

# practical Wireless

SEPTEMBER 1992 £1.75

**ANTENNA SPECIAL** - PW Looks Into The World Of The Antenna And Related Equipment

**REVIEWED**

The Cushcraft R5  
Vertical Antenna

Nelson Electronics  
21 and 28MHz  
Cubical-quad Antenna

The MFJ-247 SWR  
Analyser

**CONSTRUCTIONAL**

Build A Simple RF  
Bridge And ATU

Experimenting With  
Beam Antennas

**ANTENNA &  
ACCESSORIES  
PRODUCT SHOWCASE**



ISSN 0141-0857



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**PRIZE COMPETITION**  
Win A Kent Morse Key



# Top of the Range

To be a truly world-class competitor, you have to have a truly world-class rig. And it's here now. The versatile FT-1000 from Yaesu.

The FT-1000 will blow away your competition with a spectacular combination of power and operation flexibility. There will be no contest.

Just superb performance...yours and your FT-1000



FT-1000 HF All-Mode Transceiver

- ✓ **Direct Digital Synthesis (DDS):**  
Two ten-bit DDS plus three eight-bit DDS
- ✓ **High RF Power Output:**  
Up to 200 Watts.
- ✓ **Dual Receiver:**  
Two tuning knobs.
- ✓ **Automatic Antenna Tuner:**  
Built-in with 39 memories.
- ✓ **Built-In Vox.**
- ✓ **100 Memories:**  
Independent ATU and mode/IF Filter memory.
- ✓ **CW Audio Peaking Filter:**  
Additional selectivity on CW for weak signal work.
- ✓ **CW Spot:**  
Provides audible tone for alignment.
- ✓ **High Dynamic Range:**  
108dB (Typical).
- ✓ **Multimode Selection on Packet/RTTY:**  
Switchable FSK tone, RTTY shift and CW pitch.
- ✓ **Front Panel RX Antenna Selection:**  
Allows quick switching.
- ✓ **Digital Voice Storage:**  
Option provides instant playback.
- ✓ **BPF-1 Module Option:**  
Allows crossband dual receive.

#### SPECIFICATIONS:

Receiver Range:	100kHz-30MHz.
Transmit Range:	160-10 Meters.
Power Output:	Adjustable Up To 200 Watts (50 Watts AM Carrier).
Emission Types:	LSB/USB (J3E), CW (A1A), FSK (J1D/J2D), AM (A3E), FM (F3E).
Antenna Impedance:	16.5-150 Ohms Nominal.
Power Consumption:	95 VA (Receiver). 1050 VA (Transmit).
Sensitivity:	SSB/CW <0.25V For 10dB S/N, 1.8-30MHz..
Dynamic Range (Typical):	108dB @ 500Hz BW, (Preamp off).
Maximum Audio Power Output:	2 Watts Into 4 Ohms with <10% THD.
Audio Output Impedance:	4-8 Ohms.
Weight:	56.2 lbs. Standard Version.

*Performance without compromise*



# practical Wireless

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NEXT ISSUE (OCTOBER)  
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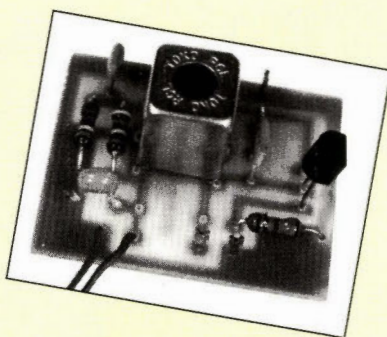
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## NEXT MONTH Special Issue

**We celebrate our Diamond  
Jubilee with a nostalgic  
look back at the last  
60 years**

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**EXPORT**

# ARE

## COMMUNICATIONS '92

**PMR**  
sales & hire



### YAESU FT5200/FT5100

Dual band receive,  
dual display, high power, what's the difference?  
What's the price?

PHONE NOW

### YAESU FT530

The latest dual bandy handy with all internal  
options fitted as standard. Too many to list.

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### YAESU FT26/FT76

Designed to replace the  
FT23/FT73. Also available with  
a full keypad, the Yaesu  
FT415/FT815



### YAESU FT890/TU

Small HF transceiver with ATU  
- plus all features - as  
expected. How much we hear  
you say? -

YOUR PHONE CALL WILL TELL YOU



### ICOM ICR7100HF

Still the best base scanner  
available on the market.  
No need for two receivers,  
listen to everything in one  
board.

box or update your model with the ARE modification



### KENWOOD TS450S ★

Very special deals  
available with ATU,  
filters, etc. etc. 6 metres also available on  
Kenwood TS690S



### AOR 1500 RCV

At last it's here  
100kHz - 1300MHz in a  
hand held, with SSB, FM, AM,  
FM-W.



### ALINCO DJ580E

A dualbander which has  
certainly taken-off. A  
complete package with  
wideband receiver.



### YAESU FT1000



### ICOM IC765



### KENWOOD TS950SDX



### ICOM IC229H KENWOOD TM241E YAESU FT212RH

2 metre FM mobiles. All three are 50 watts output, all three are  
small in size, all three are packed with features. What's your  
preference, what's your price?



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With 9, 24 or 32 amp units to  
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- both in stock.



### YAESU FT747GX

Still the best selling budget HF  
transceiver. Especially at ARE price.

There are simply just too many items to list and talk about on one page, if there is any requirement for any brand available on the  
market, new or secondhand, you cannot afford not to give us a call, dropping us a line or by coming in to see us.  
Not only do we cater for a large part of the amateur fraternity in this country but we are suppliers of amateur and commercial radio  
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# HF RECEIVER TECHNOLOGY

INNOVATION DESIGN MANUFACTURE TECHNICAL SUPPORT

## HF-150 Compact Communications Receiver

£329 inc VAT

Designed as a logical alternative to the Japanese 'push button portables', the HF-150 places a 'real radio' within your price reach. Whilst reflecting the Lowe approach to simplicity of operation, the HF-150 nevertheless has all the features and facilities you need. This truly is 'Real Radio'.

**Frequency coverage:** 30kHz - 30MHz  
**Modes:** USB/LSB/AM/Sync. AM (Selectable S'band)  
**IF Bandwidths:** 2.5kHz & 7kHz  
**Tuning:** 8Hz steps with variable speed  
**Memories:** 60 holding frequency & mode

**Aerial inputs:** 600 ohms, 50 ohms & Hi-Z Whip  
**Power:** 12Vdc from mains adaptor (supplied)  
**Case:** All-metal light alloy case  
**Size:** 185mm(W) x 80mm(H) x 160mm(D)  
**Weight:** 1.3kg (less batteries)



## HF-235 The Professionals' Choice

£1116 inc VAT

**Frequency coverage:** 30kHz - 30MHz  
**Modes:** AM/LSB/USB/CW/NBFM (Sync AM optional)  
**Filters:** 6 Input bandpass filters  
**Tuning steps:** 8Hz - 125Hz (stepped by mode)  
**Construction:** Fully floating chassis

**Remote control:** RS232C Computer interface (optional)  
**Memories:** 30 holding a host of data  
**Tuning:** Spin-wheel, keypad & MHz button freq. entry  
**Power supply:** 110-120 or 220-240Vac 50Hz  
**Size:** 483mm(W) x 88mm(H) x 320mm(D)

## HF-225 Gateway to the World

£429 inc VAT



**Frequencies:** 30kHz - 30Mhz  
**Tuning:** 8Hz steps.  
**Memories:** 30 channels  
**Filters:** IF filters for all modes fitted  
**Tuning:** Keypad & spin-wheel  
**AM/FM Sync. Detector** (optional)  
**Keypad for remote entry** (optional)  
**Excellent quality at reasonable cost**

## LOWE ELECTRONICS LIMITED

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## STANDARD®



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New low price of  
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\*including  
CNB III  
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### C150

The new Standard C150 is a super compact 2m transceiver that has all the usual features that you would expect from a modern microprocessor controlled radio - plus several new ones.

**£199** Special Offer



### C528 Dual Band Hand Held

**Special September Offer!**  
Now tried and tested by hundreds of users.

- ★ Direct 13.8M in for 5 Watts out
- ★ Programmable offsets
- ★ VHF 2.5W, UHF 2W with CNB151 NiCad pack
- ★ Coded paging function
- ★ Dual Displays
- ★ Various scanning modes
- ★ Power save function
- ★ Programmable step sizes
- ★ Multiple memories
- ★ 144-146 VHF, 430-440UHF, 800-975 Rx only
- ★ Priority Channel
- ★ Separate Vol. and Squ. Controls for each band
- ★ Tone Squelch (option)
- ★ 2m & 70cm
- ★ 5 Watts output
- ★ Repeater Function

**NOW WITH  
NI-CAD PACK AND  
WALL CHARGER  
£379**

### C168 C468 Series

- World's smallest full-keyboard handheld

- 5W RF power
- Intelligent scan
- Cloning feature
- DTMF paging and code squelch



- 40 memory channels/200-channel memory unit available
- Unsurpassed 0.158µV sensitivity (12dB SINAD)

**C168 – £269**

**C468 – £279**

Please remember, we are the sole authorised importer of Standard equipment in the UK and we are able to offer a full back-up service and spares from stock.

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**NORMAN  
G4THJ**





**ALINCO**  
ELECTRONICS

## 2m & 70cms Dual Bander DJ-580E

**£369**

inc VAT

The DJ-580E hand-held is the most advanced design ever offered to the radio amateur. Building on the winning formula of the DJ-560E, ALINCO have now reduced the size dramatically and introduced a combination of innovative features that will make your operating even more fun and certainly more versatile.

It goes without saying that ALINCO offer you all the standard features you expect from a hand-held including dual watch, dual controls, scanning, searching, priority, etc. Of course ALINCO's standard of engineering and reliability is now becoming the envy of its competitors. (They're also pretty envious of ALINCO's prices!) Naturally you get a full 12 month warranty including parts and labour. It's the extra features that really make this a winner.

For example you now have ALINCO's patented circuit that retains full operation with dry cells even when battery voltage falls by 50%. Great for emergency applications. You get a programmable auto power off feature, battery saver, digital telephone dialler and three output power levels. And we've only just started! Key in a special code on the keypad and your rig will turn into a fully operational automatic crossband repeater. Key in another code and you will open up the receiver for a.m. airband reception and frequency segments up to 995MHz! You can even use the DTMF feature to send and receive two digit code messages.

**To learn more about the transceiver that has already taken the Japanese and American markets by storm, phone or write for a full colour brochure.**



**"The Most Comprehensive Specification Ever Offered!"**

Available direct or from your local dealer

Auto repeater mode  
AM Airband Reception  
Expanded Receive to 995MHz

**UK "Gold Seal" Warranty**  
Now with every unit  
Look for the sign on the box!

### Specification

<b>Tx</b>	144-146MHz 430-440MHz
<b>Rx</b>	AM 108-143MHz FM 130-174MHz FM 400-470MHz FM 810-995MHz
<b>Steps</b>	5, 10, 12.5, 20, 25kHz
<b>Memories</b>	42
<b>Power Output</b>	2.5/1.0/0.3 Watts 5 Watts with 12V DC
<b>Scan</b>	8 Modes
<b>Tones</b>	1750Hz plus DTMF Optional CTSS
<b>Sensitivity</b>	12dB SINAD -15dBu
<b>Size</b>	140x58x33mm
<b>Weight</b>	410g
<b>Accessories Supplied</b>	Ni-Cad pack, AC charger, belt clip, carry strap, dual band antenna.

### WATERS & STANTON ELECTRONICS

22 Main Road, Hockley, Essex. Tel: (0702) 206835

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# South Midlands Communications Ltd.

**SMC**

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**Birmingham** 021-327 1497 **Axminster** (0297) 34918

## FT1000 – the best of the best

After 25,000 hours of research and development time Yaesu's engineers have achieved the ultimate in DX and contest transceivers, the FT1000. Offering peak performance and unfailing durability the FT1000 delivers unmatched performance for the serious HF operator including unlimited simultaneous crossband dual receive, with BPF1 fitted, 200 watts power output with heavy duty P.S.U. The world's best receiver performance utilising quadruple conversion, Yaesu's exclusive DDS, IF notch, IF shift, IF variable bandwidth, CW APF, independent mode and IF filter selection.



The latest version internal software works with both the K1EA and DX base contest logging program. Also included are CW spotting and built-in high speed antenna tuner unit. This all adds up to proven performance: The choice of the world's top DX'ers, the FT1000.

Write, phone or drop in for a demonstration or full details. Part exchange always considered and HP available.

## Yaesu's magnificent seven



**FT415 – 2m**  
**FT815 – 70cm**

With the arrival of the FT415 and FT815 miniature hand-helds to complement the existing range Yaesu now has a hand-held to suit most tastes and pocket sizes.

Including all the latest in miniaturisation techniques the FT415 and FT815 boast many features including Automatic Power Off (APO) and Automatic Battery Saver (ABS) to extend normal battery life. Along with two independent VFO's, 41 memories and direct keypad frequency entry these transceivers are extremely versatile machines.

Next in line are the FT26 and FT76 although similar to the FT415 and FT815, the FT26 and FT76 are a different kettle of fish, so to speak, being designed with

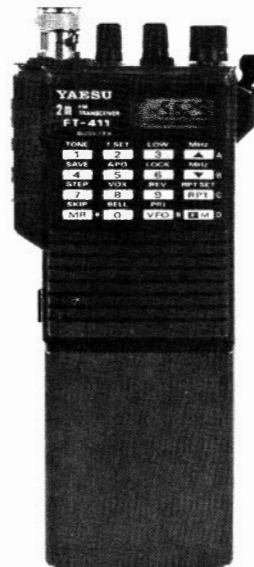


**FT26 – 2m**  
**FT76 – 70cm**

ease of operation as the major consideration but still with the versatility expected of a modern hand-held. With 53 memories, APO and ABS what more do we need to say.

Last but definitely not least in line are the FT411, FT811 and FT911 hand-helds. Based on the popular FT23 and FT73 these transceivers are packed with useful features to suit most occasions. Built inside diecast aluminium cases the transceivers are designed to be 'bullet proof' and provide many hours of trouble free enjoyable operation.

A wide range of accessories to complement all the above transceivers are available to adapt the hand-held to meet your exact requirements.



**FT411 – 2m**  
**FT811 – 70cm**  
**FT911 – 23cm**

FT26, FT76, FT415, FT815 all supplied as standard with FNB28 nicad pack and NC28C wall charger. Phone SMC for the best deals in town.

**SMC HQ, S.M. HOUSE, SCHOOL CLOSE, CHANDLERS FORD INDUSTRIAL E**

Carriage charged on all items as indicated or by quotation. Prices and availability subject to change without prior notice. Same day despatch whenever



## JAYBEAM ANTENNAS

Jaybeam have for many years been producing a quality product at very affordable prices. At SMC we have a large stock of these very popular antennas available for immediate delivery

HF			
MM3	10-15-20m Mini-Beam	426.53	D
VR3MK3	10-15-20m Vertical	96.35	C
TB3MK3	10-15-20m 3 Ele Yagi	425.53	D
TB2 MK3	10-15-20m 2 Ele Yagi	293.75	D
TB1MK3	10-15-20m Rotary Dipole	139.83	D
TB3/SSKIT	TB3MK2 to TB3MK3 Conversion kit	79.90	B

6m & 4m			
4Y6M	4 Ele Yagi 6m	66.00	C
4Y/4m	4 Ele Yagi 4m	54.40	C

2m			
HO/2M	Halo Head only	13.87	A
HM/2M	Halo c/w 24" mast	16.10	B
UGP/2M	Ground Plane (folded radiator)	22.45	B
CS/2M	Colinear	124.55	C
LW5/2M	5 Ele Yagi	26.20	C
LW8/2M	8 Ele Yagi	33.60	C
LW10/2M	10 Ele Yagi	40.77	C
LW16/2M	16 Ele Yagi	59.46	C
PBM10/2M	10 Ele Parabeam	80.84	C
PBM14/2M	14 Ele Parabeam	98.23	C
Q4/2M	4 Ele Quad	49.59	C
Q6/2M	6 Ele Quad	64.51	C
Q8/2M	8 Ele Quad	80.37	C
D5/2M	5 over 5 slot Yagi	47.59	C
D8/2M	8 over 8 slot Yagi	65.33	C
5xY/2M	5 Ele Crossed Yagi	50.53	C
8xY/2M	8 Ele Crossed Yagi	64.51	C
10xY/2M	10 Ele Crossed Yagi	80.84	C

2m/70cm			
6Y/12Y	6 Ele 2m, 12 Ele 70cm Yagi	72.03	C

70cm			
C8/70	Colinear	132.31	C
D8/70	8 over 8 slot Yagi	47.71	C
PBM24/70	24 Ele Parabeam	73.32	C
MBM28/70	28 Ele Multibeam	38.54	C
MBM48/70	48 Ele Multibeam	61.57	C
MBM88/70	88 Ele Multibeam	85.89	C
8xY/70	8 Ele Crossed Yagi	74.03	C
12xY/70	12 Ele Crossed Yagi	91.77	C

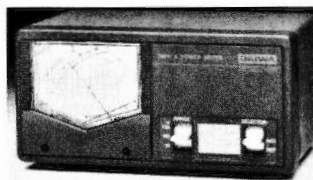
23cm			
D15/23	15 over 15 slot	80.72	C
D15/24	15 over 15 slot	80.72	C

PHASING HARNESES			
PMH2/4M	4m 2 way	27.85	C
PMH2/C	2 way circular polarisation	17.86	B

PMH2/2M	2m 2 way	19.98	B
PMH4/2M	2m 4 way	48.88	B
PMH2/70	70cm 2 way	18.57	B
PMH4/70	70cm 4 way	38.07	B
PMH2/23cm	23cm 2 way	50.76	B

## SWR METERS COAX SWITCHES

SMC have a wide range of SWR/PWR meters to suit almost all applications from low power hand-held to high power HF transceivers. To complement these meters a range of high quality coax switches is also available for switching all your antennas.



HANSEN			
FS710V	50-150MHz 15/150W	107.80	B
FS301MH	2-30MHz 200/2000W	42.25	B
FS711H	2-30MHz 20/200W	43.65	B
FS711V	50-150MHz 20/200W	34.99	B
FS711C	26-30MHz 10/100W	24.55	B
FS20DL	3-150MHz 1/10W	43.65	B
FS20D	3-150MHz 5/20W	43.65	B
SWR3E	3.5-150MHz 20/200/1000W	28.75	B

SMC			
OSCAR171-B	3.5-150MHz	27.45	B

WELZ			
SP425	140-524MHz 5/15/150W	122.55	B

YAESU			
YS60	1.6-60MHz 20/200/2000W	95.00	B
YS500	140-525MHz 4/20/200W	83.00	B

DAIWA			
CN101	1.8-150MHz 15/150/1500W	59.95	B
CN103N	150-525MHz 20/200W	69.95	B

COMET			
CM-420	140-150/430-450MHz 15/50W	39.95	B
CM-420N	140-150/430-450MHz 15/50W	45.83	B
CD-120	1.8-200MHz 15/60/200W	76.60	B
CD-160H	1.6-60MHz 20/200/2000W	90.85	B
CD-270D	140-525MHz 15/60/200W	79.65	B

## COAX SWITCHES

DAIWA			
CS201	2 way SO239 DC-600MHz 1kW	17.50	A
CS201G2	2 way 1N DC-2GHz 1kW HF	27.50	B
CS401	4 way SO239 DC-800MHz 1kW	69.95	B



## CREATIVE DESIGN

SMC are pleased to be able to stock a comprehensive range of HF & 6m antennas from Creative Design. Built in Japan these antennas are manufactured to the highest standard using only the best materials. Also available are a high quality range of rotators to suit all applications ranging from small 2m beams to large HF multiband beams.

HF			
CV730V-1	V Dipole 40-20-15-10m	152.00	D
CD218	10-15m 3 Ele Yagi	203.50	D
CD318JR	10-15-20m 4 Ele Yagi	305.50	D
CD318	10-15-20m 4 Ele Yagi	357.00	D
CD318B	10-15-20m 5 Ele Yagi	459.00	D
CD318C	10-15-20m 6 Ele Yagi	740.00	D
CL10	10m 5 Ele Yagi	219.00	D
CL15	15m 5 Ele Yagi	325.00	D
CL40B-4	40m 3 Ele Yagi	1120.00	E
CY103	10m 3 Ele Yagi	123.00	D
CY104	10m 4 Ele Yagi	175.00	D
CV48	40m Vertical	214.50	D
AD385	40/80m Switch Box for CV48	50.00	D

6m			
CL6DX	6m 6 Ele Yagi	117.50	D
CL6DXX	6m 7 Ele Yagi	176.65	D
CL6DXZ	6m 8 Ele Yagi	235.00	D

LOG P'S			
CLP5130-1	50-1300MHz 25 Ele	189.00	C
CLP5130-2	105-1300MHz 20 Ele	129.00	C
CLP5130-3	90-220MHz 12 Ele	109.00	C

ROTATORS			
RC5-1	Round meter variable speed	223.75	C
RC5-3	Round meter variable speed + preset	280.00	C
RC5A-3	Round meter variable speed + preset	434.00	C
RC5B-3	Round meter variable speed + preset	689.00	C

BALUNS			
CB2F/2K	1:1 2-30MHz 2kW PEP SO239	30.50	B
CB2F/3K	1:1 2-30MHz 3kW PEP SO239	30.60	B
CB2F/4K	1:1 2-30MHz 4kW PEP SO239	56.00	B
CB2F/6K	1:1 2-30MHz 6kW PEP HN Input	179.00	D
CB2F/10K	1:1 2-30MHz 10kW PEP HN Input	460.00	D
CB2F/5K-6M	4:1 50MHz 3kW PEP N Input	105.75	D
	A-£2.00 B-£5.00 C-£7.50 D-£12.50 E-£16.50		

# LISTEN OUT with SMC SONY at SMC

SMC stock a comprehensive range of scanners to suit all tastes and pockets. Ranging from a simple airband thumbwheel scanner to the top of the range models. Always in touch with latest developments we maintain a watchful eye on the market and buy the latest and best models in so that you, the customer, can obtain the scanner that's the current hottest seller. So why not contact us today for more details of our comprehensive range?

## AOR AOR AOR

SMC are pleased to be able to offer a large number of models from the very comprehensive AOR range which includes both hand portables and mobiles/base stations.



All the receivers are built to the highest possible specification yet remain very competitively priced. Often the leaders in the field, the AOR range is proving very popular amongst both professional and non professional users.

The amazing AR1500 is the hottest scanner in the market at the moment boasting an incredible range of 500kHz to 1300MHz with SSB. So why not phone us today for more details of this super scanner?



models illustrated cover VHF broadcast, SW broadcast, and some models cover other bands as well. The very latest model available from SONY is the ICF-SW77. This receiver covers LW, MW, SW and FM stereo broadcast bands and has SSB reception on the SW bands. A comprehensive keypad and LCD display give easy control over the massive array of features available.



## NRD535 from JRC

The new NRD535 epitomises the very best in communications receiver design. This high technology product is based on the abundant technical experience gained by JRC in the professional communications receivers field. This means that the NRD535 is arguably one of the best receivers available to meet the discerning listeners needs. Brief specifications are as follows.

Frequency coverage: 0.1-30MHz; Operating modes: CW, SSB (LSB & USB), AM, FM, FSK & RTTY; Supply voltage: 240V A.C. or 13.8V D.C. ECSS, BWC & RTTY units available as options.



JRC  
NRD535



DRAKE  
R8E

## DRAKE R8E

Now available from SMC the new DRAKE R8E communications receiver. These receivers utilise the very latest in technology to meet the demanding requirements of today's listeners. Conveniently located front panel controls allow for rapid operator programming and ease of use. The R8E receiver covers 0.15-30MHz and with the optional VHF converter will also cover 35-55MHz and 108-174MHz. The large clear LCD display gives the operator full information about the current receiver status.



The FRG9600, a premium scanning receiver covering 60-905MHz, SSB, CW, AM & FM modes. 99 memories. 5, 10, 12.5, 25 & 100kHz scanning steps. Keyboard frequency entry. Optional converters to extend range from 0.15-30MHz and 800-1300MHz

The UK appointed agents for:-

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Also suppliers of:-

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issible. Up to £1000 instant credit subject to status written quotation on request. Yaesu distributor warranty, 12 months parts & labour



# MARTIN LYNCH

**From the person who put the "stuffing" back into celebrating his 2nd birthday at the EALING shop.**

For those of you who couldn't make it to my party last year, no worries! Here's another one for you to go to. The official day is **SATURDAY, the 12th of SEPTEMBER**. Open from 8 o'clock to 8 o'clock there is of course **FOOD and DRINK**, but most of all I'll be **TALKING TURKEY** even more

than usual with **HUGE SAVINGS ACROSS THE RANGE. NEW & USED, it doesn't matter, OFFER ME A SENSIBLE PRICE AND WE'VE GOT A DEAL!**

If you can't make it to EALING, come and see me and the **LYNCH MOB** on **SUNDAY, at the famous B.A.R.T.G.**

## New Lines for Autumn

### CUSHCRAFT ANTENNAS

I've been selling CUSHCRAFT for donkeys years - the range is now available either **MAIL ORDER** or by visiting the shop.

PRODUCT LIST			
40-2CD	40m 2 element Beam	D3W	30-17-12m Dipole
20-4CD	20m 4 element Beam	R7	40-10m H/W Vertical
20-3CD	20m 3 element Beam	R5	20-10m H/W Vertical
15-3CD	15m 3 element Beam	AP8	80-10m Vertical
10-4CD	10m 4 element Beam	AV5	5 Band HF Vertical
TEN-3	10m 3 element Beam	AV3	20-15-10m Vertical
A45	20-15-10m 4 element Beam	617B	6m 6 element Boomer
A35	20-15-10m 3 element Beam	A50-65	6m 6 element Beam
A3WS	17-12m 3 element Beam	A50-55	6m 5 element Beam
D40	40m Rotary Dipole	A50-35	6m 3 element Beam
D4	40-20-15-10m Dipole	AR-6	6m Ringo Vertical
D3	20-15-10m Dipole	17B2	2m 17 element Beam
		13B2	2m 13 element Beam
		124W/B	2m 4 element Beam
		A144-7	2m 7 element Beam
		A144-11	2m 11 element Beam
		A144-20T	2m 10 element X Oscar
		AR-2	2m Ringo Vertical
		ARX-2B	2m Ringo Ranger II
		AR-270	2m/70cm Vertical
		424-B	70cm 24 element Beam
		A430-11	70cm 11 element Beam
		416TB	70cm 8 element X Oscar
		ARX450B	70cm Ringo Ranger II

### TONNA ANTENNAS

The full range of Tonna antennas is still available at good value for money prices.

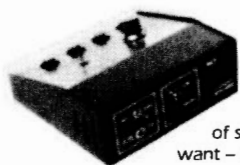
### DIAMOND & COMET ANTENNAS

Base and Mobile, their range of Verticals and car fixings is virtually endless.

### MUTEK

The professional range of MUTEK products is now, once again available in LONDON. From their **HIGH PERFORMANCE** Mast Head Pre-Amps to their Transverters and replacement Front-End boards you are assured of the very best in commercial quality.

### MICROKEY ELECTRONIC KEYS



Manufactured in the U.K. by Airwave Systems, this is the very latest in advanced electronic keys. Based on the Motorola 68HC705 microcomputer, the designers have eliminated the requirement of input keyboards and rows of switches and knobs - in favour of you telling it what you want - by the key itself!

#### Features include:

- ◆ 4 x 48 character memories
- ◆ Adjustable weighting 25-75%
- ◆ Contest serial number 0 - 9999
- ◆ Auto beacon mode - message loop with time delay
- ◆ Keyer status enquiry mode
- ◆ High speed facility 70 - 990 WPM
- ◆ Housed in a tough steel case
- ◆ Adjustable sidetone 500Hz - 990Hz
- ◆ Analogue or digitally controlled speeds 6 - 60 WPM
- ◆ Ultra low power consumption with auto 'sleep' mode
- ◆ Internal 9V battery or external 9 - 15V DC supply
- ◆ Designed and built in the UK

Available now.... only **£99.00 inc. VAT**

### OPTOELECTRONICS 1200 HANDHELD FREQUENCY COUNTER/SNIFFER...

It's like having a wideband receiver in your hand, displaying transmissions going on around you, but giving you the actual TX frequency their operating on in **BIG CLEAR** digits! Ideal for checking your own transmitter frequency and lots of others. Can detect R.F. at over 200 meters depending on power output. Ideal for the D.F'er. See the frequency, then tune in on your scanner.



Only **£149.00**, including nicads, charger and antenna.



**I'll be talking Turkey**

**POUND FOR POUND**

**TURKEY & HAM PIE THE**

### THE LATEST H.F. TOP TEN



**1. ICOM IC728** - Straight in at number 1, ICOM's latest H.F. Multimode. All band, general coverage, 100W O/P with P.B. tuning and up-to-date packaging make this a firm favourite! **£825.00**

**2. YAESU FT890** - You thought the FT990 reviews were good, wait until you read this one! The world's smallest H.F. all band transceiver with optional auto A.T.U. - built in. **£1075.00**

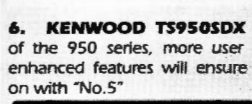


**3. KENWOOD TS690S** - A first 100W H.F. transceiver with general coverage receive and a full feature 6 metre option, running 50W output thrown in? Price up two separate rigs and see what that comes to! Free PSU. **£1395.00**

**4. YAESU FT990** - So I've finally beaten my own U.K. record for sales of FT1000's with the FT990! Rob Mannion and Peter Hart say it good - so have dozens of Martin Lynch customers. **£1799.00**



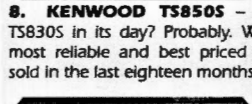
**5. YAESU FT1000** - Its confirmed - the ultimate in H.F. base station - £3K is a lot of money, but for a life long investment? I don't think so. If you want the best engineered transceiver and appreciate quality, ring me for a super deal.



**6. KENWOOD TS950SDX** - The latest version of the 950 series, more user friendly and further enhanced features will ensure this competes head on with "No.5" **£2995.00**



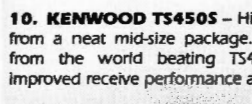
**7. ICOM IC725** - H.F. 100W, all mode general coverage, built to ICOM's exacting standards, enter the world of H.F. for a budget price. **£775.00 - free F.M. fitted.**



**8. KENWOOD TS850S** - As popular as the TS830S in its day? Probably. Without question the most reliable and best priced H.F. transceiver I've sold in the last eighteen months. **£1475.00**



**9. YAESU FT767GX** - Now series II, YAESU are the only company to offer general coverage, 100W, all mode and 2M/6M/70CM (as options) all in one neat package...Oh don't forget the built in PSU, digital power/SWR metering, auto A.T.U. etc., etc. **£1599.00**



**10. KENWOOD TS450S** - High performance H.F. from a neat mid-size package. Defiantly takes over from the world beating TS440S. New display, improved receive performance and a sensible price.



**MARTIN LYNCH**  
G4HKS

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Practical Wireless, September 1992



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**Remember to bring your PART-EXCHANGES along. I'm still paying top money either to buy**

**out-right or as a part exchange against another item.**

**Finally, Thanks for a great first TWO years at Northfields. Without your help, I couldn't have got as far as I have today. Without you I haven't got a business. I'll never forget that.**

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### THE LATEST VHF/UHF TOP TEN

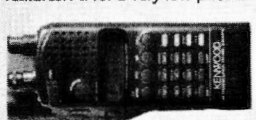


**1. KENWOOD TM732E** - With Kenwood's hi-fi styling influence, their visual appearance and ergonomics are left unchallenged. The TM732E is the latest high power dual band compact transceiver. Remote head, full 50W out on 2 & 35W on 70CM. In stock **£599.00**

**2. KENWOOD TM741E** - The only "triple band" mobile with all options located in one small housing. You can have a 2M & 70CM transceiver with a choice of 6M or 10M or 23CM working along side. Full duplex between any of the bands. The ultimate choice of Raynet users country wide, together with my 7 pages of mods, it's unbeatable! **£369.00**



**4. ALINCO DJ580E** - The latest dual band handle hosts features that others are still catching up on, how many for example can still operate below 3.8 volts? Patented by ALINCO, this is one of its many outstanding features. All for a very low price of **£369.00**



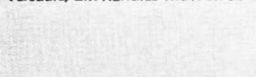
**6. KENWOOD TH-28/48E** - Along the lines of their new TH-78E, these new single banders offer you single band TX on either 2 or 70, together with dual RX on one band (i.e. two frequencies in-band simultaneously received), plus RX on the opposite band i.e. for the TH-28E transceiver on 2 and RX on 70CM, or visa-versa for the TH-48E. Phone.



**8. ICOM IC275H/475H** - The best in high power base station multimodes. These two supremos from ICOM have killed the competition dead - there isn't any! 100W on either 2 or 70, only enquire if you are serious on VHF or UHF operation.



**10. ALINCO DJF1E/S1E** - Small, neat, tough, versatile, 2M handies with AM air band. **£239/£179**



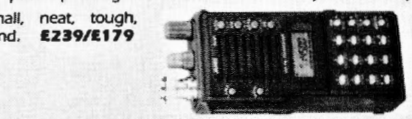
**3. ICOM ICW2E** - The milestone and bench mark to which other dual band handies are compared - full duplex, dual band 2/70, A.M. RX on airband, 900MHz receive and lots more, together with never ending range of accessories **£395.00**



**5. KENWOOD TH-78E** - Can't keep up with the ever changing range of dual banders? Neither can I! The successor to the TH-77E, this one is splendiferous. (Splendid what?). The only handle to offer you dual band RX on both bands, i.e. two frequencies on 2 or 70CMs in addition to its dual band TX capabilities. Beats the hell out of me! **£395.00**



**7. ALINCO DR-599E** - Dual watch, remote head high power mobile 2/70. Special attention to U.K. operation - one of the few to offer tone burst inside the rig, not built into the mic like most. New bright lit display and a host of features. **£539.00**



**9. YAESU FT736R** - Like the FT767GX. YAESU have as yet, no competitor alternative to this one - all mode 2 & 70 with 6M and 223CM all in one box. PS.U. included. ICOM & KENWOOD wakey wakey! Is there a patent pending on this idea? **£1395.00(£623 extra)**



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At the last count, over six pages of condensed print. All pre-owned equipment sold by Martin Lynch is thoroughly tested cleaned and offered with a meaningful guarantee. Furthermore, if you are ordering mail order, you have a money back guarantee if the equipment is not as described to you. Here's a little sample of what's in stock at present.

ICOM		TS120V 10w QRP HF TCVR +cw filt	
IC04E 70cms Handheld/keypad TCVR	£165	TS530S Top perf HF TCVR + cw filt	£569
IC211E 10w, 2mtr basem TCVR	£399	TS780 2m/70cms base TCVR	£699
IC228H 2m FM, 45w - 20 mem, 12v.	£220	TS830S HF TCVR various specs.	from £595
IC251E 2m all mode base TCVR	£425	TW4100E Dual band FM mobile 45w from	£399
IC271E 2m multimode 25w TCVR from	£499	YAESU	
IC275E 2m base TCVR 25w ssb/fm/cw	£595	FC902 ATU various	from £165
IC28E 2m fm mobile TCVR	£175	FRG7 RCVR g.c. 500kHz-30mHz	from £150
IC2KL/PS Linear 1kwll	£750	FT ONE HF TCVR	£795
IC322OE Dual band 2/70cm mobile	£425	FT101ZD HF TCVR Mk3	£529
IC4E 70cms handheld-ideal novice	£129	FT101ZD HF TCVR +warc	£549
IC551D 100w dig. multimode 6m TCVR	£549	FT107M Solid state HF TCVR +psu	£595
ICR72 Communications RCVR	£499	FT203 2m FM handy TCVRs	from £119
KENWOOD		FT208R 2m FM handy TCVR	£119
PS50 Heavy duty psu for 440	£165	FT209RH 2m FM handy 5w various from	£160
R1000 Communications RCVRs	from £239	FT221R 2m base multimode TCVR	£325
TS950S HF gen cov RCVR	£1895	FT411 2m handy TCVR	£195
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TM431 70cms mobile TCVR	£225	FT747GX HF TCVR g.cov various from	£499
TR9000 2m multimode TCVR	£249	FT757GX HF TCVR g.cov various from	£499

### THE MARTIN LYNCH ROAD SHOW Rally Dates

**12th September** MARTIN LYNCH BIRTHDAY PARTY 8 to 8 at Ealing

**13th September** B.A.R.T.G. Sandown Race Course, ESHER SURREY

**27th September** HARLOW RALLY, Sports Centre HARLOW, ESSEX.

**26th/27th October** LEICESTER SHOW, GRANBY HALLS Leicester.

**13th December** Verulum A.R.C. Rally in Hatfield Poly, Herts

### MARTIN LYNCH SPONSORS "THE H.F. & IOTA CONVENTION" 26th & 27th September.

I'm proud to announce that I am sponsoring the 1992 H.F. & IOTA Convention this year at the ICL Beaumont Conference Centre in Old Windsor, Berkshire. With excellent lectures including H.F. DX station design, H.F. Transceivers, H.F. Trophies, and DXpeditions, there will also be a full range of all the latest equipment from the major H.F. manufacturers on display for you to discuss with both myself and Barry Cooper, G4RKO. Accommodation and overseas visitors contact Roger Ballister, G3KMA on 0276 858224. For Programme & DX Dinner, Contact Bob Wheelan, G3PJT on 0223 263137.

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£179**

The long awaited MFJ QRP rig has arrived. 5 Watts of CW with an excellent receiver including a 500Hz xtal filter. You also get semi break-in, rit in and a very smooth vfo from 14.00-14.075MHz. Power requirements are 13.8V DC.

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VFO-120 Remote vfo	£89.00
PA-120 100 W PA	£99.00
TS-520 hf rig 230V AC	£199.00
TS-530SP hf 160-10m	£449.00
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FT-101ZD 160-10m	£399.00
FT-DX401 Old but works!	£99.00
FT-DX401 Not working	£49.00
KW-204TX	£89.00
FT-221 2m all mode base	£269.00
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HT-106 6m SSB transceiver	£199.00
TR-715E 2m all mode	£449.00
IC-2E 2m handy	£139.00
R-2000 Receiver	£359.00
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FT-203 2m handy	£139.00
FT-411 2m handy	£179.00
TR-2600E 2m handy	£149.00
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Peter Waters G30JV/G0PEP

## DIAMOND

**VSWR/POWER METERS**

SX-100	1.6-60 MHz, 30w-300w-3kw	£97.00
SX-200	1.8-200 MHz, 5.20-200 watts	£69.00
SX-400	140-525 MHz, 5.20-200 watts	£79.00
SX-600	1.8-525 MHz, 5.20-200 watts	£125.00
SX-1000	1.8-1300 MHz, 5.20-200 watts	£165.00
SX-2000	1.8-200 MHz, 5.20-200 watts AUTO	£95.00
SX-9000	1.8-160 & 430-1300 MHz, AUTO	£190.00

**BASE STATION ANTENNAS**

CP-4	10-15-20-40m vertical with radials	£149.00
CP-5	10-15-20-40-80m vertical with radials	£199.00
CP-6	6-10-15-20-40-80m vertical with radials	£219.00
D-130N	Discone 25-1300 MHz 50 FT cable	£84.95
CP-22E	2m 2 x 5/8 6.5dB gain omni directional	£49.00
D-707	Active rx. 1.5-1300 MHz 12V	£99.00

**FIBREGLASS VERTICALS**

X-50	2m/70cms 4.5/7.2db gain 1.7m long	£59.95
X-300	2m/70cms 6.5/9db gain 3.1m long	£99.00
X510N	2m/70cms 8.3/11.7db gain 5.2m long	£129.00
X-700	2m/70cms 9.3/13db gain 7.2m long	£219.00
V-2000	6m/2m/70cms 2.15dbi/6.2db/8.4db 2.5m	£99.00
X-5000	2m/70cms/23cms 4.5/8.3/1.7 db 1.8m	£109.00

**MOBILE ANTENNAS AND MOUNTS**

NR-2000M	23cms/70cms/2m mobile whip PL259	£49.95
D-505	Active rx. antenna 1.5-1300MHz 12v	£69.00
NR-770R	2m/70cms whip PL-259	£35.00
NR-790	2m/70cms 4.5/7.2 dB gain 100 Watts	£48.00
SG-7900	2m/70cms whip 5.0/7.5 db supergainer	£68.00
DP-21H	2m 1/4 wave whip PL259	£6.95
M-285	2m 5/8th whip PL259	£16.95
EL-2L	2m 7/8th deluxe whip PL259	£33.95
NR-07C	70cms mobile whip PL259	£25.00
AM-L	Gutter mount fold over type	£12.95
EC-H	PL259/SO239 cable kit for DP-GL	£9.95
SP-M	Heavy duty magnetic mount with cable	£25.95

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**40-20-10m bands**

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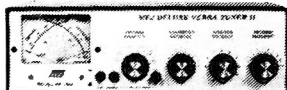
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**NEW!**

**ALINCO**

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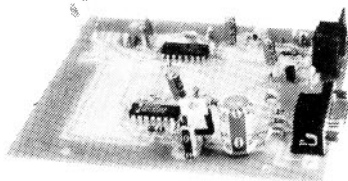
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# Keylines

The 70MHz band has been considered as being the 'gentleman's band' for many years. Generally speaking, as the allocation has been under-used, it has escaped the hurly-burly that 144MHz has attracted.

One of the main reasons why the band has escaped the activities and problems of 144MHz, was the lack of commercially made ready-to-use equipment. However, that's all changing now and many more operators are to be heard on the band.

Now that I've got the AKD 4000 70MHz f.m. rig in the car I'm able to sample activity on the band wherever I travel. And unfortunately during my travels, I've noticed that some of the bad habits from 144MHz are creeping onto the band.

## Mobile On Motorway

The worst example of bad manners and poor operating practice I've heard recently, was when I was mobile on the M25 motorway. It happened when I was on my way home from visiting a club in the south-east.

It was quite late on in the evening, and I listened on the national f.m. calling channel before putting out a short CQ. However, by the time I had gone back to receiving, the motorway had climbed a ridge and I realised there was already a QSO underway on the channel.

Naturally, I identified myself again and tried to join in the QSO. To my surprise, neither station identified themselves, and to my further dismay, they carried on the QSO with comments such as "He says he's a mobile on the M25, he must be mad" and so on.

I quickly understood the situation. The f.m. calling channel was their frequency, and they certainly weren't going to let me intrude!

I was about to switch the rig off and let them enjoy the frequency, when another station called me and asked that I QSY down to a free channel. This station turned out to be Tony G7DQW, in Kingston-upon-Thames, not far from the motorway.

Fortunately the pathway between us was good, and Tony and I enjoyed our QSO. I was pleased to have him call me, as he restored my temporarily lost faith in the ideals of amateur radio.

When I received his QSL card (express service?) a few days later,

Tony turned out to be using a modified p.m.r. rig with various channels. So if he could QSY easily, why couldn't the other operators?

Fair enough, in years past on a.m. I sat in common with many others, on 70.260MHz. But at least we let others join us on that frequency!

## Highlights A Trend

The behaviour on 70MHz that evening, highlights a trend that concerns me very much. This bad-mannered habit of sitting on a channel (or repeaters for that matter) and depriving its use to others is spreading from 144MHz.

Amateur radio operators are a privileged group. We have the use of frequencies that many others covet, and at times I wonder if other illegal users aren't already on our bands!

In fact, whenever I drive through or near London, Birmingham and other large cities, I'm never too sure whether the many QSOs that I overhear without call signs are amateur or not! Amateurs who operate without their call signs should realise the error of their ways. Surely, this behavior must always work against the hobby, if offending amateurs don't identify their transmissions?

You can also be sure that other people are listening. A recent court case where amateurs overheard suspicious transmissions (they reported it to the Radiocommunications Agency), led to an office cleaning company being fined for illegal use of 144MHz equipment.

The Amateur Radio Observation Service (AROS) and the Department of Trade & Industry's Radio Investigation Service are hard pressed. Despite the fact that they try their best, we can help them on their way.

