

Diamond Jubilee year 1932-1992...Diamond Jubilee year 1932-1992

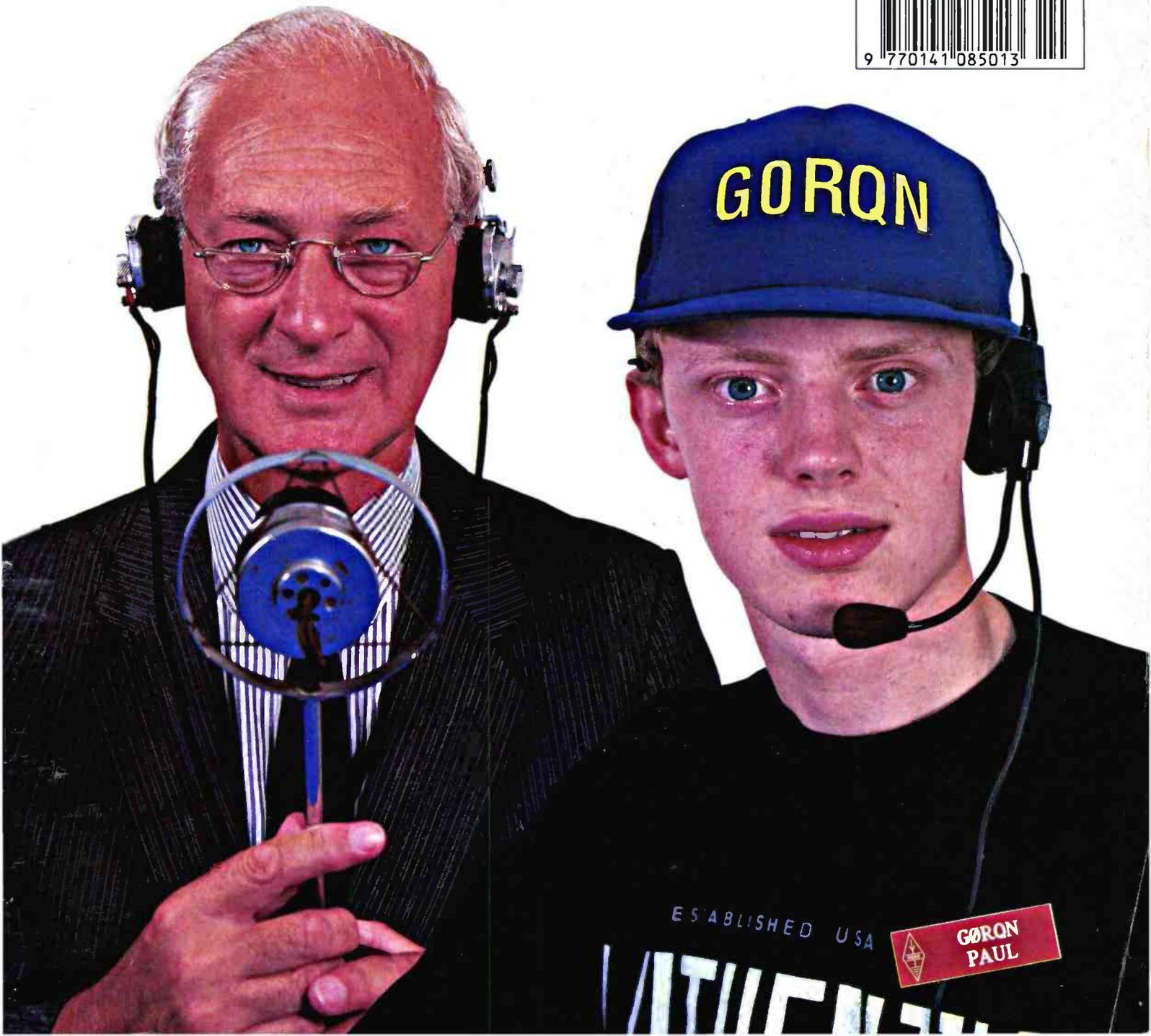
practical **Wireless**

OCTOBER 1992 £1.75

Diamond Jubilee Issue **Celebrating 60 Years of Practical Wireless**

Bumper issue with a special look back at the changing face of amateur radio 1932 - 1992

ISSN 0141-0857



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practical Wireless

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Front cover acknowledgements: Our grateful thanks go to Peter Welch G3OFX for modelling the amateur from 1932, and to Paul Robertson GORQN for modelling the 1992 counterpart.

Focal Point and Mathematics For The RAE have been held over this month.

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ICOM IC765



KENWOOD TS950SDX



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Size: 185mm(W) x 80mm(H) x 160mm(D)
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Modes: AM/LSB/USB/CW/NBFM (Sync AM optional)
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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)

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Frequencies: 30kHz - 30Mhz
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Memories: 30 channels
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Tuning: Keypad & spin-wheel
AM/FM Sync. Detector (optional)
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Excellent quality at reasonable cost

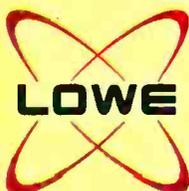
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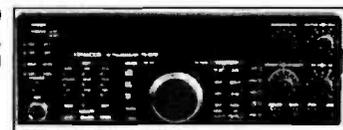
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It goes without saying that ALINCO offer you all the standard features you expect from a hand-held including dual watch, dual controls, scanning, searching, priority, etc. Of course ALINCO's standard of engineering and reliability is now becoming the 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.



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Auto repeater mode
AM Airband Reception
Expanded Receive to 995MHz



Specification

Tx	144-146MHz 430-440MHz
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Steps	5, 10, 12.5, 20, 25kHz
Memories	42
Power Output	2.5/1.0/0.3 Watts 5 Watts with 12V DC
Scan	8 Modes
Tones	1750Hz plus DTMF Optional CTSS
Sensitivity	12dB SINAD -15dBu
Size	140x58x33mm
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FT990/DC £1659

FP25	P.S.U. for FT990/DC	£189.00	SP6	External Speaker	£109.00
XF109C	CW Wide Filter	£52.00	TCX02	Temp. Compensated Osc Unit	£89.75
XF10.9m202	SSB Filter	£42.00	DVS2	Digital Voice Storage	£153.95
XF455K	CW Narrow Filter	£76.00	YH77ST	Stereo headphones	£34.73

FT990 STANDARD AC MODEL NEW PRICE

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transceiver to operate seamlessly with a personal computer when running either of the above software packages logging all your calls without you having to lift a pen!

This flexibility combined with the transceivers dual receive capability makes the FT1000 the ultimate in contest transceivers and ideal for the serious contest operator.

N.B. The Vers. 6.0 EPROM does not make any difference for normal operation using front panel controls.

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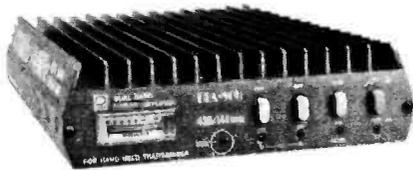
SMC for all your accessories

Daiwa DLA80H Linear Amplifier

The latest linear amplifier from Daiwa, this DLA80H, is a new dual band linear which is ideal for low/medium power handhelds and mobiles.

With fully automatic input power selection from 0.5-2.5w, operation on 2m and 70cms and full duplex mode make the DLA80H one of the most versatile linear amplifiers on the market today.

See HRT August 1992 for Review.



Brief Specifications:

Output Power: VHF 80w at 5w input
UHF 60w at 5w input
0.5 - 25w (Max).
Input Power: VHF 15dB
UHF 12dB
Preamp Gain:
Power Consumption: 15A at 13.8vDC
Dimensions: 160W x 45H x 238D (mm)
Weight: 1.5kg

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PS120MKII	3-15v Variable	9A/12A max	£69.95 C
PS140MKII	Fixed 13.8v	12A/14A max	£65.00 C
PS304	1-15v Variable	24A/30A max	£129.95 D
RS40X	1-15v Variable	32A/40A max	£189.00 D

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

SWR METERS

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

LINEAR AMPLIFIER

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DLA 80H	Dual Band Linear 5W in on VHF/UHF for 80W out VHF/60W out UHF		£339.00 C

ROTATORS



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A=£2; B=£5; C=£7.50;
D=£12.50; E=£16.50

G-250	Bell type twist/switch CTL	£79.75 C
G-400	Bell type meter controller	£152.00 C
G-400RC	Bell type round controller	£182.85 C
G-600RC	Bell type round controller	£240.00 C
G-800SDX	Bell type 450 deg. var. speed	£332.00 C
G-1000SDX	Bell type 450 deg. var. speed	£376.00 C
G-2000RC	Bell type round controller	£454.00 C
G-2700SDX	Bell type 450 deg. var. speed	£649.00 E
G-500A	Elevation meter controller	£203.00 C
G-94008	Azimuth/elev. dual control	£379.00 D
G-56008	Azimuth/elev. dual control	£444.00 D
RC5-1	Bell type round controller	£223.75 C
RC5-3	Bell type preset	£280.00 C
RC5A-3	Bell type var. speed, & preset	£434.24 C
RC5B-3	Bell type var. speed, & preset	£689.00 D

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GS-050	Rotary bearing 1.5' mast	£20.39 B
GS-065	Rotary bearing 2' mast	£30.60 B
GC-038	Lower mast clamp G-400, 600 etc.	£17.35 B
9523	Channel master bearing	£19.95 B
CK46	Rotary bearing 1.5-2.5 mast	£35.75 B
MC1	Lower mast clamp RC5 series	£35.75 C

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IF-100PC	1/F C/W lead & software IBMPC	£142.00 B
IF-100C64	1/F C/W lead & software C64/128	£148.00 B

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RC6W	6 way G-250, 400, 600, RC XR500 per mtr.	£0.74
RC8W	8 way G-2000 create series	£0.88

CARRIAGE

Rotator cable
£3.50 up to over 20 mtrs over 20 mtrs £5.00

COMET ANTENNAS

SMC are proud to be associated with COMET Co LIMITED

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BALUNS

CBL-30	1:1 1.7-30MHz, 1kW P.E.P.	£18.95 A
CBL-2000	1:1 0.5-60MHz, 2kW P.E.P.	£25.50 A

HANDHELD ANTENNAS

CH72S	2m/70cm BNC 0dB/3.2dB	£12.25 A
CH1200WS	23cm BNC 5.6dB 2x* wave	£14.50 A
CH-600MX	2m/70cm/23cm BNC triband (OK for scanners Rx 120/300/800/900MHz)	£23.50 A

MOBILE ANTENNAS

CA-7HR	7MHz ¼ wave centre loaded	2.13m	£33.95 B
CA-14HR	14MHz ¼ wave centre loaded	2.13m	£33.95 B
CA-21HR	21MHz ¼ wave centre loaded	2.13m	£33.95 B
CA-50HR	50MHz ½ wave centre loaded	2.13m	£33.95 B
CA-285	6m/2m dualbander 0dB/3.5dB	1.32m	£20.75 B
B-22	2m/70cm 3dB/5.5dB Black	0.9m	£26.85 B
CA2x4MB	2m/70cm 4.5dB/7.5dB	1.99m	£38.50 C
CA2x4KG	2m/70cm 6.0dB/8.4dB	2.06m	£40.75 C
CX-702	6m/2m/70cm 2.15/6.0/8.4dB	2.1m	£46.95 B

DUPLEXERS

CF-305	10m+6m/2m Duplexer	UHF Conn	£25.00 B
CA-520	6m+2m/70cm Duplexer	UHF Conn	£24.99 B
CF416B	2m+70cm Duplexer	UHF/N Conn	£26.00 B
CFX-514	6m+2m+70cm Triplexer	UHF/N Conn	£36.75 B
CFX-431	2m+70cm+23cm Triplexer	UHF/N Conn	£39.95 B

MOUNTS

TBR	Adjustable trunk mount	£11.50 B
RS-9	Mini trunk mount (black)	£6.25 A
RS16	Mini gutter mount	£12.75 A
RS17	Mini trunk mount	£12.75 A
CK-3M4B	Mini cable assembly	£16.25 B

MINI MOBILE ANTENNAS

B-10	2m/70cm 0/2.15dB (black)	0.3m	£16.95 B
CHL21J	2m/70cm 0/2.15dB	0.3m	£14.75 B
CHL23J	2m/70cm 2.15/3.18dB	0.44m	£17.35 B

BASE ANTENNAS

CA350DB	10m/6m 2.15/6.5dB	6.9m	£139.00 D
CX-725	6m/2m/70cm 2.15/6.2/8.4dB	2.43m	£75.00 C
CA2x4MAX	2m/70cm 8.5/11.9dB	5.4m	£102.12 C
CX-902	2m/70cm/23cm 6.5/9.0/9.0dB	3.07m	£79.95 C

FILTERS

CF-30MR	HF cut off 32MHz 1kW P.E.P.	£38.75 B
CF-50MR	6m cut off 54MHz 1kW P.E.P.	£38.75 B
CF-30H	HF cut off 32MHz 2kW P.E.P.	£80.75 A
CF-30S	HF cut off 32MHz 150W CW	£19.35 A
CF-50S	6m cut off 57MHz 150W CW	£20.35 A
CF-BPF2	2m Band pass 150W CW	£31.65 A

METERS SWR/PWR

CM-420	2m/70cm 15-50W mini	£39.95 B
CM-420N	2m/70cm 15-50W mini 'N' skts	£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

CSW-20	2 way DC-1GHz 50239	£26.50 B
CSW-20N	2 way DC-1.5GHz N	£45.95 C

ACCESSORIES

CEP-M2	Earphone 3.5mm jack	£9.15 A
CES-M2	Mini clip on speaker 3.5mm jack	£5.62 A
CHM-M4	Mini mic + PIT 2.5mm jack	£9.15 A

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**MFJ 20m QRP
CW RIG
£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
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Ten-Tec Omni-V	£1395.00
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Yaesu FC-700	£109.00
Yaesu FC-902	£119.00
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Kenwood TH-215E	£149.00
Kenwood R-600 Rx	£229.00
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SEM Transmatch	£79.00
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20808 4 el	£41.00
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20089 9 el	£39.00
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20813 13 el	£55.00
20817 17 el	£69.00
70cm	
20909 9 el	£33.00
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20623 23 el	£39.00
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Peter Waters G30JV/G0PEP

MFJ 1278 Multi mode Data Controller

£279



The MFJ-1278 has taken the USA by storm and is now available in the UK from stock. For the first time you get nine modes in one box! Use it for Packet, FAX, AMTOR, SSTV, RTTY, Navtex, ASCII, Electronic keyer, CW reader. Probably the most advanced modem ever offered. Now you can spend hours experimenting with the various modes, all at a very modest price and all in one box. Send today for the full details.

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MICROSET POWER SUPPLIES

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RU-2070cms 0.8-3 in 15-20W max out SSB/FM	£119.00
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Ten-Tec OMNI-VI

Just arriving is the all new Ten-tec OMNI-VI hf transceiver. It includes such extras as Digital signal processor, Automatic notch filter, programmable CW offset, oven stabilised xtals, "Sport" PC interface, new RIT control, 100 memories, fast CW break-in and superb receiver front end. This promises to be the most professional transceiver ever offered to the ham radio market.
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600 Watts
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Other Ameritron linears are available. Send SAE today.

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MFJ-260B	300W dummy load DC-160MHz	35.95
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MFJ-1020A	Indoor active antenna station. 0-30MHz	84.95
MFJ-1272B	TNC/Microphone interface	36.95
MFJ-722	Superb rx audio filter	89.95
MFJ-752C	Tunable audio filter	109.95
MFJ-207	Antenna analyzer. Brilliant idea!	99.95
MFJ-557	Self contained CW practice key and oscillator	29.95
MFJ-407B	Electronic keyer. 8.5-WPM Self powered	79.95
MFJ-931	Artificial HF ground unit. Ideal for flats etc.	79.95
BY-1	Genuine Bencher Paddle. A precision product	69.95
MFJ-704	HF Low Pass Filter	39.95
MFJ-108B	Dual time deck top clock. LCD Display	19.95

Ten Tec Argonaut £995



We are now able to offer the latest Ten Tec Argonaut II at a new factory direct low price. This follows on from Ten Tec's new marketing policy to offer even better value for money. This 5 Watt all mode transceiver has a host of features including general coverage receiver. Ex stock.

DIAMOND

VSWR METER

SX-100	.....1.6-60 MHz, 30W-300W-3kW	£99.00
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-22E2m 2 x 5/8 6.5dB gain omni directional	£49.00
D-707Active rx. 1.5-1300 MHz 12V	£99.00

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X-502m/70cms 4.5/7.2dB gain 1.7m long	£59.95
X-3002m/70cms 6.5/9dB gain 3.1m long	£99.00
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ALINCO
ELECTRONICS GmbH

DR-119E 2m Mobile
50 Watts
£289

RX: 135-174MHz



The latest 2 metre mobile from ALINCO now offers superb value. No larger than a car radio it boasts 50 Watts output and extended receiver coverage. Completely re-styled it offers all the usual features including memories, scanning etc, and comes with microphone, mounting kit and full warranty. For more details send or phone for brochure.

ALINCO
ELECTRONICS GmbH

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2m/70cm Mobile
45/35 Watts
Full Duplex
DR-590E

£100 off!
£449



Brand new stock with 12 month's warranty. No catches. Just check prices with our adverts last year and you'll see the price saving is really genuine. Nobody can beat this price. Our bulk purchase has cleared the factory of this model. Act now and save £100 into the bargain. Send for colour brochure. (please note illustration shows DR-599 which is almost identical)

NEW!

ALINCO
ELECTRONICS GmbH

70cm 2 Watts

£239

The new exciting DJ-F4E has arrived. ALINCO engineering at its best, a superbly clean transmitter and the usual "no nonsense" warranty that takes the worry away from purchasing ham gear.

Ideal for the new NOVICE license, this is a really tough little rig. Use it mobile with external 12V DC, use it for Packet radio, or just pop it in your pocket knowing you have the most advanced and reliable transceiver on the market!



DJ-F4E in stock

- ★ Tx: 430MHz - 40MHz
- ★ Rx: 410MHz - 470MHz
- ★ 5 Watts output (12V DC)
- ★ 40 Memories
- ★ 3 way Power Setting
- ★ Illuminated Key Pad
- ★ 6 Programmable steps
- ★ Programmable Shift
- ★ 1750Hz tone
- ★ Frequency Lock
- ★ PTT Lock
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NEW Packet Radio Kit

£49.95
p&p £2.00

Ramsey — USA
P-IBM

- ★ Powered directly from RS-232 port.
- ★ Includes free software for IBM



Other Kits

AR-1 Airband VHF Rx	.....£23.95
FR-1 FM broadcast Rx	.....£17.95
HR-20 20m DC Rx	.....£26.95
HR-40 40m DC Rx	.....£26.95
HR-80 80m DC Rx	.....£26.95
QRP-20 20m QRP Tx	.....£26.95
QRP-40 40m QRP Tx	.....£26.95
QRP-80 80m QRP Tx	.....£26.95

This is a truly amazing kit for all those who want to get into packet radio without committing themselves to a large outlay. The complete kit of parts is provided with circuit, board layout and comprehensive manual. It can be put together in an evening. All you need is an RS-232 lead to your computer and cable connection to your transceiver mic socket. You'll be receiving and sending Packet signals in no time at all. If you haven't tried Packet radio, here's your chance to do so with minimum outlay and guaranteed results.

Dual 24 hour/12 hour Station Clock

£19.95
p&p £2.00

Ideal for all ham stations, this large LCD clock gives both local and distant times. Completely self-contained and battery powered it has a smart satin finish.



Digital HF Antenna Analyzer

MFJ-247
£189.95
Post Free
1.8 to 30MHz

This amazing instrument enables you to tune your antenna system in minutes. It has built-in rf generator, frequency counter and meter. All self contained, simply connect to antenna system and watch the effect as you make adjustments in the garden. Amazing!



NEW!

ALINCO
ELECTRONICS GmbH

DJ-180 2m Transceiver
£159.95!

- ★ LCD Display
- ★ 10 Memories
- ★ Repeater Shift
- ★ 2 Watts Option
- ★ Ni-Cad Pack
- ★ AC Charger
- ★ Auto Power Off
- ★ Battery Warning
- ★ Steps 5kHz - 25kHz
- ★ Superb Audio
- ★ 132 x 58 x 33mm

Alinco break the price barrier again! Forget the cheap old-fashioned technology, this is brand new designed stock that will rock the market. Ideal as second rig or for those who only occasionally use 2 metres.



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SX	FTONE	Yaesu HF 100w	895
CX	FTONE	Yaesu HF 100w	895
RX	FTONE	Yaesu HF 100w	975
RX	FT757GX	Yaesu HF 100w	525
RX	FC757AT	Yaesu ATU Automatic	225
SX	FT980	Yaesu HF 100w	895
RX	FT980	Yaesu HF 100w	795
AX	FT980	Yaesu HF 100w	625
BX	TS-940S	Trio HF 100w	1595
LX	TS690S (inc. ATU)	Trio HF TX/RX (inc. 6 mtrs)	1095
CX	TS-530SP	Trio HF 100w	475
AX	TS-530SP	Trio HF 100w	475
RX	TS-530S	Trio HF 100w	550
AX	FT107 (12v)	Yaesu HF 100w	425
SX	FL7000	Yaesu HF 500w L/amp	1295
AX	FL7000	Yaesu HF 500w L/amp	1185
RX	FT902DM	Yaesu HF 100w	550
AX	FT901DE	Yaesu HF 100w	439
SX	FT101ZD	Yaesu HF 100w	485
SX	FT101Z	Yaesu HF 100w	449
RX	FT102 (inc. FM)	Yaesu HF 100w	550
LX	FL2100Z	Yaesu HF 500w L/amp	450
AX	FL2100Z	Yaesu HF 500w L/amp	549
AX	FV101Z	Yaesu 2nd External VFO	135
AX	IC-735	Icom HF 100w	749
AX	IC-725	Icom HF 100w	675
CX	IC-730	Icom HF 100w	425
AX	AT-500	Icom Auto ATU 500w	345
AX	AT-100	Icom Auto ATU	239
AX	PS-55	Icom PSU 20 amps	145
AX	FT102	Yaesu HF 100w	495
AX	YO-100	Yaesu HF Monitor scope	129
AX	FL2100B	Yaesu HF 500w amp	449
SX	FT767GX	Yaesu HF 100w	1095
CX	FT767GX	Yaesu HF 100w	975
AX	FT767GX	Yaesu HF 100w	1195
CX	430/767	Yaesu Module 70cm	175
LX	HX240 (10-80)	Tokyo HF 40w. Transvert. 2mtr IF	200
SX	HC-2000	Tokyo HF ATU 2kw	275
AX	Corsair	TEN-TEK HF 100w	825
AX	Century 22	TEN-TEK HF 80-10 MTRS 25w	285
AX	MX145	Mizuho HF 20mtr 2w.ssb handie	169
SX	FC-70P	Yaesu HF ATU 200w	79
SX	SPC-300D	CapCo HF ATU 1kw	189
AX	MT3000A	Dentron HF ATU 3kw	199
AX	TM1000	Nevada HF ATU 1kw	99
SX	AL-84	Ameritron HF 400w amp	349
AX	AL-84	Ameritron HF 400w amp	349
AX	PC-1	Dalong HF Converter (2mtr IF)	89

RECEIVERS/SCANNERS

			£ inc. Vat
SX	FRG8800	Yaesu RX. 150khz-30mhz	525
CX	FRG8800	Yaesu RX. 150khz-30mhz	449
AX	FRG8800	Yaesu RX. 150khz-30mhz	499
CX	FRG7700M	Yaesu RX. 150khz-30mhz	299
AX	FRG7700	Yaesu RX. 150khz-30mhz	295
RX	FR101	Yaesu HF RX. 10-160m	225
SX	NRD 525	JRC RX. 150khz-30mhz	699
SX	PRO-2004	Tandy Scanner 25-1300mhz	249
SX	PRO-9200	Tandy Scanner 66-512mhz	89
SX	FRG9600M	Yaesu RX. 60-950mhz	395
RX	FRG9600M	Yaesu RX. 60-950mhz	475
RX	FRG9600	Yaesu RX. 60-905mhz	395
SX	IC-R70	Icom RX. 150khz-30mhz	425
AX	IC-R72	Icom RX. 150khz-30mhz	489
AX	IC-R71	Icom RX. 150khz-30mhz	499
AX	R2000	Trio RX. 150khz-30mhz	429
CX	IC-R70	Icom RX. 150khz-30mhz	449
AX	MS1000	Nevada RX. 500khz-30mhz	199
AX	I08	Win RX. VHF airband	119
AX	R532	Pro RX. VHF airband	149
AX	ICF-SW77	Sony Portable RX. hf/vhf	299
AX	ICF-AIR7	Sony RX. HF + VHF airband	149
AX	ICF-AIR7	Sony RX. HF + VHF airband	179
SX	ICF-PRO80	Sony Portable RX. hf/vhf	219
BX	ICF-PRO80	Sony Portable RX. hf/vhf	219
AX	ICF-PRO80	Sony Portable RX. hf/vhf	149
AX	ICF-PRO80	Sony Portable RX. hf/vhf	220
AX	ICF-2001D	Sony Portable RX. hf/vhf	189
AX	MX7000	Regency Scanner 25-1300mhz	249
AX	AR2002	AOR Scanner 25-1300mhz	249
AX	AR1000	AOR Scanner 8-1300mhz	169
SX	DX-440	Tandy Portable RX. hf/vhf	109
SX	PRO-34	Tandy Scanner vhf/uhf	129
AX	200XLT	Bearcat Scanner vhf/uhf	125
AX	BJ-200	Jaguar Scanner vhf/uhf	139



TM741

VHF/UHF TRANSCEIVERS

			£ inc. Vat
SX	IC-251E	Icom 2mtr multimode 10w	385
SX	IC-575A	Icom 6mtr/10 mtr 10w	795
RX	IC-25E	Icom 2mtr FM handle	155
RX	TH215E	Trio 2mtr FM Handle	175
AX	TR751E	Trio 2mtr multimode 25w	495
AX	TR851E	Trio 70cm multimode 25w	525
LX	TS790E	Trio 2mtr/70cm multimode	1250
RX	FT650	Yaesu 6mtr/10mtr 100w	825
AX	FT690R2	Yaesu 6mtr 3w. multimode	350
LX	FT290R2 (FL2025)	Yaesu 2mtr 3w (25w) multimode	460
AX	FL2025 (+MMB31)	Yaesu 2mtr 25w L/amp (290r2)	110
AX	FT290R	Yaesu 2mtr 3w. multimode	250
AX	FT480R	Yaesu 2mtr 10w multimode	325
AX	FT780R	Yaesu 70cm 10w multimode	375
SX	FT230R	Yaesu VHF 25w FM mobile	139
AX	FT227R	Yaesu 2mtr 10w FM mobile	139
RX	FT203R	Yaesu 2mtr Thumbwheel handle	145
AX	FT03R	Yaesu 70cm Thumbwheel handle	149
SX	FT73R	Yaesu 70cm 3/5w FM handle	189
LX	FT470	Yaesu 2mtr/70cm FM handle	220
RX	FT727R	Yaesu 2mtr/70cm FM handle	275
RX	FTV107R	Yaesu Transverter 2mtrs 10w	175
RX	FTV107R	Yaesu Transverter 2mtr/70cm	275
RX	FTV901	Yaesu Transverter 2mtrs	175
SX	HT106	Tokyo 6mtr 10w ssb/cw	249
AX	C120	Standard 2mtr 5w handle	139
AX	C5800	Standard 2mtr 25w multimode	279
AX	D520	Standard 2mtr/70cm handle + bits	379
BX	Palm-4	Dunno 70cm 6ch. Handle	99
AX	KT22E	Kenpro 2mtr Thumbwheel handle	99
AX	KT22E	Kenpro As above + loadsa bits!	149
AX	ALM203E	Alinco 2mtr LCD + memory handle	145
AX	MML-100S	M/mouse 6mtr 100w L/amp	125
AX	MR150V	Tono 2mtr 100w L/amp 10w in	139
AX	LPM144/10/100	Bnos 2mtr 100w L/amp 10w in	189
AX	LPM144/10/180	Bnos 2mtr 180w L/amp 10w in	200
RW	MR750E	Daiva Rotator (no guarantee)	185



