

*Amateur*

MARCH 1983 90p

# RADIO

For all two-way radio enthusiasts

**The secrets of  
wartime radio**



**Buyer's rights—  
Angus McKenzie reports**

**Put to the test: Icom IC R70  
receiver and MM linear amp**

**Low power receiver: build project**

**What Radio?  
Amateur Radio's price guide**

**Special offer:  
badges and  
plaques!**

**MAIL ORDER OR RETAIL**  
**FROM THE COMMUNICATION**  
**CENTRE OF THE SOUTH**  
 TO ORDER ANY OF THE ITEMS LISTED BELOW  
 SIMPLY WRITE ENCLOSING A CHEQUE OR PHONE  
 AND QUOTE YOUR CREDIT CARD NO.  
**WE DO THE REST!**

# Bredhurst electronics

HIGH ST. HANDCROSS W. SUSSEX O444 400786

WELZ		£	C&P
SP15M	SWR PWR Meter HF/2M 200W	32.00	(1.00)
SP45M	SWP PWR Meter 2M/70cm 100W	45.00	(1.00)
SP200	SWR PWR Meter H.F./2M 1KW	61.95	(1.50)
SP300	SWR PWR Meter H.F./2M/70cm	85.00	(1.50)
SP400	SWR PWR Meter 2M/70cm 150W	61.95	(1.50)
SP10X	SWR PWR Meter H.F./70cm compact	21.95	(0.75)
SP380	SWR PWR Meter H.F./2M/70cm compact	49.00	(1.00)
AC38	A.T.U. 3.5 to 30 MHz 400W PEP	59.00	(1.00)
CT15A	15/50W Dummy Load (PL259)	6.95	(0.75)
CT15N	15/50W Dummy Load (N type)	11.95	(0.75)
CT300	300/1kW Dummy Load 250MHz (SQ239)	45.00	(2.00)
<b>SWR POWER METERS</b>			
Model 110	H.F./2M Single Meter	11.50	(0.50)
YW-3	H.F./2M. Twin Meter	11.50	(0.50)
UH 74	2M/70cm Single Meter	14.30	(0.50)
T435N	2M/70cm 120W N plugs	34.00	(0.75)
<b>DAIWA</b>			
.CN 620A	H.F./2M Cross Pointer	52.80	(-)
.CN 630	2M/70cm Cross Pointer	75.00	(-)
<b>DUOMY LOADS</b>			
OL 300	15/30W - PL259	5.00	(0.50)
WELZ	CT 15A 15/50W PL259	6.95	(0.75)
WELZ	CT 15N 15/50W N plug	11.95	(0.75)
T 100	100W Max 450MHz	22.95	(0.75)
T200	200W Max 450MHz	34.00	(0.75)
DL600	600W Max 350MHz	29.95	(1.50)
WELZ	CT 300 1000W 250MHz	45.00	(2.00)

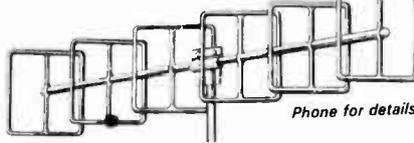
## YAESU TRANSCEIVERS



### YAESU FT 102 - £785

YAESU		£	C&P
FT1	Superb H.F. Transceiver	1349.00	(-)
FR9202M	160-10m 9 Band Transceiver	885.00	(-)
FC902	All Band A.T.U.	135.00	(1.50)
SP901	External Speaker	31.00	(1.50)
FT102	160-10m 9 Band Transceiver	785.00	(-)
FC102	A.T.U.	209.00	(-)
FT707	8 Band Transceiver 200W Pep	509.00	(-)
FP707	Matching Power Supply	112.50	(5.00)
FC707	Matching A.T.U./Power Meter	85.00	(1.00)
MMB2	Mobile Mounting Bracket for FT707	16.10	(1.00)
FRG7	General Coverage Receiver	199.00	(-)
FRG7700	200KHz-30MHz Gen. Coverage Receiver	335.00	(-)
FRG7700M	As above but with Memories	399.00	(-)
FRT7700	Antenna Tuning Unit	37.85	(1.00)
FRA7700	Active Antenna Unit	36.40	(1.00)
FT208R	2M FM Synthesised Handheld	199.00	(-)
FT708R	70cm FM Synthesised Handheld	229.00	(-)
NC7	Base Trickle Charger	26.88	(1.30)
NC8	Base Fast/Trickle Charger	44.10	(1.50)
NC9C	Compact Trickle Charger	8.00	(0.75)
FNB2	Spare Battery Pack	17.25	(0.75)
PA3	12V DC Adaptor	13.40	(0.75)
FT480R	2M Synthesised Multimode	369.00	(-)
FT780R	70cm Synthesised Multimode (1.6MHz Shift)	411.00	(-)
FT290R	2M Portable Multimode	265.00	(-)
FT790R	70cm Portable Multimode	325.00	(-)
MMB11	Mobile Mounting Bracket	22.25	(1.00)
CSC1	Soft Carrying Case	3.45	(0.75)
NC11C	240V AC Trickle Charger	8.00	(0.75)
FL210	Matching 10W Linear	59.00	(1.20)
Nicads	2.2 AMP HR Nicads Each	2.50	(-)
FF507DX	H.F. Low Pass Filter 1kW	23.00	(1.00)
FSP1	Mobile External Speaker 8 ohm 6W	9.95	(0.75)
YH55	Headphones 8 ohm	9.90	(0.75)
YH77	Lightweight Headphones 8 ohm	9.90	(0.75)
QTR240	World Clock (Quartz)	28.00	(1.00)
YM24A	Speaker/Mic 207/208/708	16.85	(0.75)
YD148	Stand Microphone Dual IMP 4 Pin Plug	21.10	(1.50)
YM38	As 34 but up/down Scan Buttons	24.90	(1.50)
<b>FDK VHF/UHF EQUIPMENT</b>			
Multi 750E	2M Multimode Mobile	259.00	(-)
Expander	70cm Transverter for M750E	199.00	(-)
<b>DRAE</b>			
Power Supplies			
4 AMP £30.75 (1.50)	12 AMP £74.00 (2.00)		
6 AMP £49.00 (2.00)	24 AMP £105.00 (3.00)		
VHF Wavemeter 130-450 MHz		£27.50	(-)

## JAYBEAM ANTENNAS



TRIO		£	C&P
TS930S	New Transceiver	1154.00	(-)
TS830S	160-10m Transceiver 9 Bands	678.00	(-)
VFQ230	Digital V.F.O. with Memories	231.00	(2.00)
AT230	All Band ATU/Power Meter	129.00	(2.00)
SP230	External Speaker Unit	39.00	(1.50)
TS430S	160-10m Transceiver	(-)	(-)
TS130S	8 Band 200W Pep Transceiver	531.00	(-)
TS130V	8 Band 20W Pep Transceiver	433.00	(-)
TL120	200W Pep Linear for TS120	145.00	(1.50)
MB100	Mobile Mount for TS130/120	17.70	(1.50)
SP120	Base Station External Speaker	25.00	(1.50)
AT130	100W Antenna Tuner	88.00	(1.50)
PS20	AC Power Supply - TS130V	54.90	(2.50)
PS30	AC Power Supply - TS130S	93.30	(5.00)
MC50	Qual Impedance Desk Microphone	29.40	(1.50)
MC35S	Fist Microphone 50K ohm IMP	14.00	(0.75)
MC30S	Fist Microphone 500 ohm IMP	14.00	(0.75)
LF30A	HF Low Pass Filter 1kW	20.00	(1.00)
TR9130	2M Synthesised Multimode	411.00	(-)
BO9A	Base Pinth for TR9130	37.00	(1.50)
TR7800	2M Synthesised FM Mobile 25W	257.00	(-)
TR7730	2M Synthesised FM Compact Mobile 25W	268.00	(-)
TR2300	2M Synthesised FM Portable	144.00	(-)
VB2300	10W Amplifier for TR2300	62.30	(1.50)
MB2	Mobile Mount for TR2300	20.00	(1.50)
TR3500	70cm Handheld	238.00	(-)
TR2500	2M FM Synthesised Handheld	220.00	(-)
ST2	Base Stand	49.45	(1.50)
SC4	Soft Case	13.11	(0.50)
MS1	Mobile Stand	30.36	(1.00)
SMC25	Speaker Mike	15.40	(1.00)
PB25	Spare Battery Pack	23.69	(1.00)
TR8400	70cm FM Synthesised Mobile Transceiver (inc PS10)	299.00	(-)
PS10	Base Station Power Supply for 8400	64.00	(2.00)
TR9500	70cm Synthesised Multimode	428.00	(-)
R2000	200KHz-30MHz Receiver	391.00	(-)
H600	Gen. Cov. Receiver	244.00	(-)
SP100	External Speaker Unit	26.90	(1.50)
HC10	Digital Station World Time Clock	64.40	(1.50)
HS5	Deluxe Headphones	21.85	(1.00)
HS4	Economy Headphones	10.80	(1.00)
SP40	Economy Headphones	13.57	(1.00)
ICOM	Mobile External Speaker	15.00	(0.75)
IC740	HF Mobile Transceiver 8 Band	725.00	(-)
IC720A	HF Transceiver & Gen. Cov. Receiver	949.00	(-)
PS15	Power Supply for 720A	119.00	(3.00)
IC251E	2M Multimode Base Station	559.00	(-)
IC25E	2M Compact 25W Mobile	269.00	(-)
IC290E	2M Multimode Mobile	379.00	(-)
IC-R70	Gen. Cov. Receiver	469.00	(-)
IC2E	2M FM Synthesised Handheld	169.00	(-)
ICL 1/2/3	Soft Cases	4.25	(0.50)
ICHM9	Speaker/Microphone	12.00	(1.00)
IC BC30	230V AC Base Charger and Hod	45.00	(1.50)
IC 8C25	230V AC Trickle Charger	5.75	(0.75)
IC CP1	Car Charging Lead	3.75	(0.50)
IC BP2	6v Nicad Pack for IC2E	29.50	(1.00)
IC BP3	9v Nicad Pack for IC2E	20.00	(1.00)
IC BP4	Empty Case for 6 AA Nicads	6.95	(0.75)
IC 8P5	11.5v Nicad Pack for IC2E	39.50	(1.00)
IC DC1	12V Adaptor Pack for IC2E	9.75	(0.75)
IC ML1	10W Booster	59.00	(1.00)
<b>TV INTERFERENCE AIDS</b>			
Ferrite Rings 1 1/2" dia. per pair		0.80	(0.20)
Toroid Filter TV Down Lead		2.50	(0.50)
Low Pass Filter LP30 100W		3.95	(0.50)
Tro Low Pass Filter LF30A 1kW		20.00	(1.00)
Yaesu Low Pass Filter FF501 DX 1kW		23.00	(1.00)
HP4A High Pass Filter TV Down Lead		5.95	(-)
<b>ANTENNA BITS</b>			
H1-Q Balun 1:1 5kW pep (PL59 Fitting)		9.95	(0.75)
7.1 MHz Traps Pair		7.95	(0.75)
T Piece Polyprop Dipole Centre		1.20	(0.30)
Polyprop Strain Insulators		0.40	(0.10)
Small Egg Insulators		0.40	(0.10)
Large Egg Insulators		0.50	(0.10)
4mm Polyester Guy Rope (strength 400kg) per metre		0.18	(0.04)
75 ohm Twin Feeder - Light Duty Per Metre		0.16	(0.04)
300 ohm Twin Feeder - Per Metre		0.14	(0.04)
URM67 Low Loss 50 ohm Coax-Per-Metre		0.60	(0.20)
UR76 50ohm Coax Per Metre		0.25	(0.05)

Please send total postage indicated. Any excess will be refunded

All prices correct at time of going to press

TELEREADERS (CW & RTTY)		£	C&P
TASCO CWR 610		189.00	(-)
TONO 500		299.00	(-)
TONO 9000		699.00	(-)
<b>MORSE EQUIPMENT</b>			
MK704	Squeeze Paddle	11.95	(0.75)
HK708	Up/Down Key	10.50	(0.75)
-	Practise Oscillator	8.75	(0.50)
EK121	Elbug	33.00	(0.75)
EKM12A	Matching Side Tone Monitor	10.95	(0.75)
EK150	Electronic Keyer	78.00	(-)
<b>ROTATORS</b>			
Hirschman	RO250 VHF Rotor	45.00	(2.00)
9502B	Colorator (Med. VHF)	56.95	(2.00)
KR400RC	Kenpro - inc lower clamps	125.00	(2.50)
KR600RC	Kenpro - inc lower clamps	175.00	(3.00)
<b>DESK MICROPHONES</b>			
SHURE	444D Dual Impedance	39.00	(1.50)
SHURE	526T MkII Power Microphone	53.00	(1.50)
AODNIS	AM303 Preamp Mic. Wide Imp.	29.00	(-)
AODNIS	AM503 Compression Mic 1	39.00	(-)
<b>MOBILE SAFETY MICROPHONES</b>			
ADDNIS	AM202S Clip-on	21.00	(-)
ADDNIS	AM202H Head Band Up/Down Buttons	31.00	(-)
ADDNIS	AM202F Swan Neck Up/Down Buttons	33.00	(-)
<b>TEST EQUIPMENT</b>			
Drae	VHF Wavemeter 130-450MHz	27.50	(-)
DM81	Trip Dip Meter	67.60	(0.75)
MM050/500	Dig. Frequency meter (500MHz)	75.00	(-)
<b>CO-AXIAL SWITCH</b>			
2 Way Diecast (V.H.F.) SA450		10.00	(0.75)
2 Way Diecast with N sockets		12.95	(0.75)
2 Way Toggle (V.H.F.)		6.00	(0.50)
Western 5 way 1KW Switch		13.95	(1.00)
<b>HELIAL ANTENNAS</b>			
2M 8NC or PL259 (state which required)		4.50	(0.50)
2M Thread for TR2300 or FT290R (state which)		4.50	(0.50)
70cm 8NC or Thread		4.50	(0.50)
<b>MICROWAVE MODULES</b>			
MMT144/28	2M Transverter for HF Rig	109.95	(-)
MMT432/28S	70cm Transverter (HF Rig)	159.95	(-)
MMT432/144R	70cm Transverter (2M Rig)	184.00	(-)
MMT70/28	4M Transverter for HF Rig	119.95	(-)
MMT70/144	4M Transverter for 2M Rig	119.95	(-)
MMT1296/144	23cm Transverter (2M Rig)	184.00	(-)
MML144/300	2M 30W Linear Amp	69.95	(-)
MML144/100S	2M 100W Linear Amp	139.00	(-)
MML144/100LS	2M 100W Linear Amp	159.00	(-)
MML432/30LS	70cm 30W Linear Amp	85.00	(-)
MML432/50	70cm/50W Linear Amp	109.95	(-)
MML432/100	70cm 10/100W Linear	228.64	(-)
MM2001	RTTY to TV Converter	189.00	(-)
MM4001	RTTY Transceiver	269.00	(-)
MMC50/28	6M Converter to HF Rig	29.90	(-)
MMC70/28	4M Converter to HF Rig	22.90	(-)
MMC144/28	2M Converter to HF Rig	29.90	(-)
MMC432/28S	70cm Converter to HF Rig	37.90	(-)
MMC432/144S	70cm Converter to 2M Rig	37.90	(-)
MMC435/600	70cm ATV Converter	27.90	(-)
MMK 1296/144	23cm Converter to 2M Rig	69.95	(-)
MMD050/500	500MHz Dig. Frequency Meter	75.00	(-)
MMD600P	600MHz Prescaler	29.90	(-)
MMDP1	Frequency Counter Probe	14.90	(-)
MMA28	10M Preamp	16.95	(-)
MMA144V	2M RF Switched Preamp	34.90	(-)
MMF144	2M Band pass Filter	11.90	(-)
MMF432	70cm Band Pass Filter	11.90	(-)
MMS1	The Morse Talker	115.00	(-)



## DATONG PRODUCTS

		£	C&P
PC1	Gen. Coverage Converter HF on 2M Rig	137.42	(-)
VLF	Very Low Frequency Converter	29.90	(-)
FL1	Frequency Agile Audio Filter	79.35	(-)
FL2	Multi-mode Audio Filter	89.70	(-)
FL3	FL2 Audio Filter and Notch	129.00	(-)
ASP	Auto RF Speech Clipper	82.80	(-)
O75	Manually controlled RF Speech Clipper	56.35	(-)
RFC/M	RF Speech Clipper Module	29.90	(-)
O70	Morse Tutor	56.3	

# Amateur RADIO

## 4 Current comment

All about this, the first monthly issue of Amateur Radio. Plus, news that affects you, the reader.

## 5 Your letters

Where it's your turn to write for us. Again, it was difficult to select letters from the bags that have arrived on our desks. Praise and criticism, whatever, but please keep them coming. It's your magazine.

## 8 Straight and level

News and views, chat and gossip from the Editorial mouth. We list the fortunate forty – those who have been chosen to work 50MHz, and we mention a lovely letter from a certain Mr. Arnold Geoffrey . . . Plus new information, making it legal to call in times of emergency.

## 10 Wartime radio

How radio communications helped the war effort in World War 2. Describing the techniques, the risks, the people and the radios they used to send often-secret messages to their own people. Written by Pat Hawker.

## 18 Sound analysis: The Icom IC R70

Chris Drake puts the R70 general coverage HF receiver through its paces. It's a device that has that something extra, and comes with a reputation for reliability.

## 23 Short Wave

The Editor has always been a good listener. At least that's what the rest of the staff say. Seriously, this is the page for the SWL.

## 24 Card games

The hobby of collecting QSL cards is growing, and many people now have thousands to their credit. Here, John Heys describes the delights and problems of collecting QSL cards. Some good and rare cards to illustrate the feature too.

## 28 The Classics: The Racal RA17

Full technical and handling description of this classic receiver. If you are considering buying one (or have one now) then you must read this first. By Peter Dodson.

## 34 Starting from scratch: Resonance

Last time we discussed inductance and capacitance. This issue concentrates on resonance, the phenomenon and how it works.

## 38 Buyers' rights

The customer's always right – or is he? Here, Angus McKenzie sets out the benefits and otherwise, of buying through mail order, from the high street, or from specialists. The message here is to be prepared before you buy. But we'll let Angus sort the technicalities out for you . . .

## 44 Receiving on a budget

One way to get the YL involved in your hobby is to buy her a receiver. There are a few low priced versions on the market well worth a look. Here David Lazell points you in the right direction.

## 48 Workshop test: Linear amplifier

Nigel Gresley takes a linear amplifier (144/30LS) from Microwave Modules' stock, and puts it through some simple checks. Impressive it is too.

## 52 Shoptalk

New products on the amateur radio market. Books, catalogues, hand-held cases, soldering iron, front end boards, frequency meter, and a prescaler.

## 54 What Radio?

Price comparison chart: along with telling comments from the staff of Amateur Radio.

## 56 On the ROX

Build yourself a good workable receiver to interface with last issue's low power crystal controlled transmitter that can work the Americas. Rev. George Dobbs takes you through the build step-by-step. He calls it the ROX.

## 64 Try headphones

Where headphones can help the amateur is described here, by John Morris. Plus simple instructions on how to modify your old hi-fi headphones for amateur use.

## 66 Around the clubs

News and reports from amateur radio clubs throughout the country. Send in your club's monthly bulletins and we'll try to print them here.

## 68 The RAIBC

A brief look at the work carried out by the Radio Amateur Invalid and Blind Club.

## 69 Amateur answers

Readers questions answered. Technical or otherwise, if you have a question to ask, write to The Editor at the address on this page and we'll endeavour to answer it.

## 70 Free classified ads

Advertise, free of any charge, your radio equipment, spares, components, or if you are looking for a particular piece of hardware, use these pages to cast your net.

*Front cover picture shows an early version of the Special Communications Mark 7, believed in this case to have been built or assembled in Occupied Europe. This photograph is reproduced courtesy of Pierre Lorain, F2WL, author of Armament Clandestin, a book that includes many details of clandestine radio equipment and ciphers. When used by SOE, the equipment was often called the Paraset.*

**Editor:** Christopher Drake  
**Technical Editor:** Nigel Gresley  
**Art Editor:** Frank Brzeski  
**Graphic Design:** Gina Satch  
**Contributors:** Angus McKenzie, Rev. George Dobbs, Pat Hawker, John Heys, George Zitterstein, David Lazell, John Morris.  
**Advertisement Manager:** Linda Beviere  
**Ad Assistant:** Rose Kirtland  
**Production Co-ordinator:** Alison Pezaro  
**Managing Director:** Eric Rowe  
Published by Goodhead Publications Ltd., 27 Murdock Road, Bicester, Oxon OX6 7RG. Telephone Bicester (08692) 44517.  
Printing by Wiltshires (Bristol) Ltd., Bristol. Typesetting by Arty Type, Grosvenor House, Eastgate, Whittlesey, Peterborough PE7 1AE.  
Distributed by COMAG Ltd., West Drayton, Middlesex.  
© Goodhead Publications Ltd.

Whilst every effort is made to ensure the correct reproduction of advertisements, neither the Publishers nor their advertisement contractors accept any responsibility for errors in, or non-appearance of the final reproduction of advertisements.

Advertisements are accepted and reproduced on the understanding that the Publishers' "Conditions of Acceptance" apply in all cases. Copies of these conditions are also available from the Advertisement Offices.

All material printed in this magazine is the copyright of the Publishers and must not be reproduced in any form or affixed to as any part of any publication or advertising whatsoever without the written permission of the Publishers.

# CURRENT COMMENT

Well, folks, here we are again with another bright and breezy magazine; many, many thanks for all your letters (261 of them altogether) and we've published some of them, answered the technical queries later on and replied to all the rest. At least, we *think* we have! We honestly didn't expect so many, and it took us a bit of time to bash away at the replies, so if we've missed anyone out we hope you'll accept our profound apologies.

It seems that our proofreaders and typesetters must have let the Christmas spirit creep in a bit early last year – there *were* rather a lot of typographical errors, weren't there . . . Given that we're a bit dim out here in the country and we spend far too much time messing about on the wireless, we really must do better and we're hoping that this issue doesn't contain a single solitary goof. Some of the last issue was put together rather at the last minute because we were hoping for some late news items which didn't turn up in the end – the 50MHz licences, for one, and some news of changes in the emergency and Raynet sides of the hobby. Naturally, they turned up three days after the mag went on

## Introducing you to this month's issue

sale . . . such is life! Anyway, sanity and normality have now returned to Bicester – stop laughing, you at the back!

What goodies do we have in store this month? There's a good meaty feature by Pat Hawker, G3VA on amateur radio in World War II; Pat is probably one of the most well-known and respected writers in the field and we're delighted to have him along. Plus all the usual articles by the great, the wise and the witty – oh yes, a few things from me as well. Talking about a few things, we were delighted to hear on GB2RS just before Christmas that the Home Office is now completely up to date with the issuing of licences – marvellous. We must admit that for a microsecond or so we thought that the RSGB had let an April Fool joke out a bit ahead of schedule – even the newsreader didn't quite sound as though he believed it – but we rang their Press Office and the Home Office's nice man at the other end assured us that it was true and that they were even going to streamline the issuing procedure so that it didn't happen again.

To cap it all, we received a press release from them the next week setting it all out, which we thought was a giant leap for amateur radio mankind. Maybe things are looking up in the bowels of Waterloo Bridge House, although the earth hasn't moved enough in London SE1 to produce any replies to *three* letters to them. Come on, chaps, with all those licences out of the way surely you can find the time to answer a couple of little questions??

Other than that, amateur radio seems to have started 1983 rather well – there are some relaxations on the use of the use of amateur radio in an emergency, which almost puts us on a par with CB! We'll delve into that later on. Likewise, there's a new Telecommunications Bill before Parliament which looks likely to amend at least a few of the sillies in the Wireless Telegraphy Acts. And finally, we do as of now have some lucky folk on 50MHz – a round of applause to the RSGB, the Home Office and the BBC for co-operating and making it possible. Let's wish them happy operating, and we're looking forward with in-

terest and intrigue to see what comes up in the propagation stakes.

Oh yes, and we do have the Phase 6 repeaters, and even some of the Phase 5 VHF ones at the time of writing – the Lord He knoweth why the Home Office have taken so long to get round to it. Actually, we did think of writing a *Yes Minister* script based on the HO's antics and submitting it to the Beeb, hoping to augment our meagre and pitiful salaries (belt up, you lot, and get on with it – Managing Editor) but we finally decided it was too true to be funny and no-one would believe it . . . Actually, someone told us on the air the other day that they'd issued the same callsign to three different people by mistake.

Still, nobody's perfect – after all. Well, not all of us . . .

73 and we hope you enjoy the mag.  
**Chris Drake**

**Remember – Amateur Radio is now a monthly magazine. Make sure of your copy by placing a regular order at the newsagent. Or take out a subscription.**

# Amateur RADIO

## . . . on subscription

Make sure of your copies of Amateur Radio. Order 12 issues for the basic price of £10.80 – no extra charges

Just complete the coupon and send it, with a cheque or postal order for £10.80 (£16.80 surface mail outside UK) to: Amateur Radio Subscriptions, 27 Murdock Road, Bicester, Oxon OX6 7RG.

Please send me Amateur Radio magazine for one year. I enclose a postal order/cheque made out to Goodhead Publications Ltd., in the sum of £10.80 (£16.80 surface mail outside UK). Please write clearly.

Name .....

Address .....

.....

# LETTERS

## High cost QSL

Full marks to the new *Amateur Radio* – what a great magazine. As an SWL since 1947 with 12,789 QSL cards, FR101, Sommerkamp 500, and a Trio QR666, it's a revelation to read such realistic articles re: SWL and transmitting topics and novice topics.

Whilst I fully understand the poor reports by the SWL fraternity I have always given a good overall report; nevertheless direct paid post to rare stations and others have not always reaped the expected returns. Many have gone astray, in dustbins, pinned on other people's walls and not replied to for many reasons.

QSLing has reached "saturation point" viz a viz the cost of cards, postage and time involved to the transmitting fraternity. The cost must be very high, and prohibitive to many ordinary fellows. We cannot expect every card to get acknowledged on cost basis, even if there's a good report.

I hold many rare and valuable cards including the Hussein JY1, and JY2 his divorced English Ipswich wife, and many others about the world. Of course the topic of Novice Licences has been muted for years, but Britain has always been backward and "pompish" about amateur radio. We seem to prefer to bow to the commercial interests of CB chat, putting forward administration and technical reasons. The constant jibe is those with a "ticket" are fully equipped to use the air properly – LISTEN DEAR FELLOWS TO THE PILE UPS. IT'S DISGUSTING AND PATHETIC.

There's no doubt these "cryptic messages" transmitted are meant for a listening fraternity for reasons not in keeping with the security of Britain. But you can't stop it, any more than Tirana on 40 metres. So it's up to *Amateur Radio* to highlight our topics for all people – Government, SWLs, transmitting amateurs etc etc to learn and inwardly digest . . . and ENJOY.

**Peter Webb,  
Tiverton, Devon.**

## No elitism!

As a newcomer to this fascinating hobby, may I be permitted to make a few observations? It would appear to this writer that interest in amateur radio has grown very fast in the UK in the last two to three years.

Many of these newcomers appear to be like myself, that is, they come from either non-electronic or non-radio backgrounds, so we are, accordingly, putting more pressure on the RSGB for a standard of service and technical advice not previously required.

This type of member is obviously resented by some of the older, long-standing members with B.Sc and A.M.I.Mech.E qualifications, who are of the attitude that any "ham" worth his salt should be able to design and build his own remote controlled atomic-powered radio communication satellite on the kitchen table! This attitude may have been understandable thirty or more years ago, when it may have been feasible for the average amateur to make a rig comparable with those then available on the contemporary commercial market, but I would suggest that very few amateur builders could turn out anything to compare with, say, a Yaesu 101 or a Trio 830. Many of us wouldn't wish to try, and why should we?

If many members wish to use their new found skills and qualifications to merely play as glorified CBers, then let them – provided they obey the obvious regulations vis-a-vis advertising, obscene words, interference etc. That though, is surely up to the individual. It must, I would have thought, be up to the hobby enthusiast how much he or she feels able to put into, or take out of, amateur radio.

On joining the RSGB, I was not given the impression that technical skills were the absolute order of the day. Quite the reverse. And this brings me to the exam itself. I started studying for the Amateur Radio Certificate, using the recommended books from the RSGB (who have always been patient and helpful to me, even before I became a member) in February 1982. Fortunately I acquired the necessary standard in the June examination, and am now working hard for a pass in Morse.

But coming from a non-academic environment, I found it hard, and find obtaining the necessary Morse skills also difficult. I would suggest that for me and my ilk, that the exam is quite difficult enough. There is no doubt in my mind that we are paying a high enough price in effort and time, in order to join the band of G4s and G8s etc, so let's have no more of this intellectual and technical elitism.

**M.S. Stewart RS52074  
Welwyn, Herts.**

*We couldn't agree more. Although some people moan because our magazine style is humorous and informal, others seem to like us because we don't have delusions that amateur radio is for the Favoured Few. It's right that one should make some effort to get the licence, and the sense of achievement is worthwhile, but let's not get delusions of greatness! – Ed.*

**Er . . . um . . .**

I claim the deliberate mistake

prize (*what deliberate mistake? - Ed*) in your last issue! You say in your article "Starting from Scratch" that:  
 $X1 = 2\pi fL$   
 $Xc = 1/2\pi fC$   
 But of course:  
 $f = \frac{1}{2\pi\sqrt{LC}}$   
 Joking apart, congratulations on a good magazine. I'm looking forward to future issues.

**Clive Dunnico,  
Shoeburyness, Essex.**

## Valve technology

I was delighted to read Chris Drake's article (No 3 *Amateur Radio*) on valves. Perhaps it might help to bring a renewed interest in valve technology and home construction.

In the same issue, the article on the venerable AR88 showed that even the most modern amateur receivers can offer little if anything more than classic valve designs.

In the commercial, mobile and handheld fields, solid state techniques have undoubted advantages, but for home construction hard wires valve circuitry allied to a few new ideas has still much to offer. Even at VHF the classic RSGB 6J6 converter could produce a noise factor better than most present day bamboo boxes. That design is twenty five years old and the valve was designed forty years ago! Particularly in transmitters,



# LETTERS

valves can offer many advantages, for the RF can be produced in copious quantities with far greater ease.

There is one final advantage of valves that will appeal to many – cost. As “everyone knows” that valves are out of date, as a consequence you can get all you need from club junk sales for a few coppers and your local TV dealer will probably give you as many old valve TVs as you can carry.

From this letter, please do not think that I am oblivious of the advantages of solid state, I just think that most people go overboard to be modern and tend to forget the advantages of the older technologies sensibly applied.

**Brian Kendal G3GDU,  
12 Weald Drive, Furnace  
Green, Crawley, Sussex  
RH10 6JU.**

## Calling old timers

I found your publication most interesting, and wish you and the staff luck . . . I will make note in a future issue of our historical paper. Maybe members in the United Kingdom would be interested in subscribing.

**Bruce Kelley,  
Editor, Old Timers Bulletin,  
Antique Wireless Association  
Inc., Holcomb, New York  
14469.**

*At the bottom of the page you'll find some examples of Old Timers Bulletin stories and front covers. If you're interested in taking this excellent A5-sized magazine, write to Bruce Kelley. - Ed.*

## Magdeburg Annie

I read your issue number 3 and on your SWL page you raise the query: what are the lists of numbers that are broadcast from the Eastern Bloc?

Well, I hope that the enclosed article cleaned from the March 1981 issue of Readers' Digest helps. The lady who reads the numbers is nicknamed “Magdeburg Annie” by British forces in BOAR. I hope the article answers your query.

**V. Richards,  
Canterbury, Kent.**

*Thanks for the cutting, Mr.*

*Richards. Interesting reading it is too; entitled “East Germany's Sinister Spymaster”; the story covers the progress of Lieutenant-General Markus “Mischa” Wolf, one of Europe's ablest spy chiefs who is head of the HVA, (Hauptverwaltung Aufklarung) part of the East German Ministry for State Security.*

*Summed up, the relevant paragraph says that every day, at 5am, coded radio messages – usually numbers in five digit groups – emanate from the HVA Authorities in other countries – especially West Germany – listen in and apparently, wonder who Mischa Wolf is contacting this time.*

*Several readers have contacted us with their answers to this question. All say the codes come from East Germany – beyond the Harz Mountains said one – and the numbers are what is called a one time code, where the ciphers are written down on a paper pad, and each day (or each time a code is required) that page is torn from the pad and destroyed. The following time, a new page is used. Any advance on this information? - Ed.*

## Myth exploding?

Congratulations on an excellent magazine – the first couple of editions will be particularly useful to newcomers to the hobby.

However, I must join what surely must be many others in drawing attention to a myth which you are perpetuating rather than exploding. In the article on p48 in issue 2 Amateur Radio, item 6 concludes by stating that whilst in your country cottage you would be “G4ZZZ alternative.”

“Alternative” is never transmitted as a suffix to a British callsign, as the further article on p58 also attempts to explain. The confusion over the use of suffixes seems to arise from the fact that section 9 of the licence does not correspond exactly with the wording of item 1 (a), but quite simply if you are operating from alternative premises, the address of which has been advised to the authorities, then you use

your normal callsign with no suffix. The comparatively few people who have made these arrangements should be well aware of this.

The majority of us are faced with choosing between items (1) (b), (1) (c) or (1) (d) of section 9 and these seem to be quite clear. If you are in a premises you sign “/A” (not alternative), not in a premises, but at another location then you sign “/p” and where the equipment is used (not necessarily installed) in a vehicle then you sign “/m”.

We are left to decide what type of structure constitutes a “premises” but certainly the question of a postal address has no relevance, nor does the fact as to whether or not a vehicle is moving when signing “/m”.

**Jack Tootill, G4IFF,  
Ipswich**

*You've defined it very succinctly, Mr. Tootill, and thanks for pointing out the fact that our definition could have been misinterpreted. We've never heard of anyone who has informed their local telephone manager when they've gone away on holiday or to “alternative premises,” though, and indeed we wonder if he'd know what to do if somebody did! - Ed.*

## From the ITU

Thank you for sending us a copy of your excellent publication *Amateur Radio*. We have put your name on our mailing list for press and information releases.

I enclose an information kit on World Communications Year 1983 and a list of publications of the ITU.

**For the Secretary-General,  
W. Wolter, Chief, Press and  
Public Information Section,  
Public Relations Division,  
International Telecommuni-  
cation Union, Geneva,  
Switzerland.**

## Keeping in Touch

As an OAP with a radio that should have retired long before me, a Lafayette HE-30 which just about lights up and copies BBC Channel 4, I would like to ask if there is anything I can do to make

this radio work.

I want to keep in touch with my son who is eight miles away, and has a transceiver at his home. As a pensioner, I am unable to buy these miracle Japanese radios. Pity really, because I was a PoW out there – I really should have thought ahead! Mind you, who did think ahead on that railway, and in a camp under the great Tojo himself?

**G. Wells, 94 Dupont Road,  
Raynes, Park, London,  
S.W.20 8EQ.**

*It all depends on how much radio you know, Mr Wells, because the problem could either be very simple or quite complicated. The HE-30 was a good machine – have you a reasonable aerial for it? As regards talking to your son, you could always go for CB – or maybe even go for the RAE and a Class B ticket. Anyone local to Mr Wells who'd like to have a hack at his HE-30? - Ed.*

## My nearest club

Your magazine has whetted my appetite to find out more about amateur radio, and the first thing I would like to know is: are there local amateur radio clubs or societies which could wean a beginner into radio?

I would like some advice on how to set up, what equipment to get, and where from.

**Paul Billin,  
4 Rokeby Terrace, Heaton,  
Newcastle upon Tyne, NE6  
5ST.**

*Write to the RSGB, Alma House, Cranborne Road, Potters Bar, Herts EN6 3JW for information on local radio clubs. Good luck. - Ed.*

**Have readers any ideas for useful circuits or other equipment that would be of interest to others? If so, let us see them and where possible, we will publish your ideas in future issues of Amateur Radio. What's more – we might even pay you some real money for the privilege. - Editor.**

# LETTERS

## Moving question

I am an SWL and enjoyed your recent articles on meteor scatter, feeders and connectors. I took the RAE last May, and passed the first paper. In May next year I intend taking the second paper again, and hope to pass. There was one dreadful question in the paper, and the answers were disputed because of the way it had been written down on exam paper. Listen to this: A G4XZZ was on holiday, in Wales, in a touring caravan. What call sign would be used? I would be interested in *Amateur Radio's* answer to that one!

**Robert Roberts,  
Gwynedd, North Wales.**

*We muttered a bit over this one, but we think it'd be /A. Mind you, Mr Tootill takes us to task over this very same thing in a letter this month... Has anyone else had a bad time with RAE questions? - Ed.*

## RSGB bashing

At the moment I am a listener, but if the December RAE went my way, I hope to be a G6 in the not too distant future – wake up there at the HO!

There seems to be a bit of RSGB bashing going on in the letters pages of magazines, and although I haven't been involved for very long, at least they can help us along the way. The point is, it is up to the membership to push to get a change – not to sit back and say "Oh it's their job" because it is not their job, it's OUR job.

I enjoy reading the RSGB magazine, and if I don't understand something, instead of giving up I go away and either read up or make a nuisance of myself at my local club (G4MEB or G6MEB being the Midlands Electricity Board Club calls) or I ask one of my lecturers (I am doing TEC in electrical engineering, but a couple of the lecturers are wet finger types and hams as well).

I liked your article on the HF QRP rig, but until I get round to the dreaded Morse, that will have to be filed away. Some of our club members are building rigs like

the ones constructed by the Rev. Dobbs, so there is definite interest in these projects.

I am interested in building my own kit and using it, but will probably buy something like an FT290R as a black box transceiver to keep me on the air for a while. Meanwhile, articles on how to build 70cm rigs, aerials and general features on propagation, are welcome and not too technical. Otherwise you'd lose me, probably.

### **Name and address supplied.**

P.S. The MEB made a smelly mess of one of their 132kv transformers – beats anything a silly little electrolytic can do. Something to do with a fault level of over 2000mV!!!

*Absolutely agree, sir. It's the members who vote for the Council members of the RSGB, and we have only ourselves to blame if they're not very good – maybe if our Council man doesn't do his stuff we have to vote with our feet next time there's a Council election!*

*By and large, we think the RSGB do a pretty good job and get a bad press for some fairly trivial reasons – but isn't that human nature? Glad to hear that the MEB do the odd silly thing as well as us – there's a fair amount of prospective fault current in those systems isn't there? - Ed.*

## Question of bandwidth

I have just read the article "Receiving you loud and..." in *Amateur Radio* 3. Up to this moment I was beginning to think we had a good magazine, but that impression is now faded.

It would be a good idea to put a name to these articles so we know who writes them. I agreed with your article until you got to deviation. I am sure an FM receiver with a total bandwidth of 3kHz would have a terrible audio output. The Trio TR2300 which you picture in the said article has a maximum deviation of 5kHz so it has a possible transmitted bandwidth of 10kHz – now how would that sound when received on a receiver with a 3kHz bandwidth?

The article states we

should look for a receiver with a 3kHz bandwidth. Why do you think Yaesu produce the FRG7700 RX with FM bandwidth of 15kHz, and Trio have the R1000 with 12kHz bandwidth which suits the FM conversion when fitted?

I know CBers who know more about DXFM and evasion than the writer of the said article. Sorry to start your new year off in this vein, but we don't want a comic book, do we?

**C.A. King,**

**Swallownest, Sheffield.**

P.S. *Practical Wireless* has been our bible for more years than I care to remember and it is still going strong. I hope PW takes offence at your remarks.

*Thanks for your letter, Mr. King. Actually, the writer of the article is a professional engineer who works in defence and other military areas, and he's probably forgotten more about FM than most of us can ever learn. We don't feel that a misprint in his copy deserves quite a slating! The feature needed to be cut just before printing, so this, plus the misprint, seemed to add up to a sort of garbled paragraph. Of course you are correct in what you say.*

*Regarding Practical Wireless, I agree that it's been around a long time, and a basically good magazine it is too. But it doesn't excuse them getting their facts wrong, plus publishing information slanted at knocking an organisation for no very good reason than scoring a couple of points. Nobody should be immune from criticism, and aren't PW's comments about the RSGB in the same league, if not worse, than ours about them? - Ed.*

## New generation

I have just been into town and picked up your December issue. Congrats! It is nice to see a piece written by Angus McKenzie. He certainly knows what he is talking about. Other magazines have been the mainstay of the hobby for a long time, but some might be on the way out because they have not caught the mood of the present day generation of radio amateurs. The

dinosaurs were great and lords of the earth in their day, but they inevitably became obsolete when they could not adapt to new conditions and perished!

**John, G3BDQ, East Sussex.**

## Equatorial mount

With no disrespect, it is obvious from your article on moonbounce that none of your editorial staff has ever peered seriously through a telescope. If they had, they would have pointed you towards the nearest astronomy/telescope book and told you to look up equatorial mount.

This is a very easy (and for radio purposes where you're not really bothered about rock steady mounts with spot on accuracy) and simple to make mounting. Two setting circles, and a slow clock, slow by four minutes a day, will enable an idiot to find the moon in a snowstorm. But since none of your editorial staff are astronomers you won't have heard of this.

An equatorial mount will enable you to track any cosmological object easily but since satellites are artificial (yes, I do know the moon is a satellite) they follow laws of their own, so it's unfortunately no good for the Oscars.

No need to resort to computers, just try one simple experiment. Get a normal pan and tilt mount, and then put it at an angle to the ground.

**Philip Greener,  
Wakefield, Yorks.**

P.S. The "Fullerscope" explanation is not too clear but it's the only one I could find that wasn't in a book. The setting up is for a telescope where you need to be spot on. You soon notice inaccuracies when you've got 200+ magnification. For radio work, just point the mount in the general direction of the pole – you'll only notice the inaccuracies if you talk for four to five hours. In Morse I don't think it's too critical.

By the way, one interesting point: some of the large professional telescopes use an altazimuth (pan and tilt) mounting with a computer control. It's easier to build!

# STRAIGHT AND LEVEL

Here we are again with all the malicious gossip, tall stories and so on; actually, there aren't too many of them this time! Mr Arnold Geoffrey, of Bourne-mouth, just has to be our most ardent reader and fan because he sent in a copy of *Amateur Radio* with every mistake carefully pointed out in red pen and neatly underlined. It must have taken him hours, and we seriously thought about offering him a job as a proofreader ...! Thank you, sir, and well done. You "corrected" a couple of things that weren't actually wrong in the first place but what the hell, there's nothing like enthusiasm.

We had a couple of letters from people who flatly refused to believe us when we said (in the last issue) that the amateur service was a "shared secondary" user of the 432MHz band in the UK. They quoted the Radio Regulations at us and said that there was nothing whatsoever in them that stated anything about the military having effective primary status there.

Well, sorry but it is so; the Radio Regs are the official ITU mammoth tome, but individual administrations can actually do what they wish and, in the case of the UK, the amateur service is definitely secondary to "radio-location". This in practice means two things; systems like Syledis, which is what offshore oil exploration people use for position fixing (it's a French system, and it stands for *Système Légère de Mesure de Distance*, would you believe) and also military systems like the MoD thing we discussed last time. So what we said was dead right, and the Radio Regs only tell you half the story.

Still with 432MHz, there was still some last-minute faffing about with the Phase 6 repeaters as we hit the press, although the delay was apparently due to nothing more serious than a licencing technicality according to the Home Office. Ditto with the Phase 5 VHF units, and we're eagerly awaiting GB3RD so that we can see if we can get into it from the office. We wonder whether there's much need for more UHF repeaters now. The coverage seems to be getting not far off nationwide, and driving up to Newcastle last week the network didn't exactly seem to be heavily loaded with

## News and views from the world of the radio amateur, compiled by the staff of Amateur Radio.

customers. What a friendly crowd they are on Tyneside, by the way - thanks for some super talk-in, chaps, and the direction to the transport cafe was first-rate!

There's a new Telecommunications Bill before our lords and masters in Parliament at the moment, or so we hear, and there were some flutters in the dove cote just before Christmas in case amateurs were going to get hard done by. From our reading (or rather wading through - it's a massive document, and the writing style is worse than anything we've seen before which is saying something), the main aim seems to be to cut down on interference from such things as AM CB gear, cordless telephones and the like, by making possession, advertisement or sale of such things illegal.

Spin-off for the amateur is likely to be indirect - fewer accusations of TV flying about, we'd guess - but probably not much more. At least it might put some teeth in the Wireless Telegraphy Act, which wouldn't be bad, assuming that Parliament doesn't change too much of it.

What about 50MHz? We now have 40 good men and true launched upon the band, or at least any day now, and we hastily switched the tape recorder on when GB2RS announced that the following callsigns would henceforth be heard on the band outside of TV hours. It all started on February 1st, this

year and the lucky folks are listed below.

It doesn't look a bad selection to us, although it looks as though there will be some pockets of activity (lots of Scots, and why two in Stoke-on-Trent? Is it the Staffordshire air?) and it will be most interesting to see how they all get on. We've been doing quite a bit of listening to 50MHz ourselves recently, and it's intriguing how much odd DX crops up after TV has closed down. ZB2VHF on 50.035 was a rock-crushing signal in Bicester about midnight a week or two ago, and it was still loud at 2am (we were testing the ICR70 reviewed in this issue with a homebrew converter at the time).

## Heard Jo'burg

We've also heard ZS6DN in Johannesburg a time or two, and the best so far was PY 2CVR/PY8 at about 1am talking to some Stateside stations - he was a good solid S8 here, which was intriguing. So all in all, along with the H.O., we hope the forty chosen folks will put up a good show, and produce enough to open up the band to others later. Full marks, again, to the RSGB for the work that must have gone into this - OK, so they've only a few people out of hours, but that's about a million per cent better than no people at all at any time.

Talking about the RSGB, one of our staff was passing through Potters Bar the other week and

decided to pop in. He says it's really rather good and kilowatts better than Doughty Street; a couple of delightful young ladies sold him some books and told him that they were even thinking of getting a coffee machine for the members in reception! He didn't say who he was or that he was from the magazine, and he was rather impressed with the place - people were rushing about doing things and there was a general air of efficiency around although there was a certain amount of redecoration going on and they hadn't really got themselves settled yet.

We're pleased for them. As we've said in the past, we're very much in favour of a strong and good national society and we hope that some of the things they couldn't do in Doughty Street can be done now. And, as always, if we don't like it, the remedy is in our hands - it's a democratic society. We, the members, vote for the Council people (or not) and we can vote with our feet if we want some changes to be made. Another amateur magazine referred to the RSGB recently as a gerontocracy - well, if it is, it's no-one's fault but our own. We don't agree with them actually, and in many ways they're rather progressive in Potters Bar - we hope to have an interview with the General Manager in a subsequent issue, and we'll see what's what.

We've had a few letters and a phone call or two asking whether there was any truth in the rumour that it was illegal for a listener to own any transmitting equipment or a transceiver? Well, no there isn't. As far as we understand the legislation, it

GB3RXV	Londonderry, Northern Ireland	GM3WOJ	Fort William, Inverness-shire	GW411L	Tregaron, Dyfed
GB3ZSC	Co. Antrim, Northern Ireland	GM3ZBE	Inverurie, Aberdeen	G2AOK	Staunton, Gloucestershire
G14MJD	Londonderry, Northern Ireland	GM4DLJ	Edinburgh	G3COJ	High Wycombe, Bucks
GJ3RAX	St Brelade, Jersey	GM4ELV	Glasgow	G3LTF	Harlow, Essex
GJ3YHU	St Lawrence, Jersey	GM4FDT	Invergordon, Ross-shire	G3NOX	Saffron Walden, Essex
GJ4ICD	St Saviour, Jersey	GM4FZH	Caithness	G30HH	Stoke-on-Trent, Staffs
GM3DOD	Greenock, Scotland	GM41HJ	Dunfermline, Fife	G3PWK	Ely, Cambridgeshire
GM3WCS	Dunfermline, Fife	GW3LDH	Wrexham, Clwyd	G3TCU	Godalming, Surrey
		GW4BCD	Porthcawl, Glamorgan	G3USF	Newcastle-under-Lyme, Staffs
		GW4HBK	Blackwood, Gwent	G3VZJ	Arundel, Sussex
		GW4HXO	Haverfordwest, Dyfed	G3ZIG	Dereham,

# WOOD & DOUGLAS

## WHY NOT TRY ONE OF OUR WELL PROVEN KITS?

PROJECT	CODE	ASSEMBLED	KIT
<b>70cms EQUIPMENT</b>			
<b>Transceiver Kits and Accessories</b>			
FM Transmitter (0.5W)	70FM05T4	38.10	23.10
FM Receiver	70FM05R5	68.25	48.25
Synthesiser (2 pcb's)	70SY25B	84.95	60.25
Synthesiser Transmit Amp	A-X3U-06F	27.60	17.40
Synthesiser Modulator	MOD1	8.10	4.75
Bandpass Filter	BPF 433	6.10	3.25
PIN RF Switch	PSI 433	9.10	7.75
Converter (2M or 10M i.f.)	70RX2/2	27.10	20.10
FM Package 2 (Synthesised)	70PAC2	163.00	128.00
<b>TV Products</b>			
Receive Converter (Ch 36)	TVUP2	26.95	19.60
Pattern Generator	TVPG1	39.95	32.53
TV Modulator	TVM1	8.10	5.30
3W Transmitter (boxed)	ATV-1	87.00	-
3W Transceiver (boxed)	ATV-2	119.00	-
<b>Power Amplifiers (FM/CW Use)</b>			
50mW to 500mW	70FM1	14.65	8.85
500mW to 3W	70FM3	19.65	13.25
500mW to 10W	70FM10	30.70	22.10
3W to 10W	70FM3/10	19.75	14.20
10W to 45W	70FM45	58.75	45.20
Combined Power Amp/Pre-Amp	70PA/FM10	48.70	34.65
<b>Linears</b>			
500mW to 3W	70LIN3/LT	25.75	18.60
3W to 10W (Compat. ATV1/2)	70LIN3/10E	39.10	28.95
<b>Pre-Amplifiers</b>			
Bipolar Miniature (13dB gain)	70PA2	7.90	5.95
MOSFET Miniature (14dB gain)	70PA3	8.25	6.80
RF Switched (30W Max)	70PA2/S	21.10	14.75
<b>2M EQUIPMENT</b>			
<b>Transceiver Kits and Accessories</b>			
FM Transmitter (1.5W)	144FM2T	36.40	22.25
FM Receiver	144FM2R	64.35	45.76
Synthesiser (2 pcb's)	144SY25B	78.25	59.95
Synth Mult/Amp (1.5W o/p)	SY2T	26.85	19.40
Bandpass Filter	BPF 144	6.10	3.25
PIN RF Switch	PSI 144	9.10	7.75
Synthesised FM Package (1.5W)	144PAC	138.00	105.00
<b>Power Amplifiers/Linears</b>			
1.5W to 10W FM (No Changeover)	144FM10A	18.95	13.95
1.5W to 10W FM (Auto-Changeover)	144FM10B	33.35	25.95
1.5W to 10W SSB/FM (O/P c/o)	144LIN10A	26.80	19.87
1.5W to 10W SSB/FM (Auto c/o)	144LIN10B	36.80	26.95
<b>Pre-Amplifiers</b>			
Low Noise, Miniature	144PA3	8.10	6.95
Low Noise, Improved Performance	144PA4	10.95	7.95
Low Noise, RF Switched	144PA4/S	18.95	14.40
<b>SYNTHESISER ACCESSORIES</b>			
Display Decoder/Driver	DISP1/2	22.60	16.10
<b>GENERAL ACCESSORIES</b>			
Toneburst	TB2	6.20	3.85
Piptone	PT3	6.90	3.95
Kaytone	PTK3	6.80	4.25
Relayed Kaytone	PTK4R	9.95	7.75
Regulator	REG1	6.80	4.25
Solid State Supply Switch	SSR1	5.80	3.60
Microphone Pre-Amplifier	MPA1	5.40	2.95
Reflectometer	SWR1	6.35	5.35
CW Filter	CWF1	6.40	4.75
TVI Filter (Boxed)	HPF1	5.95	-
<b>MICROWAVE PROJECTS</b>			
Microwave Drive Source	MD05T	29.50	20.40
Bandpass Filter	BPF 384	5.10	3.25
<b>4M EQUIPMENT</b>			
FM Transmitter (1.5W)	4FM2T	34.75	21.20
FM Receiver	4FM2R	61.65	43.15
Pre-Amplifier	4PA4	10.95	7.95
Pre-Amplifier, RF Switched	4PA4/S	18.95	14.40
<b>6M EQUIPMENT</b>			
Converter (2M)	6RX2	27.60	19.95

Enquiries by post should contain a SAE. Please restrict telephone technical enquiries between 6pm and 9pm in the evening on either 0256 24611 or 07356 5324. Access and Barclaycard orders can be taken on 07356 5324.