## The System Works

So, now you know the system works, and it can help the hobby effectively by removing intruders from our allocations. However, even the 'official' system won't rid the amateur bands of bad manners and selfish operating. **This we must do ourselves!**

For the sake of a wonderful hobby, that brings untold pleasure to thousands of enthusiasts, I ask that you avoid sitting on a calling frequency. If you do occupy such a frequency, and can't move because

your transmitter is crystal-controlled, invite other stations to join you when they call.

If we don't act in this way, all our bands will become untenable. In my opinion, our hobby could be killed off in no uncertain manner by such bad behaviour.

Whether you're sitting on a channel in Kent, in the Bournemouth area (yes, I've heard it down here too!), or in the Midlands, don't forget that it's a hobby where we share an interest and channels alike.

## Meeting Readers

I enjoy visiting amateur radio clubs and groups. It provides a chance of meeting many of our readers and other enthusiasts. The occasions also provide a very useful form of feed-back regarding PW's contents and approach, because on the whole radio amateurs aren't very good at letter writing!

On one such visit earlier this year, I travelled to a club and was met by a warm and friendly response from the members. They paid close attention to my talk, and the following question and answer session went down very well.

One particular lady (she was sat right down at the front) was particularly attentive. She seemed very interested in the earlier history of PW, especially as she had first read the magazine in the early 1930s.

I was looking forward to talking to her informally. But unfortunately for me, she left the meeting as soon as the formal part of the evening was over.

Naturally, I asked other members of the club who the lady was. It turned out that nobody knew her name or much about her, as she had only been attending meetings for a short while.

## An Old Problem

When I heard that none of the members knew who the lady was, I realised that an old problem was still with us. The old problem was nothing to do with the lady's age or sex, but was directly due to the established members forgetting to welcome her as a newcomer.

We've all come across this unfortunate British trait. Some people say it's due to our natural reserve. In my opinion, I think it's due to a failing to provide a welcome!

I'm not going to name the club where the incident happened, and that's because it occurs everywhere. However, if we are to encourage club membership, surely someone must be on the look-out for new faces at meetings?

I was a member of the old Southampton Radio Society of Great Britain Group for many years. I was a schoolboy when I first started to attend meetings. Despite my youth and interest, it was quite a long time before I felt welcome, although friendships that were eventually made, have stood the tests of time.

Although I eventually 'broke the ice' and became an established member, surely it doesn't take much to approach a visitor and welcome them to the club? Quite a few clubs have a 'new members' official nowadays, and I'm pleased to say that they seem to do the job very well.

I've seen them in action, and what a pleasure it is to see shy newcomers being welcomed, particularly when they are young people. Of course, the appointed 'welcoming' member must not pounce on newcomers, demanding their subs or they'll put them off for life! But I can't imagine that happening anyway, can you?

## A New Tactic

So, to round off for this dose of 'Keylines', I'd like to suggest we all try a new tactic. Welcome people to your club, invite them to your meetings and if they are completely new to the hobby, ask them along to your shack to see what amateur radio is all about.

For a hobby that's based on communications, we don't talk to each other or potential newcomers nearly enough. I've seen enough proof of this myself, so I know it's a correct statement.

I practice what I preach, so perhaps I should finish this off by reminding everyone that I'm always pleased to talk to people at shows and rallies. That's what I'm there for.

One or two readers have said they've hesitated to approach me! Although I know I must look rather large and formidable, I'm always pleased to meet readers and have never been known to eat one!

**73 DE Rob  
Mannion G3XFD**

# Services

## Queries

We will always try to help readers having difficulties with a *Practical Wireless* project, but please note the following simple rules:

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

## Back Numbers & Binders

Limited stocks of many issues of *PW* for past years are available at £1.80 each including post and packing.

Binders, each holding one volume of *PW* are available price £5.50 each (£1 P&P for one, £2 for two or more).

Send all orders to the Post Sales Department.

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

## Constructional Projects

Each constructional project is given a rating to guide readers as to its complexity.

**Beginner:** A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently.

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**Advanced:** A project likely to appeal to an experienced constructor and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Definitely not recommended for a beginner to tackle on their own.

Components for our projects are usually available from advertisers. For more difficult items a source will be suggested in the article.

The printed circuit boards are available, mail order, from the Post Sales Department.

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# Receiving You



Send your letters to the editorial offices in Poole. They must be original, and not duplicated in any other magazine. We reserve the right to edit or shorten any letter. The views expressed in letters are not necessarily those of *Practical Wireless*. The Star Letter will receive a voucher worth £10 to spend on items from our Book, PCB or other services offered by *Practical Wireless*. All other letters will receive a £5 voucher.

## £10 LETTER

**Dear Sir**

I've just been reading your review (July issue) regarding the MFJ-9020 transceiver. I find it somewhat perplexing as to why you recommend *PW* readers to spend an arm and a leg on such obviously overpriced equipment. I'm wondering whether it's a case of 'you scratch my back and we will scratch yours'?

No, you look to me to be a fine upstanding fellow! By the way, is it true that your feet are size 16, and your height 7ft? If it's true, there's no chance any one could lose you in a crowd and maybe not the sort of chap to stoop to questionable favours.

It's my opinion that any radio amateur who spends his or her hard-earned £179 on pseudo-Japanese technology must want their head read. (Our American cousins purchase the same thing for £90, even this price is too high). After all is said and done, the RAE doesn't include intelligence tests...right? Perhaps then, those of us who possess this questionable ability, would not be sucked into perverse selling techniques?

You strike me as a naval type, you certainly fit the bill. I can just imagine you standing up there on the poop deck, barking out orders to all those idle good for nothing ratings. There again, perhaps I'm wrong.

To return to my original complaint, you would think wouldn't you, that the majority of 'radio enthusiasts' could throw a 14MHz c.w. transceiver together in an evening or so for £25 or thereabouts?

**Ray Howes G4OWY**  
Weymouth  
Dorset

**Editor's reply:** Thank you for your amusing letter Ray. The team enjoyed it, although we've had to shorten it for publication. Yes, I am big, and my feet are too, and I was in the navy. But far from shouting the orders from the poop deck, I was receiving them. In reply to your comment regarding the review on the MFJ 14MHz c.w. rig, I have to say that in all fairness to everyone, *PW* must review a large a variety of equipment as possible. Readers have commented in the past, that we have appeared to concentrate on main rigs, and equipment in the £1000 plus bracket. Many readers have also stated that they like to be informed about anything that's slightly different. I took the decision to review the MFJ QRP rig, because there are not many cheaper (ready-made) h.f. rigs available. Perhaps other readers would like to express their views on reviews?

**Dear Sir**

With reference 'Keylines' *PW* June. As a user of CB radio, I would support a move for licensed radio amateurs to purchase illegal multi-mode and a.m. CB radios for conversion.

This would be of assistance to all parties, cheap radios for 28MHz use and will remove a.m. mode interference from the legal CB channels while assisting the DTI and RA in removing illegal equipment from the market place.

Also of course, there must be many people with a.m. and s.s.b. CB equipment they will never use again, but are still in their possession. Although they would like to get rid of the rigs, apart from breaking them up and throwing the components away, they have no legal way of disposing of the equipment.

If licensed amateurs were authorised to purchase these radios, and the DTI and RA gave another amnesty for people with these sets in their possession to be able to pass them on to licensed amateurs, this would help remove these sets from the market place.

I hope you have success with this move, and support from the RSGB and DTI.

**John Bidgood, Eastleigh, Hampshire**

**Dear Sir**

After reading the June edition of 'Keylines', I must say that I agree with your comments about the CB radios that can be bought at car boot sales. I have been to many of these and find it a bit frustrating not to be able to buy the radios and convert them to 28MHz legally. Any change in the law to make it legal, would certainly get my support.

Also at car boot sales over the years, I have seen many computers for sale. Everything from ZX81s to VIC20s, C16s, Genies, Aquarius, Texas TI99s, Orics, Atari 400s and so on. Some of these can be bought very cheaply.

In the past I have bought a Dragon 32 for £3 and most recently an almost brand new 16k Spectrum for £5. While I believe that some radio related software is available for a few of the older type of computers, I'm sure that for many machines it isn't. So, I'm wondering if *PW* could publicise some software programme listings or add-on projects which could be useful to amateurs or s.w.l.s.

There must be many old computers gathering dust in cupboards which could be put to a good radio-related use. Using

them would certainly work out cheaper than going out and buying a modern 'all singing all dancing' megabyte computer, just to use on packet radio or to decode c.w. Even a ZX81 will decode Morse, though I'm not sure about using one for packet! Is it possible I wonder?

**Mike Hahn G4JRB**  
Rainham  
Essex

**Editor's reply:** I agree that car boot sales do seem to be a good source of older computers. You've raised a very interesting point as regards software and projects for older machines. Although we did not have much direct feed-back from readers following our recent 'Computing In Radio' supplement, the many specialised computer and software suppliers who advertised did. The response was quite amazing, so it's obvious that readers found the supplement very helpful. With that in mind, how about all you silent computing-in-radio enthusiasts letting us know what's required in the next supplement, just like Mike G4JRB did.



Dear Sir

Ref. the map on page 35 May PW.

The trouble with getting middle-aged is that it becomes increasingly harder to read the **SMALL PRINT** in magazines.

Now on your map of Europe, all the countries are showing in large letters with one exception - that of Gibraltar. Hey, what have you got against ZB land?

However, the information about getting a reciprocal licence is correct, people tell me its particularly easy to get a reciprocal licence in Gib' and it's free too. The only ones that have a problem are the Spanish, but there again, they do not recognise that we exist, so that makes it hard!

Jim Watt ZB0D  
Gibraltar

Editor's reply: Sorry Jim, our mistake. Next time I'm on 'the rock' I'll come and apologise! You probably saw that we managed to 'flood' Germany with colour as well as forgetting Gibraltar. I apologise for both production errors.

Dear Sir

In reply to the article by Rob Mannion G3XFD in the June issue, 'Mobile & Portable Operation On A Shoestring'.

I would like to suggest that part of a future article covering inverters, could clarify how people like myself have a 110V d.c or a 50V d.c. generator or Green Goddess type charging set, (respectively).

I found this first article interesting, and it has wetted my appetite to solve my problem, i.e. 110V d.c. to 110V to 240V a.c.

Alec Spencer, Stockport, Cheshire

Editor's reply: I bought a 50V d.c. to 230V a.c. inverter approximately seven years ago. Such inverters (ex British Telecom I think) are still available. If you have a lot of current available, there are surplus 18V d.c. to 230V 50Hz motor-alternator sets available. Both units have been advertised in the PW small advertisements.

## COMPETITION CORNER

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Q	W	G	X	I	Z	L	N	U	B	B	H	J	N	T	E	G	I	M	Z
C	V	J	W	A	Y	Q	R	D	X	Y	U	O	V	B	H	S	R	F	E
B	V	Z	F	E	U	S	V	Y	S	M	S	L	T	J	V	D	E	P	L
Q	T	I	S	S	G	Y	C	K	Q	L	H	Y	U	D	S	D	F	H	K
J	I	U	M	L	C	W	G	E	E	H	F	K	R	O	T	O	L	J	P
R	Q	A	J	D	H	U	I	N	D	Y	S	P	R	F	K	D	E	U	D
W	E	Y	C	N	E	U	Q	E	R	F	T	A	E	B	K	R	C	I	S
B	L	Y	C	U	B	I	C	A	L	Q	U	A	D	P	M	E	T	D	T
C	V	S	P	F	I	X	V	V	C	L	J	O	A	S	S	T	I	W	E
V	E	R	T	I	C	A	L	A	N	T	E	N	N	A	P	E	O	T	V
V	L	A	F	R	M	Y	E	K	T	N	E	K	Z	U	Q	P	N	P	E
X	C	H	G	N	I	T	N	E	M	I	R	E	P	X	E	P	S	A	O
H	Z	K	E	A	O	K	Y	J	M	B	K	X	V	W	G	O	M	S	R
S	H	B	X	H	W	J	L	S	Y	Q	G	Z	L	J	Z	V	I	E	T
C	J	R	O	T	A	L	L	I	C	S	O	Y	E	L	T	R	A	H	M
T	U	L	Y	O	X	D	F	N	T	B	M	G	P	Y	U	S	Q	Y	A
K	E	S	H	U	A	N	F	W	R	A	E	G	Z	H	I	A	X	L	Y
U	G	T	F	A	R	C	H	S	U	C	Y	S	H	J	Q	N	I	T	E
A	T	I	M	D	R	N	I	C	X	J	G	B	Q	M	W	G	Z	L	R
J	B	L	Z	W	U	F	O	U	F	J	E	T	X	U	H	V	U	Z	W

Twelve different words have been hidden in the letter grid. They have been printed across (forwards or backwards), up and down or diagonally, but they are always in a straight line without odd letters in between. You can use the letters in the grid more than once for different words. Once you have found all 12 words, mark them on the grid and send it, along with your name and address (photocopies accepted with the flash below please) to our editorial address, marked Competition Corner, Wordsearch September '92. Closing date is Friday 25 September 1992.

Name.....

Address.....

.....

.....

.....

☐ Subscription ☐ Voucher

Send your entry (photocopies acceptable with coupon) to: Wordsearch September '92, PW Publishing Ltd., Enefco House, The Quay, Poole, Dorset BH15 1PP. Editor's decision on the winner is final and no correspondence will be entered into.

Entries to reach us by September 25.

First Prize: A Kent Morse Key.

Second Prize: One year subscription or £20 book voucher.

Two runners-up: Six months subscription or £10 book voucher.

Beams  
Beat Frequency  
Cubical Quad  
Cushcraft

Experimenting  
Hartley Oscillator  
Kent Key  
Nelson

Peter Dodds  
Reflections  
Steve Ortmayer  
Vertical Antenna

Competition Corner  
Sept '92



## Radiocommunications Agency

The Radiocommunications Agency has just issued an information sheet, RA 198, on the subject of Abuse of Amateur Radio. Its topics are: What is abuse?; What should you do when you encounter abuse?; What to do with the information collected and what can the Agency do? For copies of the sheet, contact the **RA at Room 102, Waterloo Bridge House, Waterloo Road, London SE1 8UA.**

## Satellite Scene

Pat Gowen G3IOR, author of 'Satellite Scene', is producing a new reader send-out service, 'Basic Amateur Radio Satellite Information Requirements'. The document will cover all the amateur satellites, MIR, SHUTTLE, etc., and will include frequencies, methodologies and modes. Regularly updated, you can get a copy of this, by sending a s.a.e. to our Poole editorial address, marked 'Satellite Scene'.

## New BBC English Dictionary

Four years of BBC World Service radio broadcasts and millions of words of output have been analysed by computer, to produce a new kind of English dictionary aimed at a world-wide readership.

Published jointly by BBC English, the language teaching arm of BBC World Service, and Harper Collins, the new BBC English dictionary places a special emphasis on the spoken language. The analysis of the broadcast material provides evidence for many new expressions and uses. For example, the dictionary's compilers found that in broadcast English the word 'hardware' most typically refers not to hammers and nails, nor even computers, but to military equipment. A 'plank' usually refers to the most important element of an idea or policy rather than a piece of wood. 'Goal posts' are now more likely to be mentioned in a current affairs context, rather than a sporting one, as in 'moving the goal posts'.

The Cobuild team of researchers at the University of Birmingham were responsible for compiling the new dictionary in co-operation with experts in linguistics and current affairs from the BBC.

They analysed more than 70 million words of news, current affairs and sports output. The words were fed into Cobuild's computerised 'bank of English', a 150 million word database, which has already been used to develop a range of English teaching materials.

Work on compiling the dictionary began in April 1991, and information up to January 1992 is included.

## Happy Second Birthday!

Martin Lynch's business is two years old on Saturday September 12. So, how about giving him a visit at his shop in Ealing. Open from 8am to 8pm, there will be food and drink. You'll find huge savings across the range. New and used, it doesn't matter, offer him a sensible price and you've got a deal.

**The Amateur Radio Exchange Centre, 286 Northfield Avenue, Ealing, London W5 4UB. Tel: 081-566 1120.**

## RAE Courses

**Ounsdale High School, Ounsdale Road, Wombourne, Wolverhampton.** Commencing September 21. RAE classes on Mondays, 7.15 to 9.15pm. Enrolment on September 14 and 15th at Wombourne Community Centre, Church Street. Further details from **Bob G3NOW on (0902) 331985.**

**Reddish Vale Evening Centre, Reddish Vale Road, Reddish, Stockport SK5 7HD.** A full RAE course of 25 sessions, commencing Monday September 28. The classes will run on Mondays, 7 to 9pm. Facilities will be available for students who register for the course to sit the examination in December 1992, either for those wishing to obtain the licence quickly, or for students needing to re-sit one or more components. The examinations are held at the centre.

They also run a Morse Code course of 25 sessions, up to 20w.p.m. Several tutors are available to cater adequately for all levels of ability. The sessions will run on Thursdays, 7 to 9pm, commencing Thursday October 1. Enrolment for both of the above courses on September 14, 15 and 17th, between 7 and 8pm, at the centre. Further details from course tutor, **Dave Wood G4UJD, on 061-430 6246.**

**Belfast Institute of Further and Higher Education, College Square, East Belfast BT1 6DJ.** Commencing September 8 at 5.30pm. A 28-week RAE course. For further details, contact **J. Wilson G13NEB on (0232) 327244 ext. 297 (from September 1).**

**West Notts College, Mansfield.** Commencing September 14. A full RAE course for the May 1993 examination. Classes will be on Mondays, 7 to 9pm. Enrolment takes place on September 9 and 10th. Further information from course tutor, **Alan Lake G4DVW, on (0602) 382509.**

**Oldswinford Hospital School, Heath Lane, Stourbridge, West Midlands.** Commencing September. A Morse code class, aimed at the 12 w.p.m. amateur radio Morse test, the course will run until Easter 1993. As last year, the course is designed to suit people of all ages and no experience or knowledge of the code is required. For enrolment details, contact the tutor, **Phil Harris G4SPZ, on (0299) 403025.**

**Hellesdon Adult Education Centre, Middleton Lane, Hellesdon, Norwich.** Commencing Tuesday September 15. A full RAE course. Classes will be on Tuesdays, 7 to 9.15pm.

**Thorpe Adult Education Centre, Longfields Road, Thorpe St. Andrew, Norwich.** Commencing Wednesday September 16. A full RAE course. Classes will be on Wednesdays, 7.15 to 9.30pm. Tutor for the above two courses will be Pat Gowen G3IOR. After examinations, Roger Cooke G3LDI, will commence with Morse tuition.

**Avondale Adult Education Centre, Heathbank Road, Edgeley, Stockport, Cheshire.** An RAE course. Classes will be Tuesdays, 7 to 9pm.

Also at the Avondale Adult Education Centre, a Morse code course. Classes will be Mondays 7 to 9pm.

Enrolment for the above two courses will take place the week commencing September 14. Courses start the week commencing September 28. Further information is available from the above address or from course tutor, **Rik Whittaker G4WAU, on 061-427 4730 evenings and weekends.**

**Arnold & Carlton College, Digby Avenue, Mapperley, Nottingham NG3 6DR. Tel: (0602) 615886.** Commencing Wednesday September 16. A full RAE course, leading to the May examination. Classes will run on Wednesdays, 6.30 to 9.15pm. Cost is £48.20, plus a £2 registration fee.

The college will also be running a short RAE course, which is suitable for those wishing to resit the examination, or for those with some knowledge of basic electronics, and is aimed at the December examination. It will run on Thursdays, 6.30 to 9.15pm and will commence Thursday September 17. Cost is £24.10, plus a £2 registration fee. The tutor for the above two courses will be Alan Lake G4DVW.

Also at the college will be a Morse class, which will run on Wednesdays, 7 to 9pm, and will be tutored by Ron Wilson G4NZU. Cost is £8.05, plus a £2 registration fee.

Enrolment for all of the above, is by post, telephone (credit cards only), or at the college from 2 to 7pm on September 8, 9 or 10th, or during the evening of the first class, although early attendance is advised in order to complete the paper work!

Enquiries should be addressed to the **Central Admissions Dept.,** at the college, address above.

**North Trafford College, Talbot Road Centre, Stretford, Manchester M32 0XH. Tel: 061-872 3731.** Commencing September. The college is offering another RAE course this year. The course tutor will be J. T. Beaumont G3NGD. Theory will be on Monday evenings or Wednesday mornings, Morse on Tuesday evenings or Wednesday afternoons, amateur television on Wednesday mornings and an advanced radio course on Tuesday afternoons.

The full day course (Wednesdays) should appeal to retired or unemployed people, as a successful student could apply for an A licence at the end of the first year. Enrolment dates are September 2, 3 and 4th. More details from the college at their address above.

**Len Buck G0DLR, 21 Willow Walk, Culverstone, Meopham, Kent DA13 0QS.** Len is to run another RAE evening course, commencing the last week in September, for the May 1993 examination. Because Ken runs the course on his own premises, he is able to accommodate people who are on shift work, and will provide daytime tuition to fit in with your available time. Those interested should contact **Ken on (0732) 823483.**

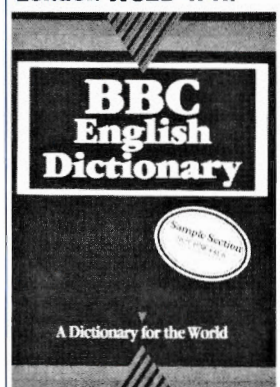
**Poverest Centre, Orpington, Kent.** Bromley Adult Education are holding RAE and Morse classes at the Poverest Centre. Courses start week commencing September 21. Enrolment details: by credit card on 081-462 9184 between August 24 and 28th; by Fax on 081-462 7768 between August 24 and 28th; by post to Bromley Adult Education, Prince's Plain, Bromley, Kent BR2 8LD between September 1 and 11th; or in person to Bromley Adult Education (address above) between September 8 and 10th. Further details from **Dr. Malcolm Williamson G0EGA on 081-695 6000 ext. 4853 office hours only.**

**Telford College, Haybridge Road, Wellington, Telford. Tel: (0952) 641122.** A beginner's Morse course will be run at the college by John G0ISO, objective 12 w.p.m. Commencing Thursday September 24, at 7pm. Enrolment nights are Monday September 7, from 2 to 8pm and Tuesday September 8, from 10am to 8pm. Further details can be obtained from the college at the above address.

ed. It contains over 60 000 references and there are more than 70 000 authentic language examples showing how English is actually used. The dictionary includes some 1000 encyclopedic entries designed to help readers follow a news or current affairs programme. These provide information about countries, capital cities and political leaders in the news. Differences in American English have also been recorded, with the aid of broadcasts from National Public Radio of Washington.

The BBC English Dictionary is published in hardback at £14.95.

**BBC English  
Bush House  
The Strand  
London WC2B 4PH.**





## Kenwood Amateur Radio Distribution

From 1 December 1992, Trio-Kenwood UK Ltd., will take over the distribution of Kenwood Amateur Radio Products in the UK and Ireland, from Lowe Electronics Ltd.

Lowe Electronics will continue to distribute the products until the end of November, by which time Trio-Kenwood UK will have set up dealerships, avoiding any disruption of supply to customers.

Mike Atkins, Communications Division Sales & Marketing Manager, says: "Our relationship with Lowe Electronics has been long and successful, and we look forward to its continuation, albeit on a different basis."

## Special Event Station GB0LSF

Special event station GB0LSF (Lions sight first), at RAF Mona, Anglesey, on 22 August 1992, from 9.30am to 6pm.

Lions international sight first, objective to eradicate preventable blindness throughout the world by 1996. Expected (hopefully) are 30 000 people, and 10 000 are needed to attend so that they can attempt the world record for musical chairs (*Guinness Book of Records*). Events include:

Team Toyota Aerobatics; hot air balloon; British Hovercraft Soc.; go-carting; archery; brass band; bungee jumping; hangar theatre; funfair; dog show; stalls; helicopter rides; aircraft rides.

The event will be televised with eight minutes on national TV, and also local TV Radio Gold and Marcher Sound (local radio).

Further details from **Dave Keely GW0GI** on (0407) 810996 QTHR.

## Scarborough Special Events Group

The North York Moors is one of Britain's eleven National Parks where special care is taken to conserve beautiful landscapes for the benefit of all. The National Park was designated in 1952 and extends over 555 square miles of heather moorland and attractive dales farmland edged on the eastern side by some of the highest cliffs in England.

To celebrate the 40th anniversary of the National Park, in 1992, the DTI have issued the very special call sign GB40NY, which the Scarborough Special Events Group will be using from Sutton Bank visitors centre, during the weekend of September 12 and 13th. Operation will be around 3.725 and 7.055MHz, in the h.f. bands, plus 144 and 432MHz. A special full colour souvenir QSL card will be issued to commemorate the occasion and further details can be obtained from **Roy Clayton G4SSH, 9 Green Island, Irton, Scarborough, North Yorkshire YO12 4RN.**

## Club News

As of next month, only the clubs giving specific activity details of their meetings will be included in our 'Club News' pages. Details of those clubs who do not send in their activity details will still be available, but only upon receipt of an s.a.e. to 'Club News', at our editorial offices in Poole.

## Surplus Postal Sale By Auction!

Greenweld are holding a massive disposal sale by auction - with a difference, to clear older items of their stock. As their customers are located all over the country, they've decided to hold a postal auction sale. A catalogue with hundreds of lots in has been prepared and will be sent to anyone who encloses an s.a.e.

Bids can be submitted by post, and full details of all goods listed are in their catalogue and lists, and a special supplement showing just the goods to be auctioned is also available for £1, plus an A4 size 28p s.a.e.

Lots vary from individual items to thousands, so both the hobbyist and bulk buyer are catered for. Viewing is from 10am to 4pm, September 1 to 5th. Final acceptance of bids by 5.30pm on Monday September 7.

This really is the 'Sale of the Century', so don't miss out - send for your catalogue now!

**Greenweld Electronic Components, 27 Park Road Southampton SO1 3TB. Tel: (0730) 236363.**

## Practical Wireless Elmer Award Nominations

The closing date for nominations for the first *Practical Wireless* 'Elmer' Award is September 7th 1992. If you have a possible 'Elmer' to nominate for the special PW award, you still have time to write in to us.

Launched in the January issue of the magazine, the *Practical Wireless* 'Elmer' Award is designed to recognise all those unsung heroes who help others to enjoy the radio hobby. They may not be radio amateurs themselves, and they don't need to be PW readers. The person you're going to nominate has already shown what they can do, because they've earned your nomination.

Full details of the 'Elmer' award are provided in the January issue of 'Keylines', but just to make sure your nominee doesn't lose out, here are the brief details again:

The PW 'Elmer' Award is very special. The award is open to all (except full-time PW Publishing employees, regular authors and advertisers and anyone professionally involved in producing the magazine) in recognition of the very varied type of helper who is, or has been an 'Elmer' at some time.

Some nominees will be radio amateurs, others will be experienced s.w.l.s and they may not be directly interested in the hobby as such. Readers who wish to nominate someone (who can be in the UK or abroad) are asked to write in **immediately** (by Monday September 7 at the **very** latest) telling us why their particular nominee deserves the award, and a recent photograph of the prospective 'Elmer'.

Presentation of the specially commissioned 'Elmer' cartoon, drawn by John Worthington GW3COI, and hand-painted in water-colours, mounted in an attractive wooden frame, will take place at the 21st Leicester Show, during the weekend of October 23/24th.

So get writing, and the person who helped you start off in the hobby, could have their name on the brass nameplate that goes with the 'Elmer' cartoon.

## All Formats Computer Fairs

There have now been over 40 All Formats Computer Fairs all over the country. Between one and two hundred trestle tables at every Fair, the diversity of products on sale is amazing, as are the prices. Here's a look at their Autumn schedule:

September 5 - National Motorcycle Museum, Birmingham  
September 12 - Sandown Racecourse, Esher, south London  
September 19 - Donington Racecourse, east Midlands  
October 3 - Northumbria Centre, Washington  
October 4 - University Sports Centre, Leeds  
October 10 - Assembly Rooms, Edinburgh  
October 11 - City Hall, Candleriggs, Glasgow  
October 17 - Novotel, Hammersmith, north London  
October 18 - Brunel Centre, Temple Meads, Bristol  
October 24 - Haydock Park Racecourse  
November 1 - University Sports Centre, Leeds  
November 6 - National Motorcycle Museum, Birmingham  
November 7 - Sandown Racecourse, Esher, London  
November 8 - Southampton  
November 14 - Novotel, Hammersmith, north London  
November 15 - Brunel Centre, Temple Meads, Bristol  
November 21 - Donington Racecourse, east Midlands  
November 22 - Northumbria Centre, Washington  
November 28 - Haydock Park Racecourse  
November 29 - City Hall, Candleriggs, Glasgow  
December 5 - National Motorcycle Museum, Birmingham  
December 12 - Sandown Racecourse, Esher, south London

Newsdesk  
'92



## Is Your Car A Cause For Alarm?

The all new remote control car alarm system from Maplin Electronics, at just £29.95 (including VAT), is without a doubt, one of the best value remote control alarm systems in Britain. Packed with more features than many other more expensive models, the unit uses latest technology self code-learning microprocessor and remote control, with one of half a million codes for maximum security.

The system also produces maximum sound. Because the piercing 120dB siren is installed under the bonnet, where there is usually little sound insulation, it sounds much louder than units fitted in the passenger compartment. The two wire installation is easily fitted and the unit provides full radio remote control operation. The one button transmitter - DTI approved - controls all functions:

- \* Sets alarm, with or without 'warn-away' feature, (this prevents many false alarms - if car is only accidentally lightly knocked - the warning alarm bleeps).
- \* Sets off alarm instantly - panic feature.
- \* Unsets alarm - memory feature lets alarm tell you if it has been set off while you've been away.
- \* Electronic sensor sets alarm off if any door, etc., is opened.

Order information: Remote Control Car Alarm MAP07 £29.95 + £1.35 carriage (inclusive of VAT).  
**Maplin Electronics, PO Box 3, Rayleigh, Essex SS6 8LR. Tel: (0702) 552911.**



\* Practical Wireless & Short Wave Magazine in attendance.

## Radio Diary

**August 16:** The Southend Rally will be held at The Rocheway Centre, Rochford, nr. Southend-on-Sea, Essex. Bring & Buy sale, bar & refreshments, ample parking. Talks in & out on SS2 v.h.f. For booking & other details, contact John Stone G0DFE on (0702) 202216.

**August 23:** The West Manchester Radio Club's 'Red Rose Rally' will be held at the Bolton Sports & Exhibition Centre, Silverwell Street, Bolton (town centre). All the usual trade stands, societies, Bring & Buy, etc. All at pavement level. Refreshments available all day & bar. Doors open at 10.30am for disabled & 11am for general public. Admission £1, children free. Further details from Dave G1100 on (0204) 24104 evenings only.

**August 30:** The Galashiels Club are to hold their Open Day at the Focus Centre, Livingstone Place, Galashiels. All the usual activities, Bring & Buy, traders, club stalls & refreshments, etc. Doors open 11am until 4.30pm. More details from John Campbell, 9 Brunton Park, Bowden, Melrose TD6 0SZ. Tel: (0835) 22686.

**August 31:** Huntingdon ARS will be holding their Annual Rally & Junk Sale at the usual venue, the Medway Centre, Coneygaere Road, Huntingdon, Cambridgeshire. Doors open 10am until 4pm. Featuring trade stands, Bring & Buy, components, junk & their usual excellent refreshment bar. Car boot pitches available. Talk-in on S22 & GB30V (433.125MHz). Details from David Leech G7DIU on (0480) 431333.

\***September 6:** Bristol Radio Rally will be held in Brunel's Great Train Shed, Temple Meads Station, Bristol. Lots of traders in an historic venue.

**September 6:** Preston ARS will be holding their 25th Annual Rally at the University of Lancaster, as in previous years. The university is located south of Lancaster & the entrance is on the A6 trunk road. From the M6 leave at junction 33 on to the A6 & proceed north for approximately three miles. Trade stands, club/repeater stands, large Bring & Buy, snack bar, lunchtime restaurant, licensed bar, free prize draw & free parking on campus. Doors open 11am (10.30am for disabled). Details from George Earnshaw on (0772) 718175.

**September 6:** Vange Amateur Radio Society will be holding their Annual Rally at The Landon Community Centre, Landon High Road/Aston Road, Landon, Basildon, Essex. The centre is only a short walk from Landon Railway Station on the Fenchurch Street to Shoeburyness Line. Doors open from 10.30am to 4.30pm. Admission 75p. Featuring many traders, Bring & Buy, refreshments & a free raffle. Talk-in on S22. Approach roads will be signposted. For further details contact Mike Musgrave G4NVT on (0268) 543025 or Doris Thompson on (0268) 552606.

**September 6:** Milton Keynes & DARS will be holding their 6th Car Boot Rally at Cranfield Airfield, (south side), Cranfield, Bedfordshire MK43 0AL (off J13 or J14 of the M1). Doors open 9.30am until 4pm. Hot & cold snacks & drinks,

admission is 30p. Talk-in on S22, GBMKC. For further details, contact either Ray G1LRU on (0908) 660798, Tony G6WXM on (0908) 316435 or Dave G3ZPA on (0908) 501310.

**September 12:** The Scottish National AR Convention will be held at the Fife Institute of Physical & Recreational Education, Viewfield Industrial Estate, Glenrothes, Fife. Doors open 10.30am until 5pm. For further details, contact John Hardwick GM4ALA on (0506) 410677 during office hours or otherwise on (0592) 742763.

\***September 13:** The 11th Lincoln Hamfest will be held at the Lincolnshire Showground and Exhibition Centre, four miles north of the city on the A15 Scunthorpe Road. As well as the usual amateur radio stands, they hope to have helicopter rides, model car racing and model aircraft displays. Refreshments (hot & cold/inside & outside) and licensed bar with real ale. Sue Middleton. Tel: (0522) 531788.

\***September 13:** BARTG's 1992 Rally will be held in Sandown Park Exhibition Centre, Esher, Surrey. Located close to London, it is a 10 minute drive from the M25 (junction 10) & is not far from the M3, M4 & the M40 which is now open all the way to Birmingham. Bring & buy, on-site catering, hot & cold meals, snacks, beverages & licensed bar. Over 250 tables, many exhibitor & special interest groups will be attending. See the latest in radios, computers, computer peripherals, software books, publications, aerials, kits, components & much more. Free parking for over 5000 cars. Open 10.30am to 5pm. Admission prices, £1.50 for adults, £1 for OAPs & under 14s free if accompanied by an adult. More details from Peter Nicol G8VXY, 38 Mitten Avenue, Rubery, Rednal, Birmingham B45 0JB. Tel: 021-453 2576.

**September 13:** Telford Amateur Radio Rally will be held in The Telford Exhibition Centre, Telford, Shropshire. Doors open 10.30am. Admission £1 for adults & 50p for children. Traders' stands, flea market, craft show, restaurants, bars, free parking. More details from John Bumford G0GTN, 19 Bewdley Avenue, Telford Estate, Shrewsbury SY2 5UQ.

**September 13:** The Madley Satellite Earth Station Amateur Radio Group (G7BTI/G0SAT) are holding their Annual Amateur Radio Car Boot Sale on the sports ground of the Satellite Earth Station. Doors open 9.30am and will feature all the normal attractions, plus a conventional car boot sale for all the family. The cost per boot is £5 and there is ample room for free parking. Madley Satellite Earth Station is located seven miles south-west of Hereford, near the village of Madley. Talk-in on S22 will be available from G7BTI. For further details, contact David Butler G4ASR on (0873) 87679 evenings.

**September 20:** The Peterborough Radio & Electronics Society present The East of England Radio Rally, which will be held at the ICI Building, The East of England Showground, Uundle Road, Peterborough. Admission is £1. Doors open

10.30am (10am for the disabled, toilet facilities available). Traders' main hall with bar & catering. Traders' marquee with Bring & Buy, separate outside area with flea market, plus radio & electronics car boot sale. For further details, please contact Mike Bowthorpe G0CVZ, 2 Chancery Lane, Eye, Peterborough PE6 7YF. Tel: (0733) 222588. Nigel G1ARV on (0733) 78685.

**September 20:** The Centre of England Radio, Computer & Satellite Rally will be held at the British Motorcycle Museum, Bickenhill, near the NEC Birmingham (junction 6 M42). Doors open 11.30am. Admission £1, OAPs 50p & children under 14 free. Over 60 trade stands in three large exhibition halls, talk-in on S22. Bar & restaurant available, ample free parking, concessionary rates to visit museum. Frank Martin G4UMF, tel: (0952) 598173.

**September 26/27:** The RSGB International HF & IOTA Convention will be held at the ICL Beaumont Convention Centre, Old Windsor, Berkshire, (situated near motorways M3, M4, M25 & is only 10 miles from Heathrow Airport). For further details contact Roger Balister G3KMA, La Quinta, Mimbridge, Chobham, Woking, Surrey GU24 8AR. Tel: (0276) 858224.

**September 27:** Harlow & District ARS will be holding their 34th Annual Amateur Radio Rally & Computer Show at Harlow Town Sports Centre, off Fifth Avenue, Harlow. Doors open 10.30am. Varied selection of traders, both old & new, with products ranging from complete radio/computer systems & software, through to second-hand equipment & electronic components. Bring & Buy & special interest groups. The rally has easy access off M11, junction 7 A14, the fully signposted route will be complemented by talk-in on S22 144MHz & SU22 430MHz by G8UT. Free parking for 1000 cars, adjacent to the centre, on-site disabled parking & full facilities for anyone with special needs available throughout the event. Catering & licensed lounge bar facilities. Entry is £1 for adults, & 50p for children & OAPs. Further details (0279) 432306 day & (0279) 722569 evening.

\***October 4:** The Great Lumley Rally will take place in the Community Centre, Great Lumley, nr. Chester-le-Street, Co. Durham. Doors open 11am (10.30 for the disabled). Trade stands, Bring & Buy, refreshments. Talk-in on S22 by G6XGLR. Admission will be £1, which includes programme. Children under 14 free if accompanied by an adult. For further details, contact Barry G1JDP on 091-388 5936.

**October 11:** Computercations '92 (Computer & Radio Rally) will be held at Hillhead Campsite, Dartmouth Road, Brixham, South Devon. Trade stands, Bring & Buy, raffle, refreshments, unlimited free parking, overnight camping & car boot sale (weather permitting). Doors open 10am. Talk-in S22 G7FDC & G4SD5. Special event station G84CPU. Details from W. T. Trezise G6ZRM on (0803) 522216.

\***October 23/24:** The 21st Annual Leicester Amateur Radio Exhibition will be held at the Granby Halls, Leicester. Doors open at 10am each day (9.30am for the disabled). All the usual facilities. For further information, contact Frank G4PDZ on (0533) 553293 (business hours) or (0533) 871086.

\***October 31/November 1:** The 6th North Wales Radio & Electronics Show will be held at the Aberconwy Conference Centre, Llandudno. The show opens at 10am, entrance fee is £1 for adults & 50p for under 14s. For any further details, contact B. Mee GW7EXH, Annecott, Hylas Lane, Rhuddlan, Clwyd LL18 5AG. Tel: (0745) 591704.

**November 8:** The 2nd Barnsley Amateur Radio Rally will be held at the Willowgarth Senior High School, Brierley Road, Grimethorpe, Barnsley. For further information, contact Ernie G4LUE on (0226) 716339 between 6 & 7pm.

**November 19/22:** Blenheim PEL's Christmas Computer Shopper Show takes place at Olympia's Grand Hall. The show offers the complete buying solution for home and business. For further details on The Christmas Computer Shopper Show '92, contact Mav Mann at Blenheim PEL on 081-742 2828.

**November 22:** The West Manchester Radio Club's 'Winter Rally' will be held at the Bolton Sports & Exhibition Centre, Silverwell Street, Bolton (town centre). All the usual trade stands, societies, Bring & Buy, etc. All at pavement level. Refreshments available all day & bar. Doors open at 10.30am for disabled & 11am for general public. Admission £1, children free. Further details from Dave G1100 on (0204) 24104 evenings only.

**November 22:** The Bishop Auckland Radio & Computer Rally will be held at a new venue, The Spennymoor Leisure Centre, Spennymoor, Co. Durham. There will be catering & bar facilities on site, as well as all the other amenities of a top-class leisure facility, for those members of the family not wishing to partake in the rally. The venue is very easy to find from major routes through the area A1(M). Further details from Mike G0PRQ on (0388) 766264.

\***November 22:** Bridgend Rally.

**November 28:** The Greater London Amateur Radio & Computer Show will be held at Harrow Leisure Centre, Christchurch Avenue, Harrow, Middlesex. Major suppliers & manufacturers of radio equipment, computers, accessories, antennas, computer software & second-hand gear. Close to Harrow-Wealdstone BR & tube station. Easy access from motorways M1, M4, M25 & the A406 north circular road. Fully signposted by the AA. ample car parking available. Two bars & cafe serving hot meals & drinks all day. Large Bring & Buy. Easy access for the disabled. Rally information centre on site. Talk-in on S22 & SU22. Doors open from 10.30am until 4.30pm. CLPK, 18 Litchfield Close, Clacton-on-Sea, Essex CO15 3SZ.



# SUPER

# HAMSTORES

## LAUNCH DAY FOR ICOM'S BIRMINGHAM SHOWROOM

Well, it's not exactly the official opening day, because we opened in Birmingham last January. Since then we have been very busy bringing it up to Super Hamstores standard by stocking up with all kinds of goodies for the radio Amateur, shortwave listener and scanning enthusiast.

We believe that we now have one of the best showrooms in the country, but don't take our word for it, come along and take a look for yourself. We are open every day from Tuesday to Saturday, but on ...

## SATURDAY 12th SEPTEMBER

you are invited to call in and celebrate the setting-up of our Super Hamstore in Birmingham.

Between 10am and 4pm on that day we plan to give our visitors an extra special welcome. Yes, we do have the best coffee on hand every day, but how about a little Buck's Fizz? Maybe you might even treat yourself to a new radio, there will also be some *extra special discounts on offer* plus ...

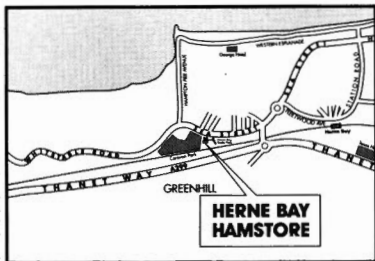
- Loads of clearance items
- Selection of second-hand radios
- 2m/70cms transceiver checks
- Test your morse code skill
- Advice on the Radio Amateurs exam
- Guidance on the novice course
- Local radio club representation
- Loads of radio books
- Shortwave listening demonstrations
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- Extensive stocks of new gear
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- Mobile radio aerials and accessories
- Portable radios of all kinds
- Data sheets for you to mull over, in fact everything for radio hobbyists, be they listeners or transmitters!



We stock items by AEA, AKD, Alinco, AOR, Barenco, CDE, Comet, Cushcraft, Dee Comm, Diamond, Drae, Hills Kits, Hustler, Icom, JRC, Kenwood, Lowe, MFJ, Siskin, Sony, Toyo, Yaesu, Yupiteru etc. Gordon G3LEQ, John G8VIQ and their Herne Bay colleagues look forward to meeting you!

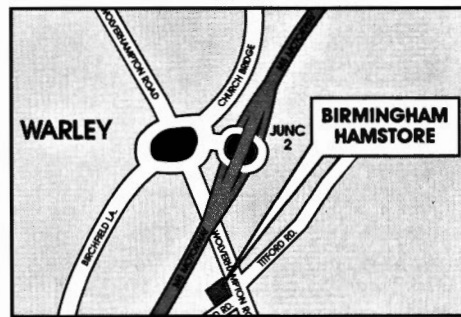
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Please send in all of your 'Club News' items to Sharon George at the editorial offices in Poole.

**Acton, Brentford & Chiswick ARC** meet 3rd Tuesdays, 7.30pm at Chiswick Town Hall, Turnham Green, London W4. August 18 is an 'Open Discussion on Radio'. Further details from **Paul Truitt G4WQC** on 071-938 2561.