ICF2001D

DATA/COMPUTER

SX	AMT-1	I.C.S.	Amtr/rtty terminal
SX	PK-87	I.C.S.	Packet TNC (88 software)
SX	FIF80	Yaesu	RS232 interface
SX	MMT4001	M/Modules	TU Rtty, CW c/w keyboard
SX	MM1000	M/Modules	Ascii to morse conv.
AX	Microreader	ERA	LCD 16 char. rty/cw
AX	IF232C	Kanwood	Computer interface
SX	5000E	Tono	Multimode TU inc. KB/VDU
AX	CD660	Telereader	TU - AMTOR/RTTY/CW

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KT22



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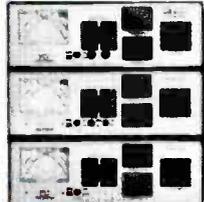
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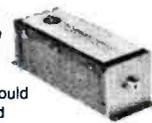


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A3S	20-15-10m 3 element Beam
A3WS	17-12m 3 element Beam
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D4	40-20-15-10m Dipole
D3	20-15-10m Dipole
D3W	30-17-12m Dipole
R7	40-10m H/W Vertical
R5	20-10m H/W Vertical
AP8	80-10m Vertical
AV5	5 Band HF Vertical
AV3	20-15-10m Vertical
A50-6S	6m 6 element Beam
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124WB	2m 4 element Beam
A144-7	2m 7 element Beam
A144-11	2m 11 element Beam
A144-20T	2m 10 element X Oscar
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ARX-2B	2m Ringo Ranger II
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40M-2	40m 2 element Beam
20M-4	20m 4 element Beam
15M-4	15m 4 element Beam
10M-4	10m 4 element Beam
KT34-A	20-15-10m 4 element Beam
KT34-XA	20-15-10m 6 element Beam
6M-7LD	6m 7 element Beam
6M-5	6m 5 element Beam
2M-20LBX	2m 20 element Beam
2M-16LBX	2m 16 element Beam
2M-13LBA	2m 13 element Beam
2M-22C	2m 11 element X Oscar
2M-14C	2m 7 element X Oscar
432-30LBX	70cm 30 element Beam
432-20LBX	70cm 20 element Beam
435-40CX	70cm 20 element X Oscar
435-18C	70cm 9 element X Oscar

LINEAR AMPLIFIERS

A1015G	6m 10-150w g/f rx
B3030G	2m 30-300w g/f rx
B3016G	2m 30-160w g/f rx
B1016G	2m 10-160w g/f rx
B108G	2m 10-80w g/f rx
B215G	2m 2-150w g/f rx
D3030N	70cm 30w-100w
D1010N	70cm 10w-100w
D15N	70cm 2w-20w

GASFET PRE-AMPLIFIERS

KP-1/2M	2m Indoor unit
KP-1/70	70cm Indoor unit
KP-2/2M	2m Masthead unit
KP-2/70	70cm Masthead unit

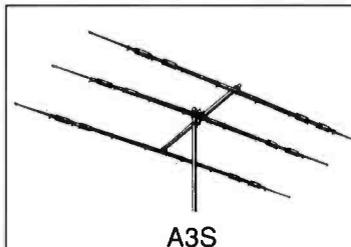
TELEX. hy-gain

7-2	40m 2 element Beam
7-1	40m Rotatable Dipole
205CA	20m 5 element Beam
204BAS	20m 4 element Beam
203BAS	20m 3 element Beam
155CA	15m 5 element Beam
153BAS	15m 3 element Beam
105BAS	10m 5 element Beam
103BAS	10m 3 element Beam
TH7DXS	20-15-10m 7 element Beam
TH5MK2S	20-15-10m 5 element Beam
EXP14	20-15-10m 4 element Beam
TH3JRS	20-15-10m 3 element Beam
TH2MK3S	20-15-10m 2 element Beam
DX88	8 Band HF Vertical
12AVQS	20-15-10m Vertical
14AVQ	40-10m Vertical
18VS	80-10m Vertical
66DX	6m 6 element Beam
64DX	6m 4 element Beam
215DX	2m 15 element Beam
216SAT	2m 8 element X Oscar
7031DX	70cm 31 element Beam
7030SAT	70cm 15 element X Oscar

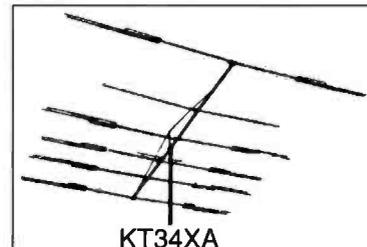
ROTATORS

T2X	Windload 1.9m ²
HAM IV	Windload 1.4m ²
CD45 II	Windload 0.79m ²
AR40	Windload 0.28m ²

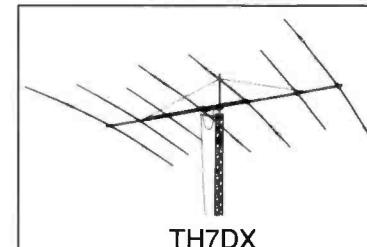
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Rob Mannion G3XFD

Words will never convey the tremendous honour I feel sitting in the editor's chair, as *PW* reaches its Diamond Jubilee issue. The keen schoolboy who started reading *Practical Wireless* nearly 40 years ago had many ambitions, but he had no idea that things would turn out the way they have!

I've got three abiding memories from my younger days. The first was travelling from deepest Devon to London to see the Festival of Britain (I can still remember the 'tree walk' in Battersea Park and the 'Skylon'), reading the *Eagle* comic (a boy's magazine really), and sneaking a read of my grandfather's *PW*.

DIAMOND JUBILEE Wireless 1932-1992

It was the *Eagle Annual* book that first guided me into radio. The fascinating cut-away drawings, and the 'Professor Britain' articles really helped. The latter article described a power station and electricity. That hooked me, and then I got stuck into

PW, and have remained glued to it ever since.

Practical Wireless was with me at school, on holiday and at home in bed (when the lights should have been out). The magazine went with me when I joined the Royal Navy, and provid-

ed excellent reading when I ended up in hospital.

In other words, *PW* has been part of my life for almost four decades. It's a respectful love that I share with many people. The response to my appeal for your memories have proved what a large 'family' we are!

And I hope that we can share many more years together, as friends and admirers of a very dear and cherished magazine. Thank you *Practical Wireless*, for 60 years of service. Thank you readers, advertisers, authors, publishers and staff for your generations of support. Here's to the future, and God bless us all!

Rob Mannion G3XFD

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.

Subscriptions

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.

Intermediate: A fair degree of experience in building electronic or radio projects is assumed, but only basic test equipment is needed to complete any tests and adjustments.

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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All *PW* services are available Mail Order, either by post or using the 24hr Mail Order Hotline (0202) 665524. Payment should be by cheque (overseas orders must be drawn on a London Clearing Bank). Access, Mastercard or Visa please.

Receiving You

Vintage

Everyman's Wireless Book and Television and the Short Wave Handbook. Both published in 1934, when I bought my copies.

Apart from the crystal set era during the 1920s, my interest in wireless was first aroused at the age of 12 years. I built a broadcast receiver as a school science exhibition project.

I was first motivated when I saw a photograph in the *Meccano Magazine* of a two valve set, but there was insufficient detail to make any progress. Fortunately, I had an uncle who was a keen constructor.

Learning of my interest, he kindly produced a blue-print and the necessary components to construct the Mullard 'Master Three Star' receiver. It had an elegant Telson, two-waveband coil, wound with green silk-covered insulated wire.

My first loudspeaker was a horn type, bought for 2s 6d (12.5p), from a neighbour. At the time I was living in south London and we were fortunate in having a local shop that hired out accumulators.

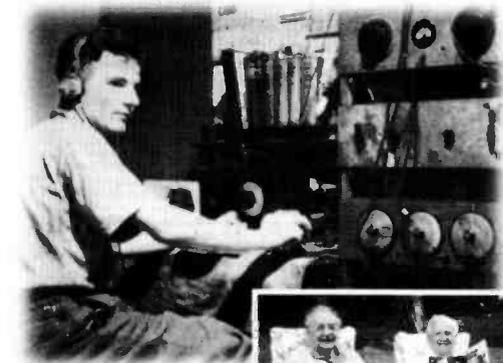
After a couple of years listening on the short waves, I became a licensed radio amateur in 1936, with the full call G3CU in January 1938. Subsequently, apart from the war years, I have been involved in radio and electronics professionally.

Over the years, I have seen many changes from valves through transistors to integrated circuits. Although now retired, I still enjoy amateur radio. I spend some time operating, but prefer building and constructing equipment and in the experimental aspect of the hobby.

The tradition goes on, for I now have a grandson who appreciates any help and advice I can give him. He is awaiting the results of his novice RA examination.

Best wishes to *PW* and may it continue for many years to come.

Herbert (Bert) F. Knott G3CU
Wantage
Oxon



Bert G3CU in 1938.
Bert today (on right)
with old friend VE3XE
(formerly G2JK)



Dear Sir

On the occasion of *PW's* 60th Anniversary, please let me offer you congratulations on achieving your Diamond Jubilee on behalf of the Radio Society of Great Britain, and of course, on my own behalf.

I have been a reader of *Practical Wireless* since shortly after the Second World War, when a number of us young schoolboys used to pool our pocket money to buy the magazine, edited then by the late F. J. Camm.

To have managed 60 years is a great achievement, but to have progressed as you have in content and presentation, while retaining your friendly chatty style, is a greater one.

Well done, and may you continue for another 60 years.

Terry Barnes G13USS
RSGB President 1992

Dear Sir,

The Radiocommunications Agency sends every good wish to *Practical Wireless* for its 60th Anniversary edition.

Of course, a lot has changed in amateur radio in the 60 years that *Practical Wireless* has served the amateur community. Radio amateurs have increasingly gained access to many different parts of the radio spectrum, there is now a progression of licensing from novice level through to Class A and the licence permits many facilities that were unthought of 60 years ago.

The amateur radio community has always been quick to let the Agency and its predecessors know its views. It is important to amateur radio and the Agency that this dialogue remains as it has in the past. *Practical Wireless* has been a constant feature of that dialogue and the Agency wishes the magazine continuing success.

Sincerely yours
Barry Maxwell, Director
Radio Investigation Service
Radiocommunications Agency, London

Dear Sir

My memories of *Practical Wireless* go back to when I was 14 years old in 1945, when I bought my first *Practical Wireless* magazine. It cost nine old pence or was it one shilling (five new pence)?

I was hooked, and kept on buying the magazine every month after that, and still read it 46 years later. It catered for the constructor in every way, from simple radio circuits to more sophisticated and often experimental pieces of equipment.

Since transistors and i.c.s had not come on the market, the circuits were built around valves. I can recall two such circuits, from one of the older magazines.

There was a radio astronomy receiver (valved of course) and I wonder what a modern i.c. circuit would produce today, regarding sensitivity with its higher gain? The other circuit was a 250V a.c. mains superhet receiver.

It used five valves, and covered short, medium and long waves, using a 4µF 500V working paper capacitor as a voltage dropper for the valve heaters. I built this set, it worked perfectly. The advantage was no dropper resistor heat, no heater transformer therefore less weight to carry around (and less expensive component wise).

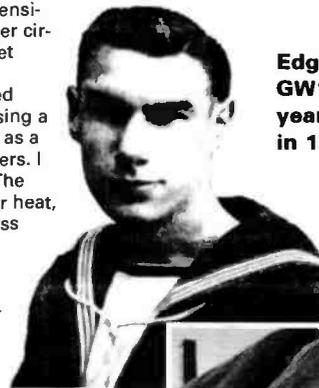
But this was the first and last time I have ever seen this configuration, even in a commercial radio. It was a unique circuit.

The adverts were good, and most firms were selling ex-government surplus, like new short wave receivers at £40 to £60 each. What a bargain!

Nearly every month or so there were circuits and descriptions of popular domestic radios in the magazine. This was a great help when repairing the neighbours radio sets.

I could fill a writing pad of my memories relating to *Practical Wireless*, and I would like to give thanks for the knowledge and practical experience which I have gained over the years from the magazine.

Edgar Powell GW1TDW
Mid Glamorgan
South Wales



Edgar in 1992.



Dear Sir

In response to your request for memories of *PW*, I would like to contribute to your letters on how the magazine changed my life. Many a time I used to read comments such as "dedicated reader since issue number one" in your pre-war correspondence columns. Well I am one of these, and have all the issues (except one) to prove it!

It all started in 1942 when as a teenager, I used to scour the local newsagents for my precious copy of the wartime *PW*. With the help of a few schoolmates, I was able to work out the distribution system, and one of us always appeared at the right place at the right time. So collecting began.

Whilst on holiday from school that year, our rent collector called in and found me studying the latest issue. He invited me to visit his workshop, where he had many magazines.

I left the workshop with a mountain of the magazines, from number one to 1941, and a non-working F. J. Camm £5 Superhet 4! The *PW's*

Edgar Powell
GW1TDW as a 16-
year old Sea Cadet
in 1947.



G8AYK in QSO with a K9 friend.

were to be a basis of study for my formative years, as a result of which I changed my academic career for one in radio.

The articles in *PW* made a major contribution to my studies. They gave me a good grounding for the RAF, following school.

It so happened that our rent collector also had a daughter, who although not quite up to the £5 Superhet 4, had a good 'chassis'. She responded to careful handling without negative feedback and we were married in 1956. It's fitting that the October 1956 issue of *PW* accompanied us on our honeymoon.

My interest in radio has never waned, but the hobby isn't quite the same as the 1930s and 1940s (three cheers for valves). I've always wondered what happened to those excellent *PW* contributors, in particular 'Thermion' whose anti-establishment views were always a joy to read (I think I know who the Thermions were, but haven't proved it yet!).

**Peter Lockwood
Luton
Beds**

Dear Sir

I'm writing this in response to your request for readers letters, for the Diamond Jubilee issue. I was reading *PW* in the 1930s, and remember a fascinating short wave receiver called the Trio-Pen SW2.

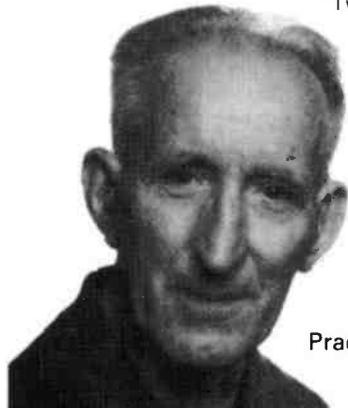
It used a Mazda TP230 valve as an untuned r.f. stage and detector, with a Hivac PX230SW for output. I would have dearly loved to have built this receiver, but there was no way I could afford to buy the components in those days.

Then about 15 years ago, I purchased from the Vintage Wireless Co., a batch of *PW*s from the 1930s. Among them was a copy of this particular issue dated 12 November 1938. The old fascination came flooding back, I obtained components (as far as possible) that were typical and built the receiver. It worked very well.

I also have a replica of the ST300 which I built a few years ago using genuine Ormand tuning condensers, dials and other components. The only components not genuine are probably the coils, but even these I wound on Telsen formers. I also made a vintage-style cabinet.

I have always been a constructor starting at the age of nine, and now at 71 I am still constructing! My only regret is that I did not keep all those copies of *PW* that I bought in the early days of the magazine.

**Bert Hennis
Stevenage
Herts**



Dear Sir

My early memories of *PW* go back to about 1935-36. At that time, as a young lad of about 12 to 13 years old, I was living in a large village in the midlands.

There were two gentlemen's hairdressers in the village at that time, Mr A and Mr B. My mother always insisted that I go to Mr B to get my hair cut, as his shop was that little bit better in appearance.

At that time, I had been interested in experimenting with old crystal sets. People were discarding them in favour of the newer valved sets, and I was eager to learn more about radio.

Mr A had a smaller shop, with a little waiting area for customers with the usual papers and magazines for customers to read. He was also a keen radio builder and experimenter, so there were always a number of copies of *Practical Wireless* there to look at.

I remember that up on a shelf, there was a rather large valved amplifier built on an open chassis coupled to a radio and loudspeaker. On the front of this amplifier was a large meter, which used to swing up and down in step with the music. This used to fascinate me in those days.

Practical Wireless cost 3 pence a copy in those days, but as a schoolboy that was beyond me. Needless to say, the risk of a cuffed ear from mother if she found out where I had been, was far outweighed by the chance to read *PW* for free occasionally.

**Mr D. Johnson G8AYK
Burnham-on-Sea
Somerset**

Dear Sir

Glancing rather nostalgically through some old copies of *PW*, it occurred to me that I had read practically every single one since the first issue way back in 1932, and I wondered if this was anything of a record? Apart from a few pre-war copies which went for paper salvage during that conflict, I still have them in the archives of the National Wireless Museum!

As a schoolboy, I spent many happy hours building circuits published in what was generally referred to as 'Camm's Comic'. All of them were of the 'straight', t.r.f. variety, with components carefully screwed down to a plywood base and then wired up.

Soldering was not easy when the iron had to be heated in the open kitchen fire! Pocket money was saved to buy a green Solan electric iron, which cost all of 35p. It was in use until only a few years ago. Happy memories.

During the thirties, *PW* ran a competition in every issue, and I recall how delighted I was to win a book prize for my answer to a technical question. It must have been the first one to be drawn out of the hat!

Six years in the RAF as a Wireless Operator Mechanic put a stop to home construction, but gave time for a little technical writing. My first article appeared in the August 1944 edition, with two pages and a photograph on the front cover. That really made my day, especially when a cheque arrived in due course!

However there is one big advantage of table-top construction nowadays. All the parts are so much smaller, lighter and easier to handle on the proverbial kitchen table. Still, I have happy memories of those big, tough 807 valves, they even kept the kitchen warm!

**Douglas Byrne G3KPO/GB3WM
Ryde
Isle of Wight**



Douglas in 1992.

Young Douglas in 1932



Dear Sir

I was two years old when *PW* began in 1932, and wonder if any other readers remember a radio magazine called *Radio Contact And Television*. I still have Volume 1 No. 2, published in 1934 (price 4d, i.e. 1.66p!) plus a 1936 issue without its covers.

The number two issue included a congratulatory message from F. J. Camm, who at that time was editor of *PW*. Older readers will probably remember with affection the 'Camm's Comic' nickname for *Practical Wireless*.

In those days, and even in *PW* of the 1960s, circuit diagrams were referred to as blueprints. Presumably because factory diagrams were reproduced by a process that gave blue/purple printing. Even blueprint reproductions in magazines were printed in blue on white. Even 'A Stabilised Power Supply' in *PW* August 1961, page 316 - the inside rear cover still referred to the *PW* Blueprint Service.

Another fond memory that I have is of the government surplus 1132A v.h.f. receivers, used at RAF ground stations. I bought one for a few £s in the 1950s, added my own power-pack and audio output stage on a separate chassis. I changed the r.f. coils to tune the receiver to what is now the lower end of the Band II broadcast band. I was able to listen to the BBC test transmissions from Wrotham, when one frequency used a.m. and the other one used f.m. for evaluation purposes.

There were also numerous government surplus r.f. units available, such as the type 26, which enabled us to convert for reception on 50-65MHz. Some models were fitted with the excellent Muirhead drive.

These are some of the memories that the *PW* Diamond Jubilee rapidly bring to mind, congratulations to the magazine and happy listening to all its staff and readers.

**Ivor Nathan
Southgate, London**



**Receiving
You
Vintage**

Receiving You Vintage

Dear Sir

I congratulate you on your Diamond Jubilee. I was a radio fan before you were born! In 1920 I applied for a licence at our local post office in Longton.

An elderly lady did not want to serve me. "A lad at your age does not want to mess with electricity"! As I persisted, she eventually issued me with a 10/- (50p) radio experimenters licence, printed in red.

In those days we had no books, the nearest stations were 2ZY and 5IT. I had an elderly friend who knew an electrician at the local colliery, who gave him a sketch of a radio set.

It was what we now know as a block diagram. As you could not buy things, we made our own valve rheostats, grid leak resistors and capacitors. I made a single-valved set on a child's slate.

The two coils were pancake-shaped, about 50 turns each, wound on cardboard and waxed. In those days it was always 22s.w.g wire. Long waves for Daventry needed about 200 turns. After a while along came *Popular Wireless*. Then came *Amateur Wireless*, and eventually *Practical Wireless* and *Amateur Wireless* merged. As time went on, the amateurs made a success of the bands.

I am 87, and hope you can manage this scrawl, as it's quite a job these days to put pen to paper. I thought of making you a tape but thought it would be too scrappy.

Congratulations for another 40 years, *PW* keeps me going. I tape a lot of your articles for a blind friend of mine, G4AYY and they keep him up to date also. Best wishes.

**J. W. Heath
Werrington
Stoke-on-Trent**



Mr Heath's Great-Uncle Tom with his crystal radio receiver and Nana with a crystal-set made by her eldest brother.

Dear Sir

Having read *Practical Wireless* for over 30 years, I have listed a few memories which you may find of interest.

While still at school, a friend who had a newspaper-round showed me an advert in *Practical Wireless* for a transmitter/receiver (I think it was a 19 set). That was the start of my interest in wireless, and so I started buying *Practical Wireless* myself.

I remember reading articles such as 'On Your Wavelength', 'Transmitting Topics', etc., and of course the adverts. They made inter-

esting reading, including surplus gear such as the R107, R1155 and R208 communications receivers.

My first home-brew set was the 'Brittanic Two' which worked well. I also built the 'Luxembourg Tuner' and many other projects which gave me many hours of pleasure.

Of course through the years, there have been many articles on the RAE. They certainly helped me to pass when I eventually opted to get my ticket. I still occasionally read the older issues of *PW* and enjoy doing so. However, I still look forward to the second Thursday of every month

when the latest *Practical Wireless* arrives.

I have enjoyed the articles using valves in recent issues, and hope to build the 3.5MHz transmitter/receiver in the near future. I was also impressed with the solid state h.t. power unit for valve equipment - a great idea.

Keep up the high standard *Practical Wireless*, and thanks from a reader for life.

**A. Blyth GM4TAL
East Lothian
Scotland**

Dear Sir

I have in front of me *Practical Wireless* for October 1946 which was the first one I bought. It cost me 9 old pence, just under 4p in today's money.

I was 15 years old at the time, and was a day pupil at a boarding school. Since all reading matter, except that approved by the school heads was forbidden, I used to smuggle in *PW* to a couple of classmates who were boarders, and cut off from the outside world. I had just bought my first radio receiver, a crystal set, which used to pull in the local transmitter on medium waves.

However, the station didn't come on until 6pm. In winter time when darkness came soon after 4pm, I could hear faint signals from BBC on the long wave, until the local station came on and swamped it. This whetted my appetite, and I was soon making my first one-valve receiver with all connections made on screwed terminals.

I later graduated to building a two-valved set using a solid copper soldering iron, heated over a Primus stove. I had good moments, like when I heard a radio amateur from Australia, and bad moments - when I somehow connected the h.t. battery to the 2V filament of my PM2HL valve! This had required weeks of hard saving to purchase.

Little did I dream at that time, that I would eventually have an article of my own published in *PW* (Feb 1986). I'm still reading *PW* as eagerly as ever, and still busy at my workbench, but I now have an electric soldering iron!

The smell of melting solder and burning flux is as pleasant as ever. Your magazine is going from strength to strength. May it continue to prosper in years to come. Congratulations on your Diamond Jubilee.

**Sean Linehan EI7CV
Dublin 15
Ireland**



Sean EI7CV today....and in 1947.

Dear Sir

During the early 1930s I was an apprentice at the printing firm of Newnes & Pearson's in North Kensington. I was working on a weekly periodical entitled *John O' Londons 's Weekly*.

We were asked to produce a provisional layout, or dummy, for a new weekly entitled *Practical Wireless*. General public interest in radio, then called wireless, was increasing. The idea that we would be producing a home construction wireless weekly, provoked great excitement throughout the works.

Headed by overseer Ernie Bauser and assisted by Bert Ried, his nephew Bill Reid, Jim Mathias and George Barrett, the dummy was speedily put together. The proofs were dispatched by special messenger to George Newnes and Pearson's Head office, just off the Strand.

Approval given, the printers waited for copy. Diagrams were etched, and soldered onto solid leaden blocks. The type was set on monotype keyboards using punched tape, and then transferred to type-casting machines.

As the youngest member of the team, and with the best eyesight, my contribution was to set the advertisements by hand. They were set in the smallest useable type, five point - about 14 lines to an inch.

The best remembered F. J. Camm circuits for me are the Fury Four and the superhets. F. J. Camm would come down on the eve of press day, to check over each page before giving the final okay for press. Remembered as a courteous man of few words, the job done he would depart without ceremony.

Other publications with which I had links were *Radio Times* (2d), *World Radio* (2d) and *The Listener*. These BBC links brought me into contact with Ralph Judson of the BBC who ran a column in *World Radio* entitled 'Which Station Was That?'

Having worked on *PW* at such an early age, naturally I became hooked and my last days before retirement were as a Tele-photo operator working worldwide. You modern types would know it as a specialised FAX machine for transmitting and receiving press photographs.
**Les Bober G4NOZ
Colchester
Essex**

On behalf of everyone on the *PW* team, I say thank you to all the readers who wrote in. Your comments and congratulations are gratefully acknowledged. Without you, the magazine would not be *Practical Wireless*. Editor.

Vintage Newsdesk

I'll start the archive extracts with a reminder of what dark times lay ahead, even in 1932:

Formation of the Royal Naval Wireless Auxiliary Reserve.

A statement about a scheme, whereby British wireless amateurs could assist His Majesty's Forces, was outlined in *Wireless World* for 26 August 1932. In January of that year the Admiralty had asked the Radio Society of Great Britain whether the society would be prepared to support such a Naval Reserve scheme.

There would be two types of training for operators and watchers organised by Unit Petty Officers:

(a) Operators: Wireless amateurs owning transmitting sets.

(b) Watchers 1st Class: Must possess receiving apparatus for use on all amateur and Naval h.f. bands and be capable of receiving Morse code, plain language English sent for five minutes, four-letter code for three minutes and four-figure cypher for three minutes, in each case at 10 words per minute.

Watchers 2nd Class: No tests, but given one year in which to qualify as Watcher 1st Class.