### MAIN AGENTS

J. Birkett. LINCOLN 0522-20767  
 Darwen Electronics, LANCS 0254-771497  
 Amateur Radio Exchange, ACTON 01-992 5765  
 Wood & Douglas (Scandia) HB, SWEDEN 040-94-89-55

Prices include VAT at the current rate. Please add 75p postage and handling to the total order. ATV-1 and ATV-2 orders should include £2.00 for postage and insurance. Please allow 28 days for delivery if not stock at time of ordering.

UNIT 13  
 YOUNG INDUSTRIAL ESTATE  
 ALDERMASTON  
 READING RG7 4PQ.



isn't an offence to own it - the offence would come if you used the transmitter, that is if you hadn't got your licence.

This little rumour seems to have started because of the new legislation we mentioned earlier on, but it shouldn't affect amateur gear at all as far as we can see because it *can* be licenced. So all the SWLs out there with FT102s waiting for the ticket to plop on to the doormat - it's OK, just don't use the Tx. Lock the microphone up in the kitchen cupboard with the emergency packet of fags and the 44 tins of ravioli you got cheap when the grocery shop near you closed down...

Actually, it was intriguing that there were "only" 2,800 passes in the RAE for the last exam - although we gather that this is a 68 per cent pass rate, it's a lot fewer than the last time when about 6,000 chaps were panting to go on the air as soon as the Home Office got their act together. Is interest in amateur radio decreasing? Or is it just that fewer people take it in December? Either way, at least the Home Office shouldn't have as much trouble processing this number as they did last year. We like the way GB2RS tells us where the Home Office is at now, and about the most recent calls issued - that's certainly nipped a few pirates in the bud round our way.

There have been some changes in the way that Raynet operates - Raynet being the Radio Amateur's Emergency Network. Those of you who are in Raynet will know about them already and those of you who aren't would be bored stiff with all the

	Norfolk
G4BAO	Cambridge
G4BPY	Walsall, West Midlands
G4CUT	Chelmsford, Essex
G4GLT	Coalville, Leicester
G4HUP	Stoke-on-Trent, Staffs
G41JE	Bishops Stortford, Herts
G4JLH	Ryde, I.o.W.
G5KW	Gravesend, Kent
G6XM	Christchurch, Dorset
GM30BC	Glenrothes, Fife

details so we'll leave out all the fine print. One thing is that in the past, there was never any provision in the amateur licence for its use at the scene of an emergency - say you came across a multi-car pile up on the M5, for instance.

Well, things have changed - you can now pass messages concerned with this sort of thing, provided that there's nothing else available. We rather suspect that this is just legalising what any sane person would have done anyway, but it's nice to be legal isn't it? Also, you can now legally hand the microphone over to a doctor or any other "responsible person", as the blurb puts it, in an emergency.

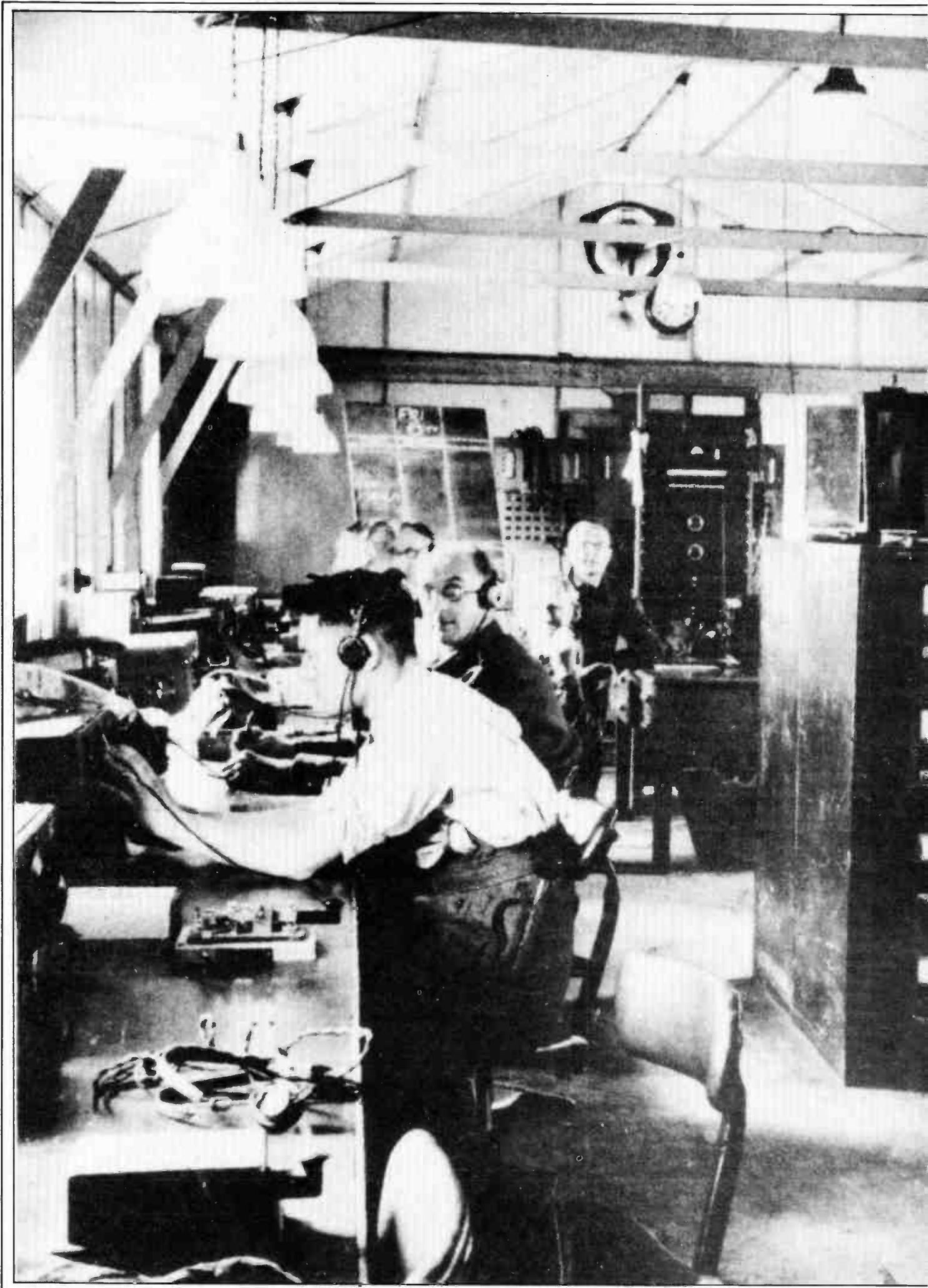
### Life saving

The amateur "must supervise the operation of the station", you'll be fascinated to know! It's all good stuff. Personally, we'd have thrown the rig on the ground and stamped on it if we thought it would save someone's life, let alone call for help with it or hand it on to an ambulance-man whose own radio had quit on him, so although it's nice to be legal it's only legalising what we'd have done without the slightest hesitation in an emergency.

One doesn't tend to worry about the fine print in a licence if the blood is pouring out of someone's head on a filthy night on the motorway and you need to do something *fast*.

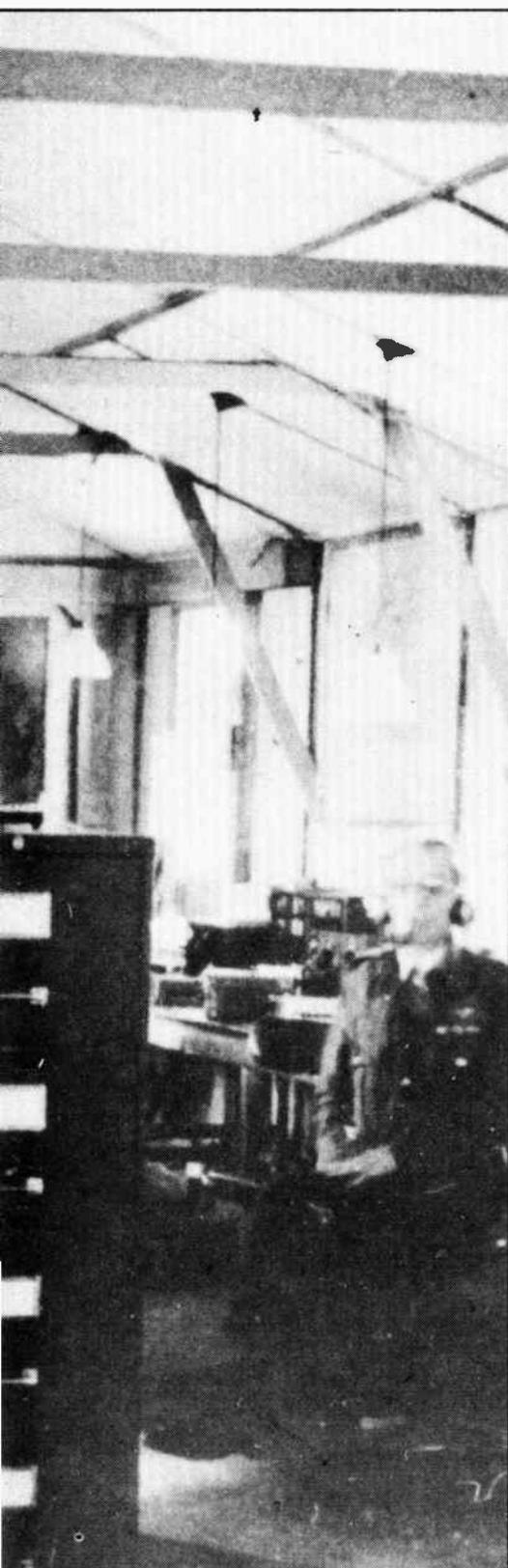
That's about it for this time. We'll see you next month, and if you have any news, know any scandal or just want to let off some steam, do write to us and we'll share it around. Not a soul contacted us about the novice licence proposal feature in the last issue, for instance, so we deduce that no-one's interested in it.

Incidentally, the firm of H. Lexton (who advertise in *Amateur Radio*) were of great help in putting together the Angus McKenzie Report in the last issue of *Amateur Radio*. Were it not for Mr. Harvey Lexton, there would have been a few blank spaces in the comparison feature between the Yaesu FT102, and Icom IC740. Anyway, a very helpful gentleman and well worth a visit if you're in the East London area.



# THE SECRETS OF WARTIME RADIO

**The war of 1939-45 was a hot house for the development of radio communications, radio and radar navigation, black broadcasting, signals intelligence and secret communications links for the clandestine war in the shadows. In such activities, radio amateurs of many countries played a role that has largely escaped the military historians . . . . .**



*A Special Communications control station in Buckinghamshire, working to clandestine stations in France and Belgium. Receivers were mostly HRO but also included AR88 and other RCA models.*

**Written by former underground secret radio service operator, Pat Hawker, G3VA.**

**August 31, 1939:** My amateur log book lists just four 14MHz contacts – LY1AP in Lithuania, YR5BV in Roumania, LA8J in Norway and SM6QN in Sweden. Then a note: "During the BBC news bulletin at 2100 heard announcement that licences have been withdrawn. All valves removed from transmitter. Further information awaited".

There follows an entry dated September 2, the day before Britain officially entered the gathering storm. "GPO engineers removed transmitter". Not until February 1946, over six years later, does my log reopen with a 28MHz contact with Eric Cole in Athens who – as Chief Signals Officer, Land Forces Greece – had allotted himself the call-sign SV1EC and was using his Corps BC610 transmitters (the military version of the 1940 Hallicrafters HT4 amateur radio transmitter).

For most of the intervening years the Defence Regulations made it illegal to have possession of valves of more than 10 watts dissipation, piezo-electric quartz crystals or any form of transmitting equipment. Yet amateur radio, far from disappearing, gathered innumerable new adherents, waiting eagerly for the official resumption of activity on some amateur bands in January 1946 (or, if truth is to be told, sometimes jumping the gun from the end of the war in Europe in May 1945).

Of the four European countries I had happily worked on that last day of pre-war activity, three were ravaged by war. Of the under 5000 men and women who had held British "full" (radiating) or "artificial aerial" (non-radiating) experimental licences in August 1939, the vast majority became involved in wartime radio and radar activities that made use of their technical and operating knowledge.

The amateur bands did not suddenly go "quiet" in 1939. American amateurs remained active, though subject to increasing restrictions, until Pearl Harbor in December 1941. After an initial suspension, a few hundred German "amateurs" resumed activity, under the supervision of an SS General; whether as harmless propaganda, training or covert activities is still a matter of speculation. These D3 and D4 stations, including band-edge beacons, could be heard on 3.5, 7, 14 and 28MHz working among themselves, attempting dx or contacting similarly-active Hungarian amateurs (or at least people using HA call-signs, some of whom were British 'pirates'). Sometimes the German stations changed their calls to snatch contacts with the Americans.

The German government attempted to "nazify" the German amateur radio movement in the years immediately before the war – but came to regret this. Goering, as Chief of the German Air Force, is on record as having said, in March 1943: "We smashed up the amateur radio 'ham' clubs and wiped them out, and we made no effort to help those thousands of small inventors. And now we need them . . ."

This is echoed in *Most Secret War* by Dr R.V. Jones, who headed British Scientific Intelligence. He writes: "The low technical ability of the (German) operator and the high engineering standard of the equipment were not altogether dissociated. When I met General Martini, the Head of German Air Signals and Radar, after the war, I told him that these two factors had surprised me, and he pointed out that he had a very low priority in demanding personnel . . . he had no skilled reserve to draw upon among radio amateurs, as we had, because Hitler had banned amateur

# THE SECRETS OF WARTIME RADIO

radio before the war since it might provide communication links for disaffected organisations”.

Actually, individual German pre-war amateurs, in the early days of the war, were drafted into German Military Intelligence (Abwehr) to provide communications for the Abwehr and the German Security Police (RSHA). Together with other operators, they were later formed into Signals Regiment 506. As the war progressed this organisation had many outposts in occupied and neutral countries, and was responsible for the German clandestine links with agents in the UK, Eire, North Africa, Middle East and North and South America. Their main base stations were in Hamburg, Wiesbaden, Berlin and Vienna. Their transmissions were listened to with great interest by the many British amateurs working, as we shall see later, on behalf of the Radio Security Service.

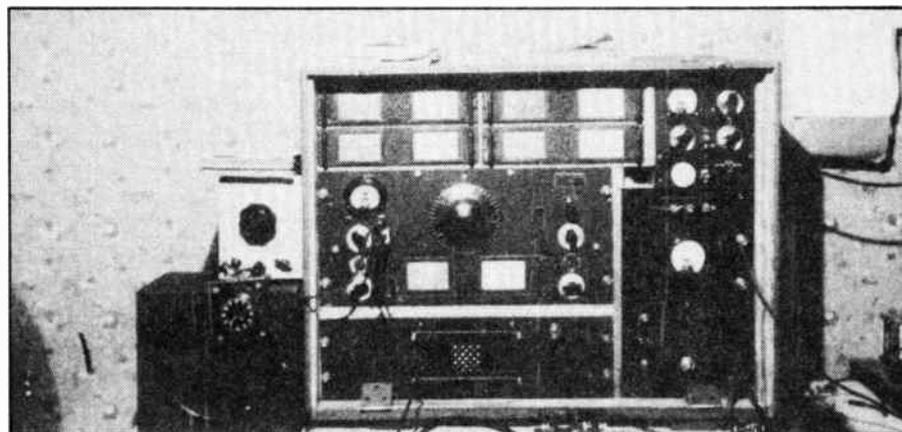
Britain, surprisingly in view of our tradition of losing every battle but the last, had foreseen that amateur radio represented a useful reserve of radio skills. Some amateurs were serving members of the Forces, although there were no Service Associations of the type that exist today. The Royal Navy had established a Volunteer Wireless Reserve in the early 1930s. As a schoolboy I was present at the 1938 RSGB Convention when a new RAF Civilian Wireless Reserve (CWR) was announced; Group Leaders were appointed shortly afterwards and training networks set up.

## Casualties among wartime British amateurs

In 1933 radio amateurs, including Douglas Walters, G5CV, then radio correspondent of *The Daily Herald* and George Jessup, G6JP, had conducted pioneering 56MHz experiments in two chartered Dragon Moth aircraft. These two-way contacts between aircraft in flight and between aircraft and the ground – and the resulting publicity that surrounded them – were prime reasons why the RAF entered World War II with vhf radios in fighter aircraft – an essential requirement for the effective use of the first early warning radar chains.

The CWR and the RNV(W)R were mobilised as war threatened. The first draft of the Civilian Wireless Reservists (The Early Birds) reached France on September 5, 1939 to form part of the RAF's "Wireless Intelligence Screen" and paved the way for the close relationship between radio amateurs and the "Y" signal intelligence (Sigint) services that monitored the radio traffic of the enemy and so contributed directly to the outstanding

*Below: Heavy but still transportable station used by Special Communications and consisting of an HRO receiver and a Whaddon-built Mark 3 transmitter (6V6co and 807pa). Beside the unit is a home brew VFO used unofficially to dodge QRM. Right: Picture taken inside one of the wartime SCU d/f stations. Photo by Gerald Openshaw, G2BTO.*



success of the Bletchley Park code-breaking coups. That first draft included two amateurs who in later years were to play an important role in post-war amateur radio: Roy Stevens, G2BVN and W.H. ("Bert") Allen, G2UJ.

The CWR also brought into RAF Signals Intelligence an enthusiastic radio amateur, Rowley Scott-Farnie, G5FI who was later to head RAF Air Intelligence in the Middle East. Dr R.V. Jones describes him as "a generous-natured rugby player who had badly injured a leg and who before the war had been in a bank. An enthusiastic radio amateur, he had joined the RAF Signals Intelligence Service at the outbreak or war. Incidentally, our community of radio amateurs in Britain was to prove an invaluable reserve, both in Signals Intelligence and in Signals proper, as well as furnishing the staff for our rapidly increasing number of radar stations". Indeed many amateurs passed through the RAF radio schools at Cranwell and Yatesbury and some remained there as instructors, using as an official "text book" the RSGB's *Amateur Radio Handbook*.

Some erstwhile radio amateurs made a mark in ways less directly connected with their peacetime hobby. Royce Wilkinson, G4HW, a peacetime recruit to the RAF, became an outstanding fighter pilot, leading a squadron in France in 1940, then being posted to the Eagle squadron of American volunteers, making an escape when downed in occupied territory, and later appointed to command Britain's "top-scoring" fighter squadron. As a BBC engineer, Reg Pidsley, G6PI flew in a Lancaster bomber over Berlin to make the famous disc recordings

for commentator Wynford Vaughan-Thomas.

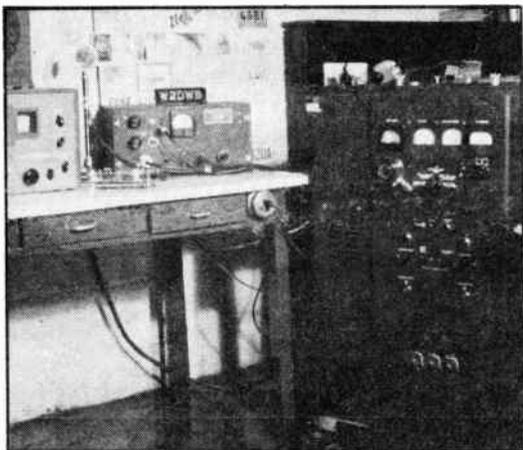
Of the first 1000 RSGB members listed as "on active service" 60 per cent were in the RAF, mostly on technical duties. 14% were Royal Navy, 12% Royal Corps of Signals.

But there were the "silent keys". Fortunately the British did not suffer the mass slaughter of World War I, though I find it difficult to forget that almost a quarter of the boys in my class at school never made V-J Day. Apart from combat, people died in flying accidents while training, or were lost at sea, or fell ill and died in the deserts and jungles – and there were the air raids.

First casualties among British amateurs were Jack Hamilton, G5JH and Ken Abbott, G3JY. Both were members of the RNV(W)R drafted on the outbreak of war as telegraphists to HMS Courageous. The ship struck a mine on September 15, 1939. John Buchan, G4QA was lost with many other British servicemen, when the liner *Lancastria* was sunk while evacuating troops from France in 1940. One whose name is remembered in an annual RSGB award is Norman Keith Adams, G5NM, a young London solicitor who met his death gathering electronics intelligence in a flying-boat crash in the Mediterranean in 1942. Later, W/Cdr John Hunter, G2ZQ, a leading pre-war dx operator, was to die in the Far East . . . and there were many others, such as Lew Nash, G4DA who as a radio mechanic in Crete stayed to destroy vital equipment but was ambushed by the enemy.

### The prisoners

Radio amateurs were inevitably among those taken prisoner in the series of military



*Left: One of the fabulous Hallicrafters HT4 (BC610) transmitters in use in 1946 by W2DWD. Many of these rigs found their way into amateur stations until TVI made them unpopular... In the SCR229 American signals vehicle they were an outstanding success. Below: This group of young Belgians provided daily weather reports by radio. It was organised by Albert Toussaint (left) and operated successfully until the liberation of Belgium, working to a Special Communications control station near Stony Stratford. This is a wartime photograph, and at least one of the group was subsequently caught and executed.*



disasters in 1940-42 in Norway, France, Greece, Crete, the Western Desert, Hong Kong, and Malaya—or shot down in enemy or enemy-occupied territory. Efforts were made to establish uncensored communication into and out of the camps without jeopardising the Red Cross conventions. Along with their “evader” packs, some aircrew were taught “letter codes” and efforts were made to smuggle radio books and components into the camps.

A number of secret radio receivers were made and concealed in the camps under the eyes of the guards, although I have never found any firm evidence that two-way radio contact was ever established with the POW (prisoner-of-war) camps.

Tom Douglas, G3BA described some of his work in making a radio receiver while a prisoner in the Far East in the BBC Open Door programme in 1979. Another account comes from New Zealand: Herb Dixon, ZL2BO, a lieutenant in the RNZNVR, was taken prisoner after the fall of Hong Kong, early in 1942. During the following months he played a leading role in making and using three hf receivers in prison camps on the island.

To convert an old broadcast receiver, smuggled into one camp, flux was made from pine-gum scraped from firewood, involving careful inspection of every piece of wood brought into the camp. Solder was scrounged from the tag-boards of old power equipment. Prisoners contributed 300 torch cells to provide an ht supply. At another camp, the receiver was built from scratch. An abandoned Austin 7 car provided wire, nuts and bolts; the rim of the horn formed a vernier tuning dial. Head-

phones were constructed from small metal cheese and sugar tins. Graphite from pencils made effective resistors. Sheet metal plus a 4-inch nail were transformed into a variable capacitor. Over a period of seven months, enough tin foil and thin wrapping paper was obtained from cigarette packets to make three smoothing capacitors.

A small supply of thermionic valves was located in an operating theatre of a nearby hospital to which the prisoners were taken when needing medical attention, but an excuse had to be found to get into the place. At last, a prisoner complained of a pain in his stomach; he returned to camp minus a perfectly sound appendix but with three valves concealed in his bandages.

### Valves concealed in his bandages

On its first trial, in July 1943, this receiver successfully picked up a BBC programme on 9.5MHz and the latest news from England was soon circulating secretly within the camp. A continuing problem was concealment of the sets from the regular searches carried out by prison guards. In Shamshupo camp, receiver and batteries were kept, in a watertight container, in one of the lavatory cisterns continuously submerged under water. At North Point, a hole was dug beneath one of the huts while a Canadian military band was persuaded to play loudly outside to drown the noise.

However, on September 21, 1943, after a four-hour search, the receiver was located. Herb Dixon, ZL2BO, was one of nine officers harshly interrogated and sentenced to 15

years ‘imprisonment’. He served two years of this sentence under appalling conditions before his release with the ending of the war.

### The equipment

Many radio amateurs were involved in signals intelligence, based on interception of enemy messages, codebreaking and/or traffic analysis; or conversely in signals deception including the creation of “phantom” armies or the operation of the suitcase radios of “turned” agents. The war also saw the development of electronic warfare including the jamming of radar, the so-called “bending” of navigational signals etc. It should not be imagined however that all these techniques were entirely new. As early as 1903 an American admiral proclaimed “Wireless is totally unsuited for war. The enemy could either hear all conversations, or could jam transmissions so nothing can be heard”. In 1904 British Intelligence was already analysing signals received during the Russo-Japanese war! The Admiralty codebreakers of Room 40 showed in World War I that radio traffic is often far less secure than the senders believe.

During World War II the German U-Boat Command developed a signals network which “for complexity, flexibility and efficiency was probably unequalled in the history of military communications”. But this did not prevent much valuable information being derived from the signals, both before and after the cracking of the complex German Navy Enigma machine-cipher. Nor should we forget that many Allied lives were lost at sea because of the ability of the German codebreakers to read for several years the GBMS and GBXZ messages sent to merchant and Navy vessels.

German wartime radio equipment was built to superb mechanical standards. By comparison much British equipment had to be produced in a rush and was far from reliable in tough environmental conditions. Indeed the history of British wartime Service radio is often of lessons learned too late.

In 1940 it was the Germans who taught the Allies that the key to successful mobile warfare, or “blitzkrieg”, was the effective co-ordination of armoured forces, with close air support and motorised infantry and artillery, by means of good tactical radio communications. They also showed, in the short Norwegian campaign, that even low-power clandestine “suitcase” radios could provide a reliable and valuable communications aid. By comparison British military communications thinking had progressed little in the inter-war years, and the 1930s designs were crude.

One reason, perhaps, was the absence of any significant indigenous amateur radio industry. Admittedly, Eddystone produced a good deal of vhf equipment during the war, although successively bombed out of two Birmingham factories and finally set up in a local swimming baths! The tiny Quartz Crystal Company, established by Ernie Dedman, G2NH, was overwhelmed

# THE SECRETS OF WARTIME RADIO

by orders for thousands upon thousands of crystals but was given priority help in expanding facilities.

Designs were often shared between several factories and firms. In June 1940, Marconi began production of what became 80,000 T1154/R1155 mf/hf transmitter/receiver units, based on their 1937 civil aircraft design AD67/AD77. These went into all aircraft of Bomber Command as well as many fighter-bombers, flying boats, reconnaissance aircraft, ground stations, air-sea rescue launches and the like. British, Canadian and American firms produced several versions of the standard No 19 vehicle set, though this design was subjected to last-minute changes, poor quality components and proved far from reliable in North Africa. Rather better was the Marconi CR100 (B28) communications receiver, one of the few British designs that came near to achieving the performance of the many receivers brought across the Atlantic, including the National HRO and RCA AR88.

Until Pearl Harbor, the British were able to buy much of the output of a number of American equipment and component firms. The large amateur market in North America had led, by the late thirties, to some excellent high-performance communications receivers by such firms as National, Hammarlund, Hallicrafters and RCA. Arthur Collins, W0CXX, had established a reputation

## The tracing of MF beacons in the UK just before the war

for making fine transmitters for aviation as well as amateur purposes.

Many American equipments were brought into the UK for the intercept stations of the Y service and for the special intercept organisation set up initially by the Radio Security Service (MI5). American components were also used almost exclusively by Special Communications for clandestine equipments, and for the Mark 3 and Mark 10 transmitters used in distributing the Ultra intelligence to Overseas Commands.

These purchases helped prepare American industry for the communications requirements of its own Services. Undoubtedly the most effective of all Allied signals vehicles were the SCR299/SCR399 units comprising an Hallicrafters HT4 (BC610) 400W transmitter, two BC348 receivers and a trailer-mounted petrol-electric generator. The Americans also benefited from the early development of mobile fm equipment as a result of the work of Howard Armstrong. Radio-teletype equipments were used first in North Africa – a joint-project with which Christopher Her.n-Collins, GU5ZC was closely con-

nected; receivers for rtty were usually Hammarlund Super Pros. Hallicrafters made 18,000 BC610 transmitters, 50,000 SX28 hf receivers and many S36 (BC787B) vhf receivers covering 27 to 140MHz.

Clandestine "suitcase" and special equipments were built by Special Communications at Whaddon and Little Horwood; by Special Operations Executive (Special Forces) at Stoneleigh; by British industry for SOE; and by a group of Polish engineers at a small factory in Hertfordshire. A number of radio amateurs were concerned with the SCU and SOE projects, including Major John Brown, G3EUR who designed the B2 equipment which was certainly the best design for "para-military" operation in situations where relatively heavy equipment could be used. For Western Europe, SOE's A3 (the so-called B2 Minor) built by Marconi was a deservedly popular design, although pick of the bunch was indisputably the Polish AP series using a keyed 6L6 crystal-controlled power oscillator with a small three-valve superhet receiver (6K8, 6S7 and 6SC7).

### The war of secrets

The Services recognised in setting up the RNV(W)R and CWR that war imposes urgent need for radio operators and technicians requiring only a minimum of additional training. A similar, though less foreseen, need arose also for the Secret Services.

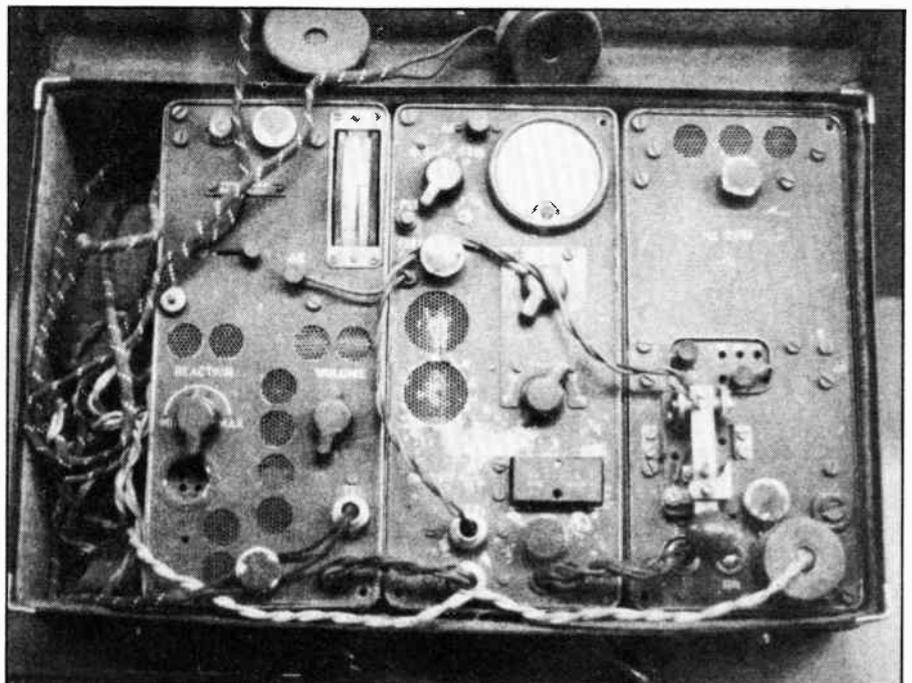
The Security Service (MI5) already included a radio section (RSS) and as peace faded a number of Post Office interference-tracing teams were earmarked for tracing mf radio beacons that might be set up in the UK by persons working on behalf of the enemy. A number of Voluntary Interceptors were also recruited, at first mostly among Post Office staff, "to intercept, locate and close down illicit wireless stations operated either by enemy agents in Great Britain or by other persons not being licensed to do so under Defence Regulations, 1939".

Soon after war broke out, Lord Sandhurst

of RSS realised the need to expand this rather shadowy organisation. He consulted Ken Alford, G2DX who suggested that radio amateurs would be willing to help, and advised him to talk to Arthur Watts, G6UN then President of the RSGB. Over the next months more than 1000 British amateurs still in civilian jobs were approached, asked to sign the Official Secrets Act, given security clearance, and then told to listen at home for any suspicious stations that could not be positively identified.

At this time also, RSS became directly involved in the first of the many "Double-Cross" operations. A German suitcase radio transmitter had been delivered in Spring

*Below: A Mark 3 transmitter and HRO receiver in use at Eindhoven in the winter of 1944/45. Although originally fitted in a signals vehicle, such stations were often brought into more comfortable surroundings. Working the home made "bug" key is Watson Peat, GM3AVA. Bottom of page: Early SOE suitcase transmitter/receiver. This is the Mk2 model of which more than 1000 were manufactured by Marconi to an SOE 1941 design. A number were given to the USSR, but it was also used in Western Europe (photo Dick Rollema PAoSE).*



1939 at Victoria Station to Arthur Owens, a Welsh electrical engineer who, in the 1930s, had worked both for the Abwehr and for British Intelligence. With Owens's set, signal plan and code a V.I. operator made contact with the large Abwehr Hamburg control station run by Major Trautmann. Spurred on by this success, the V.I. noted that Hamburg was contacting other stations, including what proved to be a clandestine ship sailing in Norwegian waters. Other V.I.s began to report similar traffic and an elaborate complex of Abwehr and Police (RSHA) radio communications began to emerge, including a highly effective system for relaying messages from observation posts around the Iberian peninsula, reporting Allied ship movements to a control station in Madrid that was in hourly contact with Berlin.

Meanwhile parallel work was being undertaken by the French Special Services radio organisation under Gustave Bertrand, intercepting traffic from the German Wiesbaden control station and also "playing back" the radio of a controlled German agent. After the fall of Norway and France, the German networks rapidly expanded until they covered virtually all of Europe and North Africa, while the Hamburg station also worked to agents in North and South America (some genuine, others including that of William Seborg in New York controlled by the FBI). Bertrand continued his codebreaking activities in the unoccupied zone of France until November 1942, radioing information to Britain.

An analysis carried out in the summer of 1940 showed that the Wiesbaden traffic in the spring had contained many clues, unnoticed at the time, to the German offensive of May 1940. This underlined the valuable strategic information that could be gleaned from tapping into the German spy networks, as well as their value for finding out what the enemy Intelligence services were doing.

## Secret listeners on the HF band

By the end of 1940, RSS had a large and effective V.I. system with hundreds of logs and QTCs flooding into "Box 25, Barnet" but hampered by the problem that most of the volunteers had full-time jobs during the daytime. At Bletchley Park, Dilwyn Knox cracked the ciphers and broke into more and more of this unique source of Intelligence. Main Police and Abwehr hand ciphers were broken from December 1940 onwards, but it took another year before the Abwehr's Enigma machine-cipher was mated; BP never succeeded in breaking the Gestapo Enigma.

At Barnet, a highly-effective "discrimination" section run by K. Morton Evans, G5KJ, supported by the regional Group Leaders, almost all ex-amateurs, helped and encouraged the secret listeners to spend hours searching the hf band, despite the "distraction" of the air-raids of 1940-41.

The success of RSS in providing, separately from the established Y service, information of military as well as counter-



espionage value soon attracted interest – and some jealousy – on the part of the Secret Intelligence Service (MI6). SIS was still smarting from the blow inflicted on its activities by the kidnapping in November 1939 of two of its officers at Venlo, in Holland, and the subsequent "blowing" of a large part of its European activities.

Through the personal intervention of the Prime Minister (Winston Churchill who cherished a strong belief in the value of Signals Intelligence), MI6 was given prime control of a large part of the RSS operation, under the designation MI8c. An early result was the decision to set up special full-time intercept stations, concentrating solely upon enemy Intelligence communications, at Hanslope Park, near Bletchley and at Forfar in Scotland, supported by its own d/f network. From late 1941 a large number of V.I.s, including many radio amateurs, were specially enlisted into Special Communication Unit No 3, overtly part of the Royal Corps of Signals, but in reality controlled by MI6 from its headquarters at Broadway Buildings in London and Whaddon Hall, near Bletchley. Similar material was also intercepted in the Middle East, primarily at the Services-controlled "Y" intercept station at Heliopolis where there were often many radio amateurs. John Roscoe, G4QK, was concerned with devices (RFP and TINA) for identifying individual transmitters and operators.

SCU3, it must be admitted, was altogether less adept than RSS at handling the highly individualistic radio amateurs who sought to make the "Country Farmyard" (Hanslope Park) a reflection more of National Field Day than a conventional military establishment. Viewed in retrospect, the amateurs won – but not without a struggle!

Yet the heart of Special Communications was far from an orthodox organisation. It was under Brigadier (Sir) Richard Gambier-Parry, ex-G2DV, ex-BBC, who had been attached, as they say, to the Foreign Office in 1938 to run radio communications for British Intelligence (a fact known to the Germans after Venlo, if not to the British public). He gathered around him a very varied collection of professional communications engineers, radio amateurs, professional and ex-Service operators at first to provide radio links with Intelligence stations overseas, usually located within the embassies, and using transmitters such

*Group leaders and RSS staff at the Leatherhead Regional Office which includes Lord Sandhurst and many well known Home Counties radio amateurs. Among those identified are G2IZ, G2QY, G2CD, G6UN, G6CJ, G6OT, G6NF, G2NS, G2BV, G5WP, G6WN, G2NM, and G2XP. Photograph taken in the summer of '45 by S.E. Janes, G2FWA.*

as the Mark 3 (807 pa) and Mark 10 (813 pa) – the designs for which are believed to have originated in various amateur radio handbooks! Soon the organisation was called upon to provide equipment and operators for the special network needed to distribute "Ultra" intelligence to the overseas Commands, and then to run the clandestine radio links with occupied Europe, including – for a time – those controlled by the rival Special Operations Executive set up in 1940 to "set Europe ablaze".

Until his death at the end of 1941, one of G-P's senior assistants was Leslie Lambert, G2ST, a one-time professional stage magician. He had been engaged in Sigint since before the start of World War I, but was known to millions of radio listeners as "A.J. Alan" the most polished and most popular radio story-teller of all time.

### The clandestine operators

I have to confess that in nearly 50 years of short-wave radio, the operators that I have admired most were those who dared tap out messages from enemy-occupied territory. Every time they pressed the key they knew that skilled ORPO d/f teams were probably listening, ready to close in on them. Although the casualty rate was perhaps less than that of the w/t operators of Bomber Command, the stress undoubtedly was greater. Relatively few of the agents in the field were former radio amateurs. Most were newly and all-too-hurriedly trained young men and women or ex-Service, ex-marine, ex-aeronautical operators.

Agents and/or transmitting equipment were infiltrated into occupied Europe by parachute, by submarine, by feluccas and other disguised fishing boats, stepped out of the daringly-landed Lysanders and Hudsons of No 161 Squadron, or came in by those curiously commodious "diplomatic bags". Some equipment was secretly built under the shadow of the enemy, particularly in Denmark and Holland.

# THE SECRETS OF WARTIME RADIO

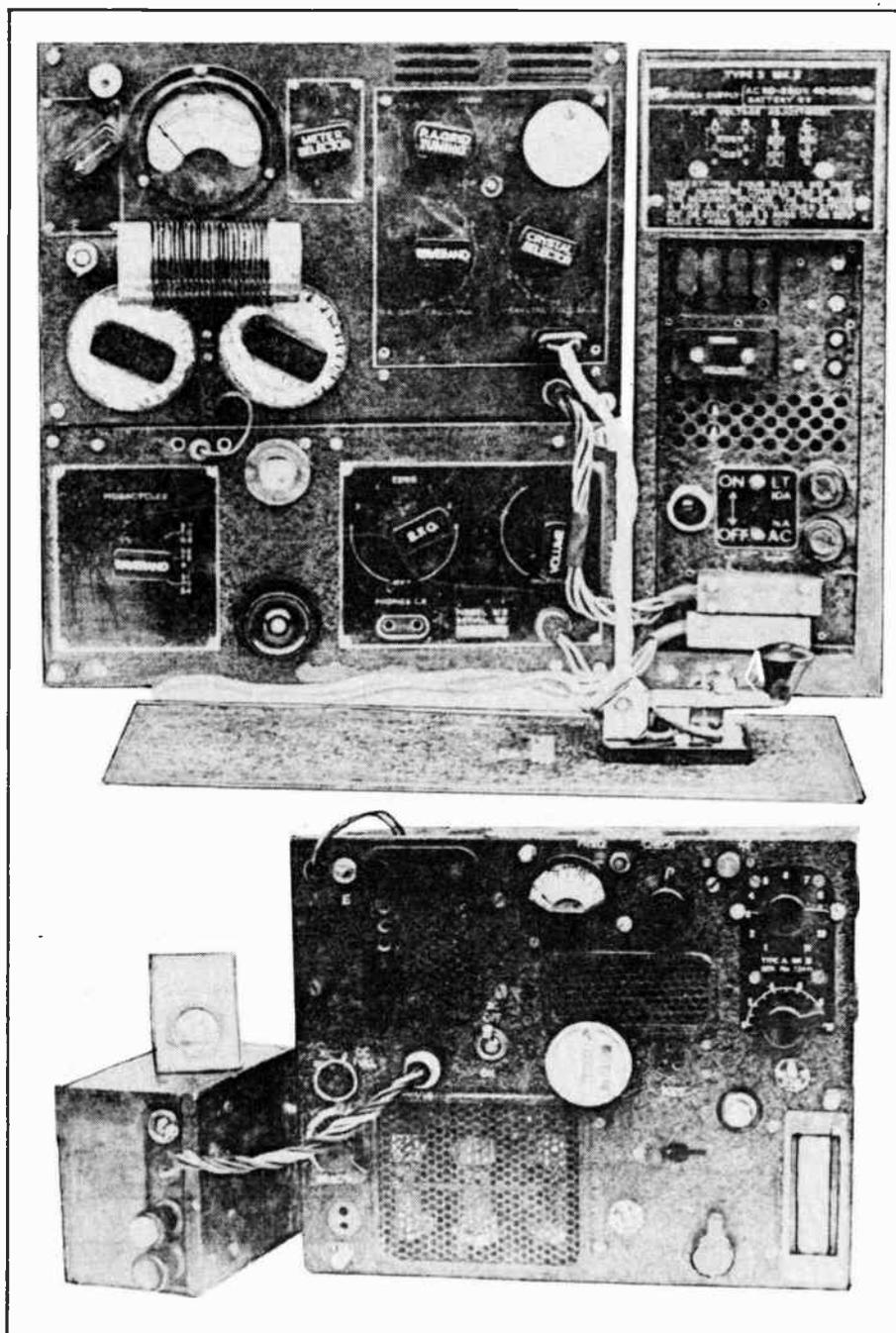
It needs to be recognised that when any radio-equipped agent, well or indifferently trained, is infiltrated into enemy-occupied territory any of a number of things may happen. He or she may succeed in the mission, remain at liberty and transmitting. The agent may believe he has succeeded yet in fact be working under secret surveillance or transmitting messages stemming from the enemy who may have already secretly penetrated the network. The agent on arrival may be quickly captured, possibly even being met by an enemy-organised reception party. He or she may then volunteer or be persuaded to act as a controlled agent; the agent may already be a double agent using this means of returning to his masters or penetrating the network. He may reach his destination but be unable to make radio contact, possibly due to faulty equipment, inexperience or loss of nerve or loss of crystals.

## Capturing members of the Red Orchestra

During World War 2 the counter-espionage organisations became adept at running "radio games" (Funkspiel). Virtually all German agents in the UK and most of those in the Middle East, were run by the British. The Germans ran the SOE networks in Holland (Operation Northpole) in 1942-43 and also penetrated a number of the French networks. They also continued to send messages to the USSR after capturing operators of the so-called Red Orchestra. A number of RSS operators spent many months of the war transmitting messages to the Abwehr stations in Germany, France and Spain. They were radio amateurs who had entered the shadowy world of counter-espionage through the V.I. system.

In the early spring of 1941, 25-year-old Andreas Bertnes, LA6R, a medical student, was arrested by the Germans in Norway. He was accused of espionage, illegally using a radio transmitter, and shot early in 1942.

In Holland in Summer 1944 W. J. Dalmijn, PAODD took over the running of the OD-section of the Binnenlandse Radiodienst – a clandestine radio network set up by the dutch themselves to aid in the liberation of their country. OD was one of the Dutch Resistance organisations that contributed to this network which, from September 1944 to May 1945, sent a stream of information to Eindhoven from the occupied north. Dutch amateurs took a full part in the radio links of the OD and RVV groups, although RVV relied mainly on several highly skilled Dutch KLM airline operators. Both OD and RVV suffered severely from German raids. Some operators were executed on the spot, some in



front of the families giving them shelter, some together with those families, some were executed after imprisonment, some perished in the final holocaust of the concentration camps.

France, more than most occupied countries, was beset by doubts and by divided loyalties brought about by the existence of a "legal" Vichy government. Many myths have been created about French Resistance in which De Gaulle's followers were the good guys and Vichyites all collaborationists. The truth is much less black and white. In particular little credit has been given to the remarkable help given to the Allies by the highly professional French Special Services, while nominally working on behalf of the Petain government at Vichy and so highly suspect to De Gaulle's secret services.

From Spring 1941 radio links with France were made, broken, remade, penetrated, remade and rebroken almost continuously until the liberation of France in 1944, both by Special Communications and by SOE/

*Two of SOE's best suitcase transmitter/receiver designs. Top is the B2 equipment designed by John Brown. G3EUR of which more than 7000 were manufactured in the SOE "factory" at Stonebridge Park. Below it is the smaller A3 equipment with a 7C5 power oscillator. Some 4000 of these were made by Marconi.*

Special Forces who established their main base station "Charlie" at Poundon.

Relatively few French amateurs were involved in the links. But there were some. After the collapse of France in 1940, Robert Perton, F3IQ returned from military service and set about constructing a transmitter which was used for communications with Britain for more than a year. In order to disrupt the monitoring services, he built an "interference generator" which he installed not far from the local d/f service and which was switched on at times when the trans-

mitter was in use. As a radio repair technician he also took an unusually long time when requested to repair faulty equipment of the d/f team.

Resistance movements, intelligence-gathering and escape organisations, supported by clandestine radio links, often came into being spontaneously, founded on courage and idealism. It was only later that they tended to become deeply involved in politics. History has not treated clandestine activity kindly. Admittedly, wartime Resistance fathered the techniques now associated with urban terrorism; the plastic explosives; the assassination squads; the taking of hostages; the extortion of funds; the savage reprisals.

A French amateur, Claude Gremont, F5HS wrote to me in 1982: "I find it rather moving that the British pay a tribute to a somewhat forgotten corporation. Here, in France, the best thing you can expect, when you are brought to confess that you have been a radio agent, is an ironic smile". Yet, at the time, Leon Faye, military head of the large Alliance organisation, wrote in prison shortly before his death: "Close down the prisons, throw out the executioners . . . later the historians will give their verdict. Now we need unity not reprisals, work and not chaos. These are my last wishes". As George Mangakis has put it: "Resistance starts with very little steps of human dignity. You find the courage from the feeling that you will shame yourself every morning in the mirror – and so you act".

## Messages flowed in and out of Europe

Those British and American radio amateurs and others who, in Special Communications or Special Forces, endeavoured to assist the clandestine operators from the comparative safety of UK or overseas base stations, were acutely aware of the dangers facing those in the field – and of the many deficiencies of the early British suitcase radios (compared to either the German or the Anglo-Polish sets) and of the operating procedures. Special Forces made valiant efforts to overcome the technical problems with their A3 and B2 designs. SIS tended to rely more on what it believed was its greater expertise in conducting covert activities and its penetration of the activities of the German counter-espionage teams. Both organisations made serious mistakes; both achieved some remarkable successes. Many thousands of messages flowed in and out of Europe. Nor should we forget the work of the Coast Watchers in the Pacific.

Any rivalries that may have existed between members of the Royal Navy, RAF and Army pale into insignificance beside those that are endemic within different secret services, though fortunately few had such far reaching results as the bitter conflict between the Abwehr and the SD (Gestapo). Nevertheless Churchill in 1944 was driven to write: "The warfare between



*A youthful-looking Pat Hawker, G3VA. This is a photograph taken in Brussels in 1944 where he found himself after spending six weeks in Paris immediately following the never-to-be-forgotten liberation in August 1944. Later, he spent six months in Eindhoven working for the secret internal radio service of the Dutch Underground, feeling sorrow but admiration for the Dutch operators across the rivers in still-occupied territory.*

SOE and SIS is a lamentable but perhaps inevitable feature of our affairs". One reason was that SIS felt that sabotage and covert paramilitary operations tended to stir up German countermeasures; Intelligence and escape networks prefer to work alongside apparently dormant populations rather than in an atmosphere of police raids and hostage taking.