**Appledore & District ARC (Devon)** meet 3rd Mondays, 7.30pm in Appledore Football Clubroom. For further details, contact **Trevor Brookes G0JRZ** on (0237) 477777.

**Axe Vale ARC** meet 1st Fridays, 7.30pm in the 'New Commercial', Trinity Square, Axminster, Devon. Further details from **Pat Cross G0GHH** on (0297) 33756.

**Aylesbury Vale RS** meet 1st & 3rd Wednesdays, 8pm in the Village Hall at Hardwick. September 2 is a RSGB Video evening. Further details about the club from **Martin G4XZJ** on (0296) 81097.

**Barr Beacon RC** meet 1st Mondays & 3rd Wednesdays, 7.30pm at 112 Walsall Road, Aldridge, West Midlands. For further details, ring (0222) 36162.

**Barnsley & District ARC** meet Mondays in the radio club room & shack, at the rear of the Darton Hotel, Station Road, Darton, Barnsley. August 17 is a proposed talk, the 30th is a talk on 'Moonbounce' by **G6ZTU** & September 7 is On the air. For further information, ring **Ernie, G4LUE** on (0226) 716339.

**Basingstoke ARC** meet 1st Mondays, 7.30pm at the Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. September 5/6 is HF Field Day. For further details, phone (0256) 25517.

**Bedford & District ARC** meet Thursdays, 8pm in the Allen Club, Hurst Road, Bedford. More details from **Gavin Carmichael, 15 Evesham Court, Avon Drive, Bedford MK41 7AJ**. Tel: (0234) 365660.

**Blyth ARC** meet Wednesdays, 7pm at Newsham Community Centre, Elliott Street, Blyth, Northumberland. All welcome. Details from **Keith Ritson G0PKR** on 091-237 1963.

**Bradford ARC** meet 2nd & 4th Thursdays, 8pm at the Polish Ex-Service Club, Shearbridge Road, Bradford, West Yorkshire. **Charles Bolt G0ACX** on (0247) 494694.

**Braintree & District ARC** meet 1st & 3rd Mondays, 8pm at the Community Centre, Victoria Street, Braintree. **Eddy Scherer, 21 Maysent Avenue, Braintree, Essex CM7 5TZ**.

**Brighton & District ARC** meet 1st & 3rd Wednesdays, 7.45pm at the Roast Beef Bar, Brighton Racecourse, Elm Grove, Brighton. More details from **Harold Lunson G3WR**, 17 Tongdean Rise, Brighton, East Sussex BN1 5JG. Tel: (0273) 501100.

**Bromsgrove & District ARC** meet Fridays at Avoncroft Arts Centre, South Bromsgrove, Worcester. August 14 is a Club BBQ at Waseley Hills Country Park (trying for GB2BBQ) & September 5/6 is SSB Field day at Waseley Hills Country Park. More details from **Joe Poole G3MRC** on (0562) 710010.

**Bromsgrove ARC** meet 2nd & 4th Tuesdays, 8pm at Lickey End Social Club, Alcester Road, Burcot, Bromsgrove. August 25 is Antenna construction & September 8 is PME earthing. **Mr D. Edwards G4ZWR**, 2 Mason Close, Headless Cross, Redditch, Worcs B97 5DF. Tel: (0527) 546075.

**Bury St Edmunds ARC** meet 3rd Tuesdays, 7.30pm in Room E0-40 of West Suffolk College, Out Risbygate, Bury St Edmunds. For more details, contact **Ian G0KRL** on (0359) 70527.

**Bury RS** meet Tuesdays, 8pm in The Mosses Community Centre, Cecil Street, Bury, Lancashire. 2nd Tuesdays are Lecture/Talk nights & other Tuesdays are general natter nights with the club's 'new' rigs on the air. More details from **Colin Fox G3HIL**, 'The Lair', 5 Pinewood Crescent, Holcombe Brook, Ramsbottom, Bury BL0 9XE. Tel: (0204) 883212.

**Buxton Radio Amateurs** meet at the Lee Wood Hotel, Buxton at 8pm. August 25 is NiCad battery charging & September 8 is Visit to a local company. For further details, contact **Derek Carson G4IHO** on (0298) 25506.

**Charnwood Amateur Radio Contest Club** meet 1st & 3rd Sundays at 'The Albion', Loughborough. Dedicated to operating & demonstrating the joys of amateur radio & furthering the hobby. August 30 is a BBQ. Listen on S17 or contact **Phil on (0509) 232927**.

**Chelmsford ARC** meet 1st Tuesdays, 7.30pm at Marconi College, Arbour Lane, Chelmsford, Essex. September 1 is a talk on 'Moonbounce' by **Pat G3IOR**. More details from **Roy & Elia Martyr G3PMX & G6HKM**, 1 High Houses, Mashbury Road, Great Waltham, Essex CM3 1EL. Tel: (0245) 360545.

**Chester & District RS** meet at the Upton Recreation Centre, Cheshire County Sports & Social Club, Plas Newton Lane, Chester CH2 1PR. More details from **David Hicks G6IFA** on (0244) 336639 or **Sid Ainsworth G0HTP** on 051-355 2833.

**Chiltern ARC** meet at the Equity & Law Social Club, which is located at the top of the hill (from the Wycombe direction) on Amersham Road in Hazlemere. More details from **Dale Kipping**, 46 Old Hardenway, High Wycombe, Bucks HP13 6TJ.

**Clacton RC** meet alternate Wednesdays in The Imperial Public House, Rosemary Road, Clacton-on-Sea. For their membership details, phone (0255) 672606, 636565 or 615207.

**Conwy Valley RC** meet 1st Thursdays, 7.15pm at The Studio, Penrhos Road, Colwyn Bay, Clwyd. For further details, contact **Mervyn Jones G4WNL**, 72b Princes Drive, Colwyn Bay, Clwyd LL29 8PW. Tel: (0492) 530725.

**Cornish RAC** meet at the Memorial Hall, Perranwell Station, Perranwell, nr. Truro, 7.30pm. For further information, please contact **Mr G. Bate**, 9 Tresithney Road, Carharrack, Redruth, Cornwall TR16 5QZ. Tel: (0209) 820836.

**Cousland ATS** meet 2nd Mondays, 7.45pm at St. Swithun's Church Hall, Grovelands Road, Purley, Surrey. **Andy Briers G0KZT** on (0737) 557198.

**Coventry ARC** meet Fridays, 8pm at Baden Powell House, 121 St. Nicholas Street, Radford, Coventry. For further details phone **Jon** on (0203) 610408.

**Crystal Palace & District RC** meet 3rd Saturdays, 8pm at All Saints Parish rooms, Beulah Hill, London SE19 (opposite junc. Grange Road). More details from **Marino Fiorentini G7HUC** on 081-653 1090.

**Dacorum AR & TS** meet 1st (informal) & 3rd (formal) Tuesdays, 8pm at The Heath Park, Cotterells, Hemel Hempstead. A special event station GB17USA is being held throughout August. Further details from **Dennis Boast G1AKX** on (0442) 259620.

**Delyn RC** meet every other Tuesday, 8pm at the Gwernymynd Community Centre in Gwernymynd, near Mold, Clwyd, North Wales. September 8 is an Open Night. For more details, contact **Steve Studdart G4W7AAV** on (0244) 819618.

**Denby Dale & District ARC** meet at Pie Hall, Denby Dale, nr. Huddersfield, 8pm. More details from **Ivan Lee, Clayton Lodge, Sunnyside, Edgerton, Huddersfield HD3 3AD**.

**Derby & District ARC** meet Wednesdays, 7.30pm at 119 Green Lane, Derby. August 19 is EMC - an illustrated talk by **Bob Peace** of the RSGB EMC committee, the 26th is 'How chips are made' by **Chris Muriel G3ZDM**, September 2 is a Junk Sale & the 9th is 'Lightning Protection' - illustrated talk by **Furse & Co., Lightning Protection Specialists**. More details from **Richard Buckby G3VGW**, 20 Eden Bank, Ambergate, Derby DE5 2GG. Tel: (0773) 852475.

**Dereham ARC** meet 2nd Thursdays, 8pm at the St. Johns Ambulance Hall, Yaxham Road, Dereham. August 13 is a BBQ & Surplus Equipment Sale. More details from **Mark Taylor G0LGJ** on (0362) 691099.

**Derwentside ARC** meet Wednesdays, 7.30pm in the Steel Club, 36 Medomesley Road, Consett, County Durham. Regular talks by amateurs & non-amateurs. Construction work overseen by **Don G4LGA**. Further details from **Geoff Derby G7GJU**, 60 Pine Street,

**Grange Villa, Chester-le-Street, County Durham DH2 3LX**. Tel: 091-370 2032.

**Dorking & District RS** meet at The Friends Meeting House, South Street, Dorking, 7.45pm. More details from **John Greenwell G3AEZ** on (0306) 77236.

**Dorset Police ARS**. A new radio society. Membership open to anyone connected with Dorset police, such as all regular police officers, all special constables, civilian staff employed by Dorset police, immediate families of all the above & retired police officers resident in Dorset. Further details about membership from **Richard Newton G0RSN**, Ferndown Police Station, Ringwood Road, Ferndown BH22 9AF. Tel: (0202) 552099 ext. 3198.

**Dragon ARC** meet 1st & 3rd Mondays, 7.30pm at the Four Crosses Hotel, Menai Bridge. August 17 is a construction evening & September 7 is Vintage radio. **Tony Rees G4VFMQ** on (0248) 600563.

**Dronfield & District ARC** meet 1st & 3rd Mondays, 7.30pm in Room 3 of Gladys Buxton School, Oakhill Road, Dronfield. On other Mondays, members meet socially, by arrangement at the Fleur-de-Lys Public House, Main Road, Unstone. More details from **Piers Dildham G7HRW**, 110 Green Lane, Dronfield, Nr. Sheffield S18 6FU. Tel: (0246) 290444.

**Dundee ARC** meet Tuesdays, 7pm in the College of Further Education, Graham Street, Dundee. Further details from **George Millar G4MFSB**, 30 Albert Crescent, Newport-on-Tay, Fife DD6 8DT.

**Dunstable Downs RC** meet Fridays, 8pm at The Old Mill, West Street, Dunstable, Beds. August 14 is a DF hunt & the 28th is a BBQ. Further details from **Wendy Jefferson** on (0582) 451057.

**Easington ARS (Co. Durham)** meet Thursdays, 7.45pm at Southside Social Club, Easington Village. Further details from **Mr H. Walker G3CBW**, 20 Birchfield Drive, Eaglescliffe, Stockton-on-Tees, Cleveland TS16 0ER. Tel: (0642) 788280.

**Echelford ARS** meet in the Community Hall, St. Martin's Court, Kinston Crescent, Ashford, Middlesex, 7.30pm. Further details from **P. Townshend G6PMT** on (0344) 843472.

**Edgware & District RS** meet at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, 8pm. August 27 is SSB Field day briefing, September 5/6 is SSB Field Day & the 10th is 'Radio Data Systems' by **Chris Nicholas G0LZV**. More details from **Howard Drury G4HMD**, 11 Batchworth Lane, Northwood. Tel: (0923) 822776.

**Erewash Valley ARG** meet Thursdays, 8.30pm at 'The Ancient Druid' public house, Cotmanhay Road, Ilkeston. Further details from **Graham Beech G0KBN**, 15 Fisher Court, Cotmanhay, Ilkeston, Derbyshire DE7 8PZ. Tel: (0602) 327540.

**Fareham & District ARC** meet Wednesdays, 7.30pm in Portchester Community Centre, Westlands Grove, Portchester, Fareham, Hants. Details from **Red Smith G0ERS** on (0705) 373572.

**Farnborough & District RS** meet 2nd & 4th Wednesdays, 7.30pm at Farnborough Community Centre, Meudon Avenue, Farnborough, Hants. More details from **Tommy Tomlinson G3UHW** on (0252) 515041.

**Fylde ARS** meet 2nd & 4th Thursdays, 7.45pm at South Shore Lawn Tennis Club, Midgeland Road, Blackpool. August 13 is a DF Foxhunt. **Eric Fielding G4IHF** on (0253) 726685.

**Glenrothes & District ARC** meet in their clubrooms, Provosts Land, Leslie, Fife, 8pm. Further details from **John Hardwick G4M4LA** on (0592) 742763.

**Gloucester ARS** meet Wednesdays, 7.30pm at St. John Ambulance HQ, Heathville Road (off London Road), Gloucester at 7.30pm. August 15 is DF Hunt at Beechenhurst, the 19th is Packet Self-Help Group, the 26th is construction group, September 2 is their AGM, & the 9th is a Construction group. Further details from **Jenny Beckingham G7JUP** on (0452) 528533 Ext. 2734.

**Goole R & ES** meet most Fridays, 7.30pm at the West Park Pavilion, West Park, Goole, last Fridays at the 'Black Swann Inn', Asselby. August 14 is CW Instruction night, the 21st is a Summer Junk Sale, the 28th is a Social evening & September 4 is G0OLE on air night. Further details from **Steve Price G0VHL** on (0405) 769130.

**Grafton RS** meet 2nd & 4th Wednesdays, 8pm in Holy Trinity Club Hall at the rear of Holy Trinity Church, Granville Road, London N4. Further details from **Rod G6JUZ** on 081-368 8154.

**Graham RC** meet 1st & 3rd Tuesdays at

the Kontak Social Club, Barrowby Road, Grantham. Further details from **John Kirton G8WWJ**, 'Treetops', 13 Saltersford Road, Grantham, Lincolnshire NG31 7HH. Tel: (0476) 65743.

**Great Lumley AR&ES** meet Wednesdays, 8pm at Great Lumley Community Centre, Great Lumley, Nr. Chester-le-Street, Co. Durham. For more details, contact **Barry G1JDP** on 091-388 5936.

**Halifax & District ARS** meet 1st & 3rd Tuesdays, 7.30pm at the 'Running Man' Public House, Pellon Lane, Halifax. August 18 is 'Old & New Equipment' by **J. Fish G4MH**. For further details, contact **David Moss G0DLM**, Beechwood Lodge, Leeds Road, Lightcliffe, Halifax, West Yorkshire HX3 8NU. Tel: (0422) 202306.

**Hambleton ARS** meet in West House, Allertonshire School, Northallerton at 7.30pm. On September 10 they have a Practical night. For more details, contact **Nigel Robertshaw G0NHM** on (0609) 776608.

**Hereford ARS** meet 1st & 3rd Fridays at the Civil Defence HQ, Magistrates Court, Gaoi Street, Hereford. More details from **Errol Robinson G4MET**, 29 Folly Lane, Hereford HR1 1LX. Tel: (0432) 355297.

**Hoddesdon RC** meet alternate Thursdays, 8pm at the Conservative Club, Rye Road, Hoddesdon, Herts. August 20 is a Video & talk on 'Friedrichshafen' by **Roy G4UNL** & September 3 is a social night. Details from **Roy G4UNL** on 081-804 5643.

**Horndean & District ARC** meet 1st Thursdays, 7.30pm at Horndean Community School, Barton Cross (off Catherington Lane), Horndean, Hants. September 3 is Surplus two-way radio conversions, **Chris Lorek**. For more information, contact **Stuart Swain**, 35 Mavis Crescent, Havant, Hampshire PO9 2AE. Tel: (0705) 472846.

**Hornsea ARC** meet Wednesdays, 8pm at the Mill, Atwick Road, Hornsea. Further information from **Jeff G4IGY** on (0564) 533331.

**Horsham ARC** meet at the Guide Hall, Denne Road, Horsham, West Sussex, 8pm. Further details from **Peter Stevens G8SUI**, 11 Nutwood Avenue, Brockham, Betchworth, Surrey RH3 7LT. Tel: (0737) 842150.

**Ilford Group RSGB** meet Thursdays at 7pm. For further details, please contact **J. Hooper** on 081-478 3741.

**Ipswich RC**. Contact **Mrs S. Elden G8HYE**, 124 Larchcroft Road, Ipswich IP1 6PQ.

**Itchen Valley RC** meet 2nd & 4th Fridays, 7.30pm at the Scout Hut, Brickfield Lane, Chandlers Ford. Further details from **Maurice Cheeseman G1IPQ** on (0703) 736784.

**Jersey ARS** meet Fridays, 8pm at La Moye Signal Station, St. Brelade. Further details from **Ken** on (0534) 483722.

**Keighley ARS** meet at The Ingrow Cricket Club, Ingrow, Keighley, 8pm. August 13 is Ideas for club events 1993, the 20th is a natter night, the 27th is 'Sounds on the Air' G4ZVD, September 3 is a natter night & the 10th is a Visit to Royal Mail, Bradford at 6.30pm. Further details from **Kathy Conlon G1IGH** on (0274) 496222.

**Kettering ARS** meet Tuesdays, 7.30pm at the Electricity Sports & Social Club, Eksdale Street, Kettering. Further details from **Lan GORDV** (but QTHR as G7EHM) on (0536) 514544.

**Kidderminster & District ARS** meet alternate Tuesdays, 8pm at The Queens Head, Wolverley, Worcestershire. For more details contact **Geoff Philpotts G7JIR**, 62 Erneyale Close, Stourport-on-Severn, Worcs DY13 0AH. Tel: (0299) 379229.

**The Kilo Delta Club** for all radio enthusiasts meet in the 'Victoria Inn', Hollins Road, Oldham, Lancashire, at 8pm. All enquiries to the **Secretary, Kilo Delta Club**, PO Box 93, Oldham, Lancashire OL8 3XE.

**King's Lynn ARC** meet Thursdays, 7.30pm at the 19th King's Lynn Scout HQ, North Runcion. Further details from **Derek Franklin G0MQL** on (0553) 841189.

**Lothians RS** meet on the 2nd & 4th Wednesdays, 7.30pm in the Drwell Lodge Hotel, Polwarth Terrace, Edinburgh. Further details from **Mel Evans** at 56 Southhouse Road, Edinburgh EH17 8EU or telephone 031-664 5403.

**Loughton & District ARS** meet in Room 14 of Loughton Hall, 7.45pm. For more details contact **Mike Pilsbury G4KCK** on 081-504 4581.

**Louth & District ARC** meet 3rd Tuesdays, 7.30pm at the Kings Head, Louth. More details from **Neil Bartholomew G0JXY**, The Bunlough, Main Road, Grainthorpe, Lincs LN11 7HX.

**Maidenhead & District ARC** meet at The Red Cross Hall, The Crescent, Maidenhead,



7.30pm. August 18 is a 144MHz Foxhunt. Details from **Neil G8XYN** on (0628) 25952.

**Maidstone YMCA ARS** meet Fridays, 8pm at the YMCA Sports Centre, Melrose Close, Maidstone, Kent. August 25/September 1 are dummy Morse tests & September 4 is an open night. RAE classes every other week with lectures & events on alternate weeks (starting September), CW classes every week. More details from **Colin Roberts** on (0622) 670936.

**Manchester & District ARS** meet Tuesdays, 7pm at Simpson Memorial Community Association, Moston Lane, Manchester M10 9NB. Further details from **Roger Farley GOKTR**, 6 Cardigan Road, Hollinwood, Oldham OL8 4SF.

**Mansfield ARS** meet at the Polish Catholic Club, off Windmill Lane, Woodhouse Road, Mansfield. September 3 is a talk by Doug on 'Narrow Band TV' at 7.30pm. Further information from **Mary GONZA** on (0623) 755288.

**Midland ARS** meet in Unit 22, 60 Regent Place, off Caroline Street, Birmingham B1 3NJ. Wednesdays are RAE classes & Thursdays are Natter nights. August 18 is a Junk Sale, the 28th is Atari night & the 31st is Computer night. For further details, contact **John Crane GOLAI** on 021-628 7632 evenings.

**Milton Keynes & District ARS** meet 2nd Mondays at North Bucks Youth Sports Hall, Haversham Road, Wolverhampton, Milton Keynes. For more information, please contact **Julian Winsor G3FGB** on (0908) 611005.

**Morecambe Bay ARS** meet every other Tuesday, 7.30pm at the Trimpell Sports & Social Club, with Morse instruction each Tuesday during club meetings. For more details, please contact **J. Burrow G0NYD**, 36 Longfield Drive, Cragbank, Barnforth, Lancashire LA5 9EJ. Tel: (0524) 733212.

**Nelson & District ARS** meet Wednesdays, 7pm at Llancaiach School Nelson. They also run a c.w. class at their meetings. Anyone wishing to find out further information is welcome to call in, or otherwise contact **Leighton Smart GWOLBI** at 33 Nant Gwyn, Treflewis, Mid-Glamorgan, Wales CF46 6DB. Tel: (0443) 411736.

**Norfolk ARC** meet Wednesdays, 7.30pm at 'The Norfolk Dumpling', The Livestock Market, Harford, Norwich. **Jack Simpson G3NJK** on (0603) 747992.

**North Bristol ARC** meet Fridays, 7pm at Self Help Enterprise, 7 Braemar Crescent, Northville, Bristol. RAE & Morse tuition is available for members. More details from **Tony G4ROX** on (0272) 513573.

**North Ferriby United ARS** meet Fridays, 8pm at the North Ferriby Utd. FC Social Club, Church Road, North Ferriby, East Yorkshire. Further details from **Frank Lee G3YCC** on (0482) 650410.

**North Wakefield RC** meet Thursdays at 'The White Horse' PH, Fall Ings Lane, East Ardsley, Nr. Wakefield. Morse classes start at 7.30pm & all are welcome, with the Novice class on Friday evening. More details from **John Hoban G0EVT** on (0924) 825443.

**Nottingham ARC** meet Thursdays, 7.30pm at the Sherwood Community Centre, Mansfield Road, Nottingham. August 13 is a talk on 'Balun Construction' by Stewart G3WQV, the 20th is Activity/Foxhunt 4, the 27th is a talk on 'Repeater Construction & Logic' by Barry GOLCV, September 3 is Forum & the 10th is a talk on 'Foreign Language QSOs' by Walter G00MO (postponed from the July 9). Further details from **Ian Miller G4JAE** on (0602) 232604.

**Otley ARS** meet Tuesdays, 8pm in the shack at the rear of the RADB Club, Westgate, Otley, West Yorkshire. Further details from **Jack Worsnop G7DFC** on (0274) 636197.

**Oxford & District ARS** meet 2nd & 4th Thursdays, 7.45pm at the British Legion Club, Haddow Road, Crotch Crescent, Marston Road, Oxford. August 27 is a Video night. More details from **Terry Hastings G0CFN** on (0865) 863526.

**Pontefract & District ARS** have Morse classes on Mondays, Novice classes on Tuesdays & normal meetings on Thursdays, all at the Carleton Community Centre, Carleton, nr. Pontefract, at 8pm. Details from **Colin Wilkinson** on (0977) 677006.

**Poole RAS** meet 2nd & last Fridays, 7pm at Lady Russell-Coates House, Lower Constitution Hill Site, Bournemouth & Poole College of FE. More details from **Vernon Cotton G3BCI**, 45 Branksome Hill Road, Bournemouth, Dorset BH14 9LF. Tel: (0202) 760231.

**Preston ARS** have 'A Preston Kaleidoscope' an illustrated talk by Mrs Crossley on August 20 & 'Test Equipment'

talk by Mr Grimes on September 3. Details of their meeting place & time from **Eric Eastwood G1WCQ**, 56 The Mede, Freckleton, Preston, Lancashire PR4 1JB. Tel: (0772) 686708.

**Prudential ARS** is open to all employees & ex-employees of the Prudential companies. All those interested in PARS should contact **David Dyer G4DNX** at 'Highbank Cottage', Underhill, Moulsoford, Oxon OX10 9JH.

**Reading & District ARC** meet 2nd & 4th Thursdays, 8pm at The Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading. August 13 is 'Standing Wave Ratios' by Peter Chadwick G3RZP, the 27th is 'History of GB2SM' by Geoff Voller G3JUL, the 29th is 'SE Guide Dog Fete' by Chris Young G4CC, the 29/30th is 'Support Horse Trials' by Paul Reed & September 10 is the Autumn Junk Sale. More details from **Nick Challacombe GOLGG** on (0734) 722489.

**Rochdale & District ARS** meet Mondays at T. S. Frohisher, Greenbank Road, Rochdale. Further details from **Brian** on 061-653 8316 or **Dave** (0706) 32502.

**Rhyl & District ARC** meet 1st & 3rd Mondays. August 28 is the Annual Dinner. For more details, contact **Ken Padley GW7IAR**, 67 Rosehill Road, Rhyl, Clwyd LL18 4TS. Tel: (0745) 338276.

**Salisbury Radio & Electronics Society** meet Tuesdays, 7.30pm at Grosvenor House Centre, Churchfields Road, Salisbury. For further details, contact **David Kennedy G7GWF**, 'Celeborn', 11 Silverwood Drive, Laverstock, Salisbury, Wiltshire SP1 1SH.

**Salop ARS** meet Thursdays, 8pm at the 'Old Buck's Head', Frankwell, Shrewsbury. August 13 is 'At Home With G1YJB/G1YJA', the 20th is a natter night & the 27th is 4th Foxhunt - The Oak Hotel, A5, Shelton. Further details from **Glenda G1YJB** on (0939) 232090.

**Sevenoaks & District ARS**. Details from **The Secretary, c/o Sevenoaks District Council, Council Offices, Argyle Road, Sevenoaks, Kent TN13 1HG**.

**Sheffield & District ARS** meet Thursdays, 8pm at the Church Hall, Amphil Road, Sheffield, Bedfordshire. For further information, contact **Paul G1GSN** on (0462) 700618.

**Silverthorn RC** meet Fridays, 7.30pm at The Chingford Community & Adult Education Centre, Friday Hill House, Simmons Lane, Chingford, London E4 6JH. August 14 is a 144MHz direction finding contest starting at Friday Hill House at 7pm, non-members welcome & the 21st & 28th are informal meetings at Royal Oak public house, Chingford, E4, as Friday Hill House is closed for annual maintenance. More details from **Andrew Mowbray GOLWS** on 081-529 4489 between 5.30 & 6.30pm weekdays only.

**Solihull ARS** meet 3rd Thursdays in The Shirley Centre, 274 Stratford Road, Shirley, Solihull, West Midlands. For more details, contact **Colin Taylor G3USA**, 231 Robin Hood Lane, Hall Green, Birmingham B28 0DH. Tel: 021-777 9965 evenings or (0827) 53344 day-time.

**South Dartmoor ARC** meet Mondays, 8pm at South Dartmoor School, Balland Lane, Ashburton, Devon. This radio club has a committee of only one adult - the rest being school-age youngsters! Although anyone wishing to join in is welcome. For more details on this Novice-run radio club, contact **Peter Thornhill G6ZKQ**, 21 Elmbank, Buckfastleigh, Devon TQ11 0DX. Tel: (0364) 43433.

**South Dorset RS** meet 1st Tuesdays, 7.30pm in the Wessex Lounge of Weymouth Football Club. **Geoff Gwillian G4FJO**, 13 Overl&s Road, Wyke Regis, Weymouth DT4 9HS. Tel: (0305) 781164.

**Southdown ARS** meet 1st Mondays, 8pm in the main hall of the Chaseley Home for the Disabled, South Cliff, Eastbourne. On September 7 they have G3MXJ on HF Contests, Computers in Contests & Future developments. Details from **John Vaughan G3DQY** on (0323) 485704.

**South Notts ARC** meet at Highbank Community Centre, Farnborough Road, Clifton Estate, Nottingham, or Fairham Community College, Farnborough Road, Clifton Estate. August 14 is a talk-in (S22) & a talk on 'Designing & Constructing Repeaters' by Barry GOLCU, the 16th is a Treasure Hunt, the 21st is on the air, the 28th is a talk-in (S22) & a talk on 'Weather Stations & Propagation' by Roy G4NPT & the 30th is a 5th Foxhunt. For further details contact **Ray G7ENK** on (0602) 841940.

**Southgate ARC** meet at Winchmore Hill Cricket Club Pavilion, Firs Lane, Winchmore Hill, London N21. August 13 is a lecture by Keith Draycott G8UKT on 'WAB Hunting', the 27th is a Club DF equipment check, the 31st is

a Bank Holiday DF hunt & BBQ in White Webbs Park, Enfield & September 10 is a Lecture & show by R. A. Davis G0MEO on 'Model Aircraft'. **Brian Shelton G0MEE**, 22 Berkeley Gardens, Winchmore Hill, London N21 2BA. Tel: 081-360 2453.

**Spalding & District ARS** meet Fridays, 8pm at The Riverside Centre, The Old Fire Station, Double Street, Spalding, Lincolnshire. Further details from **David Johnson**, 65 West Street, Bourne, Lincolnshire PE10 9PA. Tel: (0778) 425367 (6-7pm).

**Spenn Valley ARS** meet Thursdays, 8pm in Old Bank Working Men's Club, Mirfield. Alternate Thursdays are 'Noggin & Natter nights'. Further details from **Ian Barraclough G7OWY** on (0484) 716453, early evening.

**Stevenage & District ARS** meet in Ground Floor Rear Suite, Sitec Building, Ridgmond Park, 7.30pm. The club will be running an RAE course again from September at the above address. More details from **Pete Daly G0GTE**, 48 Lincoln Road, Stevenage, Herts SG1 4PJ. Tel: (0438) 724991.

**Stirling ARS** meet Thursdays, 7.30pm at premises near Throsk, Stirling. Details from **Brian Muleady GMOKWL**, QTHR or on (0324) 36235.

**Stockport RS** meet 2nd & 4th Wednesdays, 7.45pm in Room 14 of the Dialstone Centre, Lisburne Lane, Offerton, Stockport, Cheshire. Further details from **Ray Dawson G3JLX**, 4 Douglas Road, Hazel Grove, Stockport SK7 4JG. Tel: 061-483 0372, or **Andrew Paterson G0HAL** on 061-980 1334.

**Stourbridge & District ARS** meet 1st & 3rd Mondays, 8pm at Robin Woods Community Centre, Scotts Road, Stourbridge. Details from **Dennis Body G0HTJ** at 53 Grove Road, Wollescote, Stourbridge, West Midlands DY9 9AE.

**Stratford-Upon-Avon & District RS** meet 2nd & 4th Mondays, 7.30pm at the Home Guard Club, Main Road, Tiddington, Stratford-Upon-Avon, Warwickshire. Further details from **Alan Beasley G0CJX**, 2 Ilmington Road, Blackwell, Shipston-on-Stour, Warwickshire CV36 4PE. Tel: (0608) 82495.

**Stroud & District ARS** meet fortnightly in the Minchinhampton Youth Centre. For more details, please contact **Dave Stallon** on (0453) 886964.

**Sudbury & District ARC 'SANDRA'** meet 1st Tuesdays, 8pm at the Five Bells Inn, Great Cornard, Sudbury, Suffolk. Further details from **Colin Muddimer G0PAD** on (0787) 77004.

**Surrey RUC** meet at 'Terra Nova', The Waldrons, Waddon, Croydon, Surrey. August 17 is a natter night & September 7 is 'Packet Radio' by Peter G3ZPB. More details from **Berni G8TB** on 081-660 7517.

**Sutton & Cheam RS** meet 3rd Thursdays, 7.30pm at Sutton Indoor Football Club, The Borough Sports Ground, Gander Green Lane, Sutton, Surrey, with natter nights on 1st Thursdays. August 25 is a committee meeting at G3VHK/G0PNT, September 3 is a natter night & the 5/6th is SSB Field Day. More details from **John Pott G0BWW**, 53 Alexandra Avenue, Sutton SM1 2PA.

**Taunton & District ARC** meet 1st & 3rd Fridays, 7.30pm in 'The Basement', County Hall, The Crescent, Taunton. Other Fridays informally for a natter & station operation, Morse code classes, etc. For further details, contact **Mr W. Lindsay-Smith G3WNI**, Way Close, Madford, Hemycok, Culmpton, Devon EX15 3QY. Tel: (0823) 680778.

**The GB3HZ Repeater Group** meet at Chiltern Communications, Lincoln Road, Cressex Industrial Estate, High Wycombe, Bucks, 8pm. Details from **Francis Rose G2DRT** on (0494) 814240.

**The Submarine ARC** submerge on Thursdays, 7pm at HMS Dolphin, Gosport, Hants. For more details contact **K. Fisher GOLXX** on (0329) 281174.

**The Three Counties ARC** meet every other Wednesday, 8pm at the Railway Hotel, Liphook Hampshire. August 26 is a Junk Sale & September 9 is 'The History of Witchcraft in the Three Counties' by Jeremy Ross. **Kevin Roche G8GOS** on (0420) 83091.

**The Kingsotn & District ARS** meet 3rd Wednesdays, 8pm at 'Alfriston', 3 Berrylands Road, Surrey KT5 8RB. On August 19 they have a Technical discussion. More details from **Ray Fuller** on 081-398 1128.

**Thornbury & District ARC** meet at the United Reform Church, Chapel Street, Thornbury, 7.30pm, talks start at 8pm. Morse practice sessions are held between 7.30 & 8pm. More details from **H. Cromack G0GFI** at Rose Cottage, The Naite, Oldbury-on-Severn, Bristol, Avon BS12 1RU. Tel: Thornbury 411096.

**Tor ARS** meet Tuesdays, 7.30pm at the Ernest Bailey Community Centre, New Street, Matlock, Derbyshire. More details from **Vince Shirley G0ORC** on (0773) 826747.

**Torbay ARS** meet Fridays, 7.30pm at the ECC Social Club, Highweek, Newton Abbot. August 14, 28th & September 4 are club nights, August 21 is 'Steam Nostalgia' talk/slides & the 30th is Torbay Mobile Rally at STC Paignton Social Club. More details from **Andy Stafford G4VPM** on (0803) 329055.

**Trowbridge & District ARC** meet at 8pm, in the Territorial Army Centre, Bythesea Road, Trowbridge, Wiltshire, 8pm. More details from **Ian Carter G0GRI** on (0380) 830383.

**Vale of Evesham RAC**. Further details on the club from **Alasdair** on (0386) 41508.

**Verulam ARC** meet 2nd & 4th Tuesdays, 7.30pm at the RAF Association Headquarters, New Kent Road (off Malborough Road), St. Albans, Hertfordshire. 2nd Tuesdays are their activity evenings & 4th Tuesdays are their main monthly meetings. More details from **Walter Craine G3PMF**, 5 The Crescent, Abbots Langley, Watford, Hertfordshire WD5 0DR.

**Wakefield & District RS** meet Tuesdays, 8pm in First Floor Rooms, Ossett Community Centre, Prospect Road, Ossett. August 18 is a 144MHz DF/Foxhunt & September 1 is 144MHz CW Cumulative Contest. More details from **Dave Ackrill G00JA**, 104 Durkar Lane, Crigglestone, Wakefield WF4 3HY. Tel: (0924) 240577.

**West of Scotland ARS** meet Fridays, 7.30pm at the Scout HQ, 21 Elmbank Street, Glasgow. For further details, please contact **John Power G0MKT0**, PO Box 599, Glasgow G3 6QH.

**White Rose ARC** meet Wednesdays, 8pm at Moorstown RUFC, Moss Valley, King Lane, Leeds LS17 7NT. August 30 is a Silver Jubilee BBQ. More details from **Mrs Betty Cappelluto**, 7 Rycroft Place, Leeds LS13 4PF. Tel: (0532) 555488.

**Whitton ARC** meet Fridays, 8pm at the Whitton Community Centre, Percy Road, Whitton, Twickenham. More details from **Ian G00FN** on 081-894 9131.

**Wiesbaden ARC - DA1WA** - is a club mainly for US military personnel stationed anywhere near Wiesbaden, Germany. For more details, contact **Robert Kipp J0J0PU**, Hugelstr. 25, D-6070 Langen, Germany.

**Wigtownshire ARC** have meetings & RAE classes every Thursday, 7.30pm at the Community Education Office, Stranraer Academy. More details from **Ellie Gaston G0MHPK**, 3 Victoria Buildings, Cairnryan, Stranraer, Dumfries & Galloway DG9 8RA. Tel: (0581) 2202.

**Wimbledon & District ARS** meet 2nd & last Fridays in St. Andrews Church Hall, Herbert Road, Wimbledon SW19. **Chris Frost G0KEB**, 61 Selbourne Avenue, Tolworth, Surrey KT6 7NR. Tel: 081-397 0427.

**Winchester ARC** meet 3rd Fridays, 7.30pm at the Red Cross Centre, Durrigate House, 44 Featherals from **Malcolm Butler G0LMD**. Further details from **Nr. Winchester, Hants SO21 3DU**. Tel: (0962) 89550.

**Wirral ARS** meet 1st & 3rd Wednesdays, 7.45pm at Ivy Farm, Arrowe Park Road, Birkenhead, Wirral. More details from **Alec Seed G3F00** on 051-644 6094.

**Woodpecker Radio Group** meet Mondays, 8.30pm at Richmond Place Club, Edgar Street, Hereford. More details from **Chris** on (0432) 352441.

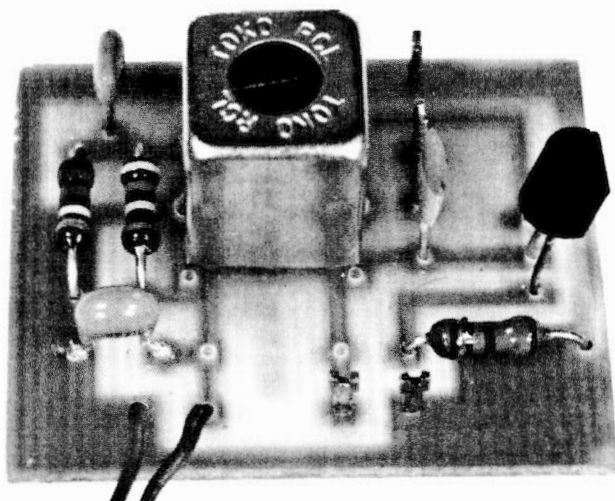
**Wrexham ARS** meet at the Maesgwyn Community Centre, Maesgwyn Road, Wrexham. August 18 is a Field Evening & September 1 is a talk on 'Magnetic Loops' by John GW3RBM. More details from **Ian Wright GW1MVL**, 'Derwydd', 2 Duke Street, Rhos, Wrexham, Clwyd LL14 1SY. Tel: (0978) 845858.

**Yeovil ARC** meet Thursdays at Red Cross HQ, Grove Avenue, Yeovil, Somerset. August 13 is RSGB Video, the 20th is 'A Single Side-band Transmitter' by G3MYM, the 27th is a natter & operating night, September 3 is 'PME' by G4XXX & the 10th is 'Break Through' by an Official of RCA. Further details from **Mike Woodford G0JVG**, Holm Wood, 5 Orchard Close, South Petherton, Somerset TA13 5DX.

**Club News**

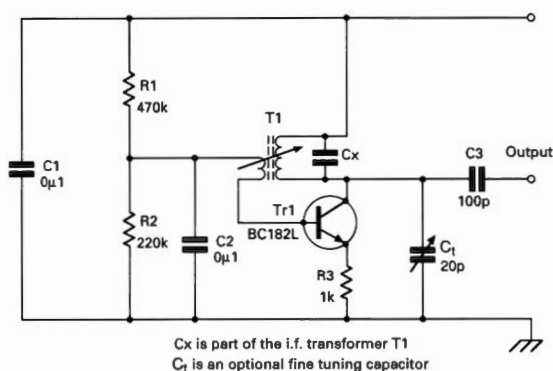


# Getting Started - The Practical Way



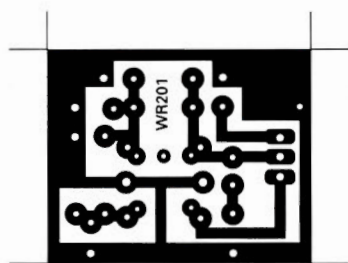
**This month's project, a beat frequency oscillator or b.f.o.**

*This month the Rev. George Dobbs G3RJV looks further into the subject of radio frequency oscillators, and has more to tell us about the mysterious Mr Hartley of oscillator fame.*

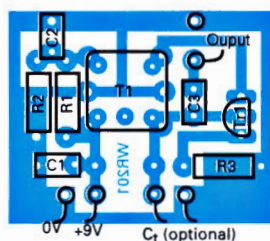


**Fig. 1: The Hartley Oscillator type b.f.o. circuit described in the text by G3RJV.**

**Fig. 2: Copper track lay-out for the Hartley Oscillator b.f.o. printed circuit design.**



**Fig. 3: Component side overlay and placement diagram for the Hartley Oscillator p.c.b.**



Readers of *Practical Wireless* are well known for their response to what they read. I can vouch for that, because in the April 'Getting Started...', I asked if anyone knew who 'Mr. Hartley' of the Hartley Oscillator circuit was.

My question brought a result of course! Not being one to leave the question unanswered, Sam Smith G7LSO, a keen *PW* reader, conducted his own research.

After a lot of fruitless searching, he found an American book called *Inside Electronics*. The book, published by Signet Science Library in 1965, gives a little more information about the man behind the circuit.

## Telephone Engineers

Sam found that the story goes back to about 1915. It began when American telephone engineers had installed improved versions of de Forest's Audion valve on their long distance telephone lines. The stations were around 480km apart, and were located in Long Island and Delaware.

At this point, the American Navy stepped in. They then installed equipment developed at the Long Island and Delaware stations, in the Navy base at Arlington, Virginia and were that same year transmitting speech to Paris and Honolulu.

At that time, the largest valves (in 'American' they're called 'tubes') were made by Western Electric and were rated at 25W! To get the necessary power, they had to use a lot of valves. In fact they had to use 500 to obtain 1.5kW of modulated power in the antenna!

## The Triode Valve

America's first big transmitter was made possible by the invention of the triode valve. Although familiar now, the engineers of those days had overlooked the possibilities of the amplifier-oscillator-modulator. But they soon made up for lost time.

In the experimental transmitters Sam G7LSO read about, the grid modulation circuit was developed by a South African engineer by the name of H.J. Van der Bijl. The transmitter itself was designed by Raymond A. Heising, and the inductive feed-back oscillator was devised by one Ralph V. Hartley!

Sam suspects that there may not be any biographical details available on Ralph Hartley because if he was a serviceman without flag rank, details on him may well be restricted to footnotes in text books. But then, who has heard of Heising\* or Bijl! Perhaps some other enterprising reader may dig up more details on Mr. Hartley?

**Editorial note:** \*We've heard about 'Heising modulation', but research in the *PW* office drew a blank on Mr Bijl!

## A Practical Circuit

The diagram, Fig. 1, shows a practical circuit using a Hartley oscillator. This is a beat frequency oscillator or b.f.o. for use with a short wave receiver.

Those of you who are familiar with communications receivers, will probably know the function of a b.f.o. They're used when c.w. (Morse) signals or single-sideband suppressed carrier (s.s.b.) signals are being received.

For reception of these signals the receiver must add a carrier (an oscillator signal) to the incoming signal to make it intelligible. This is an important



Modern communications receivers have a switch position for receiving c.w. and s.s.b., which automatically selects a b.f.o. However, older receivers often have a b.f.o. which could be switched on and off.

The b.f.o. signal is usually added to the received signal at the intermediate frequency (i.f.) stage of the receiver. This is a fixed frequency, within the receiver, at which a lot of the signal processing takes place. This has the advantage that the b.f.o. can be at a single fixed frequency.

A simple b.f.o. with an output frequency of 455kHz is a useful circuit to build, as it will enable older receivers to resolve amateur c.w. and s.s.b. signals. The circuit in **Fig. 1**, is about the simplest way to do this job.

The circuit, shown in **Fig. 1**, is a Hartley oscillator using inductive (via the coil) feed-back. The transistor, Tr1, has a tuned circuit in its collector, provided by a coil and capacitor within an i.f. transformer.

## A Suitable Layout

As I've said before in this series, the circuit could just as easily be built using perf-board, if you prefer doing it that way. The method used with this technique has already been described in previous articles.

The diagram in **Fig. 3**, shows the view of the p.c.b. from above, with the component overlay provided to help you position each item on the board.

A BC182L transistor was used in the original design. The recommended transistor is not expensive, and it's easy to buy either at rallies or from mail order sources.

The i.f. transformer could be culled from any old transistor radio. If you do use an i.f. transformer recovered in this way, make sure you remove one that's placed centrally in the i.f. amplifier. They're usually fitted with a green or yellow core.