This month we've got a guest news contributor joining Sharon George. Our 'Maths For The RAE' author Ray Fautley G3ASG, has taken time off from his regular page this month. Delving into the past, Ray has discovered some interesting items from his early 1930s radio magazine archives.

How To Obtain Complete Station Separation Without Sideband Cutting

Here's an interesting advert about the use of amplified a.v.c. (automatic volume control) by Haynes Radio. It purports to ensure that signals are received without sideband cutting, and without the sidebands from adjacent signals causing interference.

There's a surprising sentence in bold type in the advertisement stating "that in their 32-page book there is a clear explanation given for the superiority of the straight HF set over the superheterodyne". This advert appeared in *The Wireless World* for 26 August 1932.

Modern Wireless

The contributor, L.W.O. (anybody know who he was?) in the magazine *Modern Wireless* for May 1932, reported something he'd heard when he was tuning around the medium wave at 1.15am. After finding WTIC Hartford in Connecticut, and WPG in Atlantic City, he heard an obviously American station that was jammed by a spark-type Morse transmission.

The contributor was just about to give up attempting to identify the station through the interference, when the Morse code signal stopped for a short time. Imagine his surprise, when during that brief period, he heard his own name mentioned by the announcer followed by, "...three thousand miles away may be listening to this station now..." and then a very American "Gee!", before the spark transmission started again. The QRM didn't stop again, so he never identified the station. Quite an experience for 1932!

The same magazine had a short note by W.L.S. (this is another 'I wonder who he was?') listing a few of the British Empire short wave stations that he had logged. They included **VE9GW** Bowmanville Canada 24.43m (12.280MHz) **VE9JR** Winnipeg Canada 25.60m (11.720MHz) **VK2ME** Sydney Australia 31.28m (9.590MHz) **VK3ME** Melbourne Australia 31.55m (9.510MHz).

The emphasis at that time was always on the wavelength of a station and not on its frequency, which we now know is the only way to log a station! So the approximate frequencies of the above stations appear in parenthesis for all you youngsters!

Two Valve Set In Just One Valve!

'The Experimenters' in *Amateur Wireless* for 30 September 1933, described how the class B double triode valve type B21, can be used as a two valve set. One of its triodes operates as detector, and the other as a transformer coupled power output stage.

In the same magazine, there was a list of the cost of receiving licences in various countries. It showed that in 1933, it ranged from 2s 6d (12p) in Hungary, and £1.19s (£1.95) in Lithuania. This was paid each year for the privilege of operating a receiver. In the UK it was 10s (50p) whilst in Holland, Portugal and the USA it was free! What a surprise!

The Radio Amateur Call Book Magazine

The *Wireless World* for 9 November 1934 stated - "Radio's biggest periodical - the 312 page *Radio Amateur Call Book Magazine*, Fall edition 1934 has arrived. More than 200 pages are required to contain US amateurs, while the remainder of the world's 'knob punchers' can be accommodated in 54 pages. Price 6s 6d." (32p).

Radio Romania

Although, during the past few months, we have been told to stand by for tests of the new 150kW Nation station at Brasov, it is now confirmed that the transmitter is carrying out experimental programmes on 1875 metres, the channel to be shared with Hilversum (Holland).

PW 1935.

High Power Stations For Japan

Work on the new transmitter near Tokyo is progressing so favourably that it is expected this 150kW station will be ready to be brought into operation at the beginning of 1936. It will be the most powerful station in eastern Asia, and will be exclusively used for broadcasts.

PW 1935.

ADDRESS
YOUR STAFF
THROUGH A
QUESTION

Vintage Newsdesk

YES! BE PREPARED

News From The Front

Daily at 16.00GMT, all Italian stations broadcast a war news bulletin, which is relayed direct from Asmara (Eritrea), to which centre the Italian Government has sent an official correspondent. In addition it is stated in Rome that broadcasts will be made from the war front in Abyssinian territory. PW 1935.

From Boots To Radio

The famous Bata works in Czechoslovakia, one of the largest boot factories in the world, now proposes to turn its attention to the manufacturer of radio receivers of the cheapest possible make, to compete with the Volksempfänger which the Germans have been producing in such large quantities. PW 1935.

The Thirteenth Anniversary

November 14 marked the 13th anniversary of the birth of the BBC, and those who can remember the first programmes can well judge the rapid strides which have been made in those 13 years. From the old carbon microphone with wooden screen around it, to the latest ribbon microphone mounted on universal tripods, and from the improvised studio to the latest 'irregularly-shaped-quadrilateral' conception, the years have been well marked. PW 1935.

An American Development For Ultra Short Waves

Again from *Wireless World* for 9 November 1934, I've found another interesting item: "Ordinary valves can be used at wavelengths down to around 5m, but there is a definite limit below which they cannot be employed. Reducing the dimensions of a valve allows operation at lower wavelengths, and this new American valve, known as the 'Acorn' because of its shape, has been found to operate successfully at 0.5m" (600MHz). I've no doubt that you know the saying 'From little acorns giant oak trees grow'. Well, that little 'acorn' valve helped a very big 'oak tree' grow...in the form of radar. WW 1935.

Round The World Of Wireless

Here are some interesting items taken from 'Round The World Of Wireless' in the 23 November 1935 issue of *PW*. "The £4 Superhet Four. The preparations made by component manufacturers for the supply of components for the £4 Superhet Four indicates that dealers throughout the country have stocked their shelves in preparation for the heavy and consistent demand which publication of any of Mr Camm's receivers always arouses" The report went on to say that they considered it would be 'the set' of 1936. They were right, and the design went on to be very successful indeed.

The BBC Five Hours Back Feature

The NBC mid-day programme from the USA which listeners may hear every Saturday afternoon listening five hours behind through the National transmitters, is relayed through the BBC Tatsfield station from W3XALL, Boundbrook in New Jersey on 17.780Mc/s, and W2XAD, Schenectady, New York on 15.33Mc/s. While the separate broadcasts may suffer from fading effects, the steadiness of the signals is assured by capturing the transmissions on several aerials feeding four separate receivers. PW 1934.

High Power Broadcaster For Tallin

The Estonian Broadcasting Company has decided to replace the present station in the capital by a 60kW transmitter, and transfer the old plant to Tartu (formerly known as Dorpat). The wavelengths of 410.4 metres (731kc/s) and 580 metres (517kc/s) will be retained. Such an increase in power will make broadcasts from Tallinn well heard in the British Isles. PW 1935.

The Principle Of The Superheterodyne

I've taken the following extract from the *Wireless World* for August 26. "Although the superheterodyne is now very old, as reckoned in radio, it is only within the last two or three years that it has been successfully employed for the high quality reproduction of broadcasting."

This quote was followed by an explanation. This stated that it was "the application of band-pass filters in the i.f. amplifier stage that simultaneously provided selectivity and quality of reproduction".

The essential difference between straight and superhet receivers, was stated as "being in the method of tuning. In the straight set every tuned circuit in the receiver is tuned to the frequency of the required signal. This making it necessary to re-tune each circuit by adjusting the variable condensers when changing from one station to another".

The article continued "The i.f. amplifier of a superhet uses resonant circuits, all tuned to the same frequency, with no provision made for varying the tuning, as it only operates at one frequency". (Perhaps "a small band of frequencies" would have been a better phrase here.)

"To make use of this fixed tuned amplifier it is preceded by a 'piece of apparatus' (my single quotes!) whose purpose it is to change the frequency of the incoming signal to that of the amplifier. Instead of tuning by adjusting the amplifier to operate upon the signal frequency as in a straight set, we work the other way round and alter the frequency of the signal to conform to the requirements of the amplifier." So ended an 'informed' look at the superhet! PW 1932.

Newsdesk '92

Up-To-Date Now where Sharon George Has The Very Latest Information From The Amateur Radio Scene.

Phoenix Amateur Radio & Novices Society

Phoenix Amateur Radio & Novices Society will be holding stands at the Telford & District ARS Rally in the Telford Conference Centre on Sunday 13 September, commencing 10.30am. They will be using a special event callsign of GB0NOV and look forward to any QSOs.

On show will be a range of novices' course work, the aim of this is to generate new interests to up-and-coming operators.

At the event will be instructors to answer any questions from those who are interested in starting radio as a hobby.

Mr C. Edwards 2E1AKI
68 Westbourne
Woodside
Telford
Shropshire TF7 5QL.

Haydon Communications

Mike Haydon, previously of Waters & Stanton Electronics, has announced the opening of his own Communications Shop. It will stock leading brands for both retail and mail order. Mike looks forward to meeting old and new friends at his shop. We wish him every success in his new venture.

Haydon Communications
132 High Street
Edgware
London HA8 7EL.
Telephone and FAX number 081-951 5782.

Relocated RF Engineering

RF Engineering Ltd., has permanently relocated to:
Woeful Lake House,
Sherborne,
Gloucestershire GL54 3PR.
Tel: (0451) 844237
and Fax (0451) 844253.

RAE Course News

Poverest School,
Poverest Road,
Orpington, Kent. They are planning RAE classes to run Wednesdays, 7.30 to 9.30pm, commencing September 23. The course leads to the May 1993 examination, which will be held at the school. Early enrolment is advised, by post to Bromley Adult Education, Church Lane, Prince's Plain, Bromley BR2 8LD, tel: 081-462 9184. Further details from tutor, **Alan Betts G0HIQ on (0689) 831123.**

King Edward 6th School, Morpeth, Northumberland. RAE classes to run Mondays, 7.30 to 9pm, commencing September 28. Enrolment from September 12. More details from the course tutor, **Mr Chicken G3BIK, at 21 Townsend Crescent, Kirkhill, Morpeth, Northumberland NE61 2XP.**

Sony Broadcast Amateur Radio Training Group, Sony Broadcast & Communications Ltd., Jays Close, Viables, Basingstoke, Hampshire RG22 4SB. RAE classes to run on Mondays, 7 to 8.30pm. A course is currently in progress, aiming at the December examination, but new students are welcome to enrol, or make an entry through this examination centre. Further details from **Stephen Harding at the above address or on (0256) 483454.**

Radio School Ltd., 33 Island Close, Hayling Island, Hampshire PO11 0NJ. A very intensive 8-day (Wednesday to Wednesday) course of preparation for the radio amateur's exam is available. Further details from the tutor **Peter Bubb G3UWJ on (0225) 427467.**

Radio Construction Enthusiasts Look What's Coming Next Month - A Free Mainline Electronics Catalogue

See the November issue (published October 8) of *Practical Wireless* for your free pull-out copy of the new 72-page Mainline Electronics catalogue.

This brand new catalogue, is jam-packed full with all those special components including:

Chip capacitors, microwave cable, waveguide and flanges, r.f. power modules, Gunn diodes, r.f. power dividers, HEMPT devices, Modern chips, toroids and ferrites and much more!

If you're into general or specialised construction, whether it be microwave or state-of-the-art equipment, you'll find this FREE catalogue extremely useful.

**M A I N
L I N E**

ORDER YOUR COPY NOW TO AVOID DISSAPPOINTMENT

Club News

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

Avon

Bristol ARC meet at 159th Scout HQ, Firtree Lane, St. George, Bristol. September 10/October 8 are QRP/Homebrew Play & Display nights with Dave G4ZBT, September 17 is a Computer evening with Barry G0CFM, the 24th is Morse Key/Paddle Exhibition, bring yours along, however new/old/worn/disused! & October 1 is QSL Card Display night with Alan G3ZKI. More details from **Lance Whitelegg G0CCU** on (0272) 721744.

Bedfordshire

Dunstable Downs RC meet Fridays, 8pm at The Old Mill, West Street, Dunstable, Beds. Further details from **Wendy Jefferson** on (0582) 451057.

Berkshire

Maidenhead & District ARC meet at The Red Cross Hall, The Crescent, Maidenhead, 7.30pm. September 20 is Quiz against Burnham Beeches RC at home & October 1 is a Junk Sale. Details from **Neil G8XYN** on (0628) 25952.

Reading & District ARC meet 2nd & 4th Thursdays, 8pm at The Woodley Pavilion, Woodford Park, Haddon Drive, Woodley, Reading. September 10 is the Autumn Junk Sale & October 8 is 'Club Internal Quiz' by Chris Young G4CCC. More details from **Nick Challacombe G0LGG** on (0734) 722489.

Buckinghamshire

Aylesbury Vale RS meet 1st & 3rd Wednesdays, 8pm in the Village Hall at Hardwick. September 16 is 'EMC & its cure' by Peter Lauder G1OSC & October 7th is 'Digital Audio Broadcasting' by Peter Jackson. Further details about the club from **Martin G4XZJ** on (0296) 81097.

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 **Oale Kipping, 46 Old Hardenway, High Wycombe, Bucks HP13 6TJ**.

Milton Keynes & District ARS meet 2nd Mondays at North Bucks Youth Sports Hall, Haversham Road,

Wolverton, Milton Keynes. September 14 is Equipment Clinic - get your equipment tested with Dave G8EDW. For more information, please contact **Julian Winson G3FGB** on (0908) 611005.

Cheshire

Stockport RS meet 2nd & 4th Wednesdays, 7.45pm in Room 14 of the Dialstone Centre, Lisburne Lane, Offerton, Stockport, Cheshire. September 23 is a Surplus Equipment Sale. Further details from **Jim France G3KAF** on 061-439 4952.

Clywd

Delyn RC meet every other Tuesday, 8pm at the Gwernymyndd Community Centre in Gwernymyndd, near Mold, Clywd, North Wales. September 22 is a talk on 'UFOs' by Steve G1HAW. For more details, contact **Steve Studdart GW7AAV** on (0244) 819618.

Rhyl & District ARC meet 1st & 3rd Mondays in the WRVS Centre, 116 Vale Road, Rhyl. September 21 is the AGM. For more details, contact **Ken Padley GW7IAR, 67 Rosehill Road, Rhyl, Clywd LL18 4TS**. Tel: (0745) 338276.

Wrexham ARS meet at the Maesgwyn Community Centre, Maesgwyn Road, Wrexham. September 15 is 'Slow Scan Television' Mike GW0HWW, the 19/20th is a Special Event Station GB4WXM & October 6 is 'Worked All Britain' Ian GW1MVL. More details from **Ian Wright GW1MVL, 'Derwydd', 2 Duke Street, Rhos, Wrexham, Clywd LL14 1SY**. Tel: (0978) 845858.

Derbyshire

Buxton Radio Amateurs meet at the Lee Wood Hotel, Buxton at 8pm. September 22 is Discussion night - JOTA/Foxhunt. For further details, contact **Derek Carson G4IHO** on (0298) 25506.

Derby & District ARS meet Wednesdays, 7.30pm at 119 Green Lane, Derby. September 23 is 'Pyrography' a talk & demonstration by Bob Neil & October 7 is a Junk Sale. More details from **Richard Buckby G3VGW, 20 Eden Bank, Ambergate, Derby DE5 2GG**. Tel: (0773) 852475.

Devon

Torbay ARS meet Fridays, 7.30pm at the ECC Social Club, Highweek, Newton Abbot. September 11 & 25th are club nights & the 18th is 'CQ World Wide 1989' video. More details from **Andy Stafford G4VPM** on (0803) 329055.

Dorset

Poole RAS meet 2nd Fridays, 7pm at Lady Russell-Coates House, Lower Constitution Hill Site, Bournemouth & Poole College of FE. September 11 is a talk on 'Skywave Propagation' by Rob Micklewright G3MYM. More details from **Vernon Cotton G3BCI, 45 Branksome Hill Road, Bournemouth, Dorset BH14 9LF**. Tel: (0202) 760231.

South Dorset RS meet 1st Tuesdays, 7.30pm in the Wessex Lounge of

Weymouth Football Club. October 6 is 'Developments in Post War Electronics & Thickfilm Circuits' Ted G3ETA. **Geoff Gwillian G4FJO, 13 Overlands Road, Wyke Regis, Weymouth DT4 9HS**. Tel: (0305) 781164.

East Sussex

Southdown ARS meet 1st Mondays, 8pm in the main hall of the Chaseley Home for the Disabled, South Cliff, Eastbourne. October 5 is a Surplus Equipment Sale. Details from **John Vaughan G3DQY** on (0323) 485704.

Essex

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

Chelmsford ARS meet 1st Tuesdays, 7.30pm at Marconi College, Arbour Lane, Chelmsford, Essex. More details from **Roy & Ela Martyr G3PMX & G6HKM, 1 High Houses, Mashbury Road, Great Waltham, Essex CM3 1EL**. Tel: (0245) 360545.

Gloucestershire

Gloucester ARS meet Wednesdays, 7.30pm at St. John Ambulance HQ, Heathville Road (off London Road), Gloucester at 7.30pm. September 16 is Packet Self Help Group, the 23rd is Home-brew clinic, the 30th is a Construction group, October 3 is a Jumble Sale at Longlevens Church Hall & the 7th is a Junk Sale. Further details from **Jenny Beckingham G7JUP** on (0452) 528533 Ext. 2734.

Greater London

Acton, Brentford & Chiswick ARC meet 3rd Tuesdays, 7.30pm at Chiswick Town Hall, Heathfield Terrace, London W4. September 15 is 'QSL cards' a discussion led by GOURY. Further details from **Colm Mulvany G0JRY, 11 Erconwald Street, London W12 0BP**. Tel: 081-749 9972.

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.

Edgware & District RS meet at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, 8pm. September 10 is 'Radio Data Systems' by Chris Nicholas G0LZV, the 24th is Morse Training evening, October 6/7 is Edgware activity period & the 8th is a club meeting. More details from **Howard Drury G4HMD, 11 Batchworth Lane, Northwood**. Tel: (0923) 822776.

Southgate ARC meet at Winchmore Hill Cricket Club Pavilion, Firs Lane, Winchmore Hill, London N21. September 10 is a Lecture & show by R. A. Davis G0MEO on 'Model Aircraft', the 24th is a talk by Mike Dennison G3XDV on *Radcom* & October 8 is a Junk Auction. **Brian Shelton G0MEE, 22 Berkeley Gardens, Winchmore Hill, London N21 2BA**. Tel: 081-360 2453.

Greater Manchester

South Manchester RC meet Fridays, 8pm at the Community Centre, Norris Road, Sale. September 18 is a Surplus Equipment Sale. More details from **Edward Spark G7FQY** on 061-969 1964.

Gwynedd

Dragon ARC meet 1st & 3rd Mondays, 7.30pm at the Four Crosses Hotel, Menai Bridge. September 19 & 20 is a Special Event GB2NTC - National Trust Event, the 21st is 'VHF Pick and Mix' by Tony Jones GW4VEQ & October 5 is the AGM. **Tony Rees GW0FMQ** on (0248) 600963.

Hampshire

Basingstoke ARC meet 1st Mondays, 7.30pm at the Forest Ring Community Centre, Sycamore Way, Winklebury, Basingstoke. For further details, phone (0256) 25517.

Horndean & District ARC meet 1st Thursdays, 7.30pm at Horndean Community School, Barton Cross (off Catherington Lane), Horndean, Hants. October 1 is the AGM. For more information, contact **Stuart Swain, 35 Mavis Crescent, Havant, Hampshire PO9 2AE**. Tel: (0705) 472846.

The Three Counties ARC meet every other Wednesday, 8pm at the Railway Hotel, Liphook Hampshire. September 23 is 'Computer Prediction of HF Radio Propagation' by Nigel Gerdes G7CAW & October 7 is 'Steam Engines' an illustrated talk about the local steam railway by M. J. Mason. **Kevin Roche G8GOS** on (0420) 83091.

Hereford & Worcester

Bromsgrove ARS meet 2nd & 4th Tuesdays, 8pm at Lickey End Social Club, Alcester Road, Burcot, Bromsgrove. September 22 is Technical Topics. **Mr D. Edwards G4ZWR, 2 Mason Close, Headless Cross, Redditch, Worcs B97 5DF**. Tel: (0527) 546075.

Bromsgrove & District ARC meet Fridays at Avoncroft Arts Centre, South Bromsgrove, Worcester. September 11 is a slide show & talk (G4AAL). More details from **Joe Poole G3MRC** on (0562) 710010.

Hertfordshire

Dacorum AR & TS meet 1st (informal) & 3rd (formal) Tuesdays, 8pm at The Heath Park, Cotterells, Hemel Hempstead. September 15 is 'EMC' a talk by George Halse G3GRV. Further details from **Dennis Boast G1AKX** on (0442) 259620.

Hoddesdon RC meet alternate Thursdays, 8pm at the Conservative Club, Rye Road, Hoddesdon, Herts. September 17 is a talk on 'WAB' by Robert G40BE & October 1 is an informal/project night. Details from **Roy G4UNL** on 081-804 5643.

Humberside

Goole R & ES meet most Fridays, 7.30pm at the West Park Pavilion, West Park, Goole, last Fridays at the 'Black Swann Inn', Asselby. September 11 is Microwave video evening, the 18th is the AGM, the 25th is a social evening & October 2 is GOOLE 'on air night'. Further details from **Steve Price G8VHL** on (0405) 769130.

Kent

Maidstone YMCA ARS meet Fridays, 8pm at the YMCA Sports Centre, Melrose Close, Maidstone, Kent. RAE classes every other week with lectures & events on alternate weeks (starting September), CW classes every week. September 11 is RAE, the 12th is RSGB Morse tests, the 18th is a lecture on Antennas G3ORP, the 25th is RAE & October 9 is RAE. More details from **Colin Roberts** on (0622) 670936.

Lancashire

Fylde ARS meet 2nd & 4th Thursdays, 7.45pm at South Shore Lawn Tennis Club, Midgeland Road, Blackpool. September 24 is informal & October 8 is an Equipment Sale. **Eric Fielding G4IHF** on (0253) 726685.

Preston ARS. September 17 is 'Novice Licence' a talk by Mr Williamson & October 1 is 'RSGB Zone A' a talk by Mr Shepherd. Details of their meeting place & time from **Eric Eastwood G1WCO**, 56 The Mede, Freckleton, Preston, Lancashire PR4 1JB. Tel: (0772) 686708.

Lincolnshire

Spalding & District ARS meet Fridays, 8pm at The Riverside Centre, The Old Fire Station, Double Street, Spalding, Lincolnshire. September 11 is 'Vintage Radio' G4EMK. Further details from **David Johnson**, 65 West Street, Bourne, Lincolnshire PE10 9PA. Tel: (0778) 425367 (6-7pm).

Norfolk

Dereham ARC meet 2nd Thursdays, 8pm at the St. Johns Ambulance Hall, Yaxham Road, Dereham. September 10 is Calculating your line of sight & October 8th is a night on the air. More details from **Mark Taylor G0LGJ** on (0362) 691099.

Nottinghamshire

Mansfield ARS meet at the Polish Catholic Club, off Windmill Lane, Woodhouse Road, Mansfield. October 1 is a talk by a local crime prevention officer. Further information from **Mary GONZA** on (0623) 755288.

Nottingham ARC meet Thursdays, 7.30pm at the Sherwood Community Centre, Mansfield Road, Nottingham. September 10 is a talk on 'Foreign Language QSOs' by Walter G00MO (postponed from the July 9), the 17th is Activity/Foxhunt 5 (last of the series), the 24th is 'Oscilloscopes' a talk by Dave

G3YUT, October 1 is Activity/Construction/WAB & the 8th is Forum. Further details from **Ian Miller G4JAE** on (0602) 232604.

South Notts ARC meet at Highbank Community Centre, Farnborough Road, Clifton Estate, Nottingham, or Fairham Community College, Farnborough Road, Clifton Estate. September 11 is Construction, the 18th is a talk-in (S22) & 'Shack Safety Pt 2' by Martin G7FRA, the 20th is 6th Foxhunt, the 25th is On Air, the 27th is a Treasure Hunt & October 2 is a talk-in (S22) & Junk Sale. For further details contact **Ray G7ENK** on (0602) 841940.

Oxfordshire

Oxford & District ARS meet 2nd & 4th Thursdays, 7.45pm at the British Legion Club, Haddow Road, Crotch Crescent, Marston Road, Oxford. September 24 is 'Computer Viruses' by Dr. R. Ford. More details from **Terry Hastings G0CFN** on (0865) 863526.

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.

Vale of White Horse ARS meet at The Fox, Stevenon. October 6 is their AGM. More details from **Ian White G3ESK** on (0235) 531559.

Scotland

Dundee ARC meet Tuesdays, 7pm in the College of Further Education, Graham Street, Dundee. September 8 & 15th are enrolment nights, the 22nd is construction & committee meeting, the 29th is the AGM & October 6 Holiday. Further details from **George Millar GM4FSB**, 30 Albert Crescent, Newport-on-Tay, Fife DD6 8OT.

Somerset

Yeovil ARC meet Thursdays at Red Cross HQ, Grove Avenue, Yeovil, Somerset. September 10 is 'Break Through' by an Official of RCA, the 17th is a talk on club project, an 80/20mtr transceiver by G3PCJ & G3MYM, the 24th is a committee meeting, October 1 is Construction & Operating night & October 8 is Getting the best out of your rig. Further details from **Mike Woodford G0JVG**, Holm Wood, 5 Orchard Close, South Petherton, Somerset TA13 5DX.

Suffolk

Sudbury & District ARC 'SANDRA' meet 1st Tuesdays, 8pm at the Five Bells Inn, Great Cornard, Sudbury, Suffolk. October 6 is 'Electrical Wiring & Safety in the Shack' Frank G1MYD & Nigel G0ORL. Further details from **Colin Muddimer G0PAD** on (0787) 77004.

Surrey

Coulsdon ATS meet 2nd Mondays, 7.45pm at St. Swithun's Church Hall, Grovelands Road, Purley, Surrey. September 14 is 'Packet Radio for

Beginners' by Peter Burton G32PB. **Andy Briers G0KZT** on (0737) 557198.

Horsham ARC meet at the Guide Hall, Denne Road, Horsham, West Sussex, 8pm. October 1 is a Surplus Equipment Sale. Further details from **Peter Stevens G8SUI**, 11 Nutwood Avenue, Brockham, Betchworth, Surrey RH3 7LT. Tel: (0737) 842150.

Surrey RCC meet at 'Terra Nova', The Waldrons, Waddon, Croyden, Surrey. September 21 is a natter night & October 5 is a Surplus Sale. More details from **Berni G8TB** on 081-660 7517.

Sutton & Cheam RS meet 3rd Thursdays, 7.30pm at Sutton United Football Club, The Borough Sports Ground, Gander Green Lane, Sutton, Surrey, with natter nights on 1st Thursdays. September 13 is BARTG Rally, Sandown Park, Esher, the 17th is 'Antenna forum' by Geoff Plucknett G4FKA, the 20th is 70MHz trophy contest, the 24th is a committee meeting & October 1 is a natter night. More details from **John Puttock G0BWW**, 53 Alexandra Avenue, Sutton SM1 2PA.

The Kingston & District ARS meet 3rd Wednesdays, 8pm at 'Alfriston', 3 Berrylands Road, Surrey KT5 8RB. September 16 is Surplus Equipment Sale. More details from **Ray Fuller** on 081-398 1128.

Wimbledon & District ARS meet 2nd & last Fridays in St. Andrews Church Hall, Herbert Road, Wimbledon SW19. September 11 is Interclub Quiz night & the 25th is General Activity evening. **Chris Frost G0KEB**, 61 Selbourne Avenue, Tolworth, Surrey KT6 7NR. Tel: 081-397 0427.