Although the Signals Directorate of SOE and SIS's Special Communications both included significant numbers of former amateurs, there was little mutual co-operation and from 1942 both tended to go their own way. Both for example developed r/t links with Resistance groups from high-flying aircraft. Special Communications used American fm equipment on about 30MHz to contact French and Belgian groups; SOE, in a number of the theatres of operation, used 450MHz S-Phone equipment developed by Captain Bert Lane. I believe he was a pre-war amateur working in the radio industry but cannot trace his call sign. This in turn led to the development of the American OSS 260MHz "Joan-Eleanor" equipment which Al Gross, W8PAL claims to have been the direct predecessor of the first post-war 465MHz CB equipment. "J-E" was used in the final stages of the European war to contact agents in Germany – up to then virtually all clandestine links had been to the marginally less dangerous occupied countries.

Converted French fishing boats, based in Falmouth and the Helford estuary, were used in 1942-44 to slip across the Channel to take, and bring back, agents and written reports. The vessels carried Special Communications Mark 3 transmitters and often used a call sign that was, in fact, the initials of the old-time radio amateur who

organised the radio communications in support of these operations. Surprisingly the full story has never been told of this secret cross-channel ferry that rivalled, in even more dangerous waters, the "Shetland Bus" that served Norway. Norwegian radio agents, incidentally, worked to an SCU station in Scotland. Most of the other SIS base stations were in the Bletchley area.

By the time of the invasion of France in June 1944, a number of the French clandestine links were known to have been penetrated by the Germans; indeed over 25 of the "alert" and "imminent action" iodoform messages (personal messages) broadcast by the BBC to the French Resistance were known to the Germans in advance. Fortunately the enemy was misled by Allied deception plans – including the creation of phantom "armies" by means of false signals traffic – into putting only their forces in the Pas de Calais area on to full alert. For the invasion, SOE and OSS, together forming Special Forces, concentrated on their Jedbergh para-military teams with uniformed signallers using suitcase sets; SIS took part in a joint British/French/American operation called "Sussex" that had as its target the putting into France of 50 two-man teams of French agents, equipped with battery-operated radios, to report German military movements.

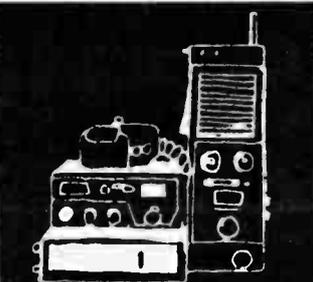
One of the devices made for this operation was the Mark 21 transmitter-receiver based on the then new miniature 1.4V filament valves and layer batteries. Again, it is sad to note that the great courage displayed by some of the French "Sussex" teams has never been presented to the British public.

## Reporting German military manoeuvres

The end of hostilities in Europe in May 1945 and in the Far East in August 1945 did not bring an immediate restoration of amateur radio activities although the bands began to fill up with strange call signs concocted by servicemen still waiting for their demob number to come up. By then there was often a profound disenchantment with all matters military. The euphoria of the "liberated" cities had been followed by the rough justice of the "cleansing" of collaborationists; the "blitz" and the V-weapons had to be set against acres of devastation in the Ruhr, Hamburg and Dresden; the Burma railroad against Hiroshima.

Sir Martin Ryle, G3CY, who spent six war years working as one of the T.R.E. back-room boys on radar, has put it thus: "By the end of the war we were all very tired. Few of us knew precisely what we wanted to do . . . I certainly knew what I didn't want to do . . . I wanted nothing more to do with military equipment . . . to go on designing bigger and better radars in preparation for the next war".

So finally, it was good to be back on the air. International friendship rather than conflict or Intelligence intrigue. The ideals of true Amateur Radio!



## SOUND ANALYSIS

The Icom ICR70 is the latest in a line of general coverage HF receivers from various manufacturers which use broadly similar circuitry. For what they do they're all cheap and they perform well in use. Such radios as the Trio R1000, which is discussed in this issue, the Yaesu FRG7700 and now the R70 all offer similar facilities and are all worth thinking about if you want general coverage of the HF bands.

All of these receivers use frequency synthesiser techniques of one sort or another, usually tuning from practically DC up to 30MHz in 1MHz segments. The modern trend also is to use something called "up-conversion", which we'll get to shortly – this is a good way of getting rid of certain nasties which afflict the classic superhet-with-455kHz-or-10.7 MHz-IF if yore. So what about the newcomer, the Icom ICR70? Is it different, better or what?

Here again, before we wade in and talk about the receiver itself, we ought to have a word or two about our approach to reviews. Now although we have access to some good test gear (and, more important, people who know how to use it) it's worth pondering about how to test something. Amateur radio equipment is complex, and not everyone is over-familiar with some of the more advanced concepts which you can use to state the performance of things. Hands up those who can define "third-

order intercept point", for instance, and who can say how relevant it is, or isn't to receiver performance?

All the magazines tend to publish things like this, and they blithely assume you're as familiar with noise floors, synthesiser phase noise and jitter as you are with your breakfast cornflakes. Now this isn't necessarily so. It's supposed to be a hobby, chaps, and it's all very well for *RadCom* to do in-depth esoteric reviews, but we'd be interested to know what proportion of amateurs really understand the concepts behind all the big words and how much they influence their choice of one rig against another. We're planning an article on "testing techniques" for a future issue, by the way.

### Wants something better

And when it comes to receivers, we need to think even more carefully about who buys them. We imagine – maybe wrongly, but from what people tell us we think not – that the man who buys this sort of receiver does so because he's interested in radio and HF listening and wants something better than the multiband portable with all the HF bands crammed into about an inch on the tuning dial and which can't really cope with CW or SSB. Since he hasn't yet got to the RAE stage and is really only just coming to terms with what the hobby is all about, he's going to be even less likely than Mr Average Amateur to nod his head sagely when some article discourses wisely about Minimum Discernible Signal and VCXOs which interpolate the Hz in the synthesiser.

***Amateur Radio's technical staff put this excellent receiver through its paces.***

So we felt that in reviewing receivers we'd do well to keep hyper-technicalities out of it. But it's your magazine and we need to hear from you about what you'd like to see. The questionnaire helped a lot, but we have a heavy programme of reviews scheduled for this year and we're just wasting space if we aren't doing them in a way which helps the majority of our readers.

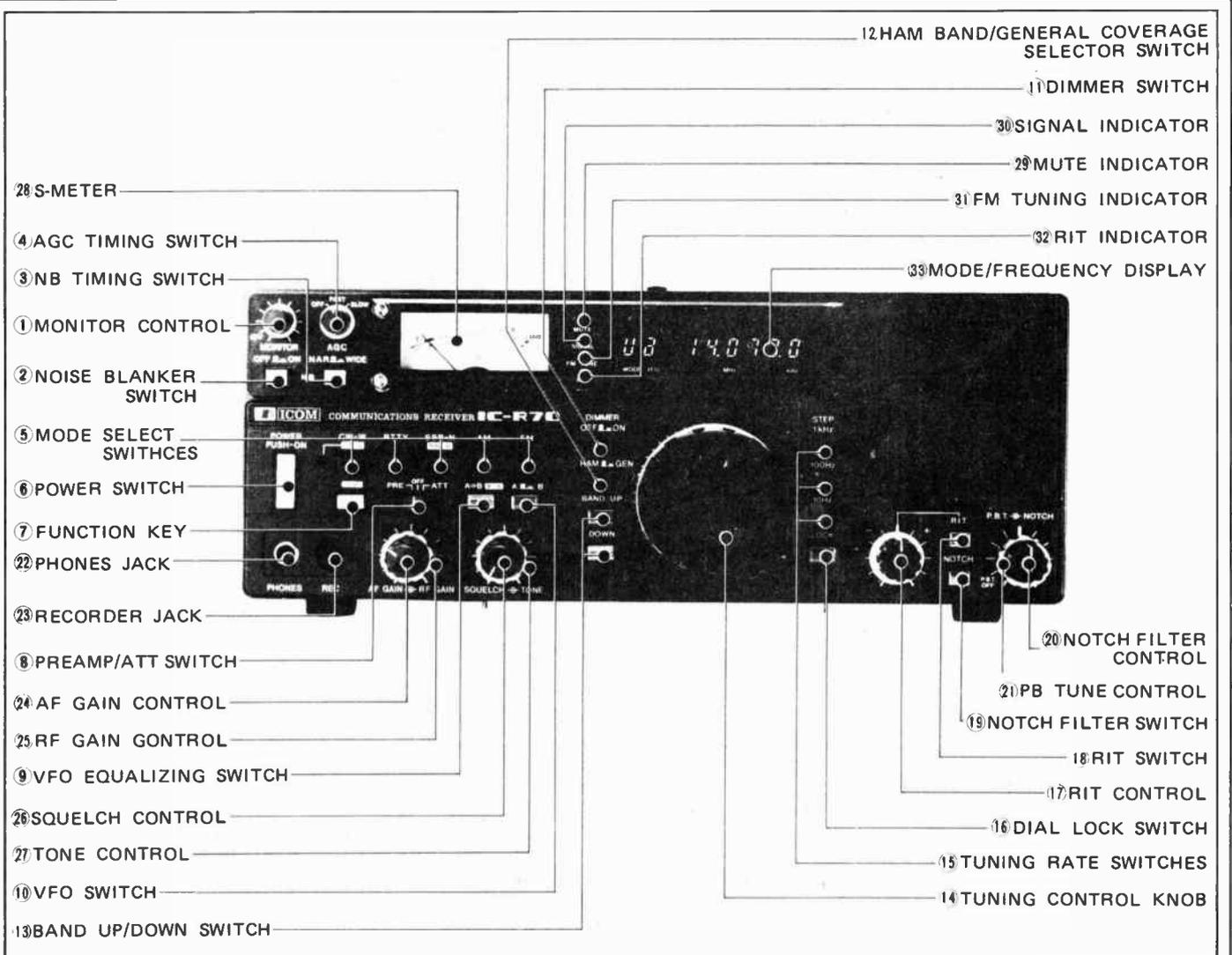
Right then – enough of the thoughts of Chairman Drake, what about this radio? We tend to like Icom gear because it seems to have that little something extra; from the technical point of view, the designs have a certain flair that makes us grin a little when we see it in the circuit, and they have a good reputation for reliability. Our first ever mobile rig was an Icom and it served well for years until someone nicked it out of my wife's car – ah well, that's life. So we were most pleased to see that Icom had followed the trend and produced a general coverage HF band receiver, and we were delighted when the lads at Thanet Electronics suggested we give it the old once-over.

So it duly arrived courtesy of Securicor, and we whipped it into my office before Technical Bod could carry it off into his den for a fate worse than death. It came packed securely in polythene and polystyrene packing pieces, along with what looked like a comprehensive instruction book.

First step was to sit the rig on the desk and have a read of the book to get the general idea of how it was supposed to work – the book was typically Icom, with nary a trace of "Japanglish" and lots of good solid information. There was a good clear description of the facilities, and a nice circuit description and troubleshooting guide at the end. So after a good ponder, we turned to the rig itself. The manual, plus the very clear circuit diagram and layout chart got nicked by the technical office, and mutterings and grunts were

# ICOM IC-R70

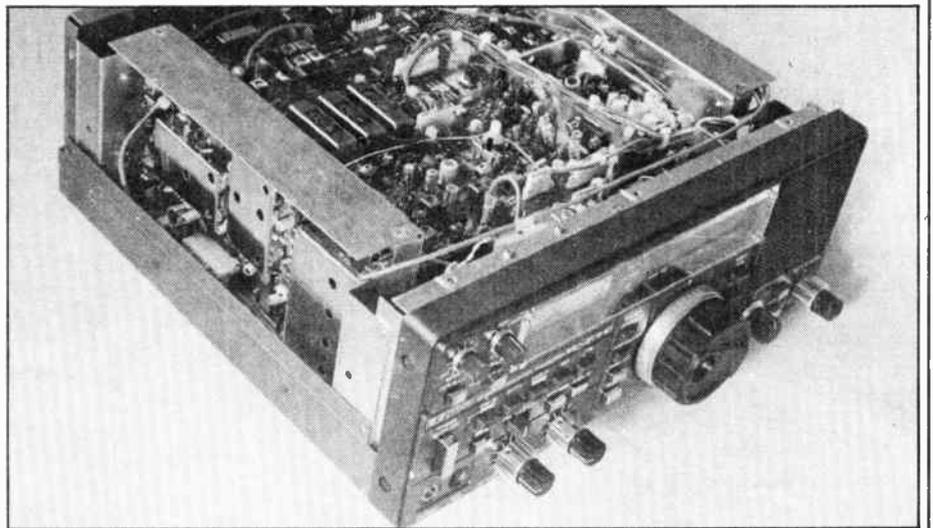




heard to emerge from their room until we shut the door and left them to get their test routine sorted out. Dreadful lot, they are – they'll even swipe your coffee if you turn your back for a second, and whole linear amplifiers disappear over lunch . . .

First impression of the wireless was of a solidly built and clearly laid out device – it turned the office scales at a hefty 10 lbs and the front panel was dominated by the VFO knob, with the speaker to its right and a big S-meter to the left. We plugged in and everything lit up – so much so, in fact, that we thought for an awful moment that we'd set the voltage selector wrongly! The digital display was the brightest we've ever seen, and the S-meter almost hurt our eyes to look at. Even strong sunlight didn't bother the display one iota, which is more than you can say for many LED-type readouts. Very good, although when it came to tests late at night (we had some fun with a homebrew 50 MHz converter and the R70 later in the tests) we were glad that there was a dimmer switch.

It was then a matter of plugging an antenna in, and the R70 showed its breeding right away by having two antenna sockets, one for a balanced 50ohm input and one for "low band" operation with a random length of wire. The receiver switches to this latter terminal automatically unless you've connected the two sockets together with a switch on the rear panel. Very nifty – you can either use a proper dedicated



antenna if you're interested in reception below 1.6MHz, or you can use your usual HF dipole or beam or whatever for general listening around if you aren't after optimum performance. To begin with, we hooked our three-element triband antenna to the R70 and settled down to get the feel of it.

In a sense there are two receivers in one because you can set a switch which either confines you to amateur band coverage only or gives you the whole works from 100kHz up to 29.999MHz. With the switch set to GEN, the machine starts up set to the 15MHz band, actually at the bottom of it, and set to HAM it comes on an 7.1MHz.

*Top of this page: Front panel with controls explained. The circled numbers refer to items in the Icom instruction manual. Above: With the top casing removed, the interior looks extremely complicated, and it should be, for the facilities it boasts.*

Since the R70 has a microprocessor inside it to look after the housekeeping and general chores, it always comes up in the right mode as far as sidebands are concerned – upper for 15MHz, lower for 7MHz, for instance – and we also like the way it comes on at 7.1MHz so that you're all set to tune down the band. Since it's LSB on



# SOUND ANALYSIS

that band, that always feels more natural to us, just as it does to tune up a band where signals are LSB.

To the right of the VFO dial are push-button switches with a lovely light action which you use to set the steps you want the VFO to tune in. You have the option of 1kHz, 100Hz or 10Hz, which is good (some earlier synthesised radios didn't have a 10Hz step, which made life a misery if you were trying to wrinkle out weak CW signals in heavy QRM) and in use these were really nice. The way we ended up tuning the receiver, being right-handed, was to tune the VFO with first finger and thumb and change steps with the second finger, and it worked like a charm.

Technical Editor is left-handed, and he used his thumb to change steps – both of us were impressed with the way it worked out in practice.

So it was time for some serious listening around, in order to establish the feel of the receiver and to get some idea of how good the front-end was and what the filtering was like. First stop, as always, was 7MHz – this is our regular test track for receivers because there's a mixture of weak CW and rock-crushing broadcasts and it takes a good wireless to cope with it. So we connected the 7MHz dipole and set ourselves up.

First thing was to establish how good, and how versatile, the filters are in the R70 – basically it has passband tuning coupled

with a notch filter. Both of these worked well, and with a little tweaking and getting used to things we were copying DJ2FV or CW within 1 kHz of Radio Tirana doing its usual nonsense on 7065 or thereabouts. This also suggested that the front end was doing rather well, and this impression was confirmed as we got used to things.

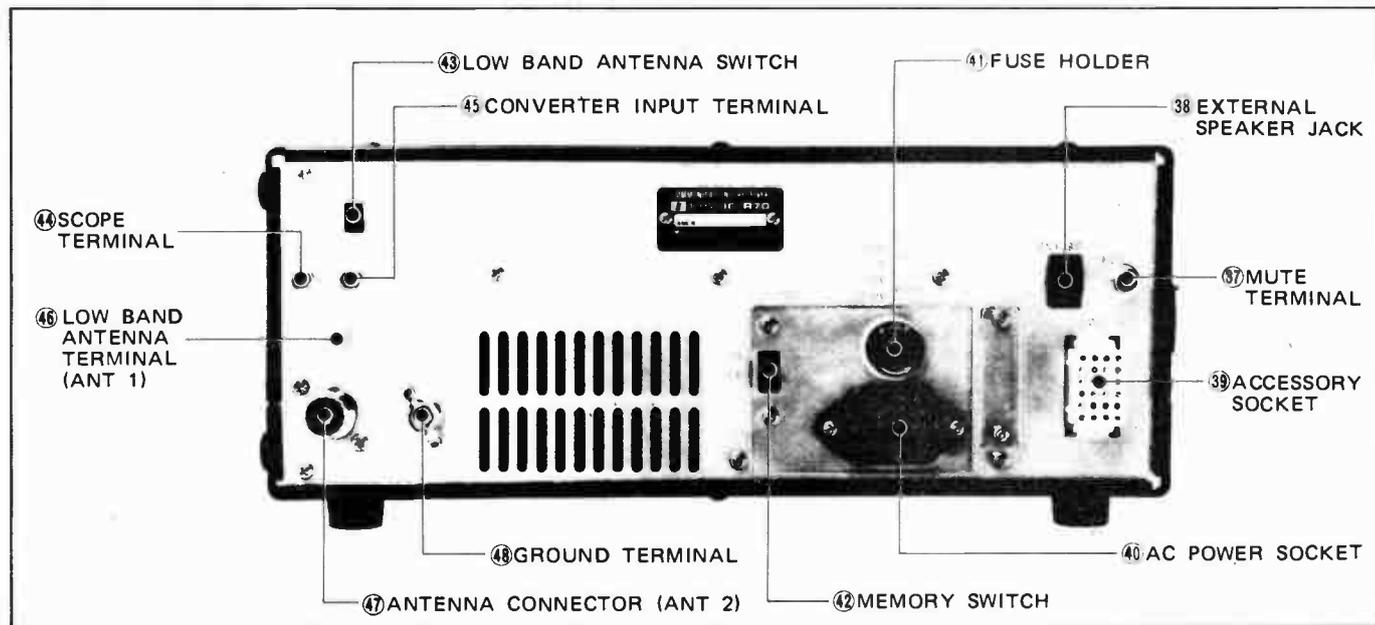
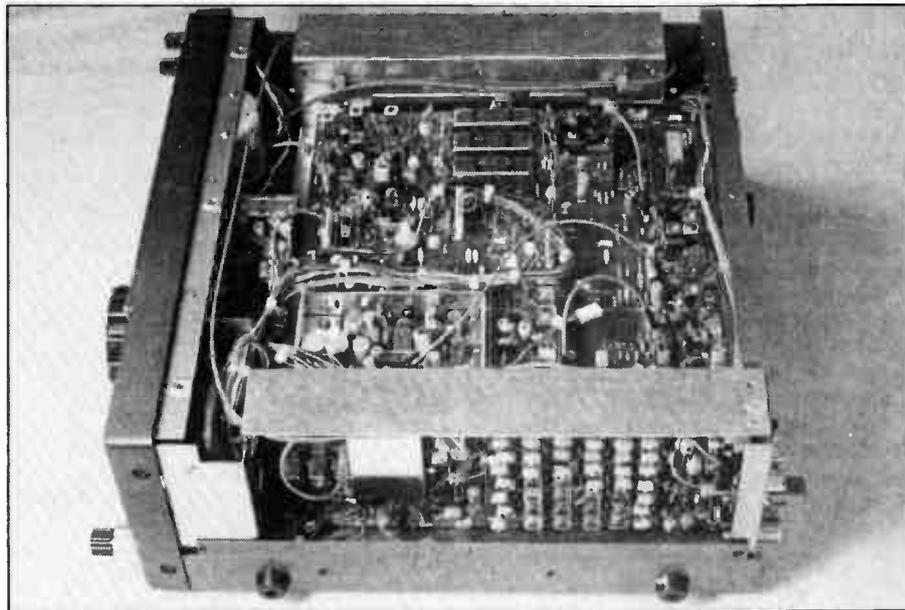
There is a three-position switch which gives you the option of a wideband preamp and about 10dB gain from a pair of push-pull JFETs, no preamp and the signal being fed straight to the first mixer (which is a high-level Double Balanced type that looked very purposefully and properly designed) or a 20dB attenuator before said mixer. On 7 MHz, we found that the preamp produced very slight intermod products at times but at no time would they have made the difference between copying a call sign and not, whereas with the preamp out the signal handling was first rate – as later tests showed, the dynamic range on this band was 92dB with the preamp out, which is pretty good. If you neither know nor care what "dynamic range" is, don't let it bother you.

The other nice operating feature we

found was the dual VFOs. Being synthesised, all the frequencies you tune are generated electronically, so to speak, instead of the old variable-capacitor type VFO, and this means that it's easy enough to have two of them. It might not seem obvious why you might want two, but there are several reasons; one is that DX operations often involve "split" working whereby the man transmits on one frequency and the ravening hordes attempt to speak to him on another, or indeed a whole band of them if he's the Rarest of the Rare.

It's useful to be able to switch quickly between frequencies to see what's going on. Equally, there is a memory facility in the R70 so you can elect either to store frequencies after you've switched off or not. If there's one channel you monitor a lot, it's nice to put this in one VFO and scan around it with the other. In fact, to sum up, once you've used any rig with two VFOs,

*Below: Side view with the top off. Note the well designed layout of all things electronic. Bottom of page: Rear view taken from the instruction manual. As before, the circled numbers refer to data in the manual.*



you feel lost when you come to use another that hasn't.

We then switched to 4MHz, in the hope that the Woodpecker would be there so that we could try out the noise blanker. In fact it wasn't, but when we fished around we found it pecking away at about 11 MHz. The Blanker in the R70 has two positions, narrow and wide, and we found that the "wide" setting practically stopped the thing dead! This was very good, except that we came across what must have been a local signal testing on 11.120MHz – it was very strong, and the blanker didn't like this too much and the voice announcing that it was testing got a bit strangled.

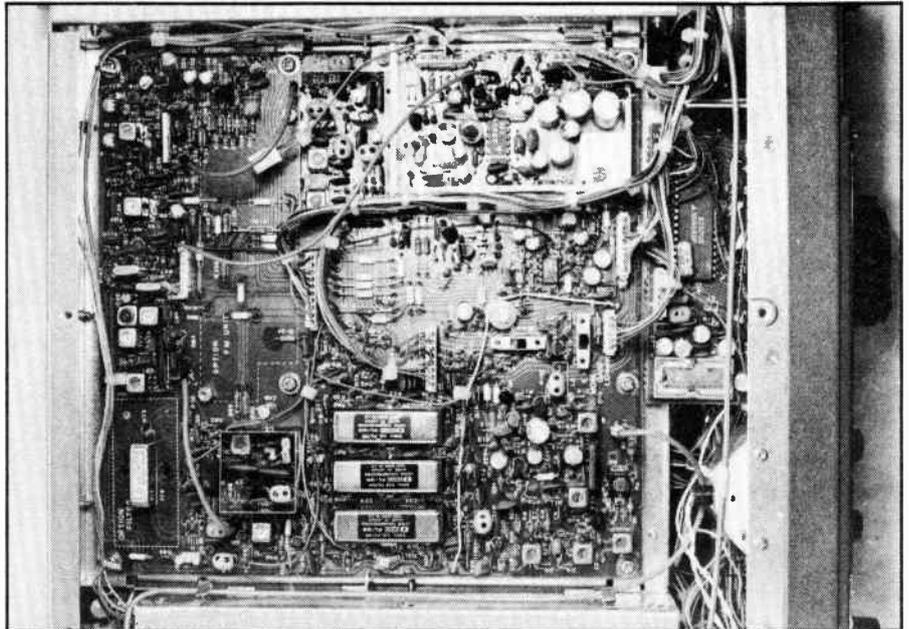
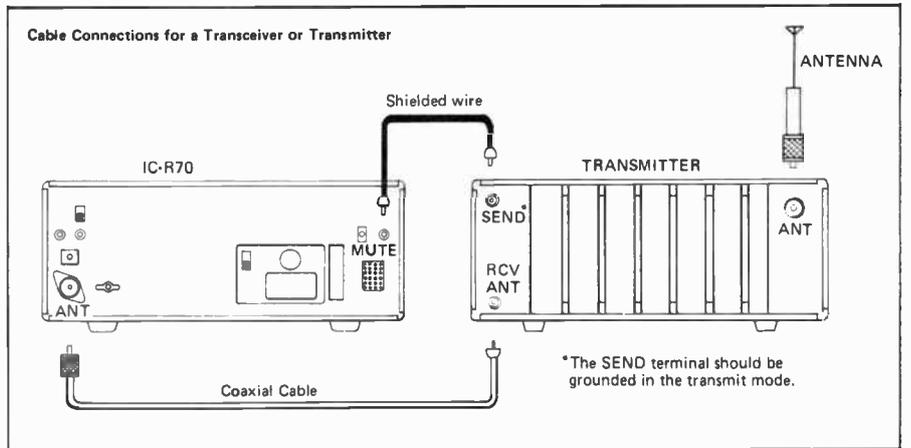
However, this was a bit academic because it was a lot stronger than the pecker and any signal less strong than about S9 + 10dB didn't suffer in this way. The "narrow" setting was very good, taking out the racket from sister magazine *Rally Sport's* nasty Mini which they were playing with outside the office in usual style. So that was pretty good, and indeed we've only used one better noise blanker to date, in the TS830. That was superb – but the R70's was pretty damned good and should stop a lot of the rot on the HF bands.

## Squelch with FM in mind - it worked a treat

There is an optional FM board for the R70 which ours didn't have fitted so we couldn't test that – however, one control which is obviously fitted with FM in mind is a squelch. Surprisingly, this worked well on other signals; we sat on a frequency in the 10MHz band for a while listening to an aircraft talking to its operations centre on SSB, and the squelch worked a treat. It would be especially handy if you wanted to use the R70 with a VHF converter because you could then monitor, say, the 144MHz FM channels without blasting your lugholes all evening. Full marks for that.

In fact, there's a separate input for converters and things, which takes you straight into the mixer. This is about the best way to do it, since any respectable converter is going to put a fair amount of gain ahead of the receiver front end and you stand less chance of running into overload problems with this configuration. We tried a homebrew 50MHz machine and a Microwave Modules 432MHz device – both worked well, and it was a treat to have all the facilities of the R70 available on the other bands.

So we thought we'd better hand the rig over to the other office so that they could get out their measuring implements and start hacking away. To sum up what they found without all the big words, the R70 performs extremely well and in many ways better than the makers say. In fact, the R70 performs in some areas as well as commercial receivers costing a small fortune. The fact that it uses "up-conversion" (which is where the first intermediate frequency is higher than any frequency



tuned by the set itself) immediately removes a lot of potential problems concerning selectivity, the front end came out pretty nigh bomb-proof (a third-order intercept point on 7MHz of +4 dBm) and in particular the rig had the lowest drift figures we've seen so far.

You could switch off, switch on again three hours later and it hadn't budged, which is good. The synthesiser was about averagely quiet, which in practice means you won't miss anything you particularly want to hear, and the reciprocal mixing figure was also a bit better than average for this sort of radio.

At the end of the day, though, the question is how well does it do what it's supposed to do, how does it feel to use and does it have useful facilities or just marketing-type ones? In other words, is the basic radio good, or is it an average radio with lots of peripheral bells and whistles to make you think it's a good one?

Our verdict is that the R70 is excellent. Operationally speaking, it's delightful to use and it's one of those that you can drive for several hours without getting frustrated – it feels right. The features it has are well thought out and useful, without being frilly for the sake of it, and it backs these up with an excellent technical performance.

We feel that these things are infinitely more important than the last dBm of noise

*Top of page: Cable connections for a transceiver or transmitter. Above: Showing the pcb, AM, SSB, and CW filters lower centre of picture. Option filter is laid out neatly at lower left. The neatness of the designed-in components and the layout makes fault-finding (for the professional!) an interesting job.*

floor or whatever, and it's a fact that you buy a receiver to use and to listen to radio stations rather than to fret about how much phase noise the synthesiser has. The Icom R70 is a user's radio – it isn't an ego-massaging device with more lights and hooters than Cape Kennedy, and it will hear the stations when you want it to. It deserves to sell like hot cakes, and Messrs Thanet will supply you with one for £469. And not only to SWLs either – there's many a licenced chap who could give this little beast a very good home!

★★★★

**Postscript:** Just as we were finishing this review, we borrowed an RTTY decoder and VDU for an afternoon and tried it out on the R70. It worked extremely well with this mode, producing nice copy of all sorts of weird and wonderful things and we found it very easy to use after five minutes with the instruction book. Which just adds to what we said earlier – the R70 is very versatile and useful and sets a standard for others to follow.

# Whatever Next?



## FIND OUT WITH

# Radio & Electronics World

Available at your Newsagent each and every month — price 85p

## For the short wave listener

Last issue, we mentioned the numbers game as played by someone in a heavy Cherman accent on the HF bands – well, to judge from the letters we got, including one from the good ol' U.S. of A. (thank you sirrr), many of you have come across this. Condensing your letters into a few ideas, it seems that these transmissions originate from the other side of the Harz Mountains – in the People's Democratic Republic of East Germany, no less – and either consist of messages using something known as a "one-time pad", which is apparently completely undecodable unless you've got the corresponding bit of paper, or the numbers themselves are a cover for some other kind of transmission.

One correspondent suggested that it might be interesting to break out the spectrum analyser and have a look at what might be going on – well, we did have a go at this but the twice we've heard the numbers being read out coincided with weak signals and a lot of noise and crud on the band and we got precisely nowhere.

We weren't that convinced that we *would*, with all respect to the chap who took the trouble to write, because we couldn't think of a way of encoding an HF signal in such a way as to transmit other information on it without running into trouble from fading and distortion of various nasty sorts.

Be that as it may, a man from the United States wrote to say that they get them too! Apparently they emanate from Their "Man" in Havana, or so he thinks, and she goes on for hours and hours in a sort of Spanish German accent. She's known in some quarters as Havana Harriet, and the European version is Magdeburg Annie!

It takes all sorts, doesn't it? We had a letter or two asking us exactly what the so-called Woodpecker is – well, we don't know

that anybody is exactly sure apart from the general details, but it's generally agreed to be something called an over-the-horizon radar system. The thinking behind it is that radar often uses microwave-type signals that travel in straight lines and hence don't have any range to speak of over the "radio horizon". However, a radar using the HF bands can bounce signals off the ionosphere in the usual way of short waves, and hence if you use enough urge you can get signals back from targets thousands of miles away.

### Fantastic power

In fact, the Russian Woodpecker seems to move up and down more or less with the MUF, which makes sense, and if you assume that the noise you hear is related to its PRF (which stands for Pulse Repetition Frequency – a basic parameter of radar) it has a theoretical range of more than one thousand miles. Mind you, there's probably a lot more to the Woodpecker than that and we don't pretend to know the last word about it. It's apparently located in a place called Poltava, and is running some fantastic amount of power into a fairly monumental antenna array – bet the inhabitants of that town get some problems with their balalaika music on the mid-fi!

We seem to remember an esoteric analysis of exactly what the pulses were in *Wireless World* some time last year but it was about a million times too clever for the likes of us; if anyone *can* explain the beast in words of one syllable we'd be delighted to hear from you. It's your column, remember? Tell us what you've heard and what you want to know and we'll make it a good SWL column.

Actually, there's a lot for the listener in this issue – the receiver comparison and a cracking

write-up of a real classic in the shape of the Racal. This is one of the great valve receivers of all time, and without being rude to the makers of modern radios we'd expect the Racal to beat the pants off practically anything from Japan from the point of view of signal handling. Maybe we ought to put our money where our mouth is and do a direct comparison between an AR88, say, and something like the Trio R1000 – would you be interested?

The HF bands seem to have been in a fairly patchy state since our last issue, actually – there've been some good periods but the old sun hasn't been behaving quite according to plan and, instead of going quieter and letting the ionosphere calm down a bit, there was some strong solar activity around Christmas – at times the HF bands were stone dead and the VHF men were having a ball with auroras and whatnot. It just shows you that it pays to be interested in both; a day when the HF bands sound as though someone's abolished the F-layer probably means that 144MHz is full of fellas calling CQ Aurora in husky, echoing voices and tapping at the Morse key nineteen to the dozen. The intense solar activity and geomagnetic whatsits (it's all on the GB2RS Sunday news bulletin, although we must confess to only understanding about one word in five of the propagation news – couldn't they write it for the bod with something approximating the Average British Brain instead of the chap who probably confers with the Angel Gabriel about what they're

going to do to the ionosphere this week?) that wreck the HF bands are involved with the root cause of auroras. To be honest, we'd do an article on auroras and how they're formed, only every time someone explains it to me I get very confused and my brain starts to emit noxious gases and throbs a lot.

### Sporadic E

One very nice letter in the postbag this month, from Andy, G4MAQ, asked us whether we could do a simple HF propagation forecast each month – it'd be good for listeners and licensees alike. Well, yes – we think we can and we're presently trying to make arrangements with various clever chaps about getting the data and writing it up. We couldn't get it together this month, unfortunately but watch this space and we should have something for you next time. So until then – happy listening.

Oh, by the way, don't forget that the VHF Sporadic E season is creeping upon us. And don't forget to give your VHF rig a polish and keep the beam looking south or thereabouts in a week or two, keeping an ear open for those crashing great E signals. People have thought in the past that someone was hoaxing them, because surely stations from that far away couldn't be so loud? Well, they sure can, so keep an ear out. It sometimes helps to listen to VHF FM broadcasts in Band II to get some forewarning, although often the ionisation doesn't get up as far as 144MHz. See you next time...

### Biggest rally of the year

It's at the NEC, Birmingham, on March 5/6th, and it is called the National Amateur Radio Convention. Organised by the RSGB, the rally will have around 100 exhibitors. Tickets are £2 at the door.

The NEC event replaces that which used to be held at Alexandra Palace, and we understand from readers that there is already a faction campaigning for it to return to London. Oh well, can't win them all. See you there.



ALSO

## THIS BOOK WILL HELP YOU PASS

### THE RADIO AMATEURS EXAM

published by Lutterworth at £8.95 available from Peter Bubb G3UWJ

at £10.00 inc post and packing.

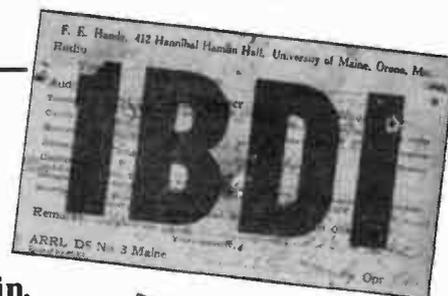
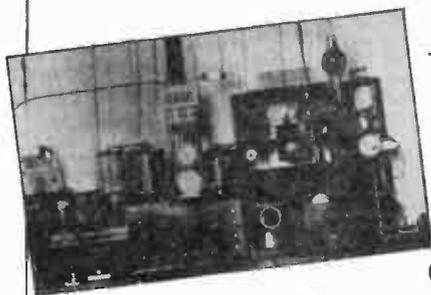
- ★ 5 day courses
- ★ private tuition
- ★ domiciliary tuition

S.A.E. for full details:

**PETER BUBB – Tuition**  
58 Greenacres, Bath, Avon BA1 4NR  
or telephone 0225 27467

# CARD GAMES

But it's not a game any more. QSL card collecting is a serious and possibly profitable hobby for the enthusiast. Here, John Heys G3BDQ outlines what's involved in sending and receiving QSL cards. Certainly, don't put them in the dustbin, and it's not a good idea to pin them to the wall either!



It is probably correct to state that all radio amateurs holding call signs are (or have formerly been) interested in QSL cards. The writer has yet to meet a licenced amateur who has not sent on his or her own personal QSL cards as confirmation of contact with or reception of other stations.

Many amateurs restrict the number of cards disseminated either for reasons of cost, lack of interest or just laziness! These same characters, however, are often eager to receive cards from rare or elusive DX stations contacted. When one considers the sum total of amateur stations world-wide, and also includes those (many who are now 'silent keys') who operated right back as far as the 1920s when the QSL habit really took off, there must be millions of cards accumulating in shacks, cupboards or attics.

Unfortunately most of them

are likely to end up in the dustbin or on the garden bonfire. So, an interest in QSL cards will ensure that at least a proportion of the existing cards will survive.

To a collector all QSL cards are fascinating. Each one is a unique historical record of an event, the event usually being a radio contact between two amateur stations. On every card should be the call letters of the station and its location, the time and date of the contact, a signal report, the frequency or band used, the call sign of the recipient, a signature, and if possible details of the rig used, the antenna, weather conditions etc. If all the listed criteria is present a card may then be used in the acquisition of awards, certificates or so called 'sheepskins' which are available these days in such profusion.

The Short Wave Listener

fraternity also plays a part in the QSL world and they often have their own cards produced to report reception of DX stations. When a schoolboy, the writer was a keen listener on the amateur bands, and between 1935 and the start of WW2 spent much of his limited pocket money on postage to distant lands. Then (as now) the return rate was low and each incoming card was eagerly seized and displayed on the wall to bedazzle relatives and perhaps instil some envy amongst schoolboy friends!

**The keen collector will search for historic or interesting QSLs**

The use of QSL cards as "wallpaper" is to be deprecated and is an old and

lingering habit dating back to the early days and which inevitably ensures that such cards become pinholed, rusted and discoloured. Tobacco smoke, sunlight ( a rare commodity in many shacks!) and the vapours from soldering irons do nothing to enhance exposed QSL cards, and many early cards are quite impossible to decipher. The lesson is: If tempted to display cards on the wall, make sure that they are mounted on a sheet of card with "photo corners" and if possible covered with glass or a transparent plastic material.

At first it is perhaps best to concentrate upon making a personal collection using cards received from stations contacted or reported on. Later, the keen collector will begin the more difficult search for historic or particularly interesting QSLs from other sources. The mechanics of finding and acquiring such cards for a



From top left, clockwise: Captain Kurt Carlsen of the Flying Enterprise which went down in January 1952 off Cornwall; W7IDB on a one-Yen note; ZS60S Dan Mahoney in South Africa; early card from G6MN in 1926; Barry Goldwater K7UGA of Arizona; from OZ9BR in Denmark



Opposite page: From top left, clockwise, as it was in the beginning – a card from G5DC in Lancashire in the twenties; the famous F.E. Handy 1BD1 to Bill Corsham; AC4RF from Tibet; W2NFU describing his hobby?; cat-call W2OQR card from New York; historical football ticket from G4FAJ.



collection will be dealt with at some length in a later article. Membership of a national radio society is essential if large scale QSLing is contemplated, for otherwise the postal costs become prohibitive.

RSGB members can send cards in bulk to all destinations by first posting them to the Society QSL Manager. An excess of 100 cards of normal thickness will currently cost 32p to send at the second class mail rate. The QSL Manager in turn sends large batches of cards to his opposite numbers all over the world, from where they are distributed to the eventual recipients. To receive cards it is not necessary to be a member of the RSGB. One simply determines the name and address of the sub-manager handling your call sign series (there is one for BRS and ARS numbers too) and then sends him a batch of self-addressed and suitably franked large envelopes. The non-member however must determine some way to get his cards overseas and this can be expensive. To confirm especially rare or important



contacts or reports direct mailing using the International Callbook or some similar source for the address is usual. Another method is to accumulate cards for a particular country and then send a batch to that country's national radio society. The addresses of these foreign societies and much more valuable information may be found in the RSGB publication, the *Amateur Radio Operating Manual* by R.J. Eckersley, G4FTJ.

What of the cards when they (hopefully) begin to roll in? Fortunately there will be a great variety. Amateurs are often individualists and the range of card types will be vast. To economise, some operators resort to specialist QSL card printers who produce cards in certain formats into which are inserted individual call letters. Although cheaper than having one's own personalised cards printed to individual whim,



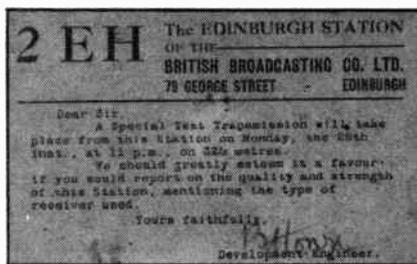
the end product is likely to be rather boring and utilitarian and is hardly likely to stir the pulse rate of a keen collector.

### To receive cards it is not necessary to be a member of the RSGB

Modern QSLs are often printed upon ultra-white glazed card of a quality unobtainable more than 25 years ago. Vintage cards can often be instantly recognisable by their duller lustre appearance. Today's fluorescent inks and titanium fillers did not exist before the last war. Sending an unusual or especially artistic or eye-catching card can often result in a higher return rate from other amateurs and is a point not to be overlooked.

Special cards are really prized by both recipients and collectors and many are outstanding examples of the printer's art and worthy of a place in any collection. A point of some importance to intending QSL card designers is the avoidance of anything likely to embarrass the QSL Bureaux or the postal services. A card can be much too large or much too small!

The standard postcard dimensions of 140x 90mm are ideal and any deviation from this norm must not be excessive. In the writer's collection are many examples of enormous and also ludicrously tiny cards. An outsized American card (234 x 200mm) sent to the late G6QB by W9VFZ in 1946 is only shadowed by the effort produced by G5AAB/W3MDI and sent to G3BID. This huge card measured 280 x 215mm and yet had very little space for QSO details! Probably the smallest card seen in general use was DL6PH's miniature 75 x 44mm effort sent through and actually handled by the German Bureau DARC in 1959. By some miracle it did not get lost in transit.



From top: Fine illustration of 1923 equipment on a folding card from Dr. Carl Klenk of St. Louis; special test transmission card of 1928 from 2EH of the BBC in Scotland; OZ1LO is Lief Ottosen of Denmark; advertising card used by ER8H in Ireland; 2KF in 1923, named John Partridge of London; home-made with real feathers! From XE1CE in Mexico; 30Q in New Jersey; battery advertising card used by G4HMV, formerly BRS31701.



Unusual materials used in the manufacture of QSLs are also most unwelcome to the QSL bureau managers. In the past even metal cards made from thin aluminium or copper have been used. Such cards can easily cut the fingers of the sorters, and Arthur Milne, G2MI who for almost 30 years ran the RSGB Bureau has related to the writer many tales of weird and wonderful materials used to fabricate cards. Although such oddities remain unwelcome in QSL bureau circles they are nevertheless sought after by some collectors.

This is akin to the excitement generated when errors on postage stamps are discovered by philatelists! Through the 1920s most cards were printed to order by local print shops. Many were even hand-drawn on ordinary plain postcards or stamped stationery. Even then however a few specialised QSL card printers were active in Europe and the USA. In the latter country 'Radio Printers' of Mendota, Illinois and 'Quality Cards' produced by 1CHQ (there



were no call letter prefixes at that time) were being sold to amateurs in 1925 and maybe even earlier. Our own G6MN, a printer by profession, began QSL production in a limited way in 1924. By 1926 he was working on a large scale, and a collection of cards which had emanated from Eric's workshop would be an interesting and not too difficult or expensive exercise. There are many thousands of his cards remaining including many printed in quite recent times.

One way to get one's cards free is to discover a willing sponsor. This will usually be a local industrial firm or business, a town or city council or some other publicity-seeking organisation. The practice of running advertising on QSL cards is not new, and such material was printed onto cards more than 50 years ago. Amateurs living by the seaside or at inland resorts or spas are often fortunate enough to get



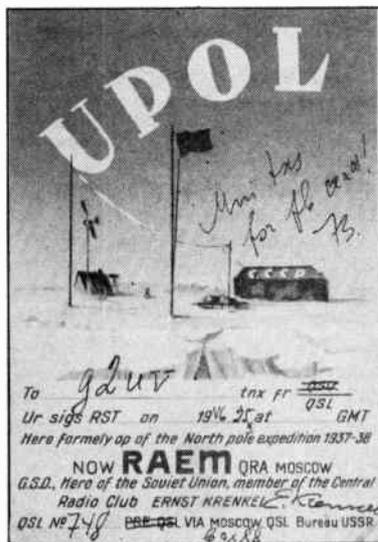
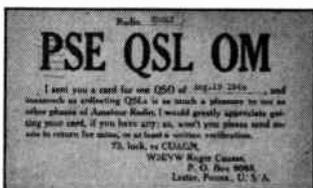
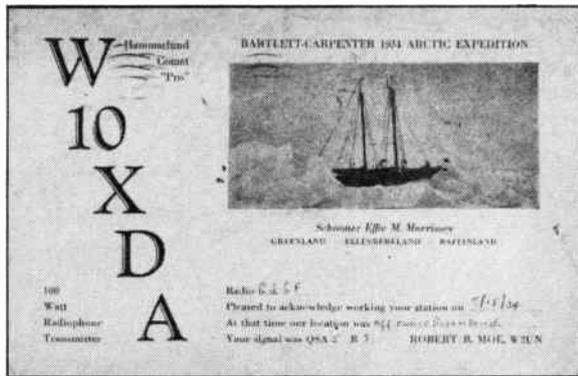
free or subsidised cards from their local Publicity Departments. Should the reader live in such a place, a few enquiries and one's assurance that the cards will go all over the UK and indeed flood the world might result in a free supply of QSLs! Advertising QSL cards are quite common today and with each batch of cards coming in from the bureau the writer finds at least half a dozen or so.

### Knowledge may be gleaned from the study of early QSL cards

'Guinness' cards are especially amusing and well produced and are eagerly sought after by ordinary postcard collectors. These cards are catalogued at £2 each so keep your eyes open for such items. Perhaps the widest range of advertising

cards are those concerned with the electrical and electronics industries. This is hardly surprising, for such industries employ many radio amateurs who are able to approach their companies for aid. Food, clothing and particularly tourism and recreation are also themes widely advertised on QSL cards. The collector can find (without too much difficulty) cards used for all kinds of advertising and they make a fascinating sideline collection.

The information on cards gives us an insight into the equipment used and is useful in tracing the development of transmitters, receivers and aerials. Much information on early amateur gear is found in contemporary wireless journals and magazines but a great deal of additional and valuable knowledge may be gleaned from the study of early QSL cards. Often circuit diagrams were drawn on the backs of cards and many important innovations or experiments were recorded. Even modern cards record the current fashion in station equipment, and such information will be valuable



From top left, clockwise: From the 1934 Bartlett-Carpenter Arctic Expeditions W10XDA; from UA4LBF in Moscow in 1979; from XE1YJ in Mexico, from football fan CT1UA in Portugal in 1969; from none other than Kermit A. Slobb W9YMZ in Illinois; nice artwork by SU1RX in Egypt; from an official "hero of the Soviet Union", Ernst Krenkel, Moscow, UPOL; from GM4HX in Pennsylvania.

to future collectors and radio historians.

When the information on the card is supplemented by a photo of the shack and its gear this is a further bonus. It is possible to collect a run of cards from the 1920s to the present time, each depicting typical amateur stations of the relevant period. The gradual evolution of transmitters and receivers through the years may be seen, and often the pictures are of quite ordinary run-of-the-mill stations, not the noted (or notorious) high-power set-ups of the record breakers which seem to find their way into magazine articles and books.

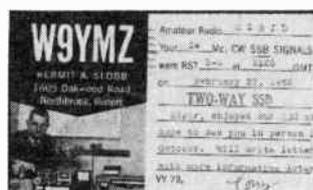
On the large folding QSL (pictured) from the USA station of Dr. Carl Klenk, 9AAU which was sent to British 5BV in October 1923 there is a fine illustration of the equipment. Very surprisingly it is not made up of the tangle of wires and breadboard layouts that one usually associates with amateur stations of that date. It is a neat installation more reminiscent of the gear seen in shacks during the early and



mid-30s. Notice the electric fan positioned beautifully where it could cool the three valve high power oscillator which was the CW transmitter. The picture shows the 9AAU shack without its operator. This is quite refreshing for so many of us can hardly resist having our physiognomy displayed on our cards!

## It is possible to collect a run of cards from the 1920s to the present time

Whatever our outside interests or other hobbies, there are QSL cards to link up with them. There is a vast range of military cards and also many hundreds depicting aircraft or shipping. For those so inclined there are glamour cards showing pin ups or even naughty and near



pornographic specimens. Many cards are related to scouting activities and of course there is another group of QSLs from the Polar regions and small islands. The writer knows several keen collectors of philatelic and other ephemera from Ascension, Tristan and St. Helena who are always begging for QSL cards from these remote and lonely spots. Humour is an important element in all our lives and can be found on many cards. Some of the modern cards from European countries seem especially rich in humour and are well worth collecting.

Although outside the parameters of an article dealing with amateur radio. QSL cards, mention must be made of a further wide range of QSLs which are obtainable from commercial short wave broadcast stations, if sensible reports and appreciations are sent to them. When the

explosion of short wave broadcasting took place in the 1930s, collecting cards from small stations all over the world was a popular pastime. Today QSL cards may be obtained from similar stations and also certain MW and even some European VHF broadcasters.

Another new facet of collecting concerns the CB fraternity. There are QSL clubs which arrange 'card swapping' although this activity does not appear to be based upon actually making radio contact. There are many long distance inter-UK contacts made on CB using the sporadic E mode of propagation and these are often confirmed by card.

We have touched only lightly upon the world of QSL collecting in this initial article, but it is hoped that it may stimulate an interest in the topic. How to get cards, how to store and classify them intelligently and a much deeper look into the many sub-divisions of car types and their origins must await a later and more detailed article. Go out and get hunting!