If the circuit is to oscillate (and that's the object of the exercise!), the feed-back must be in-phase with the signal. So if you're using a surplus i.f. transformer which fails to oscillate, all you have to do is reverse the connections on the feed-back winding, and try again.

The b.f.o. is not connected directly to the receiver, so no modifications are required to the existing equipment. The b.f.o. output goes to a

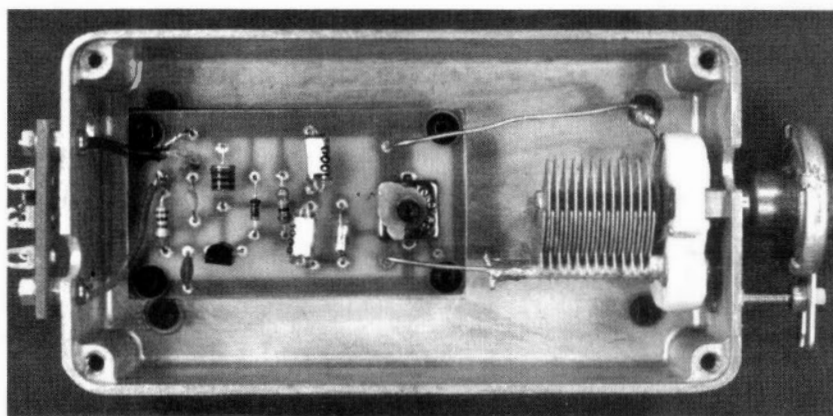
**Practical Wireless, September 1992**

**Fig. 4: Circuit diagram for the alternative, Colpitts type oscillator b.f.o. project.**

Cx is part of the i.f. transformer T1  
C101 is an optional fine tune capacitor

**Fig. 5: Copper track lay-out p.c.b. design for the Colpitts Oscillator version of the b.f.o. project.**

**Fig. 6:**  
**Component side**  
**overlay and**  
**placement**  
**diagram for the**  
**Colpitts version**  
**b.f.o.**



**The completed Colpitts  
b.f.o. built into a  
screened box. More  
about this next time!**

random length of wire, approximately one metre long.

The wire acts as the b.f.o. antenna. It radiates enough signal to be picked up in the i.f. amplifier stages of the receiver.

Testing the completed unit is very simple. All you have to do is attach the wire to the b.f.o., and lay it over the receiver and switch both units on.

You'll have to tune the b.f.o. to the i.f. frequency. This is done by adjusting the core in the



transformer.

To start the tuning process, tune in a station on the receiver. You should then adjust the core until a distinct whistle is heard on the signal. In practice, this operation can be done with a normal broadcast on the medium wave band (often referred to as the 'a.m. band').

Ideally the core should be adjusted with a non-ferrous trimming tool, but for this purpose a small screwdriver will do the job. However, do try to avoid forcing the core to move because this could damage the core material. If you do break the core, it's best to replace the i.f. transformer and start again!

After this initial adjustment, find a c.w. or s.s.b. signal on the receiver, and re-adjust the b.f.o. until the signal sounds right. This may also involve adjusting the amount of signal injected into the radio, which is done by changing the position and closeness of the radiating wire.

With a little practice, it should be possible to resolve c.w. and s.s.b. signals, even on a simple short wave receiver. You'll then find a whole new world open to you as a listener.

### The Limitations

The Hartley b.f.o. I've outlined above, offers a simple circuit, but like many simple circuits, it has limitations. One of the serious shortcomings is its lack of frequency stability.

As a result of this problem, you'll find it will require re-tuning from time to time, in order to remain at the correct frequency. To help in this respect, I've included a small (optional) variable capacitor,  $C_1$  in Fig. 1, which makes fine tuning easier.

To help overcome the tuning stability problem, a better circuit is the Colpitts b.f.o., which is shown in Fig. 4. The Colpitts circuit is a favourite with amateur radio constructors who are looking for a stable r.f. oscillator.

The necessary feed-back for this oscillator is provided by a capacitive arrangement. The capacitor, C102, couples the tuned circuit in the i.f. transformer to the field effect transistor (f.e.t.) Tr101.

The signal appears at the f.e.t.'s source, where you'll see there's a radio frequency choke (r.f.c.). This signal appears at the junction of the two capacitors, C103 and 104.

The two capacitors are of equal value. This means that half of the signal is decoupled to ground, and half is fed via C103 into the gate of Tr101, providing the feedback.

The resistor R102 and capacitor C105 decouple the supply at the drain. The resistor R101 and D101 together provide the bias for Tr101, while D101 is also an aid to the level stability of the signal.

Finally, the output signal may be taken from the secondary winding of the i.f. transformer or from the source of Tr101. The signal is then radiated via the simple antenna, and picked up by the receiver.

### Colpitts Version

The diagram, Fig. 5, shows the p.c.b. copper track side layout for the Colpitts b.f.o. The next diagram, Fig. 6 shows the component side of the board in an overlay fashion to help you place the individual parts.

As with the first version, there's no need to connect the b.f.o. to the receiver. The radiating wire is used, in the same fashion as the first version.

The central core in the i.f. transformer will also require adjustment, using the procedure I've already described. But, there will be a difference. This is

because of the added capacitance of the circuit, and the core will need to be unscrewed almost to the top of the screening can of the i.f. transformer.

### Best Results

Although both circuits perform well, the Colpitts oscillator gave the best results. I used it with a very old medium wave and short wave receiver. We'll be using this circuit in another project, so you'll probably find it to be the best option in any case.

Using the Colpitts b.f.o. I found it very easy to resolve s.s.b. signals for long periods of time without having to alter the tuning core. It put new life back into that old receiver!

### Shopping List For Hartley Oscillator BFO

#### Resistors

Carbon film 5% 0.25W

1k $\Omega$	1	R3
220k $\Omega$	1	R2
470k $\Omega$	1	R1

#### Capacitors

Miniature ceramic

100pF	1	C3
0.1 $\mu$ F	2	C1, 2

#### Semiconductors

Transistor

BC182L	1	Tr1
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#### Miscellaneous

Suitable i.f. transformer, recovered from scrap radio or bought new, Maplin HX43 or similar suitable. Optional fine tuning capacitor ( $C_1$ ) 20pF. These are obtainable at rallies or you can use the f.m. tuning section of Maplin FT79L, as these are 20pF maximum, p.c.b. (PW PCB Service).

### Shopping List For Colpitts Oscillator BFO

#### Resistors

Carbon film 5% 0.25W

100 $\Omega$	1	R102
100k $\Omega$	1	R101

#### Capacitors

Polystyrene

220pF	1	C102, 106
1nF	2	C103, 104

Miniature Ceramic

0.1 $\mu$ F	1	C105
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Variable

20pF	1	C101 (see miscellaneous)
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#### Semiconductors

Diodes

1N914	1	D101
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Transistor

MPF102	1	Tr101
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#### Inductors

Radio frequency choke

RFC101	1	1mH (see miscellaneous)
T101	1	(See text)

#### Miscellaneous

The variable capacitor, C101, can be 20pF section of f.m. section of Maplin FT79L. The i.f. transformer (T101) can be recovered from scrap radio as in the Hartley version, or bought new (see Hartley version of b.f.o. project). The r.f.c. (RFC101) can be Maplin ref. WH47B).



# Experimental 430MHz Wire Antennas

*Tony Martin G4XBY, has built two experimental collinear antennas for the 430MHz band, using lengths of wire and other basic materials. Although they're simple antennas, Tony says they should work well in any location.*

The two antennas I'm going to describe came about from a series of experiments. But, I'm going to describe them individually.

The diagram in **Fig. 1**, shows the first experimental antenna. For this version, which is a  $5\lambda/8$  over  $5\lambda/8$  collinear antenna, you'll need a piece of hard drawn copper wire 1.5 metres in length.

Take the length of wire and straighten it out. But be warned, this isn't as easy a task as it sounds!

I've found the best method to straighten the wire out, is to start by fixing one end to something that won't move. Then, all you have to do, is ask someone to pull the other end as hard as possible, by leaning back and using their weight against it.

While this kind person is pulling, and the wire is under tension, you can be busily 'wiggling' the kinks and bends out by hand.

## Vital Statistics

Now let's look at the vital statistics of the project. It's easy enough, as all the measurements are made from one end. You'll see I've marked this as point A in **Fig. 1**.

Mark all the points B-I out before you start. I

find a small triangular file provides one of the best methods of marking this wire, as it is rather hard. Make rings, or nicks (but not too deep) on the wire at the distances shown, taking care to measure everything accurately.

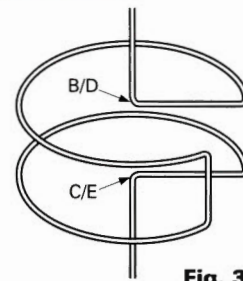
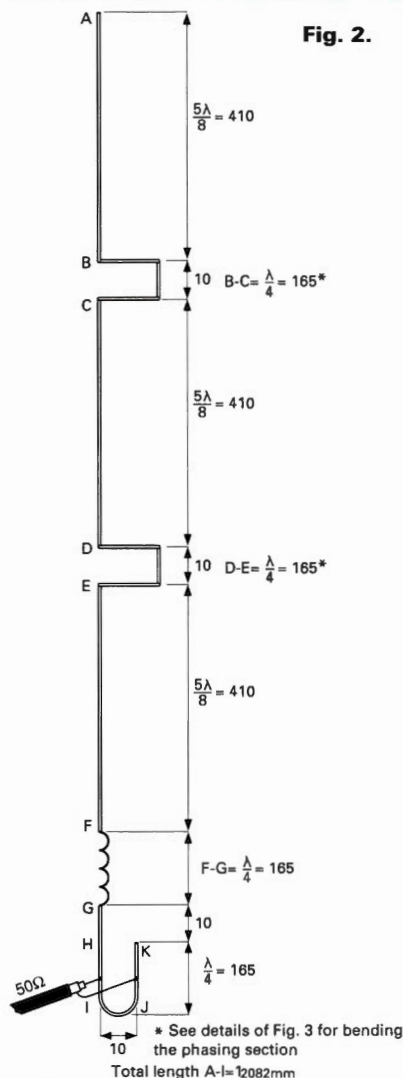
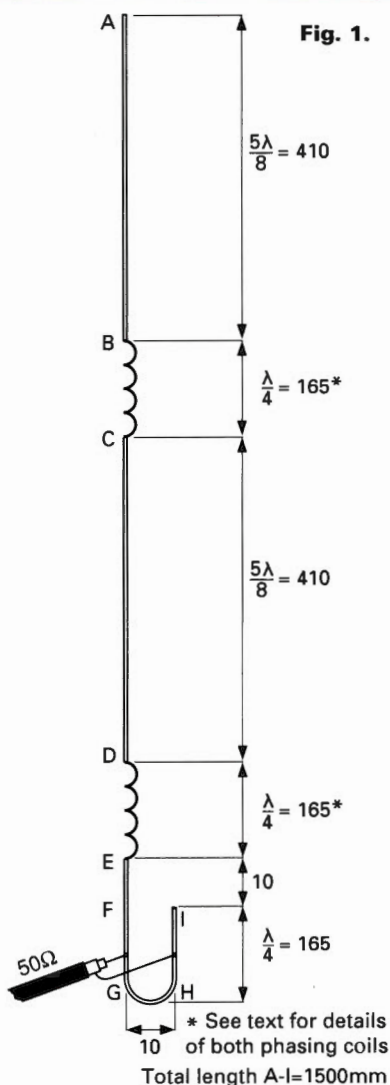
## Bending Wire

You start by bending the wire at a right angle at point B, and trapping it against a length of 12.5mm (1/2 inch) dowelling. I use a self-gripping wrench for this job.

Keeping about 7mm between each turn, wind the wire in a clockwise direction around the dowelling as tightly as possible. After four turns, this should bring you to point C, which should be in line with the section A-B.

Now bend the wire, again at a right angle, to continue in the original direction. At point D, repeat the process with the dowel and pliers, to create a similar coil to above.

The next job we have to do, is form the 'J' match feed-line. From point E, make a mark at 178mm in the direction of point I. This is to become the centre line (mid way between G and H) of the 'u' bend at the bottom of the 'J' match section.

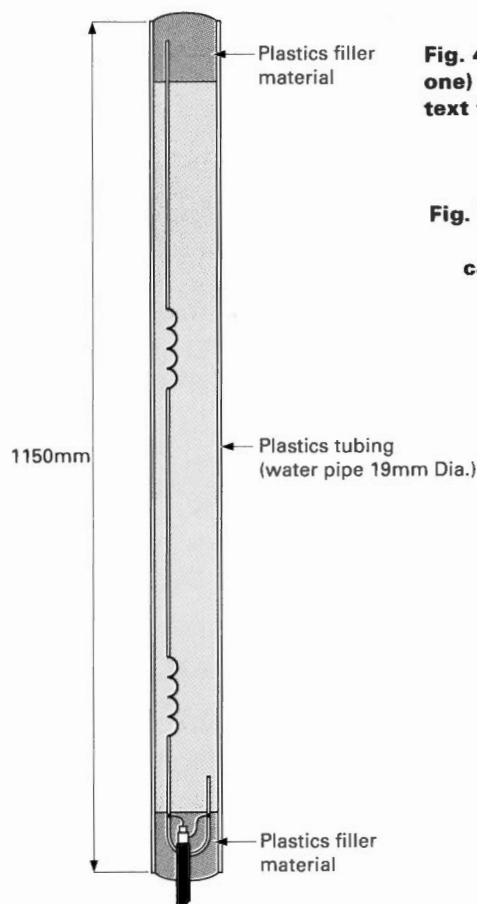


**Fig. 1: Detailed constructional diagram of the first antenna project. See text for full details on setting-up and adjusting the matching of the coaxial cable feed to the antenna.**

**Fig. 2: Constructional details of the second antenna project. See text for setting-up the matching of the antenna to the coaxial cable feed-line.**

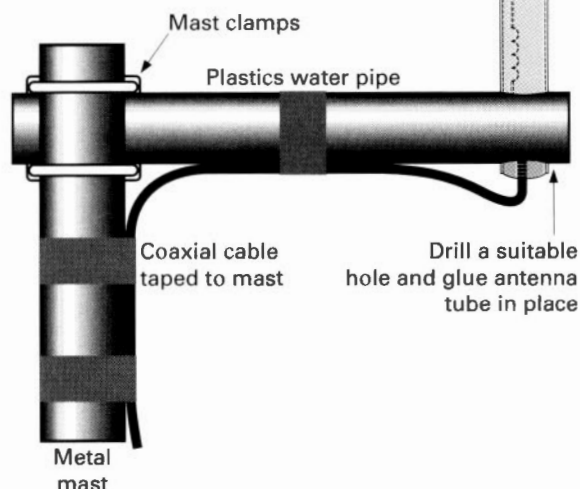
**Fig. 3: Constructional details of the preferred way of winding the coils for positions D-E and B-C on antenna project two. Coils wound using this method are less bulky, and the finished antenna is easier to fit into the plastics tube (see text for further details).**





**Fig. 4: Diagram showing the finished antenna (version one) fitted into a section of plastics water pipe. See text for suggestions regarding suitable materials.**

**Fig. 5: The completed antenna (either version) mounted in a length of plastics tubing and erected on a cantilever section made from the same material (see text).**



## Tuning Arrangements

The tuning arrangements are straightforward. Make up a 'patch' lead to fit your s.w.r. meter, using good quality crocodile clips on one end.

Ideally, the 'patch' lead should be an odd number of half wavelengths long at the centre working frequency of 434MHz. The free space  $\lambda/2$  wavelength of 434MHz is 346mm. Taking the usual velocity factor of coaxial cable as 0.66, this would give a coaxial  $\lambda/2$  as 228mm.

To start the tests, suspend the antenna from the ceiling (or somewhere out of the family's way!), using nylon mono-filament fishing line or similar. Don't forget to keep the antenna, as far away as possible from anything that might detune the system.

Next, you should attach the coaxial outer clip to the short side of the 'J' and the inner on the long side. Once this has been done, you can begin to adjust the feed-point to give the lowest s.w.r. reading possible.

It's not a difficult process, as long as you remember the following rule. And that golden rule is: keep both clips equal distances from their points G or H as you adjust the feed-point.

## Potted Antenna

When you are happy with the s.w.r. measurements you've obtained from the antenna, solder a piece of 50 $\Omega$  coaxial cable to the same positions as the clips. Then check the s.w.r. again, to see that it's still low.

If all is well, the antenna may be 'potted' into a piece of plastics water pipe. This is not a difficult job, and it will provide a neat finish, as shown by the diagrams in Fig. 4 and 5.

## Antenna Two

Having tackled the first project, I'll describe antenna two. As you've probably surmised, the second version I'm going to describe, is based on the first antenna.

Project number two is slightly different, as I've added another  $5\lambda/8$  section to provide greater gain. This time, I've also altered the phasing arrangements between the upper two sections of the antenna.

Before you start, look at the diagram in Fig. 2 which is the linear diagram of the second project. The new phasing sections, comprising B-C and D-E are phasing lines, rather than phasing coils. I have retained a phasing coil for the lower section, between points F and G.

## Same Methods

Using the same methods and techniques as described above, mark out the various distances from the reference (point A) as shown in Fig. 2. Once this has been completed, for the time being, just leave the two sections, B-C and D-E as shown in the diagram.

Next, beginning at point F, using the dowelling method I've already described, wind the section F-G into a four turn coil. The coil must be wound with about 7mm between the individual turns.

## Repeat The Process

Now we have to repeat the bending process. This is done to form the 'J' match section, just as we did for the first antenna.

The next job is the bending of the two phasing lines. These two sections of the antenna are formed



as shown in the diagram in Fig. 3.

The diagram in Fig. 3 demonstrates the most compact method of bending the wire, and the overall diameter of the phasing section should be about 20mm. The antenna elements run centrally through the phasing sections.

Another method is to wind the whole section around a length of 25mm (one inch) dowelling to form an almost complete loop. However, this method is slightly less compact, and the loop formed is off to one side of the antenna, making the 'potted' project quite large in diameter.

## Setting Up

As with the first antenna, we have to set up the feed-point to achieve the lowest s.w.r. possible at band centre, 434MHz. Once again, this is done by moving the feed-point on the 'J' match section so as to provide the lowest s.w.r. reading at 434MHz.

**Note:** There's an important point to remember, if the antennas are to be mounted on a metal pole, as shown in Fig. 5. When mounted in this way, you must make sure that the cross support plastics tube, is in-line with the feed-points on the 'J' match section of the antenna.

## Radiation Pattern

I make no claims for the gain or radiation pattern. As the results achieved will vary between antennas, I only offer these designs as a basis of experimenting with antennas at u.h.f. frequencies.

Even though I've qualified my results, they've worked for me. In my location, using either antenna, I can gain access to repeaters that a 'Slim-Jim' design is unable to do under the same conditions.

These two projects are fun to build, cheap to make and they work. Go on, have a go yourself!

## How Much? How Difficult

## Around £5 Intermediate

### Shopping List

Copper wire (see text), coaxial cable, crocodile clips, suitable length of 19mm plastics water pipe, mast clamps, plastics insulation tape, plastics filler material for sealing antenna into housing tube (fillers such as Plastic Padding, available at car accessory shops are suitable for this job, but make sure that the material you use is not loaded with metal and that it's not a conductor). **Warning: Many plastics filler materials give off inflammable vapours that can be dangerous in confined areas. Be safe, and follow the manufacturer's advice on where and how you mix the material.**

## BARGAIN BASEMENT

Write your advertisement in BLOCK CAPITALS - up to a maximum of 30 words plus 12 words for your address - and send it together with your payment of £2.35, and corner flash or subscriber despatch label to: **Donna Vincent, PW Bargain Basement, Enefco House, The Quay, Poole, Dorset BH15 1PP.**

Subscribers must include the despatch label bearing their address and subscription number to qualify for their free advert.

Advertisements from traders, apparent traders or for equipment that is illegal to possess, use or which cannot be licensed in the UK, will not be accepted.

No responsibility will be taken for errors.

**For Sale** Panasonic RF-B65 short wave receiver. Features include 36 memories, b.f.o., scanning and l.c.d. display, c.w. soft case, a.c. p.s.u. and long wire. Boxed as new with manuals, £120 o.n.o. Tel: Ian (0354) 660800.

**For Sale** Realistic PRO-2004 scanner, 300 channels, 25-520MHz and 760-1300MHz. Excellent condition, £160 carriage free. Loss of interest forces sale. Tel: 091-567 4048.

**For Sale** 60ft tower, including winch, a home-brew tower in the same style as Versatower. Wall mount but can be converted to post mount. Needs tidying up and cleaning etc., £150 buyer collects. John G4HGT, Leeds. Tel: (0532) 873874.

**For Sale** Racal RA17L h.f. receiver v.g.c. with service manual. Steve, Essex. Tel: (0702) 296285 after 6.30pm.

**For Sale** Swan 350 transceiver, s.s.b., 3.5, 7.0, 14, 21 & 28MHz with power unit, mic, handbook, 400W p.e.p. Carriage paid. Tel: (0504) 49514.

**Wanted** Drake model DC-4 power supply. Your price and postage paid. P. Gater, NB Halcyon, Orchard Marina, School Road, Rudheath, Northwich, Cheshire.

**Wanted** Any coils for HRO receiver, mains p.s.u. and matching loudspeaker. Mounting base for BC-348-0 receiver's cabinet, Dynamotor DM28 and filter, two sprung loaded jack caps, any MCRI receiver coils. A. J. Humphriss. Tel: (0926) 400876.

**For Sale** Yaesu FT-290RII, 18 months old complete with NiCad batteries and carrying case, £275. Tel: (0684) 72860.

**For Sale** Masthead Amps, UHF CM7066, CM7271, v.h.f. fringe 1220-3, v.h.f. 40-230MHz, 12V p.s.u., £10 each item. DXTV D100 deluxe converter, bands 1, 2, 3, 4 & 5 bandwidth sound variable, £40. Sat dishes + mounts, 800mm, £40, 600mm, £20. Tel: (0278) 793917.

**For Sale** Realistic PRO-2001 v.h.f./u.h.f. scanner, 16 channel, very good condition, boxed with manual, £75. Tel: 051-487 5911.

**For Sale** Working PW49'er in-car short wave to medium wave converter for 6MHz band to specifications - see PW January 1990. Built for PW advertiser who 'backed down'. Fair price, £45. Tel: (0299) 826659.

**For Sale** Yaesu FT-102 a.t.u. very good condition, complete with instructions and cables, boxed, £150. G5RV antenna, £5. Tandy electronic reverberator, £5. G4ZSB. Tel: Nottingham (0602) 256389.

**For Sale** Three RCA 6146B, £22.50. Two GE

6146B, £15. Drae 4A power supply, £15. Two Eddystone formers 2 1/2in dia, 26 turns, £10. AVOMinor, £10. Two 7MHz antenna traps, new, £10. Hamgear pre-selector 1.6-32MHz 240V, £10. G3OXY, QTHR. Tel: (0327) 702265.

**For Sale** Normende Galaxy 25 multi-standard portable colour TV, v.h.f./u.h.f., PAL/SECAM 240Va.c./12Vd.c., remote control, little used as reviewed in *Short Wave Magazine*, £250. Tel: Burton-on-Trent (0283) 33161.

**For Sale** GE oscillator units, power supply 5-920MHz, £25. Bush DAC10 1950 full working order, £35. 8-ele 144MHz Yagi, £10. Wayne Kerr oscillator S121 10 - 120Hz with handbook, £15. G3OXV, QTHR. Tel: (0327) 702265.

**For Sale** Sony ICF SW7600D communications receiver, very little used, v.g.c. with earphones, mains p.s.u. and long wire antenna, boxed with instruction book, £135 inc p&p. G0RZI, Cumbria. Tel: (0946) 812092.

**For Sale** Kenwood 231E 144MHz mobile, £200. Kenwood 431E 430MHz mobile, £245. 531E 1296MHz mobile, £300. All as new - base use only. Kam t.n.c. (v5.0 Eprom available), £195. Paul G4XHF. Tel: (0293) 515201.

**For Sale** Panasonic RF3100 32-band radio, £120 inc p&p. Zenith 3000 and R-7001, offers for the two, both in good condition. Diamond D130N discone antenna for wideband reception, £50, buyer collects. Tel: (0695) 28945.

**For Sale** Freehold QTH semi-detached house, near shops, 3 bed, bath, small garden, 2 rec rooms. Holbeach, Lincs, £28,950 for very quick sale, OAP selling for health reasons. Tel: (0406) 22649 after 6pm.

**Exchange** HT-106 sidebander plus pre-amp and combined 4/6m Yagi for 144MHz

multi-mode or good 144MHz sidebander. Tom Burke G1LXU, Cleethorpes. Tel: (0472) 602335.

**For Sale** SX200 scanner, £110. TF200 f/counter, £90. Bird Wattmeter to 1.26GHz, £90. Rotator, £20. 88-element 70cm Jaybeam, £20. Pye u.h.f. mobile (modern), £50. Tandy 200 l.c.d. computer with c.w., i/o ports, £150. Datong Morse tutor, £30. 165MHz mobile, synth, easy converted, £25. Tel: Edinburgh 031-663 2633 ask for Alastair.

**For Sale** Yaesu FT-290R multi-mode transceiver with accessories. Microwave linear amplifier MML 144/100LS. Toyo s.w.r. meter 144/430MHz, 12-element ZL special antenna with rotator. All in good condition, £300 the lot. Tel: (0562) 515305.

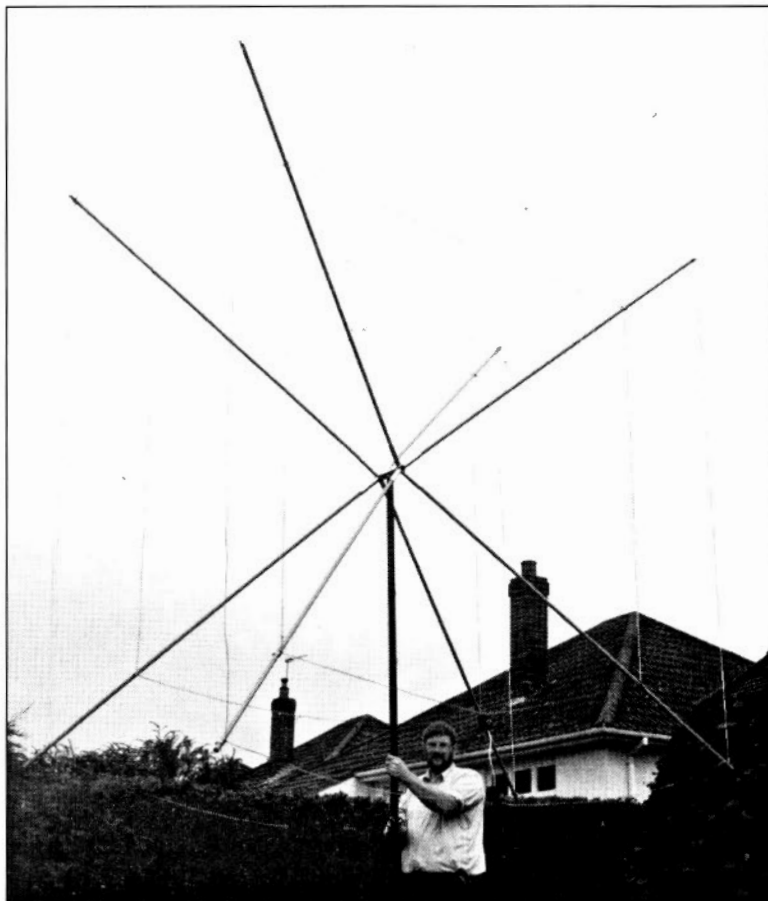
**Exchange** IC725 and FT-290R both in excellent condition, for 144/430MHz multi-mode base. Will consider 144MHz mm base with 430MHz mobile or hand-held, any suggestions? Tel: (0594) 542146 evenings.

**For Sale** Jaybeam Minimax tribander beam, Clark PT4 pump-up mast 8-40ft, field type complete, CDE rotator, Hobby air compressor, offers? David Wright G4BKE, Broadstone, Poole. Tel: (0202) 697338.

**Exchange** Trio 9130 25W 144MHz multi-mode mobile, fist mike, MC 60A base mike, two mobile mounting brackets, two power leads, workshop and operator's manuals, 12-element ZL special 144MHz beam, 3 x 5/8 wave 144MHz vertical collinear antenna, home-brew 144MHz a.t.u. and Tandy antenna rotator (needs proper controller), for Icom 725 or similar h.f. transceiver. John G4XPP, QTHR. Tel: (0388) 745787 after 6pm.

**BARGAIN BASEMENT  
SEPT 92**





Rob Mannion G3XFD, who bumps his head at just over two metres, pictured standing next to the cubical-quad antenna.

# The Nelson Electronics 21 and 28MHz Cubical-quad Antenna

*Rob Mannion G3XFD has been using the kit-form Nelson Electronics cubical-quad for over a year. He says, that despite its size the cubical-quad has got a lot to offer the h.f. enthusiast, even when they've only got a small garden.*

## Review

**T**he cubical-quad antenna has a fascinating history, which started high up in the Andes mountains in South America. In fact, I recommend that you read the book *All About Cubical Quad Antennas* by William Orr W6SAI and Stuart Cowan W2LX.\*

The book is compulsive reading, and there aren't many technical books that fall into that category! You'll also learn a lot about the antenna and just what you can and can't do with it.

Without any doubt, the cubical-quad must be one of the most well-known amateur radio antennas. However, unless you read the book already mentioned, you'll probably never realise it started life as an answer to a broadcasting engineer's prayer over 50 years ago!

### What Is A Cubical Quad?

Those readers who may not know much about this form of antenna, are probably asking 'what is a cubical quad'? So, to answer the obvious question, I'm going to quote the most concise reference to hand.

William Orr W6SAI says in his *Radio Handbook* (21st edition) that "The cubical-quad beam is a parasitic array whose elements consist of closed loops having a circumference of one wavelength at the design frequency.

The loops may take a diamond, square or triangular shape. The cubical-quad beam has proven to be a very effective antenna, and provides somewhat enhanced gain over a Yagi having an equal number of elements".

I think that the W6SAI definition is excellent, but as this is a review, I'm going to share my experience

of building, erecting and using this kit-form antenna. After all, that's what a review is all about and I'll leave the full theoretical treatment to our antenna specialists.

### Well Packed Kit

The Nelson cubical-quad for 21 and 28MHz comes in a well-packed kit form. Ernie Quinell G4JEV, the designer and manufacturer of the antenna, has produced a good quality kit, complete with fibre-glass spreaders, aluminium alloy spider (it's a boomless design) and everything you need.

Tex Swann G1TEX and I already own the excellent little v.h.f. cubical-quad produced by Nelson Electronics. This version of the antenna covers 50, 70 and 144MHz, and it has proved to be an ideal small space antenna to get going on v.h.f.

The longer-established 21 and 28MHz cubical-quad kit was just as easy to assemble and adjust. In this case, G4JEV's homespun, and user-friendly instruction booklet proved to be very helpful with the assembly of the antenna.

For best results, all antennas have to have fine tuning carried out, and the cubical-quad beam is no exception. In fact, G4JEV points out to all his customers that experimentation is necessary. There's no need to worry though, as the adjustments are extremely simple, and even easier to carry out.

### Easy To Assemble

The cubical-quad I've had on loan from Ernie G4JEV, is well travelled. Fortunately, it's very easy to assemble and the components are robust. It's also proved to be capable of withstanding the British climate!



Although it's a 21 and 28MHz antenna, this cubical-quad is still large. Each of the fibre-glass spreaders is almost 2.65m long when mounted into the central spider.

The four spreaders (these are coloured a light shade of green) are fixed into the central spider by a stainless steel screw. They're a tight fit at first, but once in place they are quite secure.

I replaced the self-tapping screws supplied by Nelson Electronics, for larger versions. Although this meant that I had to drill a bigger hole for each of the four spreaders, I ended up with a larger screw to take the load. (it was also easier to screw in and out).

The wire for the loops comes ready cut. All you have to do is to attach the loops using the supplied small plastics cable-ties on the spreaders.

The cable-ties are held in place by circular hose-clips on the spreader itself. They can be adjusted and slid up and down the spreader.

## Setting Up

The job of setting up the cubical-quad was very simple, but it takes some time because of the sheer size of the job. As recommended by G4JEV, I assembled the reflectors first.

All the spreaders are marked with a coloured band, showing the recommended starting points for the appropriate element. This is helpful, as you then have an idea of where to begin.

Ernie Quinell says in his instructions that "at my location the 28MHz reflector comes out at eight foot four inches". Then he concludes by reporting the 21MHz reflector length "came out at 11 foot two inches".

Included in the kit are two very useful little aids to setting up the reflectors. They're in the form of small, pre-formed (and clearly marked for each band) diameter loops of heavy gauge wire.

Although they aren't depicted in a circuit diagram of the antenna, the coils are placed in the appropriate reflectors. Tuning the antenna, and adjusting it for either maximum gain or front-to-back ratio is then made much easier.

When you're ready to tune the reflectors, all you have to do is squeeze the coils gently, or pull them out. In other words you compress the coil to lower the frequency, and stretch it out (lengthen the coil) to increase the frequency.

## Maximum Forward Gain

I adjusted the antenna for maximum forward gain, using my dip-meter to help tune the driven element. As I wanted to use the antenna on the c.w. portion of both bands, I had a loop coupling on the end of the coaxial cable connected to the driven element.

The loop coupled into my dip-meter. I tuned the driven element to the centre of the c.w. band. All I had to do then was to adjust the loop on the reflector, while my wife was watching the field strength meter needle moving. This was necessary as I had placed it almost 50 metres away, down the garden!

One of these days, I'm going to make myself a field strength meter with an audio indicator. It's much easier to listen for a peak on a distantly-placed field strength meter this way.

The audio technique is especially useful if you arrange it (with a suitable voltage to frequency chip) so that the highest output in voltage from the meter provides the highest frequency output on the audio indicator, in the same way blind radio amateurs tune up a transmitter.

## Busy On The Bands

Once I had set up the cubical-quad, it was time to get busy on the bands. It was a new experience to me, to be able to null out interfering stations and pull the DX out of the noise!

To make any sense out of a review such as this, the antenna on test must be compared to a known standard. In my case I already had a 28MHz dipole, and all I had to do was to erect one for 21MHz.

Both comparison antennas were mounted approximately seven metres above the ground, with the main lobes firing east and west. For the tests, I mounted the cubical-quad on a short mast which made the lower parts of the elements loops clear the ground by only two metres or so.

I've always been told that one of the biggest advantages of the cubical-quad, is that it works extremely well when mounted almost at ground level. So, I kept it at a convenient height, and this enabled me to turn the antenna by hand.

## Excellent DX Antenna

The late Charles Shilley G3PZO, was a source of constant envy in the Southampton Radio Society of Great Britain Group. Charles, despite only having a very small garden and using a 14, 21 and 28MHz cubical-quad antenna mounted less than a metre above ground, consistently worked the most exotic DX imaginable.

I'm now referring back nearly 30 years, to the days of amplitude modulation. It was when most DX hunting amateurs seemed to be running around 150W into their p.a., trying to work those exotic calls.

However, dear old Charles scored every time, and his rotund little figure used to swell even more with justifiable pride when he told us the latest news. He was doing even better, running 50W d.c. input, and using a cubical-quad in his tiny garden!

## Band Conditions

So, with G3PZO's success in mind, I got busy. I started on 21MHz first, as band conditions weren't so good on 28MHz.

Using a KW2000B running into the cubical-quad, I was soon working into the east coast of the USA. It was late on a Saturday afternoon and I could have filled my log-book with QSOs.

Using c.w., I asked several stations to provide me with comparisons between the cubical-quad and the dipole. That was when I came unstuck, because none of the stations I was working could hear me on the 21MHz dipole.

In fact it was only after a period of several days operating that I found an American station who could hear me on either antenna. The station I worked, gave me a report of RST589 on the cubical-quad, and a wavery S-5 on the dipole.

Although I couldn't prove that the dipole was orientated to best advantage, I was running the cubical-quad horizontally polarised (fed at the bottom). In my opinion, the test was entirely satisfactory because without the cubical-quad, I would have only been heard by one American station during the test period.

## Conditions Improved

I had to wait some days before conditions on 28MHz improved. It was worth the wait, because I found that not only did the cubical-quad bring the DX out of the noise, it greatly reduced QRM from the many European stations chasing the same DX.



## Manufacturer's Specifications

<b>Band</b>	<b>Forward Gain</b>
21MHz	8 to 9dB
28MHz	8 to 9dB
<b>Band</b>	<b>Front-to-back ratio</b>
21MHz	15dB minimum
28MHz	15dB minimum
<b>Band</b>	<b>Side Rejection</b>
21MHz	35dB
28MHz	35dB
Central spider	Aluminium alloy
Spreaders	Fibre-glass

On 28MHz, I found that the signal reports I got from American stations equalled those on 21MHz. Again, I found that the other stations said I had almost disappeared into the noise when I changed from the cubical-quad to the dipole.

It became obvious that using the half-wave dipole as a reference, wasn't such a good idea. Perhaps I should have used another directional antenna. However, remembering that all effective gain should be quoted in dBs, using the half-wave dipole as a reference, I felt the result of the experiments were reasonable.

I was attempting to provide a bench mark, for other operators who might be considering a directional antenna for the first time. In the circumstances, I considered it was highly probable that anyone interested in a cubical-quad, may well only have a basic dipole for the bands in question.

In future experiments of this kind, I have decided on another course of action. In place of the half-wave dipole for the band in question, I shall compare a rotary (in other words a moveable) dipole's results to that of the beam antenna.

## Interference Nuisance

Out-of-band interference is a nuisance where I live. My home is not very far from the busy ferry port of Poole, and we have a constant procession of lorries passing by on the busy A31.

A large number of these vehicles seem to be equipped with high-power s.s.b. CB radio equipment, and a larger number seem to operate with linear amplifiers for f.m. CB. Added to this, there always seems to be a lot of localised activity on 27MHz using s.s.b.

Receiver front ends can't be expected to cope with the extremely high localised field strengths to be found from such equipment. As a result, I'm quite used to being blasted by a stream of Spanish or Italian as the lorry-driver's pass by on the nearby A31.

However, I found that the forward gain and the protection offered by the cubical-quad's front-to-back ratio reduced the problem dramatically. The ever present problem caused by TV receiver line-timebase radiation was also considerably lessened.

## Conclusions

Following the extended loan of the antenna, I came to several conclusions. The first, and most important, has got to be the success of the antenna when it was operating only just above the ground.

The second conclusion, drawn from the first, is that the cubical-quad can be considered as a viable directional antenna for a smaller garden. The only problem prospective buyers will have is whether or not their families object to the antenna.

Personally, I find the cubical-quad to be an attractive antenna. When they're well-constructed, the cubical-quad doesn't seem so obtrusive (provided they're not mounted too high) as a Yagi array.

The cubical-quad antenna in theory also has a gain over an equivalent Yagi array, and occupies less space. This theoretical gain however, can be lost easily if the antenna is not maintained properly. How many cubical-quad antennas have you seen with wires that are loose and dangling in the wind?

## Summary

During the loan period of almost a year, I've had plenty of time to observe the effects of the weather on the Nelson Electronics cubical-quad. The only comment resulting from these tests, is that I recommend that the connecting boxes be fully weather-proofed.

The connecting boxes are made from ABS plastics. They are supplied with PL259 sockets on one side and terminals (for the wire element loops) on the other side.

For long-term operation they need to be fully waterproof, and I used self-amalgamating tape for the plug and socket. The terminals on the other side posed another problem, but this was solved by moulding bee wax around the connections.

I have no hesitation in recommending the Nelson Electronics 21 and 28MHz cubical-quad antenna kit to readers. They're great fun to use, and if you don't have room for a Yagi array in your garden, the cubical-quad antenna could be the answer for you. Among other products (including the new JEV a.t.u.) Nelson Electronics also produce a three-band version of the cubical-quad which includes 14MHz (costing £270).

My thanks go to Ernie Quinell G4JEV of Nelson Electronics for the loan of the review antenna. The 21 and 28MHz version can be obtained from them for £210 plus £15 post and packing at 36B The Green, Stubbington, Fareham, Hampshire PO14 2LE. Tel: (0329) 668080, FAX (0329) 668068.



**A**s we've got a rather special antenna theme to *PW* this month, I've been rather busy working with antennas. In fact, one or two of the reviews I got my teeth into, have whetted my appetite for further antenna experimenting.

You may remember that I said last month, in the first of the 'In The Workshop With...' articles, my workshop is equipped with only what I consider to be basic equipment. In fact, since then, I've lost my oscilloscope as the p.s.u. started to imitate a coal-fired power station for a short time!

Despite only having a basic collection of tools and equipment in my workshop at home, I'm always on the look-out for labour and time-saving gadgets. My wallet (rarely seen in the office) came out several times at the recent RSGB NEC show.

Among the items I bought there, were a set of one-handed operation wire strippers (very useful for me), a tiny gas-powered soldering iron, and a set of six Cyclon 2V rechargeable cells. When I bought the battery pack, I didn't have a specific use in mind, but I quickly found them to be very useful.

## Antenna Analyser

Following all the testing and preparation I have been involved in recently, I think the idea of a suitable antenna analyser would be useful. So, it was a remarkable coincidence that when I had the chance to borrow the MFJ-247 h.f. antenna analyser, at the same time as I was working on the antenna reviews.

It's not often you get a real innovation, such as the combined instrument available in the form of the MFJ-247. In one unit you get the facilities to find the resonant frequency of your antenna, the s.w.r. of your antenna at a particular frequency and the frequency at which the antenna provides the lowest s.w.r.

I soon found that there was one possible problem to this useful item of portable equipment, and that was the power consumption. As the analyser comes with its own built-in frequency meter, it consumes a fair bit of current.

Although MFJ recommend alkaline batteries, I decided to use the external power supply socket to feed 12V d.c. from the 12V Cyclon pack I'd bought at the NEC. End of problem!

## Practical Use

As I was evaluating various antennas, including an h.f. cubical-quad and an h.f. vertical, I found the analyser very useful. It covered all the h.f. bands from 1.75 to 33.75MHz.

The analyser is a dream come true for frustrated antenna experimenters. I managed to make the measurements of the antenna under test at the input to the feed-line, and thanks to a prepared chart (supplied by MFJ) was able to determine the s.w.r. at the antenna.

It proved to be simple to use. All I had to do was to connect the coaxial cable feed-line into the antenna socket, set the appropriate band, and then adjust the frequency dial of the analyser to the frequency I wanted to check.

I then read the s.w.r. measurement from the meter on the analyser. This provided the s.w.r. measurement at the input to the transmission line looking **towards** the load (the antenna).

Previously, I had already determined the loss involved on the cable between the input and the antenna. I then used the prepared chart provided by MFJ to determine the s.w.r. at the antenna.

## Useful Plotting

After a little practice, I realised that the analyser was very useful for plotting s.w.r. versus frequency results with antennas. It became obvious to me that the analyser would enable a great deal of time to be saved, for anyone doing regular antenna checks.

Intrigued with my results, I put the unit through other

tests. To do this, I connected my trapped dipole up, and used the MFJ-247 to find where the best s.w.r. was for that antenna. I was surprised at the results, although on reflection (forgive the pun) I should not have been.

My trapped dipole had showed far more 1:1 readings than I had expected to see, as I had tuned the analyser over the bands. It was interesting to then verify these results against a transmission test using a standard s.w.r. meter. I soon realised that a test such as this, would enable anyone to quickly evaluate alterations and modifications to multi-band antennas.

## Adjusting Antenna Tuners

I've got several antenna tuners, and I'm often to be found adjusting and modifying the various units. Following the manufacturer's suggestions, I discovered an easy way of setting up and testing a.t.u.s with the help of the analyser.

With a one metre length of coaxial cable connected between the a.t.u. transmitter input and the MFJ-247's antenna connector, the test was ready to go. I then switched the 247's frequency to 7MHz (the band I was checking on my a.t.u.) and adjusted the a.t.u. for best results.