Warwickshire

Stratford-Upon-Avon & District RS meet 2nd & 4th Mondays, 7.30pm at the Home Guard Club, Main Road, Tiddington, Stratford-Upon-Avon, Warwickshire. September 14 is Opening Evening, Mike Webb Award & the 28th is a visit from Castle Electronics. Further details from **Alan Beasley G0CXJ**, 2 Ilmington Road, Blackwell, Shipston-on-Stour, Warwickshire CV36 4PE. Tel: (0608) 82495.

West Midlands

Midland ARS meet in Unit 22, 60 Regent Place, off Caroline Street, Birmingham B1 3NJ. Wednesdays are RAE classes & Thursdays are natter nights. September 25 is Atari night & the 28th is Computer night. For further details, contact **John Crane G0LAI** on 021-628 7632 evenings.

West Yorkshire

Halifax & District ARS meet 1st & 3rd Tuesdays, 7.30pm at the 'Running Man' Public House, Pellon Lane, Halifax. September 15 is the AGM. For further

details, contact **David Moss G0DLM**, Beechwood Lodge, Leeds Road, Lightcliffe, Halifax, West Yorkshire HX3 8NU. Tel: (0422) 202306.

Keighley ARS meet at The Ingrow Cricket Club, Ingrow, Keighley, 8pm. September 10 is a Visit to Royal Mail, Bradford at 6.30pm, the 16th is a Quiz at Northern Heights, the 17th is a natter night, the 19/20th is a Special Event at East Riddlesden Hall, the 24th is a talk on 'Whiterose TX Fame' by G3TDZ, October 1 is a natter night & the 8th is 'Microwaves the easy way (10 & 24GHz)' by G0DJA. Further details from **Kathy Conlon G0RLO** on (0274) 496222.

Wakefield & District RS meet Tuesdays, 8pm in First Floor Rooms, Ossett Community Centre, Prospect Road, Ossett. September 22 is 'Electricity in Animals' John Bailes G0MVA, the 29th is 'From the Power Station To Your Door, Just like that' David Ackrill G0DJA & October 6 is the Annual Junk Sale. More details from **Dave Ackrill G0DJA**, 104 Durkar Lane, Crigglestone, Wakefield WF4 3HY. Tel: (0924) 240577.

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

Wiltshire

Chippenham & District ARC meet Thursdays, 7.30pm at the Sea Cadets HQ, Long Close, Chippenham. For further details, contact **Mr B. Winslow G0LJA**, 18 Sunderland Close, Bowerhill, Melksham, Wiltshire SN12 6TZ. Tel: (0225) 706265.

Yorkshire

Bemsley & District ARC meet Mondays in the radio club room & shack, at the rear of the Darton Hotel, Station Road, Darton, Barnsley. September 14 is a Junk Sale, the 21st is a proposed talk & October 5 is a proposed talk on 'CTCSS v 1750' by Dave G80WN. For further information, ring **Ernie**, G4LUE on (0226) 716339.

Bridlington & District ARS meet alternate Thursdays, 7.30pm in the Combined Cadet Building at Bridlington Upper School, Bridlington. September 17 is 'ATV' by Richard G4YTV & October 1 is 'HF Antennas' by Geoff G3PWN. More details from **Norman G4NJP** on (0262) 673635.

Hambleton ARS meet in West House, Allertonshire School, Northallerton at 7.30pm. On September 10 they have a Practical night, the 17th is a talk about GB3HG by Dave G4DAX, on the 24th the RAE course commences, October 1 is Practical/Ops night & the 8th is RAE. For more details, contact **Nigel Robertshaw G0NHM** on (0609) 776608.

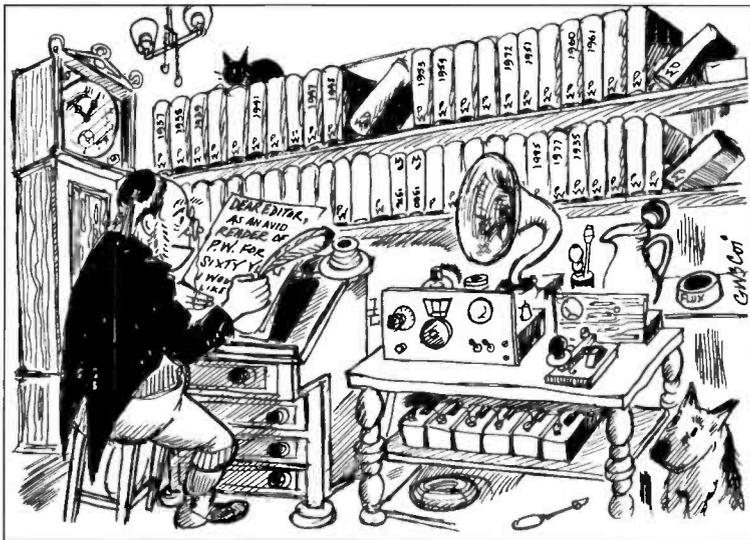
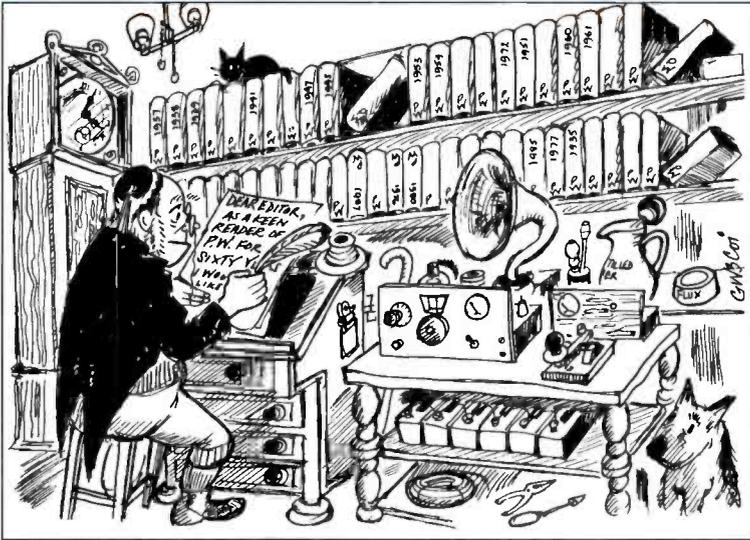
Club News

We hope you like this easier-to-read layout.

COMPETITION CORNER

Spot The Difference

and win a Nelson Electronics Cubical-Quad Antenna



Mark the twelve differences on the cartoon and send it, along with the coupon below (photocopies accepted with the flash below please) to our editorial address. Closing date is Friday 23 October 1992.

Name.....

Address.....

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First Prize is the Nelson Electronics 21 & 28MHz Cubical-Quad Antenna as reviewed by G3XFD in September *Practical Wireless*.

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

Subscription Voucher

Send your entry (photocopies acceptable with coupon) to: Competition Corner, Spot The Difference, October '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 Friday 23 October.

Radio Diary

* Practical Wireless & Short Wave Magazine in attendance.

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 & 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 & model aircraft displays. Refreshments (hot & cold/inside & outside) & 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 2676.**

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. Featuring all the normal attractions, plus a conventional car boot sale for all the family. The cost per boot is £5 & 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, Dundle 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 Conference 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 AHS 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 A414, the fully signposted route will be complemented by talk-in on S22 144MHz & SU22 430MHz by G6UT. 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 G6GLR. Admission will be £1, which includes programme. Children under 14 free if accompanied by an adult. For further details, contact **Barry G1JOP on 091-388 5936.**

October 4: Blackwood Rally will be held at Oakdale Community College, Blackwood, Gwent. Doors open at 10.30am. Admission is £1. Traders, Bring & Buy, videos, raffle. Talk-in on S22. Details from **Norman Oavies GW0MAW on (0495) 227550.**

October 4: Wincanton Radio Rally will be held at The Wincanton Racecourse, Somerset. Indoor event with unlimited free parking. Doors open 10am, admission is 50p. Talk-in on S22. Featuring two halls of radio equipment, computer & electronics surplus, with radio car boot sale outside. Sunday market operating on the adjacent site. Enquiries to **Norman G4YXX on (0749) 850432.**

Competition Corner
Oct '92

Practical Wireless 60 Glorious Years

The late Fred Judd G2BCX wrote this poem, paying tribute to *Practical Wireless*, earlier this year. Everyone involved with the production of the magazine takes this opportunity to congratulate *PW* and its readers for 60 years on continuous publication. This is because a magazine is nothing without its readers, our memories are yours too. Here's to the next milestone....75 years!

The first cover was red and blue,
popular with people like you and me too.
About 70 pages from front to back cover,
all about wireless, very practical moreover.
Three pence weekly, with a free pull-out plan,
Practical Wireless, the Editor Fred Camm.

Each weekly edition never failed to contain,
new circuits for wireless, and parts to obtain.
Week after week, with projects all new,
easy for many but some hard for a few.
We even made parts but valves we *all* used,
for battery and mains sets suitably fused.

By the end of the thirties many were called for.
They and their wireless went off to the war.
PW contributors and readers too,
were soon engaged in technologies new.
With the aid of Wireless, some were to provide,
links with our forces far and wide.

Radar' for locating the enemy planes
and Sonar for those in the shipping lanes.
All though the time of bombing and noise,
Our Practical kept going with news for the boys.
Most wearing uniforms and a few with red tabs.
Those with more knowledge, became boffins in labs.

Had the enemy invaded, help was at hand,
to transmit the signal for Britain's last stand.
Some in Dad's Army, all full of zest,
knew about wireless and would have given their best.
A few repaired radio sets, when they had time,
so we could all hear the news and Big Ben at nine.
When war reached its end some never returned,

They've not been forgotten, or what they had learned
of the new techniques that were ours to retain.
Our wireless colleagues, they died not in vain.
T'was a sacrifice made so that we could take part
in a new technology that from wireless did start.

Then a new publisher had to be found.
This was IPC who proved itself sound.
It embraced *PW* and other Practicals well known,
and during those years, as the group had shown,
the Practicals did well, their sales were bold.
But for financial reasons some had to be sold.

There were times when new Editors had taken the rein,
but even *PW* could not stand the strain.
As with others it had to go but now it lives by the sea
with former rival *Shortwave Magazine*, it runs in
harmony.
But sixty years on, if it's still going strong,
who will write the next accolade, 'ere so long.

Last but not least, names to remember, contributors all,
are the Hon: Barton Chappel, and D. B. Hall,
Delaney and Deller with A. J. Budd.
Then after the war came F. C. Judd,
with Gordon J. King, Ron Ham and the rest.
Bless 'em all. They've each done their best.

F. C. Judd G2BCX

A Schoolboy Discovers

Keith Wevill G4UKW, was a schoolboy in 1966 when he discovered PW on the bookshelf. Although he doesn't regard himself as a veteran just yet, Keith's had 26 years in the hobby and he's still counting!

It happened during April 1966, while we were out shopping when I was on holiday at my grandmother's. That was when I saw a copy of the May edition of *Practical Wireless* at the local newsagent.

It was the first issue in the new 7 x 10 inch format, so I lashed out 2/6d (12.5 new pence) from my hard-earned pocket money and started reading. I was no stranger to the Practical Series of magazines, as I had started reading *PW's* (then) sister magazine *Practical Electronics* a few months earlier.

I already had an old copy of the August 1964 *PW*. I had got that one by swapping some components several months earlier at school.

That particular issue had a tuner converter which I later built, and eventually got working. I used it in conjunction with my portable radio to listen to the local amateurs on 1.8MHz.

Free Booklet

I think the reason I bought the May *PW*, was the fact that it came with a free booklet on valve circuits. There was also the incentive of a resistor colour code calculator.

So, what was in this first issue of the new size *PW*, which was the 711th issue? Well, for a start, the cover showed a picture of the '208 Bandspread Portable'.

The cover subject was a six transistor, long and medium wave receiver. It was equipped with a bandspread facility at the high frequency end of the medium wave for Radio Luxembourg.

The author was the late F. G. Rayer G3OGR. This well-known author produced many transmitters, receivers and other articles over many years.

The magazine also included a 'Comprehensive ATU' by David Gibson G3JDG. This was capable, the author claimed, of matching anything to anything, including end-fed coat hangers and base-loaded cufflinks! David Gibson also wrote the amateur band reception report column.

Gordon J. King had a mono or stereo pickup booster, cleverly built into the then ubiquitous tobacco tin. There was also an article on simplified cabinet design using simple woodworking techniques.



Five year old Keith Wevill, with his brother Brian on holiday. Even then, Keith was showing an interest in radio by collecting vintage equipment, while brother Brian is more interested in the basket of pre-packaged omelettes in his hand.

Micro To Mega

Looking further into the issue, for the beginner there was an explanation of indices entitled 'Micro to Mega'. 'Experimenters Corner' had G. R. Wilding showing techniques for volume expansion, and 'Henry' had his 21st 'Practically Wireless' commentary.

The Club Spot featured the Verulam Amateur Radio Club G3STA. There were also continuation articles on H. T. Kitchen's 'Trace Doubler' and R. Leyland's series on oscillator circuits.

All in all, it was an interesting issue for someone like me who was fairly new to the hobby. I then bought the next couple of issues with the other two booklets in the series on transistor circuits, and testing transistor and valve circuits.

The July issue had a constructional article on a 'Grid Dip Oscillator'. This was a genuine g.d.o., as it used a 6C4 triode valve and measured 6 x 4 x 2in with a separate power supply.

Having decided that I only wanted the booklets, I didn't get the August issue. But for some reason I got the September issue and continued buying *PW* for another three years.

Receiver

In those three years, there were many articles worthy of note. They included a 'TRF Communications Receiver' in October 1966 and a 'Medium Wave DX Loop' in the November issue.

In the December issue, in the article on 'Getting Your Ticket', I had circled one of the four conditions for getting an amateur licence (I satisfied the age limit). The annual Amateur licence fee was only £2 back in 1966!

In 1967 there was an item on 'Future Broadcasting Plans'. These included the financing of the BBC, which would continue from the TV and radio licences. The cost was then £5 for TV and radio, £1-5s (£1.25p) for radio only.

Although a fourth television service was suggested in a government White Paper, it was low in the order of priorities. The two v.h.f. 405 line channels still had to make the switch to u.h.f., 625 lines and colour.

The *PW* article said that during 1967, colour transmissions would start on BBC2. There was to be a supplementary licence fee of £5 for those viewers with colour receivers. (The BBC2 service had started three years earlier on u.h.f. only, with 625-line standard transmissions).

Domestic

On radio, the BBC had three domestic services. They were the Light Programme, the Home Service and the Third Programme.

Practical Wireless reported that it was the BBC's intention to start a 'pop' music service on the medium wavelength of 247 metres, in response to the pirate radio stations. This happened on 30 September 1967 when Radios 1, 2, 3 and 4 came into being.

On the subject of local radio, the proposal was to locate such services on v.h.f. only without any advertising. How things have changed!

A 'Modulated Light Transmitter' featured in the April 1967 issue 'Experimenters Corner'. I built this project and it formed part of a display at school. The transmitter used a neon in the transmitter and an ORP12 light dependent resistor in the receiver.

There was another free gift in that issue. This time it was a flexible record, with the sound effects of fault symptoms. It accompanied the first article in a series of six by Gordon J. King and H.W. Hellyer on repairing radio sets.

In July 1967 there was radio project using ceramic i.f. filters (Transfilters). New ground was then broken in the December issue, when the first use of an integrated circuit (the CA3014) in *PW* was employed as the i.f. of a v.h.f. Band II f.m. tuner.

Not all the constructional articles were for radios, although there was at least one receiver in each issue. For example, the March 1968 issue featured the Rhodian tape recorder, which used valves.

Fault Locator

In the January 1968 issue there was an intermittent fault locator. It used 25 valves, the author considering that as most of the intermittent faults were on transistor equipment, he didn't want the test equipment to suffer from the same problems!

The same issue had the start of a series on the construction of the 'Clubman' step-by-step general purpose receiver. It was by John Thornton-Lawrence GW3JGA, and was the first I believe of many articles he wrote for *PW*.

This series ran until July, starting with a simple receiver with a reflexed i.f. stage. It ended with six variations including a direction-finding version, a car radio, a full superhet with and without r.f. stages and a version with a loudspeaker.

Later, when I went to university I met John, and apart from being most helpful to me with printed circuit board design, he introduced me to the British Amateur Television Club (BATC). He was always willing to give advice on most aspects of radio and electronics, and writing articles for magazines.

Solid State

For the magazine, 1969 started with a series celebrating 21 years of the solid state. More articles were appearing using integrated circuits.

Valves were slowly disappearing, and there appeared to be a bias towards audio equipment. There was even a 'Pedal Steel Guitar' design, published in November 1969.

I stopped buying *PW* in December 1969 as my electronic interests were tending away from radio. Despite this, that December issue of *PW* had an interesting item in the 'News and Comment' section from a railwayman trying to form a radio club for railway workers.

Who was that man? It was none other than the current editor of *PW* Rob Mannion G3XFD. I wonder if he did get a club established? (Unfortunately, my attempts to start a local club in Hampshire failed, but the British Rail Amateur Radio Society formed several years before is still going strongly **Editor**).

Adverts

There were many interesting items in those earlier *PWs*. The adverts I found particularly fascinating.

There was an advert in every issue from Sinclair Radionics. How many of you remember the Micro-6, the Micromatic, Micro-FM, Z12 amplifier, Q14 loudspeaker, IC10 integrated circuit, Z30 amplifier and Stereo Sixty pre-amp?

Surplus services equipment still featured in many adverts, as did many famous names, now only memories. Valves were readily available, as were germanium transistors. Gradually however, more expensive silicon transistors were slowly creeping in, together with the occasional integrated circuit.

Constructional

Each issue averaged about six constructional projects, at least one being a radio receiver. Many of the projects used valves, especially in the early issues.

Transistors, mainly germanium



Keith and his son, 18 month-old David, who is showing evidence of 'itchy' finger already. Keith's worried look is explained by his comment "David is into everything". Perhaps there's a future AMTOR or RTTY fan in the making!

pnp types (remember the old OC44/45 and OC71/72?), were becoming more evident as were integrated circuits. Power supplies for the smaller valve projects usually used air-cooled half-wave metal rectifiers (the types that used large metal cooling fins), and transistor circuits that usually ran from a 9V battery.

The constructional techniques ranged from a full blown metal chassis, which was more or less compulsory with valve circuits. Other projects used empty tobacco tins and Paxolin boards, with components interconnected with tinned copper wire to 0.15in Veroboard.

One article, published in 1967 using 0.1in Veroboard with instructions to take care as it wasn't the 'normal' size of Veroboard. There were some printed circuit designs, but you had to make them yourself.

Each project using a p.c.b. usually had full instructions on how to make the board from copper clad board, ferric chloride and assorted resist materials. I remember making up several p.c.b.s using these methods. I even made a machine using Meccano parts, to agitate the board during etching.

Tennis Game

I started reading *PW* again in 1974, as the July issue featured Mike Hughes 'Tele-Tennis' electronic game. This was based on similar games that had appeared in pubs and clubs.

I didn't build the project, but was interested in the circuit techniques used. There was a wider mix of projects in the magazine than five years before. There were fewer valve circuits and more projects using i.c.s, but there was still at least one radio-related project every month.

Larger Size

In September 1977 the magazine changed to a larger size. It featured a series co-written by John Lawrence GW3JGA, on how to pass the RAE. This proved to be a useful series for me a couple of years later.

Along with the change of size,

there was a relocation for the *PW* offices from London to Poole in Dorset. By then my interest in radio was being re-awakened.

Aided by John Lawrence's RAE series, I took the first of the new style examination in 1979. I passed and became G8TKW in October of that year.

The magazine's coverage were changing as the November 1980 cover showed. It clearly stated it was 'for the radio enthusiast' rather than being a radio, electronics, instruments and audio magazine.

So, in future *PW* would only publish radio and related topics. The more generalised electronics items were to be published by the (then) sister magazine *Practical Electronics*.

Notable Projects

There were several notable projects over the next few years. These included the *PW* 'Exe Microwave Transceiver' (June 1981), 'The Marchwood 30A Power Supply' (June 1983) and 'The Meon 50MHz Transverter' (October 1985).

Other dramatic changes took place. From the March 1986 issue, the ownership of the magazine changed from IPC Magazines to *PW* Publishing. *Practical Electronics* also changed hands at the same time.

The 1980s ended and the 1990s began with a new look, colour, and a new editor. The new editor was Rob Mannion G3XFD, who had written to *PW* all those years ago in 1969.

So, what has changed about *Practical Wireless* in the 26 years since I started reading it? The answer is quite a lot.

Nowadays, virtually every constructional article is based around semiconductors, usually involving i.c.s. Printed circuit boards are readily available for most projects, and the old tobacco tin projects have all but disappeared.

The adverts are totally different, being mainly for ready-made equipment. It would appear that there are fewer shops selling components.

Reliability

Equipment has benefited from the use of integrated circuits. It is now able to provide more functions, greater reliability and is cheaper in real terms.

Equipment reviews feature regularly, much more than they did back in the 1960s. There are fewer constructional articles now, generally one or two per issue.

Does this trend mean there are fewer people building equipment? Or is it just that it's easier to go out and buy the latest transceiver, etc., off-the-shelf or do we have less leisure time to devote to such pastimes?

Perhaps it's a combination of all the factors I've mentioned. I still think there's room for the home constructor though. This is proved by the articles on QRP, where it's difficult to obtain ready-built equipment.

There's definitely a certain thrill in building something yourself and getting it to work. To me, that's half the pleasure of building it yourself!

Morse Test

I passed the Morse test in 1983, obtaining the callsign G4UKW in August of that year. Unfortunately, that seemed to be the start of a series of events meaning I wouldn't be able to make best use of the callsign.

I changed my job, and I had to move house shortly after getting my A licence, moving to the midlands from North Wales. That meant buying a house with all the associated costs, having previously been in rented accommodation.

It was my intention to put up a few antennas in the new house, but there were other more pressing demands for my hard earned cash! Then I got married, and now with two young children I have even less time for any pastime, let alone radio!

Nowadays, the spare bedroom, once the radio room in my bachelor days, is used for its intended purpose. Most of my radio gear is packed away, and the log book has had no entries for three years.

Back On Air

One day I'll get my radio room back, and have the time to get back on the air. It's possible I'll try some of the newer aspects of amateur radio.

I would like to try packet radio, linking my computer to the radio. But as a complete contrast, I would also like to build something from the early days of my interest in radio, perhaps something really nostalgic, like a valved receiver.

Just a simple long and medium wave superhet, with not a semiconductor in sight. I've got most of the components except the antenna and oscillator coils. I can still dream, and I'll still buy *PW*.

The Man Behind it All - F. J. Camm

As *Practical Wireless* is celebrating its 60 years of publication, Joan Ham takes the opportunity to look at the man behind it all, F. J. Camm, his work and the legacy we're still reading today.

Ask anyone familiar with technical publications about F. J. Camm, and the response is immediate. 'Oh yes! Camm's Comics'. Ask who he was, or what's actually known about him, and it's unlikely that there will be any further information, not even his first names.

The name Camm is the one everyone knows about, until further details are wanted. This was a challenge to someone who spends days every week at the county record office, so I started to dig!

Second Son

Frederick James Camm was born on 6 October 1895, the second son of Frederick William Camm and his wife Mary (nee Smith) at 10 Alma Road, Windsor. His father was a carpenter and joiner.

In the next 20 years, ten more children were born. One of the youngest sisters (aged 82) was still living there in 1986. She entertained the mayor, the local press and others when a blue plaque was unveiled, but it wasn't in memory of F.J., but to his brother Sidney.

Aircraft Designer

The first son born to Mr and Mrs Camm in 1893, was Sidney, later to earn fame and a knighthood as an aircraft designer for Hawker Siddeley. Among his many superb aircraft were the *Hurricane* and the *Harrier*.

Sidney's career spanned aircraft history from stringbags to jets. This, however, is the story of his younger brother Frederick.

The boys of the Camm family included Sidney, Frederick, Charles, Ernest, George, Jack and Percy. They were born between 1895 and 1912.

The boys began their school life at Holy Trinity Infants' School. They then continued, when about eight years of age, into the Royal Free School in Windsor.



Oldest School

The Royal Free School was the town's oldest, taking in pupils of mixed scholastic abilities. Both Sidney and Frederick stayed until they were 15 years old. They distinguished themselves at the school.

Sidney outstripped his teachers so much, that the headmaster told Mrs Camm that there was nothing more he could teach him in mathematics! Frederick showed early promise as a fine draughtsman, a factor which was to have considerable effect on his career.

Sidney became fascinated with aircraft, and whittled away at models during school breaks. Frederick was a fine model engineer, and he made superb models for which he gained prizes.

Exquisitely Detailed

In 1989, two of Frederick Camm's exquisitely detailed models were sold at auction in London. One model was a one-eighth scale 1895 Werner motorised cycle, with the paintwork beautifully lined.

Even a kit of parts could look out of the ordinary when assembled and finished by Frederick Camm. When Bassett-Lowke Ltd., introduced a three-quarter inch scale Burrell type traction engine into their catalogue, he built one.

The beautifully finished model was purchased in 1989 by the Princess Margaret Royal Free School in Windsor. The late George Camm was a leading member of the Old Pupils

Association. All three models were part of George's estate.

Aircraft Interest

Frederick shared an interest in aircraft with Sidney. They were soon taking orders for model aeroplanes from boys attending the nearby Eton School.

It was during their schooldays that Sidney and his brother started the Windsor Model Aeroplane Club, of which he was secretary. When he left, Frederick took over from him.

There are photographs in the Royal Borough Collection, Royal Borough of Windsor, and Maidenhead and the Berkshire Record Office. These show members in their workshop in Arthur Road, and some show what appears to be various construction stages of a full-sized 'box-kite' biplane.

Frederick never lost his interest in aeroplanes, and was even to use the names *Fury*, *Hurricane* and *Air Hawk* for some of his future radio designs. I'm wondering if these names were originally given to some of the Windsor models? Both F.J. and Sidney used them in their separate fields of technology.

Practical Skills

Frederick Camm left school in 1910 equipped with considerable practical skills. He was able to construct things, and draw well.

He also had a keen interest in the fascinating world of mechanical and engineering developments. This included the first exciting squeaks and crackles of wireless.

In 1906, crystal detectors had arrived, replacing the coherer. Fleming had then been making diode valves for two years. In the following year, De Forest filed a patent for his Audion valve, which added the grid to Fleming's two-electrode valve.

At that time enthusiasts could tune in time signals, shipping and

experimental transmissions. Other enthusiasts read out stock market prices and similar verbal noise to test their equipment, but there was little else to hear.

Arrest Of Crippen

In the year that young Frederick Camm left school, the country was thrilled by the arrest of Dr Crippen. The arrest was achieved with the help of wireless communication.

In 1912, the world was grieving over the loss of the mighty *Titanic*. The liner on its maiden voyage, broadcast the urgent Morse signals 'CQD CQD' and the then recently introduced and internationally-understood - SOS SOS.

There can be no doubt that the dramatic events drew attention to the interesting possibilities of the new science of wireless. I'm also sure that the young Frederick, with his interest in the mechanical and scientific world would have followed such current events avidly.