# THE CLASSICS 2: THE RACAL

A communications receiver that was a world leader in the fifties, is still going strong today – albeit in a smaller casing! By Peter Dodson

It is not very often that we in the UK can boast of a British project that was conceived in this country, to be produced, marketed and to become outstandingly successful against all international competition. Nevertheless, the success story of the Racal Company remains as one prime example of a British concept that (for once) was not wasted, given away or sold abroad and which has been developed to this day to keep abreast of parallel technology.

The origins of the Racal receiver go back to the mid 50s, after a Doctor Wadley had unsuccessfully presented his ideas for a more stable receiving system to Marconi, a decision they were to live to bitterly regret. However, Wadley's ideas were adopted by Racal from which day they have never looked back. Quick to appreciate the potential qualities of a near-revolutionary design,

which not only gave greater stability to a receiver, but also a deal more selectivity, the Admiralty, together with other government departments, were taking RA17Ls from Racal at a rate of 20-plus a week. And hundreds of sparkers the world over suddenly found life just that little bit easier!

## An improved frequency scale accuracy and resettability

The Racal Company had produced a communications receiver which eliminated four of the basic problems of HF reception. By keeping the frequency of operation of the local oscillator low, and ensuring that it tracked only over a restricted tuning range, instability was greatly reduced; this also had the effect

of almost eliminating scale cramping and non-linearity. Band changing was achieved by an analogue movement of a tuning capacitor as opposed to switched inductors, and the inherent calibration facility was based on a reasonably stable one MHz crystal. This, incidentally, provided an improved frequency-scale accuracy and resettability.

Finally, by using a process which ensured that all HF signals were converted to a two to three MHz range, the frequency was determined by a crystal oscillator having a degree of stability of five parts in ten degrees.

But with the passing of years, and the

*The controls should be smooth to operate, and are very easy to handle. We liked the non-ambiguous frequency display.*



## RA17 SIMPLIFIED BLOCK DIAGRAM

requirements of commerce and government departments for communications equipment to cope with more sophisticated transmissions and much higher frequencies, it was inevitable that RA17 receivers would emerge on the open market. Radio amateurs therefore, have inherited a receiver which, with its selectivity is ideal for the crowded amateur bands below 30MHz.

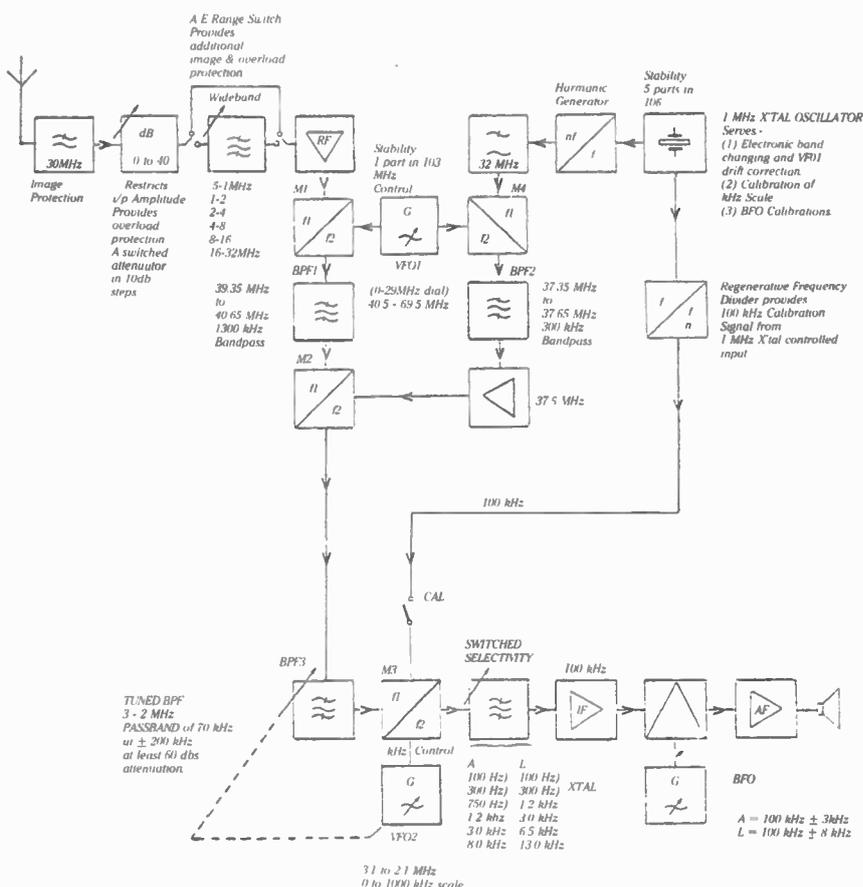
In effect, the Racal is a triple superhet valve receiver producing two intermediate frequencies to reduce, if not eliminate adjacent and the second-channel interference which occurs when the frequency of an unwanted signal differs in frequency from the desired signal by twice the IF. Adjacent Channel Interference, on the other hand, is eradicated by the use of a low (100kHz) IF. An interfering signal of, say, 110kHz will be 10% off-tune and is therefore outside the bandpass of a normal tuned circuit resonating at 100kHz.

### The Wadley Loop compensates for any frequency drift

The signal path through the Racal starts with a low-pass filter with a value of 30MHz which cuts off all signals above that frequency, and provides protection against second-channel interference. The signal then passes through an attenuator which restricts input amplitude to 40dB, and provides protection against overload, and on to the antenna range switch.

This, in its turn, gives additional image and overload protection and is used for the selection of the appropriate frequency range for the required signal. It consists of a five-position switched attenuator. Four degrees of attenuation are provided in 10dB stages from 0-40dB and reduces the possibility of high level signals driving the RF amplifier into non-linearity.

After amplification in the fourth stage of the receiver, the RF then mixes with the output of the first variable frequency oscillator (at M1). This VFO, which is the MHz control on the fascia, indicates a range of 0-29MHz but, in fact, tracks between 40.5 and 69.5MHz. The mixing



of the two frequencies will generate many harmonics, but the difference between the RF and VFO values is selected and it is an inverted first IF signal which emerges, and is put through a 39.5 to 40.65MHz filter with a bandpass of 1300kHz.

And so to the second mixing stage at M2 which combines the output of a frequency source of 37.5MHz with the on-going signal. This source is fed from the fourth mixing unit (M4) which derives its output from a combination of outputs from VFO 1 and a harmonic generator. This one MHz crystal oscillator from which the receiver gets its stability, is stable to within five parts in  $10^6$  or plus or minus five Hz in one MHz. It gives stable oscillations for electronic band-changing and VFO1 drift correction, and provides a one MHz stable oscillation for scale and BFO calibration. Harmonics of 100kHz are produced in M3, and the 20th and 30th beat with the local oscillator to produce calibration markers every 100kHz. The

*This is the RA17 block diagram considerably simplified – we hope you can read the small print! If not, let us know and we'll send you a photostat of the original.*

100kHz itself acts as a check on BFO calibration. With BFO on, and 100kHz present at M3, the beat between the signals can be heard at the AF output. When the beat is zero, the BFO is aligned to 100kHz. As a working rule, the harmonic in use is three above the number of MHz of the required signal.

This part of the receiver is known as the 'Wadley Loop', so named after the patriotic doctor who 'did it for Britain' instead of the Japanese! What, in effect, his concept achieves is to compensate for any frequency drift; as the frequency of VFO 1 drifts, so the output of mixer M1 and M4 change by the same value. The output of M2, however, remains constant.

## THE CLASSICS 2: THE RACAL

Meanwhile, the signal continues on its way from the second mixer stage to the interpolation section of the Racal. Still in its inverted state, the path passes through a three-to-two MHz 70kHz bandpass filter with at least 60dBs of attenuation at plus or minus 100kHz. This, in turn, is mixed (at M3) with the output of VFO 3 – a frequency-source generating 3.1 to 2.1MHz – and is the kHz control on the facia giving frequency selection from 0 to 1000kHz. It will be noted that the MHz and kHz tuning arrangement at VFO 1 and VFO 2 respectively does not involve any mechanical device which automatically eradicates all the associated problems.

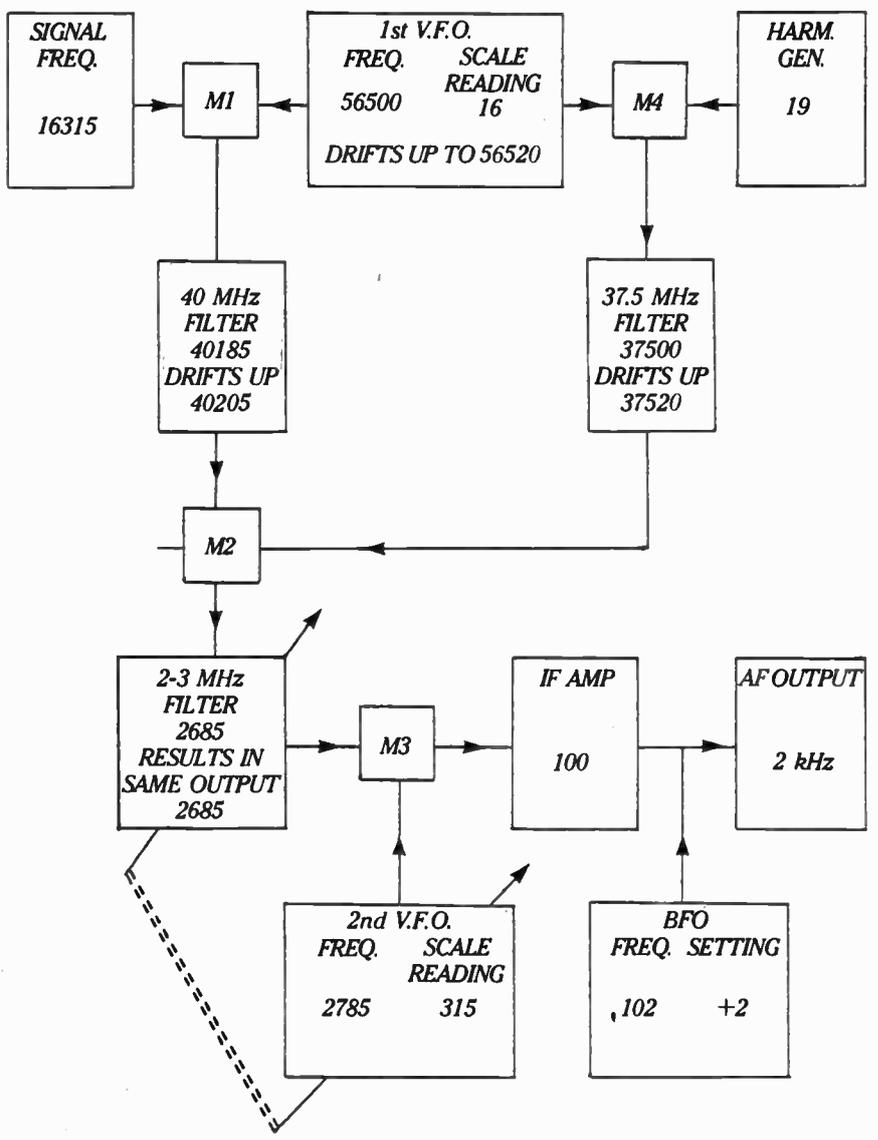
The output from M3, now returned to an erect condition, goes through a switched selectivity unit which, although complicated, is merely a band pass filter. With crystal-controlled bandwidth of 100 to 300kHz, the unit also allows values of up to 13kHz to pass before passing the 100kHz output through an IF amplifier to a demodulating unit (where it mixes with the BFO output) to the AF output.

### The systems dispense with mechanical-type problems.

By way of demonstration, take a signal on a frequency of 10.505MHz which mixes with VFO 1, tracking at 50.5MHz. This will produce a 'mixed' frequency of 39.995MHz. Meanwhile, in M4, the 13th harmonic will mix with VFO 1 to produce a frequency of 37.5MHz (which is bandpass filter 2). At M2, the 37.5 and 39.995MHz signals combine to produce a frequency of 2.495MHz to go into bandpass filter 3. So, the 2.495MHz goes into the interpolation section to mix with the output of VFO 2 which tracks 10kHz high, thereby re-erecting the signal, in the form of the third intermediate frequency of 100kHz. It is then a matter of mixing the 100kHz output with the BFO centred on 100kHz (but offset plus or minus eight kHz as required) to produce an audio frequency output.

Operationally, the MHz and kHz controls on the facia are smooth, easily-handled units. Visually, the frequency display is easy to read, self-explanatory and non-ambiguous. Technically, as has already been said, the system dispenses with mechanical-type problems. The RF

### Illustrating Drift of VFO1



input is boosted in an untuned RF amplifier with a sufficiently flat response over the whole HF spectrum. The signals are then mixed with a local oscillator tuned continuously over 40.5 to 69.5MHz frequency range. Irrespective of what frequency VFO 1 is set to, a band of HF signals between one and 30MHz will be converted to 39350-40650kHz which are the limits of the first IF bandpass filter. However, the 37500 injected frequency is only available when the frequency at VFO 1 is 40MHz above the centre of each MHz wide band. It follows, therefore, that M2 will only produce a two-to-three MHz output at the correct tuning points.

### Disadvantages in the area of spurious responses, are mostly eliminated

If VFO 1 is set at a frequency of 52.5MHz, HF signals between 12 and 13MHz will be converted to 39500-40500kHz with the facility to go through the first IF bandpass filter. As VFO 1 is in a plus 500kHz tuning situation, the

The MHz and kHz tuning arrangement at VFO 1 and VFO 2 respectively doesn't involve mechanical devices that will remove all problems associated with the tuning.

37500kHz injection frequency is activated, and the output of the first IF filter is converted to the two-to-three MHz band. This may well be a conventional double – frequency conversion, but it does ensure that the stability of the two-to-three MHz band will depend on the stability of VFO 1 and the 37500kHz frequency-source when used in conjunction with the Wadley Loop.

Although the Racal may well be an excellent receiver, there are some disadvantages, and these are to be found in the area of spurious responses. Although the vast majority of these (and associated) problems have been eliminated, there is a problem at the first IF in that signals at twice the IF are unlikely to 'make it' as the 30MHz bandpass filter will reject VHF. In the second IF stage, signals at twice that IF (around five MHz) will be attenuated by aerial range/tuning and eliminated by the 40MHz bandpass filter.

Second channel signals at third IF are present at the output of M2, as the previous stage is designed for a bandpass of at least one MHz. As the signal is inverted in M1, second-channel interference is to be found 200kHz below the required signal in the RF stages, but 200kHz above the required signal in the second IF. Although some attenuation of this interference is to be gained in the RF stage from the aerial range configuration and tuning controls, greatest protection is afforded by the tunable bandpass filter which can give at least 60dB of attenuation. And, of course, the aerial attenuator itself can eliminate much of the high-amplitude second-channel interference.

Finally, there is the problem of Audio Image. The BFO, being a local oscillator which beats with the signal at IF level, can track plus or minus of the centre of the IF passband. With the BFO set at 99kHz (negative), if the IF passband is wide enough, there will be two positions on the kHz tuning dial which can produce the same one kHz audio note. In one position, the signal is resonating in the IF stage (100kHz) whilst in the other, it is twice the BFO offset. This will make for reduced sensitivity and any further reduction of bandpass can result in no signal at all! It must be stressed, however, that these problems relate to specific situations and are not general shortcomings of the receiver.

Probably of more cosmetic than technical interest is the fact that the Racal sports its own high-quality speaker, and the frequency display is reproduced on a continuous band of film some five feet in length. On the technical aspects of the RA17, suffice to say that when it appeared on the communications scene in the 1950s, it was a receiver ahead of its time; that the company has maintained that lead over its competitors ever since is reflected not only in the declared profits, but also in the share value.

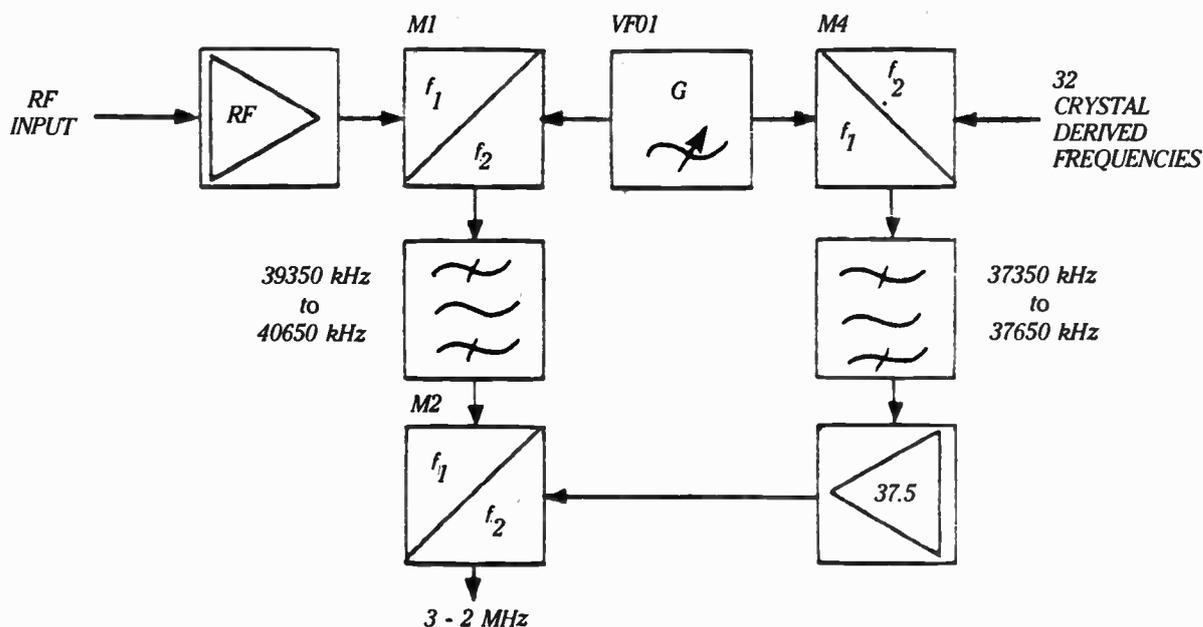
Moving with the times, Racal have branched out into many other aspects of associated equipment, such as tape recorders. Their RA1770 was one of the first transistorised communications sets to be made 'way back in the late 1960s, and the RA1792 emerged in the 70s as a synthesized unit accessible by computer.

### The RA17 was a receiver ahead of its time. The company has maintained its lead . . .

The company now market model RA1795, with even more goodies including LED display. The fact that their latest product is barely a third of the size of the 30-year-old Racal bears no relationship whatsoever to their degree of success!

*The degree of drift in VFO 1 is determined by the extra plus or minus 150kHz at the extremities of the 40MHz bandpass filter frequency tolerance, and the additional plus/minus 150kHz at either side of the 3750kHz filter. When VFO 1 drifts over small limits, the outputs of mixers M1 and M4 vary to the same degree; the output of M2, therefore, remains constant.*

*The stability of VFO1 is one part in  $10^3$ , so drift can reasonably be expected to be restricted to not more than plus/minus 69.5kHz at its highest operating frequency – a value adequately provided for. If, on the other hand, VFO 1 strays from its current setting by more than 150kHz the M4 output (ie the difference between VFO 1 and one of the 1 to 32MHz crystal-derived frequencies) moves outside the passband of the 3750kHz filter and is attenuated to such a point that it cannot input M2 to convert the one MHz-wide signal to fall into the necessary two-to-three MHz band.*



### THE WADLEY LOOP

# So you want to become a radio amateur?

We don't expect you to know the technicalities so you need not be shy to ask. Our technically qualified staff includes 30 licensed amateurs only too willing to help.

## Where to start?

Booklearning, for the RAE is a must, out of our top twenty titles, "A Guide to Amateur Radio" and "The RAE Manual" are recommended at £5.50 the pair, post free. This offer also includes the 40 page Home Office book "How to become a Radio Amateur" free.

## South Midlands Communications Ltd.

Should you need a radio repaired, remember we have our own expertly manned service department, equipment with over a hundred thousand pounds of spares and test equipment, and as the importer of most of our merchandise we are in daily contact with the manufacturer.

On many regular priced items for an invoice over £120 we provide *free finance*, 20% down (Balance over 6 months) or 50% down and the balance over a year; you pay no more than the cash price. Where this service is not available we have taken the worry out of finance: enter a personal loan agreement—remember the deposit can be as low or lower than your monthly instalments—for 12 months to 3 years (at a typical APR rate of 31.8%) and in the event of sickness, accident, compulsory redundancy or death *your credit is covered by SMC*. If you have an Access, Barclay or Bankers card or a UK call sign and you bring your license with you, or it appears in the call book, it's *INSTANT*.

Earning the title "The Communicators" in the amateur, commercial and marine fields was not gained easily, and we guard our reputation as jealously today as we did a quarter of a century ago. Maintaining our reputation requires service with a capital 'S'. We offer free Securicor delivery on major equipment, take Access and Barclaycard over the phone and have superb demonstration facilities.

We are proud to be the largest representative in Europe of Yaesu Musen of Japan who produce the most diverse line of amateur radio equipment in the world. With them, communications is their only business not a sideline, thus providing you with premium products at the forefront of technology.

We are also proud to be chosen as UK representatives by such fine manufacturers as The Japan Radio Company, KDK, Hansen, Kenpro, TTE, Delica, Leson, Telewand, Dengineer, Comet, Fitlay, and Hokushin of Japan, plus HyGain, CDE, Mirage, ETO, Dentron, MFJ, and KLM from the USA.

The items illustrated here form only a tiny fraction of our range: 200 stock lines of Yaesu Musen equipment, 600 different antennas, masts, rotators, coaxes etc., etc., plus 300 general items of communications equipment, selected as offering the best value in the world.

We trust the outline of our services, recommendation from another amateur (aspiring or veteran) or a visit to your nearest SMC store will convince you to give us a chance to serve.

SMC, your single stop source.

## SHORT WAVE LISTENING – THE WORLD AT YOUR FINGERTIPS

### RECEIVER WITH 12 MEMORIES: FRG7700M £399 inc

VAT @ 15%  
& SECURICOR

- ★ 30MHz down to 150kHz (and below).
- ★ 12 Channel memory option with fine tune.
- ★ SSB (LSB/USB), CW, AM, FM.
- ★ 2.7kHz, 6kHz, 12kHz, 15kHz. @ - 6dB.
- ★ 3 Selectivities on AM. Squelch on FM.
- ★ Up conversion, 48MHz first IF.
- ★ 1kHz digital, plus analogue, display.
- ★ Inbuilt quartz clock/timer.
- ★ No preselector, auto selected LPF's.
- ★ Advanced noise blanker fitted.
- ★ Antenna 500Ω to 1.5MHz, 50Ω to 30MHz.
- ★ 20dB pad plus continuous attenuator.
- ★ Switchable A.G.C. Variable tone.



'7700 THE ONE WITH FM!  
NON-MEMORY VERSION £335

- ★ 110 and 240Vac, 12Vdc option.
- ★ Signal meter calibrated in "S" and SIMPO.
- ★ Acc; Tuners, Converters, LPF Memory.
- ★ FRT7700: 150kHz 30MHz, Switch, etc.
- ★ FRV7700A: 118-130, 130-140, 140-150 MHz.
- ★ FRV7700B: 118-130, 140-150, 50-59MHz.
- ★ FRV7700C: 140150, 150-160, 160-170MHz.
- ★ FRV7700D: 118-130, 140-150, 70-80MHz.
- ★ FRV7700E: 118-130, 140-150, 150-160MHz.
- ★ FRV7700F: 118-130, 150-160, 170-180MHz.
- ★ FF5: 500KHz (for improved VLF reception).
- ★ MEMGR7700; 12 Channels (internal fitting).
- ★ FRA7700; Active Antenna.

### COMMUNICATION RECEIVER: NRD515 £825 inc

VAT @ 15%  
& SECURICOR

- ★ 30MHz to 100kHz or lower, 100Hz steps.
- ★ PLL digital VFO, stable (50Hz/hr AWU).
- ★ Backlash free, 500Hz analogue calibrated.
- ★ Fast tune up/down switch, dial lockout.
- ★ SSB (USB/LSB), CW, AM, RTTY.
- ★ 6 and 2.4kHz, 600° and 300°Hz @ - 6dB.
- ★ Passband tuning ±2kHz on SSB and CW.
- ★ Variable BFO on CW for preferred tone.
- ★ Modular plug in design with mother board.
- ★ Reliable – low power schottky & CMOS.
- ★ Designed for maximum ease of operation.
- ★ Noise blanker 0-10-20dB attenuator.
- ★ Small (140x340x300mm) light 7½Kg.



PROFESSIONAL MONITOR

- ★ Up conversion. 70.455MHz and 455Hz.
- ★ No R.F. amplifier, balance U310 mixer.
- ★ Crystal filter before first IF amplifier.
- ★ Transceiver provisions; sidetone, trip etc.
- ★ Frequency data input output port.
- ★ NVA515 External 3W speaker.
- ★ CFL260 600Hz mechanical filter.
- ★ CFL230 300Hz crystal filter.
- ★ NHD518 96 (4x24) channel memory unit.
- ★ CQE515 Junction unit (NCM to NHD).
- ★ NCM515 Remote keypad controller, LCD readout 4 channel memory Up/down step tuning.

SMC: LARGEST STOCKISTS OF ANTENNAS, MASTS, CABLES, ETC.

# SOUTH MIDLANDS COMMUNICATIONS LTD

MAIL ORDER; AS NEAR AS YOUR 'PHONE OR PEN



#### SMC SERVICE

Free Securicor delivery on major equipment. Access and Barclaycard over the phone. Biggest branch agent and dealer network. Securicor 'B' Service contract at £4.49. Biggest stockist of amateur equipment.

#### FREE FINANCE

On many regular priced items SMC offers Free Finance (on invoice over £100). 20% down and the balance over 6 months or 50% down and the balance over a year. *You pay no more than the cash price!!*

#### GUARANTEE

Importer warranty on Yaesu Musen products. Aply staffed and equipped Service Department. Daily contact with the Yaesu Musen factory. Tens of thousands of spares and test equipment. Twenty-four years of professional experience.

S.M. HOUSE, RUMBRIDGE STREET, TOTTON, SOUTHAMPTON, SO4 4DP, ENGLAND,  
Tel: Totton (0703) 867333, Telex: 477351 SMCOMM G, Telegram: "Aerial" Southampton

TWO OR SEVENTY: FT230R, FT480R, FT780R, 2030, and FT726 PLUS:

- ★ Multimode USB, LSB, FM, CW.
- ★ 100Hz backlit LCD display.
- ★ 10 memories '5 year' backup.
- ★ Any Tx/Rx split with dual VFDs.
- ★ Up/down tuning from mic.
- ★ AF output 1W @ 10% THD.
- ★ Bandwidth 2.4kHz and 14kHz.
- ★ LED's 'On Air', 'Busy', m/c meter.
- ★ 58 (H) X 150 (W) x 195 (D) (1.3Kg).



- SMC2.0C NiCad 2.0 A/hr, "C"..... £2.35
- SMC8C Slow Charger (220mA)..... £8.80
- MMBII Mobile Mount..... £22.25
- CSCIA Soft carrying case..... £3.45
- FL2010 Linear Amplifier 2m 10W..... £51.00
- FL7010 Linear Amplifier 70cms..... £91.00

**FT290R  
PORTABLE  
144MHz  
£265**

VAT @ 15%  
& POSTAGE

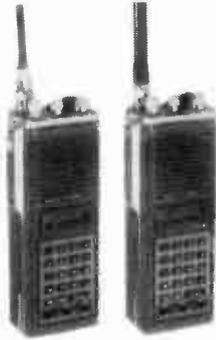
- ★ 144-146MHz (144-148) possible.
- ★ 2.5W PEP, 2.5W FM/CW/300mW.
- ★ FM: 25kHz and 12.5kHz steps.
- ★ SSB: 1kHz and 100Hz steps.
- ★ ±600Hz split 1750kHz burst.
- ★ Integral telescopic antenna.
- ★ Rx, 70mA, Tx; 800mA (Fm max.).

**FT790R  
PORTABLE  
432MHz  
£325 inc.**

VAT @ 15%  
& POSTAGE

- ★ 430-330MHz (440-450 alternative).
- ★ 1W PEP, 1W/250mW FM/CW.
- ★ FM: 100kHz and 25kHz steps.
- ★ 1.6MHz shift with input monitor.
- ★ 1750Hz burst.
- ★ Rx: 100mA/200mA, Tx; 750mA.
- ★ BNC Mounting ½ flexi antenna.

- ★ Keyboard entry of frequencies.
- ★ LCD digital display backlight.
- ★ Any split + or - programmable.
- ★ Ten memories '5 year' back up.
- ★ Up/down tuning. Memory scan.
- ★ Manual or auto scan busy/clear.
- ★ Priority channel with search back.
- ★ Scan between any two channels.
- ★ Auto scan restart. 1.750Hz tone.
- ★ Built in condenser microphone.
- ★ 500mW to int/ext speaker.
- ★ External speaker/mic. available.
- ★ 168(H) x 61(W) x 39 (D)mm.
- ★ C/w Quick change NiCad pack.



**FT208R  
HANDHELD  
144MHz  
£209 inc.**

VAT @ 15%  
& POSTAGE

- ★ 144-146MHz (144-148 possible).
- ★ 12.5/25kHz synthesizer steps.
- ★ ±600kHz repeater split.
- ★ 2.5 or 0.3W RF output.
- ★ Rx: 20mA squelch 150mA max.
- ★ Tx: 800mA at 2.5W RF.
- ★ 0.25uV for 12dB SINAD.

**FT708R  
HANDHELD  
432MHz  
£229 inc.**

VAT @ 15%  
& POSTAGE

- ★ 430-440MHz (440-450 option).
- ★ 25kHz synthesizer steps.
- ★ ±7.6MHz EU split standard.
- ★ 1W or 100mW RF output.
- ★ Rx: 20mA squelch, 150mA max.
- ★ Tx 500mA at 1W RF.
- ★ 0.4uV for 12dB SINAD.

HF TRANSCEIVERS: FT-ONE, FT980, FT102, FT902 and JST100 PLUS:

- ★ 160-10 metres including new allocations.
- ★ Variable IF bandwidth 2.4Hz down to 300Hz.
- ★ Selectable CW fixed width CW-W and CW-N\*.
- ★ Semi-break in with sidetone for excellent CW.
- ★ Digital plus analogue frequency displays.±
- ★ 180W PIP and - 31dB 3rd order intermod.
- ★ RF speech processor fitted - adjustable level.
- ★ VOX built-in adjustable from the front panel.
- ★ Wide dynamic range for big signal handling.
- ★ High usable sensitivity, for those weak ones.
- ★ Superb noise blanker - adjustable threshold.
- ★ Attenuator; 0-10-20dB, AGC; slow-fast-off.
- ★ Clarifier (RIT) switchable on Tx, Rx or both.
- ★ Universal power supply 110-234V AC+12V DC\*.
- ★ Range of accessories include Transverters.

\*Option.

- ★ 6 models: Digital/Analogue - AM/FM options.

**FT101Z £559 inc.** VAT @ 15%  
& SECURICOR



FREE  
FINANCE

FREE  
SECURICOR

- ★ 80-10 metres (including 10, 18 and 24 MHz).
- ★ USB-LSB-CWN-AM (Tx and Rx operation).
- ★ 100W PEP, 50% power output at 3:1 VSWR.
- ★ Full "broad band" no tune output stage.
- ★ Excellent Rx dynamic range, power buffers.
- ★ Rx Schottky diode ring mixer module.
- ★ Local oscillator with ultra-low noise floor.
- ★ Variable IF bandwidth - 16 crystal poles.
- ★ Bandwidths 6kHz\*, 2.4kHz-300Hz, (600-350)Hz\*.
- ★ AGC; slow-fast switchable VOX built-in.
- ★ Semi-break in with side tone for excellent CW.
- ★ Digital (100Hz) + analogue frequency display.
- ★ LED Level meter reads: S, PO and ALC.
- ★ Indicators for: calibrator, fix, int/ext VFO, RIT.
- ★ Advanced noise blanker with local loop AGC.

\*Option.

SMC FM MODIFIED VERSION AVAILABLE: £40 EXTRA

**FT707 £509 inc.** VAT @ 15%  
& SECURICOR



'PLASTIC'  
BY PHONE

FREE  
CREDIT COVER

A LARGE SAE BRINGS MORE DATA PLUS 26 PAGE STOCK LIST

**SOUTH MIDLANDS COMMUNICATIONS LTD**

SHOWROOMS: SPANNING THE UK - TO SERVE YOU



**SOUTHAMPTON**  
SMC Ltd  
36-38 Rumbidge Street  
Totton, Southampton  
Southampton (0703) 867333  
9.5.30 Mon Sat

**LEEDS**  
SMC (Leeds)  
257 Otley Road  
Leeds 16, Yorkshire  
Leeds (0532) 782326  
9.5.30 Mon Sat

**CHESTERFIELD**  
SMC (Jack Twendy) Ltd  
102 High Street  
New Whittington, Chesterfield  
Chesterfield (0246) 453340  
9.5 Tues Sat

**BUCKLEY**  
SMC (TMP)  
Unit 27, Pinfold Lane  
Buckley, Clwyd  
Buckley (0244) 549563  
9.30.5.30 Tues-Sat

**STOKE**  
SMC (Stoke)  
76 High Street  
Talke Pits, Stoke  
Kidsgrove (07816) 72644  
9.5.30 Tues-Sat

**GRIMSBY**  
SMC (Grimshy)  
247A Freeman Street  
Grimshy, Lincs  
Grimshy (0472) 59388  
9.30.5.30 Tues Sat

Edinburgh Jack GMBGEC (031 657) 2430 Day  
(031-665) 2420 Eve  
Stourbridge Brian G3ZUL (03834) 5917

SMC AGENTS  
Bangor John G1JKDR (0247) 55162  
Llandranga Mevyn G13WVY (0762) 840656

Neath John GW4101 (0630) 52374 Day  
(0649) 2942 Eve  
Jersey Geoff GJ41CD (0934) 26788

# • RINGING • • TRUE •

Last time, we discussed inductance and capacitance – two things without which we wouldn't have any wireless at all and Marconi would have been out of a job. We noted that they were two different things which are complementary to each other, like bacon and egg or pencil and paper; specifically, we noted that each possesses a property known as **reactance**, which is in a way like resistance except that it is a function of frequency. Remember? No? Shame on you – go and dig it out of the pile of old Christmas cards and even older copies of other magazines and take another look.

Both inductors and capacitors, as we saw last time, have the property of storing and releasing energy: the capacitor does it in terms of electric charge, like the kind of thing that happens when you comb your hair and then pick up bits of paper with it (the comb, dummy) whereas the inductor does it by the induction of a magnetic field opposing the voltage that's inducing it which induces a voltage as it collapses. Yes, of *course* you remember. What do you mean, I didn't put it very clearly? Well all right, just think of it as magnetism in the case of an inductor and charge in the case of a capacitor and then we can all get on with it – don't ask difficult questions at this stage, we'll get to the clever stuff later . . .

## A couple of formulae to bear in mind . . .

Right, then. We know that a resistor has a constant resistance which doesn't vary with frequency; it doesn't have reactance as such because that word is reserved for the sort of resistance which does vary as the frequency changes. We know that the reactance of an inductor increases as the frequency goes up, and that the reactance of a capacitor decreases, etc. etc. So – three components which all possess resistance and/or reactance (remember that since an inductor will allow DC to pass as well as AC, it has resistance as well as reactance). What happens next?

Let's just remind ourselves at this stage that there are a couple of formulae to bear in mind in order to relate the value of an inductor or capacitor to its reactance at a

**Resonance is fundamental to radio. Without it there'd be no transmitters, receivers or pretty well anything else! It's all to do with reactances and resistance and various other exotic things. Chris Drake explains.**

given frequency – oh yes, while we're at it, why did only one person spot the deliberate mistake (oh well, all right, not *that* deliberate) last month? Come on, own up! Stand up Mr Clive Dunnico of Shoeburyness, who sent us a nice Christmas card and pointed out that we got our square roots mixed up and put them where they didn't ought to be. Well done, sir, it's nice to know that we have at least one reader . . . Ahem. Well, as Mr Dunnico quite rightly points out, the correct formula for the reactance of an inductor is:

$$X_L = 2\pi fL$$

( $X_L$  = inductive reactance)

and that for a capacitor is:

$$X_C = \frac{1}{2\pi fC}$$

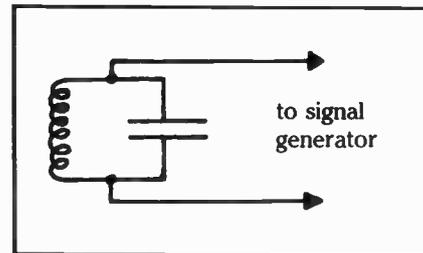
( $X_C$  = capacitive reactance)

The X bit is the symbol for reactance, just as R is the symbol for resistance – as we said a couple of months ago, they're the same but different insofar as you can't add them directly but you have to cheat a bit. If you've forgotten the formula, go and stand in the corner for 15 minutes. (Actually, why *did* only one person spot the boob? Does anyone read this? Here I am staying up at all hours, sweating over textbooks and striving to write beautiful prose about inductors and capacitors and nobody reads it. Think I'll shoot myself . . .)

Now, now Carruthers, keep your pecker up and get on with it; we'll even give you half a day off at Christmas if you work hard and be a good boy. Ahem. You'll note that

one formula has a "1 over" term in it, or what mathematicians call a reciprocal, from which you'll see why reactance increases with frequency in one case and decreases in the other.

So, having got that bit perfectly clear, we'll press on. I don't know which genius first got the idea of connecting an inductor and a capacitor together, but I doff my hat to him because that's where it all starts, as we'll see. Suppose you take one capacitor and one inductor – say a perfectly ordinary bog-standard nF polycarbonate and a perfectly ordinary ditto ditto 1 millihenry inductor – and connected them together, like this:



Well, I know it doesn't look much this is one of the fundamental circuits in all wireless. Believe it or not, it's known as a **parallel-tuned circuit** – now don't worry, just hang in there and it'll get better in a bit. It's called "parallel" because the inductor and capacitor are connected in parallel as opposed to series (remember, resistors and Ohm's Law and all that) and it's a tuned circuit because . . .

## This is the phenomenon of resonance

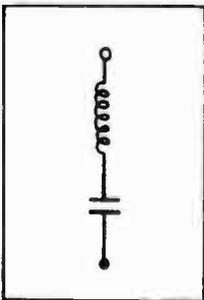
This is where it gets interesting. Why *should* it be called a tuned circuit for heaven's sake? Does it play a tune when you connect it up? Well, no. Let's take a careful look at it. Specifically, what happens when we apply an alternating current of a particular frequency to it. Let's imagine that we connect an audio-frequency signal generator with a frequency range of, say, 0 to 60 kHz to the circuit and monitored the amount of alternating current which flowed in the circuit at various frequencies, with some suitable test equipment such as an oscilloscope or a valve voltmeter.

As we crank up the frequency from the bottom, we'll see – actually, not a lot. A current will flow and it'll be constant, not changing at all as we wind the frequency up. But what's this? As we get to around 8 kHz, the current flowing starts to decrease, and by the time we've set the generator to just under 16kHz there's almost no current flowing! As we carry on increasing the frequency, it comes back up again and stays that way. Very odd – it seems that something happens at around one particular frequency and no other. Why can this be?

Ladies and gentlemen, we have just seen the phenomenon of **resonance** – three loud cheers and you may now light your cigar and quaff the port. In fact, we can say that this circuit possesses a **resonant frequency** of just under 16kHz (it actually is 15.9kHz) and that single fact is most important.

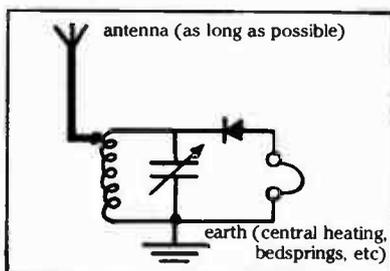
## The implications of this are enormous

Can you now see why it's called a tuned circuit? You can see that something happens when it's tuned to its resonant frequency, or to put that another way there's a change in the current flowing in the circuit when you apply alternating current of such a frequency as to coincide with the resonant frequency of the circuit. What happens in this particular case, in fact, is that the circuit offers a high **impedance** to the passage of AC at its resonant frequency and offers a low impedance to anything else. You might like to know, in fact, that if you take the other form of this circuit, which is known as a series-tuned circuit (it looks like this):



this animal works the other way about – it offers a low impedance at resonance and a high impedance the rest of the time.

The implications of this are enormous because for the first time we can make circuits that respond to one frequency and no other. We can see this, for instance, in the case of Grand-dad's crystal set. The circuit of that usually looked something like this:



The idea here is that the antenna feeds signals into the tuned circuit but this offers a low impedance to earth to the passage of all signals except those to which it's tuned. These later get passed on to the detector diode, which was the crystal-and-cat's-whisker in Grand-dad's wireless and an ordinary semiconductor diode these days, which promptly lops off half of the AM signal and leaves you with the original sound which modulates the transmitter. In practice, Grand-dad would have a capacitor which could be made to alter its value (ie a tuning capacitor, as we'd call it nowadays) and he'd be able to tune in to 2LO or 5XX or whatever it was. It's an interesting experiment to try out – go on, string a length of wire down the garden and use the bedsprings or something for an earth. You ought to be hear something if you use something like a 500pF variable and about a hundred turns of some suitable thin wire on an old bog-roll centre or thereabouts. You'll need a germanium diode such as an OA81 or OA91 – don't use silicon for this job – and any old high-impedance headphones will do.

We'll come back to the crystal set in a minute because we can learn a lot from it – but let's take a closer look at this resonance matter. Let's assume that we measure the frequency at 15.9kHz – the frequency our 1nF and 1mH resonate at, that is. Why should it be that? Just out of interest, let's work out the reactance of our 1nF at that frequency. That's 1 over  $2\pi$  times  $fC$ , with  $f$  in Hertz and  $C$  in farads. Our capacitor is 1nF, which is 1000pF or one thousandth of a millionth of a farad – not very easy units, these! I make it 1 over 6.28 times 15,900 ( $f$  is the frequency in Hertz, remember) times 10 to the power minus 9 (I'll put it that way so that the typesetters don't mis-spell my name – of course it's 0.000000001 of a Farad. AAAAARGH . . .)

## It seems to pan out in practice

According to my calculator it comes out to 99.852ohms reactance at 15.9kHz. Interesting. Let's see what the reactance of our 1mH inductor is at that frequency also. It's 6.28 times 15,900 times . . . well, it's a thousandth of a Henry, so we'll multiply 6.28 by 15,900 and divide that by 1,000 so that it comes out in the end. Well, what do you know? It's 99.852ohms.

Intriguing – and fundamental. This resonance bit occurs when the reactance of the capacitor equals that of the inductor – or, to put it in stately mathematical language for the boffins,  $X_C = X_L$ . Can it perchance be that there's a formula for working out the resonant frequency of any tuned circuit? Yes, friends, there is as long as you know the values of inductance and capacitance you've got. Pause for the roll of drums – it's;

$$F_{res} = \frac{1}{2\pi\sqrt{LC}}$$

where  $F_{res}$  is a natty way of saying resonant

# STARTING FROM SCRATCH

frequency. Actually, I must admit that I learned once how to derive that formula from the other two but I can't for the life of me remember how to do it any more. Anyway, all the learned textbooks say that's what it is and it seems to pan out in practice, so there you go. Actually, Mr Dunnico put that formula on his Christmas card as well, so he obviously knew which way we were looking. We'll have to sign him up – bet *he* knows how to get one formula from another!

## All that changes is the nature of the impedance at resonance – it's the same formula

Be that as it may, you can now see how I sussed that the resonant frequency of our combination was going to be 15.9kHz. It's the same formula whether the circuit is of the series-resonant or parallel-resonant variety, by the way – all that changes is the nature of the impedance at resonance.

So you can see that it's now possible to have circuits of whatever resonant frequency we like, and we can use them in all sorts of wonderful ways. Next time we'll have a look at some of them, but to end with this time we can go back to the crystal set. Let's assume that we've actually made the thing – and in most areas of the UK ten gets you one that you'll hear not just one program but two or three or even more. Why is this? Isn't the circuit only supposed to be resonant at one frequency, not two or three? How come we're hearing more than one?

Well, we'll have to look closely at this next time, but the basic story is that some tuned circuits are better than others insofar as what you might call their efficiency – specifically, the difference between the current flowing at resonance and the current that gets through the rest of the time. There's an expression for the "goodness" of a tuned circuit, which is  $Q$ .

And on that suitably mysterious note, we'll leave it for now – see you next time . . .

Next month –  $Q$  and  $L/C$  ratio and all that . . .

# AMATEUR RADIO SPECIAL OFFER! YOUR OWN CALLSIGN BADGE AND PLAQUE

15% off normal prices!

## Callsign badge £1.50 each

(approx. size 3in x 1in. Supplied with brooch pin on reverse side)

Background colours	Lettering colour
Black	White
Blue	White
Red	White
Black	Yellow
Red	Yellow
White	Black
Yellow	Black



Amateur Radio magazine's special offer on callsign badges, callsign plaques and ARS plaques. Produced and engraved by Newton Engraving of North Devon – see them at many rallies and shows.

## Callsign plaque £2.25 each

(approx. size 6in x 2in)

Background colours	Lettering colour
Black	White
Blue	White
Red	White

## ARS plaque £4.00 each

(approx. size 8in x 2in not shown)

Background colours	Lettering colour
Black	White
Blue	White
Red	White

Note: Supplied with either perspex base, or holes and suckers (ARS plaque only)

All prices include post and packing. Please allow 21 days for delivery.

### ORDER FORM

Please send me, as soon as possible, the following badges/plaques:

Callsign badge(s) <input type="checkbox"/>	Background colour .....
	Lettering colour .....
Callsign plaque(s) <input type="checkbox"/>	Background colour .....
	Background colour .....
ARS plaque(s) <input type="checkbox"/>	Holes/suckers .....
	Perspex base .....

I enclose a cheque/postal order for £.....

Made out to Newton Engraving.

Name .....

Address .....

Please print name and address clearly.

Send to: **Amateur Radio Special Offer,**  
**Newton Engraving, Newton St. Petrock, Torrington, North Devon EX38 8LU.**

# DEWSBURY

# ELECTRONICS



## TEN METRES USE IT OR LOSE IT!!

Work U.S. REPEATERS  
either home or mobile, with the  
DE 4800 6 watt FM TRANSCEIVER.  
Price £46.25 plus £2 post and packing.  
6 month warranty.  
MAKE TEN YOUR LOCAL CHAT BAND



Dewsbury Electronics offer a full range of Trio Equipment always in stock.  
We are also stockists of DAIWA - WELTZ - DAVTREND - TASCOS TELEREADERS - MICROWAVE MODULES -  
ICS AMTOR - AEA PRODUCTS - DRAE

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands.  
Telephone: Stourbridge (0384) 390063. After Hours: Kidderminster (0562) 851255  
Closed Thursday

# SETTING UP A STATION...

Finding the right equipment at a price to suit your pocket – now that's a serious business.

You need a wide range to choose from. We have it – Trio, Yaesu, Icom, FDK.

You need time to look, time to listen. We provide it – with our full-scale operating station.

You may need advice from serious, dedicated amateurs. We've been on the air for years – HF, VHF and UHF... and there are all those local amateurs who drop in from time to time.

You may need finance facilities – we accept Access and Barclaycard – we offer Creditcharge Instant Finance.

Above all, you need to know we are reliable and know our business. We've been in electronics and amateur radio for years. We are approved dealers for Trio, Yaesu, Icom and FDK – and we offer full, prompt and efficient servicing in our up-to-date workshop...

... the latest in receivers. Sensitive, selective and a pleasure to operate...

A lot of receiver for the price...



The Trio R600 £244.49

The latest in receiver technology...



The Icom IC R70 £469

... a wide range of antennas for HF and VHF.

... Antenna Tuning Units to peak up receiver performance.

... VHF and UHF converters to bring more to your listening...

All of these to help you build the complete station.

..... **See the Professionals** .....

Derek G3 TGE  
Roy G3 TLE  
Kerry G6 IZF

Four minutes from the M1. Exit Junction 14. Head for the High St, Newport Pagnell. We're at number 58. Parking opposite or round the corner in Silver Street. Or phone 0908 610625



## Photo Acoustics Ltd.

● OF NEWPORT PAGNELL ●

# NEW OR USED?

There are decisions to be made before, during, and after you've bought your radio equipment. But the first rule is: be prepared before you make that final move for your cheque book . . .

Angus McKenzie advises.

