G3PK, P4W0, J0LSC, R5DOL, K8BV, K4ZD2M, WABYW, K3NGH, K3GN, W5KDNP, WB5GDC (a yl), W4JX, VE3OFR, VE1AYY and assorted smaller fry.

John G3BDQ gave 14-year old niece KC4WNL his first contact with 5, and also worked with 2J2BD, EA87TA, JBS8, VES and W1D. Now we turn back to Don G3NOF, who is all s.s.b. and raised EL2C1, FYSFJ, XX3XHA, KADL5, VA1S (a VE special), VEC5VM, VE7DG1, VP2E5L, VEPEV, UVH6JHK, XX9AW, SVJ5G, J2ZTC and W4WFL for a mutual friend of earlier years. Many G0ZNA stuck with the side-band too, for contacts with WP4EPC, 9HL, VP2E5L and VE3MVP.

**The 14MHz Band**

The 14MHz band is where it all happens! G4ITL keyed with VK3J5 and PY3AVF, to save his voice for the contact with ZL4AN. The happenings so far as Ted G2HKU were concerned were the c.w. contacts out to PJ8A and UA0GEU.

**Solar Data for December 1991**

During the last week of November the solar and geomagnetic levels remained around with no flares of any type being reported, but by December 1 the active side of the sun had rotated into view causing an increase in solar flux levels. The active area, solar region 8952, became increasingly magnetically complex producing 15 M-type flares between December 1-8. Major flares occurred on December 3 at 1639UTC, December 8 at 2316UTC and December 9 at 1345UTC.

The event on the 3rd consisted of a M2.28 flare lasting 53 minutes, together with a ten flare measuring 1200 flux units. A considerable increase in flare activity occurred during the period December 9-15 with 28 M-type flares being reported, although most of them were of a smaller magnitude.

The solar flux levels increased from 172 units on December 1 up to 280 units by the 10th whilst the geomagnetic A index declined from 14 units on the 2nd to only three units on December 7, the lowest daily level since February 1991. It was also at a low of four units on December 15, but on December 17 it reached a monthly high of 27 units, causing a weak auroral opening on the v.h.f. bands.

**VHF Up**

Reports to David Butler G4ASR

Yew Tree Cottage

Lower Maescoed, Herefordshire HR2 0HP

VHF Up is reporting that the opening on the 8th was so good on the 144MHz band, that he chose to work it on s.s.b. Between 1900-2000UTC he made 66 QSOs with 18 DX stations from Europe, 11 North America, 4 South America and 1 Australia.

Also busy on c.w. was Angie G0HGA, and she worked 5W6/K3IPK, FFOXX, CZ2AFT, W5JK, EAEBA, 4KUJAIKG, UKIOMO, KU2JKU, UV1B and UV4HAH in Tashkent, plus the usual V.S. and Europeans.

As work on 20MHz was quite erratic during the period December 9-15, but on December 17, some 4th class openings were made, with 3Z1AHT, 4K1B, KVEFAW, VU2PK, ZL3AW and L68AM, while s.s.b. did the trick with VP4GB, ECGNJ, JL6RU, VP4WAG and VY40W.

The telephony of Don G3NDF was returned by EA9UA, JR1LIW, J37NL, J37ZA, J39AL, KB9KUYI (IOTA NA 168), R9DSOZ, Z8BBV, VA1S, VKI9D and VKE3EE.

Finally, Mary G0ZNA who chatted to J37FR, 9K2CI and CX7BC.

**Deadline**

That’s it for another month. Deadlines for next time will be February 20 and March 20 to arrive, mailed to the address at the top of the page.

Meanwhile, have fun!
Moonbounce

Over in Germany, DL5MAE is actively using moonbounce on the 144MHz band with a 136-element array, consisting of eight 17-element Yagis. The picture, Fig. 1, shows his antenna farm, consisting of three towers supporting h.f. and 144MHz beams. Michel Winiger HB9RCL, is fortunate to have, not one, but two e.m.s. systems. On the 144MHz band he runs a Yaesu FT726R, a 4CX1000A amplifier and eight 17-element M2 Yagis. On the 430MHz band he uses the FT728R, a YD134 amplifier developing 1200W output and eight 59-element M2 Yagis, each with a boom length of 13 wavelengths. Michel is interested in schedules on either band, anytime between 2100-0800UTC. You can contact him at Hotel Loewen, 6025 Neudorf, Switzerland, or you could telephone him on 010 41 511104 or by Fax 010 41 45 513858.

Dave F4HYR, operator of the well known F6KSX e.m.s. group, reports that activity on the 430MHz band is growing rapidly in France. During the ARRL contest held in October and November 1991, eight French stations were active, each with a system capability equivalent to that of 16 Yagis! Active stations include FI6L and FG5CJ, both using 5m dishes, F7UT with a 6m dish, F5IH and F6KFI with 16 LJBV Yagis and F6KSX, FBSO and F8FT, each using 16 F8YF Yagis.

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Fortunately, the calm sea enabled a high speed c.w. to be used with his m.s. system. Similarly, he wonders if any readers have modifications to enable the FT770 transceiver to key at high speeds?

Back Scatter

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null
The Voice of America has now inaugurred its new transmitting station in Botswana - hurriedly advanced following the closure of its Liberian station - and the schedule for English to Africa is:

0300-0500 on 7.265MHz
0300-0430 on 11.94MHz
0430-0500 on 15.37MHz
1600-2200 on 15.445MHz

The Botswana station is very small, with just two 100kW transmitters and curtain antennas. We've reported that Kol Israel's schedule has required some of its former strength with the resumption of relays of the domestic English services. A reminder that English can be heard:

0500-0515 on 11.588MHz
1100-1130 on 17.545MHz
1430-1458 on 17.59, 15.64, 11.605 and 11.587MHz (not Friday, 15.37 and 15.445MHz)

The English service from Jerusalem has a DX Corner each Sunday evening at 2000 repeated at 2230 and "Calling All Listeners" is heard at 2230 on Mondays. Regular frequency announcements are carried on Thursdays during the 2000 and 2230 transmissions.

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Asian and Pacific Stations
- Radio Pakistan continues to broadcast its service of dictation speed news to Europe daily at 1105 on 21.520 and 17.925MHz (what a strange choice of frequency). The same frequencies carry normal news bulletins at 1100 and at 0800, whilst in the evening at 1700 there is an hour-long transmission on 15.55 and 11.37MHz.

North, Central And Southern American Stations
- Radio Havana Cuba is holding its 29th international contest with five first prizes of an all-expenses paid, two-week visit to Cuba, visiting schools, hospitals, farms, factories, tourist spots and historical sites. To enter, write an essay on the theme "How has Radio Havana Cuba contributed to the process of unity and identity among the peoples of Latin America and the Caribbean?" Entries should be sent by 30 April 1992 to Radio Havana Cuba, PO Box 6240, Havana, Cuba. The station seems to be difficult to hear in Europe - if you've managed to receive it, please send the frequencies and times to me at the PW Office in Poole and we'll put you into print!
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For Sale Yaesu FT-299R 144MHz
multi-mode boxed with rubber duck
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professional printer KX-P1592 multi-
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handie transceiver digital readout 30W
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For Sale Yaesu FT-1025R plus MuTek
front end, mobile bracket, NiCads,
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multi-purpose printer used eight times
at cost £52 accept, £275. Tel: Chesterfield
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For Sale Yaesu FT-290R with MuTek
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