Little Information

There's little information from the early years of Frederick's working life. However, he was later described by George Newnes as a practical mechanical and electrical engineer with unrivalled experience in the design and construction of radio receivers.

Frederick, when writing a rare retrospective in 1953, claimed to be "an engineer by education and training" without specifying exactly what training. He also mentioned that he had been asked to "witness highly technical demonstrations which would not be comprehended by the usual non-technical journalist".

He was one of the earliest radio journalists, and was employed by Pitmans where Edward Molloy was also working. After the introduction of 2LO in 1922, there was one regular wireless magazine.

Amongst the wave of enthusiasm surrounding early wireless building, publishers saw a market and two popular magazines appeared. These magazines were followed in the next two years by others like butterflies on the first warm day of summer.

As Frederick Camm said "Any man who built a crystal set became an acknowledged expert." And it can be truly said that Camm himself helped many to become experts in this way.

George Newnes

In 1929, Edward Molloy left Pitman's for George Newnes. He later became the General Editor of the Technical Books Department, and helped Frederick to get a job there.

Frederick became editor of *Hobbies*, a weekly publication for keen 'do it yourself' enthusiasts. By popular demand, he started a regular feature in the magazine called the *Practical Wireless Supplement*.

other magazines and were often disappointing for a variety of reasons.

The new magazine would produce practical designs which readers could build with confidence. They could be sure, because every component would be the exact make and specification as the prototype.

A free advice bureau in the magazine would answer queries. This was because Frederick Camm believed that every reader who built his designs, was entitled to

good idea of the scope of its editor's personal interests and expertise, and included: 'Television Made Easy' and 'Building a 15cc Model Two-Stroke Petrol Engine'.

There were also 'Chemical Experiments with Selenium', 'Building A Fine Model Speedboat', 'A Home-Made Relay', 'Model Electric Railways'. For the radio builder there was 'The Monarch Two-Valver, and for the modeller 'Electric Lighting For Models.

Other interests were reflected



The Windsor Model Aeroplane Club's workshop. Sidney Camm on the right.

Above: F. J. Camm (far left) and brother Sidney (third from left) with members of the Windsor Model Aeroplane Club in 1912.

The response from readers soon made it clear that a separate weekly wireless magazine was needed. And this would have to be launched against the established 11 weeklies and eight monthly publications available at that time!

So, we now come to the era of *Practical Wireless* magazine. Frederick J. Camm edited *PW* and he was the magazine. His life, and the story of the magazine are inseparable.

Practical Wireless 1932-1992

The Idea is Born

So, the idea for the new magazine was born. It was no lightly-undertaken venture, but the result of listening to readers, the manufacturers and some publishing research.

A new editorial policy was formulated. The new approach took into account that new set designs appeared like confetti in

the same service that they would get if it was bought off the shelf.

Every project was tested before it went into print. The various manufacturers were also encouraged to improve and produce new components.

Group Of Practicals

Frederick Camm was to say of himself, "I suffer the penalty of versatility. My interests have always been wide".

Perhaps this was true, as he was eventually editor of a whole group of 'Practicals'. They included *Practical Householder*, *Practical Engineering*, *Practical Mechanics*, *Practical Motorist* and *Home Mechanics*.

The magazines were produced on the 5th floor of Tower House in The Strand. This was where Newnes technical department, and his own offices were known to other employees as 'Mr Camm's Department'.

The April issue of *Practical Mechanics* 1935 gives a very

by 'Facts About Aircraft', 'Scale Model High Speed *Fury*', and 'Plastic Mouldings'. And, not forgetting the engineering side there were articles on 'Latest Tools', 'Patent Advice', 'Escalators and How They Work' and 'Industries under the Sea'.

The Practical Wireless Story.

Practical Wireless, now proudly notching up its Diamond Jubilee first appeared in 1932. Number 1, Volume 1, was published on September 24 by George Newnes, priced 3d (1.25p) and consisted of 68 pages.

The magazine cover, printed in red and blue, advertised "the very latest for the home constructor" with a chassis picture of the Long-range Express Three and a listener tuning the set in its elegant church-window style cabinet. The chassis of the 'Long Range Three' was itself an innovation. It avoided the usual 'breadboard' construction, and presented a professional finish.

Free Design

The cover headline offered a free blueprint design for the Long Range Three, and the foot of the page advertised Pilot Author kits. There was another free offer,

consisting of a presentation volume of Newnes *Wireless Constructor's Encyclopaedia*, valued at 8/6 (42.5p).

To obtain the free book, the reader had to order the magazine weekly. They also had to send to *PW* for a subscription voucher.

The voucher had to carry 13 gift stamps cut from the back cover of 13 consecutive *PWs*. This, plus a postal order for 2/4 (almost 12p) was sent to cover registration, postage, packing and insurance to receive the encyclopaedia. Another free book, *All About Tuning and Tuning Coils*, was promised the following week.

Over 60 000 readers took up

did not result in useful dedicated handbooks. F. J. Camm wrote handbooks on circuits, short-wave, superhet receivers, coils chokes and transformers, wireless transmission, television and others.

The wireless encyclopaedias were characterised by simple easily-understood explanations of every relevant theory and stage of construction. The components, design and methods of work were printed in a large and legible typeface right across the page.

The books were illustrated by superbly clear line drawings. The drawings were so good, it was possible to see in the black and white, whether an object was

stations including KSL at Salt Lake City.

Also mentioned was an Egyptian Government contract, placed with an Italian company for a transmitter at Alexandria. That was the '*World of Wireless*' as *PW* was born.

Receivers Reviewed

Receivers reviewed and described in the first issue, were the Lissen Skyscraper, (a kit set), The Dolphin Straight Three. This was reviewed by F.J. Camm himself, and he described it as a splendid economy receiver,

cheaply constructed and extremely selective.

The Long-range Express Three and The Lotus Bud began a weekly feature of sets "tested on our aerial". The technical staff of *Practical Wireless* were then H. J. Barton Chapple, Frank Preston, W. B. Richardson and W. J. Delaney, the sub-editor who was to hold this position for many years.

The editorial offices were equipped with a laboratory, in which components and sets could be tested and appraised. A page headed 'My favourite circuit' was compiled from the editorial staff contributions.

Frank Preston, as an experimenter and designer, opted for a "well-known detector and two l.f. type of circuit". W. J. Delaney wrote of his home receiver that (he was a musician) "it must have adequate volume and above-reproach quality".

The circuit mentioned by Delaney was a three-stage screened-grid, detector and output stage circuit. Incidentally, his love of music was passed on, as William Delaney's son is the drummer and bandleader Eric Delaney!

The favourite circuit of H. J. Barton Chapple, having designed a great many sets himself, was

difficult to choose. However, in the end he described a four-valved circuit which was simple to operate, and could be used by "any member of the family".

Editor's Choice

The editor's choice was straightforward. F.J. Camm pointed out that you could not have everything, an improvement to one part of the circuit led to complications in another.

But in the spirit of the question, he opted for a detector with leaky grid rectification. This was followed by two l.f. amplification stages, on the basis that it was an all round simple circuit.

Camm's choice was also easy to construct and operate for non-technical amateurs. And that was how readers of the first *PW* were introduced to its experts, and their attitudes and approach to wireless.

By November of that year, *PW* had published an eight-page photogravure supplement by H. J. Barton-Chapple, the eminent set designer. It featured The Argus Three and this could be purchased as a kit from Direct Radio for £8.13.0d, complete with three valves and cabinet, or for £5.2.6d without.

Data Sheets

In the following month, the magazine began printing 'Data Sheets' on single subjects. These covered subjects such as accumulators, mains transformers, coils, etc. This was continued weekly, building into a reference file, for which a binder was offered.



Practical Wireless arrives on the scene, complete with the first of many receiver designs.

the encyclopaedia offer, and its popularity caused it to be reprinted by the *News Chronicle*. In fact, *The Wireless Constructor's Encyclopaedia* was the first of its kind.

Best Seller

As expected, *The News Chronicle Wireless Constructor's Encyclopaedia* was also a best-seller. It was purchased by 58 000 readers of the newspaper. In fact, a second edition sold out in five months, and it rapidly went to even more editions.

By the time edition three was on sale, (1934) it had been joined by *Everyman's Wireless Book*. The author said in his foreword that the book was "a companion volume to, and uniform in size and binding with my *Wireless Constructors' Encyclopaedia* and my *Encyclopaedia of Modern Mechanics*".

Dedicated Handbooks

In the field of radio alone, there were very few subjects which

made of metal, wood, glass or Bakelite.

In the layout of pages, the books were extremely readable and aesthetically pleasing. They made use of 'flow-round' text broken up with framed pages, assembling story-boards on specific topics.

Camm's Comics

The same popular format, as used in the encyclopaedias undoubtedly gave rise to the collective title of 'Camm's Comics'. The term is not derogatory, and is paying tribute to the the visually-appealing layout.

The magazine promised to keep its readers informed of new developments. They also intended to dispense with highly technical terms where simple descriptions would serve. In the years that followed, these promises were kept.

The editorial pages were completed with reports of tests of the new transmitter of Radio Luxembourg on 1275 metres. The news also mentioned several new high-power North American



F. J. Camm's receiver designs were very popular and successful.

The style, policies and standards being set, *PW* and its editor rapidly said they were there to give readers a real service. It was no idle boast.

January 1933 began with Frank Preston introducing the Selectone battery receiver. By the end of the some month, F.J. Camm's specially designed four-



F. J. Camm was always looking to expand the 'Practical' group. *Practical Television* started within *PW* as a regular series.

valved Fury Four receiver was available to readers.

The receiver was cheap, easy to build and simple to operate. Moreover, F. J. published a signed personal guarantee. This stated that if these claims were not met, every reader could have his personal advice free of charge until the set functioned as claimed.

Peto-Scott made up Pilot Author Kits, comprising of components exactly to F. J. Camm's specifications. These were supplied for £6.10s, or 12 monthly payments of 12/- (60p).

Any part would be supplied separately, and each kit carried the same author's guarantee. The blueprint, which sold for 1/- (5p) was given free with the next week's *PW*. Camm went even further, by staging official demonstrations of the Fury Four daily at 159 Borough High Street, London S.E.1.

Birthday Tool Box

Practical Wireless celebrated its first birthday by having a pocket tool box, the size of a cigarette case, made and fitted with beautifully made tools. It was offered free to every reader, and I'm pleased to say that there's one of these tool kits in the Chalk Pits Museum.

The tradition of new receivers specially designed for *PW* readers continued. In December 1934, F. J. announced his "momentous achievement", which was a three-valved battery superhet for £5.

He announced "Readers of this paper know, that I take a personal interest in every receiver built from my designs, and that I guarantee them when constructed according

to my instructions and when the components which I specify are used.

"So enthusiastic am I, however, over the £5 Superhet Three which I regard as my greatest success, that I propose to accentuate the guarantee I have formerly issued. Obviously my time is limited, and it would be impossible for me to visit every reader of this paper, but it will give me great pleasure, as time permits, to demonstrate the £5 Superhet Three in various districts.

I suggest that readers in various districts who wish me to demonstrate the receiver should get together and make such local arrangements, as will enable me to

demonstrate it to a number of them on a particular evening".

So the master himself spoke. That was to be his approach to the end.

Amalgamation

By 1934, one of the competing wireless journals was showing the strain. *Amateur Wireless*, published by Cassell and Company, was a magazine which had grown out of *Everyday Science* - edited by F. J. Camm.

The answer was amalgamation, and *Practical Wireless* became *Practical and Amateur Wireless* (for the same cover price of 3d). By the following year, *PW* incorporated *Practical Television*.

The next year, 1935, was the King's Silver Jubilee. Appropriately, F. J.'s editorial noted that it had been 25 years packed with scientific and mechanical achievement.

True to form, he published another fine design to celebrate the event. This time it was The All-Wave Silver Souvenir, and this receiver covered long, medium and short wave bands.

Ceased Publication

In 1938, the last of the *Practical Wireless* competitors ceased publication. In that same year, the last of Camm's pre-war designs was published with the descriptive title of the Push-Button Four.

The October 29 issue carried the designer's photograph on the front cover, with a picture of the receiver out of its cabinet. The

constructional details were completed from the previous week.

This period marked the end of the happy pre-war *PW*, with its free offers, new wireless designs and kits. The eager reports of the latest news from the world of wireless, television, amateur activities and everything associated with the 1930s passed with the decade itself.

War Shortages

When the war came, it began to bite very quickly. Before it was a few months old, Britain felt the shortages of everything that had to run the gauntlet of the U-boats.

In common with other publications, *PW* was chronically short of paper. Eventually the magazine was slimmed down to half of its pages.

In 1940 W. J. Delaney wrote about a radiogram, but was obliged to apologise for shortages of components and materials. War shortages meant that parts of the radiogram chassis had been designed to be made in plywood instead of metal.

In 1941 things were even worse, and F. J. was battling against overwhelming difficulties. The magazine began to appear monthly instead of weekly, and cost 6d (2.5p).

War News

The editorials of the war years were concerned largely with war news. F. J. pointed out that his famous handbooks were even more of a boon now that 'make do and mend' was the order of the day.

Wartime issues carried 'Active Service Lists' of radio engineers and allied skills in the forces. There were adverts for wireless enthusiasts to join the RAF for interesting jobs.

One particularly intriguing advert, asked for women with physics skills or degrees to join the WAAFS for 'confidential' work. The advertisement said that applicants had to "be prepared to go anywhere, home or abroad".

Staff Shortages

There were other signs of war. The magazine didn't escape staff shortages, and the names of H. J. Barton, Chapple and W. J. Delaney disappeared.

At that time, F. J. was producing his magazine with the help of Frank Preston and L.O. Sparks (Could this have been a pseudonym for whoever was available?). Eventually, even these

names were no longer printed as staff.

The year 1944 saw *PW* in its 12th year of issue, but it had little to celebrate other than its continuity against the odds. The 44-page monthly magazine was reduced in format from 8.5 x 11.5in to 6.5 x 9in, and the price increased to 9d (3.75p).

The front cover of the July issue showed two RAF radio operators wearing headphones, listening to signals from their 1082 sets. The editor was already looking forward to the post-war world of radio. One advantage was that there would be no shortage of government-trained engineers!

Post-War Problems

The immediate post-war years brought little comfort. The shortages were just as severe. Although Camm did not stop designing, components and materials were not available to build new sets.

Some interesting articles published in those years included reports on German wartime equipment such as the JU88 wireless operator's gear. There were also mouth-watering adverts for such ex-government equipment as a brand-new T1154 transmitter for just over £10, Air Ministry voltmeters at 19/11 (£1) and ammeters at 17/6 (87.5p).

The BBC was reported to be testing 200 brunettes for the two TV announcing posts offered. By July of that year, planning for the new TV service included two full-length plays, and a magazine programme called *Picture Page* together with outside broadcasts.

Camm On TV

In December, F. J. Camm himself appeared on TV, in *Picture Page*, demonstrating his invention of an automatic cycle tyre pump. A photograph naturally appeared in *PW*!

Britain in 1947 was still in the grip of post-war shortages and problems. New designs, although F. J. assured readers that he had some on the stocks, were still not published.

Radio clubs were reviving, and their reports were invited for publication. They soon arrived, and G5BY was the first to hear W1HDQ on 50MHz across the Atlantic during an F2 event.

The name of W. J. Delaney made a welcome appearance in the magazine over an article on 'The Electronic Organ'. There was also a feature on recording with

the new magnetic tapes, and *PW* published a list of BBC transmitters.

August brought a most eagerly-awaited announcement of the first post-war Radiolympia. The *Practical Wireless* stand was 239 on the ground floor, where readers could see a full range of the famous blueprints and technical books.

The noticeable thing about the slim post-war *PWs* was their lack of photographs. There were usually one or two in the 'World of Wireless' round-up which followed the editorial, but the rest of the magazine was illustrated with line drawings.

Government Surplus

The big source of supply for home constructors and the radio trade alike, was the government surplus market. Articles appeared on surplus gear, using famous sets like the ex-RAF TR9, the R1155, WS18 and others.

Adverts offered an ex-RAF TR9 for £6, or a B2 (suitcase Spy set) new and unused for £9 plus 5/- (25p) carriage. An American SCR625 mine detector was offered complete for £10.10s.0d (£10.50) for "treasure hunting, pipe tracing, detecting metal in trees before sawing into them", etc.

Delaney's name reappeared in the magazine as a regular TV writer, and 1948 was the year that Britain staged the Olympic Games. The magazine reported that the events at the Empire Pool were televised with great success by the BBC.

Television Expands

Things began to look up a little. More photographs appeared in *PW*. By July 1948, there was an increased allocation of paper, allowing more magazines to be printed.

Practical Television reappeared on the cover, with a separate section inside. The 16th Radiolympia approached, and television was making up a large part of the interest.

Stand 100 at Radiolympia was advertised in the October 1949 issue. This is where readers could see the full range of technical books, the technical staff and Mr F. J. Camm.

A design for a *Practical Wireless* television receiver was demonstrated at Olympia. It used ex-government EF50 valves, and was featured over several issues.

By April, *Practical Television* was off the cover again. Inside

PW, a notice announced the launch of the title as a companion journal. Television had become too big for a few pages in a wireless magazine.

Issue number one of the new journal was published on March 24. It was the first new title to appear, and it did so only 24 days after the end of paper rationing.

Successful PW Televisor

The 1950 Show at Castle Bromwich, Birmingham, proved the enormous success of the *PW* Televisor. Although the BBC predicted that only 4000 people would be interested, *PW* proved that nearer 50 000 were building and experimenting with TV.

Miniaturisation was in the news, as the Americans had produced a matchbox-sized radio, with the circuit and resistors painted on a small square of ceramic with silver oxide. In the UK, the BBC's experimental v.h.f. transmissions began from Wrotham in Kent.

It was 50 years since Marconi bridged the Atlantic with a wireless signal. F.J. pointed this out in his editorial, and the fact that the first Radio Show had been held in 1922.

First Transistor Project

Another page featured a chocolate bar-sized experimental crystal valve receiver. It was using the new GEC germanium triode developed from the diode. The magazine had seen its first transistor project.

Early in 1952, *PW* was able to offer the first free blueprint since 1939. It was of the Mini Four battery portable, a neat little set measuring 6.5 x 5 x 3in. Its great popularity was assured, because Britain was once again plunged into austerity and power cuts.

A noticeable omission from the pages of *PW* since the war had been F. J. Camm. His name appeared as editor, and the editorials carried his initials, but no designs or articles had his by-line.

Even if Camm was not putting his name to articles during those years, his books came from the presses of George Newnes in a steady stream. *The New Practical Wireless Encyclopaedia* (12th edition) was published at 21/- (£1.05p) and over 300 000 copies were sold.

The Mini Four portable design had produced enormous demand. The free blueprint sold out on publication day, in spite of an

increased print run. The blueprint and constructional details were reprinted and sold at 1/- (5p) to meet demand.

The next new design was the Three-speed Autogram. Another project came from W. J. Delaney, who published a new electronic organ using six valves and one loudspeaker.

New Medium

The arrival of 1953 was a milestone for Britain and *PW*. The year was a morale-boosting anticipation of the coronation of H.M. Queen Elizabeth II. There was also the new medium of television to broadcast the event to the millions who could not be in London.

Television sales boomed and true to tradition, a special new *PW* receiver was promised. The magazine reported and reviewed transistors, valveless radio and TV. It looked at printed circuits and transformer windings, printed like sheets of stamps which were assembled by folding one over another.

Frederick Camm then made a rare reappearance as a journalist with a new series of articles entitled 'Beginners' Guide To Radio'. It was a return to the early days, with his ultra-simple explanations, clear drawings and projects that were enticingly easy.

Camm's Comment

During the Coronation, F. J. had watched the television outside broadcasts all through the day in the *PW* laboratory. He was looking, he said, not for the programme contents but for technical failures.

As honest with praise as he was with brickbats, he declared that there were no technical

failures. The day was the finest BBC achievement ever, and the outside broadcast department deserved the very highest praise.

Hardly had the excitement of the Coronation died away, than *PW* itself was plunged into its own great celebrations. October saw the publication of the 96-page 21st birthday number.

It was time to review the past and look forward to the future.

There was a full-size blueprint of F. J. Camm's Coronet A.C. Four free with every issue. The first of the constructional articles accompanied the blueprint.

Frederick Camm's editorial was headed by a banner proclaiming the occasion. Appropriately enough, it was surrounded by a festive border of tiny wireless components and signal traces.

Manufacturers sent good wishes, some of whom had advertised since the early days. Sir Ian Jacob, Director-General of the BBC, sent his greetings, and F. J. wrote of the 21 years of *PW* progress.

Praising Loyal Staff

The editor also told of his 21 years as editor, praising his loyal staff. Camm also acknowledged the support and encouragement which he had always received from his publishers, George Newnes.

There was special praise for his assistant, W. J. Delaney and his advertising manager R. D. Young. It turned out to be a unique insight into the life of this elusive man.

Camm estimated that he had written over 21 000 000 words, probably far more, in articles and books. "I have shunned delight and lived laborious days, but they have been pleasant days".



The cover of the *PW* 21st Birthday issue.

F. J. continued, "I have made a hobby of work. I believe in it and I do not like holidays. I believe that the best of all ways to lengthen your days is to steal a few hours from the night".

How Camm Worked

He had unquenchable enthusiasm, and did not employ 'ghost' writers. Everything that carried his name was written by him.

Camm's work wasn't done with pencil and paper, it was dictated. He also reported that the work "is typed as I talk".

In practice, it was taken down in shorthand, and recorded on tape and wire. As shorthand couldn't record mathematics, it was then back to pencil and paper.

In 21 years he had produced over 80 books. Many had run through several editions, and were still in print and translated into other languages. In typical manner, his article ended, "And now back to my desk! F. J. C."

The year ended with *PW* celebrating the jubilee of the valve, the world's biggest radio telescope at the Carnegie Institute, Washington, and the publication of the *PW* Tape Recorder. The year 1955 saw the magazine in full colour covers and a new

handbook was published - *Practical TV Circuits* at 15/- (75p).

The Film Show

The *PW* film show became an institution. It began when F. J. saw the Mullard film, made for the trade, on the manufacturing of valves.

Camm found it so fascinating, that he persuaded Mullard to put on an evening show for readers and radio amateurs at Caxton Hall. He was in the chair, with a director of Mullard introducing the film.

The hall was packed to capacity. But even then, some people who turned up without tickets were found standing room!

The magazine reported that a spokesman from RCA stated that sunspots improved communications. It also featured Project Vanguard, the American contribution to the International Geophysical Year, seeking satellite observations from amateurs world-wide.

Sixth form boys at St Albans were reported as building a computer five feet tall, valued at £75. And perhaps the most exciting of all, was the news that Russia had launched the first artificial earth satellite.

Camm had just the right comment. His editorial read, "The advantages which must follow

from the launching of this satellite must benefit radio science".

Every New Development

Frederick Camm loved his work. He followed every new development with lively enthusiasm.

Camm had kept faith with the promise made in the first *PW*, to inform readers of the latest in scientific advances. He held strong opinions, and believed in stating them in plain language.

He actively encouraged building and experimentation. Camm also believed strongly in good training. During the war when publishing was so difficult, he used the magazine and his books to train radio operators, mechanics and allied trades ready for the forces.

Camm seemed to be living in his office. He was often to be found there on a Saturday, when the rest of George Newnes was closed. It was nothing unusual for him to still be working on Sunday.

Editorial Announcement

One weekend early in 1959, he was taken ill in his office. The May issue of *PW* missed his name from the cover of the magazine for the first time in 27 years. A small

box in the centre of the editorial page carried an announcement in heavy black print.

The announcement said: "It is with deepest regret that we have to inform readers of the sudden death of our Editor, Mr F. J. Camm. For many years, Mr Camm's name has been synonymous with the *Practical* Group of journals, of which he was the originator, and the growth of which was largely due to his energetic and enthusiastic editorship".

The editorial continued, "He was one of the first to realise that there was a public demand for practical journals written in non-technical language". He met this demand by producing the *Practical* Group of magazines that made his name a household word. Mr Camm's extensive knowledge as a scientist and engineer enabled him to write many technical books in the engineering and radio field.

So, *Practical Wireless* under F. J. Camm's editorship had reached volume 35, No. 629, which even the Second World War could not interrupt. As was said of Sir Christopher Wren and St Paul's... "If you seek his monument, look around you".

Frederick Camm's monument rests on many bookshelves and reference libraries. He may have passed on, but his creation and ideals live on in the *Practical Wireless* of 1992.

Acknowledgements. I am grateful to the following people and organisations for help in the research: Berkshire County Records Office, Royal Borough Collection, Royal Borough of Maidenhead and Windsor, Mark One Photography, Mr. J. Townend, Mr. T. J. Armitage, Mr. J. Seale and Mr. Gordon Cullingham.

Views From The News 1932-1992

The *PW* team have gathered interesting, funny, puzzling and rather intriguing items published in the news pages over the last 60 years. We hope you enjoy them!

14-Year Old Girl Gets Licence

Fourteen-year-old Elizabeth Allen of Westport, New Zealand, is likely to put every 'pirate' operator in the world to shame, for only two days after her 14th birthday, she received her amateur radio transmitting licence and callsign. This makes Elizabeth the youngest licensed amateur of either sex in her own country, which must be an embarrassing fact for young male aspirants in many countries, but especially so for those in New Zealand.

In fact, it was the volume of letters published for and against the R.A.E. that prompted reader Robert Turnbull of New Zealand to send the Editor the newspaper account of Elizabeth's achievement.

Apparently, amateur radio runs in the Allen family, as both Elizabeth's parents are licensed hams. Now she is continuing the line by building her own transceiver, soon to be on the air under the callsign ZL3AAI.

PW May 1965

Atlantic Lock Out!!!

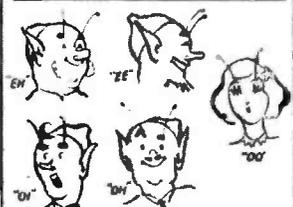
Mr S. Valentine recently wrote to tell us of an amusing incident which occurred when he was doing a bit of S.W. listening one day.

He was tuned in to a QSO between two amateurs - one in the U.S.A. and the other in Scunthorpe. The American asked the 'G3' to "let his wife in as it was raining outside". On hearing this, the Englishman was most astonished and enquired what was going on.

It transpired that the English lady of the house had allowed the door to lock behind her, and not being able to make her husband hear her had contacted one of his pals to get on the air to the American to tell her husband to unlock the door!

PW May 1972

Introducing the "Fluxite" Quins



"EH...EE...OH...OH...OH...OH..."
 "You'd find you can't TALKING
 Oh...when there's soldering to do?"

See that **FLUXITE** is always by you in the house—garage—workshop—in better equipped workshop is needed. A good for 30 years in government work and by leading engineers and scientists. BY PROFESSIONALS—no less. 6d., 3s., 1s. and 2s.

Ask to see the **FLUXITE SMALL-SPAT 4.50S.—DERING SET**—compact but substantial—complete with full instructions, 7s.

70 CYCISTS—Your wheels will NOT keep round and true unless the spokes are kept under the strain of the stresses AND STRETCHED. This makes a much stronger wheel. It's cheap—worth TRYING—see advertisement.

The **FLUXITE GEN** is always ready to get Fluxite on the soldering job instantly. A little pressure places the right quantity in the right spot and one changing leads for steel, Silver, 1s. or Biled 2s.