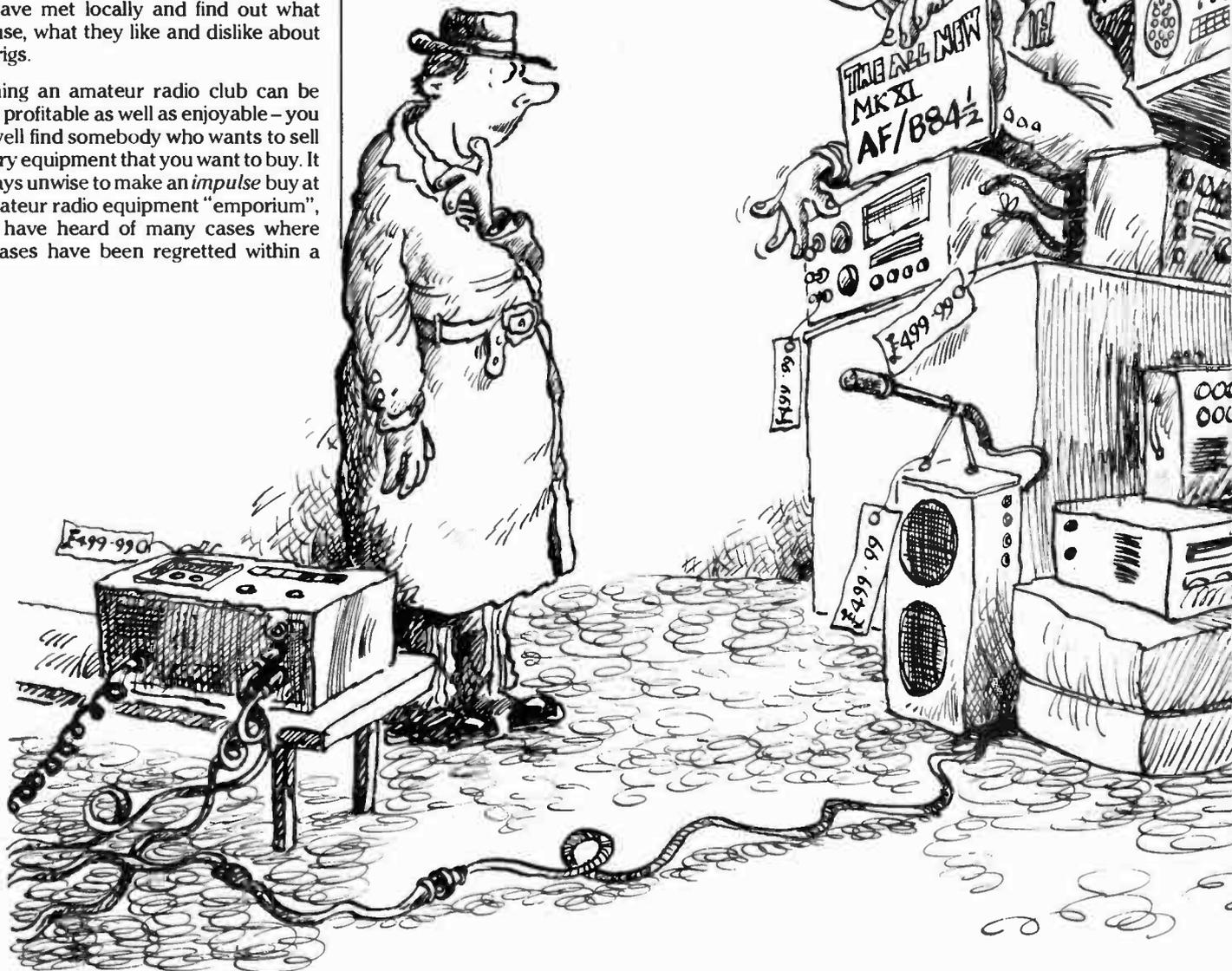
Before you go out to buy some new or secondhand equipment, it is always a good idea to work out *exactly* what you want. Not only for immediate use, but to anticipate your requirements for a period of a year or two. Have a word with some of the amateurs you have met locally and find out what they use, what they like and dislike about their rigs.

Joining an amateur radio club can be highly profitable as well as enjoyable – you may well find somebody who wants to sell the very equipment that you want to buy. It is always unwise to make an *impulse* buy at an amateur radio equipment “emporium”, and I have heard of many cases where purchases have been regretted within a week.

Many shops have only restricted dealerships, and of course they promote only the makes that they can get hold of. In my experience some dealers seem rather inclined to tell all sorts of cock and bull stories about makes that they cannot get hold of, because the main importer will not supply them. Even more strange are the number of different parallel importations going on, many of them representing imports from dealers or distributors in other countries such as the US, where trade prices may be very much lower.

If you want a new rig, no doubt you will check prices and discounts from different shops. But it's not all that simple because you may be comparing products which are *not* the same, although the catalogue number may very well be advertised as the same product. For example, an ABC123D from Joe Bloggs may be the genuine product direct from Japan, with facilities such as repeatershift auto tone burst, and reverse repeater built in specifically for European markets; on the other hand a US version may have different channel spacing and may have come into the country with different arrangements for repeater operation. Sometimes, a dealer will obtain the US version and modify it without

formal approval of the appointed importer, so that it can be used in the UK. The price may be cheaper, but sad stories arise when you try and get after sales service out of a dealer. It is not fair to name names, but at least one dealer imports a brand of equipment from distributors or shops in other countries rather than from the manufacturers. This is basically OK, but they fail to stock adequate spares, so that one customer (for instance) had to wait nine months for a spare power transistor only to find that it blew immediately because the driver transistor was also faulty. The main importer refused to have anything to do with the equipment as it had not been bought from an official agent. This is of course, very hard on the guy who didn't know the ropes and bought it from a shop that he did



not realise was not a properly appointed dealer, but the word will soon get around that you shouldn't buy Thingamepushoki from Bloggs because of bad aftersales service. Let's take a look at what has happened to the selling of amateur radio equipment in the last 25 years or so.

In the late 50s and early 60s, Japanese industry had not penetrated the amateur radio scene. Many amateurs built their own rigs (which were much easier to build in those days), and they bought components frequently from government surplus shops in Lisle Street near Leicester Square, Webbs Radio (now extinct) near Tottenham Court Road or from many of the shops in Edgware Road. If you wanted

'black boxes' you bought Collins if you were rich or spent your money on the latest KW Electronics, minimitter or TW Withers gear.

A few American manufacturers were also around, represented by established companies in the UK; brands such as Hallicrafter, Hammerlund, National, Swan, and Drake being available. Quite frequently, you found that the importers were just general equipment importers who knew next to nothing about amateur radio equipment and you had to choose what you wanted from a catalogue at enormous prices. In the mid-sixties, companies such as Trio and Yaesu came into the foreground, and slowly but surely, shops were established, some having originally been surplus dealers who changed over to retailing new equipment.

### **“Take the equipment back, and insist on your money back...”**

The big boom started around 13 years ago and the earlier dealers realised that they had to give a very good aftersales service combined with good advice to attract custom. With the expansion of FM on two metres, tens of thousands of rigs were sold, and many long established dealers equipped themselves with very comprehensive servicing workshops which allowed them to turn round faulty equipment in only a few days. Amateur radio has now become a very popular hobby, and by the time this is published the 40,000 licensees as of October 1982 may well have become 45,000.

Many new shops have become established in the last few years, some giving an excellent after-sales service, whereas others in the experience of many friends of mine, are rather lacking in such service. A dealer must live by reputation, so you should ask around about the reputation of the dealer, who may have made you what seems to be a good offer. It is probably useful to ask the advice of amateurs who have been licensed for several years for they will often know how the cookie crumbles.

I understand from discussions with several appointed importers of Japanese equipment that equipment manufacturers in Japan only guarantee their equipment in their home country. So, guarantees from UK importers are very worthwhile, but are the responsibility of the importers themselves.

Let's take a look at your legal rights during and after purchasing in the UK. A number of acts of parliament give you many rights; these include the Trades Descriptions Act, the Fair Trading Act and the Sale of Goods Act etc, all with many later amendments which were passed so the public gets a fair deal from the retailer. Unfortunately, some of the clauses of these acts might justifiably be said to be

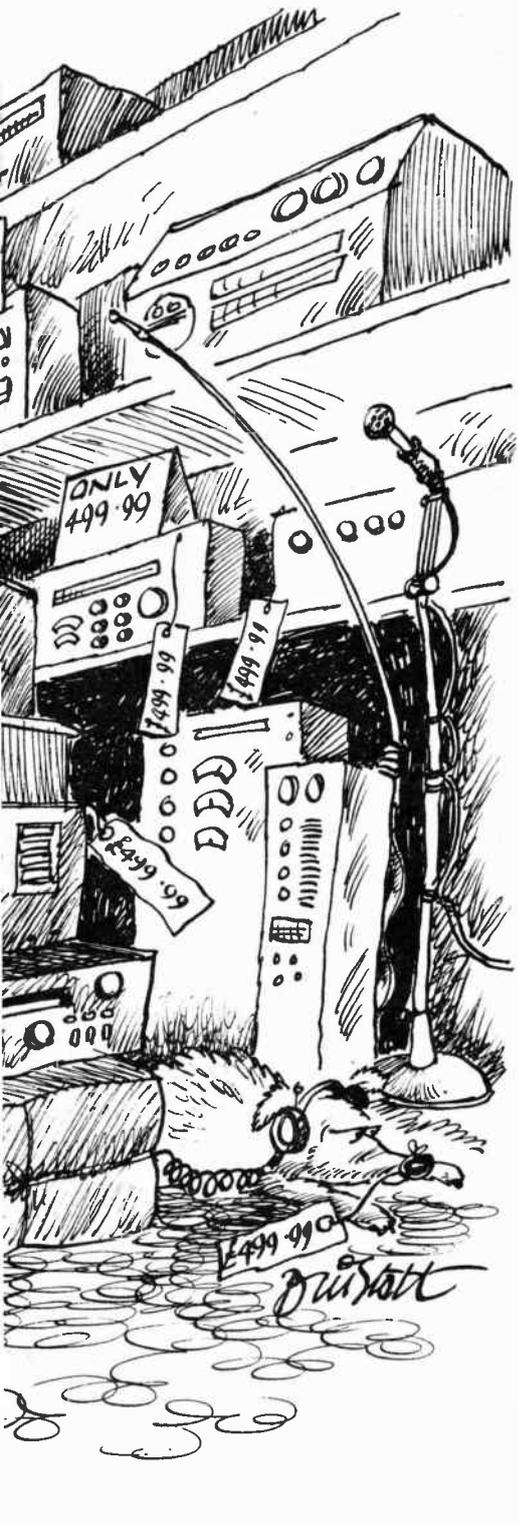
favouring the purchaser, and a few people, frankly, take shops for a ride. So what are your rights?

If you see something in the window of a shop priced at £500, then first of all this price infers the inclusion of VAT, unless otherwise stated, the same law applying to adverts in magazines. If you go into the shop or contact them in some other way, making it clear that you wish to buy the goods at the advertised price, the contract is not complete until the shop agrees to make the sale. They are within their rights in most circumstances to refuse to sell the product at the price advertised. Once they have agreed a price, and you have agreed to purchase, there is a legal and binding contract, which however, may be up to you to prove.

Once the goods are purchased, many more acts come into play. If you find the goods not as described, either verbally or in an advertisement, then you have recourse to the Trade Descriptions Act and can insist, by law, on having your money back immediately. You may also insist on payment for transport, even by taxi if this is reasonable and under some circumstances, damages if for some reason you are seriously inconvenienced by the goods being in error. It is up to you, the purchaser, whether you should be paid cash, a cheque, a credit note or even a replacement – although the shop cannot insist on giving you a replacement.

Another interesting point cropped up a year ago. If you order a piece of equipment, even one that has to be specially ordered for you, and whether you pay for it in advance or when you eventually receive delivery or you collect it, and you find when you get it home that it is not as described, or that it is faulty and therefore you are very disappointed, you can take the equipment back and insist on your money back plus expenses and any damages that are reasonable. I heard of a case when a piece of hi-fi equipment was purchased specifically for a 21st birthday party over a weekend and which did not work. The shop who supplied it, and who had specially ordered it, had to pay back not only a complete refund, but quite heavy expenses as it had not been checked properly, although the fault was only a minor one.

What happens though, if a rig goes wrong after a month or two? The law does not define adequately the period during which the purchaser can have a complete refund, but does state that after a reasonable period the equipment should be repaired in a short time, which again must be reasonable, and returned to the user without cost, unless the fault has occurred through misuse (which includes modifications). If you are prepared to let the shop attempt to correct the fault, but have even the slightest feeling that after servicing you may still be dissatisfied, or that the service may take longer than you are prepared to accept, despite promises, then you must state, before you agree to allow the shop to perform the service, that you wish to retain your legal right to have your money back. This should either be witnessed by some-





## NEW OR USED?

body with you, or should be written on a shop's receipt when they take back the goods.

Failure to reserve your rights unfortunately removes in law any possibility that you can legally demand your money back after unsatisfactory service, although perhaps in some other law you might still eventually be granted a refund. It is much better to avoid misunderstandings as early as possible in transactions than to have legal battles later on when you are trying to assert your reasonable rights. In some circumstances, you may have a right to your money back if the equipment is with the shop but has still not been serviced, and this is not awaiting your collection. Your case is particularly strong if the time that the equipment has been held awaiting spare parts for example, can be deemed unreasonable, I reckon that several weeks is unreasonable, let alone months.

If you want to purchase goods for a specific event, such as a field day or a birthday, then you can in law state your requirements for delivery before the event as part of the contract to purchase. If your requirement is accepted, and your holiday etc is ruined because of non-delivery, you have recourse to claim damages *and any expenses that you have incurred in making alternative arrangements at the last minute*. Similarly, if a rig that has only been delivered to you at the last minute is faulty when you use it for your holiday etc, then again you are entitled to expenses/damages for your disappointment and its rectification as well as your money back on return.

You should not *have* to assert your legal rights with decent and honest dealers, and it should be possible to build up a good relationship with your chosen dealer. Good dealers, upon receipt of a phone call, will go out of their way to send replacement rigs by Securicor or Red Star train to a stipulated destination to get you out of trouble, but bad ones might tell you to get lost, or say that they will give you a refund on your return, provided "x y and z" etc.

When you return you might even find that the dealer is unavailable to you on the phone and might even be on holiday. In one case a replacement was refused to me because the dealer said that he had packed up the replacement equipment ready for an exhibition and didn't want to lose a sale! The fact that in this case my own holiday was partly ruined, since a 70cm transceiver

had failed within days of purchase, and I therefore had no 70cm equipment at the beginning of my holiday was of no interest to the dealer who adopted this 'get lost' attitude.

Many years ago I obtained a very different attitude indeed from Lowe Electronics in Matlock. I had purchased some time earlier an HF transceiver which I had installed in my car and late one Friday night had reached Yorkshire from London on my way to Glasgow on holiday when I plugged in an 80m mobile aerial into the rig (so I thought) and proceeded to tune up. After a minute of tuning there was an ominous click followed by an expensive smell. I had attempted to tune up on 80m into a 2m halo antenna! The following morning I contacted Lowe Electronics who said they would do everything to help, and their Glasgow representative changed the old rig for a new one and gave me an exceptionally good allowance since I did not try to hide my own carelessness.

The co-operation that I received from "Sim", who now runs the new Lowe Electronics shop in Glasgow was magnificent and I even ended up with a slightly better rig which I then used for some years without trouble. I have also had similar co-operation from SMC and Thanet as well as from Microwave Modules.

I must also mention Amcomm Services in Harrow, who at incredibly short notice supplied an Icom 740, reviewed in this magazine, and who have a good reputation for helpful after-sales service.

**"A replacement was refused because the dealer wanted the equipment for display"**

One interesting clause in one of the acts is that the goods shall be "fit for the purpose and of merchantable quality" for use as advertised. In the context of amateur radio, this means that if for example you buy a linear amplifier advertised as capable of being used for amplifying SSB transmissions, then the amplifier should perform this task to a standard which must be considered acceptable by the majority of listeners to the transmission. If you wish to complain about a 2 metre linear which you allege is causing bad spreading on transmission, you must ensure that you are using it exactly as recommended by the manufacturer, ie that you are not over-driving it, that you are giving it exactly the specified DC voltages, and that you are not maladjusting controls.

You must also ensure that the amplifier is not amplifying a transmission which is already of poor quality. A transverter for the 70cm (432MHz) amateur band which takes an input on 28MHz and which gives a

spurious output in the middle of the IBA video carrier in the south east of England which might be measured at only 40dB below the main transmission level is not fit for the purpose of being used as a transverter, since it will cause television interference.

Our laws in the UK can be seen to favour the consumer, usually quite reasonably, to such a degree that manufacturers and importers require more initial profit, as do retailers, so that they can look after the provisions of the various parliamentary acts.

I once saw an advertisement for some RF receive pre-amplifiers which described the front end noise figure as being 1 dB. Such a performance is frankly very difficult to obtain, and one pre-amplifier tested had a noise figure some 2.5dB worse, whilst another was around 6.5dB worse, thus adding more hiss to incoming weak signals, than it should have done. This might well be regarded as a typical example of an alleged infringement of the Trade Descriptions Act. How about a linear for two metres which should really be specified as 400watts PEP output which was actually specified to me as having up to one kilowatt output? Perhaps the shop concerned might do a good trade in new bottles for the output stage, and I can imagine a few users attempting to get one kilowatt output and taking over several hundred kHz of band space caused by spreading in the process.

## Loose specifications

In looking over the specifications of amateur radio equipment, I am often disturbed by the fact that they are so loose that nobody could possibly complain. One manufacturer might specify a rig as having 0.5uV sensitivity for 12dB signal to noise ratio, or more appropriately another type of measurement called "sinad". The rig will almost certainly be two or three times better than this, but how can the intending purchaser know which rigs sail near the wind, and which ones are much better than spec? I prefer to see published typical specifications reached by say 95% of samples, thus giving a far better idea of real performance. Many rigs (for example) advertised as giving 10 watts output will typically give perhaps 14 watts, whilst others will give 10 watts FM, but only eight watts of undistorted SSB.

The dreaded "Liner 2" mobile 2m SSB transceiver that was sold a few years ago could not give more than two or three watts output without serious problems developing, and even at this low output spectrum analysis showed the presence of spuri at many frequencies both inside and outside the two metre band. This rig was advertised as giving 10 watts PEP output!

The subject of whether to buy new or secondhand is a tricky one indeed, for whilst secondhand gear will at first sight appear to represent very good value for money, you must ask yourself why that

guy wants to sell it. It may well be a rig which has proved to be a late Friday afternoon one which has missed quality control and often referred to as a rogue sample. It may be one that has proved to be poor in some significant parameter, or one where the seller has dug inside it and generally stirred around with a large hot soldering iron!

Many unauthorised, unwise, or incompetent modifications are put into rigs and demodification can be very difficult. Some dealers, in an attempt to hot up a receiver, may change the front end transistor type, but by doing so may affect the transmit performance. Changing a transistor for another with different parameters (even if it can give a better performance) can be tricky, for the original circuitry may just not be suitable for the new type. One importer, SMC, actually advertised recently a service for £10 in which they offered to "de-modify" FT290s which had previously been modified by another dealer with alleged rather sad results. SMC tell me that they had quite a few brought to them for this de-modification.

This is not to say that a carefully engineered modification is not a good thing, but it is probably better done by the main importers or their agents. So the first thing you should do when looking at a second-hand rig is to ask whether it has been tweaked or modified. You might also ask when and from where it had been purchased. Before you actually see the rig, ask around, and find out what most people think of it, and if possible listen to a transmission from somebody who has one. If relationships are good between seller and purchaser, it is reasonable practice to borrow it for two or three days so that you can be happy about its performance.

You should be a little suspicious of equipment which is more than a few years old, for there are so many parts that could give trouble after purchase. RF circuits can go way out of adjustment after a few years, and you may have to pay for a complete overhaul, or spend hours of reignment if you have the appropriate test gear.

---

## Good old receivers

---

Don't turn your nose up at an HF transceiver which either incorporates valves throughout, or which has a valve output PA. Even today valve output stages are generally superior in many ways to transistorised output stages, and give less distortion. Many old receivers using valves, which may cost in the secondhand market, between £50 and £500 may give a very much better RF performance in many areas than an all-transistor set costing about three or four times more. They may not have digital readouts, and they might not have such good filters, but you may well find that if you tune around short waves on them, that there are far less spuri and distortion problems.

Unfortunately, most old valve receivers are heavy and occupy much space on the

table. Many of them require skilled servicing, and some unusual valve types are now getting a little difficult to obtain. Many modern short wave receivers give superb audio quality on AM and FM, but have poor filters for CW and SSB. Some of them are reasonably priced though and can represent a good buy. Contrast this with a monster which weighs six times as much, and looks as large as a tank! Old receivers that I can recommend, if in good condition, are any of the Collins range, the Racal RA17 series, (warning – some government surplus samples that were flogged around two or three years ago were hopelessly out of adjustment and virtually clapped out!) and going back in time, the RCA AR88D and GEC/Marconi BRT400 receivers are worth looking at, but avoid the CR100 and CR150 models which tend to drift like the clappers as well as receiving two frequencies at once! (Very bad image response on high frequencies).

It is worth looking closely at the small ads in amateur radio magazines (turn to page 65), for the equipment and prices will give you a lot of useful information. If a particular rig is very frequently advertised secondhand, it may either have been an extremely popular one a while back, but just as likely is the possibility that many people want to get rid of them because they are rather poor. I have seen many adverts for secondhand Liner 2 SSB transceivers and I am certainly not surprised for it was a poor rig. On the other hand, many Yaesu FT101s of various vintages have been advertised, because in this case the model has been available in its various versions for perhaps ten years, and has been extremely popular. Don't forget that the Sale of Goods Act, Section 13 (concerned with descriptions) also applies to purchasing secondhand equipment.

---

## Aerials and cable

---

Many radio amateurs purchase secondhand aerials, and here I must add some words of warning. An aerial which has been up for years may well be badly corroded, but cleaned up by the seller. Traps within the elements which are part of the tuned circuits may well have become intermittent or even open circuit. Some of the clamps could have rusted into position and will probably break when you try and adjust an element length to obtain the best performance. Spare parts are often difficult to obtain, so look at secondhand aerials very carefully before purchase. Be even more careful if you are purchasing secondhand coaxial cables. The cable may well be waterlogged inside. It is normal to expect the copper at the ends of the cable to be black with minor corrosion, but if you cut off a few inches from the end, the copper should be absolutely clean. If it too is a nasty black colour, you can try cutting off more, but if the seller is not too happy about his cable gradually diminishing in length, then avoid it like the plague. Water in coaxial cable severely degrades its performance particularly at very high fre-

quencies and can cause severe losses and bad standing wave ratios. A cable which has been well taped up to properly soldered plugs can last for years and years but just a little carelessness can completely wreck a cable in one single rain storm.

If you are buying a new or secondhand microphone for your rig you must ensure that it will match properly. Rigs have various input impedances, and it is no use using a high impedance microphone into a low impedance input. Microphone responses suit some voices but not others, so try and check one out on your rig before committing yourself to purchase. Don't forget that although the mic plug may mate with your rig's socket, the pin connections may be different which will involve soldering. Yaesu and Trio rigs for example are not necessarily compatible with one another, and may again be incompatible with Icom.

---

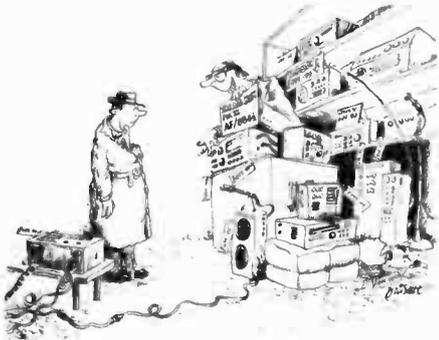
## Dealers can help

---

This article in no way is intended to bash dealers in general, but I hope it will show that there are some dealers who are interested in earning a good long term reputation, and thus do good business for years, as well as some who in my experience are rather more interested in extracting cash for the till, sometimes with insufficient regard for giving the type of service that we should all expect, and indeed do get from the majority. It should only very rarely be necessary to exert one's legal rights, and it is fascinating that many dealers have actually encouraged this article in *Amateur Radio* on the understanding that in fairness, bad dealers would not be mentioned by name. I should point out that there are some dealers that as yet I have not had any contact with, so I may not be referring to whom you think I may be hinting at!

Finally, don't forget that the ideal situation is to find a dealer who you can trust implicitly, and who does not want to flog you equipment that he knows perfectly well is not very good. It is worth seeking that dealer's co-operation and building up a relationship in which he will also trust you, and perhaps let you try out a rig before you commit yourself to purchase. Don't forget that a dealer is there to make a profit, which he must do if he is to give a good after sales service, and thus if all his customers try and squeeze the last ounce of discount, it may be half his profit, which in effect, as far as accountancy goes, may be 80% of net profit, whilst you might only be saving a few percent but find that you are in trouble when something goes very wrong.

Always be fair to the dealer. You will find that if you are honest about your own "finger trouble", and find after complaining that you misunderstood the instructions and so blew the rig up, a decent dealer will go out of his way to help, far beyond his obligations in law. Amateurs often talk about rigs and even dealers on the air, and so listen around and you will soon find out



## NEW OR USED?

who is reliable and what rigs seem to be causing trouble. It is probably better incidentally, not to buy a rig too soon after it is released, for the first production units sometimes have minor faults; these are usually ironed out after some months.

**If you are honest about your finger trouble, a decent dealer will help**

Don't forget that whilst American companies allow their rigs to remain available for many years, the Japanese come out with new ones almost every year, and that a rig bought a long time after it's first announced may well be just about to become out of date, with a new model around the corner.

*In the event of a dispute arising between the dealer and the purchaser with reference to a lack of "money back" provision, or that the goods fail to come up to the advertised description, or are faulty, there are several courses of action that can be taken.*

*By far the best is to approach your local trading standards organisation, usually located at a Town or County Hall. Don't forget that you are paying for their services in your rates. Tell them of the whole problem, and they will undoubtedly ask you for copies of paper work and notes of telephone calls, in addition to your submission to them of the disputed goods. They will then determine if the Trades Descriptions Act has been contravened, or whether they can assist you in enforcing your rights.*

*One dealer threatened a purchaser by suggesting that the local trading standards would not have enough money allocated to fight the action, but this was ridiculous. I have personally acted as consultant to several trading standards organisations, who usually go to considerable trouble to enforce consumer rights.*

*As an alternative, you can approach your local Citizen's Advice Bureau, or if you are a member of the Consumer Association, as a subscriber to Which?, they too may be able to help with advice (you have to join their Personal Service section).*

*A final alternative can be extremely expensive and harrowing, but this is sometimes necessary. A solicitor can assist you either to make a claim in the small claims court, or in a higher court. If you are able to get legal aid, then this can be the best alternative, especially since most dealers would probably settle the matter out of court after receiving a solicitor's letter. They will also, in general, settle quickly after receiving a formal letter from trading standards.*

*If you wish to make a formal complaint, you absolutely must ensure that your problem is not due to "finger problems", and that you are operating the equipment as described in the instruction manual. You would also be wise to get a friend who could also put his name to a letter verifying the nature of the problem, particularly if the dealer is awkward.*

*In too many cases in which a customer has returned goods for money back, the problem has been with the purchaser and not the dealer. Do try and be reasonable with the dealer first, and only take further action if he is totally and completely stubborn.*

# AKD

## Blackline Series

★ TELECOMMS ★  
EXCLUSIVE  
UK DISTRIBUTORS

### High Quality TVI Filters

#### TUNE NOTCH FILTER (TNF 2)

This individually tuned filter provides the highest possible rejection on both inner and braid and should be used when the frequency of the interfering signal is known.

(TNF 2)

75 ohm impedance and suitable for TV's, Video Recorders, Hi-Fi distribution systems etc.

#### HIGH PASS FILTER (HPF 1)

This is a standard high pass filter with built in braid breaker and will provide 70db of rejection at HF. (Independently checked). **£6.75**

The TNF 2 is available tuned to any one of the following frequencies:-

145Mhz, 70.2Mhz, 29Mhz, 27Mhz, 21Mhz, 14.2Mhz, 10.1Mhz, 6.5Mhz, 7.1Mhz, 3.5Mhz. **£7.95**

Please state frequency required when ordering.

#### BRAID BREAKER (BB 1)

This is for the suppression of radio interference borne along the co-ax braid and has very low insertion loss. (particularly suitable for TV's and Video Recorders). **£6.75**

AS SUPPLIED TO  
BRITISH TELECOM

### High Quality Signal Boosters

#### CAR RADIO FM BOOSTER

This booster greatly improves the reception of VHF/FM car radios (mono or stereo) and fits between the car aerial and radio. **£10.92**

#### CB VAMPLIFIER

A new product combining our established CB pre-amp and vampire into one unit with switching facilities and variable control of the vampire for the ultimate control of interference. **£25.95**

#### CB SIGNAL BOOSTER

A low noise high quality duogate F.E.T. pre-amp giving in excess of 24db gain. **£14.87**

#### CB VAMPIRE (CBA base 1)

Eliminate the worst effects of adjacent channel interference (bleed over)

**£14.37**

AKD Products are Manufactured in the UK to the highest standards.

ALL PRICES INCLUDE VAT & POST/PACKING

The answer to better reception

★ ★ ★  
NOTE: The signal booster, Vampire, and CB Vampifier have a built in TVI suppressor for your rig at no extra charge! NEW PRODUCTS AVAILABLE SHORTLY

CB 'KRUOKILLER' 2 MTR FET PRE-AMP 2 MTR WAVE METER  
Write in for details

**SAME DAY DESPATCH ON OUR HOTLINE 0705 662145**

Simply phone — quoting Barclay or Access number for immediate despatch of items listed. Send £1 for our full lists and colour brochure and receive a £2 voucher against your first purchase.



# TELECOMMS

189 LONDON ROAD, NORTH END

**PORTSMOUTH (0705) 662145**

TELEX: 869107 TELCOM G

**2 year guarantee**

# FAIR REPORT

Amateur Radio visited the Electronic Hobbies Fair in London in November, and discovered it to be an excellent centre for radio enthusiasts – let alone all the other interests in electronic hobbies.

More information in the next issue, of course, but here we present a sort of picture guide to the Fair, with comments by the staff . . .

An unpredictable whatsit for sale (no we don't mean the beer glass), but with an eyeglass we can make out that it's a starwriter, for sale at only £499 plus VAT. That's around £500 less than retail recommended!



Miscellaneous bits on this stand. A treasure corner, if you like.



The Computer Junk Shop stand. PCBs, other components for under £1 and we found some nice power supply parts too.



North London Raynet did the talk in GB2AP, in fact. They covered all subjects, and even told us about the state of the car park!



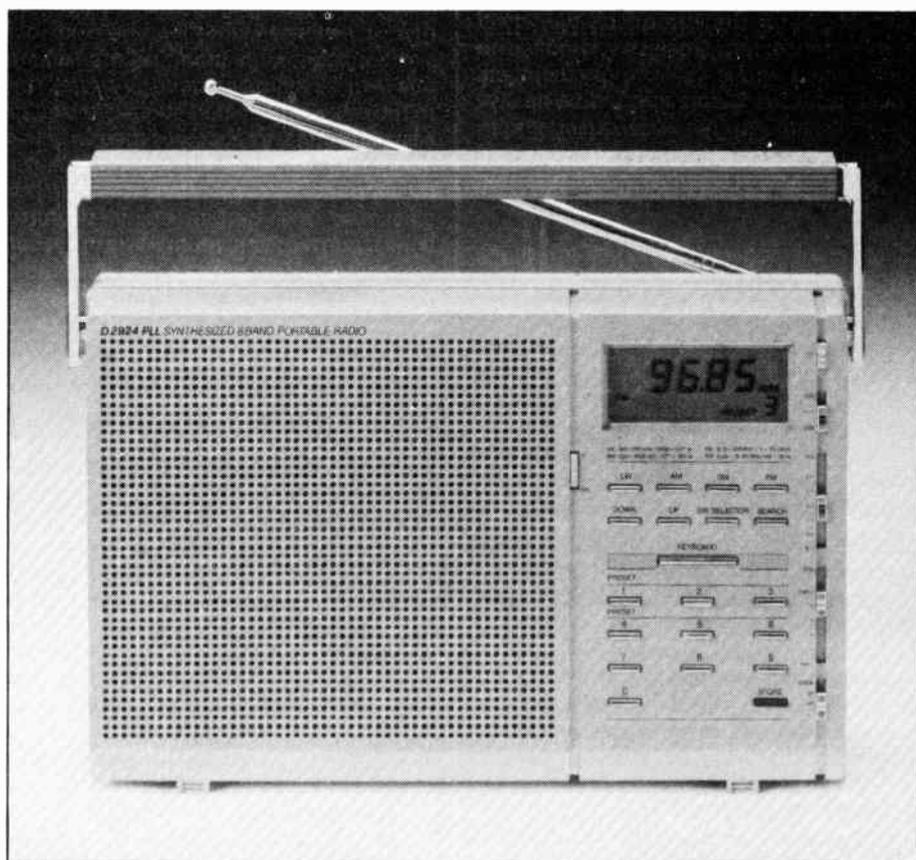
Lots of goodies for the computer enthusiast – keyboards, screens, relays etc.

Some shortwavers have a stiff neck – they dare not look in the dealer's store window. These days, temptation comes in fancy shortwave packages. Mercifully, you can always find a good reason for buying a second shortwave receiver. Say it's for Grandma – or the missus – and then ask if you can try it from time to time. Showing the lady of the house how to use a shortwave receiver is much less traumatic than teaching her how to drive. I know.

Shortwave has a distinctly masculine image, and the magazines usually feature males twiddling with the impressive electronic controls. Even the term 'radio shack' hardly evokes visions of frilly curtains and well-polished gateleg tables. Only in recent years have marketing executives appreciated the possibilities of female involvement. Let hams beware; the equal opportunities legislation could demand a ladies' entrance to the radio shack! *And regular dusting!*

In the US for instance amateur radio magazines have reported the success of female candidates for amateur radio examinations. Indeed, ladies seem to get through with flying colours – but there are too few of them. When they get onto the air, the ladies get plenty of polite conversation from the gents. "It's a pity more ladies don't know about the big welcome mat on amateur radio," one remarked. So, as competition for business becomes keener, some companies are considering the possibilities. An initial approach is that of designing shortwave receivers that have an appeal to the feminine eye. And any designer who can get a lady into a specialist radio shop to talk about equipment must be at least a 101% genius. Though the writer must admit that his telephone chat with amateur radio retailers in the UK have often been with ladies who are also experts in the noble art.

Looking around the present mouth-watering merchandise, one would have to nominate the Sony ICF2001 global radio as a front-runner for the feminine market. Of course, one should never judge a receiver purely on eye appeal, but the ICF2001 has been enthusiastically received in many markets. An Australian review in March 1981 referred to the ICF2001 as the 'legendary black box' and appropriately (in the International Year For Disabled People) referred to the control layout's suitability for the physically handicapped. The reviewer reported that he was able to perform all operator functions by strategic use of nose, toes, or implement held between the teeth. With its microprocessor interfaced with Phase Locked Loop electronics, the ICF2001 accomplishes tuning via switches and time clocking circuits. As you depress the 'up' or 'down' key, the scan circuitry is activated for manual control. Release the key and this stepping across the spectrum



# RECEIVERS · ON A · BUDGET

David Lazell describes the latest low priced receivers which could, in fact, expand the hobby to a much wider audience. It's also a good way of getting the YL or XYL involved . . .

ceases. The stepping speed can be increased as required. Normal step rate is 1KHz. In the fast mode, this is increased to 10KHz. The Sony ICF2001 uses two main slabs for total band coverage: FM from 76 to 108MHz, and continuous general coverage (AM/SSB/CW) from a low 150KHz to 29.999MHz.

LCD digital frequency display and memory pre-set readout, pre-set up to six stations, and automatic sleep timer, are additional features of the ICF2001. It's a pity that the recent adjustment in the value of sterling against other currencies may lift the UK price of this excellent model.

It is hardly surprising that Sony's models appeal to serious shortwave listeners, especially those who have yet to graduate to full amateur radio. This world-wide electronics organisation started its career in radio, in the austerity of post-war Japan. A small group of electronics engineers led by the dynamic Masaru Ibuka took a lease on a small area in a Tokyo department store. Mr. Ibuka had proven his flair during the war by developing an audio frequency generator which operated at 2,000 cycles, to ensure privacy of official telephone conversations. However, the bread and butter income of the young company was hardly glamorous. Basically, it was derived from the repair of radio receivers. The war-weary citizens of Tokyo – like those in Britain and Germany – had a hunger for radio entertainment, one of the few compensations for a persistent austerity.

## Never judge a receiver purely on eye appeal

Akio Morita, who subsequently became Chairman of the Sony Corporation, shared Mr. Ibuka's vision of a new range of products, true innovations in consumer electronics. More than ten years younger than Mr. Ibuka, Akio Morita had been educated for a career in a family brewing business. From childhood, however, he became fascinated in electronics, becoming a radio ham and an embryonic engineer courtesy of Meccano kits.

At Osaka University during the early 1940s, Akio Morita was already assisting a distinguished academic in the preparation of newspaper articles on popular science subjects. His talents seemed to point to a life-long career as a university professor. That 'might have been' was prevented by no less a person than General Douglas McArthur. Just at the time that the 25-year-old Morita was developing valuable professional work at the Tokyo Institute of Technology, General McArthur instructed that no former officer of the Japanese armed forces could hold a civil service post.



As Mr. Morita had been a lieutenant in the Japanese navy, he had to leave his post. Thus, he joined his good friend Masaru Ibuka in the new company – bringing some financial resources from the Morita family (who seem to have been remarkably perceptive in the matter). The story of Sony is one as fascinating as any adventure you will see on television – and is based very much on original design work, plus persistence. When, in the course of some work for NHK (the Japanese broadcasting company) Masaru Ibuka saw a prototype tape recorder owned by an American official, he believed that he had found a new consumer product worthy of further development and marketing. Despite the unavailability of plastic materials for recording tape, the company developed a recorder that used a tape with a paper base. This G Type machine appeared in 1949, but a smaller, less expensive machine (the H.1) came along in 1951, and as plastics at last became available in Japan, Sony became a world leader.

Of course, the marketing of so novel a product had its problems. Akio Morita, with his sales director, visited schools to astonish the children and persuade the teachers of the benefits of tape recording. In the 1960s, Sony came to an agreement with Philips, by which Sony used the Philips 'compact cassette' as its standard (though Sony did try later to market a larger, high fidelity tape cassette – the Elcaset).

Whilst Sony – as a young company, born in the mid 1940s – based its product innovation programme on the tape recorder, it also concentrated on high quality radio receivers, with a continuing interest in shortwave. The Japanese shortwave enthusiast is eager to have the latest, and best (within his financial well-being) and Japanese companies are acknowledged as world leaders in receivers and transceivers. In Australia and for that matter, the US products have familiar enough brand names, Kenwood, Trio, Panasonic, Yaesu, Icom, Sony and Sanyo. With its policy of

*Grundig's Satellit 3400 is sometimes overlooked in the shortwave sales stakes – but at the price it's an attractive proposition to the serious amateur who wants an easy to use radio. You won't see it too often in Grundig retailers, unfortunately, due to lack of demand.*

*Far left: Philips D2924 is a budget priced receiver with a price tag of around £100. It's a pretty device – one for the ladies who want to share the secrets of the shack...*

product diversity, Sony has not concentrated on shortwave receivers, but every now and then comes up with a clear winner, like the ICF2001. It cannot match receivers costing three or four times its price, of course, but the ICF2001 is an electronic attraction for the fair sex, as well as to males. Neatness, and ease of operation, may not figure high in the preferences of mature amateurs – but the ICF2001 shows that design can help expand the shortwave hobby interest.

## It's lost in the general Philips audio catalogue

Sony's commitment to global radio is interestingly confirmed in a new *Directory of World Band Radio* available in the USA at around eight dollars. Published by Sony, this useful publication is designed for the non-technical reader, yet has a lot of information for the real enthusiast. Sony dealers have found this an excellent aid to shortwave receiver business. Let's hope we will soon have the publication in Britain.

Philips have a new model, the D2924 which has some similarities to the ICF2001,

*Sony's ICF2001 is a synthesised receiver with direct push-button frequency selection, preset memory tuning, tuning scan and FM/AM/SSB/CW global coverage. Keyboard provides for direct entry of frequencies, and these are scanned from low to high in units of 3kHz for AM and 100kHz for FM. This remarkable global radio is widely acclaimed for its efficiency and facilities.*



although the Philips model costs considerably less. The Philips D2924 has synthesised tuning bands. It has keyboard entry for precise tuning on a Liquid Crystal Display, with six memory buttons for pre-selection across all eight wavebands. Here, as with the Sony ICF2001, its slim sophisticated appearance could make this an excellent gift to a lady who is just beginning to appreciate shortwave. It is, perhaps, a pity that this useful model is a little lost in the general Philips audio catalogue. Sony (like Grundig) provide separate, detailed literature on its global radios. Philips itself began business as long ago as 1891, specialising in the development of incandescent lamps. But from the time of the first world war, the company developed its radio interests. Radio valves were produced by Philips as far back as 1917, with a busy decade in microphones, loudspeakers and amplifiers from 1926 to the outbreak of war in 1939. Philips – you might say – grew up with radio (and television) and is today the fifth largest industrial group in Europe. With an impressive range of industrial and commercial activities, Philips is deeply involved in business communications and broadcasting, eg, through its Pye organisation.

### **Other companies are launching shortwave radios**

Some 45% of Philips' activity is in the professional, capital goods and components sector. The company remains committed to sophisticated consumer electronics products – and the value-for-money D2924 could be the beginning of further shortwave receiver developments. Yet it was Philips' partner in the V2000 video project – Grundig – that has most similarity to Sony in a world-wide business based on high quality radio and tape products.

Whilst Akio Morita and Masaru Ibuka

were developing their small Tokyo-based business, Max Grundig was building his company at Fuerth in West Germany. Recognising an impressive public appetite for radio entertainment, Max Grundig opened a business in 1947 for the distribution of Heinzelmann radio kits. He was soon designing the first Grundig radio receivers and took a keen interest in VHF/FM broadcasting. Early transmitters were in use in the early 1950s, and the West Germans took a keen interest in this broadcasting medium long before most Britons were even aware of it. In addition to developing high quality radio receivers, Max Grundig developed the tape recorder. Indeed, the first European reel-to-reel tape recorder, the 500L, was a heavyweight success, almost indestructible. Followed by a smaller but no less robust model, the 700L, the Grundig recorder developed the British taste for recording.

Max Grundig – now in his early eighties – has had a profound influence on consumer electronics (to say nothing of European business). Grundig shortwave receivers, in

many places, offer the only continental competition to the handsome selection from Japan. It is to Grundig's credit that their product range includes shortwave receivers that easily relate to the non-technical consumers' experience. The two Grundig Satellit models are well known in the US as well as in Australia.

The Satellit 1400 is less than £200 and has six shortwave bands with coverage of 11m to 169m, as well as normal domestic frequencies on medium wave, long wave and FM. Other features include MVC/AVC, SSB capability, Local/DX switch on shortwave and fast/fine tuning. As the lady of the house likes listening to music – and much less to technical discourses from her husband – the Satellit 1400 has the benefit of good sound quality. There is a claimed output of 7.5watts, and the twin loudspeaker system has a switchable tweeter. The more expensive Satellit 3400 (something over £400) has eighteen shortwave bands, with a coverage of 10m to 187m inclusive. An LED digital frequency indicator has an accuracy of plus/minus





World-wide cards exchanged by amateurs who have made successful short-wave contacts.

## SHORT-WAVE ADVENTURE

The hour restored to B.B.C. programmes next week will be missed by a fascinating world of late-night chatters.

**T**HOUSANDS of people, all over the British Isles, searching the air for entertainment after eleven o'clock, have been turning the waveband-switches on their receivers from 'Long' or 'Medium' to the unfamiliar 'Short-Wave' position. There they have discovered a boundless, frontierless world of adventure, where first names are banded across the oceans.

These 'Short-Wavers' find their happy hunting ground on the 20- and 40-metre bands of the ordinary domestic three-wave receiver; they find, also, that tuning is much more critical and difficult than on the normal broadcast-band.

But while a tiny touch on the tuning-knob will pass over half a dozen amateur stations, patience and practice for a few nights soon teaches them the trick, and they master the first degree, at least, of the strange and wonderful freemasonry of world-wide amateur radio transmission and reception.

### Twelve Different Countries

I listened one night to a London 'ham' (amateur) reading out the list of his latest contacts. He had 'worked' twelve different countries on speech; and his score of contacts in Morse code covered no fewer than seventy different lands—including one with an exploring expedition in the jungle of the Amazon. The station to which he was talking when I picked him up queried one call-sign, with an unfamiliar prefix, which he had mentioned. In his reply, he mentioned quite casually that it had been a Greek station: "A Greek guerilla who said he was hidden in the 'Free Mountains of Greece'!"

The same night I heard an American soldier in Germany asking an amateur in Cambridge to give him a time-check. "One thing you got over there, boy—Greenwich! Seems like I never get my watch set right, without I take my time from the British!" He went on to describe his morning's bag of contacts—this was on a Sunday forenoon, the 'ham's' best weekly time—and they included talks with amateurs in Melbourne, Australia, Atlanta, Georgia, and Honolulu, all between 7 a.m. and 10.30 a.m.

### Call Of The Woman

Several British amateur-transmitters have built up their own small groups of 'fans.' One such 'ham,' for example, is a London Civil Servant who operates from his Chelsea flat. One night, talking to a friend over the air, he mentioned his address, so that some small gadget that the other had promised him could be posted. The next few days brought him twenty-five letters from chance listeners.

Nearly every one of them wrote that he— or she, for there are several from women— had only discovered the joys of short-wave

formal exchange of call-signs and locations, Casablanca started to chat, beginning his conversation with: "Ullo, Lady! Good Evening, Woman!"

Another 'personality' of the 20-metre band is a South London policeman, known as Syd. He has a formidable list of long-distance contacts—or 'DX,' as they are called; he has 'logged' 2,500 conversations with America alone in the past two years. But on nights when conditions for DX working are bad—and the short-wave listener soon discovers that conditions change mysteriously from night to night, and indeed from hour to hour—Syd likes to tell stories to his friends in the London area.

He relates strange adventures, ranging from his experiences 'on the beat' in the West End of London, to the tale of the Retired Watchman who Bought a Hole in the Ground. Indeed, so engrossed does he become, that he has to be reminded that the terms of the G.P.O.'s Amateur Radio Transmitting Licence forbid transmissions of more than ten minutes without a break!

The short-wave addict soon gets to know the mysteries of his New World. The loud, unintelligible squawk and bark, only just recognisable as a human voice, which he will find at several points on the scale, is merely speech on the Transatlantic telephone, 'scrambled' by the G.P.O. for secrecy.

So successful is the 'scrambling' process that it is impossible to tell what language is being used,—or whether the conversation is between stockbrokers, newsmen, or passionate lovers.

### Please Keep Off . . .

He will find out that when he hears a 'ham' in London, or one of the big industrial areas, talking ruefully about 'BCL-trouble' or 'TVI-difficulties,' that this refers to complaints of interference by broadcast listeners or television viewers, living within a few yards of the amateur transmitter's aerial. Interference does occasionally happen and the 'ham' must take immediate steps to cure the trouble, or else stay 'off the air' until domestic broadcasting closes down.

He will hear the scramble to be 'first to reply' to a general call from a far-distant station. The other evening I heard four British amateurs respond simultaneously to a 'CQ DX' (General, Long Distance) call from a Colombian amateur. He apparently found the strongest answer came from a young man in the North of Scotland. Ten minutes later, an American weather-service official in Greenland put out a call; I could hear amateurs replying from five countries. He preferred his homeland, and in a few moments was chattering happily with a friend in New York.

Mr. John Clarricoats, Secretary of the Radio Society of Great Britain (the 'United

10KHz for FM and 1Hz for AM. Other facilities include an LCD quartz clock, three preset FM station selectors, three position AM bandwidth switch, ANL, etc. A carrying case is also available for the 3400, which may be fixed to a permanent position, eg on board ship. Output is rated at 7.5watts. Specification sheets are available from Grundig.

Other companies are also launching shortwave receivers to stimulate consumer interest in world radio. To quote the late and great Al Jolson: 'You ain't heard nothing yet'. Of course, veterans in amateur radio, with existing heavy investment in equipment, may suggest that shortwave receivers are just for beginners. Well, maybe they are, but because many newcomers to shortwave/amateur radio join the ranks of hobbyists, it is worth knowing about receivers that cost below £200 (and, in the case of the Philips D2924, considerably lower). Cost-conscious customers will like the appearance, as well as the facilities, of the new models aimed at a non-technical market. US enthusiasts can subscribe to equipment information newsletters, the best-known of these being the *Market Place Report* from the Anarc DX Equipment Committee (3 Camrose Crescent, Scars-bough, Ontario, Canada, MIL 2B5).

Having a shortwave radio equivalent to *Which?* magazine could be very useful, given the impressive choice of equipment—but perusal of magazine reviews and talks to well-established dealers are also important. Shortwave receivers, Stateside, can cost less than a hundred dollars. The Realistic brand products, available in Britain via Tandy stores, are popular in the USA. A Tandy dealer here in Britain also confirmed a growing interest. But the ladies, it seems, unlike the sets, have yet to be switched on.

### Readers Notes for Literature

The Sony Global Radios Leaflet may be obtained from the Sony Showroom, 134, Regent Street, London, W1R 6DJ or from the Public Relations Dept., Sony UK Ltd., Staines House, 1580162, High Street, Staines, Middlesex TW18 4AZ. (John Locke, Public Relations Officer).

Details of the Philips D2924 Global Radio may be obtained from the Public Relations Dept., Philips Audio, City House, 420/430 London Road, Croydon, CR9 3QR. (Leigh Robinson, Public Relations Officer).

Specification Sheets and Literature on the Grundig Satellit receivers may be obtained from Public Relations Dept., Grundig International Ltd., Newlands Park, London SE26.



# MM 144/30LS linear amplifier

Amateur Radio tests Microwave Modules' excellent and not unreasonably priced linear amp which can be used for SSB, CW, FM, etc.

With the popularity of semiconductor linear amplifiers increasing apace, we thought it was about time we had a good look at one in order to see how well, or not, it performed. This type of linear, which costs relatively little and requires no more than a decent power supply to get it up and running, is becoming much more common these days than the valve jobs with 4CX250s and the like.

The thing is that, having listened and taken part in more contests, Field Days and whatever than we care to think about (we still have the scars, and the antenna's never been the same since) we don't exactly feel impressed with the quality of the majority of the signals we hear. Not so long ago, it was fair to say that a lot of that was down to problems with the receiver in the presence of strong signals – inadequate front-ends, inadequate IF filter stopbands and so on – but with the availability of better technology (you have to say that in an American draw . . .) we still feel that the quality of most high-power stations leaves a lot to be desired.

Now valves tend to be able to produce better linearity than transistors insofar as RF linear amplifiers are concerned, and we have a sneaking feeling that many signals which turn out to be about 30kHz wide are down to people who don't know how to

drive their linears properly, as opposed to there being an inherent problem with the device itself. As far as solid-state linears are concerned, however, we wondered whether the same was true – which is why we were intrigued to get our mits on the Microwave Modules 30 watt machine.

## Switched out if needed

Now we must say straight away that you probably wouldn't use a linear in this class for an all-out Field Day – you'd want 10dB more power if you were in for it at all seriously – but we figured that (a) lots of people might well want this type of linear for base or mobile use, and you're likely to hear them in use more often than the occasional contest and (b) it would give a good insight into how an average everyday add-on amplifier would perform. So we thought we'd give this one the once-over to begin with and then take a look at a larger one later on.