It was a simple process, and I was able to determine the very best setting on my home-brew a.t.u., without causing the p.a. to overheat or even having to be on the air at all!

## Frequency Meter

The MFJ-247 is equipped with a frequency counter, and this 'extra' makes it a very useful item indeed. In normal use, the counter measures the analyser's own oscillator frequency, although an external probe allows external measurements to be made.

The frequency counter, with an input sensitivity of approximately 600mV, covers from 100kHz to 150MHz. This means that the MFJ-247 is a versatile little instrument.

## Club Investment

After I had completed my tests, I had time to sit and think about this little unit. I came to the conclusion that buying an MFJ-247 would be an ideal club investment.

I'd like one of these analysers myself, but could I justify buying one? Although I think most amateurs would like something like the MFJ-247, they would probably be in the same position as myself.

If a club did buy one, they'd soon recover the outlay by hiring it out to members. So, perhaps that's the answer for this particularly useful instrument. In the meantime, I suppose I'll have to start saving up to buy one myself. I wonder what other fascinating new instruments, tools and gadgets are on their way from MFJ and other manufacturers?

If you know of something useful in the workshop line, let me know, and I'll gladly try it out. Perhaps together we might get more people back into their workshops and building more projects!

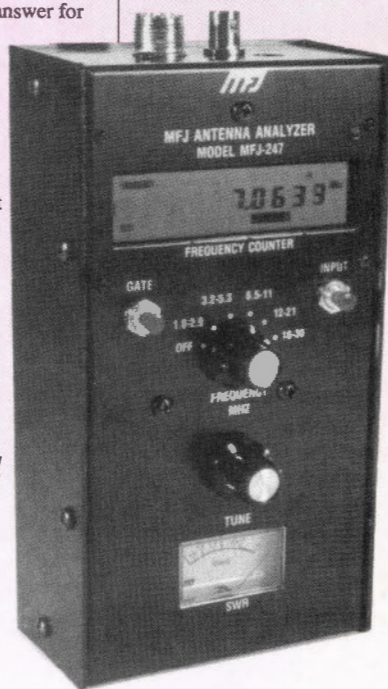
*My thanks go to Waters and Stanton for the loan of the MFJ-247.*

*It costs £189 including p&p and is available from them at 22 Main Road, Hockley, Essex SS5 4QS.*

*Tel: (0702) 206835.*

*This month, while busy in his workshop, Rob Mannion G3XFD has been using the MFJ-247 h.f. s.w.r. analyser while testing antennas.*

**The versatile MFJ-247 antenna analyser with built-in frequency measuring facilities.**



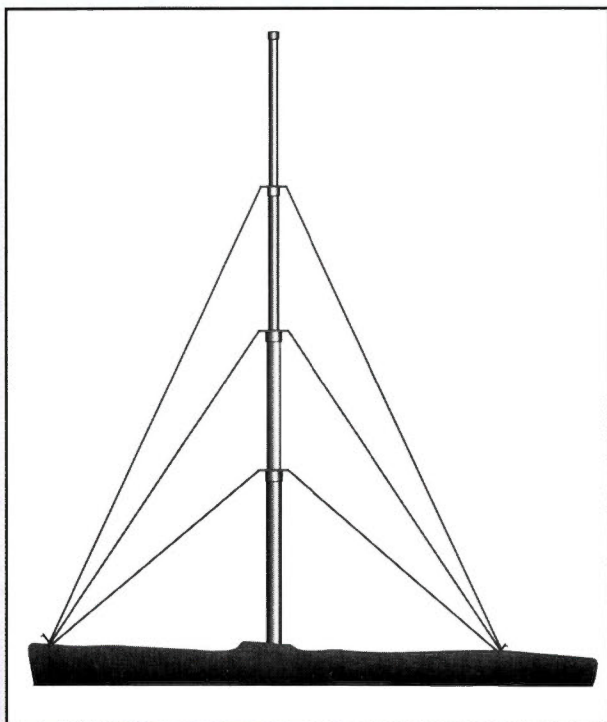
# In The Workshop With The MFJ-247 Antenna Analyser



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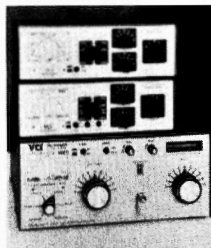
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# Experimenting With Beam Antennas...

*Well-known antenna specialist and author Peter Dodd G3LDO, aims to encourage you to 'have a go' and enjoy experimenting with antennas. So, if you want to upgrade, and make your own antennas for the minimum cost....read on!*

I've provided the following notes to try and encourage more radio amateurs to experiment with antennas. Of the many facets of amateur radio, in my opinion antenna experimenting is the most fascinating.

The appeal of this aspect of radio lies in its practical simplicity. Working antennas can be constructed from materials obtainable from the junk yard, hardware store or garden centre.

So, without further ado, let's explore the possibilities that a bit of ingenuity, experimentation and the practical approach can do for our signals. Let's experiment with antennas.

## Beam Antennas

If you want to upgrade your h.f. antenna from a dipole, long wire or G5RV type, I've no doubt that you'll have probably considered various forms of beam antennas. However, the difficulty for most enthusiasts is that even a 2-element beam at 14MHz has a span of some 11m.

To mount such an antenna up some 10 or 12m high is a complex civil engineering undertaking. Unfortunately, for radio amateurs this is a fairly universal problem.

The solution would appear to make a compact version of a 2-element beam. This can be done by either using loading inductors or linear loading to shorten the physical length, or to use full length elements and to bend them.

The 2-element metal and wire beam antenna, shown in Fig. 1, is my solution to the problem, and I call it the Double-D. The driven element is fed with coaxial cable via a gamma match, and the other element is a parasitic reflector.

The antenna uses bent elements, thereby reducing the overall span. When compared to a full size 2-element beam the size is reduced by 50%.

## Compact Antennas

Just how effective are these compact antennas? Unfortunately, because of the perceived difficulties of measuring antenna performance, it's rare to find

relative gain figures and directivity measurements (radiation patterns) included with articles on a particular antenna design.

The difficulty of experimenting with a radically new h.f. antenna configuration, is that even a compact antenna is rather large. However, an antenna for 28MHz is half the size of one for 14MHz, yet it's performance is the same.

The performance is the same, because wavelengths, capacitances and inductances are reduced in proportion to the linear dimensions, while gains, impedances, dielectric constants and permeabilities are unchanged.

This can be taken a step further, by studying the performance of a model of the proposed antenna at v.h.f. If this approach is adopted, your antenna test range can then be accommodated in the back garden!

## Most Practical Band

The 144MHz band is the most practical for experimenting with a new and different antenna configuration. On the 430MHz band, the antenna size is too small to accurately model the antenna construction detail, and the scale factor is rather large.

Unfortunately, the 50MHz band has its own problems. It would not normally be possible to perform the tests in the average size garden.

The antenna performance is measured by exciting an antenna with r.f., and measuring the resulting field strength with another. Because of the reciprocity between transmission and reception, it's not important which antenna is energised and which is used as the receiving antenna.

On most antenna measurement ranges, the transmitter (source) is used to energise an antenna that floods the area with r. f. The antenna under test (a.u.t.) is coupled to the receiver or field strength meter (f.s.m.).

When making antenna polar diagrams in the back garden, I prefer to use the test equipment the other way around and energise the a.u.t. I then use a simple antenna at the receiver or a f.s.m. There are two reasons for doing it in this way:

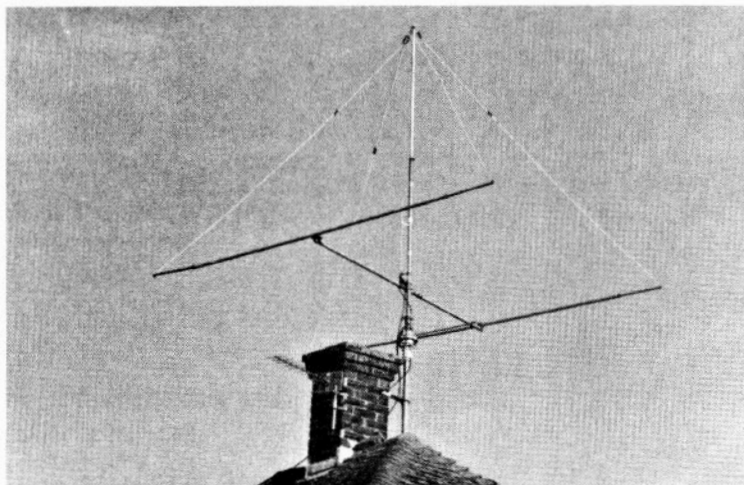
1. The s.w.r. of the a.u.t. can be monitored. This ensures the antenna is matched to the feeder in the first place. Any subsequent change in s.w.r., as the antenna is rotated, could indicate coupling into nearby objects, that may affect the results.
2. The s.w.r. meter can also be used as a sensitive indication of transmitter relative power output.

## Items Required

The following items are required to test v.h.f. antennas:

1. A transmitter, with variable power control. The source transmitter should also be stable and free of spurious outputs. In practice, it can be an amateur radio transceiver whose transmitter power output level can be controlled, such as the FDK Multi-700EX.

**Fig. 1: The 'Double-D' antenna designed by Peter Dodd G3LDO using the design approach described in his article.**





On the other hand, any surplus commercial or military transmitter will do, with the proviso that it covers the amateur bands. The most important feature it should possess is that the r.f. power output should be variable.

2. A diode field strength meter (f.s.m.) with remote analogue or digital field strength level indicator.
3. Loop or dipole antenna for field strength meter.
4. The antenna under test (a.u.t.).
5. A suitable a.u.t. mast and rotator mechanism.

If you want to make radiation patterns, then you also need to have some sort of indication of the directions to which the a.u.t. is pointing, relative to the test f.s.m. A suitable system can be made from a wooden base, painted white, (or use white plastics covered wood) with a direction indicator drawn on it with a black felt-tip pen.

A bolt can be fixed to the centre of the indicator and the mast, with a length of copper or alloy tube, slid over the bolt. An indicator pointer can be then be fixed to the bottom of the mast with a screw type hose-clip.

6. You will also require a s.w.r. meter, coaxial cable and connectors.

## Measuring Field Strength

To begin the measuring of the antenna field strength you should position the diode f.s.m., with a suitable antenna, approximately eight or 10 paces from the a.u.t. Place it at a point where the maximum signal strength is likely to occur, at 0° on the rotator indicator. Don't forget to put the f.s.m. level indicator where it can be clearly seen from the operating position.

Set up the transmitter, feeder, s.w.r. meter and the a.u.t. Switch on the transmitter. Then set the power level to, let's say 30% of maximum, and check that the antenna matching is at the optimum (lowest s.w.r.).

Tune the diode f.s.m. for maximum meter deflection. Fix the height of the f.s.m., so that it is well inside the main vertical lobe of the a.u.t. radiation pattern.

Re-adjust the transmitter power if necessary. The test range itself can then be tested with a dipole and a 3-element beam.

By measuring the radiation patterns, you can check that they are similar to those found in antenna books. You can then start experimenting with the antenna that's on trial, and compare it with a standard antenna.

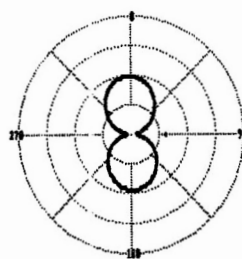
Don't be afraid to be adventurous with various configurations. When you have found a design that appears to be efficient, you may then want to plot a full polar diagram.

## Plotting Polar Diagrams

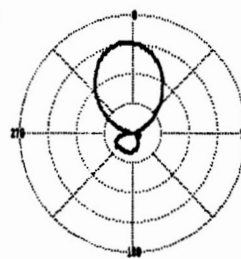
Plotting polar diagrams isn't difficult. All you have to do, is rotate the a.u.t. for maximum signal strength on the f.s.m. signal level indicator. Next, you should adjust the transmitter power level for about 75% of f.s.d., if using an analogue meter, or for about 2V, if using a digital meter.

Then set the s.w.r. meter to **forward** reading and adjust the level to a clearly defined re-settable point. Fortunately, the meter scale on most s.w.r. meters is red at levels greater than 3:1. This is a good point to set the r.f. power level at, for reference.

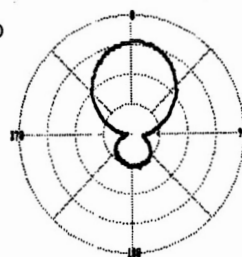
Dipole



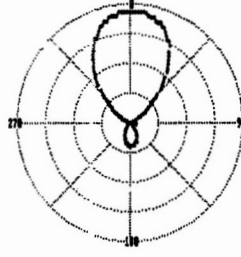
2-element Beam



Double-D



3-element Beam



Record the reading on the f.s.m. level indicator, and then rotate the a.u.t. in both directions, to ensure the point of maximum gain is near 0°. Then rotate the antenna through 360° while watching the f.s.m. signal level. In this way, you can gain a mental picture of the a.u.t. pattern.

## Useful Testing Tip

Here's a useful antenna testing tip. You'll find it's helpful to make the following preliminary check to ensure the antenna is working reasonably well, **before** going through the routine of recording the data.

Here's what you should do: Set the a.u.t. to 0°, and record the level. Switch off the transmitter. Then you should rotate the a.u.t. to a new heading.

I usually take a reading every 10° at the main lobe maximum to identify the point of maximum gain, otherwise readings every 20° may suffice. Additional readings can be made to identify the nulls.

If you are using the simple antenna rotator, rotate the a.u.t. to the new heading. Then move away from it before making any further measurement.

The transmitter is switched off and on between measurements because most transmitters are **not** continuously rated. Also, the channel should be monitored, and identification announcements made periodically. This is good operating practice, and it's a licence requirement in the United Kingdom.

## Plotting Automated

The polar diagram plotting process can be automated, by using a computer. This method takes much of the work out of plotting polar diagrams, and it speeds up the process considerably.

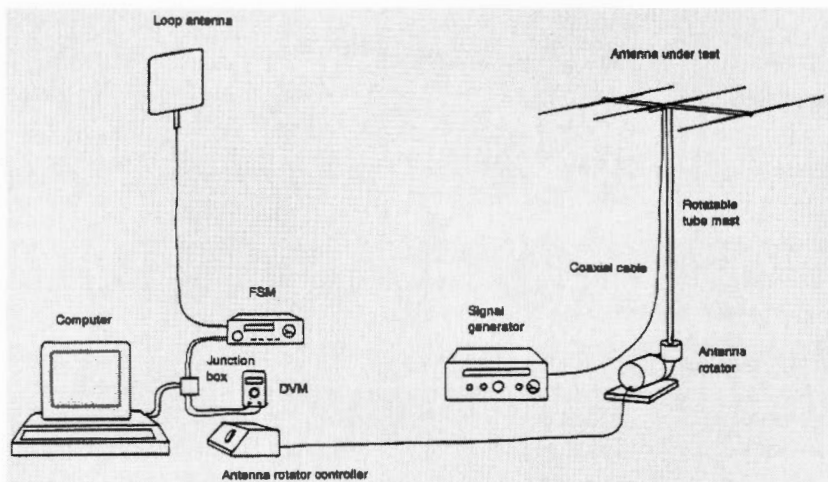
Storage of data and the application of functions for normalisation and conversion from linear to log scales, etc., are tasks ideal for computerisation. Additionally, very complex polar diagrams can be plotted, which would otherwise be difficult using the manual technique.

A method of converting the analogue data from

**Fig. 2: Polar diagrams plotted using an IBM compatible computer using GW BASIC and a commercial A to D converter.**

# ...In The Back Garden





**Fig. 3: Layout of the equipment that's required to produce antenna polar diagrams using a computer.**

the f.s.m., to a digital form, is required. A computer possessing a suitable built-in analogue-to-digital (A/D) converter is preferable, otherwise a special A/D converter has to be bought or constructed.

Suitable software is also required. The software should enable the computer to take the analogue data from the f.s.m., and display it on the screen as an evolving polar diagram while the a.u.t. is rotated.

The a.u.t. rotation must of course, be motorised. Provision can be made for linking the computer to the rotator to supply heading information for the software. This can be done with a positioning digital

encoder and input through the I/O port.

Alternatively, the system is simplified by having an adjustable polar plotting time. This is set so that it is equal to the time taken for the rotator to make one complete revolution. A minor disadvantage of the polar plotting method, is that the operator must ensure the rotator and plot routine start simultaneously.

Far more detailed descriptions of these measurements are given in my book *The Antenna Experimenter's Guide*. Additionally, the book covers measurement of impedance and resonance, together with a chapter on the use of computer modelling such as MININEC.

The book also contains construction details of antennas and listings of all the programs used in the computer antenna measurements. *The Antenna Experimenter's Guide* is available from the PW Book Service. The book is also obtainable through your local library, quote ISBN number 0 9516024 0 3 if you have to order it.

### Whetted Your Appetite?

I hope that in this short article I've whetted your appetite. Perhaps, now that you've seen what's involved and that it's not so difficult, you'll have a go.

I'd like to hear how you get on, and maybe many PW readers will be building their own 'Backyard Beams'. I can guarantee it's fascinating!

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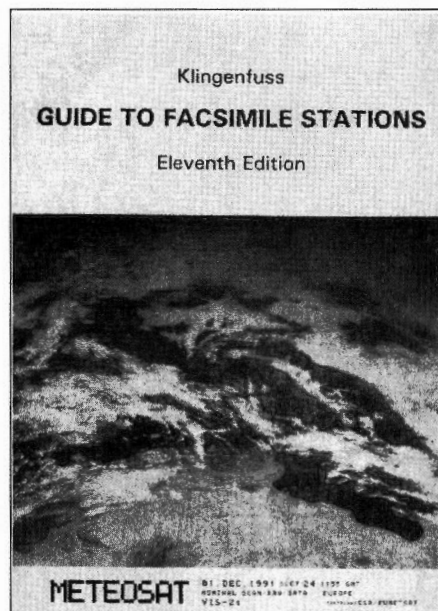
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The Eleventh Edition of the *Klingenfuss Guide to Facsimile Stations* has been extensively revised. Sections deal with new FAX equipment, regulations and techniques, meteorological satellites and schedules of 86 press and meteorological stations as well as 300 sample charts and interpretations. This is a must for all FAX enthusiasts.



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# Antenna

## And Associated Equipment

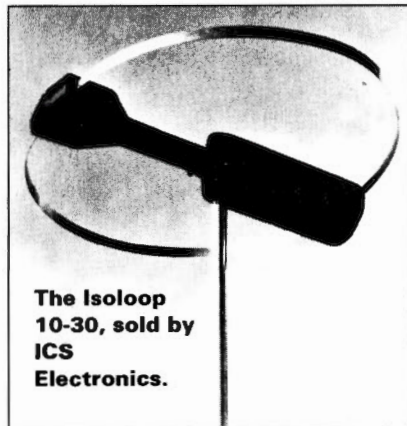
Have you ever been stuck for guy wires, or not been able to find that special heavy-duty antenna rotator? Do you need an antenna mast suitable for your small garden, or are you after a portable mast? If so, our showcase can help you.

**AA&A Ltd., Unit 28 Penley Industrial Estate, Penley, Wrexham, Clwyd LL13 0LQ.**  
Tel: (0948) 74717 or FAX (0948) 74728.

Look out for the three peaks logo of this new company at rallies. If you can't see the logo, look out for the biggest tuned loops in the hall, as they are suppliers of magnetic loop antennas, a.t.u.s, and the VFA antenna. They can also supply, through Dee Comm, capacitors and roller coasters for making your own a.t.u.

**Aerial Techniques, 11 Kent Road, Parkstone, Poole, Dorset BH12 2EH.**  
Tel: (0202) 738232.

Many amateurs enjoy an evening watching television, especially if it comes from some far off exotic place. If DXTV is your particular pleasure, or you want to cure TVI by providing a better antenna, Aerial Techniques have a catalogue full of antennas, lashings and accessories.



The Isolooop 10-30, sold by ICS Electronics.

The TU1 a.t.u. made by Lake Electronics.



**Altron Communications Ltd., Unit 1 Plot 20, Business Park, Cross Hands, Llanelli, Dyfed SA14 6RB.**  
Tel: (0269) 831431 or FAX (0269) 845345.

Readers of *Practical Wireless* may already know of Altron for their tubular masts and lattice towers, but they also manufacture a compact four-band mini-beam antenna. The AQ6-20 'Spacesaver' antenna which covers 14, 21, 28 and 50MHz, could be the answer for your small garden. Send a large s.s.a.e. (with a 35p stamp on it) to the above address will get you their catalogue.

**Bricomm, 5 Mickle Meadow, Water Orton, Birmingham B46 1SN.**  
Telephone or FAX 021-747 5077.

This company can supply you with a catalogue of all the items of mounting hardware and cables they sell. Send an A5 sized s.s.a.e. When you find what you need in the catalogue, they can take it to a rally near you for collection, saving you the postage.

**Barenco, 27 Park Road, Barnstone, Nottingham NG13 9JF.**  
Tel: (0949) 60607 or FAX (0949) 60773.

Barenco may be found at many rallies selling cables and accessories, rotators and hardware plus other products. Barenco manufacture much of the hardware they supply. Send an A5 sized s.s.a.e. for their catalogue.

**Cirkit, Park Lane, Broxbourne, Herts. EN10 7NQ.**  
Tel: (0992) 444111 or FAX (0992) 441306.

Cirkit are well-known for mail order, and their catalogue is available in many newsagents. They can supply capacitors, coils, roller coasters, turns counters and cable for making your own antennas. Alternatively, you can purchase one of their finished antennas.

**C.M. Howes Communications, Eydon, Daventry, Northants. NN11 6PT.**  
Tel: (0327) 60178.  
Well-known for quality transmitting and receiving kits, Howes have now launched an active air band receiving antenna to their range. Designed specifically for the air-band, this antenna features a low noise i.c. pre-amplifier. Send an A5 sized s.s.a.e. to the above address to receive a catalogue of antennas, a.t.u. s.w.r. meters and other radio-related kits.

**Dressler Communications, 191 Francis Road, Leyton, London EN10 6NQ.**  
Tel: 081-558 0854 or FAX 081-558 1298.

Dressler can supply an active antenna, the ARA60, for the bands 40kHz to 60MHz. The antenna is useful up to 120MHz. See their advert in *Practical Wireless* for other products.

**ICS Electronics Ltd., Unit V, Rudford Industrial Estate, Ford, Arundel, West Sussex BN18 0BD.**  
Tel: (0903) 731101 or FAX (0903) 731105.

More usually associated with the supply of equipment for reception of FAX, and weather satellite information, ICS are also the importers of the Isolooop 10-30. This h.f. antenna will fit in the smallest garden, and an earlier model was reviewed in the November 1990 issue of *PW*.

**IFW Technical Services, 52 Abingdon Road, Drayton, Abingdon, Oxford OX14 4HP.**  
Telephone or FAX (0235) 535981.

This company are program support specialists. It may seem strange to include this small firm in an antenna special, for it doesn't make or supply antenna bits and pieces. They are however, the UK support services for both 'MN' and 'YO'. These are antenna optimisation programs to run on IBM, or compatible computers. More details from IFW at the above address.

**Lake Electronics, 7 Middleton Close, Nuthall, Nottingham NG16 1BX.**  
Tel: (0602) 382509.

Already well-known for his "Kits With All The Bits", Alan Lake G4DVW also produces a range of antenna tuning units, s.w.r. meters and a power meter in kit or ready made form. The Lake Electronics TU2 a.t.u. is to be reviewed in a forthcoming issue of *PW*. Further details on Lake Electronics from the address above.

**Maplin Electronics, PO Box 3 Rayleigh, Essex SS6 8LR.**  
Tel: (0702) 554161.

The Maplin Electronics new 1993 catalogue, will be

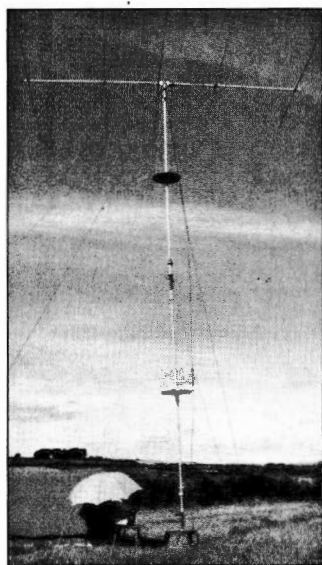
# Showcase



available through many newsagents from September 4, price £2.95. It contains many pages of antennas, fixing brackets, other hardware, cables and coaxial switches. The catalogue also contains many other radio and electronic products, including s.w.r./power meters, active antennas and tuners.

**M. Richards G3WKF,**  
**Wayside, Penwithick,**  
**St. Austell,**  
**Cornwall PL26 8UH.**  
**Tel: (0726) 850808.**

An interesting series of photographs arrived on the editorial desks a few months ago. The photographs show a multi-element h.f. beam on top of a novel, easy-to-erect mast design. With this mast it's possible to go up as high as 25m, with minimal guying. For more details contact G3WKF at the above address.



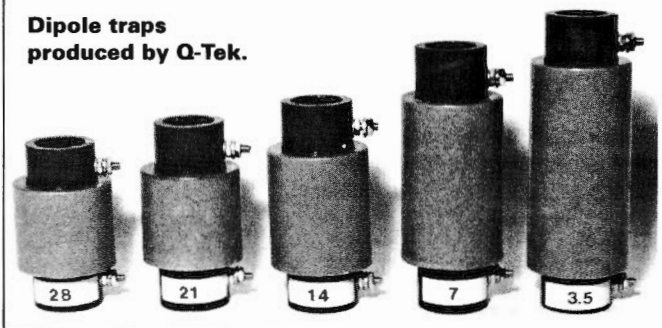
**The easy-to-erect mast produced by G3WKF.**

**Nelson Electronics,**  
**36B The Green,**  
**Stubbington, Fareham,**  
**Hampshire PO14 2LE.**  
**Tel: (0329) 668080**  
**FAX (0329) 668068.**

Ernie Quinell G4JEV, is well-known for his cubical-quad antenna designs, including the antenna reviewed in *PW* this month, and the v.h.f. model for 50, 70 and 144MHz reviewed in the November 1991 issue. Nelson Electronics also manufacture a.t.u.s and associated equipment.

**Nevada Communications,**  
**189 London Road,**  
**North End,**  
**Portsmouth,**  
**Hampshire PO2 9AE.**

#### **Dipole traps produced by Q-Tek.**



**Tel: (0705) 662145 or**  
**FAX (0705) 690626.**

Already well-known for radio equipment, Nevada also stock an extensive range of antennas for transmitting and receiving. Their latest receiving active antenna, the Scanmaster, covers from 25-1500MHz, with reduced sensitivity down to 500kHz. A catalogue is available for £2 from the above address.

**PDSL,**  
**Winscombe House,**  
**Beacon Road,**  
**Crowborough,**  
**Essex TN6 1UL.**  
**Tel: (0892) 663298 or**  
**FAX (0892) 667473.**

The PDSL (Public Domain and Shareware Library) can supply, from an extensive library, many programs to run on IBM PC or compatible computers. Among these programs are: 'Wire' and 'Yagimax' version 3. Both programs can help you to improve your antenna set-up and you can also use the propagation predictor programs. A catalogue (£2) is available from PDSL at the above address.

**QRTI, The Aerial Centre,**  
**156 Reid Street,**  
**Glasgow G40 4PH.**  
**Tel: 041-551 8228.**

This company is especially well-known for supplying antenna equipment to the remoter parts of the UK. They have a particularly well set-up postage and parcel service, for even the largest antennas and poles. Although not specifically involved in amateur radio, they are distributors for many makes of antenna and accessories and can supply brackets, clamps and hardware. In fact, QRTI can supply all the paraphernalia needed to erect an antenna, and they're also specialists in satellite and TV distribution equipment.

**Q-TEK, R. Benham-Holman**  
**G2DYM, Cobhamden,**  
**Uplowman, Tiverton,**  
**Devon EX16 7PH.**

**Tel: (0398) 6215.**

This company are suppliers of resin-encapsulated, pre-tuned dipole traps for the 3.5-28MHz bands. They also manufacture and supply the G2DYM Aerial Matching Unit. Contact G2DYM direct, for more information about the products.

**RF Engineering,**  
**Main Street,**  
**Coln St Aldwyns,**  
**Cirencester,**  
**Gloucestershire GL7 5AN.**  
**Tel: (0285) 75665 or**  
**FAX (0285) 75657.**

Gloucestershire-based RF Engineering are distributors of Barker & Williamson products from America. These antenna and associated items are designed and built to a very high standard. The company supplies silver-plated air-wound coils (as featured on this month's front cover) and high flash-over rated capacitors, suitable for a.t.u. use. They also produce a suitcase-sized antenna for the h.f. bands. A catalogue is available by sending in an A5 sized s.s.a.e. (with a 35p stamp) to the above address.

**South Midlands**  
**Communications Ltd.,**  
**S M House, School Close,**  
**Chandlers Ford Industrial**  
**Estate, Eastleigh,**  
**Hampshire SO5 3BY.**  
**Tel: (0703) 255111 or**  
**FAX (0703) 263507.**

Although best known for their Yaesu amateur radio equipment, SMC are active throughout the world in the communications and antenna field. The company supplies commercial masts, towers and hardware in conjunction with a design service. In the amateur radio context, this company has many years of antenna expertise to offer, backed by a large choice of specialised hardware, including the famous Strumech Versatower.

**Specialist Antenna**  
**Systems Ltd.,**  
**Radford Fields, Maesbury**

**Road, Oswestry,**  
**Shropshire SY10 8EZ.**  
**Tel: (0691) 670440 or**  
**FAX (0691) 670282.**

Formerly known as Western Electrical, SAS Ltd. are suppliers of antennas from h.f. to s.h.f. Their range includes the famous Cushcraft antennas (see R5 review in this issue), Mirage/KLM M<sup>2</sup> and Down East Microwave. This company also has facilities for small scale manufacture of special or commercial antennas. For more details, send a large, A4 sized, s.s.a.e. (35p stamp) to the above address.

**Sandpiper**  
**Communications,**  
**Pentwyn House,**  
**Penyard Llwydcoed,**  
**Aberdare, Mid Glamorgan**  
**CF44 0TU.**  
**Tel: (0685) 870425 or**  
**FAX (0685) 876104.**

This company is a manufacturer of antennas for all bands and situations. They are particularly well-known for their rally attendance. Their range of antennas is growing all the time, but they can supply an up-to-date catalogue on receipt of an A4 sized (35p stamp) s.s.a.e. to the above address.

**S.R.W. Communications**  
**Limited, Astrid House,**  
**The Green,**  
**Swinton, Malton,**  
**N. Yorks YO17 0SN.**  
**Tel: (0653) 697513.**

More usually known for the SRW Kilowatt Loudspeaker linear amplifier for the h.f. bands, SRW have added the G3TPW CobWeb antenna. This small (about 3.5m diagonal) antenna covers the 14, 18 21, 24 and 28MHz bands. As it's horizontally polarised and omni-directional, no rotator is required. Contact SRW for more details.

**Tennamast (Scotland),**  
**Mains Road, Beith,**  
**Ayrshire KA15 2HT.**  
**Tel: (0505) 53824.**

If you fancy a mast, but thought they were expensive, then the new Adapt-A-Mast from Tennamast starting at £127, may just be the thing you're looking for. This is the latest in a long line of masts and towers to come from this company (the Adapt-A-Mast is to be reviewed in *PW* in the near future). For further details on their products, contact Tennamast at the above address.



# A Simple Antenna Tuning Unit And RF Bridge

Construction

I've just completed another transmitter using the drawing-pin construction technique employed in the *PW* 'Challenger' receiver, published earlier this year. This very simple system is easily understood by novice enthusiasts, and it's also a good bread-board prototyping method.

Because of the success of this simple technique, I thought it would be a good idea to try and build a complete amateur radio station using drawing-pin and a board technique. So, as part of this idea I produced the antenna tuning unit (a.t.u.) and radio frequency (r.f.) bridge to help get that precious energy up into, and out of, the antenna where it's needed!

## Many Combinations

With the sort of circuit I'm going to describe, there are many combinations of coils and tuning capacitors that could be tried. I've tried Z-match, T-match, Pi-match ( $\pi$ -match), but I have had consistently good results with a simple L-match.

I first tried this idea out using a project written by the Rev. George Dobbs G3RJV in the *Short Wave Magazine* in 1980. Since then, I have made many forms of the L-match, and the smallest uses a toroid as the coil. Readers may be interested to know that the design I've just mentioned, using the toroid, was originally published in *Sprat*, the official journal of the G-QRP Club.

## Radio Frequency Bridge

The standing wave ratio (s.w.r.) device used in this project is an r.f. bridge. I prefer this method because the ordinary, cheap, CB radio s.w.r. meters aren't much good with QRP (low power) on the h.f. bands.

Another problem is that the ordinary s.w.r. meter does not present a constant load to the transmitter. If a serious mis-match occurred, there's a good chance that the power amplifier (p.a.) transistor could be zapped.

Another problem is Murphy's Law. This law almost invariably means that it's the most expensive transistor that's zapped, not the 10p rally job!

## The Circuit

If you take a look at the circuit, **Fig. 1**, I'll explain how it works. Firstly, you'll see that there is always a load to the transmitter, and this can save you a lot of bother.

Now let's take a closer look at the problem of mis-matching. The two worst forms of mis-match are an open circuit and a complete short circuit.

In the case of an open circuit R1, 2 and 3 are in series. So, in this particular pathway the load is 57 $\Omega$ . With a short circuit, R5 would go to earth as it's in parallel with R2 and 3.

Students of resistor networks (in other words Practical Wireless, September 1992

those of you who are reading 'Maths For The RAE' by Ray Fautley G3ASG), will see that the load provided by the combination of R5, 2 and 3 is now 46 $\Omega$ . Both values are near enough to 50 $\Omega$  in practice to be quite safe.

Readers may be interested to know that this attenuator circuit originally appeared in *Solid State Design For The Radio Amateur*. This useful book\* was written by Les Hayward W7ZOI and Doug DeMaw W1FB, and is published by the American Radio Relay League (ARRL).

## Building The Bridge

Building the bridge and the a.t.u. is simplicity itself. All you have to do is to solder the components and linking wires onto drawing-pins which are pushed into a wooden base-board.

Before you start, you may like to draw the circuit out on a piece of paper, and then lay it out onto your board. Then you can push the pins into the board, finally tinning them with a soldering iron of around 25W capacity.

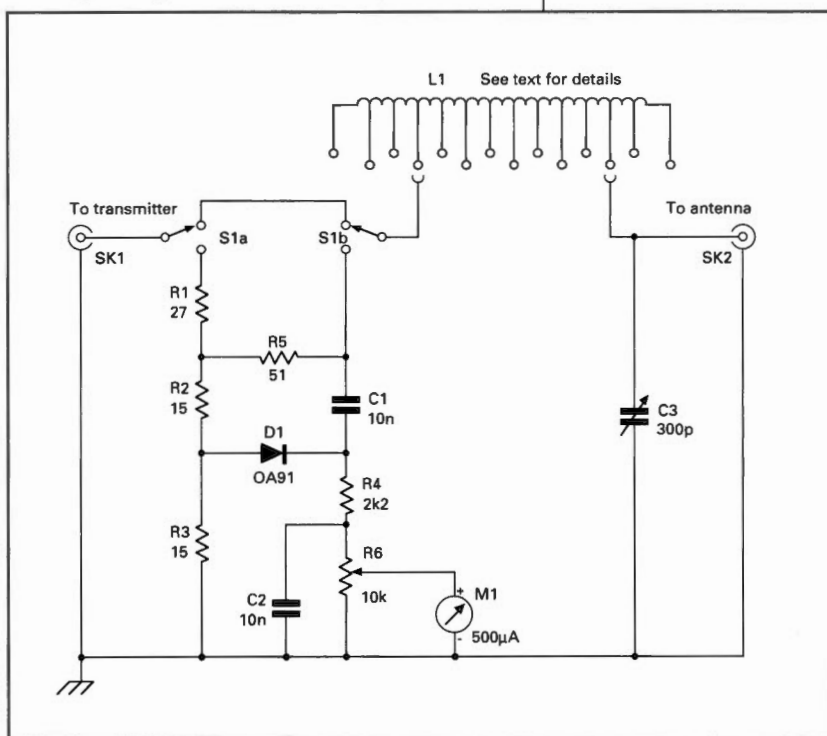
Alternatively, you can use the diagram in **Fig. 2**, as a basis of your lay-out. However, before you start, take note that the aluminium front and back panels (attached to the appropriate edges of the wooden base-board) are only shown flat for clarity.

## Soldering Tips

If you haven't used the drawing-pin method before, you might like to take advantage of the

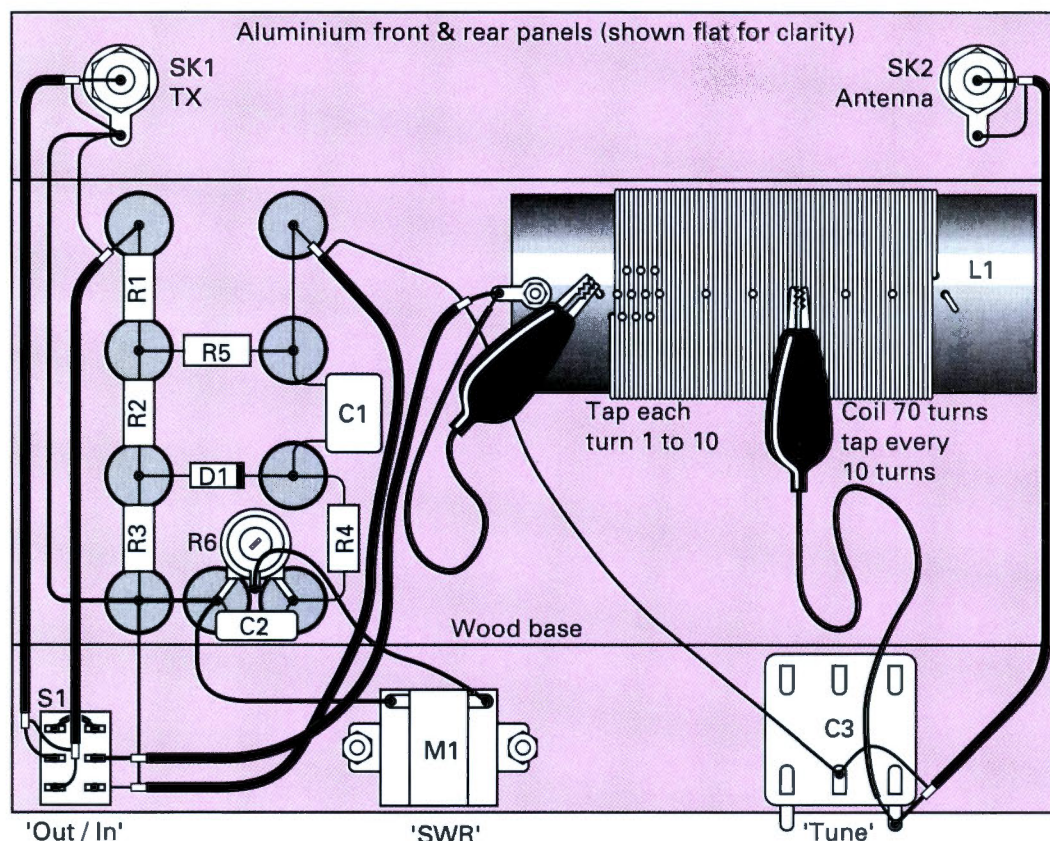
*It's time to go back to the drawing-pin board! Steve Ortmayer G4RAW has a clever, but very simple idea to help you get the most out of that hard-earned r.f., in the form of a project using drawing-pins as soldering points.*

**Fig. 1: Circuit diagram of the combined r.f. bridge and antenna tuning unit described by G4RAW in the text.**





**Fig. 2: The simple r.f. bridge and a.t.u. laid out on a wooden base-board, using brass drawing-pins as soldering points. The aluminium front and rear panels are shown flat for clarity. See text for L1 winding details.**



following soldering tips. You can save yourself time, burnt fingers and frustration, by taking advantage of my experience.

When using the drawing-pin method, a larger capacity soldering iron is advised (around 25W). This is because the drawing-pins absorb a lot of heat at first, because of their relatively large surface area.

I thoroughly recommend that the entire flat top of the drawing-pin is tinned. This job only takes a moment or two, but it can save a lot of time when you're soldering the connections to the pins.

Over the years, I've found that by pre-tinning the entire top of the pin, it's far easier to solder to during the building process. Although it means that you have to use more solder, you end up with a soldering point where you don't have to melt all the solder, and any other joints already made won't come off.

You can melt and flow the solder where you need it in this way, because there **IS** so much solder on the drawing-pin! With a little practice you'll be able to melt the solder just where you need it, and nowhere else.

**Warning:** If you do pre-tin the drawing-pins as I've suggested, don't touch them for a while, as they can remain hot for several minutes. However, once they're done, you can save a great deal of time and frustration during the soldering process.

## Testing The Project

Testing the r.f. bridge part of the project can be done before the a.t.u. section is built. To start the test, all you need to do is to apply some r.f. into the unit.

Next, you then have to adjust the 10k $\Omega$  variable resistor, R6, until the meter reads full scale. Once you've proved everything's okay with the meter circuit, connect a 50 $\Omega$  dummy load across the output and it should then read zero.

## Antenna Tuning Unit

The antenna tuning unit is straightforward and

easy to build. I used an off-cut of some plastics piping, sold as 'inch and a quarter' (inside diameter) waste pipe. Although this form of piping is very common, the dimensions are not very critical and you may like to use something else that's handy.

Using the coil former I've suggested, you need to wind the coil, L1, so that it has a total of 70 turns using enamelled copper wire. As you wind the coil, you should make one tap every turn between turn one and 10.

A tap, by the way if you're not sure, is a short loop, just long enough for a crocodile clip to grip. The tapping is drawn out from the coil winding.

When making taps, it's perhaps best to wind to the point where you're going to make the tap, and then bend the wire out at a right angle. After you have made the little loop (just large enough for the crocodile clip jaws) continue the winding by completing the loop back to the coil former surface.

Make a further turn, and then gently twist the loop you have made. Once the loop is locked by the twisting action, you can continue the winding and repeat the process at the next point.

Continue winding the coil onwards, making a tap at every 10th turn. This will leave you with 10 tappings between the start of the coil and the 10th turn, and another six between that point and the 70th turn.

## Tapping Loops

Finally, when you've carefully completed the coil (and it really does pay to take care when winding the coil) it's time to prepare the tapping loops. To prepare the loops for use, the enamelling has to be scraped away carefully, and you can then lightly tin the bare copper to provide a good contact for the crocodile clip.

Some modern enamelled wire has a coating that melts when you apply the soldering iron tip. It's a simple job to check to see if you're lucky enough to have some of this wire.

To test the insulation, just apply the soldering iron and a little solder, if there's a bit of smoke and



you can see it's tinned...you're in luck. If not, using a small piece of sandpaper, you'll soon get the wire clean and ready for soldering.

## Using The Tuning Unit

The tuning unit can be used with a counterpoise of a quarter-wavelength for each band. In practice, I've found that two lengths of wire, one five metres long and the other of 20 metres work well on all the h.f. bands. Connect the counterpoise to the earthy side of the antenna output socket on the a.t.u.

Set up the a.t.u., and adjust it by selecting turns on the coil and by turning the variable capacitor control until the meter reads nearly zero. Note the positions of the variable capacitor and theappings selected for each band for future reference.

To help you set up your a.t.u., here's a note of whatappings you unit required:

Frequency	Tapping Point
1.95 to 2MHz	16 turns
3.565 to 3.585MHz	0 turns*
10.13 to 10.14MHz	3 turns
21.1 to 21.149MHz	4 turns
28.1 to 28.19MHz	1 turn

\*The results above were achieved when I was using a 20 metre length of wire. This is a quarter-wavelength on the 3.5MHz band, and so it didn't really need the a.t.u. in circuit.

## Switched Out

The s.w.r. bridge must be switched out before you start operating unless you want to start milli-wattting. The switching-out is most important, because when it's switched-in a three watt transmitter will only radiate one tenth of a watt or 100mW!