Write for Free Book on the art of "soft" soldering and ask for Leaflet on **CASE-HARDENING STEEL** and **TEMPERING TOOLS** with **FLUXITE**. **FLUXITE LTD.** (Incorporated in England) WORKS, BERNARD STREET, B.R.L.

FLUXITE
 SIMPLIFIES ALL SOLDERING

The 'Fluxite Quins' were regulars in PW for many years.

Hundreds of motorists who escape to the country each Sunday recently had the eyes of 30 000 people watching for their slightest driving faults. A television camera with a squad of courteous cops took shots of bad driving whilst a police superintendent gave a running commentary on the fault. Jasmine Bligh, the television hostess, was present at the demonstration, which was held at Bignall's Corner, where St. Albans Road crosses the Barnet By-Pass. Our illustration shows Miss Bligh let off with a caution. She is being interviewed by a mobile police officer for careless driving.

PW 18 February 1939



A Young Inventor

Kenneth Cheeseman, with his invention for stopping would-be car thieves. It is operated by a hidden electric switch which, immediately the car thief puts his foot on the accelerator or takes off the brake, causes an electric siren to shriek, illuminates a flashing red light in the headlamps, and thus attracts the attention of police and passers-by.

PW 19 November 1932

Thermion Himself

Upon receipt of a letter from M. A. B. of London, S.W.9, my bosom swells with honest pride, and my cheeks assume the roseate hue associated with those delicate pink roses which decorate drawing rooms, containing ladies drinking pink tea out of small cups with their small fingers stuck out. Mayfair, you know. The cause of this manifestation was the following sentence: "Might I suggest that you give us a photo of 'Thermion' sometime in your valuable paper? I have had your paper since No. 1, and have not seen a photo of our old friend. It would be interesting to see how true or false our imaginations have played us". I cannot believe that any characteristics of your humble Thermion. The benignity of my countenance, the etiolated, even albedifed, hue of my schoolboy cheeks, alas, do not lend themselves to half-tone presentation. My face has lost its captivating smile, my eye its inscrutable twinkle, and I am left in the evening of my days, with a devastating wit which finds expression only through the medium of my fountain-pen. It would be dangerous for my identity to be pierced, for not even the members of the staff of this paper have pierced the mysterious veil of the identity enshrouded by my fifteen-year-old pseudonym. I have persuaded out tame cartoonist, however, to give you a faithful presentation of me in line, and you see the result on this page. I assure you that this is a disgustingly accurate presentation.

PW 9 November 1935



Thermion himself—in person.

Views From The News 1932-1992

What A Bargain!

Famous Maker's Offer! **£5 Radio-Gram CABINET for 65/- SEVEN DAYS' FREE TRIAL (OR 10/- MONTHLY)**
 Polished Oak! and Piano built! The acoustic Tone brings a fine thrill. Makers to **Jadio-Press, B.C., 3,000 clientele**
 Other Models 35/- to £15. Photographs and List **FREE.**
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- Aviation Engineering
- Banking
- Boilers
- Book-keeping, Accountancy and Modern Business Methods
- B.Sc. (Eng.)
- B.Sc. (Estate Management)
- Building, Architecture and Clerk of Works
- Chemistry
- Civil Engineering
- Civil Service
- All Commercial Subjects
- Commercial Art
- Concrete and Structural Engineering
- Draughtsmanship. All branches
- Engineering. All branches, subjects and examinations
- General Education
- Heating and Ventilating
- Insurance
- Mathematics
- Matriculation
- Metallurgy
- Mining. All subjects
- Mining, Electrical Engineering
- Motor Engineering
- Municipal and County Engineers
- Naval Architecture
- Pattern Making
- Police, Special Course
- Preceptors, College of
- Pumps and Pumping Machinery
- Radio Reception
- Road-making and Maintenance
- Salesmanship
- Sanitation
- Secretarial
- Shipbuilding
- Shorthand (Pitman's)
- Structural Engineering
- Surveying
- Teachers of Handicrafts
- Telephony and Telegraphy
- Transport
- Weights and Measures "Insp."
- Wireless Telegraphy and Telephony
- Works Managers

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THE BENNETT COLLEGE LTD.
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This advert appeared regularly in PW in the 1930s.

Moscow's Proposed 'Super' Station

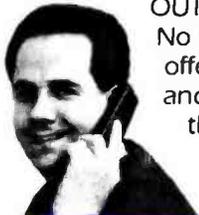
The Soviet authorities who, for several years, have fostered the ambition of possessing the world's largest radio station, are now putting their plans into concrete form. They are constructing a transmitter at Chadinka, which, when completed, will be rated at 2500 kilowatts. So far, no information is available as regards the channel to be used.

PW 12 October 1935

MARTIN LYNCH..

USED EQUIPMENT!!

Lots of new equipment this month, ready to take your trade-ins! I'm still paying top money for your unwanted equipment, either as a part exchange or an **OUTRIGHT PURCHASE.**



No mickey mouse offers, ring me today and I'll quote you on the phone. Whilst on the subject of

USED EQUIPMENT, I still hold the largest stocks in Europe, mostly all on display and offered with a meaningful guarantee. **PHONE FOR YOUR FREE LIST TODAY.** The prices shown below are all recommended retail. When you've decided what you want, contact me and I'll offer you a package deal delivered to your door. If you have been quoted a better price, tell me. If I can match it I will and offer after sales service you can't beat. **Remember, "The bitter taste of poor quality of service remains long after the**

sweet taste of super low price is forgotten."

I'm still across the road from Northfields Underground on the Piccadilly line, (the nearest store to Heathrow by tube), and only a few minutes from the M25/M4/M40 motorways. Don't worry if you can't make it to the shop - the mail order system is superb. Phone with your requirements and generally we despatch the same day. Continue to support your independent retailer - it's the right thing to do! **73 Martin G4HKS**

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! **£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's good - so have dozens of Martin Lynch customers. **£1895.00**



5. **YAESU FT1000** - It's 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 P.S.U., 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. **£1220.00**



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! **£759.00**



3. **ICOM ICW2E** - The milestone and bench mark to which other dual band handles 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**



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



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 splendid for. (Splendid what?). The only handle to offer you dual band RX on both bands, i.e. two frequencies on 2 or 70CM in addition to its dual band TX capabilities. Beats the hell out of me! **£395.00**



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.



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**



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.



9. **YAESU FT736R** - Like the FT767GX, YAESU have as yet, no competitor alternative to this one - all mode 2 & 70 with 6M and 23CM all in one box. P.S.U. included. ICOM & KENWOOD wakey wakey! Is there a patent pending on this idea?? **£1395.00 (6/23 extra)**



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



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The Three Shilling 3-Valve Radio

Wilfred Harms was interested to read an article in *PW*, referring to Scott Taggart in 1932. It reminded him of a project that first appeared in the 1920s. Those were the days when wireless constructors had to make most of the components themselves, and one schoolboy in Brighton decided to try for himself. This is his story.

In the late 1920s, a popular wireless magazine published an article called 'The Three Shilling 3-Valve Radio'. Even today, I think the idea is worth considering, so let's see what the project, **Fig. 1**, was all about.

At that time not everyone owned a radio receiver, but home construction was becoming popular as a result of designs promoted by valve manufacturers. As I remember, a set of components cost around £8 or £10 without cabinet, speaker or batteries, etc.

Average Wage

As a comparison in prices, an average weekly wage then, was

around £3 or £4. So, the cost was, relatively speaking, much higher than that of a modern transistor portable, yet it was less satisfactory.

However, three shillings (15p) was not a significant sum for it would then purchase twenty-four pounds of potatoes. However, this figure did not include the valves, etc., but included valve-holders, tuning coils, resistors and capacitors (called condensers in those days).

The Circuit

The circuit was a detector-rectifier stage, followed by a l.f. and power stages, all resistance-capacity coupled. I already had

some spare valve-holders. So all that I really needed to make the other components myself, was time and patience.

As an industrious schoolboy, I had neither time or patience, but I made up for it with enthusiasm! This is how it was done (dimensions may have changed by the mists of a 60-year old memory).

The tuning coils were straightforward, and were wound in a bundle. They were made using double cotton-covered wire with the prescribed number of turns.

Resistors were made by coating a piece of paper (newspaper was best for this job) with mother's grid polish. The polish was

composed of graphite (or similar) in a greasy paste (Zebra is a brand which comes to mind).

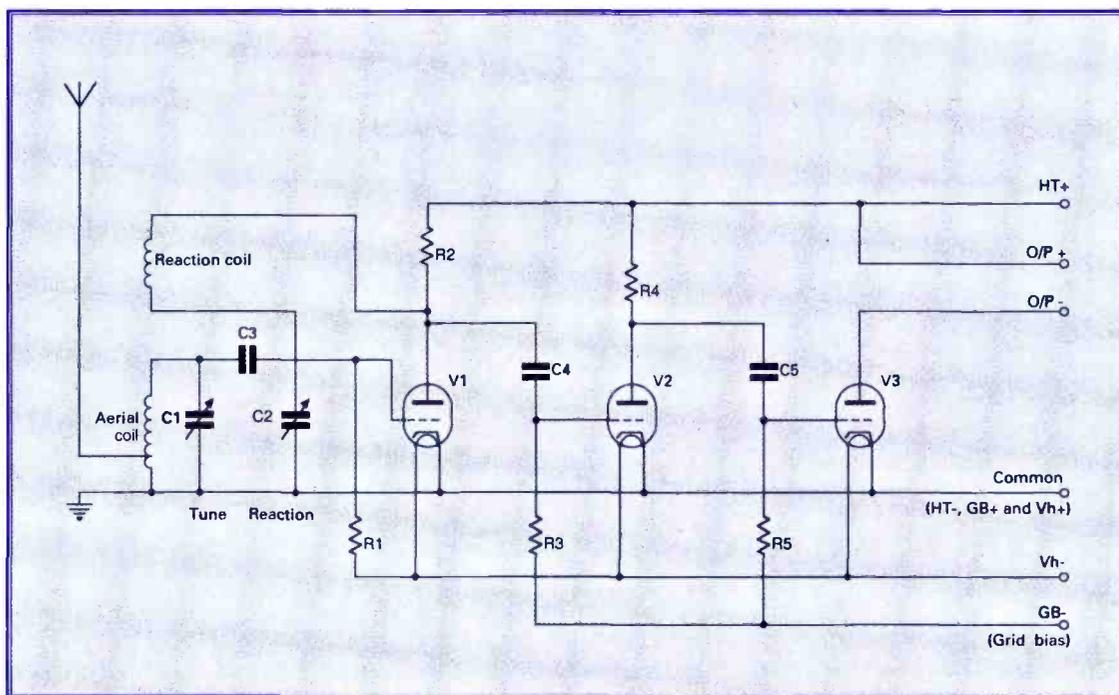
Strips of paper were cut, half an inch wide and two and a half inches long. They were fixed to dry wood, with a screw and washers at the ends for connections.

For the grid-leaks, the strips were cut to a third of this width, except for the ends where connection was made.

Metal Foil

The capacitors were a bit more involved. For the non-variable capacitors, I used two strips of metal foil three inches wide and 12 inches long (or as appropriate). A somewhat longer strip of waxed

Fig. 1: Wilfred Harms built this circuit over 60 years ago. Although he cannot remember individual component values, or exactly which magazine published the project, he was pleased that it worked well. In the text Wilfred explains how he had to make resistors from strips of newsprint and metal polish, and capacitors from metal foil. The receiver met its end when his mother wanted the kitchen table back!



paper was employed as a dielectric for the capacitor.

Then starting with a half-inch fold, and with the metal foil strips half-an-inch out-of-line, the three strips were turned over successively to form a three and a half inch by half-inch firm neat pack. This was fixed to a piece of dry wood, with screws and washers at the ends.

The washers made contact with the electrically separated metal foils. As you would expect, the area of the foil for the l.f. coupling capacitors was naturally larger than for the others.

Making Variable Capacitors

When making the variable capacitors, two eight inch diameter

semi-circular pieces of plywood were required. A nine inch square board, plus an eight inch square piece of wax paper, were also required.

The metal foils were stuck onto the plywood and board respectively. The former was held at its centre (metal foil downwards) to the centre of the latter, with the wax paper between the two, as a dielectric, so that the former could rotate (suitable clearance between metal surfaces at the pivot).

Tuning And Reaction

By rotating the plywood, the area of foils facing each other could be varied. This produced the variable capacitance for tuning, and reaction, etc.

For those not conversant with this type of circuit, the reaction capacitor varied the degree of r.f. feed-back. This action increased the sensitivity of the detector stage, up to the point where instability (oscillation) occurred.

The reaction then had to be reduced, until the stage was almost, but not quite oscillating. What all this did to the frequency response of the rectified signal, is quite a different matter, but such things were hardly noticeable in those days!

Heath Robinson Approach

All this activity may read like a 'Heath Robinson' approach to you, and no doubt it was all very elementary. But having connected

everything, and made good a few dubious connections, I can assure you it did work!

At that time, I was living in Brighton. To receive London, a good 100ft long outside antenna, and a good earth were essential.

However, the main problem was caused by the tuning capacitors. If you moved your hand, or jarred the table, the tuning was disturbed and you had to reset it.

I played with the receiver for a few days, and then mother wanted her dining table back! And so my wonderful, home-made receiver had to be dismantled, never to speak again.

It kept me out of trouble for several days, I had achieved my object and learned a lot. Not bad for a three shilling, 3-valve radio!

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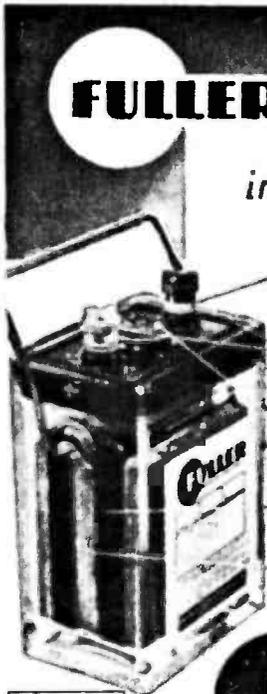
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Using Those Versatile Vacuums

Part 1

Phil Cadman G4JCP considers that it's time you got busy, and took advantage of the many valves that are still freely and cheaply available to the enthusiast. But before you do, Phil's got some timely advice gained from his own experience.

Alright, so you've read the recent valve articles in *PW*, and the thermionic bug has bitten. You've dug out a couple of old TV valves Uncle Bert gave you years ago, and the soldering iron is warming up nicely.

Now, perhaps you're wondering what to do next? Well, switch the soldering iron off for a while, make a cup of tea and read on.....!

I was fortunate enough to have become interested in radio and electronics just at the end of the valve era. That's about 1968 to all you 'teeny-boppers' out there.

Transistors were still relatively expensive, whereas valves were free, at least those I could liberate from old TV and radio receivers. The coming of the BBC 2 service ensured a steady supply of 405-line standard only TV receivers, which provided many valves for keen types like me.

First Project

The first project I tackled was a 3W audio amplifier, using components from an old tape recorder. This triumph of audio engineering design was built on a wooden base-board. In fact, the valved amplifier used basically the same technique as Steve Ortmayer G4RAW employed in the drawing-pin construction project in last month's *PW*.

However, the main difference was the fact that my project used 250V h.t.! The amplifier was not what you might call safe by any

definition of the word.

On one occasion, the electrolytic capacitor in the smoothing circuit flashed over. It went off with an almighty crack, causing a friend of mine to clear my bed with a standing jump!

At this point, I should mention that it was quite in order in those days to have your shack in the bedroom. This was despite the protestations of worried parents.

Fortunately, my friend was only slightly affected by the experience. He went on to build his own version of my famous amplifier, once he had acquired suitable components and could hold a soldering iron again without shaking too much.

Valves To Transistors

Those happy, carefree days were not to last. Wooden base-boards were replaced by aluminium chassis, and soon after, valves gave way to transistors. At least you could build transistor projects on wood, without fear of blowing yourself up, but it just wasn't the same.

I've no doubt that some of you are wondering 'is all this history relevant'. The short answer is no, but it does perhaps indicate how easy it was to get started in electronics using valve technology.

A constructor wishing to build valved equipment today, has problems which were not in evidence 20 years ago. For example, in those days, aluminium

chassis were available by mail order from several sources in *PW*.

Valve data books could be ordered from most bookshops or obtained from advertisers in publications like *PW*, the *Radio Constructor* and *Short Wave Magazine*. The various pocket guides produced by valve manufacturers were also very useful.

The valve guides were published each year (so useful for looking up valve base diagrams) and they could be bought from the local radio and TV repair shop for a few shillings. You could also pick up a scrap radio chassis or two at the same time.

High voltage capacitors, transformers, chokes, resistors, and everything you needed, were all readily available locally or by mail order. If you couldn't afford them new, you could recover them from scrap radio or TV sets.

Using Valves Today

I don't suppose my memories will be helping budding valve-enthusiasts. By now, you're probably asking what can be done using valves today? So, to help you use those versatile vacuums I've collected a series of suggestions, hints and tips learned over the years.

I've had to come to terms with the fact that my favourite device no longer commands the respect it once did. In computer jargon, valves are un-supported. This

means that only a few companies can make any money out of supplying valve-orientated constructors.

Fortunately, valves are still available from several sources, although buying them is the easiest part! Hopefully however, my suggestions will make the rest of the process easier for any intending valved equipment constructor.

Safety Tips

At this point, I'd better mention a few safety tips. Although you've probably heard it all before, you should always bear in mind that

HIGH VOLTAGES CAN KILL.

Most radio enthusiasts **HAVE** to be careful because for most of the time we're alone in the workshop. However, I accept the fact that when working on valve gear, particularly when fault-finding, the power has to be on.

Unfortunately, you can't do everything with the h.t. rail bonded to earth. Therefore, there will be times when you'll risk an electric shock. So, the sensible thing is to adopt working practices which will minimise the effect should you receive an electric shock.

Safety Should Rule

Safety should rule, okay? **Safety rule number one is:** When the power is on, always work with one hand in your pocket.

The hand-in-pocket suggestion is to prevent any current flow across your chest (your heart is somewhere in there!) should your working hand touch a high voltage source. To prevent any current flow down your legs, you should always insulate your feet from the floor.

When working indoors ordinary shoes on carpet are quite sufficient. But if you're working out of the house, in a shed for

said, is not too difficult.

If you know the type of valve you want, you can order it from one of the mail-order suppliers who advertise in *PW*. Alternatively, you can go to a radio rally and hope to see a supplier there either new or in the flea market.

Buying new valves from radio and TV repair shops is possible, but it's likely to be expensive. Nowadays, few shops stock valves as part of their day-to-day

recommended list are from the USA - examples such as RCA, General Electric, Westing-house and Sylvania). From western Europe we have Philips, Siemens and Telefunken.

Still, the eastern European manufacturers are getting better, and in many cases there is no alternative source of supply. If you are an enthusiast of valved hi-fi equipment, then British valves are obligatory. Unfortunately, the prices of certain valves reflect this state of affairs.

important electrical parameters at selected anode/screen and grid voltages.

They'll probably also have suggested operating conditions. These usually include inter-electrode capacitances and, of course, the base connections.

You could part with up to £5 or more for such a book, depending on condition, age and number of pages. Home grown 'best buys' are those by Mullard and Brimar, also Osram (if you can find one).

From the USA, the RCA company provided 'Receiving Tube Manuals'. These were excellent, as they covered almost all the American-type valves you were likely to come across. There was also a bonus, as they included a little valve theory and a selection of useful circuits.

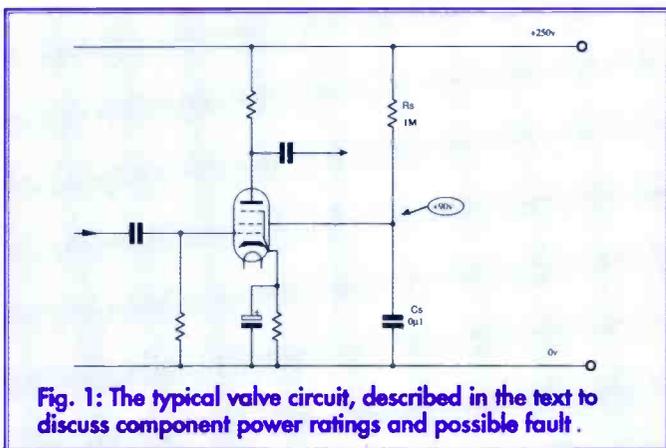


Fig. 1: The typical valve circuit, described in the text to discuss component power ratings and possible fault.

example, it's best to wear rubber-soled shoes. Safety is further improved by standing on a rubber mat and keeping the working place dry (*see suggestion below the caption of Fig. 4).

Safety rule number two:

Always try to avoid working with high voltages if you're on your own. This is another good reason for working indoors. Make sure someone is close at hand who knows how to react, should you receive an electric shock.

For less than £5 you can buy a clearly printed plastics sheet providing instructions on mouth-to-mouth resuscitation (Electromail catalogue 559-568 for example). It might seem over dramatic, but there are many unnecessary deaths each year caused by simple mistakes by people using electric hedge trimmers, lawn mowers and power tools. **You don't have to be one of them!**

Don't forget that high r.f. voltages can use you as an alternative antenna and a capacitive pathway to ground. Electric shock is not the only danger, as radio frequency burns can be extremely unpleasant. So take care, and be doubly careful when working near the anodes of power amplifier valves - use insulated tools.

New Valves

The first problem for many intending constructors, is where to get the valves from. This, as I have

business, and they'll have to order on your behalf.

Quality Varies

Most new valves are made in the USA, eastern Europe and (would you believe) China. The quality varies somewhat. Where they were made has a lot to do with it, and unfortunately some are not as good as others.

The general rule with valves is that you 'get what you pay for'. Because of this, some distributors list more than one manufacturer for various valve types. The customer can then choose to go for high quality or low price.

I should quickly add (before the importers jump on me) that no reputable company knowingly sells 'dud' valves. The cheaper alternative valves can be very useful.

Let's be honest with ourselves. Surely it must be pointless paying a high price for a premium valve, if you're experimenting and learning.

Incidentally, you should check the country of origin of valves you see on flea-market stalls. If they are marked as made in England or Great Britain and they appear to be good, buy them, if the price is not over the top! You'll find such valves to be as good, if not better, than any made today.

My favourites are those made by Mullard, Brimar, Marconi, Mazda, Ediswan, Tungram, Osram and GEC. Next on the

Valve Books

If valves are easy to get hold of, valve data books can be just the opposite. Very few are in print today, and even fewer are available or affordable.

In many cases there's nothing to do but investigate the second-hand market. The type of publications to look out for include:

The pocket guides: These are small books or leaflets that were published yearly by most valve manufacturers. Only the bare minimum of information on each valve is given, plus base connections. However, they are useful and you shouldn't expect to pay more than a £1 or so for them.

The valve data book: These books will list all of a manufacturer's current products (available when the book was first published). Some books came out yearly, others at irregular intervals.

Data Sheets

The once commonly available sheets were useful. These were specific to one valve, and were the most detailed source of information generally available to the engineer.

They are comparatively rare nowadays, except for those produced by Mullard who used to sell bound volumes of data sheets. Each volume, or in the case of receiving valves, group of volumes, covered one particular class of valve.

I suggest that you get them if you can. In my opinion £5 each is not excessive for the more popular volumes.

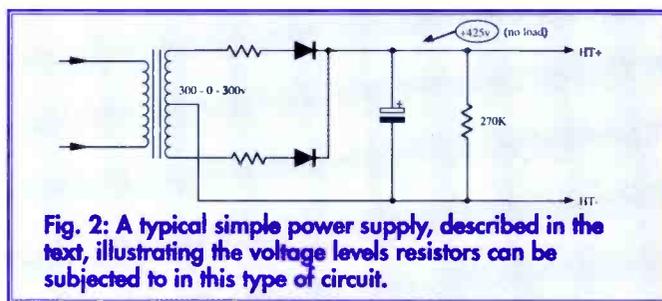


Fig. 2: A typical simple power supply, described in the text, illustrating the voltage levels resistors can be subjected to in this type of circuit.

Most of the data provided will be for the manufacturer's 'current' valve types. These were the valves being made in large quantities for both new equipment and for replacement use.

Less detailed information would be available on 'replacement' types. These were valve types still in production, but only made in small quantities intended for replacement purposes only.

The most popular valves, and new additions, may well have characteristic curves reproduced. The rest will have a selection of the following: maximum ratings, and

Independently Published Books

I mustn't forget the independently published data books. All the publications mentioned so far were published by the valve manufacturers.

Books published by individual manufacturers didn't cover any valves made by other companies, although a substitution guide would sometimes be included. To get around this problem, several independent publishers produced their own data books covering valves made by many different

companies.

The information provided by the independent books was similar to that in the manufacturers' pocket guides, so they could hardly be described as comprehensive. Nevertheless, they were extremely useful.

Two that immediately come to mind are *Radio Valve And Transistor Data* published by Iliffe of the Butterworth group, and the series of *Radio Valve Guides* published by Bernard's Radio Manuals. And lastly, I must include the Babani Company, who published various lists and substitution guides.

Finding And Buying

Now I've mentioned how useful they are, I'd better tell you about finding and buying your data books! To start, I suggest that you always check the flea-markets at rallies and shows.

Unfortunately, the larger traders very seldom have anything on valves unless it's currently or has recently been in print.

However, one company that deals in second-hand literature of all types is the Vintage Wireless Company based in Bristol, who publish irregular lists of such items.

Second hand book shops may have some valve-related books, and they are worth a try. You can try asking at long-established radio and TV repair shops.

You can ask about old valves too, as they may part with obsolete stock quite cheaply, and even give you those they have salvaged from old equipment - assuming they haven't already thrown them out!

Last on the list, though potentially the most lucrative, is the 'old timer'. This useful source doesn't have to be a radio amateur, they can be anyone who was, at some time, interested in radio, TV or electronics.

You can start the search by asking around the family and friends. The biggest problem you'll face, is getting them to part with their treasured possessions, but it's worth a try.

Designing Valved Equipment

If you want to start designing valved equipment from scratch, then you should obtain the relevant data sheets. However, you can get by with a combination of other designers' circuits and the information contained in the data books already mentioned.

Be careful when using power

valves in this way. It's wise to run such valves within their maximum ratings.

So if you're unsure, under-run. It's obvious but I'll say it anyway, as it's far better to under-run a large power valve than to over-run a small one.

Excessive anode dissipation is the usual way to shorten a valve's life. The anodes shouldn't glow red, that only happens with a few power valves and they are designed to operate that way.

Beware of excessive voltages on the electrodes. This will usually mean a glowing anode/screen grid if you are lucky, and a flashover if you are not. Needless to say flashovers can be instantly destructive.

One other parameter, often ignored, is cathode current. Try and keep it well within the manufacturer's limits. This applies even more so to rectifiers feeding capacitor input filters.

Don't use a capacitor bigger than specified. Do add resistors if the anode circuit resistance is lower than specified.

One other way to damage the cathode, is to get the valve too hot, as gas can be released from the electrode structure. If this does occur, the valve efficiency is dramatically reduced.

Valve Heaters

Talking about cathodes, leads us neatly on to the valve heaters. This important factor feature of valves is often badly treated and misunderstood.