So – this particular beast from Microwave Modules (who are known affectionately to everyone as Mickey Mouse for some obscure reason; they don't seem to mind too much . . .) is a 30 watt output-for-1-or-3-watts-input 144MHz linear amplifier,

which means that it can be used for SSB, CW, FM or whatever mode takes your fancy.

The "linear" bit, as always, means that, in theory at least, it has what our technical department calls a linear transfer function and what thickos like me call – er – "well, the output is an amplified version of the input, innit?". It also, as is the fashion these days, contains a receive preamp. This particular specimen has a gain of 12dB and a noise figure of less than 1.5dB according to its spec, and the good thing about it is that it can be switched out of circuit if it isn't needed.

This is definitely A Good Thing because, as we've said in the past, the best place for any preamp nine times out of ten is at the top of the mast to overcome feeder losses, etc – there is something to be said for ye olde preamp in a mobile situation maybe, but we're certainly wary of them anywhere else because if the receiver designer has done his job properly he'll have sussed out the gain distribution in the front-end and the IF strip, etc, and sticking 12dB in front of that is quite likely to cause various messy and distressing problems of front-end overload when you get lots of strong signals around – viz an opening or a contest. So full marks to MM for making it switchable.

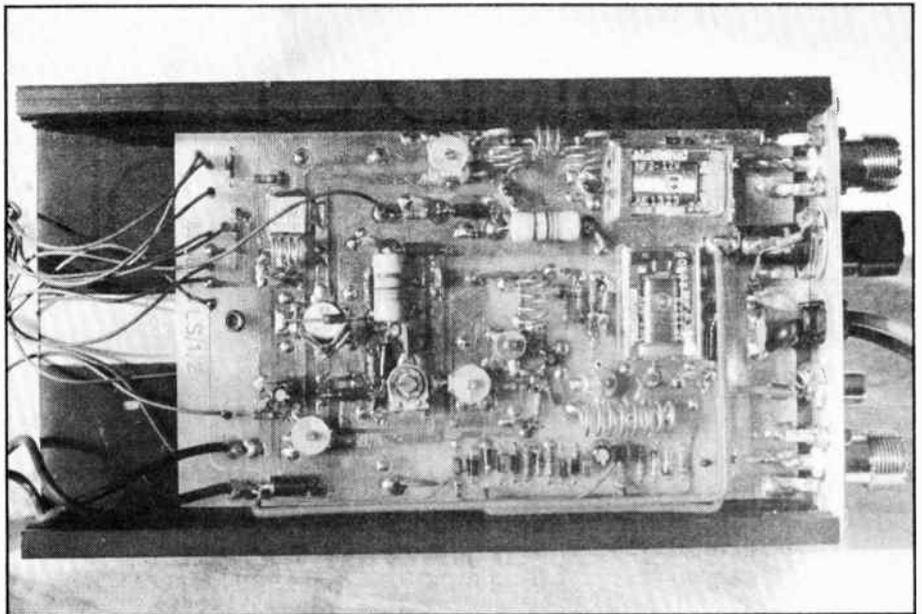
Anyhow, back to the amplifier itself. It came packed in some very nice bubbly plastic (the secretary in the office had a ball busting the bubbles with her fingernails) and it consisted of a nice black-anodised heatsink with some switches and LEDs on the front panel and three connectors and a chunky pair of wires on the back. The connectors were for RF input and output, and were the usual SO239 types – the other connection was a phono socket for the PTT line. The idea of this is that by extending an earth to this socket, the beast goes into the transmit condition; since lots of rigs have a connection somewhere to do just that when they go to transmit, the whole system can do its stuff. Mind you, MM have gone one better and also have RF VOX built-in so that a whiff of RF from the main rig will also put the linear into transmit. The delay times on the RF VOX are switchable, which is just as well – we've heard some comical things from earlier generations of amplifiers whereby they didn't switch in until the man said a few words and, since they switched out again when he stopped speaking and the RF disappeared (it does that with SSB, you know, but you wouldn't think the linear makers knew that...), the net effect was 'orrible! The MM machine switches in a much longer delay for SSB to hold the amp in until you say another word or two.

We liked the facility for a switchable 1 or 3 watt input because lots of current wire-lessees have this order of output and it makes for extra versatility. Yer average handheld seems to produce just under one or other of these figures.

## Super conductor of heat is beryllium oxide

Anyway, the first job was to open it up and have a peep at the works in conjunction with the circuit diagram supplied with the beast. We duly noted the warning about beryllium oxide on the bottom panel, which is a good point – lots of modern power semiconductors contain this stuff because it's a super conductor of heat as well as being an excellent electrical insulator but it's LETHAL. For heavens' sake don't ever try breaking open any of this sort of device, or sawing it up to see what's inside, because a minute amount of beryllium oxide can cause the most unpleasant and painful illness. We know of someone who inhaled a tiny amount of the stuff and ended up in hospital for two months – he emerged minus a fair number of his internal organs, so DON'T mess about with the stuff!

When we looked inside, the first impression was "Hmmm – that's rather nice". The majority of the circuitry sits on a well-made glass-fibre PCB, in a rather attractive and certainly robust layout with everything solidly soldered and clearly arranged. Two rather dinky flat-pack relays look after input and output switching; they aren't coaxial, but the contacts looked sufficiently hefty to us. The power cabling had splendid rectilinear runs, and a nice touch was a chunky diode across the



supply lines. Should you do a whoopsie and connect up the volts the wrong way round, the diode would conduct and blow the fuse (it did, too, when we tried it out) thus saving any embarrassment.

We liked the way all the connections off to the front panel were nicely sleeved so as to give them some support, with heat-shrink sleeving; that's not usually done in consumer-type electronics, and is a nice detail. All in all, the only two points our technical whizz muttered about were that the solder joints weren't defluxed and that he wasn't at all convinced that the main on-off switch was man enough to handle four amps, which is what the machine takes at full chat.

Well, it wouldn't be asked to *switch* four amps or at least not very often, and as for the defluxing it's a minor detail – you'd do it if it was to a professional specification and you were paying a professional price, and if it bothers you you can get some cotton buds and some propanol or similar and do it yourself. Personally we wouldn't bother, and we told Technical Person off for being a Clever Dick. He retaliated by forgetting to make some coffee for us when it was his turn...

By the way, Technical Brain Box had been gawping at the circuit whilst we had been making with the screwdriver, and to judge from the grunts and hmms he was quite taken with it. He liked the matching into and out of the PA device and looked up the spec of the transistor itself. MM claim that it's rugged, and we thought that ought to be true. We were a bit baffled by one statement in their literature, though. They say that "*Certain transceivers have PA protection circuitry which can be unreliable when used in conjunction with a linear amplifier. This can be due to a mismatch which can occur on the coax cable between the transceiver and the amplifier...*" Well, if that's true the input impedance of their amplifier must be rather a long way from 50ohms, which isn't exactly a desirable situation. MM say that you could cure it by "... altering the length of the offending cable, generally by increasing rather than

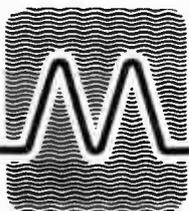
The MM 144/30LS linear amplifier with the lid off. Most of the circuitry sits on a well-made glass fibre PCB.

decreasing the length". Er – well, it's different! The funny thing is that, when Technical Maniac fished out his clever calculator and did some sums, he thought that the input impedance of this amp ought to be about 57ohms plus  $j60$ ohms, which ain't worth bothering about in terms of a possible mismatch! So why MM put that in their otherwise nice operating notes remains a bit of a mystery, and the bit about changing the length of the cable sounds distinctly weird to us. Maybe they don't want it to be a resonant length, but it shouldn't matter anyway. Have we overlooked something?

## This is the recognised way of looking at linearity

Be that as it may, it was time for the tests. The first thing to inspect was the output power, and we fed in three watts of FM and measured the output on a recently-recalibrated Bird RF Analyst – the box developed 36 watts into 50ohms, which was better than its spec. We then switched to the one watt position and fed in exactly one watt – bingo, out came 38 watts! This was with 13.8 volts input, by the way. At that, it was drawing 4.1 amps from our supply, so if you're so minded you can calculate the efficiency; not that it means much.

Next on the list were measurements of linearity, and we decided to feed in two tones at 700 and 1700Hz and see the third-order product relative to one tone at the 30watt level. This is a recognised way of looking at linearity, and we'll explain all these things in a future article on how we go about testing things and what we look for. Suffice it to say for now that this tells you a lot about what happens when you go on the air with it and how wide the signal will be.



# MICROWAVE MODULES LTD

## MML 144/30-LS, 144 MHz 30 WATT LINEAR POWER AMPLIFIER

AS REVIEWED  
IN THIS  
MAGAZINE  
See page 48



### FEATURES

- ★ 30 WATTS OUTPUT POWER
- ★ SUITABLE FOR 1 OR 3 WATT TRANSCEIVERS
- ★ LINEAR ALL MODE OPERATION
- ★ STRAIGHT THROUGH OPERATION WHEN TURNED OFF
- ★ ULTRA LOW NOISE RECEIVE PREAMPLIFIER - FRONT PANEL SELECTABLE
- ★ EQUIPPED WITH RF VOX AND MANUAL OVERRIDE
- ★ LED STATUS LIGHTS FOR POWER, TRANSMIT & PREAMP ON

### SPECIFICATION

#### LINEAR AMPLIFIER

**Power output** : 30 watts RMS typ.

**Power input** : 1 or 3 watts  
Front panel selectable

**Frequency bandwidth** : 144-146 MHz at -1dB

**Power requirements** : 13.8V DC at 4 Amps

**Quiescent current** : 800mA

#### RECEIVE PREAMP

**Overall gain** : 12dB typ.

**Overall noise figure** : Better than 1.5dB

**Frequency bandwidth** : 144-146MHz at -1dB

**Receive current** : 200mA

### GENERAL

**RF connectors** : SO239                      **Size** : 205 x 115 x 55 mm

**Weight** : 1Kg

### DESCRIPTION

This new 144MHz solid state linear amplifier, MML144/30-LS has been introduced as a result of the advent of the many popular 1 and 3 watt 2 metre transceivers currently available.

When used in conjunction with such equipment this linear amplifier will provide an output power of 30 watts. An internal attenuator, controlled by a front panel mounted switch, allows both 1 and 3 watt input levels, thereby affording maximum versatility.

Several other switches controlling the internal switching circuitry, allow the unit to be left in circuit at all times. The linear power amplifier and low-noise receive preamplifier can both be independently switched in and out of circuit. In this way, all four operational combinations are possible.

By means of an RF vox circuit the linear will automatically switch onto transmit, when 144 MHz drive is applied to the input socket. It is possible to override this facility by the connection of an earth to the phono socket located on the rear panel. This connection is compatible with all current transceiver PTT lines. The RF vox has switched delay times for SSB and FM modes.

The inclusion of the latest state of the art power transistor (rated at 65W dissipation) guarantees highly reliable and ultra-linear performance, thus making the unit ideal for all modes of operation. (SSB, FM, AM & CW).

The amplifier utilises recently developed matching techniques, which allow safe operation even when improperly subjected simultaneously to 50% overdrive and a supply voltage of 15V. The PA transistor is thermally tracked against temperature variation and operational temperature rise.

The receive preamplifier uses one of the latest dual gate MOSFETs (3SK88) in a noise matched configuration. This technique together with careful optimisation of overall gain makes the preamplifier ideal for use ahead of any popular 2 meter transceiver. The sensitivity of most current transceivers is such that a preamplifier gain of 12dB is sufficient to ensure an excellent overall system noise figure. A preamplifier with gain in excess of this figure will prove unduly detrimental to the strong signal-handling performance of the transceiver.

All circuitry is constructed on high quality glass-fibre printed circuit board and protection is included against reverse polarity. The unit is housed in a highly durable extruded aluminium enclosure. RF connectors are located on the rear panel together with the power lead and PTT phono socket. All necessary plugs are supplied.

**THIS EXCITING PRODUCT IS AVAILABLE FROM STOCK AT £69.95 inc. VAT (p&p £2.50)**



WELCOME

**MICROWAVE MODULES**  
BROOKFIELD DRIVE, AINTREE, LIVERPOOL L9 7AN, ENGLAND  
Telephone: 051-523 4011 Telex: 628608 MICRO G  
CALLERS ARE WELCOME, PLEASE TELEPHONE FIRST

**HOURS:**  
MONDAY-FRIDAY  
9-12.30, 1-5.00

# RADIO REVIEW

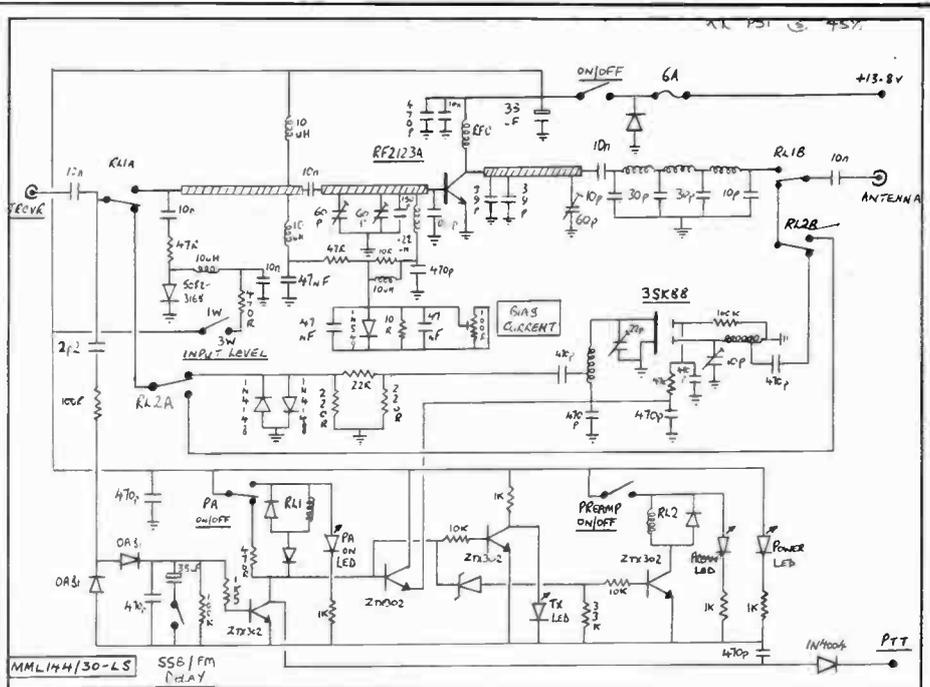
The result in this case was that the third-order product turned out to be 25dB lower than one tone of the two tones at 30watts. This is a typical figure for a transistor linear amplifier, and indeed it's about the same order of performance as you'll get out of your average black box. If you came down to 25watts, the figure improved to -31dB. However, at 35watts it was only -22dB, so we'd reckon that MM's figure for output power of 30watts is about right. We established that the maximum power you could get out of the device by driving it hard was 41watts - ie that's when the PA device went into saturation - and (a) that's unhealthy for the PA, as MM stress in the instructions and (b) the linearity at that output level is pretty awful. So *don't* try and get more out of it than it's rated for - it's that sort of thing that makes amplifiers sound lousy in contests, and gets them - and us - a bad name.

## A good time to take a close look at the preamp

So they were the basic parameters of the amplifier - we then thought we'd better take a look at how it stood up to sillies like the antenna coming undone, etc. (we all do it . . .). It survived everything we threw at it - it finally blew the fuse when we asked it to supply full power into a short-circuit, without doing in the PA device, and it also blew said fuse when we connected the power the wrong way round.

Having survived that, we thought it was time to have a quick look at the preamp. This turned out to have a gain of 13dB rather than 12 and a noise figure of about 1.4dB. This is about par for the course for the 3SK88 device in this sort of circuit, so no moans there.

So it was time to connect it up and go on the air with it. We used an IC202 on SSB and the office IC-2E for FM, and everything performed very well. On SSB the delay time worked exceedingly well - the amp only dropped out after about three seconds without any RF in the VOX mode, and went into transmit with about a picowatt of RF. Stations we worked couldn't hear anything untoward. The only time they *could* was when we deliberately tried a power supply with rather poor regulation - we noticed a fall in output power our end, and the distant station told us we had a much wider transmission than before. Technical Bod was looking at things with his spectrum analyser, and confirmed that linearity was much worse. Full of curiosity, we went QRT and fetched a car battery into the shack; we then connected it up via some rather long leads that were thinner than they ought to have been and they were,



thus, of a higher resistance than was a good thing. Bingo - the amp didn't like that at all, and we were 10kHz wide. So we got the heavy cable out and made it about a foot long - yes, you've guessed it, the problem went away.

This little test proved what we've often thought - viz, that transistor amplifiers like this positively demand a really well-regulated supply and that a lot of the problems you hear are down to silly things like connecting cables that are too thin. This problem must be a lot worse with the higher-power amplifiers used on SSB, where the varying current demand, and a high current at that, asks a lot of the PSU. It's just like valve linears, where so many of the horrid things you hear are because people don't appreciate that the power supply is just as important from the design point of view as the RF bit of the thing. We bet that if people paid as much attention to their PSUs - both for valve and transistor amplifiers - as they do to the RF side, the VHF and UHF bands would be a sight more sanitary than they usually are during con-

*One of the very helpful diagrams you will find in the Microwave Modules operating manual.*

tests and openings and what-have-you!

FM operation presented no problems, and we spent a happy hour or so working some stations in northern France since conditions were a little bit up at the time. The heatsink got fairly warm, but not dangerously so, and we switched off about midnight with no complaints.

So there it is - a nice little amplifier that's good for making a little handheld or thereabouts into a potent base or mobile station. It seems unbustable to us, and there's a good preamp if you need one - like if you're mobile and/or your wireless is rather deaf. Its performance as a "linear" is the same as the usual black box - ie acceptable, although not in the 4CX250 class - and it's well priced. Nice one, MM - can we have a look at a meaty one soon? And if only all amateur things were as well made as this one . . .

### MANUFACTURER'S COMMENT

In response to the review, we would like to clarify the situation with reference to the matter of coaxial cable lengths and impedance matching.

The impedance match between a transceiver and a linear amplifier is dependant on certain factors, irrespective of the pre-defined impedance of the two units. Under normal conditions, both equipments would have a nominal impedance of 50ohms, but the use of the highly popular SO239 connector immediately introduces a non-constant impedance into the system.

The resultant effect is that the load presented to the output stage can begin to "look" inductive, to a varying degree, and is somewhat worsened by the total number of these connectors used in the system.

Also, the alignment of the PA of the

transceiver can be somewhat inaccurate, since it will have been aligned via a non-constant impedance connector, and this will cause the output impedance to be something other than 50ohms.

In order to avoid the most obvious problem of the transceiver PA "shutting down", it is occasionally necessary to alter the length of coax cable between the two units, which can be of assistance in correcting the mismatch. Whilst we offer this advice in our operating notes, it is intended purely as a guide and the effect mentioned above is rarely encountered in practice. MIKE WOOD, MICROWAVE MODULES LTD  
*Fair enough - but personally we're not sure that SO239s are all that bad at 144MHz, but they do vary, depending on whether the maker is reputable or not. As they say, it rarely happens; full marks to MM anyway for clarifying it from their side. - Editor.*

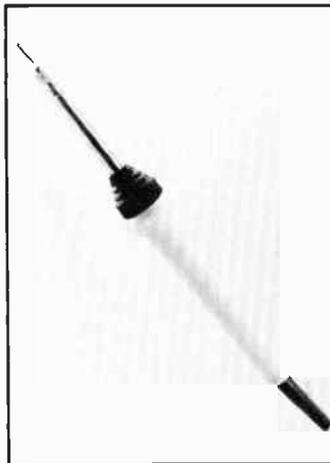
# SHOPTALK

Equipment available today. From hand-held radios to full blown bench equipment, there is enough to suit all tastes and requirements. Here is a selection of things available in the shops currently.

First off, there's a Mitsubishi LSI Data Book, which has got all sorts of useful sections on RAM, ROM and things like that – if that's your scene and you're desperate to know just what the microprocessor chip in your wireless gets up to, the tome costs a fiver from Altek Microcomponents Ltd. at 22 Market Place, Wokingham, Berkshire RG11 1AP.

Still in the world of books, we heard a few GB2RSes ago that the RSGB have just brought out the new edition of their *Teleprinter Handbook*; one chap we know who eats and breathes the things went to Potters Bar and bought one and he says it's extremely good. We haven't actually *seen* a copy yet (note to RSGB – any chance of a review copy?) but apparently it's extremely comprehensive and contains all sorts of useful facts, hints and tips and there's even a glossary. So for all you RTTY buffs, it's the book to get. Give the RSGB a ring on Potters Bar 59015 and ask them about availability and price etc. We tend to like their publications, and we also can't imagine how they do some of them for the price, so 10 out of 10 for that.

Word has it that the RSGB are shortly bringing out another edition of the *VHF-UHF Manual*, or so someone told us on the air the other day. About time, too – that's the one RSGB publication we don't rate at all. The present one is more than a bit out of date, and we've heard many stories about how some of the designs either don't work or need a lot of messing about to make them work – so let's hope the new edition is a lot better. That would fill the one gap they have, as that book does let the side down. The theoretical chapters are fine, but the practical side of it has given us some problems in the past (he said, with bitter memories of trying to get a 2 metre



converter to work . . . )

Right – what about something a bit more down-to-earth like a soldering iron? Electronic Hobbies have just brought out a new range called the Simplex and they're low-voltage types using 24 or 48 volts. This is an increasing trend in industry, and there's a lot to be said for it from the safety point of view, so full marks for someone making an affordable low-voltage type as opposed to the "professional" type with what we think of as a "professional" price tag! These will cost you £5 plus a quid for p&p with the dratted VAT on top of that, and you can have an 18 or 23 watt version. Electronic Hobbies are at 171 Broomfield Road, Chelmsford, Essex CM1 1RY.

West Hyde Developments (remember their front panel furniture in our second issue?) are at it again – they've just sent us another catalogue and a witty press release all about a new range of hand-held instrument cases. As you can see from the pic, it's just the thing for the electronic oojah you were thinking of building with a digital readout – basically, it's black, although if you're prepared to order "large quantities" (it says here) you can have them in other colours.

There's a separate battery compartment and an optional

thumb-type button which you could use for on-off switches or changing range on a frequency meter or DMM, for instance. There's also a choice of the display aperture size (the size of the 'ole at the top, Brian), so you can stuff in whatever sort of display you have in mind. How about one of those new multi-colour LCD displays that are just coming on to the market?

West Hyde are at Unit 9, Park Street, Aylesbury, Bucks HP20 1ET, or you can give them a bell on 0296 20441.

Their catalogue is well worth getting, so give them a whirl if you want to put your digital whatnot in a nice case and hear all the oo's and aah's at the club. Actually, at my club it's usually "cor stone me, what on earth's that?" . . .

Passing hastily on, we note that that clever gang down at Mutek in North Devon have just brought out a front-end board for the Icom 211/251 series. If it's as good as the front-end ditto for the Yaesu machines it's going to be well worth getting, so if you want to give your ageing 211 a birthday (they certainly were a bit deaf in our experience) give Chris a ring on 040924 543 and ask him for details.

Want a 1000MHz frequency meter? Sabtronics is a well-known name in the market place, and they've just

*Left: 24 or 48 volt soldering irons from Electronic Hobbies cost from £5. Below: new range of hand-held cases from West Hyde Developments – just right for that digital read-out.*



brought out the Model 8000 9-digit device which uses battery or mains power and covers three ranges. The sensitivity of the beast is quoted in the press blurb as being 20mV at 10Hz to 35mV at 1 GHz, and the maximum resolution is plus or minus 0.1 Hz on the 10MHz srange, 1Hz up to 100MHz and 10Hz on the 1GHz range. Sounds good to us, and you can get a full spec from Black Star Ltd, 9a Crown Street, St Ives, Cambs PE17 4EB. Or ring them on 0480 62440. This beastie would set you back £155, which is cheap for this sort of gear and very much A Good Thing if you're seriously into the more advanced aspects of the hobby.

Mind you, we wish they'd *Below: From their new catalogue, comes this very neat frequency meter for 10MHz-200MHz. The Prescaler below it allows measurements of up to one giga Hertz.*

tell us in their literature how accurate it is, how much it drifts, does it have an oven, etc, etc. We thought about starting a campaign for

So, where now? We haven't heard of any magnificent new rigs for a while so we can't tell you about those. Have you seen the new Maplin catalogue? As always it's Meaningful British Press Releases, because they so often don't tell you all the important things that a buyer might need to know, and West Hyde are in the lead so far – can we *please* have press releases that tell us something useful and not just what colour the knobs on the front panel are? Thanks, lads.

So, where now? We haven't heard of any magnificent new rigs for a while so we can't tell you about those. Have you all seen the new Maplin catalogue? As always it's chok-a-block with

components and we've always found Maplins to be pretty good when it comes to delivery; their prices aren't had either, although some of their semiconductors seem to cost way, way above the odds to us. Semiconductors tend to come down in price all the time, though, so maybe we're comparing them unfavourably with people whose catalogues get revised much more often than theirs. You can get the catalogue from practically anywhere, it seems – certainly W.H. Smiths have them, and at a bit over a quid it's very much a good buy for anyone who's the slightest bit interested in building things.

Another catalogue that's fallen on to our desks here at Bicester is a well-documented one from Thandar Electronics Ltd. It covers counters, multimeters, oscilloscopes, thermometers, generators, logic analysers and accessories. But one of

the latest products to come from this company (London Road, St. Ives, Huntingdon, Cambs. Telephone 0480 64646) is an addition to its range, a 1000MHz high sensitivity prescaler called the TP1000. It's for use with the same company's range of frequency meters.

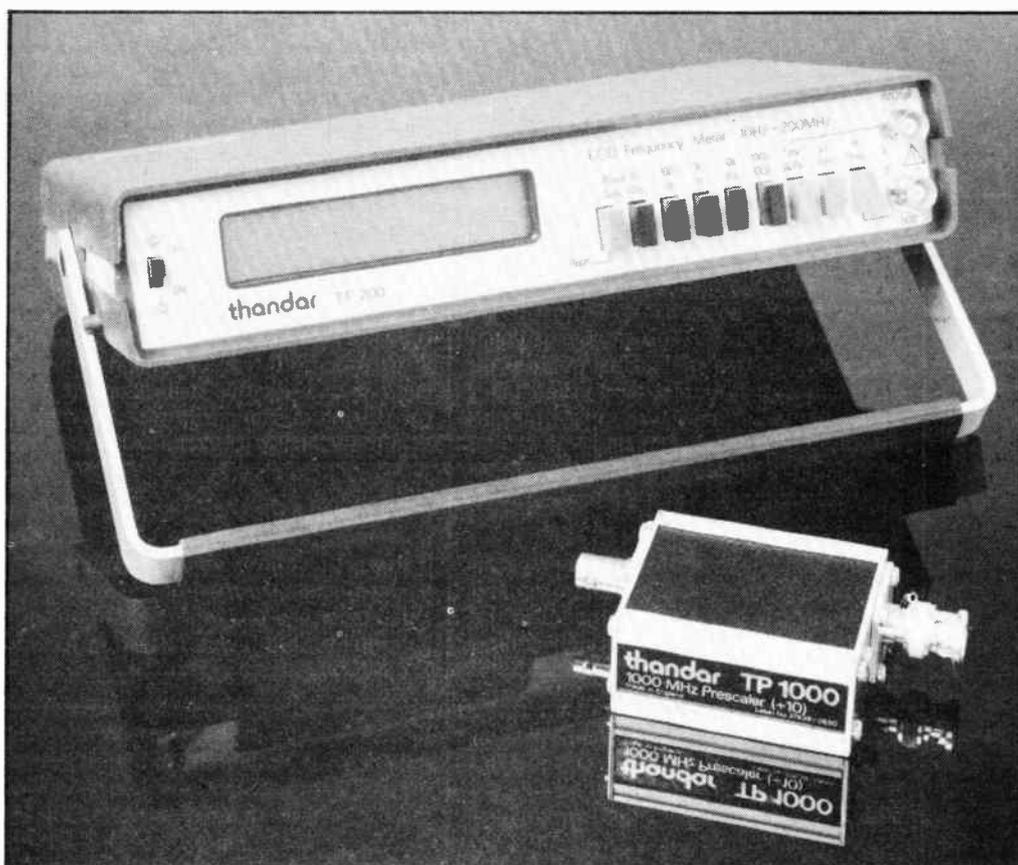
It is designed primarily to extend the upper frequency limit of the TF200 10Hz to 200MHz bench portable counter. This new prescaler now allows measurements of up to one gigaHertz. Physically, the TP1000 is connected directly to the counter via a BNC input socket, and it's powered from a separate adaptor (supplied). Incidentally, the input connector to the prescaler is 50 BNC. Price is a mere £65 plus VAT.

According to friends, Thandar instruments seem to be "conservatively rated" which means the performance often exceeds the published specs. The company's range of accessories includes a goodly number of things like bench racks, adaptors, test leads, adaptors, and a video monitor and video printer.

Well, that's about it for this time – don't forget that the ideas of this page is to feature anything that's new and if you come across something that you'd like to recommend to the big wide world don't hesitate to drop us a line and tell the world about it via us.

If you're a manufacturer, tell us about anything you do oops!

**If you're a manufacturer, tell us about anything you do that interests amateurs and listeners – and make the press release worth reading because we tend to start yawning and misspelling out words after a while and the MD calls us in and makes life a misery and keeps us off the wireless for the rest of the day!**



# WHAT

*The idea of this feature is to provide an easy-to-understand guide to all the currently available wireesses of interest to the amateur and SWL; we list HF transceivers, VHF transceivers, VHF and UHF hand-helds, mobiles and HF receivers. Where*

## HF transceivers

Icom IC720A	£690	Good performer; includes general coverage Rx
Icom IC730	£580	Good, aimed at mobile use, but nice
Icom IC740	£725	Lovely rig – see review in last issue
Trio TS530S	£520	Very good rig for the newcomer; reliable
Trio TS830S	£645	We love this one – see our review
TS930S	£1000 approx	We don't know anyone who has one
Trio TS430S	£698	Very new
Yaesu FT102	£785	Nice – see review last issue for full info
Yaesu FT980	£1115	New, and we haven't yet seen one
Yaesu FT1	£1349	It's a lot of radio, but a lot of bread too
Yaesu FT902DM	£885	Rugged, reliable, nice machine
FT101Z	£559	Has got whiskers now, but a good old rig
FT707	£509	Didn't like this one much, but it's adequate.
Drake TR7A	£1199	A lovely machine, great signal handling
Drake TR5	£657	We'd love to review one . . .

Collins KWM380 £2195

KW/Ten-Tec Argosy £?

It ought to be good for the price! A good name, but we don't know the rig.

## VHF transceivers

Trio TS780	£799	Covers 2m and 70cm; good reputation; bit deaf!
Yaesu FT290R	£265	Base-cum-portable 2m rig; rather nice multimode
Yaesu FT790R	£325	Ditto for 432MHz
Trio TR9130	£395	Very nice 144MHz multimode – reliable and solid
Icom IC251E	£499	Good 144MHz multimode, even better with Mutek front-end board
Icom IC451E	£630	Ditto for 432MHz
Yaesu FT726	£649	Brand new

## VHF and UHF portables

Icom IC2E	£159	Super 144MHz FM handheld; cousin of the IC4E
Icom IC4E	£199	We loved this – see our review last issue but one
FDK Palm II	£109	144MHz 6-channel FM hand-held
FDK Palm IV	£109	Ditto for 432MHz
Azden PCS300	£179	144MHz synthesised handheld; good Rx

# RADIO?

*we know something about the radio we've appended a comment or two – if the column's blank it doesn't mean that we'd be sued if we said what we thought, but that we haven't come across one or heard anything either way about it.*

Trio TR2300	£144	Big portable FM 144MHz box
Trio TR2500	£220	Keypad-synthesised 144MHz handheld; quite nice
Trio TR3500	£?	As above but very new
Icom IC202	£169	SSB 144MHz "portable", still going strong
Icom IC402	£245	ditto for 432MHz
Yaesu FT208R	£199	2.5w FM 144MHz hand-held – eats batteries!
Yaesu FT708R	£230	1w FM 432MHz hand-held – very good Rx.

## VHF and UHF mobiles

There are many and they change almost every month, also allow for changes and new introductions.

FDK M700AX	£180	144MHz 25watt FM – nice audio and good Rx
FDK M750AX	£269	144MHz multimode, 10 watts
Trio TR7730	£268	25watt 144MHz mobile, nice to use
Trio TR7800	£257	Much as above only bigger!
Trio TR8400	£299	A mobile 432MHz FM machine, good Rx, apparently
Trio TR9500	£428	Multimode mobile 10watt 432MHz
Yaesu FT230R	£239	25watts on

Yaesu FT730R	£285	144MHz mobile/base station (FM) Ditto on 432MHz – 10watts. Rx a bit deaf
Yaesu 480R	£369	Multimode 144MHz rig; some have had problems
Yaesu FT780R	£325	Ditto for 432MHz
Yaesu FT720	£199/229	You can get a 144 or 432MHz head for these
Icom IC25E	£269	Nice 144MHz FM mobile rig – tiny, two VFOs
Icom IC290E	£379	144MHz multimode with a 25watt brother (IC290H)
Standard C5800E	£359	Lovely 25watt 144MHz multimode
KDK FM2030	£199	Compact mobile/base 144MHz 25watt FM; good

## HF receivers

Trio R1000	£297	Synthesised, good performer
Trio R2000	£391	Lots of facilities,
Icom IC-R70	£469	See our review
Yaesu FRG7	£199	The old "Frog"
Yaesu FRG7700	£330	Reputedly rather good.
NRD515	£985	Very nice, although not without its faults



# • ON THE ROX •

Following the publication of a little transmitter for the 14MHz band, named the "OX" in the last issue of *Amateur Radio*, readers have written to enquire

about the possibility of a matching simple receiver. As any constructor in our hobby will tell you, building "simple little" transmitters is child's play but a viable receiver for the HF bands is another matter.

The receiver is the most crucial part of an amateur radio station – as they say, "If you can't hear 'em you can't work 'em". In the current state of the hobby which seems to embody an assumption that to begin in amateur radio one has to spend half a grand, my only reply to this erroneous idea is that if you must spend money, spend it on a good receiver.

Simple receivers *can* be a problem, but what is offered here is an inexpensive, easy-to-build device that puts up a very creditable performance on the 14MHz band – an ideal companion for the OX transmitter. The OX was so named because the original circuit idea came from George Burt, GM3OXX, and was published in two forms as the OXO and Super OXO, a play on his callsign.

Both circuits appeared in *Sprat*, the Journal of the G QRP Club. The little receiver described here presents no problems, is easy to build and works well. So if you have never attempted a receiver before, this might be the one for you. I have named it the "ROX" to match its brother... sorry sister... sorry fellow person, the "OX".

In the second of our series of home-brew projects, Rev. George Dobbs constructs a low power receiver to interface with the OX described in the last issue of *Amateur Radio*. He calls it the ROX...

The chosen design is direct conversion because this offers the easiest approach to a beginner. The principle of the direct conversion receiver is very simple and is shown diagrammatically in Fig.1. The signal

**Even the seasoned constructor never loses the thrill of hearing the first signals of a home-built receiver...**

received from the antenna is fed into some form of input circuit. This may be an RF amplifier and offer some gain or it can just be tuned circuits. The very simplest receivers use one tuned circuit but this is generally unwise because a simple receiver requires quite a measure of front end selectivity.

Come to think of it, any receiver requires good front end selectivity hence the dreadful cross modulation found in some of the expensive new receivers with broadband front ends. From the input circuits the signal passes to the mixer where it is mixed with a local oscillator. This variable frequency oscillator (VFO) is tuned on the frequency that is to be received.

The input signal and the VFO being on the same frequencies will produce beat notes in the audio frequency range either side of the zero beat centre frequency. This is the principle of the Beat Frequency Oscillator (BFO) in the superhet receivers we all know so well. The resultant beat notes will demodulate any audio information on the signal. The RF content of the signal is filtered out and audio filtering can be applied before the audio signals are amplified. That's all there is to it.

Unlike a superhet receiver which converts the incoming signals to an intermediate frequency (IF) and performs the functions of selectivity and gain at this frequency, the direct conversion receiver does it in one step. Most, if not all, the gain is in the audio stages and the selectivity must be produced in the front end or by audio filtering.

Direct conversion receivers have their opponents, I guess because they are so simple. I have used the technique for many years and it *does* work. Usually the opponents are those who have never built and used a direct conversion receiver. They are simple to make and give amazing results for what they contain. A direct conversion receiver makes an ideal first receiver to build. Building up little transmitters and using them on the air is very satisfying, but that is as nothing compared with the satisfaction of receiving signals on your own home-built receiver. Did you build a

crystal set and bore your family by clamping a set of headphones on each of their heads in turn so that they could hear the signals that you had conjured out of the air? Even the seasoned constructor never loses the thrill of hearing the first signals on a homebuilt receiver.

The circuit for the ROX is shown in Fig.2. The VFO is shown in the top left hand corner and is a simple Hartley oscillator using a Field Effect transistor and a single tapped coil. As this receiver matches the OX transmitter, its tuning range is very limited to cover the bottom 100KHz of the 14MHz band. L1 and C1 form the tuned circuit but enough frequency excursion can be had by having the variable capacitor VC1 in the tapping of L1. The prototype ROX ran from a 9 volt battery so some degree of stabilisation is added to the VFO by the zener diode, ZD1. Quite a basic oscillator for 14MHz but in practice it proved to be surprisingly stable. The capacitor, C3, couples the output to a simple two diode mixer D2 and D3, with R4 acting as a load.

ROX's front end is a single common gate amplifier, TR2 which receives the input signal from a 1K potentiometer, VR1, which acts as a simple RF Gain Control. The input selectivity is achieved by two tuned circuits, L2/C7 and L3/C8 loosely top coupled by C9. These tuned circuits are not variable but this is not necessary over the 100KHz range of the receiver. The output from the mixer is RF decoupled by the C10, R5, C11 combination and passes to an audio pre-amplifier TR3. The audio passes via a Volume Control, VR2, to an integrated circuit amplifier, IC1.

This amplifier is used because of its simplicity rather than its merit. The LM380 is a very cheap audio IC and requires very few external components. I have usually

avoided it in my better receivers because it can be noisy and lack stability but in this circuit arrangement it is very stable and more than adequate for the task. The output impedance is 8ohms and a small speaker may be used but it is much better to use headphones. Steal the household stereo phones if needs be and wire the jack socket for mono use.

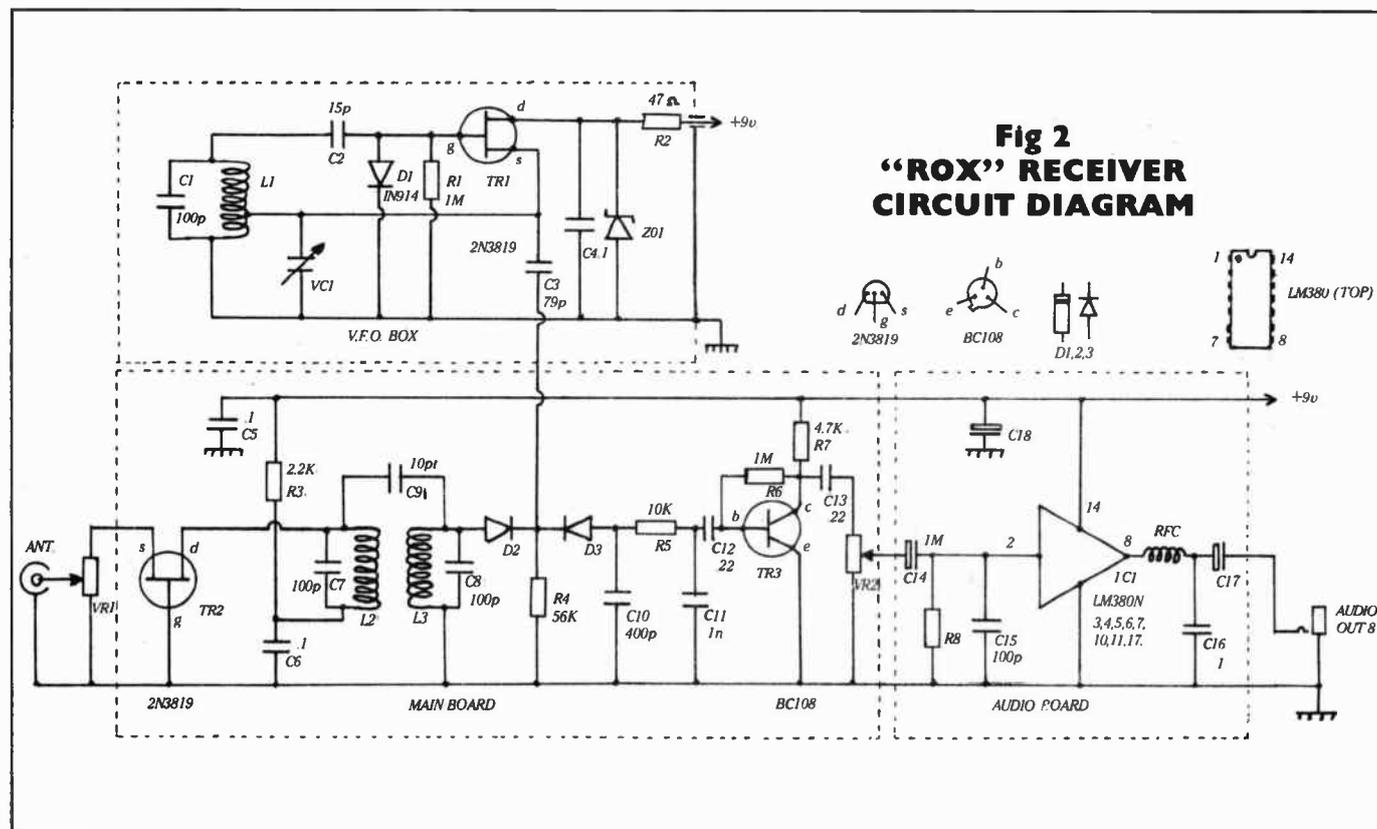
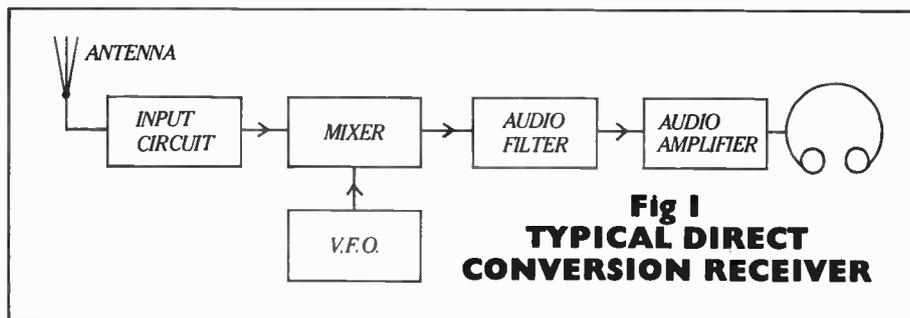
## Components are pushed through the holes and interconnected with wires on the underside

OX was built on Veroboard but this little receiver is built using another method of construction that is ideal for beginners. All the sections of the circuit are built on what our American brethren call "Perf Board", that is plain board with a matrix of holes. In effect it amounts to Veroboard without the tracks. The components are pushed through the matrix of holes and interconnected with wires on the underside. For these boards, a perforated circuit board with hole spacings of 0.1" is required.

Many radio stockists sell such board but if in doubt it can be obtained from the national chain of Tandy Stores as "Pre-drilled Phenolic Board". The ROX is built in three sections, the VFO, a Main Board and an Audio Board. This method of sectionalised building is to be advised especially for the beginner. It enables a small section of the circuit to be built at a time and tested. Construction can turn to frustration if large boards are attempted with many stages on them only to find on completion that they do not work. "Build a bit and test a bit" is the better way.

Our completed VFO is shown in Fig.3. This shows the top of the unit. The VFO is mounted in a small metal box, aluminium or tin plate are suitable. The variable capacitor, being the main tuning control, requires some form of reduction drive for ease of tuning. The prototype used a small in-line epicyclic drive which also allowed a circular scale to be used which is behind the front panel and visible through a small window. The most important factor in building oscillators at radio frequencies is mechanical stability and rigidity.

Build it to be kicked around without damage and the chances are the VFO will be stable. The variable capacitor, VC1, should be a good quality airspaced component. This could be the most expensive



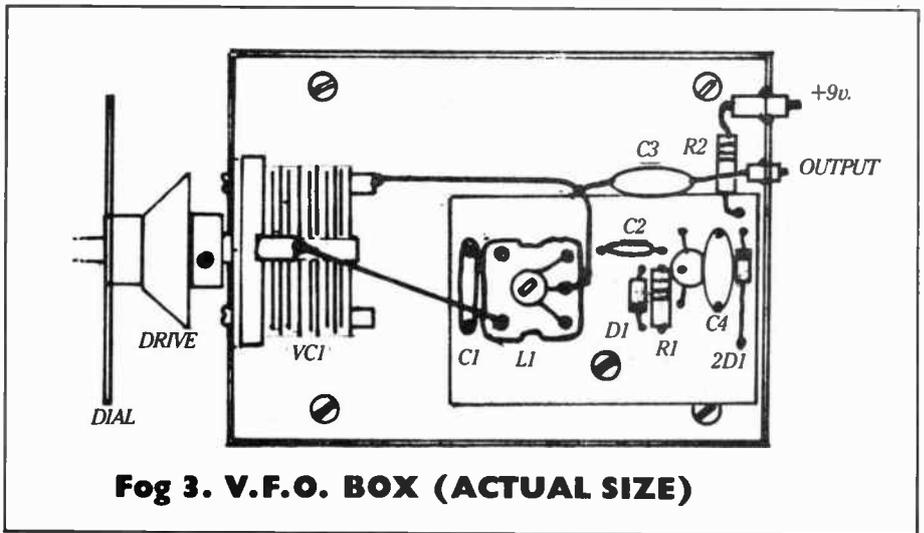
# ON THE • ROX •

item in the whole receiver if bought from a mail order firm or a local shop. Ideally, the constructor will have built up a supply of variables at rallies and junk sales; if not, start doing just that very soon to avoid spending the full price on such components again!

Layout of the top of the board is clearly shown with the relative placings of all the components. They should all be easy to get hold of as the particular types are uncritical if the values are correct. The only exceptions are the capacitors around the tuned circuit, C1 and C2, which ought to be silver mica capacitors or, failing that, polystyrene.

## Maplin sell a suitable coil former with an iron dust core

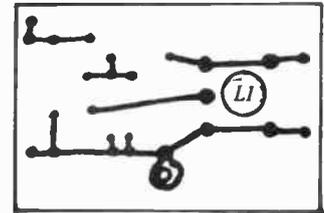
The coil L1 is homewound from the information in the coil winding table. The former is a very common item and ought to be available as a surplus item, but failing that Maplin sell a suitable coil former as Type 722 with an iron dust core Type 4. Although not essential, I used a base plate with my coils because I had them in my box. This is shown in the diagram and again Maplin sell a suitable baseplate with



**Fog 3. V.F.O. BOX (ACTUAL SIZE)**

*Above: The method of making the VFO section of the ROX. Build it as though you were going to drop it from a great height, and it will be stable. This is the most important part of the receiver.*

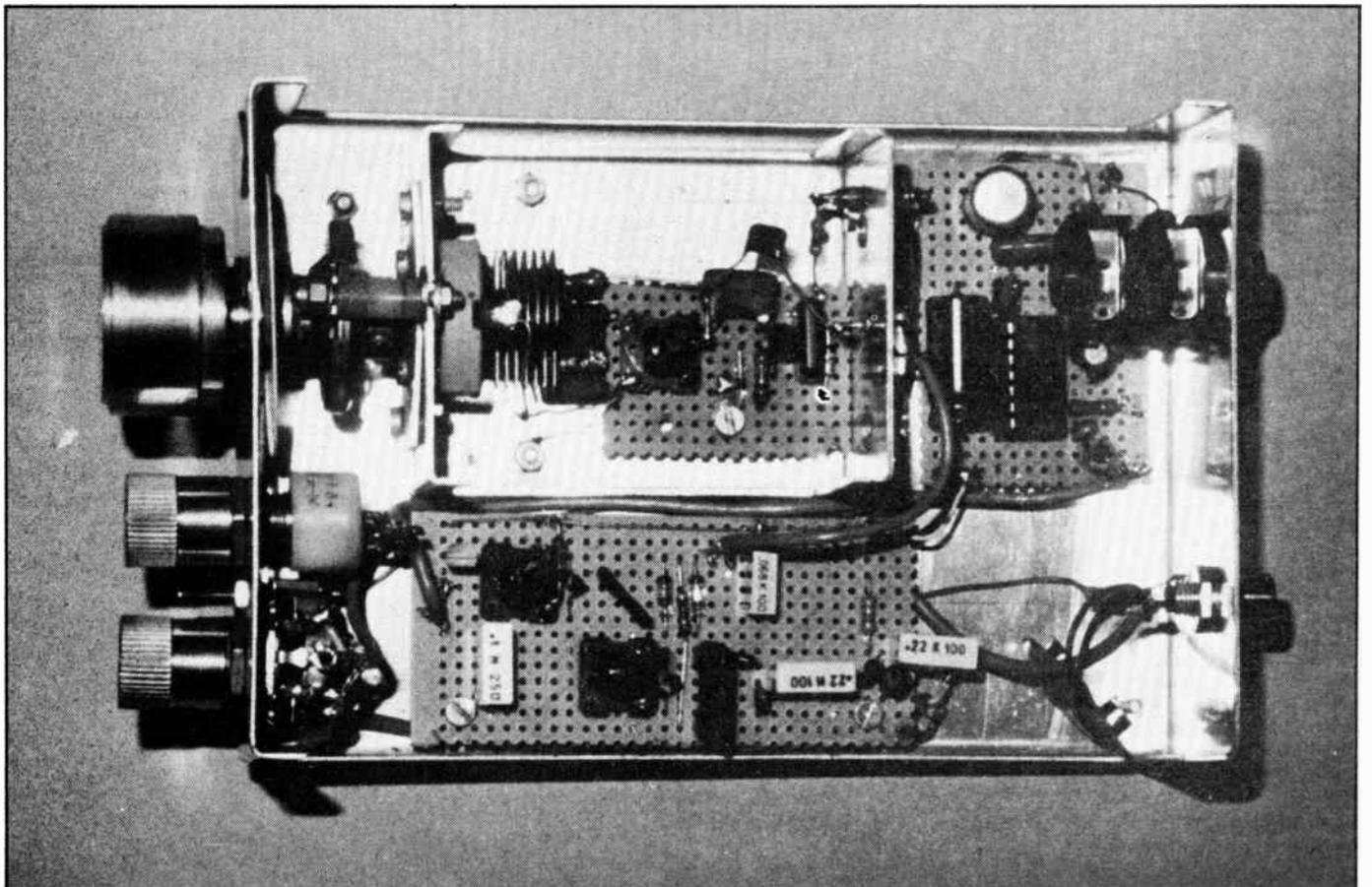
**Fig.3.(b)**

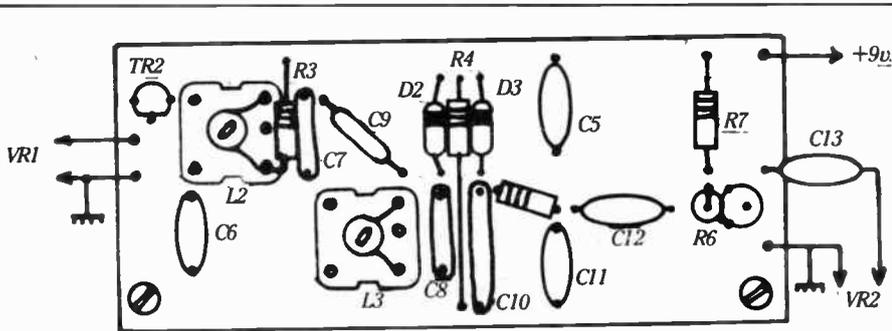


**UNDERSIDE OF V.F.O. BOARD (ACTUAL SIZE)**

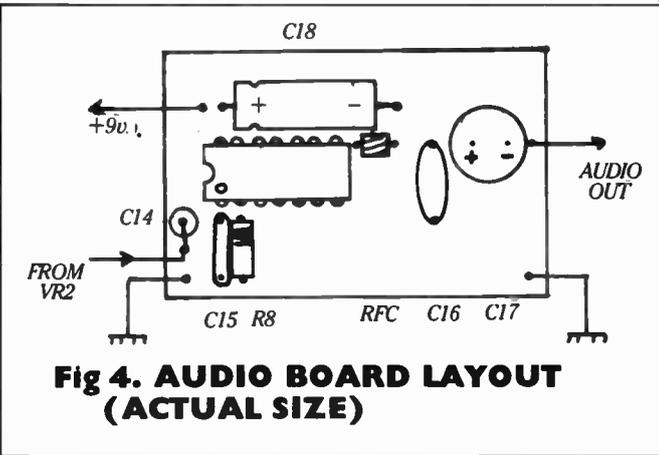
six pins for their 722 formers. The 9-volt supply line and the output are taken through the back of the case using leadthroughs. The leadthrough for the supply can be of the 1,000pF capacitive type to give additional decoupling of the line. C3 and R2 are both mounted in the air with direct leads to the leadthroughs.