Having warned you of what should be done, I must admit I have had a QSO with a similar bridge switched in. However, the 0.5W resistors get rather hot and I got comments like "sig vy weak OM"!

## Sunspot Years

I've already tried the a.t.u. and bridge project on the 21 and 28MHz Novice bands. In years of good sunspot activity, these bands could offer a novice world-wide contacts with their three watts of r.f.

My first QSO on 21MHz brought me a report of RST599, from Uri UA3PV in Moscow. I was using

## Shopping List

### Resistors

0.5W 5% Carbon Film

15Ω	2	R2, 3
27Ω	1	R1
51Ω	1	R5
2.2kΩ	1	R4

Potentiometers

10kΩ log	1	R6
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Capacitors

Disc Ceramic

10nF	2	C1, 2
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Variable Capacitor

300pF	1	C3 (see miscellaneous)
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Semiconductors

Diode

OA91	1	D1
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### Miscellaneous

Coil former (see text), 22s.w.g. enamelled copper wire, wooden base-board 200 x 80 x 15mm suggested size, aluminium strips to suit base-board chosen for the front and rear panels, double-pole change-over toggle switch for S1, variable capacitor 300pF (taken from scrap portable radio or Maplin FT78K with both a.m. sections connected in parallel is suitable) or various types available from J. Birkett in Lincoln, tuning knob, plugs and sockets to suit ('phono' plugs and sockets suitable), moving coil meter movement, a 200μA or 500μA f.s.d. movement removed from scrap tape recorder (battery and sound level indicator), or signal level meter will do (Cirkit type ref. 37-09007, 200μA f.s.d. marked in S units will do). Crocodile clips, and miniature coaxial cable (RG174 suitable).

three watts from a home-brew rig in conjunction with the r.f. bridge and a.t.u.

There's also a good chance of a QSO with American stations. The USA has a Novice band from 21.1 to 21.2MHz and this overlaps the British 21.1 to 21.49MHz Novice band. I wonder who will be the first UK Novice to work an American Novice?

But of course, I mustn't forget that the American Novices are allowed 70W! So, perhaps that QSO has already taken place.

\* *Solid State Design For The Radio Amateur* is available from the PW Book Service @ £10.95 plus £1 p&p.



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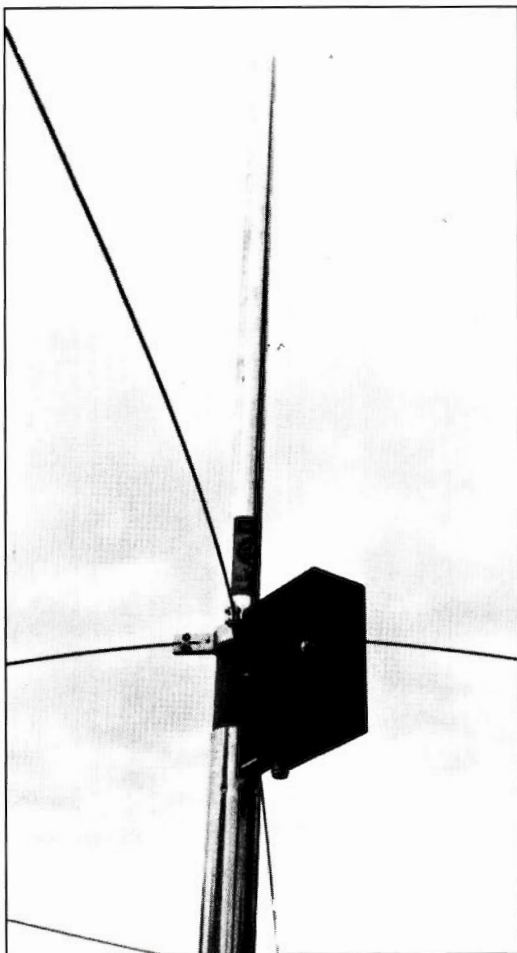


# Cushcraft

## R5 Five Band Vertical Antenna

*The PW technical staff are very conscious of the fact that many radio enthusiasts have very limited space for antennas, so with this in mind, Rob Mannion G3XFD tried out the Cushcraft R5 vertical antenna on the 14, 18, 21, 24 and 28MHz bands to see just what it could do.*

**The Cushcraft R5 partly assembled.**



**O**ver the years since I've been licensed, I have used many different antennas. Before I was married, I was fortunate in having parents who tolerated wires everywhere, and nowadays my wife also puts up with amateur radio too.

Wherever I have lived, antenna erection has never been a real problem, but not everyone is so fortunate. So, following several letters from readers who aren't able to erect large antennas, I decided to include a review on what should be an ideal antenna for anyone in this situation.

In this special antenna theme issue of *PW*, I have already looked at a cubical-quad antenna. Although I consider the cubical-quad as being (perhaps surprisingly) a possible antenna for a relatively small garden, what about enthusiasts only having pocket handkerchief-sized plots or even balconies as antenna sites?

I know of at least two amateurs who dangle long wires (with the co-operation of their neighbours I might add) from their flat windows. However, the vertical antenna must be one of the few choices towards the efficient radiation of that hard-earned r.f. from difficult locations.

### Without Radials

The Cushcraft R5 vertical antenna is an electrical half-wavelength radiator on each of the bands it covers. The R5 is designed to work without ground radials and Cushcraft claim that the R5 will work effectively from a roof top, balcony, porch and motor-caravans.

The technical staff on *PW* are aware that many radio enthusiasts only have limited space for antennas. With this in mind, I thought it best to take a specific look at a small-space antenna that could

prove useful in this respect. However, I soon realised that a compact antenna of this type has many advantages.

I took delivery of the Cushcraft R5 at the London Amateur Radio Show at Pickett's Lock in March, with the aim of trying it out on a long-term basis. It was ironic that within a few weeks of collecting the antenna, I heard of the death of the founder of Cushcraft.

Fortunately for everyone concerned, Cushcraft are forging ahead with new ideas, and I was keen to try the antenna out and see just why this American company has such a good reputation. So, with the R5's box stowed in my Ford Escort estate (yes, the box is as compact as that) I headed for home.

### Assemble It Yourself

The Cushcraft R5 comes in kit form, and you have to assemble it yourself. Bearing in mind my artificial hand, I wondered how difficult the assembly would be, but I need not have worried as it was fairly easy...thanks to the comprehensive instruction booklet.

There's always a worry that kits may have bits missing. As the R5 had come from America, I was worried that some vital parts might have gone missing. Again, I was worrying for nothing as Cushcraft have cracked this problem by weighing the antenna before despatch.

I haven't come across this form of checking for missing bits and pieces before. I don't know why I hadn't thought of the idea, because it's so simple. Each box is weighed and provided with a special certificate before dispatch to the customer.

If, when the stout box is opened, parts are found to be missing, a claim (quoting the weighing certificate) has to be made. Using this method, they

Practical Wireless, September 1992

# Review



can tell you whether or not the kit left the factory complete with all components. In my opinion, Cushcraft have got a good idea with this technique for quality control.

## Extra Instructions

In my case, the Cushcraft kit was complete, and I'm pleased to say (considering how many times I tend to lose them) there were three extra copies of the instruction booklet. Perhaps they knew that this particular antenna was on its way to G3XFD!

Everything in the box was packed extremely well. It was as if the box had been packed that very day. The quality of all the components was excellent and the instructions were very clear and concise.

The assembly turned out to be very straightforward. However, I thoroughly recommend that you lay the whole set of components on a light coloured blanket or something similar. I nearly lost several important small pieces.

I cannot stress enough, how important it is to keep track of the many R5 components. This is because a large proportion of them are specialised, and it could take time to get them replaced. I've got to thank my wife's timely advice, telling me to use the blanket on the lawn, for the fact that I didn't lose anything (this time).

## Antenna Location

Cushcraft recommend that the antenna be mounted away from trees, and as far as possible, away from any obstructions. Trees warrant a particular warning, and I'll return to this when discussing how it worked on the air.

The manufacturers also suggest that the antenna is mounted as high as possible. Nearby power lines, buildings and wires (including the garden fence) can all affect efficiency.

With this form of antenna, bearing in mind how close to the ground they can be mounted, the application of safety precautions is of paramount importance. To this end, Cushcraft go to a lot of trouble to emphasise the operator's responsibility for other people's (and four-legged friends) safety.

The antenna is supplied with special warning stickers to be attached to the antenna's built-in counter-poise ground radials. But don't forget, unlike the 'Snoopy' and 'Garfield' dog and cat cartoon characters...your furry friend is highly unlikely to be able to read!

## Many Locations

Once I had assembled the R5, I decided to try it out in as many locations as possible. In fact, I thought it best to try it out in what I considered to be the best location, and several of the worst possible sites I could find. All in the name of an unbiased and honest review.

The first location was with the R5 mounted on my garage roof, completely in the clear and erected on the top of a pole, approximately four metres high. The 50Ω coaxial cable feed was then taken directly into my shack in the garage.

Once the antenna was up, I stepped back to admire my handiwork, only to be disappointed because the antenna was so difficult to see. I was very surprised, considering how bright the new aluminium was. The antenna would no doubt become much more difficult to see, after the metal had been exposed to the air for a longer period.

## Antenna Adjustments

Before I went on the air, I carefully read the Practical Wireless, September 1992

section of the instruction booklet dealing with the initial adjustments to the antenna. Fortunately, the setting-up procedure turned out to be very simple.

When it comes to reading (and understanding) printed instructions with kits, machines and word processors, my wife and other people will tell you that I'm not at my best! However, with the Cushcraft R5, all I had to do was adjust the clearly defined sections for the lowest s.w.r.

Using my s.w.r. meter, I obtained better results on all the bands, than the manufacturer's specification said could be achieved. On the 24MHz (12m) band, there's no need to adjust the antenna. So, that job was easy, and I was ready to go on the air. I decided to use my trapped dipole and my 14, 21 and 28MHz dipoles to compare results with when working from my home QTH.

## On The Air

For my tests at home on the air, I used the Kenwood TS-450SAT transceiver (reviewed in April issue of *PW*) and my old KW2000B, which now belongs to G0RSC. This is the school club, at Clayesmore School between Blandford and Shaftesbury in Dorset, that I help to run (more about this later when I mention trees and s.w.r.).

Adjustment of the lengths of the various tuning sections for a good s.w.r. was a simple task. Only the length of the (clearly defined) sections need to be adjusted. Tuning up was then straightforward.

In practice, like many other operators, I tend to stick to certain sections of the band. Because of this, I was pleased to discover that the s.w.r. was always well within acceptable limits over the areas I'd chosen during the setting-up process.

On 14MHz I tuned the antenna so that I got the best s.w.r. in the c.w. section of the band. However, I was very pleased when I found that the s.w.r. was still very acceptable well up into the s.s.b. section.

The working bandwidth was best on 14 and 28MHz. I found that with the installation I had erected at my home QTH, 21MHz bandwidth was narrower than expected, but this still meant I could work the whole c.w. section as I pleased.

Working c.w., I found that the DX potential of the vertical antenna has not been over-emphasised. I spread the testing period out over several months, with several days on each band, consistently getting good reports.

## Compared Favourably

Without exception, I found that the R5 compared very favourably with my trapped dipole and better than my half-wave dipoles on all bands except the two WARC bands. This is not to say that the R5 is not so good on the WARC bands, it's just that I reverted to using a long wire antenna on 18 and 24MHz.

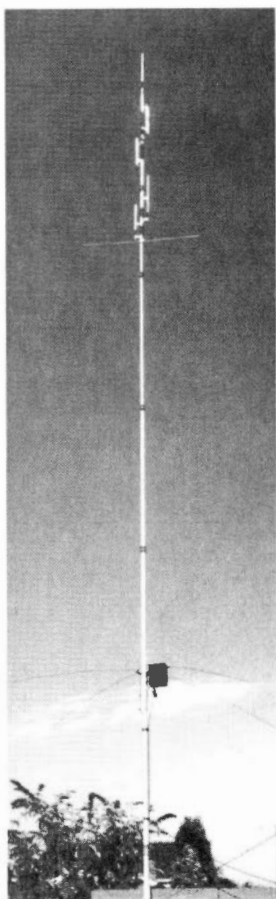
I have to report that I didn't work much DX on either 18 or 24MHz, even when using the excellent little Kenwood TS-450SAT rig. But I can say that the vertical provided better signal reports than my long wire antenna, which was used in conjunction with my a.t.u.

On 28MHz, I discovered that the R5 came into its own for inter-G working. I was surprised at this because I've always thought of the vertical as being a DX antenna. The omni-directional working also proved to be very useful for QSOs into Europe and to listening out for f.m. operation.

I have only ever worked into Hawaii on two occasions before, and I managed it for the third time on 28MHz s.s.b. using the R5. Once I had established contact, I changed over to the trapped dipole and the station in Hawaii couldn't see any

# Review





The assembled Cushcraft R5 vertical antenna, ready for use on the 14, 18, 21, 24 and 28MHz bands.

# Review

## Manufacturer's Specifications

Frequency coverage	14MHz, 18, 21, 24 and 28MHz
Electrical wavelength	Half-wave on each band
Voltage standing wave ratio	1.2:1 typical
2:1 v.s.w.r. bandwidth	300kHz on 14MHz 100kHz on 18MHz 400kHz on 21MHz 100kHz on 24MHz 1.7-2MHz on 28MHz
Power rating	1.5kW p.e.p.
Radiation angle	At horizon
Frequency selection	Automatic
Horizontal radiation pattern	360°
Height	5.2m

difference in the signal strength (S-8).

Using the half-wave dipole cut for 28MHz, I received a reasonable report of S-6/7 from Hawaii, but as the R5 is omni-directional and my dipole may have been disadvantaged by its orientation, this can only be a crude comparison.

I spent a long time on 28MHz, and enjoyed myself. It's a great pity you can't rely on a long DX contact to carry out all the antenna trials you would like to do!

Despite the problems of time and varying propagation, I found that the R5 always got me a QSO. It definitely seemed to have an advantage on the really long distance pathways.

## Less Than Ideal Locations

After I had satisfied myself that the Cushcraft antenna was working well, I decided to try it out in less-than-ideal locations. To this end, I mounted the R5 almost underneath a large silver birch tree in our front garden.

I noticed an immediate difference with the s.w.r. reading on all the bands. In particular, as the tree moved, the s.w.r. would fluctuate quite dramatically. Despite this, the signal reports were still good and compared well with the half-wave dipole.

For the next tests, I took the R5 to the home of G zero Radio-Society-Clayesmore (G0RSC). The radio shack at the school is located in attractive grounds, and we're lucky enough to have a large wooden hut.

The problem, is that the radio shack is surrounded by really enormous Cedar of Lebanon trees. These trees are close on 30 metres high, and it's difficult to overcome the problem as the trees are very much loved, protected and needed!

Despite the problems of the trees, the R5 worked very well indeed. The s.w.r. did swing about a great deal, especially when the wind was affecting the trees, but signal reports on 14, 21 and 28MHz were no different to those gained by using the club station's usual long wire antenna.

The long wire antenna by the way, is slung between two of the giant trees already mentioned. In a way, I suppose I'm fortunate to get any QSOs from G0RSC.

## Summing Up

In summing up my lengthy trials of the Cushcraft R5, I must be honest and say that I'm surprised at the results. I started the tests off, regarding the vertical antenna as being nothing but a compromise. I ended up thinking that at times it would be most useful to have a vertical antenna of my own.

Apart from h.f. mobile working, my trials with the Cushcraft R5 were the first time I'd seriously

used a vertical antenna. Following the successful review, I'm thinking about using a vertical antenna on my favourite h.f. band, which is 7MHz.

There are obvious safety drawbacks when using a vertical antenna of this type. But providing the instructions provided by Cushcraft are followed, I don't think anyone using one of these excellent antennas can be considered to be in any danger.

By following the manufacturer's advice, and mounting the antenna as high as possible and in the clear, there won't be any difficulties whatsoever. Even the very high field strengths developed around the antenna during the test period didn't cause TVI or BCI, except on our (very) susceptible telephone.

Finally, if the R5 is to be mounted on or near a balcony, I suggest that it's mounted as far out from the building as possible. I suggest this because, as you would expect, the antenna detunes rapidly as it moves (in a wind) towards the building.

## In Conclusion

In conclusion, I must congratulate Cushcraft for a well-made, easy-to-use antenna. I started the review tests regarding the R5 as (unfairly perhaps) a compromise antenna. I ended up realising that verticals of this type are exceptionally useful.

If I lived in a house or flat with little or no garden, on a boat, or in a motor-caravan, I would certainly consider one of these antennas. They're also useful for anyone requiring a portable, lightweight antenna, that will work on five bands without switching or re-tuning.

Provided the Cushcraft R5 is maintained carefully, and the coaxial cable feed point is sealed with self-amalgamating tape, these antennas should provide years of good service. Having tried one for myself, under some difficult conditions, I can see why they're popular with amateurs having only small gardens.

My thanks go to Specialist Antenna Systems for the extended loan of the review antenna, which they can supply for £269 including VAT plus £8.22 (three day delivery) or £11.74 (next day delivery) post and packing from their address at: Radfords Field, Maesbury Road, Oswestry, Shropshire SY10 8EZ. Tel: (0691) 670440, FAX (0691) 670282.



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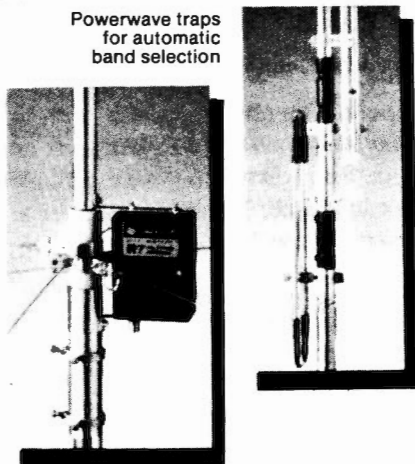


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15-3CD .....15m 3 element Beam	A50-3S .....6m 3 element Beam
10-4CD .....10m 4 element Beam	AR-6 .....6m Ringo Vertical
TEN-3 .....10m 3 element Beam	17B2 .....2m 17 element Beam
A4S .....20-15-10m 4 element Beam	13B2 .....2m 13 element Beam
A3S .....20-15-10m 3 element Beam	124WB .....2m 4 element Beam
A3WS .....17-12m 3 element Beam	A144-7 .....2m 7 element Beam
D40 .....40m Rotary Dipole	A144-11 .....2m 11 element Beam
D4 .....40-20-15-10m Dipole	A144-20T 2m 10 element X Oscar
D3 .....20-15-10m Dipole	AR-2 .....2m Ringo Vertical
D3W .....30-17-12m Dipole	ARX-2B .....2m Ringo Ranger II
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### SPECIFICATIONS

Frequency, MHz	28, 24, 21, 18, 14, 10, 7
Electrical Wavelength	Half-wave
SWR 2:1 Bandwidth	10m-2 MHz / 12m-100 KHz 15m-450 KHz / 17m-100 KHz 20m-150 KHz / 30m-25 KHz 40m-75 KHz
Power Rating, Watts PEP	1800
Radiation Angle, Deg	16
Frequency Selection	Automatic
Horizontal Radiation Pattern, Deg	360°
Height, ft (m)	22.5 (6.9)
Mast Size Range, in (cm)	1.5-1.75 (3.8-4.4)
Wind Load, ft <sup>2</sup> (m <sup>2</sup> )	2.25 (.21)
Weight, lb (kg)	12.3 (5.6)
Counterpoise Radials Supplied	7

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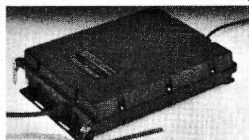


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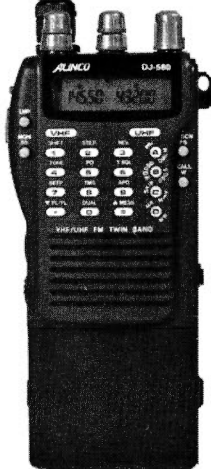
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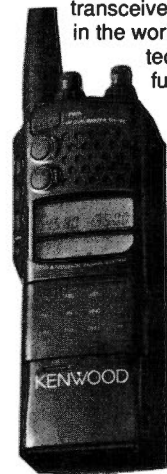
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- Built-in DTSS and paging functions
- Alphanumeric memory function (maximum 6 characters)
- Alphanumeric message paging (maximum 6 characters)
- Dual frequency receive
- Dual encoder
- Full duplex cross band operation
- ABC (automatic band change)
- Double band scan
- 50 non volatile memory channels expandable to 250 channels with optional memory module ME-1
- 4 position output power control (high/mid/low/economy low)
- CTCSS operation with TSU-7 tone decoder (opt.)
- Sliding keypad cover
- Auto power off
- Auto battery saver
- 10 minute transmission time out timer (TOT)
- 2m automatic repeater offset.

FM DUAL BANDER TH-78E £425.00

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Kenwood's new compact FM hand-held transceivers

Imagination combines with state-of-the-art technology to expand the bounds of compact communications, as



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# Fred Judd G2BCX

## An Appreciation Of The Man And His Work



**Fred Judd G2BCX in his element, demonstrating the early radio experiments carried out by Heinrich Hertz, during a lecture at the University of East Anglia. Typically, Fred later presented the fully working reproduction model of Hertz's transmitter to the University.**

in Woodford, in what is now Greater London, Fred was granted an 'Artificial Aerial' licence as 2BCX before the Second World War.

Although 'Artificial Aerial' licensees weren't really supposed to radiate, Fred (and many other pre-war 'AA' amateurs) delighted in telling of the marvellous distances they worked...while supposedly operating into a dummy load!

### Chain Home Stations

Many radio amateurs used their skills to advantage during the war, and Fred Judd was no exception. Joining the RAF, he spent the duration of his service working in the now famous (but then very secret) 'Chain Home' radar stations.

Early in the war he was working in the radar 'front line' in Kent, but later transferred to Norfolk. In fact, he loved the Norfolk countryside so much that he decided to live there when he retired. Eventually, Fred, Freda and their family moved to Cantley near Norwich where they quickly settled into the East Anglian countryside and a somewhat busy 'retirement'.

After the war, Fred had become licensed again, but this time with the full call G2BCX. Writing became a hobby for him while he was working for Kelvin Hughes, and he was soon writing for *Short Wave Magazine*.

The writing quickly became so much a part of his working life, that he became a full-time professional technical journalist. He was eventually writing for *Practical Wireless*, *Radio Constructor*, *Radio Communications* (and its forerunner the *RSGB Bulletin*).

### Other Work

Fred Judd's other work involved *Hi-Fi & Audio News*, and *Amateur Tape Recorder* magazine (he was editor of this magazine for a while). Along with writing for many foreign magazines, he was also a technical consultant to IPC magazines (the then publishers of *PW*).

Together with amateur radio work, hi-fi design and consultancy operations, Fred was busy in the world of model radio control systems. At one time he was even producing records, and even today it's possible to buy some of the special sound effect and test recordings produced by his Castle label.

Always a fine engineer and a 'hands on' man, Fred was of course extremely well-known as the designer of many amateur radio antennas. Although his Slim Jim and ZL Special antennas are justly famous, he was also professionally involved in sorting out (and designing antennas for) problems involving North Sea gas platforms, helping the Coast Guard service with radio communications, and even underwater 'pigs'!

### Underwater Pigs

Freda, Fred's widow, is still amused by the activities of the underwater 'pigs' her husband became involved with. Despite the porcine name, the so-called 'pigs' are radio-controlled robots. They are remotely controlled, and travel through underwater pipes, checking welded joints and other important factors.

The operators ran into control problems with the radio systems. As a result, Fred, was asked to help.

Fred used to delight in telling the story of how they used the pipelines, as a crude waveguide system. This was one of the methods they used to extricate the 'pigs', when they weren't picking up the radio command signals because of damaged wiring.

### Ionospheric Sounder

A visit to the G2BCX shack was fascinating. Situated way out in the Norfolk countryside, the visitor first had to pass the Judd family's pet goose to get into the house!

Inside the shack, one of the very few privately (and almost certainly the only amateur operated) ionospheric sounder worked away on the 6MHz (49 metre) broadcast band. With this apparatus, Fred kept a constant watch on his favourite subject outside of antenna work...propagation studies.

Fred's other work also brought him into close co-operation with government officials, and this brought him to the official status as an adviser to the UK Government when the introduction of CB was first suggested.

### Sensible Objections

Although he had valid and sensible technical objections against the introduction of CB radio on 27MHz, Fred was soon involved in planning for the new service. He was called in to advise government departments on antennas, propagation problems and suitable equipment.

Continuing his 27MHz design work, Fred went on to produce numerous successful products. In particular, the Big Jim CB antenna proved popular, as did many of his other designs.

### Climbing Days

Eventually, after producing some excellent antenna designs, Fred reluctantly decided that his days of climbing up on the roof of the bungalow were over. He decided to concentrate on his writing, and ended up producing (among many others) the popular series of articles 'The Oscilloscope In Your Workshop' for *PW*.

However, G2BCX still had one more talent up his sleeve, and mysterious things began to happen just before Christmas 1991. Fred's telephone calls to the office (usually two to three a week) became futile, with intriguing enquiries about members of the editorial staff.

We soon found out what he was up to, for Fred demonstrated another marvellous talent when he produced a pantomime type story (based on 'Alice In Wonderland') written, drawn, printed and published by himself. All the editorial staff got a bound copy, and we were all delighted.

Everyone on *PW* and *Short Wave Magazine* was there! The *PW* staff could easily identify the 'Duchess', and the fat little 'Dormouse' who never seemed to be quite sure what day it was (that was G3XFDI!) and the 'Great Gander - The Ruler of the very short waves' (Dick Ganderton, editor of *Short Wave Magazine*).

Fred Judd G2BCX was certainly a talented man, a good friend, and a marvellous teacher who possessed a keen sense of humour. *Practical Wireless* is determined to keep working in his tradition, so you can be sure that along with many others, we won't forget Fred Judd G2BCX.

**F**red Judd G2BCX wasn't a giant in the normal sense of the word. Despite this, he had a giant-sized reputation that had encircled the globe.

Fred's well-deserved reputation as a radio and electronics engineer, audio equipment designer, author, radio amateur, antenna designer and friend, was legendary. However, although he was such a long-established writer and author, Fred avoided the limelight whenever possible. He was happy to be busily working away in the background.

### Who Is Fred Judd?

So much did Fred keep his nose to the grindstone, that readers, fascinated in his work, wrote in to ask "Who Is Fred Judd G2BCX"? In answer to this question, Fred cheerfully agreed to allow us to feature him in one of our occasional 'Radio Personality' series of articles.

Unfortunately, it was not to be, as Fred passed away very suddenly just before Easter this year. He'd been unwell for some time, but had appeared to be recovering from a heart condition.

Many readers have written to thank *PW* for Fred's work, and complimented us on an author who always replied personally (often at great length) to every letter sent to him. So, in answer to the requests, we've prepared a short story taken from a long and active life.

### Some Achievements

Our list is undoubtedly lacking in some detail, but it will certainly convey some of his achievements. We are most grateful to G2BCX's widow, Freda, for providing a great deal of information. Freda is certainly in the know...as she typed all of his article manuscripts!

Fred would have been 78 years old in June. He left a widow, four grown-up children and four grandchildren. Born and brought up

*As the late Fred Judd G2BCX was for many years our antenna specialist, the PW team thought it was most appropriate to honour the man and his work in the form of an appreciation in this antenna special.*



# Reflections

*This time, Ron Ham chats about overhead power lines, pigeon post, the RCA AR88 receiver and also includes your regular reports.*

When Joan and I visited Exbury gardens, near Southampton, on May 20, we noticed a large section of tree trunk, adorned with 51 coloured plastic labels, **Fig. 1**. What a shame that this gigantic tree, most likely a mere sapling in the 17th century, had to end its life during that big storm in 1990.

Each label indicates the size of the trunk, at the time of a specific event in history. For example the tags scribed for 1876, "Dr. Alexander Graham Bell invents telephone" and, 1879, "Thomas Edison invents electric light bulb", can be seen at the centre of **Fig. 2**.

The 12 tags in **Fig. 3**, show the state of the tree's growth at the time of notable happenings between 1901 and 1934. Such records include the death of Queen Victoria (1901), the first powered flight by Orville Wright (1903), the loss of the Titanic (1912), the "First public demonstration of TV" (1926) and the visit of the Prince of Wales to Exbury in 1934.

## Pigeon Post

Archives tell us that when the telegraph lines were first installed a number of carrier pigeons from Reuter's 'pigeon post' were killed through colliding with, to them, the 'invisible' overhead wires. There are similar problems today, but on a much larger scale.

The mains electricity to many parts of West Sussex are fed by overhead 11kV cables which, if

damaged, can cause a loss of supply over a large area. On several occasions during the past decade we have lost supply due to swans colliding with the lines. This may well be the case in other parts of the UK, however at vulnerable points near us, the electricity authorities, trying to solve this problem, have hung a number of orange coloured spheres on their cables, **Fig. 4**, so that the birds can see them.

## Unusual Morse Key

Thinking more about the electric-telegraph, some years ago I purchased a rather unusual Morse key, **Fig. 5**, which has no electrical connection posts. The 103x90mm, brass, rocking-bar is mounted on a polished wood base measuring 140x87x10mm.

The only identification is a plate under the operating knob which reads, "J.H. STEWARD, 406 STRAND, LONDON." Ample adjustment is provided at both ends of the bar to suit the users 'fist' and, although unusual, the return spring (rear left) is very efficient. I wonder, was this key a traveller's sample, an ornament for a telegraphist's home or office, or made just for practice. Any ideas?

## The AR88 Receiver

From telegraph to telephone to wireless, the technical side of communications marched on and played an important part in several hostile actions. One fine example of beautifully

made equipment for military use is the AR88 communications receiver, **Fig. 6**.

The AR88 was built in the early 1940s to an exceptionally high standard by RCA. Many owners, still using these 50-year old sets, will confirm what I say. The main construction is a steel chassis and front panel, both accurately drilled to take octal valve holders, large i.f. transformers, a number of fixed capacitors, dial assembly and control knobs.

Having repaired several AR88s, following their many years of service, the superb mechanical construction sticks in my mind. The set, without its cabinet, is very heavy, therefore before work starts, it is best to stand it on its side on a small robust table in the centre of the room. This enables your ease of movement around it without too much heavy lifting.

In addition to straightforward jobs like changing potentiometers, dial lamps, mains leads and cleaning switch contacts, I have replaced a number of resistors and capacitors. The need for most of my repair work has been caused through age deterioration rather than actual breakdown of components.

For example, there are a couple of 33k resistors that feed the screen-grids of the two r.f. amplifier valves (6SG7) which I have found as high as 1.5M $\Omega$ . Before these can be renewed the metal cover on the underside of the r.f. unit must be removed. I have a small box handy because it is secured by about 30 nuts with spring

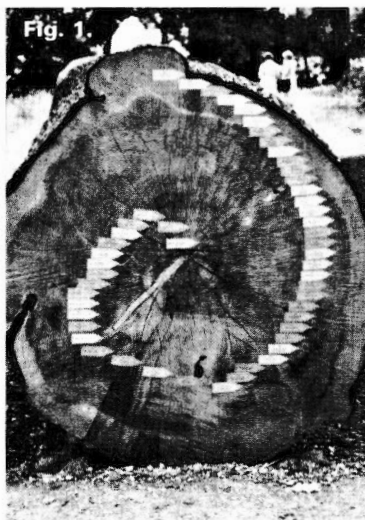
washers. It is worth checking the value of other resistors while the cover is off and replace any that are 'high'.

One set was really poor and I tracked the trouble to a leaky capacitor across one of the i.f. coils. Instead of assisting the circuit to peak when tuned, it functioned like a damping resistor giving the opposite effect. The faulty component was inside the i.f. transformer assembly which had to be removed.

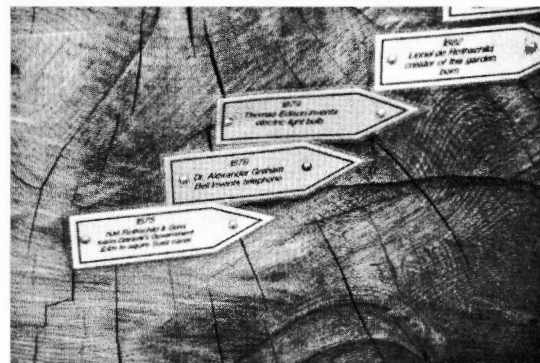
The removal is achieved by unsoldering the wires from four connection posts and undoing the securing nuts and washers. Having removed the unit from the chassis, it too has to be dismantled and the faulty capacitor replaced. It is advisable before reassemble to check all connections and replace any other capacitors that are inside the can. Slight adjustment of the trimming screws may be required following the fitting of the new parts and these may be very tight through age. However, the screws will turn a lot easier and finer tuning is accomplished by adding a drop of thin oil to the transformer end of the thread.

Similar lubrication of the 'sliding' rod style trimmers, and the screw thread type, is also important before making any adjustments to the main r.f. tuning unit. Lubrication will ensure that the trimmers move freely instead of 'jerking' when moved.

Among its many features, the AR88 has a well calibrated dial



**Fig. 2.**



**Fig. 3.**

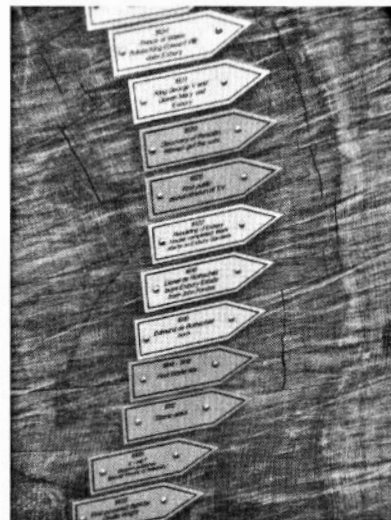
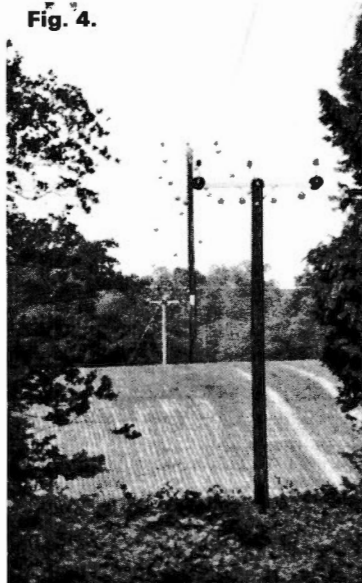




Fig. 4.



which is coupled to the drive mechanism and four gang tuning capacitor by a gear train. A touch of oil on each of the gear wheel bearings and on each of the tuning capacitor shaft bearings, will put new life into this precision made tuning unit.

The AR88 has 11, metal cased, valves, plus a plain glass type audio amplifier (6K6GT), rectifier (5Y3GT) and a voltage regulator (VR-150). Finally readers, **please beware**, there are high voltages employed in this receiver, so **do not** attempt to repair one unless you really know what you are doing. Ask a qualified radio engineer first.

## Reports And Observations

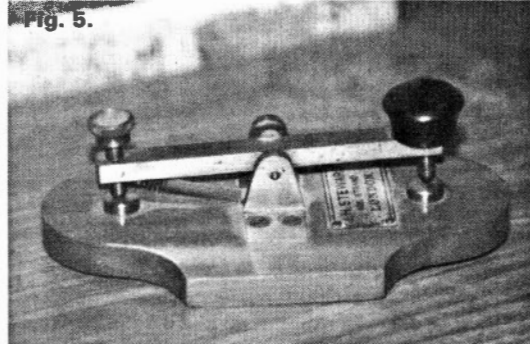
Now it's on to reports and observations. For some time I used two AR88s as tuneable i.f. amplifiers on my solar radio telescope. One of these stood in the same position for about 10 years, by which time the set was around 35 years old.

However, when I came to move it, the original mains lead was as stiff as a board, and when touched the hardened rubber insulation just collapsed. Apart from its general stability over long periods of work, I chose this set because the designers included a diversity terminal on the rear tag panel. Although the 'information' voltages at this point were small, they were strong enough, with the aid of a d.c. amplifier, to drive a pen recorder.

## Solar Activity Recorded

Among the main features of solar activity recorded during May by **Cmdr Henry Hatfield** (Sevenoaks), with his spectrohelioscope, were one sunspot group, 11 filaments and seven quiescent prominences on the 11th; 1grp, 8fs, five small qps and a faint eruptive prominence on the E.

Fig. 5.



limb on the 13th and similar on the 14th.

Although Henry saw nothing active on the 16th and 17th, he did locate 9fs and 8qps, but, next day, he saw a 'hot spot' in a group near the N. E. limb. He looked again early on the 19th

and saw an active plage and counted 16fs and 7qps.

The following morning, at 1125, Henry found that the group "has developed very much since yesterday. It is active, but no flares." His observations on the 22nd, 24th and 25th revealed an average of 13fs and 7qps. The sunspots around the 20th were also watched by **Patrick Moore** (Selsey) who kindly sent a drawing, **Fig. 7**, of this large group as he observed it on his projection screen at 0900 on the 22nd.

Observations by **Ron Livesey** (Edinburgh), using a 2.5in refractor and a 4.0in projection screen, revealed three active areas on the sun's disc on May 12, 15 and 16 and four on days 1, 2, 10, 11 and 13. At his observatory in Bristol, **Ted Waring** counted 12 sunspots on the 19th and 20 on the 22nd.

The radio telescope used by Henry Hatfield, recorded individual bursts of solar radio noise at 136MHz on May 18 and June 2, 6 and 8. As a matter of interest, Henry's original instrument also included an AR88. A high background noise level, with several very loud bursts were reported by **Fred Pallant** (Storrington) at 0900 on May 2 and on the 20th, he found the 28MHz band "incredibly quiet."

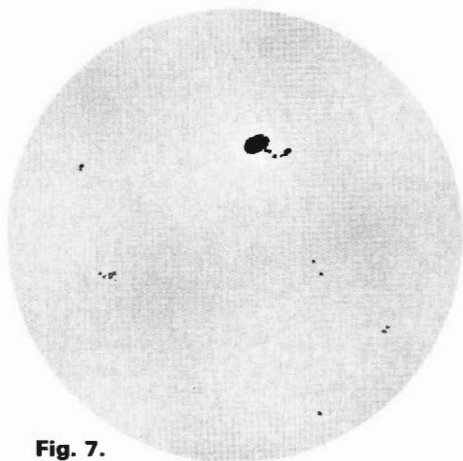
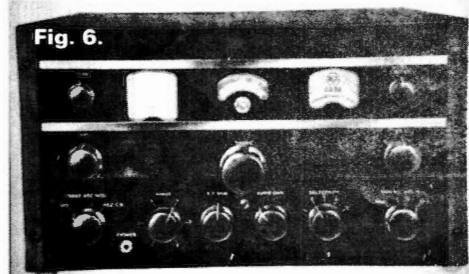


Fig. 7.

Fig. 6.



## Auroral

Ron Livesey, the auroral coordinator for the British Astronomical Association, received reports of 'glows' and 'arcs and odd rays' overnight on May 1st, 'ray structures' on the 7th, 'active storm' on the 3rd and 'major storm' on the 10th, from observers in North Dakota and Scotland.

Many Canadian Met. stations reported "aurora across Canada". Auroral sightings on the 11th, 18th, 19th, 21st and 23rd came from observers in such places as Cold Lake, Churchill Falls, Edmonton, Goose Bay, Lynn Lake and NW Territory.

In New Radnor, **Simon Hamer** received auroral reflected television pictures on Bands I (48-68MHz) and III (175-230MHz) on May 10 and **Tony Hopwood** (Upton-on-Severn) noted tone-A signals on the h.f. bands from 2030 to 2130 on the 9th and from 2015 to 2100 on the 29th. Beacon watcher **Gordon Foote** (Didcot) reports hearing weak auroral warnings from the German beacon DK0WCY (10.144MHz) on May 14, 15 23 and 24th.

## Magnetic Activity Reports

The variety of magnetometers used by magnetic activity reporters **Tony Hopwood** (Upton-on-Severn), **Karl Lewis** (Saltash), **Ron Livesey**, **David Pettitt** (Carlisle) and the late **Doug Smillie** (Wishaw), between them, recorded magnetic storm

conditions on May 1, 7, 8, 9, 10, 11 and 22. My thanks to **Ern Warwick** (Plymouth) who tells me that the German beacon DK0WCY (10.144MHz) "has changed its style" and is sending solar and magnetic activity forecasts every 10 minutes.

I regret to report that **Doug Smillie** passed away unexpectedly in May. His dedicated work will be sadly missed by all in the worlds of radio and astronomy. We extend our deepest sympathy to Doug's family and his many friends.

## Canon Palmer Diaries

Joan's further studies of the diaries kept by **Canon Palmer** revealed that while he was in Huntingdon, on 16 January 1859, he found the weather over the previous days fine and warm. However, on the 16th he walked with the Rector in the cold moonlight and noticed the moon had a large halo.

The following day the weather turned cloudy and mild, and on the 18th stormy. My weather records show that wind and rain followed the lunar halo that I witnessed at 2200 on 20 October 1989. For your interest, **Fig. 8**, is my reproduction of the sketch that the Canon made in his diary.

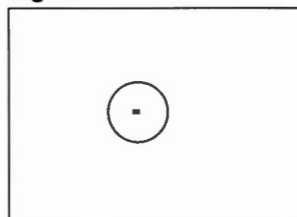
## Over The Tannoy

Many ex-RAF 'bods', from WWII, will remember the phrase, "it came over the Tannoy". The phrase is very true, because the majority of airfields and stations had a public address system which carried that famous name on their loudspeakers.

The story of Guy Fountain and the Tannoy company is currently being researched by **Julian Alderton**, for a book, and he would like your help. If any of you have any such information, Julian would be pleased to hear from you at Pear

Tree Cottage,  
Bellwether Lane,  
Outwood, Nr.  
Redhill, Surrey RH1  
5QD.

Fig. 8.





## Satellite Challenge

Since the early days of OSCAR-6, when both G6RH and myself achieved the first European DXCC Satellite awards, the pursuit of DX by satellite has been a challenge. Somehow the awareness that you are using v.h.f. or u.h.f. frequencies, upon which 100 miles can be considered DX, provides additional stimulation.

## Satellite DX?

People often ask what is satellite DX? As the actual satellite path range to a fellow G, is much the same as that to a VK, the concept of distance to the other country is not a DX qualification. It is just as easy (or difficult!) to have a QSO with a near neighbour as it is with the other side of Earth.

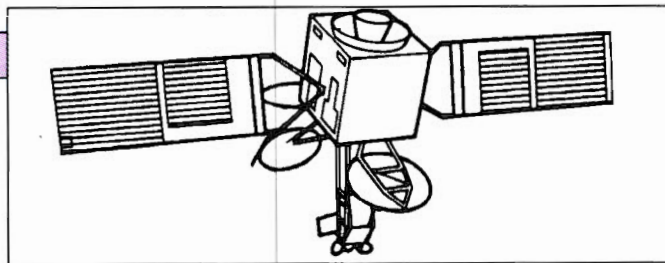
Furthermore, some countries considered rare on h.f. are not necessarily so on satellites, but more often it is the reverse, as many countries in plentiful supply on h.f. are inactive on satellites. For this reason satellite DXpeditions occur to countries that some h.f. users consider quite mundane.

## Satellite DXpeditions

Most DXpeditions have short stay durations, the intent being to work as many stations as possible within the period that they can be active. Resident stations of most of the rarer prefix countries also have limited time to devote to QSOs, often not enough to provide the many callers with a contact.

Satellites also have distinct but finite times when they are within mutual range of the DX station, and those who would wish to QSO the said DX station. For these reasons it is essential that slick and effective operating methods are developed that not only enhance your own chances of working the DX, but permit others to work the expedition also.

Andre ON1AIG sends some hints and tips on working these



# Satellite Scene

by Pat Gowen G3IOR

*In this month's column, Pat Gowen G3IOR, passes on some good tips for successful satellite DX working, tells of the new QRM problems on the space bands, and gives the new launch times for the next amateur radio satellites.*

DXpeditions and rare DX-stations provided by John KL7GRF/6, who organises many satellite DX events.