You don't just stick a few volts across a valve heater and reckon it'll do. After all, if the heater filament doesn't work, there's no electron emission and the valve won't work.

In practice, there are several different types of cathode. Some require careful (in the electrical sense of the word) handling. However, rather than complicating matters by telling you which is better, I advise you to treat them all carefully.

Heater voltage, or current, if that is the relevant parameter, should be kept within $\pm 5\%$ of nominal, although $\pm 10\%$ won't hurt while you're experimenting. Obviously, too high a voltage will burn the heater filament out quicker, but the opposite problem (too low a voltage) can cause problems that aren't so obvious.

With this in mind, it's important to realise that too low a voltage will restrict the cathode's emission. The rated cathode current can then seem like an overload.

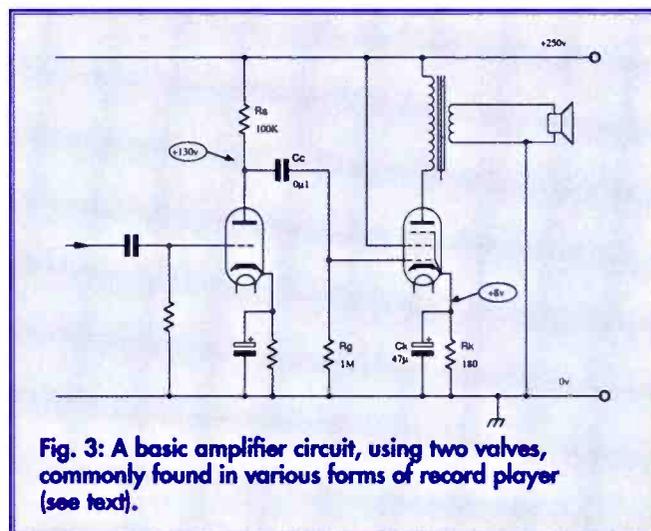


Fig. 3: A basic amplifier circuit, using two valves, commonly found in various forms of record player (see text).

Valve-holders As New

Valves need holders, and unfortunately they're more difficult to find, particularly on flea markets and the like. So, you'll probably be forced to buy them as new from one of the valve distributors in PW.

Fortunately, magnetic relays of the type that plug into octal sockets are still produced. Consequently, octal sockets which can be used as octal valve-holders are available from the suppliers who stock this type of relay (particularly at mobile rallies).

This type of socket is only suitable for the 'International Octal' type of valve base. Unfortunately, there are quite a few 'Mazda' octal valves (mainly old military surplus types) that won't fit. Incidentally, Mazda octal valve-holder sockets often have a small raised pip marker moulded into the Bakelite, positioned between pin one and eight.

The performance of the octal relay sockets may be questionable at r.f., but they are entirely suitable for all low frequency applications. But don't forget to bear in mind maximum voltage ratings for this type of holder.

Other Components

When valves are being used, you have to bear in mind other components. These of course, include resistors, capacitors and inductors/transformers.

Of these components, resistors are of course abundant. But don't let their wide availability fool you. For a start, the power ratings in valve equipment will, in general, be higher than in transistor equipment and this will restrict your choice.

Unless you're working from a published components list, work

out the power dissipated in every resistor in the design and double it. Then choose a resistor with a corresponding, or higher, power rating.

This 50% de-rating of resistors means they will run cooler. This effect is useful, especially when you realise the ambient temperature the component subjected to, is going to be higher in valved equipment than in transistorised gear.

You will soon come to appreciate that heat shortens the life of components. By de-rating all components, you'll be ensuring a long and trouble-free life for your pride and joy.

Obviously, for test and prototype purposes, de-rating is not necessary. But by the same token, never over-run any component unless you know exactly what risk you're taking by doing so.

A General Rule

As a general rule, I never use any resistor (in valved equipment) rated at less than half a watt. My reasons are:

1: 0.5W resistors are more robust, and therefore more suited to mounting on tag-strips as they're more self-supporting than lower wattage types.

2: 0.5W types are usually rated for operation at 350V or more. (Yes, resistors have voltage ratings too). In transistor equipment this rating rarely concerns us, as the voltages are simply too low to be a problem.

However, when used in valved equipment, some resistors can be within their power ratings, but outside their voltage ratings. Examine, for a moment, the 1MΩ resistor in the circuit in Fig. 1.

The resistor, has $250 - 90 = 160V$ across it. Using $P = V^2 / R$, $P = 0.0256W$, or about 1/40th of a watt. Even doubling this result

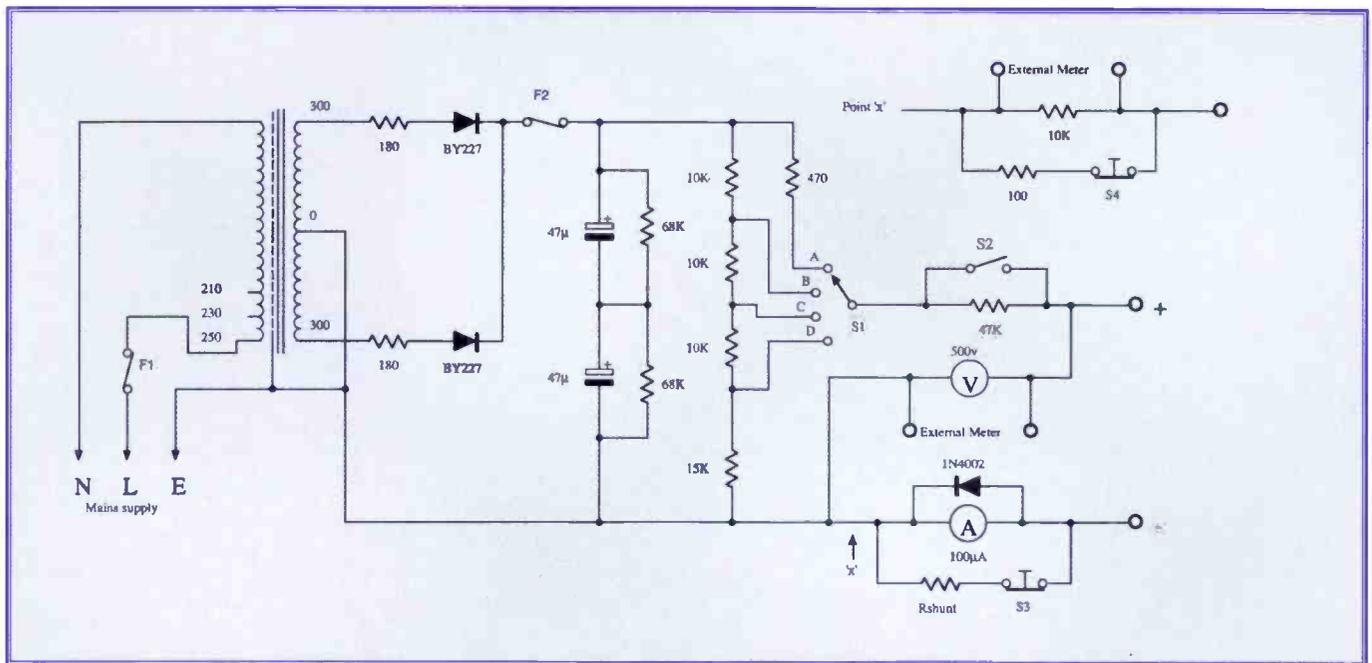


Fig. 4: Simple electrolytic reformer and tester circuit. Electrolytic capacitors have very thin chemical dielectrics that can deteriorate and become leaky after a period of non-use. Applying the full rated voltage to a capacitor in this state can result in an explosion. Before use, all medium to high voltage electrolytics should be reformed by applying the full working voltage through a high value resistor. Initially the high leakage current will cause a substantial voltage drop across the resistor. This will gradually reduce as the capacitor recovers. After some hours, the leakage current will gradually stabilise to a low value. The voltage across the capacitor will have correspondingly increased. However, if the capacitor is still drawing a high leakage current after 24 hours, it should be discarded.

Generally speaking, a 100μF capacitor should not draw more than 3 to 5mA at its working voltage if it's a good one. Higher value capacitors will draw correspondingly more leakage current, and smaller values less.

Modern capacitors will be two to three times less leaky than those of 20 or more years ago. When testing a capacitor, be sure you only apply its rated working voltage and not its surge voltage. The surge voltage is a very short term rating. It specifies the voltage the capacitor will withstand between (for example) equipment switch-on and the time the valves heat up sufficiently to draw their working current.

The circuit shown in Fig. 4, is suitable for reforming capacitors up to approximately 400V working, and for testing other types of capacitors to the same voltage. The voltmeter indicates the actual voltage across the capacitor, with the ammeter showing the leakage current.

In the low current position (S2 open), the output terminals can be short-circuited without harming the unit. You should only select the high current setting (S2 closed) towards the end of the reforming session, when the capacitor's leakage current has already fallen to a fairly low value. If the terminals are accidentally short-circuited in this condition, the diodes across the meter will protect it and the fuse will blow on the highest voltage range. On the lower ranges, the resistors forming the potential divider will survive, providing they are of at least the power ratings specified. Select the meter's 10mA range when reforming electrolytics and initial testing of other types. You should only select the 100μA range when you are checking for very small leakage currents. To prevent accidental damage, this switch should be of the 'biased-off' type, so that it cannot be left in the 100μA position.

If you do not wish to use dedicated meters in this unit, you may use a bench multimeter in the positions indicated. The value of the 10mA shunt is 100Ω, giving a reading of 1V for 10mA. The 100μA shunt is 10kΩ to give the same 1V reading at 100μA. The meter protection must be removed.

Approximate open circuit test voltages for the various positions of S1 are:

A	450V
B	350V
C	250V
D	150V

Note: Make sure that S1 is rated for 500V working.

*Readers interested in valved equipment construction (or any construction involving the use of the mains supply for that matter) are strongly advised to invest in residual current circuit breakers. These useful potential lifesavers are relatively cheap and come in many shapes and forms, the most useful for our purposes being the plug-in type. They are available from DIY and hardware stores. Additionally, I thoroughly recommend the use of an isolating transformer. In my own shack I use an isolating transformer which is fed from the mains via a residual current circuit breaker. This provides me with an isolated supply that's also protected on the input, which enables me to fully earth the equipment under test for f.f. purposes. Editor.

only gives about 1/20th of a watt.

Because of this, you may think a 1/8th watt resistor would be more than adequate. The resistor would survive, even if the capacitor shorted to ground and put the full 250V across it.

However, there's a pitfall, and

looking at the specification of a common 1/8th watt resistor reveals a working voltage of only 200V. So, at switch-on (when the capacitor is discharged) and under fault conditions, the resistor could fail by voltage breakdown, even though it would be unlikely to fail

by over-dissipation. Adopting the 0.5W rule means you can forget resistor voltage ratings, in all but a few cases.

Bleed Resistors

One such case, worthy of special mention, is the bleed and/or voltage equalising resistors wired across a capacitor. A bleed resistor should always be fitted across any capacitor (of about 1μF or more) which does not have a d.c. path between its terminals, when the equipment is switched off.

Ignore this rule at your peril! You could get a nasty shock from a charged capacitor several minutes (sometimes hours) after switching off.

The same rule applies to equalising resistors wired across series connected electrolytic capacitors in power supplies. These resistors are subjected to the highest voltages present in the equipment, particularly if solid state rectifiers are used.

At switch-on, the voltage will peak before the valves begin to draw current. As an example, let's take a look at a 300-0-300V mains transformer with full-wave rectification, as in Fig. 2.

Peak Voltage

In the circuit in Fig. 2, with no load on the output, the voltage across the capacitor will reach the peak voltage of the transformer secondary. This will be $300V \times 1.414 = 425V$. A bleed resistor of, let's say 270kΩ should have a power rating of 2W ($425 \times 425 / 270000 = 0.7W$, times two) and a voltage rating of 500V or more to

be on the safe side.

Checking in a well-known catalogue, I find that their 2W carbon-film resistors are rated for 700V working. Fitting such a resistor would mean it could, more or less, be forgotten. You would be secure in the knowledge that the resistor would outlast the capacitor.

In the same catalogue, 1W resistors of the same type are only rated at 500V working. This would be perfectly acceptable, but I prefer a greater safety margin with such a critical component.

Capacitor Voltage Rating

Now it's time to look at capacitors. Unfortunately, 99% of modern capacitors won't be suitable for use in valved equipment, because their voltage rating will be too low.

Capacitors for use in transistorised equipment seldom need to be rated above about 160V. Despite this, some capacitors, such as those used for mains suppression and in television line timebase circuits, are available with high working voltages.

So, with new higher voltage capacitors rather rare and expensive, we have to resort to flea-markets and surplus-component shops. As I've advised with resistors, unless you are working from a components list, always work out the voltage rating of each capacitor in a circuit yourself.

It's not that difficult, and you soon learn to almost guess what voltage rating is required. Remember to take into account abnormal circuit conditions.

A Practical Example

As a practical example, let's have a look back at Fig. 1. The capacitor, C_s , is the screen decoupling capacitor and its job is to keep the screen grid at earth potential for a.c.

The resistor, R_s , drops the supply voltage down to what is required by the screen grid. At switch-on, before the valve can draw current, C_s charges via R_s and can, given sufficient time, reach the supply voltage.

The same thing happens if the valve is removed from circuit with the supply still on. The reason for the seemingly gross derating of C_s should now be clear.

Although during normal operation of this circuit only 90V will appear across the capacitor, there are times when it can charge up to the full 250V. Hence the 250V minimum rating.

If C_s should go leaky, as capacitors can when they're working in very warm surroundings, the screen voltage will fall because of the additional voltage drop across R_s . The chances are that the gradual fall in screen voltage over a period of time will not be noticed, but the drop in performance will!

Audio Amplifier Circuit

I've shown a very simple valved audio amplifier circuit in Fig. 3. It's not what you would call hi-fi, but typical of what you would have found in record players before the transistor invasion.

At first sight, the coupling capacitor, C_c , looks as if it's in a similar position to C_s in the previous example. At switch-on or if the triode is removed, it can experience the full supply voltage.

With this circuit, you would perhaps think that rating the capacitor at 250V should be enough. Well, in this case I would add a little extra, because if C_c does go leaky and it isn't noticed right away you can have an expensive repair on your hands.

You might ask why does this happen? To explain the problem, let's imagine that C_c is leaky, and to the circuit looks as if it has a $20M\Omega$ resistor across it.

I'll treat the circuit as a simple resistive divider. With this approach, you can work out that the grid of the output pentode will be 6V positive with respect to earth.

The pentode will obviously draw more current, but not quite 6V worth. This is because the

increased voltage drop across R_k , coupled with the valve's characteristics, will work to oppose the new grid voltage.

Let's assume that the cathode voltage stabilises at 12V, indicating an increase of cathode current from 44 to 66mA. There are three obvious consequences:

1: The voltage across capacitor C_k increases from 8 to 12V. Fortunately, it's rated at 16V.

2: The power dissipated in resistor R_k increases from 350 to 800mW. (Don't forget that power goes up as the square of the voltage or current). Fortunately, this component is rated at 1W.

3: The power dissipated in the valve goes up by about 50%. An overload of this magnitude will dramatically shorten the valve's life. You may then have to replace both the leaky capacitor C_c and the output valve.

Extra Current

However, the effect of all this extra current on the power supply is not so easy to calculate. A new rectifier valve and/or smoothing resistor may be necessary.

Increased heat from the valve itself, can effect the surrounding components and the equipment housing. If the capacitor deteriorates further, with a corresponding additional increase in cathode current, R_k and C_k may also need replacing.

The rectifier could fail, and both the output transformer and the mains transformer may be damaged. That's a lot of trouble caused by one leaky capacitor!

Surplus Capacitors

I've already mentioned that new, high-voltage capacitors, may be difficult to come by for one reason or another. At this point, I should also warn you of the dangers of buying surplus components which were manufactured more than about 15 to 20 years ago.

Fortunately, capacitors are often date stamped. So make sure you look at the 'sell by' date!

Old stock may be perfectly serviceable, but you are taking an increased risk with older capacitors. Checking with an ohm-meter is not likely to reveal anything other than major faults.

The only way to be reasonably sure with capacitors, is to check the component at its full rated voltage. The warning applies especially to electrolytic capacitors.

Electrolytics can deteriorate markedly with age. Any surplus

electrolytic should be re-formed before use. The circuit in Fig. 4, is suitable for re-forming electrolytics and for testing most types of high-voltage capacitors.

Strangely enough, due to the popularity of switched-mode power supplies high-voltage electrolytics (up to 450V working) are generally available. They're not cheap, but you have the added bonus of small size and high reliability.

Transformers And Chokes

Transformers and chokes can be seen as a possible problem. New items are very seldom listed in catalogues, and the few examples that are will make you wince when you see the price!

Maplin Electronics feature a reasonably priced transformer in their current catalogue. Suitable for powering receivers, small amplifiers and relatively low-powered valved transmitters, the transformer provides a single 100mA h.t. winding and a 6.3V a.c. filament (heater) winding providing up to 1.5A.

Transformers are also available at rallies and shows, and from some companies dealing with surplus components. The trick is to buy transformers and chokes as you see them, providing they are sensibly priced.

The prices you will see at rallies are usually fairly cheap. If more people take up valve work again, prices will undoubtedly increase, so get in there quick!

Don't be too concerned if the transformer you see on a stall is not in pristine external condition. Transformers seldom deteriorate significantly with age.

I think that the only things to beware of are signs of overheating or dampness. Never apply power to a transformer showing any signs of damp, until you have dried it thoroughly in a warm and dry place for two or three days.

Chassis And Boxes

It's time to look at chassis and boxes suitable for valved equipment. Aluminium chassis were once commonplace, but the requirements of transistorised equipment have effectively killed that market.

However, plain aluminium boxes are still available. So, for small to medium projects these are acceptable.

Don't forget you can always bolt two (or more) boxes together if you need a bigger chassis. This

has the benefit of creating a mechanically stronger unit, as well as providing useful screening.

Indeed, the bolt-together-box chassis method was employed by many constructors who experimented a lot. They would build each sub-section of the project in a separate box, and connect them by wire or via plugs and sockets.

Then, if they wished to try another r.f. amplifier or detector, the new circuit would be built in a small box, connected in place of the original. It's an ideal way of prototyping.

Providing A Cabinet

When you've finished your valved project, you'll probably be providing an attractive a suitable casing, box or cabinet. And when this is being considered, you must remember, that valves radiate a great deal of heat.

Unless you are using battery valves, or very low power types, you'll need to provide adequate ventilation to enclosed equipment. This needs a little thought.

It's simple to calculate how much ventilation is required. Just work out the total power input to the equipment, and add a little extra for good measure.

The next step is to then place an electric lamp of similar wattage in the cabinet you're planning to use and see how hot it gets. You can then adjust air-flow with appropriate holes and grilles.

Power valves need most ventilation, so ensure they get it. I've already pointed out the need to keep things cool, now is the time to bear in mind all that I said.

I hope you enjoy working with those versatile vacuums, there's no reason why you shouldn't. Even today, valves have a lot to offer, and there's just something about those glowing filaments on a dark winter's evening!

Next time, Phil Cadman will be looking at the art of 'scrounging' those old radios, TV receivers, amplifiers and tape recorders for spares. He'll also be explaining the mysteries of valve letter codes, so you'll know just what those ECC83 and PL36 valves you've got can do for you!

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 ...

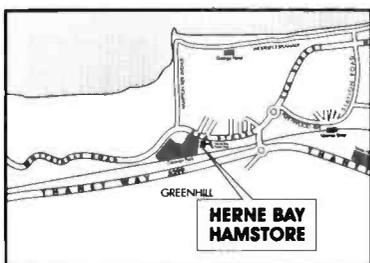
- Loads of clearance items
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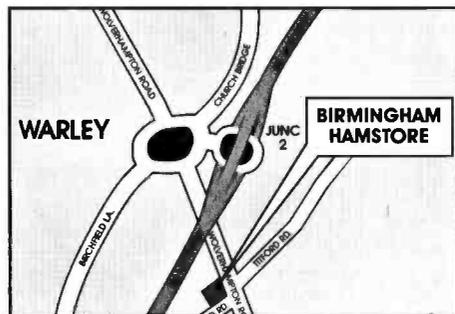
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My Sixty Years Of Amateur Radio

Bill James G6XM shares some of his 60 years of amateur radio with us. He includes some fascinating details of his early work on v.h.f. on the old 5 metre band, where he not only had to build the equipment, but find the band itself by using Lecher line techniques.

As a schoolboy in the middle 1920s, I was very interested in electricity and radio. This was because my father, who was in Royal Corps of Signals, brought home training manuals that he used to swot up prior to taking trade tests.

I used to borrow these whenever possible to read about Ohm's law, telephones, Fullerphones, Leclanché cells, lead acid accumulators, etc. I nearly drove my father mad with questions, but I think these also helped him with his trade tests!

The breakthrough came when the Colonel of the Regiment came round the married quarters to ask what I wanted for the Regimental Christmas Party gift. I said "a crystal set would be very nice".

His reply was another question "have you got headphones?". Of course I didn't have any, but I told him that once I had a crystal set, I would save my pocket-money and get the 'phones.

Much to my surprise when Christmas came, I received the crystal set. And as an extra, the Colonel presented me with a pair of his own 'phones. I have never been so pleased in my life!

Rigged Antenna

I soon rigged up an antenna of unknown length from some wire found on an Army dump. In due course, after fiddling with the tuning and the cat's whisker on the set, I managed to receive London 2LO.

After a year or so, I saved up and bought my first valve. It was of Dutch manufacture and cost about five shillings (25p).

I bought a valve holder, tuning capacitor, and was given some two-pin coils and a coil holder. One of the coils could be swung or varied from the other, to provide feed-back for oscillation (reaction).

After a few more months, I had other items including a grid leak



Fig. 1: Sixty years of amateur radio. Bill James G6XM's original Certificate of Membership to the Radio Society of Great Britain.

resistor, grid capacitor, etc., to build my first one-valved receiver.

By about 1929, I had graduated to the short wave bands and heard my first American stations. Among them were W8XK Pittsburg, W2XAD Schenectady, and others.

I also managed to hear VK2ME in Australia, but my favourite was PCJ Eindhoven, Holland. The announcer (in English) was, I believe, Edward Startz. I also listened to amateurs on 7MHz, and this is the time when I became firmly hooked on amateur radio.

Pocket Money

After I started work, I received one shilling (5p) a week pocket money, from my 10 shillings (50p) weekly wage. This opened my horizons considerably, and with the odd tips I received I was able to graduate to a straight three-valved (OV2).

About the same time, I read an interesting article in my father's regimental Journal *The Wire*. It described a transmitter circuit called a Meisner, using two valves in push-pull and three coils wound concentrically.

The author of the article was someone in the Royal Signals

serving in India, Tibet or Afghanistan. Although it described equipment used by the Royal Signals for communications - I can't remember where to!

The article fired my imagination and I started to investigate how and where to obtain a transmitting licence. I finally found a local amateur who kindly gave me details, and told me what to do to apply for an amateur transmitting licence.

After writing to the Post Office at their headquarters at St Martins Le Grand in London, I received a letter. It was actually addressed to my father (as I was a minor) asking for details of the experiments I wished to carry out. There were no RAEs in those days.

As I had read a great deal about experimental v.h.f. cross channel tests - I forget the frequency - I decided to say that I wanted to experiment with crystal control on the 5 metre band. This was the highest frequency allowed for amateur use.

Back came another letter asking for circuits to be used. I had very little idea of what was really involved, so I enquired from my amateur friend G2VV (now deceased) who gave me the basic ideas to start the ball rolling.

Artificial Antenna Licence

After several more letters and queries I was granted an artificial antenna licence for 50-60MHz only, with the call BRP. This allowed me to experiment with the transmitters and crystal control using an artificial (dummy) antenna only.

The Post Office stated that as I was intending to experiment with quartz crystal control on 5 metres (56-60MHz) there was no need for a radiating licence. This, in a way, was a disappointment, as I really intended to radiate!

However, there was some activity on 5 metres, so I built a two-valved super-regenerative receiver. This was about the only type which could be made to work at such a high frequency.

I wound the quench coils of about 2000 turns each, on a cardboard former about two inches in diameter and approximately three-quarters of an inch wide. It had end cheeks and was clamped to the chuck of a hand drill.

The drill itself was a saga and it came from Woolworths. Nothing sold over sixpence (2½p), the handle cost 6d, body 6d and chuck 6d. It took three weeks to acquire it!

However, when it was completed, the receiver worked well. I used it, with changes and improved valves until the Second World War.

No Wavemeters

One problem was how to find the 5 metres band to begin with! There were no wavemeters available for that band as far as I could find out, so I decided to use Lecher lines which I had read about and quoted to the Post Office.

I stretched the Lecher lines between two suitable trees (about six inches in diameter) and made

up a push-pull transmitter using a tuned-anode tuned-grid (t.a.t.g.) circuit. The valves I used were red spot Ediswan 6V filament type bought for one shilling (five pence) each.

With the Lecher line arrangement, the wavelength was measured physically, by using a 60mA fuse type flash lamp bulb, and looking for minimum glow on the filament. This was done sliding the bulb along the Lecher lines.

With a great deal of help from others, I learned the Morse code. While this was in progress, I badgered the Post Office for a full radiating licence, so I could arrange skeds with other amateurs to carry out radiating experiments and study v.h.f. propagation. Very little was known about propagation on v.h.f. in those days, and the Post Office wanted reasons for everything!

Calibration Certificate

After several further exchanges of letters, requesting details of proposed antennas and a crystal calibration certificate, the Morse test was arranged. I was finally granted my present callsign G6XM on 2 January 1932.

Incidentally, the Morse test was done by everyone on the same key, lamp and buzzer set. This meant that the Morse test set had to be sent to the local post office from the GPO in London!

I believe that the many queries from the Post Office were, in a way, a form of technical examination to 'sort out the wheat from the chaff'. Anyone not keen enough to go through with it fell by the wayside and gave up!

The licence was for experimental purposes only. When operating on the air, calling CQ was expressly forbidden (I don't know why!).

We had to call 'test' instead. It had one advantage when using c.w. because only the British stations used the 'test' call.

Quite a number of stations were worked on 5 metres, and numerous antennas were used with both vertical and horizontal polarisation. Also, I tried some illicit portable operation which nearly resulted in cancellation of my licence. This was because I had been apprehended by the

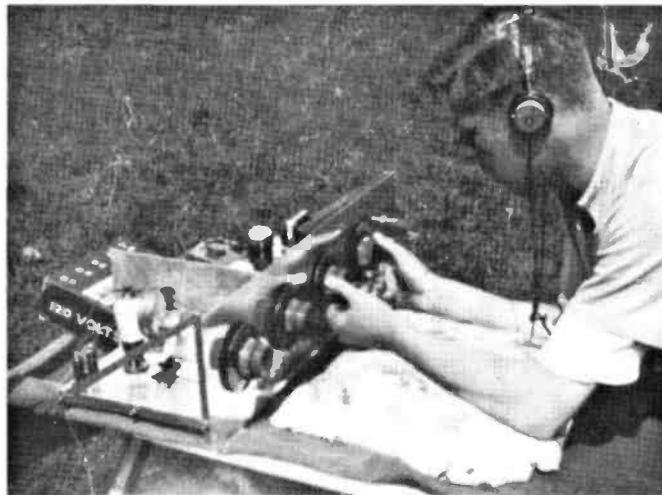


Fig. 2: Bill James G6XM operating his 1V1 receiver (3.5MHz coils fitted) on National Field Day, at Farnham Park in 1934.

police on Hindhead Common, who then reported me to the GPO.