*Above: Underside of the VFO board. Here again, solid construction and good soldering will be generously repaid.*





**Fig 5. MAIN BOARD (LAYOUT)  
(ACTUAL SIZE)**



**Fig 4. AUDIO BOARD LAYOUT  
(ACTUAL SIZE)**

Above: The layout of the main board. Note that the L2 and L3 are the same type of coil former as used in L1 in the VFO box. You can get them from Maplins (not the holiday camp...). Left: The audio board. The LM380 could not be described as a state-of-the-art IC but is very cheap and perfectly adequate for the job.

shown in Fig. 4. No layout for the underside, is given this time but it is simple to insert the components in the relative placements shown and interconnect to follow the circuit diagram. The output coupling capacitor in the prototype was a vertical mounting PCB type but a conventional axial type could be used. C14 is also mounted vertically and the input wire from the screened lead from VR2 is soldered to the top end lead. It is quite a good idea to use an IC holder for IC1. These cost a few pence but are worth it if the IC ever needs to be removed. The negative lead from C18 has to pass through a gap in the board wiring to reach the ground connection on the board.

Testing the Audio Board is quite simple. A small 8 ohm speaker or pair of headphones is connected to the output and some kind of audio source is fed into the input. Simply touching the input lead is an adequate test as this should generate enough hum for a basic test. Try the test with VR2 in circuit. This will not only show if the volume control works but also check it is wired correctly to give an increase with clockwise rotation. An on/off switch could be incorporated with this control although I used a small toggle switch to switch the 9 volt supply.

**Simply touching the input lead is an adequate test as this should generate enough hum for a basic test.**

**ROX RECEIVER COILS**

<b>L1</b>	15 turns 28 s.w.g. enall. (tap 4 turns from ground)	WOUND ON 3/16" DIA FORMER + CORE (SEE TEXT)
<b>L2/L3</b>	15 turns 28 s.w.g. enall. 15 turns 28 s.w.g. enall.	
<b>R.F.C.</b>	7 turns 32 s.w.g. enall. on FERRITE BEAD	

Left: Technical data for the coils used in the ROX.

The Perf Board method of construction gives a very similar effect to a printed circuit board; in fact the more experienced constructors may like to etch their own boards for the receiver. Fig.3.(b) shows exactly how the interconnections between the various components on the VFO Board are made. The joints are made with wire but there is no need to use additional lengths of wire as the surplus lead lengths on the components can be taken along the correct routes under the board to provide the connections.

The only additional wire that may be required is for the ground line, the bottom long line in the drawing, which is also connected to a 6BA solder tag. This tag is used under the single mounting hole on the board with a standoff added between the board and the bottom plate of the case. The finished result should be neat and gives the nearest equivalent to a printed board layout without having to etch a copper clad board.

When the VFO is completed it can be tested by listening for the signal on a receiver tuning the 14MHz band. VC1 should give about the correct coverage for the 14.00 to 14.10 CW portion of the band. The actual coverage can be adjusted using the iron dust core of L1. With the vanes on VC1 fully meshed, the core is tuned until the note from the VFO is heard at 14.00MHz. The oscillator is very simple and will shift frequency when loaded so the adjustment will have to be repeated when the VFO is finally mounted in the completed receiver. The coupling capacitor C3 is quite large as the passive mixer requires a fair injection of signal. The value of C3 can be adjusted for optimum results in the finalised receiver to give the best small signal reception although the stated value should give good results.

Once the VFO is built and working, the Audio Board can be built. This is tackled next because it can be tested in its own right. The complete layout for this board is

The Main Board is the largest of the three and can be built from the layout in Fig. 5. Once again the small coil formers as in the VFO are used for L2 and L3. Almost any germanium diodes will serve for D2 and D3, or come to think of it almost any diodes at all... so look in the junk box. C9 loosely top couples L2 and L3 and should be a value that is small enough to allow a selective input circuit but high enough not to reduce the signal input. The value stated seemed about right but again individual constructors might like to experiment with small signal reception when the receiver is completed. If doubtful about building the whole board in one go, build just the audio preamplifier stage first - C12 onwards. This stage can be tested with the Audio Board as described above.

When all the boards are completed the whole receiver can be assembled for testing. It ought to be built into some form of metal case. Not all of us are skilled at case building; like most I struggle along with my power drill, hacksaw and workmate in the garage, so I used a ready made aluminium box which measured 4" x 2" x 6" deep. This is a standard case sold by Minfordds of Sun Street, Festiniog, Wales. This company will send a price list of their inexpensive range of cases and hardware for a SAE. All the boards are mounted using 6BA nuts and bolts with standoffs to raise them

# THANET'S GUIDE

Just a few stars to choose from the fabulous galaxy of Amateur Radio Equipment available at Thanet Electronics.



**IC-25E £269.**  
**45E £289 inc.**

Amazingly small, yet very sensitive. Two VFO's, five memories, priority channel, full duplex and reverse. LED S-meter, 25KHz or 5KHz step tuning. Same multi-scanning functions as the 290 from mic or front panel. All in all the best 2M FM mobile ICOM have ever made



**IC-290E £379.**  
**490E £429. 290H £399 inc.**

This very popular 2m multimode the IC-290E now has a big brother, the 25 WATT IC-290H as well as a 70cm cousin the IC-490E. Both of these newer models have a GREEN display. All three have 5 Channel memories, scan facilities on either memories or the whole band, tone-call button on the microphone and instant listen input for repeaters. Why not call us now for further details – or even better visit us, or one of our dealers or agents for a demonstration?

## CUE DEE antennas

The BEST in recent tests and really well made too. Send for a catalogue of these DX antennas. Here's part of the range:-

4el 2m yagi VHF	4144A	8 dBd	£24.93
10el 2m yagi VHF	10144	11.4 dBd	£45.16
15el 2m yagi VHF	15144	14 dBd	£63.00
17el 70cm yagi UHF	17432	14.5 dBd	£48.00
4/5el HF Beam	DUO 2	(14/21 MHz) 9/8 dBd	£356.71

All matching cables, clamps and booms available for stacking 10 and 15 element yagis.



**IC-505 £299 inc.**

As you know, the Home Office have given permission for the 50MHz band to be used by holders of special licences – the issue of which is to be controlled. This must be one of the most exciting things that has happened to the Radio Amateur since the invention of sliced bread (or should I say the micro-processor?). As you know, there are many countries in the world who already have 50MHz – so there is already some exciting equipment available. One of these is the ICOM IC-505 which is a multi-mode portable offering a choice of outputs of 3W (portable) or 10W (fixed). We have imported a few of these excellent little transceivers and they are available at £299. inc. VAT so why not think about trying out this excellent band? Call us or send for technical details.

Securicor  
or post  
despatch  
free.

Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM Thanet ICOM



# ON THE ROX

above the bottom of the case. All the signal interconnections are made in screened wire. The sockets for the audio output and antenna are on the back and the large VFO tuning knob has a small window cut above it for viewing the homemade circular tuning dial. This dial is calibrated against an existing receiver, listening for the VFO and lettering added (Letraset).

## Covering the whole front with a layer of clear plastic film

Front panel appearance is important and I used my old trick of covering the front panel with a sheet of tinted paper, applying the legends to the paper and covering the whole front with a layer of clear plastic film of the type sold for covering books. This is quite simple to do. I just cut the paper to fit the front, Bluetack it onto the front panel and mark where the holes go. The paper can then be lettered and the holes cut with a sharp modelling knife. The paper is glued to the front and covered with the plastic film. Easy to do,

and it beats aerosol-painted front panels which tend to form ridges on application and often chip off in later use.

So there you have it, a simple 14MHz receiver. The antenna input impedance is 50ohms, which matches the OX so an antenna of similar impedance or an ATU must be used. This receiver matches the OX in only covering the CW portion of the band but if SSB signals are required the core in L1 can be adjusted to cover this end of the band. It might not beat a £200 receiver, but it will pull in plenty of signals on the band.

Don't forget you will hear the signals twice, since direct conversion receivers

tune in both sides of zero beat on a signal. So if it is being used with the OX, practise zero beating onto the transmitter so that the receiver and transmitter are in step for a QSO.

It is normal to tune low to high frequency on the 14MHz band but if there is QRM on the low side try the signal on the high side. It might be clearer... a little advantage of direct conversion! It doesn't cost much or require much skill to build, so try it. I think you will enjoy it.

**Sprat: The Journal of the G QRP Club, from 17 Aspen Drive, Chelmsley Wood, Birmingham, B37 7 QX.**

## ROX RECEIVER COMPONENTS LIST

R1	1M	} ¼ watt	TR1	2N3819	C7	100pf
R2	47K		TR2	2N3819	C8	100pf
R3	2.2K		TR3	BC108	C9	10pf SEE TEXT
R4	56K		IC1	LM380N	C10	400pf
R5	10K			¼" JACK SOCKET	C11	1n
R6	1M			ANTENNA SOCKET	C12	0.22uF
R7	4.7K			EPICYCLIC DRIVE	C13	0.22uF
R8	15K			CASE: 6"x4"x2" deep	C14	1uF 50v.
VR1	1K LINEAR CARBON		PERFORATED BOARD 1" MATRIX	C15	100pf	
VR2	10K LOG.		C1	100pf (silver mica)	C16	0.1uF
D1	IN914		C2	15pf (silver mica)	C17	100uF 16v.
D2	AA119	} or similar	C3	79pf SEE TEXT	C18	100uF 35v.
D3	SEE TEXT		C4	0.1uF	VC1	25 or 30 pf
ZD1	7.5v. ZENER		C5	0.1uF		airspaced
	BZX85 or sim.		C6	0.1uF		SEE TEXT

# WATERS & STANTON ELECTRONICS

18/20 MAIN ROAD, HOCKLEY, ESSEX. TEL (0702) 206835



**£224**  
carriage free

The FRG7700 is for the advanced listener or for the enthusiast who demands the best in short wave reception. The receiver covers the complete spectrum 200kHz to 30MHz with a highly accurate digital display. The receiver offers excellent sensitivity and selectivity and has separate detectors for AM, FM and SSB, plus switched bandwidth on AM. Other controls include automatic gain control, noise blanker, attenuator, squelch, rf gain control and clock with timer. There is also facilities for fitting an optional 12 channel memory unit. The receiver runs from 230v AC mains or 12v DC and there is an optional aerial tuner to go with it. And if you are interested in VHF, there is a complete range of specially designed converters to go with the receiver that covers the amateur, aircraft and marine bands, etc. Why not send today for our coloured brochure and get to know more about what the FRG7700 has to offer.

TRIO	
TS930 1.8-30MHz Tcvt. 230v AC 100w	£1,154
TS830 1.8-30MHz Tcvt. 230v AC 100w	£878
TS4306 New H.F.	P.O.A.
TS1308 3.5-30MHz Tcvt. 12v DC 100w	£625
TR9000 2M FM/SSB Tcvt. 12v DC 10w	£359
TR9130 2M FM/SSB Tcvt. 12v DC 25w	£411
TR7730 2M FM Tcvt. 12v DC 25w	£268
TR2600 2M FM handheld tcvr. 3w.	£220

YAESU	
FT102 1.8-30MHz Tcvt. 230v AC 100w	£785
FT902 DM 1.8-30MHz Tcvt. 230v AC 100w	£885
FT707	£509
FL2102 1.8-30MHz 1kw amp. 230v AC	£449
FT480R 2m FM/SSB Tcvt. 12v DC 10w	£369
FT290 2m FM/SSB portable tcvr. 3w.	£265
FT280R 2m FM handheld tcvr. 3w.	£199
FT230R 2m FM mobile tcvr. 12v DC 10w	£239



**£319**  
carriage £5

WSE PRODUCTS	
M700AX 2m FM Tcvt. 12v DC 25w	£179
M750X 2m FM/SSB Tcvt. 12v DC 10w	£269
EXP430 UHF transverter for above	£199
P.11 2m FM handheld tcvr. 2w.	£109
PC3000 2m FM Tcvt. 12v DC 25w	£189
PC8300 2m FM handheld tcvr. 3w.	£179
PC84000	£229
8P10X Super power/swr meters 1.8-150MHz	£21.95

TRIO, YAESU, FDK, ICOM, AZDEN, WELZ, JAYBEAM, MICROWAVE, ETC  
18-20 Main Road, Hockley, Essex. Tel: Southend (0702) 206835/204965  
Open Monday-Saturday 9am-5.30pm. EC: Wednesday 1pm

E & OE

# Get your RADIO AMATEURS

City & Guilds Qualifications with ICS  
In your own time—at your own pace

ICS, the world's leading home study specialists, offer a superb course for those wishing to obtain their City & Guilds Radio Amateurs qualifications. Prepared by experts, the course fully covers the syllabus of the examination, and you study step by step at your pace, in your own home, via the post.

## Personal Tuition

Throughout your course you have the expert and personal guidance of a fully qualified tutor, plus the ICS guarantee of tuition until successful.

## Other courses available

The ICS School of Electronics offer a comprehensive range of courses for most areas including: TV & Audio Servicing & Engineering, Radio Frequency, Electronic Engineering, Electrical Engineering, ... and many more.



Approved by CACC



Div. National Education Corporation



Member of ABCC

## POST OR PHONE TODAY FOR FREE BOOKLET

Please send me your FREE School of Electronics Prospectus.

Subject of Interest \_\_\_\_\_

Name \_\_\_\_\_

Address \_\_\_\_\_

**ICS** Dept E282  
ICS School of Electronics  
160 Stewarts Road  
London SW8 4UJ



01-622 9911  
(All Hours)

# TELECOM.

THE BEST IN AMATEUR RADIO

EQUIPMENT BY:  
YAESU MUNSEN  
SOMMERKAMK  
ICOM  
TRIO

DISTRIBUTORS OF:  
THANDAR PORTABLE  
TEST EQUIPMENT AND  
LEADER TEST INSTS.

COMPUTERS BY:  
ACORN 'ATOM'  
COMMODORE 'VIC-20'

AERIALS BY:  
CUSHCRAFT  
J-BEAM  
REVCO  
WESTERN

6 NEW ST, BARNSELY, SOUTH YORKS

Phone: 0226 5031

## AMATEUR RADIO EQUIPMENT IN THE SOUTH WEST

APPOINTED AGENTS FOR



FT1 - HF TX  
FT980 - HF TX  
FT102 - HF TX  
FT101ZDFM - HF TX  
FT707 - HF Mobile TX  
FT780R - 70cm TX  
FT480R - 2 Metre TX  
FT290R - 2 Metre TX  
FT790R - 70cm M/M H/H  
FT208 - 2 Metre Portable M/M  
FT708 - 70cm H/H

FT230 - 2Metre 25W TX  
FT730 - 70cm 25W TX  
FRG7 - RX  
FRG7700 - RX

IC2E - 2Metre H/H  
IC4E - 70cm H/H  
IC25E - 2 Metre 25W TX  
IC45E - 70cm 25W TX  
IC251E - 2M Multimode B/S  
IC720 - HF TX  
IX730 - HF TX  
IC740 - HF TX  
ICRX70 - RX  
IC290E - 2Metre 10W  
IC290H - 2Metre 25W

Instant Credit  
PHONE FOR PRICES

*all models normally always in stock plus full range of accessories.*

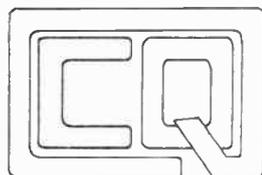
Ancillary equipment by: Microwave Modules, Mutek, Orae, Datong, Hanson, Packer, Tokyo Hypower, Himound, Shure.

Aerials by: Jaybeam, T.E.T., Hygain, G. Whip. - Tono - Tesco Telereaders - also plugs, dummy loads, rotators, cables, valves etc., RSGB Publications.

**REG. WARD & CO. LIMITED**  
GEORGE STREET, AXMINSTER, DEVON. EX13 5DP  
Telephone (0297) 33163

REG. G28SW

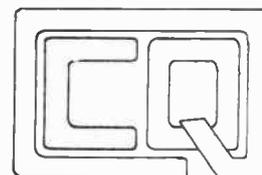
Rodney. G6LUJ



# THE CQ CENTRE

10 MERTON PARK PARADE,  
KINGSTON ROAD, LONDON SW19  
(JUNCTION MERTON HALL ROAD)

TEL: 01 543 5150



**LARGE STOCK OF NEW AND S/HAND EQUIPMENT**  
ICOM - YAESU - TRIO - STANDARD - FDK - AZDEN ETC.

**FULL RANGE**  
LASHING KIT, POLES,  
CABLE, ROTATORS  
JAYBEAM -  
SMC ANTENNAS  
SWR POWER  
METERS ETC.

**HB9-CV**  
2 EL. BEAM  
2 METRE+70CMS  
4.5 DB FORWARD GAIN  
18DB FRONT TO BACK  
£8.50 WITH CLAMP  
WE CANNOT POST THE  
2 METRE VERSION OF  
THIS ANTENNA

**SLIM JIM**  
FOR 2 METRES  
AND 70CMS  
COMPLETE WITH 4 METRES CO-AX  
£7  
OR £8.50 INC.  
POST+PACKING

**STOP PRESS:** Now available - a brand new Morse Tuition Tape from G4HXZ. Based on tried and tested subliminal techniques. Includes: Alphabet - Numerals - Punctuation - Plain Language-simulated Post Office Amateur Morse Test 12w.p.m. Full instructions and check sheet included. £6.50 inc. p&tp.



**INSTANT CREDIT NOW AVAILABLE THROUGH LOMBARD TRICITY - PLEASE PHONE OR WRITE FOR QUOTATION**



# KEEP AHEAD

If you can't hear 'em, you can't work 'em. Or so they say. So if reception is a problem, buy a pair of headphones, says  
**John Morris.**



In the average shack there are two common forms of audio output device – loudspeakers and headphones. Most modern rigs have internal speakers, but the audio quality from these usually leaves much to be desired, presumably to keep costs and size down, and tucked away at the top, bottom, side or even back of the rig, seemingly as an afterthought.

By the time your rig is cosily buried under a few other boxes, a pile of QSL cards, several half-completed projects, and the cat (surely those immaculate looking shacks we see in mags must have been specially prepared for the photographer, the carefully tailored audio response curve specified by the manufacturer becomes a little bit academic!

For these reasons those of us who just never seem to be able to find time to get round to having a general tidy up, or have vicious cats who resent being disturbed from the top of a nice warm rig, often fit an external speaker. To make this easy most new sets come fitted with an external speaker socket which is arranged to mute the internal speaker when the appropriate plug is inserted. Alternatively, the headphone socket may be used but care should be taken as some rigs have only a reduced audio level available at this point. Failing all else, it is always possible to get inside to disconnect the wires from the speaker (carefully – you may want to sell the set one day), and attach a lead from the outside world.

## Weak signals

The type of speaker and enclosure used can have a surprisingly large effect on the intelligibility of noisy signals. It should be remembered that a loudspeaker is to a receiver what a microphone is to a transmitter, and the frequency response of one is just as important as that of the other.

Surplus or ex-commercial mobile radio units are very useful, as they have been specifically designed for good communication quality in noisy surroundings. In particular the familiar blue Pye remote speakers have been found to be very effective for amateur use, and these compact units are often available at rallies at quite reasonable prices.

Headphones serve two purposes. They act as an aid in copying weak signals, and especially important at night, they allow the station to be operated without the penetrating noise of the receiver disturbing

the neighbours, other residents of the house, or the cat. Headphones help when copying weak signals for two reasons. First, they exclude some external noise, so allowing concentration on the signal itself. Second, only the direct output of the receiver is heard, whereas with a loudspeaker there are reflections from the walls of the shack which cause interference and so degrade the frequency response.

The choice of what sort of headphone to use is very much a personal one, the main consideration being comfort. Remember that they may be worn for several hours at a stretch, and so light weight is important if pains in the neck are to be avoided. They should be neither loose so that they are constantly in imminent danger of slipping off the head, nor tight so they grip like a vice. Spectacle wearers in particular may need to try several models until a pair which does not force the arms of the glasses into the backs of the ears is found. Most people find that cheap stereo “hi-fi” types with the two sides fed in parallel are quite satisfactory, and these have the added advantage that they can also be used for listening to cheap stereo.

The phones socket on most rigs is located on the front panel. Although this position is convenient for access, it has the disadvantage that the lead trails over the desk in front of the rig, which can be an annoyance. When headphones are plugged into the rig then the loudspeaker, internal or external, is usually silenced. This is the normal requirement, but there are occasions when it would be preferable to have both outputs working simultaneously, such as during a contest, with the operator wearing the headphones and onlookers monitoring the activity via the loudspeaker. For the lone operator the transfer from speaker to phones, or vice versa, can also be frustrating; between inserting or removing the plug and donning or doffing the headset there is an inevitable annoying gap when neither can be heard, and this is often exacerbated by the need to adjust the volume control. In many ways it is more convenient to keep the headphones running all the time, so that they can be put on or taken off at convenience, without more ado.

A small adaptor box, with a circuit such as that shown in Fig 1, is a very simple but nevertheless useful accessory which can be easily built in a spare hour. The audio input is taken from the external speaker socket (or suitable alternative) of the rig and split two ways. One path goes through a level adjusting variable resistor to a headphone socket. The other goes via a switch to either the external loudspeaker or a resistor. This circuit keeps the headphones constantly in operation so that they may be put on whenever desired with no hiatus in reception. The loudspeaker is turned on or off by the switch to allow either simultaneous use of both headphones and loudspeaker, or just the headphones alone.

R1 acts as a dummy load for when the speaker is switched out. Its resistance should be the same as the impedance of the loudspeaker, so that whichever posi-

tion S1 is in, the same impedance is presented to the audio output stage of the rig, so keeping the output level, and hence the headphone volume, constant. The impedance of a loudspeaker is not a particularly easy thing to measure, and should this not be known for the unit in use then the value of R1 is best determined by experiment. The impedance of most loudspeakers is four, eight or 16Ω

For those without suitable components in the "junk box" the quick and easy method is to purchase two 8.2Ω 1w resistors. Initially only one of these should be used for R1. If the headphone volume stays constant when S1 is moved from one position to the other then all is well, and the second resistor may be kept as a spare. If the volume in the headphones is greater with the loudspeaker off, then the second resistor should be fitted in parallel with the first, to give an overall resistance of just 4Ω. If the headphone volume is greater with the loudspeaker switched on, then the two resistors should be used in series to give 16.4Ω. R1 must also be capable of withstanding the audio power from the rig. A 1w rating is normally sufficient, unless the volume control is habitually turned up to very high levels for long periods.

## Very simple

A stereo jack socket with the two signal lines connected together is recommended for Sk1 to make the unit compatible with normal stereo headphones. A stereo socket wired in this way can also be used with a normal mono jack plug, although it may be necessary to only partially insert the plug.

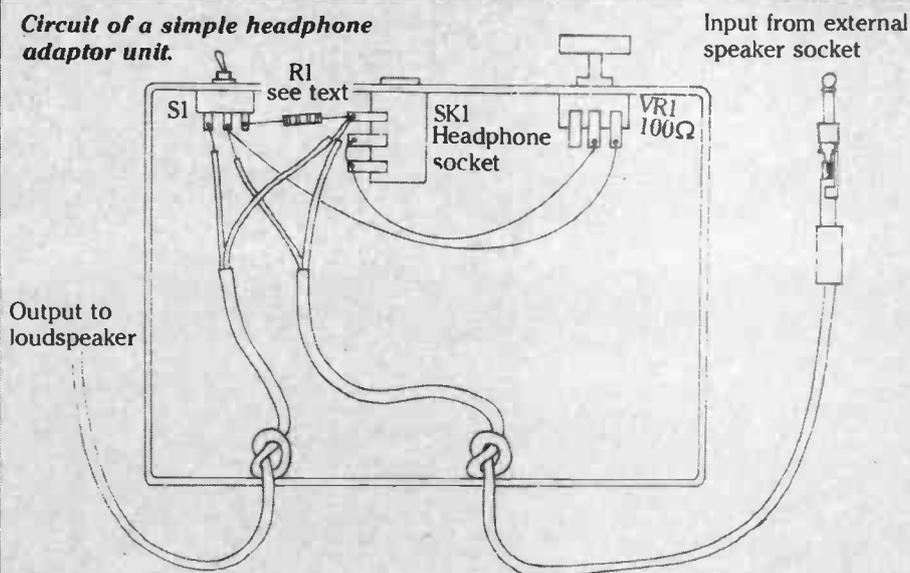
Construction is not at all critical, and any convenient box may be used. All of the components except R1 are mounted directly on the box, and the resistor may be simply wired between the earth terminal of Sk1 and the appropriate tag of S1. Screened cable is preferable for the leads from the rig and to the external speaker.

Setting up consists of simply plugging everything in, switching the loudspeaker on, and adjusting the volume at the rig to give a normal listening level from the loudspeaker. VR1 should then be set to give the required volume in the headphones.

Although this type of unit is extremely simple and relies upon no technology more complex than Ohm's Law, it can prove very useful and is well worth the small effort needed to build it. For example, the writer now keeps the headphones permanently plugged in, and when a signal starts to disappear into the QRM it is a matter of moments to put them on, with no need to fiddle with plugs and sockets or volume controls. The adaptor is also convenient when experimenting with or using circuits which use the audio output from the rig, such as RTTY terminal units, as a suitable signal can be taken from the headphone socket and the loudspeaker switched off on or for monitoring as desired.

The cat likes it too.

**Circuit of a simple headphone adaptor unit.**



The headphone/switchable speaker adaptor is one of the simplest projects and presents few problems in construction. You will need a box of some sort, but this can be anything convenient. Its only purpose is to mount the bits and pieces on and hold everything together. Specially-made project boxes tend to be a bit expensive. A cheaper alternative is a small plastic foodbox, such as those sold for storage of stuff in fridges and freezers.

You will also need 2m of two-core cable; one metre running from the rig's speaker socket to the adaptor, and the other from the adaptor to the external speaker. Two core mains cable – or even twin "lighting" flex, is fine.

The other components are a single pole, double throw (often called "SPDT" in the ads) toggle switch (these can be tricky to get hold of, but it is quite all right to use a two pole switch and only use one half of it); a panel mounting stereo jack socket; a 100Ω linear potentiometer; two 8.2Ω resistors; and a 3.5mm jack plug to fit the external speaker socket of the rig. If your rig does not use a 3.5mm jack for the external speaker (most do) then get whatever plug is appropriate instead.

If there is no handy electronic components shop near you then take a look through the mail order adverts. The total

cost for everything except the headphones and loudspeaker should be less than £3.

A few inches of connecting wire will be needed. You can save money here by chopping about six inches off the two core cable and splitting the two wires for this.

Once you have all the components, drill three holes in the box suitable for the switch, jack socket and potentiometer. Then drill two more holes at the back of the box just big enough for the two-core cable to go through. The diagram above shows how the components should be fitted and wired. Start by fastening in the switch, socket and potentiometer. Then do all of the internal wiring in the box. Finally connect the two cables and pass their ends through the holes at the back of the box. Tying knots in the cables on the inside of the box helps prevent smashing of the circuit when a wire is pulled too hard by accident.

Take care when attaching the 3.5mm plug, as it is very easy to end up with the two wires shorting together. Remember to slide the plug cover onto the wire before soldering the plug, otherwise you will have to unsolder it again – very frustrating!

If this is your first constructional project it might be a good idea to

get somebody with more experience to look it over before plugging it in, although there is very little that can go wrong.

Once you are satisfied that everything is ok, plug the 3.5mm plug into the rig's external speaker socket, and off you go. Check that the headphone volume stays the same when switching the speaker on and off. If it does not then fit the spare resistor, as described earlier. Unplug everything before doing this modification.

### Headphone and loudspeaker notes

Any headphones can be used, without alteration. A stereo jack socket is used in the adaptor, but with the left and right channels connected together. Most headphones from hi-fi shops come with a stereo jack plug fitted, which means they can be plugged straight in without further ado. The most important criterion in selecting headphones is what you find comfortable.

Finding a suitable external loudspeaker can be a bit more tricky. After a while loudspeakers from dead radios and televisions tend to accumulate in many amateur's shacks, so it might be worth asking around. Alternatively a "mid-range" hi-fi speaker can be bought for a few pounds. This will also give you the chance to exercise your carpentry skills building a box for it.

## East Suffolk Wireless Revival

This popular annual mobile rally for radio amateurs happens on the Bank Holiday Sunday, May 29th at the usual venue of the Civil Service Sportsground, The Hollies, Straight Road, Ipswich (between Bucklesham Road and Felixstowe Road A45, and adjacent to the Suffolk Show Ground).

The rally opens at 10am and will be similar to previous events except that the Bring and Buy will be replaced by a "fleamarket" and "car boot sale". The transceiver clinic and aerial testing range will be there as usual, in addition to the traders and stands, and displays for the whole family.

This rally, in the heart of Constable (not policemen!) country and the East Anglian touring region, including the new and spectacular Orwell Bridge, makes an extremely good day out for the enthusiast and the family. If you're interested in taking a stall, get in touch with George Spencer G6CRN, 83 Tuddenham Avenue, Ipswich IP4 2HG (0473 218285); Jack Tootill G41FF, 76 Fircroft Road, Ipswich IP1 6PX (0473 44047), can answer general enquiries. The rally is organised by Ipswich Radio Club and Martlesham Radio Society.

## Reading & District AR Club

Visitors are always welcome at the above mentioned club meetings held at the Clubroom, White Horse, Peppard Road, Emmer Green, Reading, Berks, on alternative Tuesdays. Contact GB3BK (RB11) on 70cm and S13 on 2m for details. Chris Young G4CCC is Secretary of the club, and he is flanked by the following main members: Chairman Andrew Barrett G8DOR, Treasurer Bryan Taylor G3AKF, and ordinary member Vin Robinson G4JTR. Chris Young's address is 18 Wincroft Road, Caversham, Reading, RG4 7HH.

Some of the club's events are as follows: March 1st Alignment evening - bring along your sensitive receiver and learn the truth! March 15th RF hazards and the amateur - Ian White G3SEK of the NRPB talks to members. March 29th (to be confirmed)

# CLUB NEWS

**Tell others about what's happening in your club - give us the information and we will try and print it here.**

The work of the Radio Interference Department of BT. April 26th The workings of the VHF Contest Committee. April 12th (to be confirmed) Demonstration by SMC - an opportunity to part-exchange your AR88, HRO or C58 for a modern rig. Cheque books not obligatory! May 5th Away round of the Maidenhead club quiz. May 10th HF receiver parameters - Peter Chadwick G3RZP of Plessey on how to drag the last dB from your HF rig.

## Edgware & D RS

The "SKE" (straight key evening) is to be held by this club on suggested frequencies 3.520 - 3.580MHz, QRP around 3.550MHz. Call CQ SKE.

It begins at 1900 BST and finishes when your arm collapses. The club presents "The Ultimate Keyer" - continuously adjustable speed, even while sending, infinitely variable dot-dash ratio, no mains or batteries, and so on. You are welcomed to take part in an on-the-air demonstration on 80m CW, Thursday, March 31st. Contact John Bluff G3SJE (G3ASR), 52 Winchester Road, Kenton, Harrow, Middlesex. Tel: 01-204 1034.

## Northern Heights AR Society

New members are also welcome at the meetings of the NHARS and their future arrangements include the following: March 9th Talk by J. Fish G4MH, March 23rd Visit to Bradford Police HQ, April 6th AGM, April 20th D. Smith G4DAX on the RSGB, May 4th Visit to Leeds/Bradford Airport, May 18th Construction competition. More information from the Secretary Brian Aspinall G6CJL, 11 Buck Street, Denholme, Bradford BD13 4BY. Telephone Bradford 834442.

## G-QRP Club

The club, as you probably know, is "devoted to low power communication" and their 1983 activity list has been released. Included are the following: Spring QRP CW Activity Weekend on March 19/20th. And the QRP Winter Sports (CW) happens from December 26th to January 1st 1984. Times and frequencies for both the above events are available from Christopher J. Page G4BUE, "Alamosa," The Paddocks, Upper Beeding, Steyning, West Sussex BN4 3JW.

Information is also available on the Late Spring QRP SSB Activity Weekend on May 7/8th, and the Late Summer QRP CW Activity Weekend (sponsored by the World QRP Federation) on September 10/11th. Main purpose of the last-mentioned weekend is to promote intercontinental QRP QSOs, and member clubs of the World Federation are invited to suggest their own times and frequencies in accordance with propagation conditions. For Europe the following are suggested: 0700 - 0800 Europe - Oceania 0800 - 0900 Europe - Japan 1600 - 1800 Europe - North America 1900 - 2000 Europe - South America/Africa. All of these on the highest HF band which is open. Remaining times for general QRR QSOs on 3560, 7030, 10106, 14060, 21060, and 28060.

## National Wireless Museum

Any reader requiring a service sheet or workshop manual for an old radio or television might be able to obtain a copy from the National Wireless Museum at Arretton Manor, nr Newport, in the Isle of Wight.

The museum has just been donated a second car load of

literature from a professional service engineer, now retired, and these go right back to before the second war. Any assistance the museum might give is entirely free of charge, and in the first instance, we suggest you ring the Hon. Curator Douglas Byrne, at Ryde (0983) 62513. More information about the museum itself in the next issue of Amateur Radio!

## Newport AR Society

The Newport Amateur Radio Society meet at Brynglas House, Brynglas Road, Newport, Gwent each Monday evening during school term times, at 7pm.

Correspondence can be addressed to Brynglas House; please mark for attention c/o Newport A.R.S.) or at Pontypool 56348. By the way the above address is QTHR.

## Royal Naval AR Society

It's an outing for the whole family, and extremely useful to anybody interested in mobile amateur radio. It is the RNARS Mobile Rally 1983 and it takes place on Sunday June 12th at HMS Mercury, near Petersfield, Hampshire, starting at 10.30 and finishing at 17.30.

Events include model steam train rides, radio controlled boats, archery, and there will be hot and cold meals laid on, along with the inevitable drinks. Trade stands will be there, under canvas, and they include the RSGB and Rallymaps of West Wellow. Further details from A.G. Walker G4DIU, 103 Torrington Road, North End, Portsmouth PO2 QTN or from HQ station G3BZU.

## Denby Dale (Pie Hall) & D AR Society

Noggin and natter nights are held on alternative Wednesdays (punctuated by club fox hunts), while other dates for future meetings include the following: March 5/6 Visit to RSGB exhibition at NEC, March 9 Oscar, by G4JJ, March 13 Component rally at Southport. In April there is a visit by Lowe Electronics on the 13th. More information about future meetings in the next issue of Amateur Radio. Incidentally, meetings are held in the Pie Hall, Denby

Dale, Huddersfield. More information from the Secretary J. Clegg G3FQH, 8 Hillside, Leak Hall Lane, Denby Dale.

### **Tynedale AR Club**

This club is active on HF, VHF, UHF, including RTTY, and ATV with action station Tx/Rx ATV. Other special activities include Morse tuition as required, and probably most important of all, refreshments are available in the restaurant of the Falcon Hotel, Prudhoe upon Tyne, Tyne and Wear, where they meet!

Meetings are held on the first and third Tuesdays of each month, in the room at the end of the bar. So, come early, stay late... Enquiries to Ken Hutton G4IZW, Secretary, at 0632 678828.

### **Thornton Cleveleys AR Society**

This club meets every Monday evening (7.45) at the 1st Norbreck Scout Group Hut, Carr Road, Bispham, near Blackpool, Lancs. Usually, the meetings open with a talk, quiz, discussions etc, and then the station is "aired" through callsigns G4ATH and G6GMW. The club's programme for March is as follows: March 7 Talk by Tony G3CLX from Dewsbury Electronics, March 14 Natter night, March 21 Film on atomic energy (hopefully), March 28 Radio controlled model aircraft, by Tom Anyon G3YEI. Get in touch with Jen Ward G8YOK, QTHR or phone Poulton le Fylde (0253) 890114.

### **Vale of White Horse AR Society**

... are hoping the landlord of the White Hart, will turn the double clubroom into one with some atmosphere (not the crackly kind), so they will want pictures, posters, club awards, pennants and so on.

Programme for the next few months includes: March 1 Repeaters, by Chris Young G4CCC, April 5 Junk sale, May 3 Morse, by Dave G3BLS, June 7 Computing and the amateur, by John Morris (who writes for Amateur Radio!), and July 5 the AGM. More information from the Secretary Ian White G3SEK, 52 Abingdon Road, Drayton, Abingdon, Oxon. Tel: 0235 31559.

# CLUB NEWS

### **Lincoln SW Club**

The club's programme includes the following: March 9th Lecture on satellites by G4CUO; March 23rd Lecture/demonstration Fast Scan TV - G8CTG & G6HMS.

### **Sutton Coldfield RS**

These are the meetings to be held in the Central Library, Sutton Coldfield on the second and fourth Mondays of each month at 7.30 pm: March 14th Natternite; March 28th Setting up an amateur station by Fred Ward G2CVV; April 11th Natternite; April 25th Spring Clean junk sale - reserves allowed, 10% commission to club funds.

May 9th Visit to Bournville Police Communication Centre - 15 members only - Natternite for remainder; May 23rd Operating techniques and procedures, by Tom Douglas G3BA; June 13th Further visit to Bournville Police Communication Centre for 15 members - natternite for remainder; June 27th Slow and fast scan TV, by Haden Bate G8AMD; July 11th Natternite.

More info from Reg Smith G3XXJ, 29 Coldstream Road, Warmlay, Sutton Coldfield, West Midlands B76 8NW.

### **Bury Radio Society**

Many of the members of Bury Radio Society thought that their recent quiz with Warrington Radio Society could possibly be a 'first' for the UK.

On January 25th Bury and Warrington Amateur Radio Societies held an inter-club quiz in which neither of the teams had to leave the comfort of their respective club rooms. Contact was maintained by speech and video links in the 144MHz and 432MHz bands throughout the quiz, with colour pictures from Warrington being received 18 miles away in Bury and black-and-white for

the reverse path. The large audiences in both club rooms were able to enjoy a close contest, which Warrington eventually won by a narrow margin.

The video equipment at the Bury end of the link was provided and operated by Mike Horrocks, G8GTP. Picture quality was excellent using a Parabeam antenna erected just before the quiz under cover of darkness!

Meetings of Bury Radio Society are held at the Mosses Community Centre, Cecil Street, Bury, every Tuesday evening at 8pm. Main meetings are held on the second Tuesday of each month. The remaining meetings are informal.

Newcomers are invited to contact the Secretary, Brian Tyldsley, G6OKE, 4 Colne Road, Burnley, telephone Burnley 24254, for further information.

### **Burton upon Trent RS**

In February (just too early for this issue) the society arranged a direction finding, and they hope to enter the HF NFD. The society meets once a week on Wednesday evenings at the Stapenhill Club and Institute, Main Street, Stapenhill, Burton on Trent.

### **North Staffordshire AR Society**

This society are in the process of arranging their 1983 programme as we go to press, although they do plan to run summer fox hunts, for which the Dave Turner Trophy goes to the winner. They also hold a construction contest each year. More information from Kevin Balch G8FGR, QTHR. Meeting place is the Harold Clowes Community Centre, Bentilee, Bucknall, Stoke on Trent.

### **Skelmersdale & D AR Society**

The club meets every Thursday from 7.45pm at the Dunlop Sports and Social Club, White Moss Road (next to the football ground), in Skelmersdale, and at the moment the club is concentrating on RAE classes, but anyone is welcome to attend meetings.

They are now preparing a newsletter entitled "Feedback" which should circulate in the NW; advertisers are welcome to £20 per page for a whole year (12 issues) which sounds like good value. More info from Joe Singleton, 3 Willow Drive, Skelmersdale, Lancs WN8 8PR.

### **Maltby AR Society**

MARS, as they call themselves, have a full programme of events, and those for March include the following: March 4 Microwaves, by G3PHO, March 11 Power supplies construction, by G6RIL, March 18 Film "Hams Worldwide", and March 25 AGM.

Group activities will be enhanced by Simon G8NVS bringing along his computer every fortnight, and Mick G6PCX coming along with his FT480R 2m multimode, and a telescopic antenna mast to enable a station to be set up will be supplied by George Bates G6RIL. Secretary is Ian Abel G3ZHI, and meetings take place at the Methodist Church, Blyth Road, Maltby. More information by ringing Ian on Maltby 814911.

### **Biggin Hill AR Club**

The BHARC's 1983 programme includes a number of interesting meetings at the Biggin Hill Memorial Library, all starting at 8pm on the following dates: March 22nd Junk Sale, April 19th Home construction techniques, by Ian Daniels, May 10th Visit to Kent police HQ (advance bookings only), May 17th follow up to April's meeting, May 24th follow up to Kent police meeting. Pat Hawker, who writes for Amateur Radio, spoke to the club on February 15th on the subject of "Secret listeners". Intriguing. For further information, contact Ian Mitchell, G4NSD, Secretary, at 37a The Grove, Biggin Hill, Westerham, Kent.

# THE RADIO AMATEUR INVALID AND BLIND CLUB

We take a brief look at the good work carried out by the RAIBC.  
Report by Chris Drake.

Founded in 1954 by a handful of disabled amateur radio enthusiasts, the club is a self-help organisation that caters for the needs of invalids and blind people by providing a focal point for information and a network of voluntary helpers throughout the British Isles with close ties with similar groups in other countries.

Membership falls into three categories. Full membership for all disabled, invalid and blind persons; Local Representatives who pledge their help to eligible members living in their area; and Supporters who give financial support and encouragement. In all categories the annual subscription is a minimum £1.50 which covers the eight copies of the club newsletter *Radial* distributed each year, currently to approx 1200 addresses!

Recognising that disability can occur in all walks of life and that people's needs are not necessarily financial, but for friendship, advice, therapy in re-habilitation as well; the aim of RAIBC is to help the members to help themselves and a great deal of the work of the club is done by people who are themselves handicapped. The work of preparing cassettes of *Radial* for blind members is undertaken by radio amateurs who are themselves blind, and among those offering morse tuition are both blind and paraplegic members.

As well as by *Radial*, members are kept in touch by weekly 'nets' on 80 metres under the club call sign of G4IBC, any interested amateur can join in these nets when news and views on many topics are discussed. The Cheshire Homes Amateur Radio Society also has a weekly 'net' on 40 metres and there are several 'nets' on VHF throughout the country which meet regularly to keep local members in touch.

Although all help is voluntarily given and RAIBC appeals for the time and expertise of amateurs rather than for funds, many local radio clubs make annual donations as well as helping members in their area, all profits from the Worked All Britain Award scheme are given to the club, and many amateurs leave their radio equipment to RAIBC in their wills as well as making donations during their lifetime. Thus the club is able to purchase radio equipment which is then loaned to individual members until such time as they can obtain their own, or on a permanent basis in the case of those who are under financial hardship.

## Some 80 members take the RAE each year

Those qualified to do so are very ingenious in adapting equipment for special needs, and the information thus gained is invaluable in helping others to obtain in the first place the equipment most easily operated under their particular handicap and in adapting it for ease of operation. A Special Aids Representative makes a band-edge marker and an audible field strength indicator for blind members and there are many other circuits for audible meter reading etc available which local clubs and helpers can make up for their members.

Some eighty club members take the Radio Amateur Examination for a transmitting licence each year, in many cases helped in their studies by local helpers if their disability prevents them from attending courses at technical colleges.

A course of instruction on cassette is

available for blind candidates. The City & Guilds of London Institute makes special arrangements for candidates to be examined in their own homes, orally if necessary; and the morse test at 12wpm can also be conducted at home by special arrangement with the authorities.

The club is affiliated to the RSGB and close ties are maintained. The AGM usually takes place at the National Amateur Radio Exhibition where RAIBC is given a stand. The club is also given space at the Amateur Radio Retailers Association Exhibition and is represented at many of the leading rallies that take place during the year. Volunteers, led by the Rallies Manager, ensure that members get a chance to meet each other at these rallies by providing transport; and the club has its own 'Picnic' organised by the Southampton RSGB Group each year which is a very popular event.

The committee consists of Chairman, Vice Chairman, Secretary, Treasurer, Net Controller, Tapes Manager and Special Aids Rep. who all play a part in the day-to-day running of the club. Despite the increasing membership, every effort is made to preserve the 'family' atmosphere of the club which is so important to those cut off from the outside world, and to enable them to enjoy one of the few hobbies which is open to all, whatever their disability, on equal terms. As a member expressed it: "How wonderful that at last I have found an organisation that really cares for the disabled and treats them like ordinary humans!"

**If you are interested in joining the club or at least getting involved, contact Mrs Frances Woolley, Hon. Secretary, RAIBC, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey KT6 4TE.**

## THE RADIO AMATEUR INVALID AND BLIND CLUB

APPLIATED TO THE RSGB



FOUNDED 1954

MAY/JUNE, 1982  
Vol. 27, No. 2

**RADIAL**

Headquarters Address: 9 Rannoch Court, Adelaide Road, Surbiton, Surrey. KT6 4TE.

Chairman	: Bill Scarr, M.A.	G2WS
Vice Chairman	: 'Digs' Acheson	G3WJT
Secretary/Editor	: Frances Woolley	G3LWY
Treasurer	: John Carter	G3KYH
Net Controller	: John Moseley	G4EUU
Tapes Manager	: Bert Retter	G4JBG
Technical Aids	: Allen Drybrough	G8HEV

**Club Nets**  
80 metres (3750 kHz upwards)  
Cheshire Homes

- : 10 am Tuesdays SSB controlled by G4EUU (G4IBC) & 2 pm Wednesdays SSB controlled by G4HX1
- : 1.30 pm Thursdays 7080 kHz approx. SSB controlled by G4EVM
- : 145.4 MHz 10.30 am and 2.30 pm daily.

Birmingham Group : 8.00 - 9.30 pm Fridays. 5.20 - 5.22.  
Bournemouth Group : 8.30 pm Tuesdays. 5.20 - 5.24.  
S. West Scotland

\*\*\* SUNDAY 23rd MAY 1982 \*\*\*  
R.A.I.B.C. PICNIC AT THE FAIRGROUND,  
BROADLANDS ESTATE, ROMSEY, HAMPSHIRE

The Southampton R.S.G.B. Group are once again playing host to us at The Fairground by kind permission of Broadlands Estates. The entrance to the field is on the A.31 Romsey bypass between the junction with the A.3057 and the gates to the Broadlands House itself. There will be the usual attractions, and we have been given a Star Raffle Prize by our member Alistair Hairstens - the R.S.G.B. Handbooks Ed. V. Bring your contributions to the junk sale, the 'bring & buy' stall and raffle, your picnic and yourselves. There will be a Committee meeting as previously announced. Talk-in will be on 2 metres, from approx. 10.30 am. Looking forward to seeing you there.

# Q & A

We've had a fair few letters asking some technical questions – our technical department has been seen poring over textbooks and what-have-you in order to provide the answers. Fine – keep them coming and we'll do our best to provide answers which make some sort of sense and publish them in these pages.

**Q** "I've just started the RAE course and I'm confused about the difference between sound waves and radio waves. Are they the same or somehow different? Also, can you modulate a radio wave with any frequency you like?" **C.R. Lloyd, Cardiff.**

**A** Well, a sound wave is known technically as a pressure wave; it's formed by compression and rarefaction in the air, rather like the ripples on a pond when you drop a stone into it. Sound needs a medium of some sort, like air or water or brickwork or whatever, to travel in.