"The most important habit to develop" says John, "is listen, listen, and listen again before transmitting. Satellite operations are unique in that you must match your uplink and downlink frequencies. The worst thing you can do is match your uplink and downlink on top of the DXpeditions downlink frequency. I have heard many stations talking themselves in on top of the DX downlink with the standard drawn-out '...h e l l o ...' or by swishing a carrier across the downlink, thereby interfering with the QSO between the expedition and a station, further slowing down the expedition operator. By listening to the DX station instructions you may ascertain that he may be working split frequency, e.g. transmitting to one downlink and listening on another, by announcing that he is listening 'down ten' or the like".

## Hints And Tips

John provides hints and tips for satellite success, as follows:

1 Don't tune up and 'find' yourself on DX station downlink. It is a very simple matter to find yourself without causing QRM to the expedition downlink by:

- a Tuning your receiver on the DX station.
- b Tuning your receiver down exactly 10kHz from the DX-station.
- c 'Finding' yourself on the receiver downlink.
- d Moving your receiver back to the DX-station.
- e Moving your transmitter up exactly

10kHz.

The result will be that you are now on the DX station frequency without causing QRM. If however, the DX station is working split, take the time to calculate the proper uplink frequency to fall in the downlink area that they are listening in. Don't transmit on the DX station downlink, as the station will hear you, and you're only causing QRM to others trying to work the station.

2 One of the very worst habits you can develop, is to transmit while you are listening on the station speaker. This is bad practice at any time on the satellites. Use headphones! Listening to yourself while using the station speaker causes the downlink heard through the station speaker to be re-transmitted as feed-back. In most cases, it is practically impossible to copy a station using a speaker instead of a set of headphones to receive the downlink.

3 Before calling a DX station listen before transmitting, making sure that the DX station is ready to work the next station. The DX station or expedition may be working by call areas. Don't bother with his call when calling, he knows his own call. Speak concisely when calling, and don't repeat your callsign over and over. Twice is sufficient.

Just give your own call, and be consistent with your phonetics using internationally understood words. Don't change 'Sierra' to 'Santiago' and back again unless a pronunciation of a particular phonetic causes difficulty. Should the DX station ask for your callsign again, give the same phonetics but change only that phonetic that is causing the difficulty.

4 After you have called, listen.

Don't just keep calling blind. It is incredible how many stations just keep on calling. They don't seem to realise that the DX station has responded to another station, and is trying to work them while you are causing all kinds of QRM. Too much of this rude and un-professional behaviour might get you on a 'blacklist' for a QSL card from the DX station.

5 When the DX station responds, remember there are many others waiting on the frequency to work the station also, many of whom will have modest stations. Please be brief. Initially give only a signal report, e.g. 'Roger ... you are 5 and 9, over.' immediately turning it back to the DX station.

Don't give your grid locator, city and weather, unless the DX station asks for it. If the DX station wants to ragchew, he will let you know, but do not expect this during the early days of an expedition when masses are calling.

Do not seek QSL information, as it will be given from time to time and will be well known to many others who you may ask on the 145.890MHz DX gathering frequency, and will later be published in any case".

John finally points out that DXpeditions cost money, saying "It is a nice gesture if you include an extra 'green stamp' to help defray the costs of printing QSL cards, transport fees, etc".

## Far From Exclusive

The amateur space service bands are far from the exclusive ideal we would all desire, to enhance long distance low power amateur satellite communications. On 29MHz, we have radar, strong broadcast station harmonics and the constant intrusion of terrestrial amateur f.m. stations.

On 145MHz, we have mixer products from the many high power users of frequencies just above our truncated space band, satellite spread spectrum transmissions giving high noise backgrounds. There's also the constant intrusion of inexperienced amateurs on a.m., f.m. and even packet, who have not bothered to read 'the rules'.

The 430-438MHz band, devoid of signals when I first came onto the band in 1953, now seems to be full of them, both amateur and 'others'. Military, research and commercial satellites seem to frequent the whole band. Nico PA0DL0, heard a weak slowly dopplering plain carrier on 430.900MHz. "This satellite is obviously very high, and is not continuous in operation" said Nico, who has no idea of the object number or type that is the source of the signal.

Brian G1NXS wrote "I've just heard a satellite transmitting on 432.200±8kHz doppler. It was sending what sounded like 1200 baud p.s.k. data with a duty cycle of

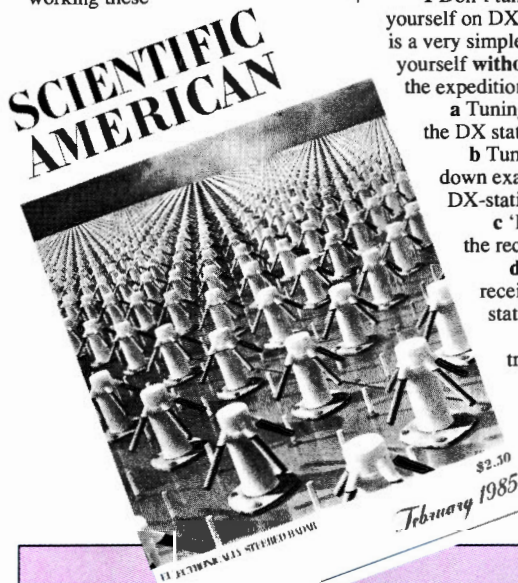


Fig. 1: An amateur's dream? Not really, but 1792 phased radiating elements on 435MHz nevertheless! The Scientific American magazine's picture of part of one face of the PAVE PAWS installation at Cape Cod.



two seconds on and six seconds off.

I first heard it on a heading of 100°. The signal stopped (switched off rather than LOS) at 1933GMT on a heading of 350°. Yet another was heard by many observers as a weak plain shifting carrier on 435.100MHz whilst the elusive UoSAT-OSCAR-15 microsat was being sought.

## Other Users

Our 432MHz amateur band, and the contained specific amateur space service allocated section of the band, is shared with numerous other users. These include civil, military, research, and a few more difficult to categorise.

It is not surprising that we should often come across other signals while looking for those that we need. The satellites are all good for tracking, relating to element sets, and for the study of the space to earth propagational anomalies.

What is not good, is the presence of highly disruptive wide-band signals that have been either intentionally or thoughtlessly placed into the band. The first menace, often severe in areas adjacent to the coast, was SYLEDIS. At first it was in the lower section of our band, but now it is in the satellite section.

## Serious Source

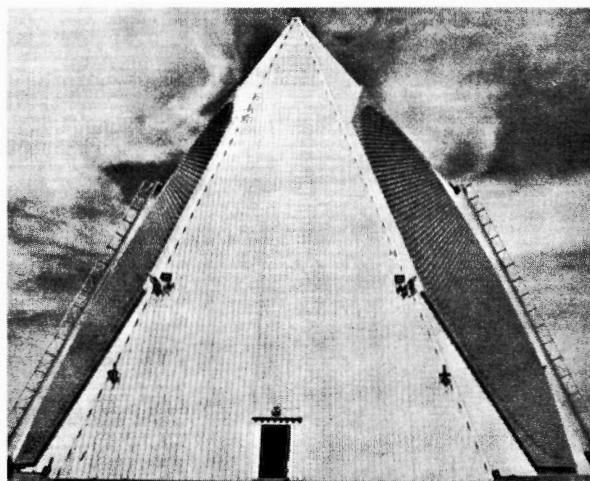
Nowadays, we have another far more serious source of QRM, in the shape of Raytheon 'PAVE-PAWS' Radar system. This 180 billion Dollar US system replaced the old four minute ballistic missile early warning system 'golf balls' at Fylingdales on the North Yorkshire Moors.

It is not felt to be entirely disconnected with the strangely non-formally publicised UK Government December order, prohibiting all but very weak amateur transmissions on the lower end of the 430MHz band over a wide area of north east England.

The PAVE PAWS system consists of microsecond time electronically phase steered dual 1792 radiating element arrays either side of a pyramid 120° apart, as seen and published by the *Scientific American* photographs in Figs. 1 and 2. Each radiating element is fed by four 100W transistors 'mean power', so the peak pulse amplitude is many MegaWatts e.r.p!

The resultant signal can be heard at S8 to S9 on a triplet of staggered channels each 300 to 500kHz wide, by stations many hundreds of kilometres from the site. It is a horrific signal in North Yorkshire, where it can be heard over 80km away on receivers with the antenna disconnected!

Formal complaints were made by Ken G4FIP and other affected stations, but after 10 days of the usual bureaucratic run-around, the reply from the Radio



**Fig. 2: It's the USA, not ancient Egypt! The *Scientific American* magazine produced this picture of the two 120° apart multi-dipole faces of the first PAVE PAWS installation at Otis AFB, Cape Cod.**

Communications Agency was that they were aware of the problem, but that "... the Ministry Of Defence was the primary user ... we suggest that G4FIP uses another band" (!)

## Little Interest

Ken attempted to bring in the liaising committee of the RSGB, but met with little interest and no action. Basically what emerged was they had decided to 'let sleeping dogs lie' for fear of upsetting someone up there, or, in other words, do nothing.

What is worse is that they consider this approach as being 'a success'! Ken feels that "... where they have got it wrong is that from my own past experience there will be someone in the MOD waiting for complaints and positive feed-back. This person will get some satisfaction from being able to assist both the amateurs and his/her own department".

## Concern Expressed

Concern has been expressed by US Generals regarding the USA based installations on the environmental hazards. They are concerned about the possibility of the high power pulse triggering explosive devices on passing aircraft and the hazard to aircraft on nearby airfields.

Spyros SV8ALQ reports that the American military have put another on his island on 435MHz and that the system is causing severe interference to the PACSATs. Further installations exist at Cape Cod and California, and they are also operational from land mobiles and large converted cargo ships.

## Command Problems

The OSCAR-10 and 13 command station Peter Gulzow DB2OS, says that the radar systems

are seriously effecting global AMSAT operations. He writes "For the past year I have encountered extreme problems with commanding OSCAR-13 by the 430MHz Uplink. If the satellite is in good view of the northern hemisphere (i.e. good pointing angles) I often need 10-20 tries to upload a single command block (512 Byte at 400 Bit/s) and mostly only a few bytes (sometimes only 1 Byte!) are uncorrupted. I have tried to use high power, but there is no difference if I run my 500W p.a. or if I use 25W. I confess these (radar) pulses are extremely powerful compared to what I can produce!"

Leonid Labutin UA3CR, head of the OSCAR-21/RS-14 command group, also finds this to be the main problem in the 432-432.2MHz analogue command failure difficulties of AO-21, with blocking and sweep pulsing misdirecting the on-board command computer.

## Hear It Yourself

Despite the incorporation of radar 'blankers' in the satellites receivers, you can both hear and see these pulses. These can be seen on a 'scope in the 145MHz downlink passbands of OSCAR-10, 13 and 21, if you place a single unmodulated carrier into the 435MHz uplink passband. When the OSCAR-21/RS-14 RM-1 or 2 transponder is on, this strong radar can produce considerable QRM.

## Wind Profile Radar

Another high power radar system, used to measure air movements by satellites has now come to 'share' the North American repeater band at 449MHz, by using a bandwidth of up to 2MHz. When on the 404MHz COSPAS/SARSAT listening frequency, these wind profile radars caused severe problems, so the amateur equipment had to be turned off

when such satellites passed through the main beam. This same consideration is felt to be unlikely with our amateur users on the newly allotted frequency. Whilst WARC-92 agreed that WPR should not be on 404MHz, it was strangely silent when it came to considering the effect upon the amateur sharers of the band.

## Not Alone

John Branegan GM4IHJ points out that PAVE PAWS is not alone. The Russian version referred to as PECHORA from the site in the Soviet Arctic where it first appeared, is also a possible QRM source. John adds "There is however another potential offender which worries me even more. This is the constellation of 'super over the horizon u.h.f. terrestrial TV stations', which has begun to appear as the advent of very advanced tetrode and Klystron techniques allows US TV stations to improve their static coverage by using MegaWatts to antennas up to 1000m high.

Theoretically, these giant radio cookers should have a near horizontal polar diagram, but I suspect that any amateur satellite regularly over flying Georgia USA (as RM-1 does) could have recently begun to experience a lot of r.f. Given the shape and power of the sync pulse of these video monsters, all sorts of non-linear mixing products may be entering our satellites front ends". John also notes that these u.h.f. TV transmitters might just perhaps get their signals direct into UK at times.

John suggests "In the real world we have to accept that on 430MHz in the UK we are the secondary user, but we are users. It is also true, that in the north-east we have effectively, through the increased arc coverage of the new Fylingdales facility and its mode of operation, lost the top 8MHz of 430MHz. As we are not allowed to use the bottom 2MHz, then for some amateurs it means a complete cessation of their 430MHz activity. This could mean, in some cases, for the remainder of their lives".

Both Ken and John are convinced that if sensible proposals are put to the primary user, a compromise solution could be found which would enable both parties to really share the band in the true spirit of the WARC.

## Launches Postponed

The two coming amateur satellite launches mentioned in last month's column have both been postponed. The KITSAT was due for a 2345UTC launch on August, 10 while the French ARSENE, due to some incompatibility with the major satellite, has now been postponed to the ARIANE V-55 mission, scheduled for November



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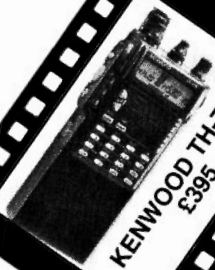
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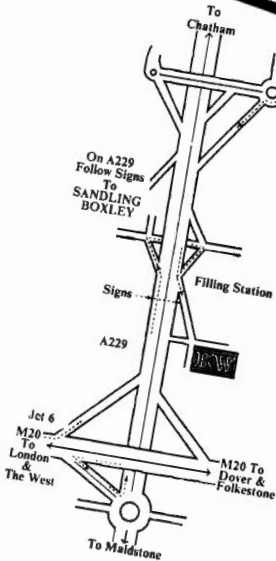


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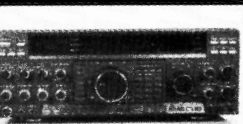


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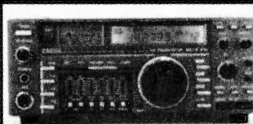
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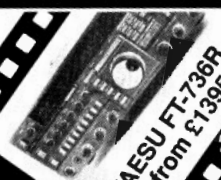


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**We look forward to serving you. 73's Tom G6PZZ**

Practical Wireless, September



# Mathematics For The RAE

Before delving into this month's subject, I'll give you the answers to last month's problems. As you will remember, I left you with seven questions covering three capacitor combinations.

For the first set, I asked you to consider the total capacitance when the three capacitors are in parallel. Here are the answers:

- i)  $79\mu\text{F}$
- ii)  $3.23\text{nF}$
- iii)  $13.2\text{nF}$

Then I left you with three more questions. The task this time was for you to find the effective capacitance of three capacitors in series. The answers are:

- iv)  $6\mu\text{F}$  ( $5.999\mu\text{F}$ )
- v)  $228.9\text{pF}$
- vi)  $643\text{pF}$

Finally, there was a combination of two capacitors in parallel, in series with a single capacitor. The answer to that tricky one was:

- vii)  $1.32\text{nF}$

I'm sure you got them all right didn't you? Those of you who are interested in the whole working out, or were unable to get the right answers, can send an s.s.a.e. (a big one please) to the editorial address, marked RAE Maths Queries (Sept 92). The office will send you the worked questions and answers.

## Capacitive Charge

Now it's time to get down to this month's business. In this part, I'm going to deal with calculating the charge held by a capacitor.

The charge in question is the amount of electricity that a capacitor is able to hold, or store. This stored charge depends on the value of capacitance and the voltage applied across the capacitor.

If you're unsure how to imagine this, I suggest that you think of the capacitor value as a car tyre! Because of its size, the tyre has a certain volume, and this is physically limited.

Let's take a closer look at our imaginary tyre. Its volume can be considered as the amount of air inside the tyre at one atmosphere. One atmosphere is equal to 1Bar or 15 pounds per square inch (p.s.i.). But the amount of air actually in the tyre (the charge we're considering) is dependent on the pressure of air inside (in the electrical world we measure the 'pressure' in Volts).

## Pump It Up

Continuing with the analogy, let's imagine that we're going to pump air into the tyre up to a pressure of 2Bar (approximately 30p.s.i.). When we've done our imaginary 'pumping', there will be twice the volume of air inside the tyre's physical volume.

If we continue our imaginary labours, at 3Bar there will be three volumes of air in the tyre, and so on. It sounds like hard work, to squeeze all that air into that small space to doesn't it?

Now we'll return to the world of electricity. And when considering the charge in capacitors, the capacitance is measured in Farads (absolute volume), and Volts ('pressure').

The 'total quantity' of electricity (number of electrons) is known by the letter 'Q'. This quantity is calculated using the following relationship:

$$Q = C \times V$$

where Q is the charge (quantity of electricity) in Coulombs.

## New Basic Unit

This new basic unit, the **Coulomb**, is new to you as I

didn't include it in the table of basic units, given in the December 1991 issue. It wasn't included at the time because it doesn't appear very often in radio calculations.

Despite the fact that it only appears occasionally, I've mentioned it now, so you can be prepared. It's possible that a problem involving capacitor charge may occur in the RAE.

## Have A Go

That's enough of the dry mathematics, let's now put some figures into the equations, and have a go at a real question! Let's calculate the charge, Q, in a  $100\mu\text{F}$  capacitor connected across a 100V d.c. supply.

From the equation, we know the stored charge (Q) will be found by multiplying the capacitance (C) by the voltage (V). Don't forget everything must be in basic units (Farads, Volts and Coulombs)

$$Q = C \times V$$

$$Q = (100 \times 10^{-6}\text{F}) \times (100\text{V})$$

$$Q = (10^2 \times 10^{-6}) \times 10^2$$

$$\text{So } Q = 10^{(2-6+2)} \text{ or } 10^{-2}\text{Coulombs,}$$

This value may also be written as 0.01C or 10mC.

## Simple Relationship

Because it's such a simple relationship, we can calculate the voltage, if given the charge and capacitance. Alternatively, if we are given the charge and voltage, we can calculate the capacitance needed to hold that charge. So, now let's find the voltage if we're given the charge and the capacitance.

Example: What would be the applied voltage across a capacitor, if the capacitance was  $680\mu\text{F}$  and the stored charge 30mC (or 0.03C)?

From  $Q=CV$ , we need to re-arrange the formula to isolate the term V on its own.

$V=Q/C$  is the start point, so now let's put figures into it.

$$V = 0.03\text{C}/680\mu\text{F} = (3 \times 10^{-2})/(6.8 \times 10^{-4})$$

$$\text{so } V = (3 \times 6.8) \times (10^{(-2)-(-4)})$$

$$= 4.41 \times 10^2\text{V or } 441\text{V}$$

## A Few Problems

Now it's time to swim a few lengths by yourself, and I've set a few problems for you:

(i) If the voltage across a  $1000\mu\text{F}$  capacitor is 400V, what is its stored charge?

- (a) 40C
- (b) 4C
- (c) 0.4C
- (d) 0.25C

(ii) A capacitor has a stored charge of 1mC. What voltage would be necessary to produce this charge if the capacitance was  $1\mu\text{F}$ ?

- (a) 100V
- (b) 10V
- (c) 100V
- (d) 10kV

(iii) A capacitor has a voltage of 50V across it, resulting in a stored charge of  $50\mu\text{C}$ . What's the value of the capacitor?

- (a) 10nF
- (b)  $0.1\mu\text{F}$
- (c)  $0.25\mu\text{F}$
- (d)  $1\mu\text{F}$

As usual, I'll give you the answers in the next part of the series. To help you further along the path of understanding, I'll soon be dealing with reactance, impedance, resonance and measurements of the quality of tuned circuits.

## Theory

*Expanding on his theme, dealing with calculations involving capacitors, Ray Fautley G3ASG continues with a look at the charge held by capacitors, and how to calculate its value.*

*See you soon, and don't forget that mathematics are just another useful part of our toolbox, and it's just a case of learning to use them to best advantage.*



# PACKET PANORAMA

*This month, Roger Cooke G3LDI takes a look at summer activities, a Kantronics up-grade, a new version of Hostmaster, describes the interesting new Clover system and discusses an up-date of the popular Lan-Link package.*

Summer is a time of outside activities, and the shack seems to be the last place to be when temperatures are in the mid 80s. It's a time to renovate one of the most important components of an efficient amateur station, namely the antenna system.

Holidays also take their toll of activity on the air, and events like National Field Day and barbecues take preference to keyboard activity. This accounts for the lull in news coming in for the column, but hopefully this will change again soon!

## Kantronics Up-graded

Kantronics have up-graded their firmware to version 5. This is available for the KAM, KPC-2, KPC-4, KPC-2400 and the KPC-1.

The up-graded software is of particular interest to the user, rather than the main BBS sysop. The up-grade includes a new EEPROM, a 24C16, providing greater storage capacity, a commands manual, an operator's manual and some extra pages for the installation manual.

In addition to the features already mentioned, a new version of Host Master (Host Master II+) will be released in the near future. Present Host Master owners will be sent a notice for an up-grade package. The new Host Master II+ will include binary file transfers and other features.

## Changes In Version Five

There are changes in version 5. The PBBS now supports bulletin IDs (BIDS), message IDs (MIDS) and hierarchical forwarding.

The PBBS now keeps track of message type, i.e. bulletin, private or traffic and also displays the status of each message, i.e. forwarded, read or held. The mail indicating i.e.d. now blinks only if the PBBS has personal mail for you that hasn't been read.

If you set a KAM TNC to Amtor mode, then the PBBS can be accessed on v.h.f. packet or h.f. Amtor. Routing header information may be prevented from being stored with the message by turning the parameter PBHEADER off.

The new commands are:

SB Send bulletin.  
SP Send Private.  
ST Send Traffic for NTS

messages.

L< List messages sent by a specific callsign.

L> List messages addressed to a specific callsign.

LB List Bulletins.

LC List the full message headers of all bulletins addressed to that category.

LLn List the most recent n number of messages.

LT List traffic messages.

## Remote TNC Access

Remote TNC access is available. You can now remotely set parameters on your Kantronics TNC at home, while you are in the field.

There's a new command called MYREMOTE. This is your remote callsign and can be set to XXXXXX-n. That's a six character callsign and SSIC. There is another Command associated with MYREMOTE called RTEXT.

The RTEXT Command is actually your password and is case sensitive. Kantronics have come up with an ingenious method of sending a password back to the TNC.

To connect to your Kantronics TNC for remote sysop functions, you connect using your MYREMOTE callsign. The TNC will respond by sending back three lines of numbers.

After you've done that, you then select the correct combination and your TNC will then allow you to change any parameter. If you send the wrong combination, another three lines of numbers are sent.

Three attempts are allowed, and then you are disconnected. You will then have to wait for 15 minutes before the TNC will allow a connect with the MYREMOTE call.

## Remote Sysop Functions

Now we'll look at remote sysop functions. As a remote sysop, you can control what comes and goes into your PBBS. To sign on as the sysop, you must have your password in the RTEXT.

Next, you connect to the PBBS using your MYPBBS call. After closing this you send the word SYSOP to the PBBS.

The TNC will send the three lines of numbers for you to decode. You then send back the correct password and that's it!

You can then edit the message headers as necessary. The messages can be edited in much the same way as a full-blown BBS. You can alter the type of message:

B-Bulletin, P-Private, T-Traffic.

The Status of the message: Y-Yes, (It has been read)

N-No, (It has not been read)

H-Held (Not available for reverse forwarding)

To-call

From-call

@BBS (Destination BBS)

Hierarchical address.

## Popular Line

This latest up-grade has provided remote sysop status to a popular line of TNCs which should prove useful. Now, if only we could have 1200 baud packet on the h.f. port as well!

In rounding off this item of news on the up-grade, I would like to pay credit to our Canadian friends in the Victoria Amateur Radio Packet Association (VARPA), and in particular, Paul Johnson VE7DHM and Al Dawson W7YLV, for most of the above information.

## Lan-Link Again

Now it's time for more news of Lan-Link. Those of you who run Lan-Link, the very popular terminal program written by Joe Kasser G3ZCZ will probably be using version 1.59.

Well, version 1.60 has now been released and is available from several different sources. Peter Hunter G0GSZ, is the beta tester for Lan-Link in the UK. He'll be happy to supply version 2.00 providing you supply a disk, return addressed mailer and enough return postage. You can contact Peter at: 2 Mayes Close, Bowthorpe, Norwich, Norfolk.

## Up-date On Roger

I suppose that I ought to call this next bit of news 'Roger's up-date on Roger', as it's an GB7LDI up-date! The main news is that I have been quite busy lately, installing a satellite gateway station.

With the patient help of several 'Elmers', namely Dave G4WFQ, John GM4IHJ, Andrew G8TZJ and James G3RUH, I am now up and running on the satellite UO-22. Using the satellite software, PB/PG, it's quite fascinating watching the

data come in at 9600 bauds and re-learning packet over again.

It's unlike any terrestrial packet, and I have had some problems along the way! However, the auto-tracking is working fine, and I can copy most of each pass without using a pre-amplifier.

The new system is in its infancy at present and I'll report progress as I become more efficient. The new system should provide some really fast prime routes to places which at present have long terrestrial routes, dependent on propagation. My thanks in the meantime to my 'Elmers', who I pester quite frequently!

## Looking At Cloverleaf

I'm going to look at Cloverleaf now. This is the latest h.f. data communications mode, which will have to be catered for in our wonderful non-existent h.f. bandplan for data modes.

High frequency packet operation is susceptible to QSB, and its performance over the polar route is hopeless, unless the baud-rate is reduced to an unacceptable level. Cloverleaf offers some very worthwhile improvements over h.f. packet, Amtor and even c.w. modes.

The throughput versus bandwidth figures are typically 10 times higher than any other data mode. Whether this will catch on or not is another matter.

I understand that HAL Communications will be manufacturing a PC plug-in card called PC-Clover. However, at \$995.00 it's quite an expensive experiment. It's especially expensive, bearing in mind that the exchange rate for amateur equipment is £ for \$, making it a £1000+ investment.

Designed by Raymond Pettit W7GHM, Cloverleaf could provide a considerable saving in frequency usage on h.f. Conversely, more stations could occupy the same amount of frequency that's available.

Interested? To further enlighten you, here are its main performance features:

1. The system is extremely compact in bandwidth. For practical purposes, a Clover signal is entirely contained in a channel only 100Hz wide. Clover signals are designed for channel spacings of 100Hz, and need no guard-bands. The actual



# PACKET PANORAMA

channel width of the Clover receiver is the same 100Hz.

A Clover signal in a neighbouring channel will not cause interference, even if it is 60dB stronger than the signal to which the receiver is tuned. A network of 10 Clover links can be maintained without mutual interference in a 1kHz band. Each channel is a 'clear channel', no collisions, no splatter and no keyclicks come from any other user, regardless of signal strength.

2. A Clover link communicates data at the highest speed the r.f. path permits. As the band conditions change the system adapts to them automatically. Under the best conditions, it operates at above 100 correct data bits per second delivered to the user. Under the worst conditions, conditions in which even c.w. data rates approach zero, a Clover link can communicate a few bits per second.

3. The Clover design uses Reed-Solomon error-correcting control coding to correct errors in transmission, rather than rejecting a block of data on account of the errors. The coding is set, so that it will recover blocks which may have as many as 10% of their data symbols lost. If too many errors occur, the receiving station obtains a re-transmission from the sender. It is never necessary to re-transmit a block of data which has been received successfully, on account of errors in previous blocks.

4. The data link is completely transparent to the data user. No restriction exists on the alphabets or data sequences. There are no illegal data codes, and input is accepted as a sequence of bytes and delivered to the link in the same format. Programs using a Clover link are totally free to define their data in the ways best suited to their needs.

5. The Clover system requires and takes advantage of the extreme frequency precision and stability of its transceivers. The system also requires accurate knowledge of time. To achieve this, the transceivers obtain both the frequency and time from observation of WWV (for western hemisphere applications). Finally, a Clover channel can be centred 50Hz from a band edge with confidence.

## Amateur Clover

What about amateur Clover? To this end, I've heard that Ray Pettit and HAL Communications have filed for a Clover patent with the US Patent office.

However, this is merely to protect Ray, as the inventor, and HAL Communications as both have invested a lot of time and money in the project. Eventually, it's proposed to license other manufacturers, when a finished product is available.

The CCIR emission designator for Clover has been agreed as either 500HJ2BEN (RTTY) or 500HJ2DEN (Data). In order to identify a Clover transmission, and to prevent any mistaken assumption that the new system might be an intruder, initial Clover software will include an automatic c.w. identification feature complete with a 10-minute timer.

The c.w. identification facility is being regarded as a temporary feature only. In my opinion, it really is about time that c.w. identifiers stopped being mandatory for packet radio too, and relegated to the history books.

## Initial Hardware Base

The initial hardware base will be a plug-in card for the PC, and not a stand-alone unit. The card will be called PC-Clover and the model number is PCI-4000.

The host processor will be a 68000 device. The Clover software required to run the 68000 and DSP56001 on-card processors will be down-loaded from the PC rather than placed in ROM on the board.

The down-loading technique will avoid the hassle of ROM-based software upgrades. The interface between the PC-Clover card and the PC bus will be compatible with windowed software. This is the new architecture being adopted by most system programmers, and should assure a long life for PC-Clover hardware.

Since the Clover-card is full size, it must be used with a PC-AT. However, if you use the windowed software, a PC-386, with a lot of memory is recommended.

## Increased Use

With the increased use of modes such as Clover, I think that space on

the h.f. bands is once again going to be in demand. Data modes are increasing in popularity, as shown by the Clover project itself.

Indeed, Clover is designed primarily for the user, so as such it's not designed to replace h.f. packet as a means of passing traffic. Instead, it's there to enable the user to have a more efficient means of using a data mode as a direct contact.

Although the initial investment in a Clover system is high, it is much like the early days of packet. Locally here in Norwich on the eastern side of the UK, four of us spent well in excess of £250 on our TNC-1 (in 1985!). Since then prices for better (and smaller) units have tumbled!

The increased use of digital signal processing (DSP) techniques will probably have the same effect. But I'm wondering who will be in the first batch to spend nearly £1000 on a Clover based system!

## Regular Link

It's time to break out the champagne! When I was in Victoria in Canada, last year, I watched a demonstration of 56kbaud linking via a short-haul r.f. link at a local 'ham happenings'. I'm pleased to report that progress has been good since then, and a regular link has now been established.

The Faster Packet Radio Group in Victoria, is extremely pleased (not to mention relieved) to announce the successful linking of [ve7frg.ampr.org](mailto:ve7frg.ampr.org) to [ve7gnu.ampr.org](mailto:ve7gnu.ampr.org) at 56 kilobaud.

The circuit is though a full-duplex digital repeater, at about 500m a.s.l. approximately 10km from [ve7gnu.ampr.org](mailto:ve7gnu.ampr.org) and about 15km from [ve7frg.ampr.org](mailto:ve7frg.ampr.org).

The repeater receiver is on 220.450MHz and transmitter is on 430.550MHz at about 20W. Ground plane antennas are in use at the repeater and at both stations. The 220MHz power output at the user stations is also around 20W.

## Configuration Similar

The configuration of the system I've just described, is similar to the 56k LAN in Ottawa, including the frequency plan. The repeater consists of a modified Hamtronics R220 220MHz f.m. receiver, feeding its 10.7MHz i.f. into a GRAPES 56k r.f. modem receiver board, modified

to accept 10.7MHz input.

The demodulated digital signal is fed to a FIFO circuit, delayed several bits, and fed to a GRAPES encoder board. The r.f. output of the modem is fed to a Hamtronics XV-4 u.h.f. up-converter, which converts to 430MHz and amplifies to 1W.

This output is amplified by an amplifier, which is built out of a Mitsubishi M57745 linear p.a. module, giving 20W.

## User Stations Identical

Both user stations are identical, and are also built out of Hamtronics components. The receiver is a CA432-2 u.h.f. down-converter and the transmitter is an XV-2 v.h.f. up-converter producing 220MHz at 1W.

The 220MHz output is fed to another Mitsubishi p.a. module which produces 20W of r.f. output. Interface to the computer is through an Ottawa PI board, though a modified PacComm Tiny2 TNC has also been used.

The software is the GRI\_20j version of NOS, which inter-operates smoothly with SCO Unix in a machine linked to NOS through ethernet, thanks to the firmly-standardised TCP/IP protocol suite.

I'm pleased to hear that it's all working extremely well at the moment. As evidence, this note is being composed using the 'vi' editor through a 56k telnet connection!

## Questions Or Enquiries

Both George VE7FRG and Doug VE7GNU will be pleased to field any questions or inquiries about the new high-speed system. George is [george@ve7frg.ampr.org](mailto:george@ve7frg.ampr.org) on the internet. Doug is [samisen!djc@sol.uvic.ca](mailto:samisen!djc@sol.uvic.ca) and [VE7GNU@VE7VBB.#ISLAND.B.C.CAN.NOAM](mailto:VE7GNU@VE7VBB.#ISLAND.B.C.CAN.NOAM).

So, that's it for another month. Volunteered information can be left on my answering machine: (0508) 70278. I would like to have YOUR news so it can be shared with others, PLUS a few pictures for the column. You can see (from last month's picture) how interesting it is to see other people's photos!

Get busy with that camera, and don't forget I'm QTHR, or you can leave a FAX on (0603) 787534.

73 and happy packeting de Roger G3LDI @ GB7LDI



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**RADIO SHOPPER** have placed several investigators at strategic locations throughout the country. Their job is to report any peculiar activities from *INSIDE* the industry. This month's report comes from Mr Wood operating somewhere near Nottingham. Apparently, **RADIO SHOPPER** are being constantly bad mouthed by a number of unhappy dealers & distributors. During operation "**MONOPOLY**" Ken managed to overhear the following: "Hey, don't buy from Radio Shopper - we've repaired 6 or 7 of the rigs they've sold already". We can now exclusively reveal that this is not completely true! In fact, we can **GUARANTEE** that we have no had **ONE SINGLE** fault with any of the rigs which we have sold. Any repairs which we may carry out will all be done in the UK. Finally, have you noticed how we have had to change our logo's for Kenwood, Icom and Yaesu? Draw your own conclusions. - Sorry Guys - **RADIO SHOPPER** is here to stay. Watch this space.....

By Mr Ken Wood & Ms I Comm

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# Back-Scatter

## HF Bands

Reports to  
Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

There has been a shortage of sunspots since the beginning of the year, with the effects that inevitably follow. Perhaps we have seen the end of the good times, so we can all sit and suffer through the minimum - or could there be a secondary peak around the corner?

Of course, this is being written almost at the longest day of the year, so summer conditions and static are also there to amuse us. It's almost enough to make one try gardening, washing-up or even v.h.f.!

### National Field Day

For 25 years I was kept away from National Field Day by either magazine schedules or belonging to a club that didn't enter. This year I came back.

What differences did I see? Disregarding the rule changes of the past two decades, the most noticeable thing was the sheer lack of numbers. I estimate there were no more than a third of the entries compared with the early sixties. Secondly, how easy it all is: never a sniff of antenna, equipment or power troubles.

Thirdly, thistles are just as pointed as ever they were to sandalled feet! But as a fun day, it's still the best thing since sliced bread.

### The 1.8MHz Band

Nobody reported on 1.8MHz activity this time. However, I do know that the call of Mike Bazley VK6HD is being pirated on this band; the real VK6HD prefers c.w. on 1824, 1831 and 1833 for his contacts.

### The 3.5MHz Band

Again, it was almost zilch on 3.5MHz; but at least Ted G2HKU tried his c.w. on OH0/SM0IHR, TA0C and 4J1FS.

### The 7MHz Band

As the ads used to say, 'Now we're motoring.' Ted G2HKU gave his fleapower rig an airing on the 7MHz band, for ZV5A, Z21HQ, WZ1R, TM5RGE and K3Z0.

A first report from Rich Weiss GORKJ/N7CXB in Liskeard, Cornwall,

where the piskies hang out. Rich runs an Icom IC-725 into an inverted-V and he keyed with EA3GGG, YJ4SH and LA6CV.

Chris G4LDS in Burnham-on-Crouch says he didn't raise anything too exotic on sideband, just a few boring old G stations!

A real low-power enthusiast comes next; Eric GOKRT in Worcester Park, with a Lake DTR7, and the top half of a W3EDP antenna, operated against a quarter-wave counterpoise. Two-way QRP contacts were made with G3YHO, GW0NTX and PA3ELD, while other contacts included EI5DR, F5BM, F6EZV, FD1PQE, eight Gs, DJ5CU, DL1BL, DL2IAD, DL4SCH, DL8FCX, Y41HL, YL2KJ, Y04RDW, YU1AVQ, YU3CAB, OG30J, OK1AVG, ON4AGL/P, ON4AGZ/P, ON4AUZ, ON4DST/P, ON4VM, ON6MS/P, PON6SI/P, OR00ST and UA9CM.

Now we must head up north, to Don GM3JDR at Auckingill who keyed with 4J1FS and 9J2SZ.

### The WARC Bands

On the WARC bands all c.w. at G2HKU; Ted tried his full power on 10MHz for VK4XA, 4J1FS, ZL2AGY, EA/F9VN, dropping to 5W to deal with F8UFT/EMB, OK3TGK, 4J1FS and ZL4HB. Top whack on 18MHz saw off P4/W1XP, 3V8AD and 4J1FS, while the 5W handled OA4BCZ, 9Y4KB, SM7MS, 4J1FS, 3V8AD, SM0COP and JW0D. The low-power was used always on 24MHz, where it produced 9M2AX, HB9FT, I3BLF and SM6AOU.

Vince 9H1IP (M'Scala, Malta) stuck to sideband, and on 24MHz it netted OD5RF, VO1XC, FS/W1FC, HH2PK, 4J1FS, TT8ZH, 3B8AD and S92QM; down to 18MHz and the tally was OD5RF, T77T, FS/W1FC, YN1MF, YS1RRD, NP4TM, ZD8MS, S92QM, OJ0/SM0NZZ and OD5RAK.

Turning to Andrew G3VWC in Bath, who heard 9K2MU calling CQ, and going back to G3VNC, Andrew hadn't heard of G3VNC since they were buddies some 23 years ago, so it was frustrating that G3VNC didn't hear G3VWC's call. Some 18MHz key-bashing yielded 7P8RQ, 4J1FS, TM5CHA, W7MBJ (Nevada), K5YHB (Arkansas), KD6WW and WA6UDR.

A first report from G2DRT in High Wycombe, who has a two-band

rotary dipole, with which he connected on sideband with 18MHz signals in the form of PJ8AD, A44ZZ, VE7XN, CU1AC, 4J1FS, AH0M, VK3ACC and 9K2DT, while on 24MHz the log shows LU6MDP, 7X2VXK, RW9FW, 7X2DG, VO1ONE and JA10YY.

It seems Don G3NOF in Yeovil has deserted 10MHz, but on 18MHz he notes G14SNA, HH2PK, OJ0/SM0NZZ and OJ0/SM0FWW. As for 24MHz, he managed OJ0/SM0NZZ again, plus S92QM, Z21HJ and 3B8AD.

Finally in this section, GM3JDR; Don operated on 10MHz to collect YV5AZC, 3A/DF2UU, S79FI, 4J1FS, UA1RV/MM, UJ8KA, 4X4VF and RJ8JM. Up on 18MHz for the big killing, by way of VU/VK2DXI, SV9/SV1AHH, 8Q7WP, FR5GG, UA00GN, KP4YD, 9V1OK, 3D2QB, 4K20LQ, AH6JF, EA9/DK7ZB, UA0ZC, UJ8KA, WH6ASW/KL7, ZL1MH, SV0HS/5X5, VP2EOH, 4K4/UA90PA, RK9S, OZ1FJB/MM near 9V1, V85AA, V85KX, KL7AF, RE5Q, VK7AAQ, LU1EN, VK4RF, UD8DWW, ZA1TAE, PY7DH, HL1LUX, 4U7ITU, UA0KCL, UB9X/UB2KA, 9V10Q, EH4MC, RI8BU, KH2FT and S79FI. After that, 24MHz was a bit of anti-climax with just HZ1HZ booked in.

### Miscellaneous

Time for the miscellaneous station now! Perhaps the first G to operate from Albania is G3MHW, who, with XYL KA6ZYF, are currently signing ZA/own call.

Talking about Gs, we have our first three novices locally, 2W1AUM, 2W1AUL and 2W1AVC, of whom the former is already at work upon the c.w. and the last-mentioned is just 82. I feel we should all support the novices by giving them contacts whenever possible. At long last we have an exam which ensures novices coming on the air have at least a practical idea about operating - now let's get it into the 'big' RAE. It might be a good idea to have a retrospective exam for we old-timers, come to think of it!

Pitcairn Island is suffering problems; it seems the ZL end of the existing h.f. radio link is to be disconnected by this year's end. The new system will give improved Fax and Telex facilities at the penalty of

increased charges, up from \$1.64 to \$18 per minute. Over that, Pitcairners face further rises on top of a doubling of the electricity costs, postal rises and all, while their labour rate remains fixed at \$3.35 per hour. Cruise ships are becoming fewer, and those who do come show less interest in curios - so how will they make ends meet?

The DX Bulletin notes that 5R8JD cards are no good for DXCC; no documentation. Thus you can save yourself a card, postage and the 'tip' that F6FNU wants. When is the DXCC Desk going to put a stop to this money-making nonsense?

I've heard that OT calls are issued to Belgian clubs for major contests only, on condition that contacts are QSLed 100%, via the Bureau system.

The RSGB haven't had any cards from Box 88 for a long time now, and TDXB notes letters are going unanswered. It is therefore recommended that you do not QSL CIS contacts via the bureau until the situation clarifies. The same more or less goes for YU; although the RSGB are still sending cards out to the official bureaux, no warranty as to possible arrival.

Still on QSL cards, TI9US seems to have problems; seems several have got theirs OK, but others who applied direct, with dollar bill and/or i.r.c. are still waiting. Doubtless the envelopes are being 'filleted' before arrival.

Those French special event calls: The ones beginning with TM are in Europe, while the TX ones are in French departments abroad, like FG, FY, FM, FS and so forth. The prefix TO is used for the overseas territories, so you don't know from the prefix what the DXCC country is.

Finally, the East German Y calls will be assimilated into the DL1-DL9 series before the end of the year.

### DXpedition News

A note from Andy Chadwick G4ZVJ, to say he will be QRV as KH8/G4ZVJ, between August 12 and September 9; ZK2, Niue between August 26-September 2, and even a short blast from 5W1 - c.w. and RTTY. Cards direct to Andy at 3 Park Villas, Cheadle, Staffs. ST10 1HZ.



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## The 28MHz Band

The answer here on 28MHz is undoubtedly - a lemon! However, I do try hard. Don G3NOF found 13THJ/IL3 (IOTA EU-131), IK3RWE/IG9 and Y11BGD.

At G2HKU, Ted managed to raise PY20C and VU2BK before going on to the flea-power rig, with which he tangled with HG0NAR, YU7AV, HA5KQ and OK3TRE.

The G4LDS log has rather more, by way of VU20Q, RA0AUF, IK5PWU, AM5WM, AM25RCU both by Sporadic-E, EI7GL, DL4DH and AM6UQ.

Activity on 28MHz for Andrew G3VWC meant c.w. forays to snap up KM6HN, ZA1SES and UF6FAL.

Up north again, to Don GM3JDR, who found SV0HS/SV5, V85KX and UZ73WO.

## The 21MHz Band

Trade seems to have been better on the 21MHz band. Don G3NOF reports his sideband going to EL2PP, H5STT, HB0/DJ1BP, HI8TLF, HR1RMG, JAs, KH6OR, LX0RL, RZ0Y/UA0VWW in CQ Zone 23, S92QM, T20AA, TU2XP, TU4BI, VP8CLC (Falklands), VQ9WM, VS6GA, XX9AS, XX9GD, ZD7CW, ZD8MS, ZS8Z, ZP1AA, ZSs, 3C1EA,

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4J1FS, 4S7/DK9DR, 6W6JX, 7Q7JL, 9M8AJ, 9M8BL and 9M8FH.

Rich at G0RKJ tried his key on 21MHz and got over to AA1BN, K8RNQ, WP4KDJ, plus sideband to 7Z1AB, YC0FED and WA1ECA.

Turning to G2HKU, Ted used the lot to hook VP5P on Provo Is, but then went down to 5W and connected with CX9ABE, ZF1A, VP5P again, WC4E, PJ9X, KM1H, KA2AEV and RZ0Y/UA0VWW.

All-c.w. is GM3JDR's thing, and Don mentions that 21MHz produced UJ8KAC/RU9U, ZS70SAN, S79CD/D, UA0SQT, BV2TA, VP5P, TU4SR, CE3DNP, UM8QDX, RA0FN, UA0FZ, 4L6HMC, 9H3JR, ZY2YN, 7X2CR, VU2SQT, RV73SWB and KD6WW/C6A.

Alas for Chris G4LDS, who is 'running out of daylight hours to do everything' wiring up a caravan for lights (and radio unless the XYL finds out!) so he can operate as /P from various Civil War sites in this 350th anniversary year. We would have thought Chris might have done better to move to Shetland where daylight

hours in summer are continuous.

For Andrew G3VWC it meant c.w. to VE7CC, W8/G0E0H, 4K4/UA6WCG and UH8BBZ.

## The 14MHz Band

Lastly this month, it's time for the 14MHz band and Rich G0RKJ/N7CXB kicks off. He notes s.s.b. with UB4WXL, HB0/DA1WA, 4J1FS, 4N2AA, ZC4RAF, AA2BE, WA2CNT, WD40UG, 9H1EL, 9K2DT, CU2YA, 9K2YA, 9K2IC and Y09KPB, while the c.w. attended to the needs of AA8GA, HA0HH, HA5BUD, VK5YD, VK3DQS, P40WF, YS1EJ and 4N4PH.

Full-power c.w. was the mode for NI7M, AA7JV, while for the rest Ted G2HKU stuck to 5W to raise 4K4/UA6WCG, TK2MQ, 0H0/SM0AJV, UX9C, 4U7ITU, UA9XR, UI9ACQ, K3WWW, IK4SXJ, HS0AC, KD4HEL, VP5P, 4N2V, ES5RY, N3RS, K2VV, OK3KCM, HA6KNG, 4J1FS, HG3CW/4, R3K, ZA1TAD, T70MM, AM5CZ, OE5KMN, 13BLF and IT9XJJ.

Turning to sideband, this is the mode at Don G3NOF, where

D68/K3RA, ED3BI (IOTA EU-154), HB0/DA1WA, J28GG, JU830C (=JT), KH6JEB/KH7, LA0EW (IOTA EU-062), OJ0/SM0FVWW, VKs, T70MM, 4J1FS, 4S7AVR and 5H3DC.

Back to c.w. and Don GM3JDR, who notes LU2AAW, V47GW, UA0ZCY, ZA1TAD, RA0AMT, UM8MZ, 4J1FS, 4K4BVI, PP2RR and 3X0HNU.

Chris G4LDS says the cream of the crop was T53UN, but he also raised OG20T, 4N20B, AM25KBV, 4J1FS, SM5GA (EU-08), SK3IK/3 (EU-87), IK3RQL, R3L, SV2WT/SV8 (EU-72) and ED3BI (EU-154).

For a final-look on this band, Ron Pearce of Bungay has built another of his one transistor plus crystal ear piece jobs, and put it first on 14MHz to copy sideband from VK5AFA, W5KNK, PA3PQ, VE3RM, VE3ULT, PY52BU and 4J1FS the Malji-Vysotskij island expedition.

## Finally

That's yer lot for this time! Letters, reports, tall tales, gardening hints and so on, to reach me by August 17, September 14 and October 19. The address is as always, at the top of the column.

## Solar Data for June 1992

Solar activity at the end of May was very low, and as I mentioned last month the solar flux on May 30 and 31 sunk to only 99 units, the lowest levels since February 1988. Although the more active side of the sun rotated into view during the first week of June, the levels remained low, being only 120 units on June 6 and then only inching slowly to peak at 130 units on June 17.

The geomagnetic levels between June 1-7 were generally quiet with the daily A index averaging only one or two units. There was very much more activity between June 8-14, with the A index reaching 24, 20, 20, 16 and 24 units between June 8-12, and as a consequence a number of auroras effected the v.h.f. bands during this period.

A major flare occurred at 2014UTC on June 25 followed, at 2045UTC, by a satellite proton event. These caused the geomagnetic field to become unsettled for the following few days.

## Auroral Openings

Although we are not in the best period (in terms of our position both in the year and the solar cycle) for

# Back-Scatter

## VHF Up

Reports to  
David Butler G4ASR  
Yew Tree Cottage  
Lower Maescoed, Herefordshire HR2 0HP

contacts via auroral openings, openings still continue to exist. On June 8, 11, 12 and 18th events were recorded in central England which extended up to the 144MHz band.

In my opinion the best one occurred on June 8, and between 1545-1725UTC I made 10 c.w. contacts on the 144MHz band, including F1FHI (IN97), F6FTN (JN18), DL4XX (JO43), DL8EBW (JO31) and SP20FW (JO93AC). It was interesting to note that during this time I heard no activity whatsoever on the 50MHz band, although the GB3LER and GB3RMK beacons were very audible!

An event on June 11 was quite weak, with only the 50MHz beacon GB3LER (IP90) being reported at 1716UTC. But on June 12 Richard Gardner G4WKN (IO92) heard the 144MHz beacon GB3LER peaking 56A at 1523UTC, and then worked at 1557UTC SM5MIX (JO78) on c.w.

Another auroral opening occurred on June 18 with Tony Ashcombe G4APA (IO83) working SM0ERR (JO89), DK1KO (JO53) and GMOICF. All activity was on the 144MHz band between 222215-2230UTC.

John Hoban G0EVT (IO93) brings me up to date with openings earlier in the year. Some of his more interesting 144MHz contacts (c.w. of course!) have been RB5PA (KO21) and SP5EFO (KO02) on February 8, UZ2FWA (KO04) on February 20, ES2XM (KO29), LA3NGA (JO49) and LA8OW (JP50) on February 29, SP7DCS (JO91) and UA1NAW/MM (IO35LW) on May 22 and SM5MIX on June 12.

Reports are still trickling in about the widespread aurora of May 10. First details come from Laci HA6VV (JN97WS) received by packet radio. He worked many stations from his home QTH, including G3IMV, G4ASR,

G4HUP and G4RRA, and then went to his portable site (JN97WV) and worked G3IMV, G3NNG, G4AEP, G4HGT, G0GMS (twice) and G0MGA. Laci also heard GW4VEQ and EI4DQ and mentions that his friend HA6VX (JN97XS) also worked G4ASR, G4HUP and G0JUR.

Ela Martyr G6HKM (JO01) had a real ball on the 50MHz band working stations in G, GI, GM, GW, DL, F, HB9, I, SM, OE, ON, OZ, PA and OK1DDO (JO60) for a new country. At 1500UTC, Ela moved to the 144MHz band and managed to fill a couple of pages in the log with stations from DL, F and PA. Her s.s.b. contacts also included IW4BAI (JN45) and OE3UP (JN87).

## 144MHz Sporadic-E

Well, you can't say I didn't warn you about 144MHz Sporadic-E! It took a little time to start but once it got going we were rewarded with a number of good events. On the other hand, if you were out on June 6, 7, 20, 22 and 23, then you missed all the June openings.

The event on Saturday 6 June was a little bit patchy, and it seemed to favour operators situated in mainland Europe. Nevertheless, a few UK stations got in on the action during openings between 0925-



1000UTC, 1110-1120UTC, 1200-1230UTC and 1410-1450UTC. At the station of G6HKM, Ela caught her first 144MHz Sp-E of 1992 by working I8TUS (JM89), I8TWK (JN70), I8YGZ (JN70), IC8EGJ (JN70), IK8EVE (JN71), IW8CVV (JN70) and LZ1UH (KN11).

**Andy Cook G4PIQ** (J001), located close to G6HKM, worked a similar number of contacts, but he also found 4N5DZ (KN01) and 9H5DV (JM75). Further north, in Wakefield, G0EVT worked I8WES, IC8EGJ, IC8FAX, all in JN70, between 1223-1226UTC, IS00ZK and IS0YFG in JM49 between 1414-1419UTC and I8TUS (JM89) and I8YGZ (JN70) between 1438-1446UTC.

At my QTH (I081) I managed to rustle up IW8CVV at 0927UTC and I3DLI (JN65), I3EHK (JN55) and IW8PPJ (JM78) between 1220-1228UTC. During this brief opening I also heard IT9ZVN (JM78) and 4N2RD.

The propagation on Sunday 7 June favoured stations in northern G, GM, GI and EI. And, as the 70MHz report shows later, seemed to be centred over south-eastern England!

**Calum MacPherson GM0EWX** (I067), uses a Trio TS830 into a Mutek transverter, a Henry amplifier and a Cushcraft 18-element Yagi. Between 1009-1206UTC he made over 130 s.s.b. contacts with 23 locator squares including 70 x I, 26 x F, 19 x HB9, 2 x DL and TK/DF2VK on the island of Corsica.

**Silvio Rua IW1AZJ** (JN35) heard GM0EWX at 1013UTC for 20 minutes before the skip changed to allow other contacts with G3BW, G4KSO, GM4YX, GM4ZUK and GM6BEG. He also heard EI3GE, GI1VAZ and GM4UFD before the band closed with him at 1130UTC. Incidentally, IW1AZJ runs 180W into an 11-element Yagi and a CF300 low noise

amplifier.

**Tom DL2IAN** (JN49), using an FT726R, 100W and a 17-element Yagi worked G11CET and G10AIQ at 1037UTC and also heard packet radio signals from G and GW on the 70MHz band.

Another German operator, **Norbert Goettsche DL8LAQ** (J043), using an IC202 and 3CX400 amplifier running 350W into a 17-element Yagi, made s.s.b. contacts, between 1113-1122UTC, with EI3BK, EI5FK and EI8EF.

At the station of G0EVT, s.s.b. contacts were made stations in I4, I5 and I0 in locator squares JN53, 54, 61, 63 and 64, all between 1041-1109UTC.

Conditions on Saturday June 20 again seemed to favour stations situated in northern G, GM, GI and EI. Calum GM0EWX reports an opening lasting from 1647-1818UTC in which he worked many s.s.b. stations including EA, CT1WW and ZB0T (IM76) at 2369km. Stations located in central England were heard working into EA7 around 1645UTC, but it seemed very patchy.

## Best Opening

Without a doubt, the best opening occurred during the evening of Monday June 22, between 1825-2010UTC, although for some GM stations the opening started at 1730UTC and continued through to 2100UTC!

**Steve Potter G1JHZ** (I082) reckons that Sp-E propagation is a great leveller, and that his 25W and

7-element ZL antenna was beating many of the big stations to the DX. His QTH, in Ledbury, is only at 70m with rising ground within 500m obstructing the horizon from north-east to south-east. He was therefore very pleased to report s.s.b. contacts between 1838-1958UTC with IN3DOV, IV3GBO, IK6HCX, OE2UKL, OE6XHF, 4N2EZA, YU3CAB, YU3ES, YT3OR, YU3TS and YU3UAR.

**Llyn Leach GW8JLY** (I081) using an Icom

IC275E and a Microwave Modules 200W amplifier, throttled back to 60W and a 13-element F9FT Yagi made 67 QSOs into DL, HG, I, OE, SP and YU, from what he describes as a site of un-special interest!

At my QTH, also in I081, I had been following the build-up in the m.u.f. for some hours and was therefore prepared for the opening. Between 1827-2007UTC (100 minutes) I made 103 s.s.b. QSOs in 29 locators and nine countries, including 60 x YU, 17 x I, 12 x OE, 5 x DL, 4 x SP, 2 x HG, LZ2FO (KN13), Y05QA (KN16) and SV1ALS (KM09) at 2256km. During the event, whilst beaming at 135°, I made side-scatter contacts with SP5EFO (K002) SP2JYR (J092) and SP4CPB (K013).

All my contacts were nothing compared to that worked by Calum GM0EWX. Between 1734-2100UTC he made 250 s.s.b. QSOs which included over 150 x DL, 46 x I, 18 x HB9, 9 x YU, 8 x F and 6 x OE. Altogether, a total of 28 locator squares were worked with the best DX being IK7MOI (JN80) at a distance of 2481km. Phew!

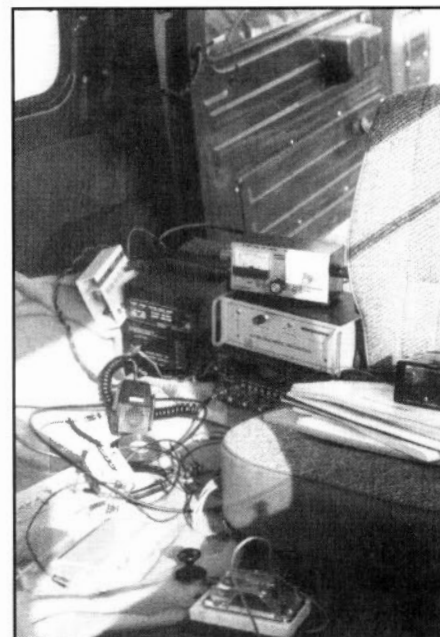
## Southern Europeans Excited

At the other end of the path, the southern Europeans were getting equally excited. Silvio IW1AZJ worked GM0EWX (I067), GM0HBK (I077), GM3XOQ (I099) and GM4IPK (I099) and also heard the Faroe Island beacon OY6VHF (IP62) but no other amateur activity!

**Wolfgang IN3TWX** (JN56) has a very good station consisting of an Icom IC275H, 3CX800 amplifier (capable of over 1kW output), MGF1302 I.n.a. and 4 x 11-element DL6WU Yagis.

Unfortunately, he has a very poor take-off towards the UK and although he's been active for more than 10 years, 144MHz contacts into G have been few and far between. The Sp-E opening on June 22 was a new experience for him, as he discovered that by reflecting his signal off some mountains on a bearing of 240°, he could work into the UK.

Fig. 2.



Between 1940-2025UTC he contacted G4APA, G4XEN, G0PJC and G4KSO. He also heard G3IMV, G0ORC, G4GVS and GM0EWX.

**Giuliano Tesero IN3KLQ** (JN56) uses an Icom IC725, a home-made transverter, 200W, CF930 I.n.a. and a 17-element Yagi. Between 1845-1948UTC he made s.s.b. contacts with G4DHF, G4SFY, G4ZTR, G0EVT, G0ORC, G0PJC, GD6ICR, G4KSO and GM8MJV.

## Eastern Europe Contacts

Although the 144MHz Sp-E opening on Tuesday June 23 was not as intense as the one on the previous evening, it was very welcome. The event allowed contacts to be made far into Eastern Europe and Russia.

The main opening appears to have been between 1800-1845UTC, although **Colin Morris G0CUZ** (I082) did hear SP4MPB (K003) on 144.300MHz as early as 1730UTC. At the station of G0EVT, s.s.b. contacts were made with SP4MPB at 1817UTC and SP4MKO (J083) at 1842UTC. Other Polish stations reported included SP20FW (J093) by G4CLA and SP4CHY (KN03) by G4APA.

I first heard the activity from SP at 1805UTC, and then moved to the c.w. end of the band at 1815UTC to work UC2CBZ (K034). He created a terrific pile-up and was being worked by many c.w. ops such as G3IMV, G4PIQ and G4WKN. Following my contact I called CQ and was immediately answered by RA3LW (K054) for a new country, at



Fig. 1.



a distance of 2261km. It was a good 144MHz day!

## Meteor Scatter

Now I'm going to look at meteor scatter, and **David Law G0LBK** passes on details of a mini-expedition which he and Geoff G7KQW made to J003 on May 30-31. The site, on the coast just south of Cleethorpes, Lincolnshire, has a very clear horizon and, although not essential for meteor scatter working, had a good take-off into Europe.

The photographs in **Fig. 1** and **2** shows the site and equipment which consisted of a Yaesu FT-767, Microwave Modules transverter, BNOS amplifier running 85W output and a 15-element CueDee Yagi. Using the callsign G7KQW/P, a total of six c.w. contacts were made with IW1AZJ, OH2BAP, OH2BYJ, OH3EX, SM4POB and SP9EWU. Stations heard, but not completed with, were HG8CE, IK1LGV, I5EUS, LA4XGA and SM0EJY.

**John-Pierre Marty FD1PMD** (JN13BO) is looking for s.s.b. tests on the 144MHz band. He uses an FT-726R, 100W, BF981 pre-amplifier and a 16-element F9FT Yagi. You can telephone him on 010 33 63717085 or write to him at 50 Avenue de Castres, 81570 Semalens, France.

## Moonbounce

Moonbounce enthusiast **Tony Read G0GMS**, recently visited the QTH of the well-known Swedish operator SM5MIX. Not being one to look a gift horse in the mouth happily took over the 144MHz e.m.e. station for a few days!

Between June 5-7 he worked DL3BWW, IK1MTZ, IK3MAC, LA9NEA, OE3UP, OK1MS, PA0JMV, N5BLZ, W5UN, K6MYC, KB8RQ, AF9Y and W90EH. Tony also used the system for some meteor scatter tests and worked G3IMV, G4YRY, G0KON and G0LBK.

## The 50MHz Band

Conditions on the 50MHz band during June were very good, with a tremendous amount of DX being worked via Sp-E. On many days, especially in the first week or so of June, propagation was particularly good into the Mediterranean area and Middle East.

Conditions were so good they allowed contacts to be made with stations such as OD5SK (KM74), SV1DH (KM18), TA5ZA (KM77), I2ADN/IG9 (JM65), I2ADN/IH9 (JM56), IS0SDL (JM49), IT9IPQ (JM78), 4X70IF (KM72), ZC4KS (KM64), 5B4JE (KM64) and 9K2ZR (LL49).

It was also a time to give a big welcome to our new friends from Eastern Europe. Among those

welcomed were ES0SM (K018), ES1CW (K029), ES5MC (K038), ES6QB (K037), LY2WR (K024), 3Z4PAR (K003), LZ1BB, LZ1KZP (K012) and UZ2FWA (K004).

There was also real DX to be found with CU1EZ (HM76), 7Q7CM, 7Q7JL and 7Q7RM (KH74) putting in an appearance for Africa, and PZ1EL showing up on June 5 for South America. But that's not all! There were also transatlantic openings to North America on June 21 and 22, the latter commencing around 1400UTC and continuing for at least eight hours.

Many UK operators worked the likes of K1JRW (FN32), K1LPS, K1NFE (FN31), K1TOL (FN44), KM1E (FM53), N1DCG (FN43), N1GNN (FN54), VE1YX (FN74), VE1XDX, VE1ZZ, VE3ASO, VE3CTT, VE3CZM, VE3KKL (FN25), N8NQS/VE3 (EN97), VO1GAP (GN17) and many, many more. And in the middle of all this there was the 144MHz opening. It was apocalypse **NOW!**

## The 70MHz Band

Activity on the 70MHz band was very much improved during June, due in part to a c.w. contest and WAB phone contest on June 7, but mainly because Sp-E propagation enabled many crossband contacts to be made with stations located around Europe.

**Graham Atkinson GD7HEJ** (IO74) is now up and running from his home QTH in Douglas and has worked a number of stations on s.s.b., including G1SWH, G3LVP, G4FOH, G4ISQ and G6RAF. He says he will be active as GD7HEJ/P on September 20 during the 70MHz contest.

At my QTH (IO81), contacts were made with ZB0T (IM76) on June 5 via Sp-E and EI9FK/P (IO62), GJ3YHU (IN89), GM3W0J (IO77) and GW4BVY/P via tropo during the c.w. contest on June 7. Sporadic-E propagation was also prevalent during the contest and I was forced to retire from the event because of the tremendous QRM from eastern European broadcast stations.

But conditions did allow me to make crossband contacts, from 70.185MHz to 50.185MHz, with DJ2RE (JN49), DK2ZF (JO43), DJ3CY (JN49), FC1GZR (JN23) and OE6XHF (JN76). At 1100UTC, the ionisation was very intense and both Chris GM3W0J and Stuart GM4AFF, were booming into central and southern England directly via Sp-E. It was really amazing! And at the same time, 144MHz contacts were being made

from EI/GI/GM into YU/I and passing directly overhead!

By the afternoon, the band had returned to normal, allowing a number of tropo contacts to be made during the 70MHz WAB contest, including G8DDY/P (SZ57), GW4SEU/P (SJ10), GW6NCP (SJ34) and GW0FXC/P (SO20). On June 8 at 1806UTC, GM3W0J was worked again, this time via aurora, 57A 57A. Three contacts with Chris in two days, tropo, Sp-E and auroral! There was more crossband activity on June 22 around 1750UTC, with DJ2RE, OZ3SDL (JO65) and OE6XHF being worked on s.s.b.

## Crossband Activity

As I've already described, crossband activity on the 70MHz band is very much on the increase. Contacts can be made either of two ways. You could listen on the recommended crossband calling frequencies, 28.885MHz, 50.185MHz or 144.185MHz, for a distant station to call for 70MHz operators. Or you could operate on or around 70.185MHz and indicate to other operators where you are going to listen for a reply.

Most of this crossband activity is carried out during periods of Sp-E, but I have also made crossband tropo, aurora and meteor contacts. Don't forget that QSOs can be made in full duplex, so it's useful to wear headphones to stop feed-back.

Most European operators seem to be using simple antennas, such as dipoles or verticals for 70MHz reception. **Herbert Hahn DJ3CY** uses a ground plane antenna and converter, whilst **Rolf Niefind DK2ZF** uses a dipole into a Microwave Modules converter, feeding a Trio TS120V.

**Michael DL1GNM**, uses an FD3 antenna into a home-made BF981 converter. On June 7 he heard GM3W0J, GM4AFF and G4ASR on s.s.b., and packet radio transmissions from G4ADD, G4MSF, GB7YM-4 and G14LKG-4.

**Marcel FD1DQK**, (JN18) uses an FT736R with an R&N Electronics transverter, and either an HB9CV in the roof space, or an outdoor dipole, but he is on the look-out for a second-hand J-Beam 50/70MHz trap Yagi. Can anyone help? If so, you can contact Marcel via packet radio @FF6PTT or by telephoning 010 331 45990290.

During the good Sp-E on June 7, FD1DQK worked 50MHz/70MHz crossband with GM4JJJ (IO86), who

was only running 8W to an indoor dipole, GM4ISM (IO85) and the BBC club station GS3RIJ (IO85).

The list of operators now QRV for this mode of operation is very much on the increase. Why don't you give it a try? Let me know what results you get.

## Expedition Update

**Clive O'Hennessey GW4VYX** has an expedition up-date and reports that both he and **Steve Jones GW6TGX** will be operating with the callsign **GB2XS** from IO78WA between August 16-30. They'll be operating on most of the v.h.f. bands.

Clive and Steve will initially meet up with Charlie Baird GM7ASN to be active from the Lairg Crofters Show (GB0LCS) in IO78TA on Saturday August 16, before moving to IO78WA later in the evening. Clive mentions that the respective families are not going with them this year, so they can now run amok with lots of skeds and play radio all day long!

The intrepid pair will be using a variety of equipment, ranging from 10W to a dipole on the 50MHz band, 160W and 2 x 17-element Yagis on the 144MHz band to 10W, and a 21-element Yagi on the 430MHz band. Most activity will be concentrated on the 144MHz band, with 144.222MHz being designated as their working frequency. They'll also be QRV on the v.h.f. net 14.345MHz for those wanting meteor scatter schedules.

The site in Highland Region is quite good, and Clive reckons that he can quite often hear the GB3VHF beacon in Kent, but gets few replies to CQ calls because most people are beaming to the south. Earlier in the year, from April 8-14, he was active from the site encountering some of the worst conditions for seven years, but despite that, GB2XS still managed to work down into IO82 and J002 on tropo and JN48 on meteor scatter.

A first attempt at e.m.e. operation was also made, but with only 160W, 16m of RG67 feeder and a battered 9-element F9FT Yagi, results did not look optimistic. However, one sked with K2GAL produced several periods of weak but readable callsigns and other signals of which the content was unclear. On returning home after the trip, he read an article on e.m.e. operation and realised that K2GAL was sending 000 (indicating that both callsigns had been received) and that the QSO was very nearly complete. Next time he'll know better!

## Contests!

You can wait a few months for a 144MHz contest then all of a sudden a whole string of them come along together! First in the queue is a



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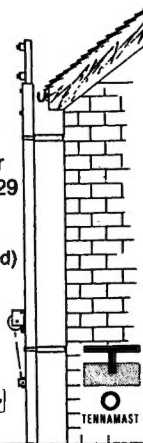
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series of RSGB c.w. cumulatives which are being held on September 1, September 16, October 1, October 16 and November 2, all between 2030-2300 local time. Participants exchange call signs, report, serial number and locator.

The next 144MHz event is the IARU Region 1 contest, being held between 1400-1400UTC on September 5-6. You can expect to find a very high level of activity during this contest, as most radio societies throughout Europe organise their own national events at the same time.

Last years winners of the multi-operator section (of which there were 332 entries) were TW1C/P (470495 points) and in second place, for the second year running, the Northern Lights Contest Group GU4APA/P (455320 points). I wonder if they'll make top spot this year?

In the single operator section (438 entries), first place went to F6HPP/P (249846 points), runner up was EA2LU (240937 points), third position went to DG3FK/P (235410 points) and in a very creditable fourth place, our very own Andy Cook G4PIQ (201758 points).

The WAB group are holding a high power 144MHz contest on Sunday September 13, between 0900-1700UTC. For those of you that want to participate, the contest

exchange consists of call signs, report, serial number, WAB area and county. Stations located outside of the UK substitute their country in place of area and county.

If you want details of all WAB contests and rules, send an A4 s.a.e. and three first class stamps to the Contest Manager, G. Horsfield G4SKQ, 2 Linden Road, Ecclesfield, Sheffield, South Yorkshire S30 3XL.

To round off the month of 144MHz events, the German AGCW-DL group are holding their c.w. activity contest between 1900-2300UTC, on Saturday September 26. It is open to three classes of stations, depending on your output power, A = less than 3.5W, B = less than 25W, C = more than 25W. Operators call "CQ AGCW TEST" and exchange report, serial number, class and locator, for example 599055/C/IO81MX.

Other bands haven't been ignored either during the period. On Sunday August 23, between 1600-2000UTC, the RSGB are holding a 430MHz contest for both single

operator and multi-operator fixed stations. In addition to the normal contest exchange, the county must also be given.

The 70MHz Trophy contest will be held on Sunday September 20, between 0900-1600UTC, and has classes for the single operator fixed stations and all others. Look out for increased activity from GM and EI during this event.

Finally, don't forget the Scandinavian activity contests, which are held between 1800-2200UTC on the following dates, 50MHz on August 25 and September 22, 144MHz on September 1 and October 6, 430MHz on September 8 and October 13. Microwaves on August 18 and September 15. A full set of rules can be obtained from myself on receipt of an s.a.e.

### Thought For The Day!

The next time you turn your 144MHz packet radio system on, make sure you don't have the 600kHz repeater shift in. It plays havoc with

the c.w. calling frequency on 144.050MHz!

### Many Letters

I've had so many letters recently that I only managed to mention 25 of you this month. I'm just sorry that Rob G3XFD won't allow me to have more pages, but that's life I'm afraid, **(Editor's comment: We'd like to give you more space David, but can only help by making the typeface smaller at the moment)**. Thank you everyone for writing in and commiserations to 2E1AIU, ON4ANT, GJ4ICD, GM4CXP, GW1MVL, G0DJA, G0HVQ, G0ISW, G0PJC, G1THG, G1UGH, G3IMV, G3KIP, G3ZPF, G4OUT, G6MXL, G7CLY and G7EYJ who didn't make it this time. I suggest you all lobby the editor to get me more space!

### Deadlines

As usual please send your letters to reach me by the end of the month at the very latest as I normally write up the column around this time. Don't forget that I can also receive messages via packet radio at my mailbox GB7TCM or at my DX cluster GB7DXC.

## Back-Scatter

### Broadcast Round-up

Reports to Peter Shore via the PW Editorial Office

Digital Audio Broadcasting - DAB - was the subject of a major symposium for broadcasters and engineers held in Montreux a few weeks ago.

The DAB technique is looking more certain to be the mainstay of broadcasting in Europe by the end of the century. And to prove the point, Telediffusion de France switched on Europe's first DAB transmitter in Strasbourg on June 1. It is the first transmitter in a test network which will be set up in France, Germany and Switzerland prior to a fully operational network which is due to be on the air in 1995.

The DAB technology will be used for international broadcasting by satellite, perhaps as soon as 1995. This is when the Broadcasting Satellite Service-Sound (BSS-Sound), which gained frequency allocations at this year's World Administrative Radio Conference, is started.

An organisation called AfriSpace plans to launch the AfriStar 1 satellite in 1995 which will beam radio signals to new digital radios with the trade name Starman. Radio Netherlands surprised the international broadcasting community on May 25, by signing up with AfriSpace for satellite

transmissions to Africa, ahead of all the station's competitors.

However, no examples of the Starman radios have been released so far, and only vague details about the satellite have been made available. Will this really prove an alternative to short wave broadcasting?

Other stations continue to invest in short wave transmitting stations. For example, WHRI has announced plans to build the first short wave centre in Hawaii. The station wants better coverage of the Pacific and according to the station's engineering head, interviewed on Radio Netherlands' *Media Network*, it intends to install a 100kW transmitter. A large curtain antenna which will operate on frequencies between 9 and 18MHz. It should be on the air by 1993.

Rebroadcasting is perhaps not quite as reliable as many broadcasters would like. The BBC

World Service's French section started a special operation, running most of the day and transmitted in Paris on f.m. With news and a sustaining music service, it has been reasonably successful.

But in mid June, the French partner which operates the transmitter was told by the authorities that it had to stop, because of what seems to be some sort of administrative problem. Meanwhile the BBC's French service is no longer carried on short wave to Europe.

A British company, Iconi Radio Limited, has announced plans to open a radio station in Lithuania. This will transmit programmes as well as relaying the English service of Radio Vilnius. It is believed that the proposed US\$5 million transmitting station will be near the coast and will be short wave equipped.

Reception of Polish Radio

Warsaw may improve in the future, as a new 250kW transmitter, manufactured by the Swiss company, Asea Brown Boveri, has been ordered.

The Arabic service of the BBC is being jammed more intensively by Iraq. The morning transmissions at 0320 to 0600 are most intensely jammed, and some afternoon and evening frequencies are also affected.

Not all frequencies are jammed for all of the time, however, indicating that perhaps Iraq's jamming capacity is not what it was. More information on BBC Arabic service frequencies is available from the frequency hotline in Bush House on 071-257 2685.

**Alan Roberts** in St. Lambert near Montreal in Quebec, Canada, has written saying that Derrick Marker's loggings of 26MHz transmissions from Russian and Sweden in February's edition of *Practical Wireless* caught his eye.

Listening for signals from American radio and TV stations, usually in narrow band f.m., on similar frequencies has long been a favourite occupation of Alan's. Try as he might, though, he hasn't managed to reproduce any of Derrick's catches.



# Back-Scatter

But since April, some Argentinian transmissions on 26MHz have come to light:

on 26.099MHz is a relay of the Buenos Aires medium wave station Radio el Mundo with a very weak signal;

on 26.139MHz, again with a very weak signal, is another Buenos Aires medium wave station, Radio del Plata;

on 26.299MHz is the best of the three, a relay of Radio Nacional Argentina giving at times quite a good signal.

## No Explanation

Alan says that all are in f.m. mode and so far no North American DXer has an explanation for these. They have been heard between 1230 and 0230GMT and the information is accurate as of June 11, when Alan wrote to me. And as he wrote the letter he could hear weak audio on 26.299 and carrier only on 26.099 and 26.139MHz.

It's good to know that PW gets across the Atlantic. Does anyone else note these signals, or offer a reason why and how they can be heard?

## European Stations

all times GMT(=UTC)

Radio Budapest's English language service can be heard daily at 2100 for an hour on 11.91, 9.835 and 6.11MHz. The station still carries a DX news programme on Tuesday and Friday and *DX World* on Wednesday and Saturday.

A new schedule has been received from the Italian Radio Relay Service in Milan, which indicates current times of operation on their standard frequency of 7.125MHz:

Monday-Friday	0500-0800, 0900-1200 and irregularly 1200-1400
Daily	1700-1900
Saturday	0500-0900, 1300-1500
Sunday	0500-1500

Reception reports are welcomed to IRRS, PO Box 10980, 120110, Milan, Italy.

Vatican Radio's European service carries English:

0500 on 7.25, 6.245, 1.53MHz, 526kHz
0600 on 15.21, 9.645, 7.25, 6.245, 1.53MHz (multi-lingual)
1000 on 21.67, 15.21, 9.645, 7.25, 6.245 (multi-lingual)
1600 on 9.645, 7.25, 6.245MHz
1950 on 7.25, 5.885, 1.53MHz

## Asian And Pacific Stations

Radio Yerevan in Armenia has a daily 10-minute news cast beamed to North America at 0250 heard on 15.58, 13.645 and 11.675, with an upper sideband feed on 10.344MHz. French news can be heard daily at 2150 to Europe on 11.92 and 9.45MHz.

Kazakh Radio's English service is carried on the frequencies used by the domestic Second Programme, daily at:

830-1900 and 2030-2100 on 21.49, 17.765, 17.73, 17.715, 17.605, 15.385, 15.36, 15.315, 15.27, 15.25, 15.215, 11.825, 9.505, 5.97, 5.96, 5.26, 5.035, 3.955MHz
---

Roy Merrill has noted the station identifying as Radio Alma Ata World Service and reports reception up to SIO 344 on 21.49 and 15.36MHz on occasions, but it is best heard at 2030 on the 60m band channel.

Radio Korea in Seoul has a revised English language schedule. Programmes are heard:

0600-0700 on 15.17, 11.81 and 7.275MHz
---

0800-0900 on 13.67 and 7.55MHz
0915-0930 on 13.67 and 9.57MHz
1100-1200 on 15.575MHz
1600-1700 on 9.87MHz
1715-1730 on 9.87MHz
2045-2100 on 9.87MHz
2145-2245 on 15.575, 7.55 and 6.48MHz

Radio New Zealand's current morning transmissions have not been well received at Roy Merrill's QTH. Neither 9.675 or 11.735MHz propagates particularly well and both channels are extremely cluttered with strong locals.

Radio Filipinas broadcasts in Tagalog (for India) via Voice of America transmitters at 1800-1900 noted by Roy on 15.19MHz up to SIO 443. The parallel 21.455 is best resolved using lower sideband to separate it from HCJB. The station announces English at 0230-0300 on 21.83, 17.84 and 17.76MHz.

## North, Central And South America

The RDN de Colombia service has continued to be heard on a fairly regular basis on 17.8644MHz (variable) in parallel with 11.8224MHz, usually from 2330, but signals are very changeable and only occasionally exceed SIO 243. Clear identifications have been noted around 0200 when the signal is reasonably clear.

La Voz Evangelica in Tegucigalpa, Honduras, can often be heard with strong Spanish signals up to SIO 343 at around 0330-0430 with frequent clear IDs, but the religious programming is fairly distinctive anyway, reports Roy Merrill.

The Voice of America has increased transmissions to Serbia

and Croatia. Croatian is now heard at 2000 for three quarters of an hour on 792kHz medium wave, and on short wave at 5.965, 9.65 and 17.705. A feeder operating on upper sideband is noted on 14.526MHz.

Serbian has a more extensive schedule:

0345-0400 on 6.04, 6.125, 7.125, 9.505 and 7.651MHz-u.s.b.
0530-0600 on 6.125, 11.845 and 15.125MHz
1930-2000 on 792kHz, 5.965, 9.56, 14.526-u.s.b. and 17.705MHz.

The WRNO service in New Orleans frequently gives good signals on 15.42MHz from around 2000 onwards. The station usually carries pop music but the *World of Radio* programme is heard on Sundays at 2030, whilst during the week Spanish programming can sometimes be heard at this time. Recently a strong Russian transmission has occupied the channel for long periods.

The World Service of the Christian Science Monitor operates Monday to Friday, with religious and foreign language programmes at weekends. The present schedule for Europe is:

0600-0800 on 9.84MHz
0800-1000 on 11.705MHz
1400-1600 on 15.665MHz
1800-2000 on 17.51#, 15.665MHz*
2000-2200 on 15.665, 17.51MHz#
2200-2400 on 15.665MHz

All transmissions from Scotts Corner, Maine except those marked # from WSHB in Cypress Creek, South Carolina and \* from KHBI in Saipan, Northern Mariana Islands.

The African service airs:

0000-0200 on 9.85MHz (except Mondays)
0200-0400 on 9.35MHz
0400-0600 on 9.84MHz
1600-1800 on 17.51MHz
1800-2000 on 21.545MHz
2000-2400 on 15.665MHz

## PW PCB Service



The new p.c.b.s., generated since the March issue this year, are now available. The boards have been improved and now include a silk-screened component overlay on the top side of the board. The component placing now matches the article in *PW*, and so the assembly is made easier for everyone.

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**Other p.c.b.s. are as shown on page 65 of the November 1991 issue of *Practical Wireless*.**

Board	Article Title	Issue	Price
WR307 SET	Crystal Checker (Getting Started) <b>WR303/304/305/306</b>	June 92	£4.25 £19.30
WR302	Inductance Bridge	Apr-May 92	
WR301	GDO (Getting Started)	Apr 92	£4.75
WR300a	CHALLENGER Receiver	Feb 92	£4.75
WR300	OSCAMP Oscillator	Mar 92	£4.75
WR300	OSCAMP Amplifier	Feb 92	£5.20
WR299 SET	Multivibrator (Getting Started) <b>WR295/296</b> PW BEAVER	Jan 92	O/S
	WR297/298 additional Beaver p.c.b.s.	Oct 91	£14.00
SET	<b>WR292/293/294</b>	O/S	£14.00
	CHATTERBOX	Aug-Sep 91	
SET	<b>WR290/291</b>	Aug 91	£12.75
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The receiver is supplied with a comprehensive selection of accessories: DA900 wide band flexible aerial, NiCad pack, Dry battery case (for use with 4 x AAA alkaline cells), Charger, DC lead fitted with cigar lighter plug, Earphone, Soft case, Belt hook, 5 metres (approx) of aerial wire terminated in a BNC connector for shortwave reception and Operating manual.

Versatility is excellent. The AR1500 may be powered from it's internal NiCad pack, spare dry batteries may be carried for extended operation and used with the dry battery case, the set may also be plugged directly into the cigar lighter socket of a motor vehicle (external input range 11 - 18V DC).

Although offering a long list of facilities and operating modes, the receiver remains easy to operate. Many facilities have been carried across for the well proven AR2000 receiver. The AR1500 has a new 'automatic memory' feature which automatically stores busy channels from search bank 9 into the 100 memory channels of scan bank 9.

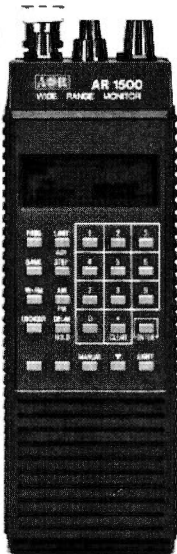
There are 1000 memories in total arranged in 100 memories x 10 banks, there are also 10 additional programmable search banks. Each memory will store frequency and mode (NFM, WFM or AM - not SSB) the search banks will also store the step increment. There is a massive EEPROM memory store for all memories and search banks so that no backup battery is required. The memories may be over-written time and time again. The display often provides 'prompts' for selected operations such as a flashing 'CH' to invite the user to key in a new memory channel number. All information such as frequency, mode (except SSB), channel etcetera is presented via an easy to see Liquid Crystal Display (LCD). The display is fitted with a switchable light to increase visibility in areas of low level lighting.

The AR1500 can meet a number of requirements to satisfy Airband or Marine enthusiasts, Professional off air monitoring and of course casual listening too. The World's shortwave and Amateur bands can be monitored, even the longer range Oceanic Airband and ship to shore. Of course the performance of this compact hand-held receiver can not be directly compared to that of the AR3000A or dedicated General Coverage Receiver.

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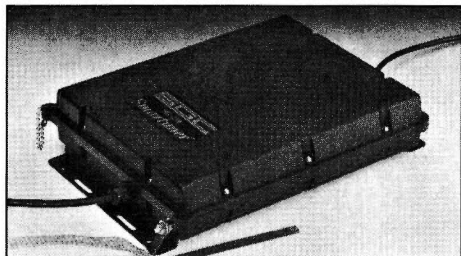
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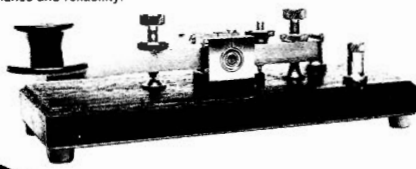
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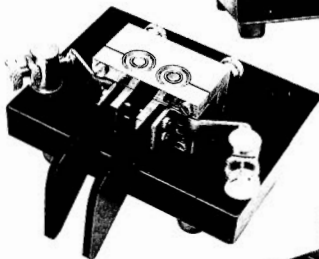
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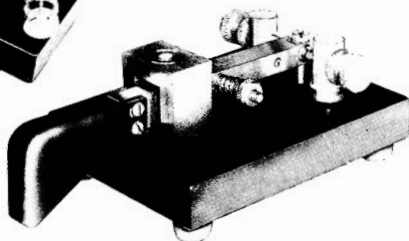
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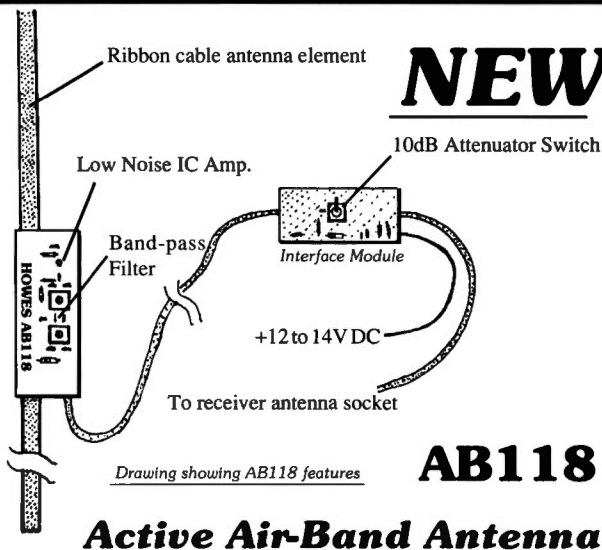


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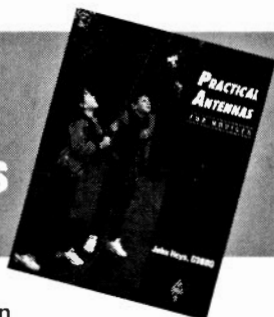
72 & 73 from Dave G4KQH, Technical Manager.



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John Heys, G3BDQ



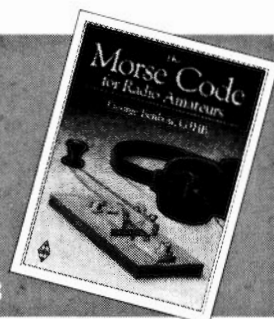
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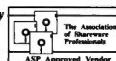
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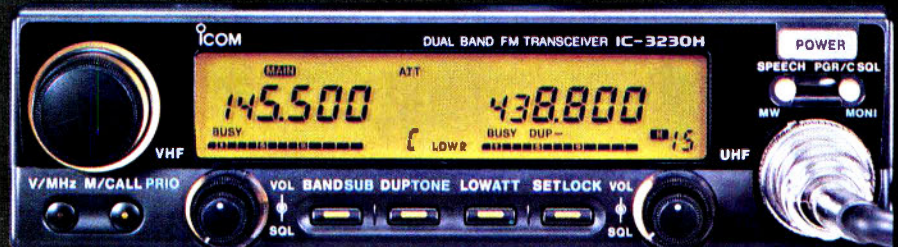
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