A radio wave is a complex interaction between an electric and a magnetic field – it's known as an electromagnetic wave, as opposed to a pressure wave – and, unlike the latter, radio waves travel quite happily in a vacuum. As regards modulation, the gospel according to messrs. Shannon and Nyquist and all sorts of other clever people is that the highest modulation frequency of a radio wave cannot be greater than one-half of the frequency of the carrier, or, in other words, if you have an RF carrier of 1MHz the highest frequency you could modulate it with would be 500kHz. Not that you'd want to modulate it with much above 5kHz most of the time, mind you, let alone 500!

**Q** "Is there much point in buying an HF receiver if you're going to go for an amateur licence? Shouldn't I buy a transceiver straight away and not use the transmitter until I get the ticket? Also, can you suggest a good HF aerial for general listening?" **J.E. Blake, Stafford.**

**A** There's certainly something to be said for buying the transceiver, for instance, isn't that you want to buy commercial gear as opposed to making something; the thing to watch is that you might become interested in something completely different after you've passed the RAE and find that an HF transceiver, for instance, isn't what you really wanted because you've suddenly become fascinated by VHF DX.

Also, you don't have to buy anything in order to get on the air – you might get a lot of fun, as well as a lot of solid practical experience, if you built something instead. Why don't you have a go at the OX receiver in our last issue, for example? Amateur radio, as someone once said, is a house of many mansions and there are many parts of it that you might want to specialise in. So don't commit yourself.

Having said that, an HF receiver is always handy for all sorts of things, which is why we tend to suggest getting hold of an AR88 or similar if you're just getting started. As for antennas, there are hundreds! Try a long length of wire down the garden to start with, or round the flat if you don't have a garden – meantime, read a book like Simple Low-Cost Wire Antennas by Bill Orr and try a few of the ideas in that. It's all part of the fun...

**Q** "Why can't Class B licences use the 70MHz band? One of the resolutions at the 1979 Conference was that a Morse test was not required for amateur use of frequencies above 30MHz, but the Home Office say that there are no plans to open 70MHz up to Class Bs. Isn't this another piece of discrimination?" **S. Cooper, Liverpool.**

**A** Unfortunately, it isn't. The snag with 70MHz is that it isn't an internationally allocated amateur band; we have it in the UK very much as a special concession from the primary users, who are the military, and the story goes that they weren't averse

to some amateurs being let loose on it so that they could see how some of the systems apparently used around those frequencies would stand up to an environment of assorted signals from all sorts of directions.

The idea of a whole new generation of amateurs, and vastly increased activity, apparently wasn't acceptable to the primary users, and to be honest we can quite see why – it is their band after all, and they make the rules. Much as we enjoy the occasional foray on Four, we're mindful that it isn't really an amateur allocation to be fought for and defended as though it were internationally allocated to the amateurs – we don't see that the refusal to let Class B people use it is the slightest reflection on them or in any way implies that they're second rate citizens.

It sounds like a reasonable way of limiting the numbers on a rather odd part of the spectrum, that's all. We assume that if we get an allocation at 50MHz there'll be no reason on the Lord's earth why Class Bs won't be given it; don't forget that what's agreed at WARC isn't the be all and end all and that the Home Office can really allocate what they like – or don't. That's why we have an experimental 50MHz allocation, which wasn't agreed at WARC at all!

**Q** "In connection with Morse in the last issue, you mentioned something called Piccolo used by the Diplomatic Wireless Service. What is it?" **L. Ross, Glenrothes.**

**A** It's a bit difficult to explain, but basically it's a teleprinter system based on 32 (or is it 36? Different books say different things) tones in the audio-frequency range. Letters are indicated by tones of different frequencies, and there are things called "quenched resonators" in the receiver which regenerate and decode them. It's a very complex system, actually, full of mathematics and words like "orthogonal" but it works exceedingly well. Apparently it produces 100 per cent copy

when even top-grade Morse operators can't detect that there's a signal there at all. You sometimes hear it in various places in the HF bands, and indeed we heard one on the 18MHz band the other week. It sounds like someone tootling away on the piccolo, which is where the system gets its name from. If anyone would like to write a readable account of how it works and leaving out all the big words, we'd love to hear from you!

**Q** "I really enjoyed the article on the AR88 and I'm thinking of buying one, but are there any other receivers like it that I could look out for?" **A.L. White, Crowthorne.**

**A** Yes, there are, and we cover one of them in this issue in the shape of the Racal. Such oldies-but-goldies as the BC348, the 19 Set, the PCR3, the CR100, the B40, any of the old Hallicrafters machines, the R1155 and the 52 Set are all worth a look, although the AR88 is probably the best of this bunch – the 75A4, PR155 and the R390 are rather higher up the social scale, as is the immortal RA17 and its later brethren. We'll run features on as many of them as we can in the months to come.

**Q** "In a recent issue you said that an electric-fire element had a high reactance, which is why it didn't take enormous currents. Surely its reactance is pretty minimal at 50Hz, and it doesn't take high currents because it's made of wire with a high resistance?" **H. Leeming, Blackburn.**

**A** Oh dear – was our face red! Quite right, sir, and we've kicked the author. He was thinking of transformers at the time and blundered on without engaging his brain. Thanks a lot for pointing out the goof – at least it shows we're human. Electric fire elements are usually made of something like Nichrome, if we remember rightly, which has a high resistivity – reactance of a coil like that at 50Hz is bound to be pretty minimal, as you so rightly say.

# Classified Ads

● **TWO ITT** Starphone single channel UHF handhelds £30, each with Ni-Cads. Mains charger for above £10. Also Video Genie with 12" monitor, books and programs, £325. G8KNC QTHR or Tel Lewes 77194 (Sussex).

● **WANTED** information on an Hallicrafters V.H.F. receiver Model S37. Any information welcomed Wegg, 23 Kerdane, Dane Park Road, Hull, HU6 9EB. Tel 855052.

● **STANDARD C58** 2 metre synthesised multimode portable £215. Standard C78 70cms synthesised FM portable £200. Matching 10watt linear CPB78 £50. Both complete scanning/mike case mobile bracket. East G410F 01-486 8286 (daytime) 01-722 7040 (evenings).

● **TRI BANDER** complete with Stoll regulator and rotator stays and feeders EX Silent Key £80 ono, collect. QTH G4NBU Winchester 69155 evenings.

● **REALISTIC DX.302** receiver coverage 10kHz to 50MHz LED digital readout six band tunable preselector quartz locked tuning AC or 12v DC, cost £289.95, as new in box £175.00. T. Norwood, 11; Keats Ave, Romford, Essex. Tel Ingrebourne 47989.

● **HAM INTERNATIONAL** Multi-mode II USB, LSB, AM, FM excellent condition £140 ono. Antenna Hi-Gain 473 CLR Mk II OHNI-directional £20, 3-range power-SWR-modulation % meter £20, 9 metres RG58 Coaxial cable £7. J. Hunter, 22 King Street, Armadale, West Lothian. Tel 0501 30030.

● **ICOM IC202S** £110. Standard C78 70CM portable, with mobile whip, carrying case, mobile mount and ni-cads, £150. G. Braund, 17 Ye Meads House, Marsh Lane, Taplow, Maidenhead, Berks.

● **HW100, HUSKY** Home-Brew PSU MIC, spare valves and manual working needs only slight attention to bring up to mark, hence only £95, (buyer collects) G3LXB QTH R. S.W. Jones, 43 New Street, Chase Terrace, Walsall, Staffs.

● **FOR SALE** Sony radio ICF 6800 W FM AM multi-band receiver new 10.1.82, cost £367 accept £230, buyer collect. Mr W. Flatt, Thurlow, Suffolk. Rink Thurlow 544 evenings.

● **WANTED** urgently trade or private SWR/power meter for 934MHZ. Phone Ipswich 830147.

● **HAM INTERNATIONAL** Jumbo 480 channels and Yagi 3 element beam with rotor and control unit plus coax all is 5 months old, all boxed, excellent condition, offers over £275. Tel: Tatsfield 384.

● **FANTASTIC** Gen/Cov receiver: 150kHz-30mHz SSB/CW/AM. Realistic DX100L. Superb reception of amateur broadcast bands: 5 months old. Sensitive meter, coarse/fine tune, external antenna socket, plus onboard telescopic whip. Absolute giveaway: £120 onno. Reason??? New G4/Ticket. Tel (0670) 816078.

● **FOR SALE:** Complete RAE correspondence course £25. F. Bull, 50 Woodlesford Crescent, Moor End Road, Halifax HX2 0RB. Phone 0422 53979.

● **YAESU FR50B** amateur band receiver 10-80 metres instruction manual. Good condition room wanted, ideal for SWL £30 plus carriage or collect. Ring Southampton 883403.

● **HALLICRAFTERS SX100** communications receiver, good working order new valves £75. Phone evenings Glous. 728985 daytime Glous. 500408.

● **SWOP MY IC2E** handheld 2 metre transceiver 2 battery packs charger full 10meg coverage for synthesised airband receiver or digital H.F. gen/cover receiver or W.H.Y. K. Wyeth, 10 Old Palace Road, Weybridge, Surrey, KT13 8PO.

● **EDDYSTONE** receiver required by old timer, short wave listener, or what have you. Current price will be paid. Tel: 051 489 3131.

● **CPR 62ABD** slotted line 12cm slot. Connectors, extension couplers, 12 pieces, offers or exchange VCR139 Type Cat or frequency counter module or W.H.Y. Critchley, 16 Finch Mill Avenue, Appley Bridge, Wigan, WN6 9DF.

● **DATONG FL1** freq agile audio filter, new with bty leads, instructions £50. Datong speech processor £20 or swap both for good ATU like FC301 or ST3 or similar. 0202 579115 anytime.

● **SUPER STAR 2000 CW LSB** USB AM FM excellent condition ideal mobile and home base. With frequency counter, only

● **G3RHT DE** surplus 2 metres equipment. Power packs 600-500V. Transmitter QQV06-40 output 80 watts. Modulator 2 x 807 80 watts. Plus sockets meters. GEC 2 metres transmitter QQV06-40 output with circuit no valves. Best offer for above. L.S. Ellsmore, 9 Barston Road, Warley, West Midlands B680PT.

● **HEATHKIT 1680** amateur band communications receiver and speaker very good condition. £75 ono or exchange for ATU. Mr B.J. Radford, Ryecroft, 9 New Road, Bolehill, Derby, Wirksworth 2866.

● **MARCONI HR71** receiver 3 MCS to 25 MCS in four bands. New original manual. Valve set weighing 6cwt. Best offer by March 14. Phone evening or weekend to Ray Knutsford (0565) 54362.

● **WANTED:** KW2000B clean in good working condition. P.Y.E Hamble PM125/12 good clean working condition. Mr O. Gunnill, 6 Lawnswood Grove, Elton, Chester CH24PB. Tel (Works) Warrington, 6500.

● **RACAL RA63H** SSB adaptor for RA17/RA117, £65. RA137A LF (10kHz-90kHz) adaptor for RA17/RA117 £70. Creed 7B teleprinter £5. Monochrome camera with F1.6 lens suitable for amateur television £85. Carriage extra on all items. Mr S.J. Haseldine G8EBM, Leamington Hovie, Windley Lane, Weston Underwood, Derbys. 033 528 (Brailsford) 755.

● **NO19 TRANCEIVER** P.S.U. ATU. Two sets working £50 each. TVDX station H. Cocks Varicap tuner £20. Fuba UHF Beam £20. B1.111, 1V/V antennas beaks dipoles also HF5 5 band vericle £20. Wanted VDU, QRP rig, 70cm transverter. Syd Thompson, 15 Carman Walk, Crawley, W Sussex. 0293-515711.

● **YAESU FRG7** with fine tuner £135. Sony CRF 160 £95. Hallicrafters SX110 £80, SX43 offers. Sony 5090 general coverage plus airband, BFO £90. Grundig Satellite with BFO £90, wanted Sony 6800. Tel York (0904) 59035.

● **EDDYSTONE EC10** 550 Kc/s to 30 Mc/s communications receiver, battery or mains operation - excellent £65, also Sinclair ZX81 with 16K Ram - £60. Microwave modules 2 metre converter 4-6Mc/s output £10. Phone evenings / weekend Sheffield 488564.

● **WANTED** 4 metre antenna. Linear amplifier also 6 metre transceiver. Phone 01-856-4123.

● **WANTED:** 3.5 and 7Mc/s crystals C W end also Raymart type 140 VAR condensers (2) type that can be ganged. Mr. J.W. MacKay (G2BYP), 11 Lansdowne Grove, Hillcrest, Whitehaven, Cumbria. Tel: 0946 4910.

● **TRIO 9000** £220. 8 element Quagi £20. Rotator £15. 70cm converter £10. Mobile safety microphone headset £15. Contact Steve G6CVZ. Walsall 612451.

● **COLT EXCALIBUR** home base 240 volts 4 bands. AM FM BSB-LSB plus Bremi 200 linear £320 ono. Mr N. McAllister, 36 Kinneff Crescent, Dundee, Scotland. Tel (0382) 815173.

● **YAESU** general coverage communications receiver FRG-7 0.5MHz thru 29.9MHz with 10kHz readout. As new little used for sal £100. Telephone Boston 0205 61952 QTHR G6 JUC.

● **WANTED:** Morse training cassette course and Tony Hancock cassettes, half hour radio and television shows including the Radio Ham etc. Write 10, Rolleston Road, Blackburn, Lancashire, BB2 6SX.

● **EXCHANGE** two RCA 813 valves with ceramic bases for reasonable comm. receiver AR88 etc. A.J. Reynolds, 139 Collenswood Road, Stevenage, Herts SG2 9HB. Stevenage 55325.

● **WANTED:** Circuit diagram or servicing data for Geloso G209 communications receiver. S. Moring, White's Cottage, Tawney Common, Epping, Essex. Tel 037882-3488.

● **ICOM 720A** all band transceiver and PS20 power supply with built in speaker. One year old in mint condition. Boxed, £750 ono. Phone 01 579 0728, Mr Berry.

● **NATO 2000 CB** radio USB LSB AM FM £130ono. Also - Bremi BRL200 linear amplifier £70 ono. Genuine reason for sale. Phone after 6.00pm 969 5357, Cheshire.

● **SENTINEL-X 2** metre converter, converts 144/6mHz to 28/30mHz. Built in PSU for mains/battery operation. Bought in October '82. Complete with leads, plugs etc. £18. Telephone Oxford 66075.

● **FOR SALE** or exchange Belcom LS10ZL transceiver. Exchange for FRG7700. For sale: ICOM ZZA 2 metre VHF transceiver, £80. Also, Motorola SWR power MOD meter 13 volt in antenna tuning unit for 26-27-28 MHz £25. M. Hilton, 30 Batford Road, Harpenden, Herts. Tel. 64349 Harpenden.

● **WANTED** for cash 720A ICOM with ATU etc. Dealers quotes welcome. Offers to M. Edwards, c/o Salammbô, Vilamoura Marina. Loule 8100 Portugal or Phone London 640-3597 after 6pm.

● **SWAP** Old valve plus battery radio, Pye Cambridge MW LW, needs slight attention. Aerial in the lid over 25 years old. Swap for old valve communications receiver. Total value £35. Must go in very good condition. David Haigh, 3 Brora Close, Lakes Estate, Bletchley. Tel: Milton Keynes Mk2 3MD.

● **HAVE CHINON CE-4** camera 100-CB flash PW540 power winder Prinzflex tele-macro lens 70-162mm carrying case £150 ono or will exchange for good RX FRG7 R600 or similar. S. Lee, 310 Brighton Road, Shoreham-by-Sea, Sussex. Tel: 64623.

● **WANTED** Pye Bantam low band VHF AM hand held two way radio or similar must be standard not modified, plus Bantam service manual. Alan Roy Batho, 28, Ancaster Court, Scunthorpe, South Humberside. Tel: Scunthorpe 845735.

● **YAESU FT 707, FP707, FC707.** Not used mobile mic. Instruction book, any trial. £540 for good value, Tel: David on 0235-20230.

● **COLLINS R390** Receiver 0.5 – 32 MHz. Very good working order £575 ovno. Delivery negotiable. Darlington CO3257 67068. Full circuit and maintenance manual available. T. D. Grantham, 1 Rossway, Barmpton Park, Darlington. Tel: 0325 67068.

● **EXCHANGE NEC-500** B.W. portable TV (5 inch screen) with built-in 2 band radio. Runs on battery/mains and cigarette lighter in car – for a good HF transceiver, will add a bit of money if the radio is a smart one. Tel: Malvern 64327.

● **FOR SALE:** National Panasonic 32 band synthesised double superhet RX. Type RF3100 FM 88-108MHz LW MW plus 29 SW bands 1.6-30MHz. BFO wide/narrow selectivity. Digital readout. Portable battery/mains still under guarantee, £150. GM3TBV. Tel: 0250-2520.

● **SELLING PANASONIC DR26** FM (88-108MHz) LW MW SW (1.6-18.6MHz) receiver. Double superheterodyne, digital display, tape in/out, BFO, mains/battery. 180 countries received. £65. Will pay carriage. Original packing. Mark Cooper, 33 Park View, Royston, Barnsley, South Yorks.

● **FOR SALE:** DX200 communications receiver, mint condition, manual supplied with receiver, immaculate bargain at £125 ono. Mohammed Mehta, 32 Blenheim Road, Gloucester GL1 4ER.

● **FT1012D** Mk1 fitted fan c/w filter absolute mint £400, prefer buyer inspect/collect. IC2E charging adaptor 2 nicads car charging adaptor £135. Again mint. FL3 Datong audio filter hardly used £100. Tel 0242-23042 Ron Smith G4LZY Cheltenham.

**TRIO R.600** communications receiver £150. Datong FL.2 audio filter £45. Datong AD.370 outdoor acting antenna including mains PSU £45 (unused), all items mint, boxed. Phone How Caple 205 (Hereford) evenings.

● **NORDEMEHDE** world radio SSB etc. Mains battery portable £125. SRG two meter 12 volt Monitor £30. Phone Bradford 676556 after 6.

● **YAESU FT75** 80-10m transceiver, mains PSU, 12v PSU, FV-50 13 VFO, manuals. Tel 01-317-9200. Weekends only £100. W.H.Y.?

● **FOR SALE** 2 Robot 400 SSTV PCB's with manuals etc. £50 each. Microwave Associates 10GHz Gunnplexer transceiver £90ono. Ring 0453-83-3411 or 0453-45461 evenings/weekends.

● **DISPOSAL** near int Hallicrafters S36A 240v 50Hz with handbook also clean "AS IS" Hallicrafter S27 240v 50Hz, no mods either, offers or swap Bolex STD 8 cine gear. W.H.Y.? Hounslow, Npton 64583 anytime.

● **FOR SALE** Yaesu FT207R mobile/home 2M rig, Microwave modules 25w linear, car power unit, Nicad charger, extension MIC, mag mount and aerial, carry case and mobile aerial, instruction manual, ideal set up for 2M mobile use. Bargain at £180 reducing £5 per week after 4/3/83. Phone Leeds 507453.

**Amateur Equipment** bought and sold, cash waiting. Contact G3RCQ, Hornchurch 55733 evenings.

**List-A-Rig.** A service offered by G3RCQ Electronics to introduce buyers and sellers of used amateur equipment. Buying? It's free, just send an s.a.e. Selling/wanted? Send s.a.e. for details on how to join the fast-growing list. List-A-Rig is sent and updated daily; no waiting, no deadlines. — **List-A-Rig (AR)**, 65 Cecil Avenue, Hornchurch, Essex RM11 2NA.

## FREE ADS: Sell your radio equipment and spares for profit!

# AMATEUR RADIO Classified Order Form

Copy Deadline for Advertisements:  
March 7th

The Advertisement Manager reserves the right to alter, reject or suspend an advertisement without assigning any reason. Advertisements are accepted subject to approval of copy and to the right of the Advertisement Manager to alter, reject or cancel any order or part of order without explanation. The Proprietors are not liable for any loss from any cause whatever, nor do they accept liability for printers errors. The Advertisement shall indemnify the Publishers in respect of any claim, costs and expenses arising out of any libellous or malicious matter or untrue statement in any advertisement published for the advertisers, or any infringement of copyright, patent or design therein. The placing of any order will be deemed to be an acceptance of these conditions.

Name.....

Address.....

Tel:.....

To: Amateur Radio,  
Classified Dept,  
27 Murdock Road, Bicester, Oxon.


Don't forget – the April issue of Amateur Radio  
appears on March 24th, 1983

● **INSURANCE** for amateurs. Policies effected with leading and old-established insurer. For quotes to compare our cover and premiums write to Pat Urquhart, 7 Padwell Lane, Bushby, Leicester or Ring G4DR 0533-412138.

● **TRIO TR2400** FM handheld and soft-case SC1 £125. TRS-80 microcomputer, 16K level 2, VDU and cassette, some software £165 ono. 061-320-7136.

● **WANTED** desperately, handbook by RCA for AR88D receiver your price paid for clean copy. Phone or write to Eddie, 23 Priory Terrace, London NW6. Phone 01 624 2546.

● **WANTED:** Trio JR310 with SSB filter any condition. I used to service AR88D receivers anyone want any info. Mr W. Handy, 105 Humber Avenue, Coventry, CV1 2AU. Tel: 0203-22201.

● **FTDX560** transceiver 80-10M 10mHz RX, 2 auxiliary bands (can add WARC), just serviced, 560W input. £235ono (carriage at cost). R.K. Bowles GM4KAV 37 Albany Terrace, Dundee DD3 6MS. Tel (0382) 24362 evenings.

● **PYE AUTO/REVERSE** car/stereo cassette. Pye car/stereo radio cassette. Pye stereo cassette. Philips Auto radio. Philips cassette car/radio stereo. Exchange for Hallicrafters SX28 Hammarlund SP600 or similar. W.T. Millington, 26 South End, Hogsthorpe, Skegness. Tel: Skegness 0754 73329.

● **SALE FT.707** Yaesu £370 or will P.X. for good receiver or VHF equipment. Tel Derby 372696, Mr Ian Hatton.

● **WANTED** Ten TEC Century 21 CW transceiver, also any type of transmitter. Large table top types for CW, any condition. G3YRQ Ian Parkinson, 207 Hurst Street, Leigh, Lancashire. Tel: (0942) 679948.

● **YAESU FRG7000** digital communications receiver 0.5-30mHz little used and immaculate £200 also Eddystone EB35 transistor communication receiver requires repair £35. 19, Central Drive, Bramhall, Cheshire. Telephone 061-439-9637.

● **YAESU FRG7700** communications receiver AM&FM LSB, USB, CW 0-30mHz, FRT7700 ATU, Datong 2m converter, m/m 70cms converter, Datong AD 270 active antenna, 2m antenna, wideband preamp, antenna switch, headphones £295. Tel: Rilla-Mill 62668 (Cornwall).

● **TRIO TR2400** 2m FM handset for sale. 1½w output fully synthesised with spare nicads, soft leather case, charger and speaker-mic. Still boxed and in as-new condition. £150ono. Telephone Ron G6JCN on Hartlepool 0429-76840.

● **YAESU FC707** still guaranteed £75ono. Yaesu YD148 desk mic still guaranteed, £15ono or will swap both for multimode 2 meter rig, also 2 meter Cambridge £50 ono. M.J. Smith, 62 Feltree Close, Ford Estate, Birkenhead, Merseyside. Tel 051-653-7170.

● **MULTIMODE** Nato 2000 rig. High, low, super low, and FCC channels plus FM. UK (legal) all bands USB, LSB, AM, FM or CW. Weeks old. Tel: Horley 4115 (After 6pm). £150 ono.

● **WANTED MULTIMODE** 10-11 Metre transceiver, preferably 26-30 megs with freq. readout. Also HF 10 metre beam, or high gain vertical 10 metre antenna. Mr M Thomas, Delaville, 42 Wyndham Road, Abergavenny. Tel: (0873) 7141.

● **EXCHANGE 12 BORE** Savage Repeater Shotgun for 2 metre transceiver mobile or portable handheld ECT. Licence holders only! Tel: Aylesbury 86916 After 6pm.

● **RACAL RA17L** 0.5-30mHz grade 1 RX.C/w matching 19" cabinet £260. K.W. Viceroy 80-10m TX. C/w P.S.U. and manual £30. SMC. SP4. Speech processor £40. Morse key (ex naval) £25. Ring Alan (G4PSU) Abingdon (0235) 23034 after 6pm.

● **DATONG DC144128** high performance 2m converter £20 MM 70cm converter 28mHz 1F £15. 144mHz circularly polarised crossed dipoles £5. Cast gutter mount with coax assembly £5. Ring Alan (G4PSU) Abingdon (0235) 23034 after 6am.

● **WANTED:** Non working receiver or transceiver or ancillary equipment to aid me in my Ham and electronics course must be cheap will collect. John S. Devanney, 14 Wellgate, Conisbrough, Doncaster, Yorkshire. Tel: Rotherham 867730.

● **HAM INTERNATIONAL** Concord II as new. £90. Wanted. Good quality receiver prefer older valve type. AR88 or similar. Something to build on. W.H.Y. Phone 02-9922-279 (Clows Top, Worcs).

● **WANTED 2M RECEIVER** by new listener, example SR9. Must be cheap as unemployed. Contact Malcolm on Middlesbrough 597308. (0642).

● **COBRA 148GTL DX** Four element beam, rotator CO-AX and cable £190 ono or will separate. Ian Crosby, 80 Burrwood Drive, Adswold, Stockport. Tel: 061 4566314.

● **EDDYSTONE EC 958** professional class receiver 10KHz-30MHz. £425. Marconi M2301 (880/2) .5-30MHz 30 bands. £235. CR91 (AR88) rx. £60. Hugh Cocks DX TV upconverter, built in psu. £28. Jaybeam 14 ele Parabeam, new condx. £35. G4AFY QTHR, Tel: Kidderminster (0562) 753358.

● **FOR SALE** Ham International multimode II £100. Tel: David Hewson, Sittingbourne 72091.

● **DX160** communication receiver property of deceased SWL £60 onon apply H.C. Hemmens GW4KUS 3 Gorseinon Road, Penllergaer, Swansea. Tel (0792) 892165.

● **FOR SALE** Hi Gain V 120 Channel AM FM SSB easily converted to 10m, Zetagi BV131 200w linear mint condition, SWR Matcher and FS metre. 10 or 11 metre Ariel (half wave) 15m of RG58 connectors and plugs. Possible exchange for 2m multimode transceiver or general coverage receivers. M. Maynereid, C/O Salter Bros, Folly Bridge, Oxford.

● **WANTED** Hammerlund Triple Conversion general coverage receiver HQ180A. Good price for clean working model.

# Amateur RADIO

## ... on subscription

Make sure of your copies of Amateur Radio. Order 12 issues for the basic price of £10.80 — no extra charges

Just complete the coupon and send it, with a cheque or postal order for £10.80 (£16.80 surface mail outside UK) to: Amateur Radio Subscriptions, 27 Murdock Road, Bicester, Oxon OX6 7RG.

Please send me Amateur Radio magazine for one year. I enclose a postal order/cheque made out to Goodhead Publications Ltd., in the sum of £10.80 (£16.80 surface mail outside UK). Please write clearly.

Name .....

Address .....

.....

# Advertisement List

<i>Bredhurst Electronics</i> .....	2
<i>Wood and Douglas</i> .....	9
<i>Radio and Electronics World</i> .....	22
<b>South Midlands</b>	
<i>Communications Ltd</i> .....	32/33
<i>Dewsbury Electronics</i> .....	37
<i>Photo Acoustics Ltd</i> .....	37
<i>Telecomms, Portsmouth</i> .....	42
<i>Microwave Modules Ltd</i> .....	50
<i>Thanet Electronics</i> .....	60/61
<i>Waters and Stanton Electronics</i> ...	62
<i>ICS School of Electronics</i> .....	63
<i>Telecom, Barnsley</i> .....	63
<i>The CQ Centre</i> .....	63
<i>Reg Wood &amp; Co Ltd</i> .....	63
<i>Myers Electronic Devices</i> .....	73
<i>Goodhead Publications Ltd</i> .....	73
<i>RAS Nottingham Ltd</i> .....	74
<i>Garex Electronics</i> .....	74
<i>Davtrend Ltd</i> .....	74
<i>Holdings Photo Audio Centre</i> ....	74
<i>Arrow</i> .....	75
<i>OCT</i> .....	76



Now turn to page 71 for your opportunity to include a free private classified ad in the next issue of Amateur Radio!



It pays to advertise in  
**AMATEUR RADIO**

## TRADE ANNOUNCEMENT

A major company dealing only with the trade has recently negotiated the sole U.K. Rights to an established range of Amateur Transceivers and will be initiating a new marketing policy involving a **National Dealership Network** offering:

- Products at a realistic price
- Units to cover all Amateur Bands
- Full service and technical back up
- A Nationally co-ordinated advertising campaign
- Full range of branded accessories

*If you want a dealership don't hesitate, write to*

**P.O. Box AR001**

**Goodhead Publications**  
27 Murdock Rd, Bicester, Oxon.

(All enquiries will be treated as Private and Confidential)

## NEW AMATEUR SUPPLIES

**A VERSATILE BENCH POWER SUPPLY.** Contains a high quality transformer made to a high quality special occasions. Gives a 20V 3amp D.C. output. Also a 20V - 0 - 120V 3amp D.C. Output. 110-250 uC/s. Bridge rectification. Contained on robust metal chassis with metal cover. Size approx. 7" x 5" x 4". Easily modified to give 50V and 80V output. Makes an ideal variable power supply. Originally costs £60. Our price, as new with circuit £8.50 carriage £3.00. 2 units £20 carriage free.

**HOW TO MAKE 2M AND 4M CONVERTERS FOR AMATEUR USE.** Fully comprehensive. Contains circuits, layouts, component lists, diagrams, and fully instructional notes. Ideal for the beginner or licenced amateur. Price £2.50 inc. postage.

**LIGHTWEIGHT HEADSETS.** (Govt release). Brand new 600 ohms impedance. A bargain at £3.50 p.p. £1. 2 pairs for £7 post free.

**CAPACITORS FOR THE AMATEUR TRANSMITTER.** Bisconol high voltage caps. 0.25 mfd. WAK. Brand new size approx. 7" x 2" dia. Ideal for transmitting and linear amplifiers. Useful for high voltage power supplies. Normally over £20 each. Our price brand new £3.75 postage £1. 2 for £8.00 post free.

**GENUINE AFV TANK HEADSETS AND MIKE.** £3.50 per pair. p.p. £1. 2 pairs £7 post free. All headphones fitted with EX-ministry plug. Standard jack plugs available 25p each. 2 for 40p. Headphone extension sockets available at 25p each. 2 for 40p. Impedance of first two items 600ohms. All headphones in good condition.

### SCOOP PURCHASE

**PYE POCKET PHONE RECEIVERS.** Type PF1 normal freq. 450 mHz. Supplied in used condition less battery. £4.50 each. Carriage £1. 2 pairs £9.00 post free. 4 pairs £16.00 post free.

**THE GOVT. SURPLUS WIRELESS EQUIPMENT HANDBOOK.** Gives detailed information and circuit diagrams for British and American Government Surplus Receivers, Transmitters and Test Equipment etc. Also suggested modification details and improvements for Surplus equipment. Incorporated is a Surplus/Commercial cross referenced valve and transistor guide. The standard reference work in this field. Only £7.50 p.p. £1.50. No VAT on books.

**New release of MODERN DYNAMIC MOVING COIL MICROPHONES.** 200 ohms impedance, Switch incorporating. Mostly with lead and DIN plug. Used but in nice condition. 3 designs of case housing. Price one mike our choice £2 plus 50p p.p. Bargain offer all 3 mikes £4.50 p.p. £1.

**GENUINE EX-GOVT COLLAPSIBLE AERIALS.** A fully adjustable highly efficient whip aerial in 5 sections. Length 1½ metres. Closed 300m/m. Copper plated sections. As used on Ex Govt Manpacks. Brand new in makers boxes £2.50 each p.p. 75p. 2 for £5 post free.

**TRANSFORMERS.** 17V - 0 - 17V 3amp transformers means output high quality. Limited stock price £2.95 postage 50p. 2 transformers for £5.50 post free.

**HAVE YOU SEEN THE GREEN CAT.** 1000x of new components, radio, electronic, audio at unbelievably low prices. Send 50p and receive catalogue and **FREE RECORD SPEED INDICATOR.**

PLEASE ADD 15% VAT to all orders including carriage and p.p.

*Myers Electronic Devices*

Dept AR2 12/14 Harper Street, Leeds LS2 7EA. Leeds 452045.  
New retail premises at above address (opposite Corals). Callers welcome 9 to 5 Mon. to Sat. Sunday 10 to 1 by appointment. Govt. surplus items always in stock.

# R.A.S. (NOTTINGHAM)

G8UUS

Radio Amateur Supplies

Tel: 0602 280267

Visit your Local Emporium

Large Selection of New/Used Equipment on Show.

AGENTS FOR:

F.D.K.  
AZDEN  
ICOM  
YAESU  
SOMMERKAMP  
FORTOP ATV

ACCESSORIES:

Welz Range  
Microwave Modules.  
Adonis Mics.  
Mutek Pre-Amps.  
Packer Communications.

AERIALS: Tonna, Halbar, New Diamond Range of Mobile Whips.

PLUS OWN

"Special" Q.R.P. GW5 HF 5 Band Beams.



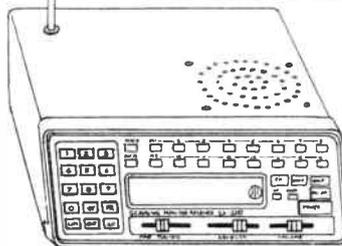
JUST GIVE US A RING



3 Farndon Green, Wollaton Park, Off Ring Road between A52 (Derby Rd) & A609 (Ilkeston Rd).

## GAREX (G3ZV1) SX200-N

THE ULTIMATE SCANNER



COMPARE THESE FEATURES

- \* SPECIALLY DESIGNED FOR EUROPEAN MARKET
  - \* MICROPROCESSOR CONTROLLED 32,000 CHANNELS
  - \* AM AND FM ALL BANDS
  - \* WIDER COVERAGE: 26-58, 58-88, 108-180, 380-514MHz; includes 10m, 4m, 2m and 70cm Amateur Bands
  - \* 5kHz and 12.5kHz FREQUENCY INCREMENTS
  - \* 16 MEMORY CHANNELS WITH DIRECT ACCESS
  - \* 2-SPEED SCAN/SCAN DELAY CONTROL
  - \* 2-SPEED SEARCH UP AND DOWN
  - \* SEARCH BETWEEN PRESET LIMITS UP AND DOWN
  - \* 3 SQUELCH MODES inc CARRIER AND AUDIO
  - \* RELAY OUTPUT FOR Aux CONTROL
  - \* INTERNAL SPEAKER
  - \* EXTERNAL SPEAKER AND TAPE OUTPUTS
  - \* LARGE GREEN DIGITRON DISPLAY BRIGHT/DIM
  - \* AM-PM CLOCK DISPLAY
  - \* 12V DC, 230V AC OPERATION
  - \* 12 MONTH WARRANTY FACTORY-BACKED SPARES AND 'KNOW-HOW' AND THE ALL-IMPORTANT PRE-DELIVERY CHECK BY GAREX, THE MAIN SERVICE AND SALES AGENTS. £299.00 inc VAT Delivered
  - ★ NEW ★ ★ REVCON ★ ★ NEW ★
- A new top quality 16-element, all British made, VHF/UHF broadband fixed station aerial from Revco. Ideally suited to SX200 and other VHF/UHF Receivers.  
PRICE £24.95 inc

MAIN DISTRIBUTORS OF REVCO AERIALS & SPECIAL PRODUCTS  
(trade enquiries welcome)

PRICES INCLUDE UK P&P and 15% VAT

GAREX ELECTRONICS

7 NORVIC ROAD, MARSWORTH, TRING, HERTS HP23 4LS  
Phone 0296 668684 (Callers by appointment only)



### AMATEUR RADIO PRODUCTS

#### POWER SUPPLIES



All fully protected, including over voltage crowbar circuit. Can you afford to buy a cheaper power supply?

4 Amp PSU £30.75

+ £1.50 carr

6 Amp PSU £49.00

+ £2.50 carr

12 Amp PSU £74.00

+ £2.50 carr

24 Amp PSU £105.00

£3.50 carr

#### VHF WAVEMETER



The 'DRAE' morse tutor, a self contained unit for learning morse  
£49.00 + £1.00 carr

#### MORSE TUTOR



VHF Wavemeter designed to meet the Home Office requirements for amateur VHF operation.  
£27.50, Carr free.

#### OTHER PRODUCTS

24v to 12v 6amp switch mode converter  
24v to 12v 10amp switch mode converter  
custom built linear and switch mode power supplies

Please phone for further details

ALL PRICES INCLUDE VAT  
ACCESS CARDS ACCEPTED

Davtrend Ltd.  
89 Kimbolton Road  
PORTSMOUTH  
Hampshire PO3 6DA.  
Ports. (0705) 816237

## THE YAESU EXPERTS G3LLL AT WORK



Referred to recently by one magazine editor as the U.K. leading expert on FT101s. Let us repair your rig.

CAN'T AFFORD A NEW RIG? We will overhaul your FT101, fit double balanced mixer and R.F. processor, and make it better than new.

D.I.Y.? DOUBLE BALANCED MIXER MODULE. Cuts down cross modulation and noise on receive, vastly improves 40m after dark; very simple to fit for FT101 Mk2 - E £12 p&p. For FT101 Mk1 £12.50 uses Plessey high level mixer I/C. S.A.E. leaflet.

G3LLL FT101 RF SPEECH PROCESSOR. Still widely held as best RF speech processor ever. Only for FT101 Mk1, Mk2, B & EE. More RX gain and selectivity plus super harmonic distortion, free speech processing on transmit - over 1000 sold in U.S.A. £35.75 post paid. Or painted circuit only wired and tested (you supply box wiring pot and switch) £26 post paid S.A.E. circuit and full details. FT101 Mk1 - E AGC improvement kit, £1 plus S.A.E.

YAESU ON DEM. FT101, FT102, FT208, FT708, FT290, FT230, FRG7, FRG7700 etc. plus FDK, Datong, J Beam, Welz, S.M.C. A.R.R.L. and R.S.G.B. books, all the best on show. *Securicor Delivery.*

10MHz, 18MHz, 24MHz with FT101Mk1 - E? S.A.E. for leaflet.  
CW FILTERS, 250Hz ultra sharp FT101, FT901, FT707, FT101ZD, £25 post paid.

#### FREQUENCY COUNTERS.

Soar FCB45 - see review in Jan. 83 Practical Wireless ±3ppm 1Hz resolution 2MHz. 100Hz @ 160MHz looks professional and functions accordingly. £67 p&p with batteries, £72 with mains unit post paid. Also Ramsey B½ digit 600MHz counters, £99 with mains unit. S.A.E. enquiries.



VALVES FOR YAESU (only these types stocked). The wrong make of PA valves can give noise on receive, spurious outputs, impossible neutralization or even smoke! 6JS6C Toshiba £35 pair, NEC £17 pair, unstamp O.K. 101 £13 pair. 12BY7A Toshiba £15 each, NEC £3 each. 6146B General Electric £19 pair, £28 matched triplets. 6KD6 NEC £17 pair, Toshiba £35 pair. Post 75p an order. *Special offer 6146B O.K. but noisy in Yaesu £4.25 each post paid.*

Barclaycard, Access, Cheque, Cash!

## HOLDINGS PHOTO AUDIO CENTRE

39/41 Mincing Lane, Blackburn BB2 2AF

Tel: (0254) 59595.

Closed Thursday.

# ARROW

7 Coptfold Road, Brentwood, Essex CM14 4BN

Tel: 0277 226470 or 219435 Ansafone on 219435 Telex: 995801 (REF: A5)

Give us a ring  
Tel: 0277-226470 or  
219435

ACCESS • VISA • INSTANT HP • TWO YEARS' WARRANTY  
• BEST TRADE-IN PRICES

## YAESU

FT 77	New model	P.O.A.
FT 700	New model	P.O.A.
FT 675	New model	P.O.A.
FT 980	New model	P.O.A.
FT 730	New model	269.00
FC 102	ATU	209.00
SP 102	Speaker	65.00
FT 102	160-10M 9-Band Transceiver	785.00
FT ONE	Gen. Coverage Transceiver	1349.00
FT 790R	70cm all-mode portable	325.00
FT 101ZDFM	160-10m 9-Band Transceiver	665.00
DCT 101Z	DC Adaptor	42.50
FV 101Z	Remote vfo	112.00
FV 101DM		239.00
FT 9020M	9-Band AM/FM Transceiver	P.O.A.
FC 902	9-Band atu, swr/pwr etc	135.00
FTV 901R	Transverter fitted 2m module	285.00
430 TV	70cm module for above	185.00
144 TV	2m module for Transverter	100.00
70 TV	4m module for Transverter	80.00
FV 901DM	Remote vfo for 901	260.00
SP 901	External speaker	31.00
FL 2100Z	9-Band 1200W linear	445.00
FT 107	with FP 107	740.00
FT 707	8-Band solid state 100W	569.00
FT 707S		399.00
FP 707	230 volts AC power supply	125.00
FC 707	Aerial tuner	85.00
MMB 2	Mobile mounting bracket	16.00
FRG 7	0.5-30MHz receiver	189.00
FRG 7700	SSB/AM/FM recvr.	335.00
MEM 7700	Memory unit for above	89.00
FRV 7700A	118-150MHz Converter	69.75
FRV 7700B	50-60MHz & 118-150MHz	75.50
FRV 7700C	140-170MHz	65.95
FRV 7700D	70-80MHz & 118-150MHz	72.45
FRV 7700E	140-160MHz & 118-130MHz	71.30
FRV 7700F	150-160MHz, 118-130MHz & 170-180MHz	71.30
FRT 7700	Receiver aerial tuner	37.85
FT 480R	2m all-mode transceiver	365.00
FP 80A	230V AC power supply	63.00
FT 780R	70cm all-mode UK rpt. shift.	399.00
FT 290R	2m all-mode portable	265.00
NC 11C	AC charger	8.00
MMB 11	Mobile mounting bracket	22.25
FT 208R	2m synthesized portable FM	199.00
NC 9C	AC charger	8.00
FT 708R	70cm hand held	209.00
FT 230R	2m FM mobile	219.00

All Yaesu accessories available - mostly ex stock.

## TRIO-KENWOOD

TR 7930	2m XCVR	NEW	P.O.A.
R 2000	Receiver	NEW	P.O.A.
TR 3500	70cm Handy	NEW	P.O.A.
TS 930S	Gen. coverage transceiver		1149.00
TS 430S	HF Transceiver	NEW	690.00
TR 9130	2M All-mode		411.00
TR 2500	2m FM synthesised handheld		207.00
DM 801	Dip meter		60.00
R 600	Gen. coverage receiver		

All Trio-Kenwood accessories available.

## SOMMERKAMP

TS 280FM	2m Mobile 50W FM	189.00
FT 78	HF Transceiver	399.00
FT 9020M	HF Transceiver	799.00
FT 102FM	HF Transceiver	799.00

## ROTATORS

KR 250	Kenpro Lightweight 1-1/2" mast	44.95
9502B	Colorotor (Med. VHF)	55.00
KR 400RC	Kenpro - inc. lower clamps	129.00
KR 600RC	Kenpro - inc. lower clamps	P.O.A.

## ICOM

IC 740	Multimode H.F. transceiver	699.00
IC 720A	HF transceiver and gen. cov. rec.	799.00
IC 730	HF mobile transceiver 8-band	586.00
ICR 70	Multimode receiver	NEW 469.00
PS 15	Power supply for 720A	99.00
IC 251E	2m multimode base station	499.00
IC 25E	2m synth compact 25W mobile	259.00

IC 290H	2m multimode mobile 25W	P.O.A.
IC 2E	2m FM synthesised handheld	169.00
IC 4E	70cm handheld	199.00
ICL1/2/3	Soft cases	3.50
IC HM9	Speaker/microphone	12.00
IC CP1	Car charging lead	3.20
IC BP2	6V Nicad pack for IC 2E	22.00
IC BP3	9V Nicad pack for IC 2E	17.70
IC BP4	Empty case for 6 X AA Nicads	5.80
IC BP5	11-5V Nicad pack for IC 2E	30.50
IC DC1	12V adaptor pack for IC 2E	8.40

## TRIO

CI 303G	Communication scope	170.00
PF 810	Power/SWR meter	85.00

Catalogue of Trio instruments send SAE.

## TONNA

20117	2m 17 element	35.19
20505	50MHz 5 ele.	31.74
20104	2m 4 ele.	12.99
20109	2m 9 ele.	15.44
20209	2m 9 el. port	17.45
20118	2m 2 x 9 el. cross	28.51
20113	2m 13 el. port	27.20
20116	2m 16 el.	29.95
20419	70cm 19 el.	18.12
20438	70cm 2 x 9 el. cross	30.05
20421	70cm 21 el.	25.98
20422	21 el. ATV	25.98
20199	2m + 70 Oscar	30.05

Full range of Tonna accessories stocked.

## G-WHIP MOBILE ANTENNA RANGE

Tribander helical for 10/15/20 metres	25.80
Base mount single hole fixing + 3m cable	6.30
LF 40m coil for above aerial	6.55
LF 80m coil for above aerial	6.55
LF 160m coil for above aerial	6.55
LF telescopic resonator whip	4.25

We also stock flexwhip & multimobile G whips.

## WELZ

SP 10X	Mini meter 1.8 160MHz 200W	21.95
SP 15M	1.8-150MHz 2 5W 20W 200W	32.00
SP 45M	2m/70cm 100W	45.00
SP 200	1.8 160MHz 20W 200W 1kW	61.95
SP 300	1.8 500MHz 20W 200W 1kW	85.00
SP 350	1.8 500MHz 200W	55.00
SP 400	130-500MHz 5W 20W 150W	61.95
SP 250	1.6 60MHz 2kW	45.00
SP 380	1.8 500MHz 20W 200W	49.95
AC 38M	8 band ATU	59.00
CH20A	<450MHz coax switch	15.95
CT 150	150/400W D load	32.00
CT 300	300/1 kW-250MHz D/load	45.00

## TONO

THETA 9000E RTTY/CWASC11	650.00
THETA 550 The latest - a winner!	299.00

## TASCO

TeleReader CWR 685 RTTY/CW/ASC11	699.00
TeleReader CWR 670E As above RX only	259.00
MorseMaster CWR 600 As above basic unit	189.00
MorseMaster CWR 610 As above basic unit	189.00

## ADONIS MICROPHONES

MM202S	Safety mic. Lapel type	20.95
MM202HD	Safety mic. head band	29.00
MM 202HM	Headphone & mic.	39.00

## BARGAIN OFFERS

FT290R +30W  
LINEAR £265

EM400 NEW  
Aunco  
Rotators  
£87.50

## ALINCO

AL 230	2m 30W Linear 1-3W in FT 290R etc.	39.00
AL 710	70cm 10W Linear	65.00
AL 730	70cm 30W Linear	79.00

## SAGANT

MT 240X	HF 80-10m Wire array	49.50
MTE 40X	80m + 40m array	45.00
BL 40X	1:1 Balun SO 239	12.65

## COMET NEW!!

7/8 Wave 2M 4.50B Whip	13.95
8/8 Wave 2M 5.20B Whip	15.85

Send for details NEW RANGE.

## HALBAR

LIN 5	70cm 5 el. Yagi	7.99
STR 5	2m 5 el. Yagi	9.99
FOLDI	2m 5 el. Foldup	13.00
TWIN	2m Vert.	14.95
TWIN 70	70cm Vertical	7.99
OIP 2	2m Dipole	3.95
HALO	2m Halo	5.50
LPA	Log periodic 70cm	15.00
QUAD 6	2m 6 el. Quad	25.00
QUAD 4	2m 4 el. Quad	17.50

## DAIWA

DR 7500X	Up to 3 el. HF beam preset controller	98.00
DR 7500R	as above round cont.	125.00
DR 7600X	Heavy duty w preset cont.	141.00
DR 7600R	as above round cont.	152.00
KSO 65	Stay bearing	18.50
CS 201	2-way switch 0 500MHz	13.80
CS 201N	above w. N sockets	21.00
CS 401	4 way w SO 239	38.00
RM 940	Infra Red mic	45.00
CN 520	1.8 60MHz SWR PWR	40.60
RX 110G	2m GaS Fet Preamp	NEW 39.00
RX 430G	70cm GaS Fet Preamp	NEW 63.00
RF 670	RF Speech Proc	NEW 44.00
FD 30LS	Low pass Filter	11.50
FD 30M	LP Filter HD	19.50
CN 650		118.75
CN 620		66.00

## MISCELLANEOUS

CANTENNA Dummy Load	14.95
ARROW 15AMP PSU with meter	86.00
COAX SEAL for sealing antennas etc against weather	20p foot
SWEDISH KEY Brass on Teak beautiful straight key	49.00
VIBROPLEX various types in stock	80.00
Microwave Modules stocked.	
KENPRO KP 100 Keyer	69.00
G4MH Mini-Beam 3 band	80.00

## TET

HB 33SP	3 el. Tri Bander HF Beam	189.00
MV 3BH	Tri-Band vertical	40.25
MV 5BH	5 Band Vertical	71.25
SQ Y08	8 el. Quagi 2m	48.96

## CARRIAGE & VAT:

ALL PRICES INCLUDE VAT. ITEMS OVER £50.00 VALUE OR TOTAL ORDERS OVER £50.00 ARE CARRIAGE FREE SECURICOR (OUR OPTION) FOR MAJOR ITEMS. ALL DESPATCHES ARE INSURED BY US NO RISKS TO YOU IF LOST OR DAMAGED.

"PHONE YOUR ORDER FOR TODAY'S  
DESPATCH. ALL WE NEED IS YOUR  
OR NUMBER, SMALL  
SPARES - PLUGS - AERIALS -  
PHONE FOR A QUOTE FOR THAT NEW  
RIG!"

OPEN 5 DAYS A WEEK. CLOSED THURSDAYS

# FOR THE PROFESSIONAL AMATEUR



# ProTel

Unit 1, Earlsfield Lane, Grantham  
Tel: (0476) 76928  
405-407 Lordship Lane, London, N17  
Tel: 01-808 5656

**OCT**  
#1 in Electronics and Communications