Licence Conditions

However, in spite of my problem with the police on Hindhead Common, I later approached the GPO to try to get my licence conditions changed. This was to allow me to operate portable, and also on the h.f. bands.

After yet more letters and queries, I was granted my request. I think that had I been a few years older, with some sort of technical qualification, things may have been a little easier for me!

My initial licence was for 10W input which was the standard. Higher power required yet more technical reasons, and was usually granted in 25, 50 and 100W steps. It also attracted an extra remittance.

Not many stations had permits allowing more power than that. Portable operation also needed further justification, and attracted a further 10 shilling (50p) fee. There was no official mobile permit, although some 5 metre mobile work was done, probably illegally!

Worked All Continents

Although I preferred building and operating v.h.f. gear, I finally ventured on the 7 and 14MHz bands. I soon worked all continents and WBE (Worked British Empire) using a Zepp antenna, c.w. and 10W input.

However, I did not neglect the 5 metre band and contacted many stations, mostly on 'phone using choke (Heising) modulation. I must admit that I have never found long QSOs on c.w. easy, but have always managed to maintain my

original 15w.p.m!

My first crystal-controlled transmitter was also completed about this time. As I only had one crystal, used in open holders, I modified old pennies and halfpennies for the electrodes.

The crystal had to double-up for h.f. and v.h.f. use. Fortunately, all pre-war amateur bands were in harmonic relationship, so I could multiply up from h.f. all the way to 5 metres!

Valves Used

Most of the valves I used were 2V types. The best one being the Osram LP2 for the transmitter and receiver audio. Later, I used the Osram HPL2K for the detector.

My main problem was that my home was supplied by 210V d.c. mains. This greatly restricted the use of most indirectly heated 4 and 6V valves.

However, the d.c. was useful for charging the lead acid batteries and high tension supply for the valves after suitable smoothing treatment. In any case, valves designed for transmitting required higher filament and plate voltages, and they were very expensive.

There were ways round the power supply problem. I managed to obtain about 300V, by putting the d.c. mains and a 120V Exide h.t. accumulator bank in series!

I should add, that about this time, battery receivers were being replaced by mains sets. As I was working in a radio shop, a fair number of goodies in the shape of valves and accumulators came my way free of charge!

Around 1935/36, my parents moved from Army married quarters into civilian accommodation where we had a.c. mains. This resulted in a complete rebuild, using 6.3V mains valves.

I then obtained my first transmitting valve. This was a Mullard T61D with a top cap anode, and was second-hand of course.

Up to the beginning of the Second World War in 1939, I rebuilt the transmitter. I also built several superhet receivers to compete with the National HRO, REME69, Hallicrafters, etc.

During that period I built an oscilloscope using a Hivac 3.5 inch tube, and this only needed about 500V to produce a good trace. It was very primitive, only being used for modulation checks using



Fig. 3: The station as located in Farnborough, Hampshire in 1947-48.

the trapezium method, and as a sort of electronic voltmeter.

War Declared

When the Second World War was declared in 1939, the Post Office collected all the radio gear. It was stored away until about early 1946, when it was duly returned 100% intact!

My War service started in the Royal Army Ordnance Corps, then the Royal Electrical & Mechanical Engineers. I was mostly employed as an instructor on army radio equipment at Aldershot, Derby and finally Gopsall Hall near Nuneaton.

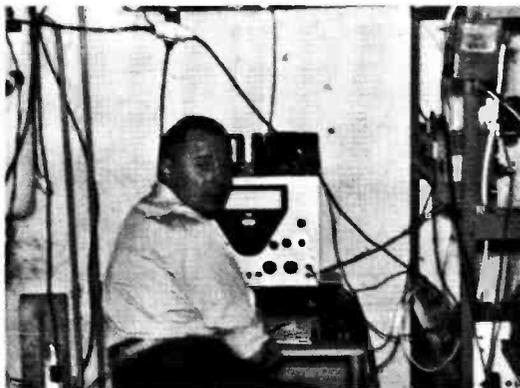


Fig. 4: Operating as DL2XM while posted to Germany. Bill quickly learned German, and made do with a home-brew receiver and operating table made from a wooden packing case.

After demobilisation, I returned to work for the Ministry of Defence. After settling down to civilian life again, I started to rebuild the station.

New Licence Conditions

Amateur radio was by then under the new licence conditions, mainly due to the negotiations by the Radio Society of Great Britain. The new regulations allowed input powers of 150W on all bands, and removed the pre-war restriction of the 33m height maximum for antennas and others.

I must add that if it were not for the lifting of the pre-war restrictions, there would be far fewer radio amateurs around today. I've included a photograph of my station taken in 1948 showing (with other gear) left to right: a 5 metre band portable transmitter, a 1.8MHz v.f.o./transmitter/3.5MHz doubler, a AR77 RX (control unit under) and a Cossor 339 oscilloscope.

Special Permits

Special 6 metre band permits

were issued for a short time in 1948, and I was one of the lucky ones. This coincided with one of the 11 year sunspot cycles.

Many QSOs were made by myself and others during the period allowed. This included working MD5KW in Egypt, FAB1H in North Africa and numerous American stations.

I continued working on the band until the 6 metre permit expired, and the allocation was lost to TV. It was to BBC Sutton Coldfield, if I remember correctly.

I had always been interested in portable work and so the portable valved transmitter was modified to 144MHz and new converters and

antennas were built. In fact, all the home station gear was rebuilt with the exception of the h.f. transmitters. It was around 1950 when everything was completed.

My first antenna for 144MHz was a 16-element stacked collinear array which worked very well. It was one of the best 144MHz beams I ever built.

I'd be using one now, if it were not for the 3m of extra mast height they need. On the other hand, activity on 144MHz is so low, and my location in Devon rather poor, that it's not worth the trouble.

A Move North

A move in 1952 up to the north, meant dismantling everything and re-assembling it in a smaller house, rebuilding the whole station. Instead of using racks two metres high, I built table-top gear for 144 and 430MHz.

The high power h.f. gear had been dismantled, and components disposed of a few years earlier. So, a rebuild of the home-made valved six-band superhet was undertaken, using the latest B9G valves instead of the older octal types.

My new QTH at York proved to be very good for v.h.f., and using my 16-element collinear I was able to regularly contact GM stations, and work as far south as the Isle of Wight very easily.

There's no doubt in my mind that the York QTH was my best v.h.f. location. Of course, I operated portable (using a valved transmitter and receiver) as much as time and family would permit! My favourite spots for portable operations were Sutton Bank and Garrowby Hill.

Another Move And Rebuild

Then, in 1956 came yet another move in the interest of my Ministry of Defence employers, and this time it was to Nottinghamshire. So, I undertook another rebuild and some high power 1kW scatter tests on 144MHz.

I settled down in a new house, got the garden done, and had a planning problem regarding getting my antenna's cleared, and then the MoD decided to send me to Germany! So, I started the same upheaval, dismantling, etc., all over again.

After moving, and settling in married quarters at Moenchen Gladbach, the headquarters of the British Army on the Rhine (BAOR), I was licensed as DL2XM.

My shack here was in a cellar, and the 144MHz 4-over-4 beam, had to be obtained direct from J-Beams. This was because there was no place I could get the material to make one!

On arrival, the antenna was located in the loft. In any case, my



Fig. 5: The G6XM shack of 1992, with microwave gear in evidence. Bill says he doesn't believe in tidying up for photography and titles the picture as "warts & all".

knowledge of the German language was nil.

However, I had brought my receiving gear and enough bits to make a 144MHz transmitter and the necessary tools, etc., with me. So, while busily going to German

lessons, I also built the gear to go on 144MHz.

With Some Trepidation

It was with some trepidation that I called in German "Achtung - allgemeiner anruf - CQ d.l. zwei X-ray mexico". Much to my surprise, I got an immediate reply!

I struggled through those early QSOs and was greatly helped by German amateurs, particularly when I got more proficient in German conversation and the technical language. It also helped me with my work, as I often had to liaise with German technicians employed by the British army.

I also built a new transmitter for the h.f. bands, and kept regular skeds with old friends in the UK. The antenna I used for this was the G5RV, with rather a long feeder.

Terminated Tour

After three years, my employers terminated my tour, and we returned to the UK. My wife was delighted, as were our two boys aged 11 and 13. The now usual routine followed, dismantling and packing everything to send home.

Many service people have gone through this routine probably a lot more. I was however, a civilian working for the MoD but leading very much a serviceman's life!

For the next 20 years or so, it was more or less a repeat of previous years, until I retired at the end of 1979. Although the various

moves meant a complete re-organisation and rebuilding each time, I don't think I was off the air for more than six weeks at a time!

For the first fifty years of my amateur life the greater proportion of my gear was home-built.



Fig. 6: Accidents do happen, even on microwaves. This mishap occurred in 1980, when a car passed by too quickly and too close during portable operations near Broadway in Worcestershire.

Nowadays though, I have succumbed to some commercial gear and test equipment.

Latest Venture

My latest venture is into microwaves, 10 and 24GHz (3 and 1.2cm). Although having played on 3cm about 15 years ago, using w.b.f.m with some success, things have changed very much.

I realised of course that

Dartmoor was very near, and was useful for microwave work using portable gear. I did not have much success at first, and although I went out at every opportunity to enter in the 3cm RSGB cumulative tests, I did not have a QSO for three years!

By joining the RSGB Microwave Newsletter Group I was able to find out what was really happening. I also received lots of help and advice from other microwavers.

The state of the art is now astounding as the receivers and transverter are now as good, or even better than 1.44MHz versions. Despite this, it must be remembered that reliable communication is still limited, although

distances around 1000km have been worked to date.

Microwave Working

Microwave working isn't for the faint hearted! I've had my 24GHz wide-band rig for nearly two years, and so far only had one QSO, and that was for a distance of about 100m.

The QSO was pre-arranged

with GW4JJW, and it took place at a local radio rally. Microwavers really do travel a long way to get results.

My main interest in microwaves is the construction of the gear. The low powers involved, which can be anything from a few milliwatts to several watts or so, means no QRM. It's a big contrast to the 500 to 1000W I used on 1.44 and 1296MHz for moonbounce and backscatter experiments in the 1960s and 1970s.

More Satisfaction

Nowadays, I get far more satisfaction working 100km on 3cm, than I would get out of working any number of rare DX

stations in any part of the world. But I still enjoy a good old 'rag-chew' on the h.f. bands.

However, I haven't yet come to terms with computers. And because there are only 24 hours in a day, I probably never will!

All I can say now, is that I've enjoyed my 60 years-plus in amateur radio. The hobby has also helped me greatly with my work, and enabled me to keep up with the changes in radio techniques. So, I send my good wishes and success to *Practical Wireless* for the next 60 years.

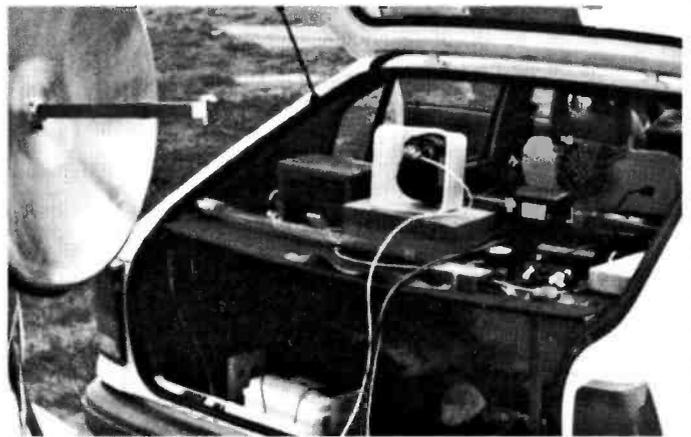


Fig. 7: Still at it in 1992. Portable operation on microwaves (3cm and 24GHz) May 1992.

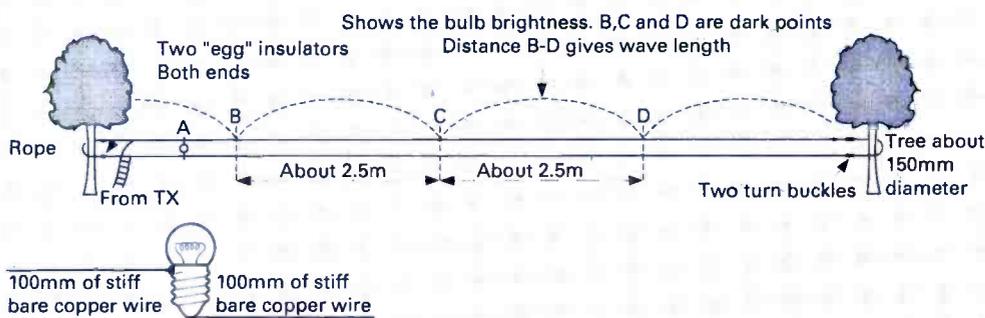
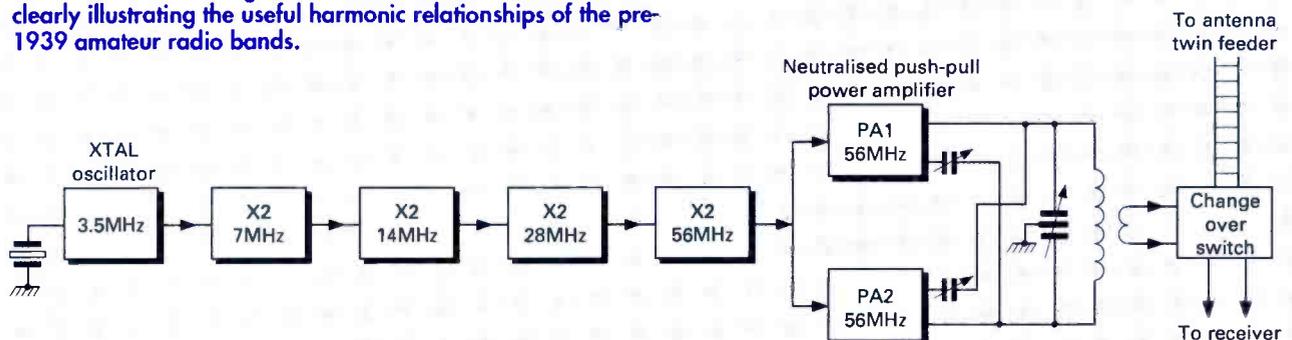


Fig. 8: Diagram illustrating the Lecher line technique G6XM used to find the correct wavelengths for the old 5 metre band. Also shown is the block diagram of G6XM's 5 metre transmitter, clearly illustrating the useful harmonic relationships of the pre-1939 amateur radio bands.



A Magic Eye Grid-Dip Oscillator

George Pickworth has come up with an interesting use for the once very popular 'magic eye' valve tuning indicators. If you're one of the many enthusiasts who were fascinated by the action of the various indicator valves, with their distinctive green or blue fluorescent displays, read on!

I needed a grid dip oscillator that would work with virtually any kind of coil, over a frequency range extending from below 50kHz to more than 30MHz. Being unable to obtain a suitable commercially made instrument, I decided to construct this simple, versatile and extremely efficient 'magic eye' grid-dip oscillator.

The project is one of three versions I built, and they all performed perfectly and without any vices! Moreover, the magic eye indicator valve is tolerant to any high voltages that may happen to be present.

Transistor Circuits

Before deciding on the magic eye g.d.o. project, I experimented with various transistor and f.e.t. circuits. But under some conditions, they would either not oscillate, or were too temperamental.

Because of this, I then reverted to a triode valve type g.d.o. which

I had made more than half a century ago! It was extremely simple, and the valve would oscillate with almost any kind of coil.

Realising the superiority of a valve over solid state devices in this particular application, I decided to simplify the g.d.o. I did this by eliminating the actual meter.

As the meter only indicated a change in the values of current, rather than an absolute measurement, it could employ a magic eye instead. The next step was to adopt a design I remembered seeing more than 40 years ago, where the triode section of the magic eye served as the actual oscillator valve.

So, instead of the expense of both a valve and a meter, only a magic eye is required. Having said that, I found that the opening of the eye, is far easier to observe than the dip of a conventional meter. Additionally, the setting up adjustments of the g.d.o. are far

less critical with the magic eye than with a conventional meter.

Tuning

The magic eye was originally developed as a tuning indicator. They were common on high quality pre-war receivers. Early magic eyes gave a circular display, and presumably that's how the name arose, because they looked like a winking eye!

However, there are variations on the basic theme. For example, the EM87 indicator has a bar-type display.

In the EM87, the two illuminated bars meet in the middle of the tube when the 'eye' is closed. They move away towards the ends of the tube as the 'eye' opens.

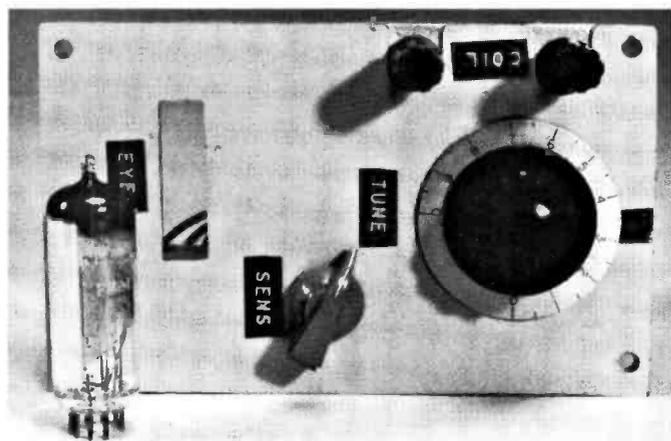
The EM87 I used in the original design, is still advertised by valve shops for about £3. If the EM87 is not readily available, I can't see any reason why other magic eyes should not be used.

Salvaged Eye

My g.d.o. projects used a salvaged magic eye and the two gang 500pF variable capacitors that came from an old domestic radio receiver. I bought the old radio at an auction for a couple of £s.

Old domestic radios seem to be the only source of 500pF double gang tuning capacitors. New capacitors seem only to be available with a capacity of 365pF and cost about £9 (**Editorial note:** suitable capacitors are available at rallies and from surplus dealers, including J. Birkett at Lincoln. See advert in this issue).

The disadvantage of a new 365pF capacitor is not only in the cost, but the lower capacity reduces the frequency range. However, in some cases (particularly at higher frequencies) a lower value capacitor may well be an advantage.



The practical g.d.o. circuit using a magic eye tuning indicator in place of a moving coil meter.

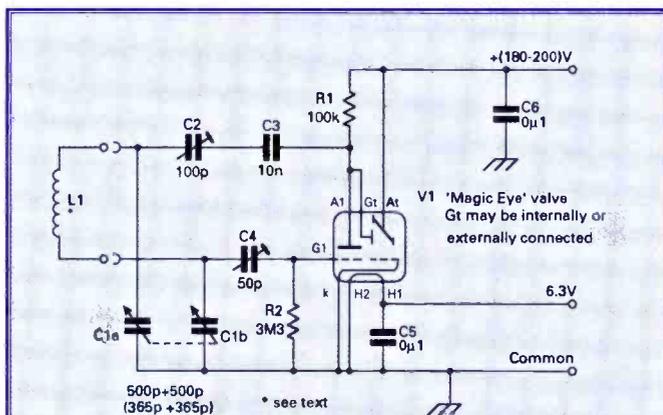


Fig. 1: Circuit of the magic eye valved grid-dip oscillator. See Table 1 for the valve pin connections, and alternative valves.

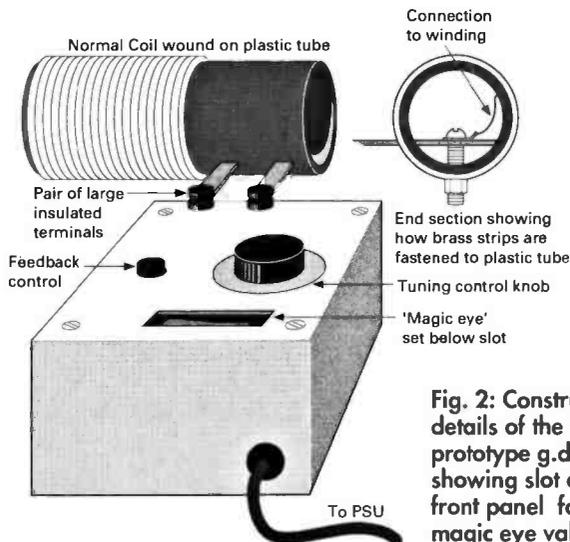


Fig. 2: Constructional details of the author's prototype g.d.o., showing slot cut in the front panel for the magic eye valve display. See Fig. 3 for internal details.

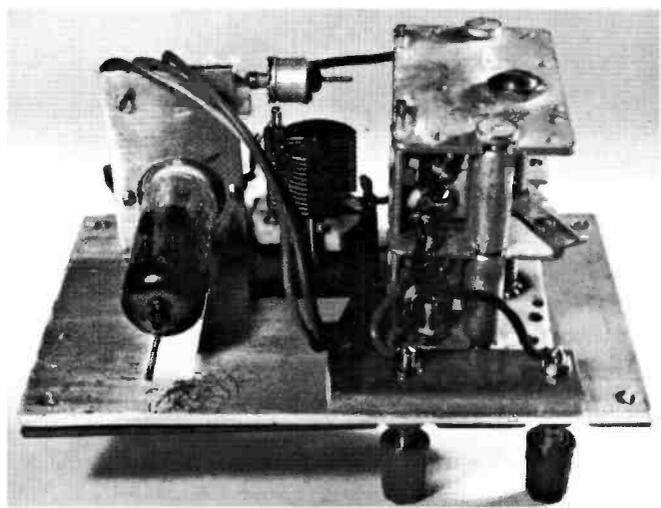


Fig. 3: The inside of the g.d.o. showing the layout of the major components and the magic eye mounted behind the slot cut in the front panel.

Three Versions

Except for employing different values for tuning and feed-back capacitors, all three versions of the g.d.o. have the same basic circuit, Fig. 1. However, as my main interest is with low and very low frequencies, a version was designed to operate down to about 10kHz.

In the very low frequency (v.l.f.) version, C3 consists of a double gang 500pF variable capacitor, connected in parallel. This is used in conjunction with a series of fixed capacitors, that can be switched into the circuit as required.

I've also constructed an experimental high frequency version which employs a 175 + 175pF tuning capacitor (C1). This variation when used with suitable coils, oscillates readily at frequencies up to 300MHz.

However, the version I've described in this article, designed as a general purpose g.d.o., oscillates from about 50kHz to more than 100MHz. To achieve this coverage, C1 is a 500pF double gang capacitor.

Any Kind Of Coil

The general purpose, and the low frequency versions of the g.d.o., were found to oscillate with virtually any kind of coil. Indeed, some were several feet in diameter. In my versions, the coils are wound on lengths of plastics water pipe, fitted with brass mounting strips that engage the terminals, as in Fig. 2.

Because of the versatility of the instrument, I'm not providing specific coil winding information. You can experiment and provide the coverage you need, with the

coil formers you have to hand.

When experimenting with coils, it's a good idea to start off on the medium waves. Once you have decided on the coil size you're going to use, wind the first coil to provide a signal that tunes over the medium wave band.

Once the coil is finished, and the signal can be heard on the medium waves, you can then quickly find the coverage of your oscillator. Find the lowest point it will tune to (variable capacitor fully meshed) and the highest point (capacitor minimum mesh) by listening on a receiver.

When you've done this, and you know where you are frequency-wise, other coils can be wound. Other coils can be checked by using a general coverage receiver of known calibration.

Oscillation is indicated by the eye closing. A quick check to see if all is well, can be carried out by touching one of the coil terminals. This action damps, or even stops oscillation, causing the eye to open.

Tuned To Resonance

When the g.d.o. is tuned to resonance with an inductor/capacitor of unknown value, placed with its axis in line with, and fairly close to the g.d.o.'s coil, it absorbs power from the oscillator. This causes the eye to open.

The degree to which the 'eye' opens depends on the Q of the coil being measured. It also depends on the degree of coupling between the two coils, and therefore the load on the oscillator.

The dial can be calibrated directly in frequency. This can be

carried out with reference to a frequency meter, or (of known tuning accuracy) radio receiver. Alternatively, graphs can be

Take care to differentiate oscillator harmonics from the fundamental signal! Having said that, the g.d.o. can cause interference to nearby radios, and must therefore be used with discretion.

Editorial comment: the warning regarding causing interference with the g.d.o. should be taken seriously. A valve g.d.o. can radiate a potent signal. When it's coupled to the antenna under test, or in use with a particularly large coil, operators are advised to use the g.d.o. for the shortest time possible. It's not unknown for transistorised dip-meters to receive a 'QRZ?' from puzzled amateurs hundreds of miles away, when the instrument has been coupled to a good antenna.

Setting Up

The degree to which the eye closes, depends largely on Q of the coils, and the value of the feed-back capacitors. Therefore it required a little experimentation to determine their optimum value.

Mica (compression type) 500pF trimmers are used for both C4 and C2 in the low frequency version of the g.d.o. I used 40pF trimmers for the high frequency version. The trimmers are mounted so that adjustments can be made with a screwdriver inserted through a small hole in the panel.

The approach I eventually adopted for the general purpose version, was to use a 100pF variable capacitor. This was salvaged from surplus equipment, for C2 and a 47pF mica compression trimmer for C4.

Increases Versatility

The variable capacitor, used instead of the trimmer, greatly increases the versatility of the g.d.o. This is because feed-back can readily be set at a point where the eye just closes. In this state, even the slightest dip (opening of the eye) is immediately apparent.

Unfortunately, the feed-back control slightly complicates construction. This is because the variable capacitor has to be mounted on an insulator, and be used with an insulated extension shaft.

Bought new, such a trimmer will cost about £6. Fortunately, suitable trimmers are often found in amateur's junk boxes. Finally, as the feed-back capacitors have to take virtually the full h.t. potential, high quality components must be used.

Construction Process

In the construction process I used, all the components are mounted on a 130 x 160mm piece of heavy gauge sheet aluminium, as in Fig. 3. This fits into the top of a wooden cabinet.

The magic eye is mounted horizontally below a suitable slot cut out of the panel, and can be seen in Fig. 3. The actual layout does not seem to be critical at low frequencies, but mains voltage standards must be adopted throughout.

Only Disadvantage

The only disadvantage of a magic eye is that the EM87 requires a supply of between 150-

200V d.c. at 1.5mA, and 6.3V a.c. at 0.3A. Despite this, the cost of a p.s.u. is far outweighed by the versatility and efficiency of the g.d.o.

A suitable p.s.u. can be either constructed as a separate unit or be incorporated into the g.d.o. As an alternative, a small 6.0V d.c. to 200V d.c. inverter may well be suitable. In this case, the valve's heater would be supplied directly from the 6.0V d.c. source.

My philosophy is that simplicity is often the best approach. There's no technical reason why a design that operated perfectly in the past, should not do so today.

Indeed the magic eye g.d.o. is an excellent example of how a simple, and long-established design can still compete with complex hi-tech instruments.

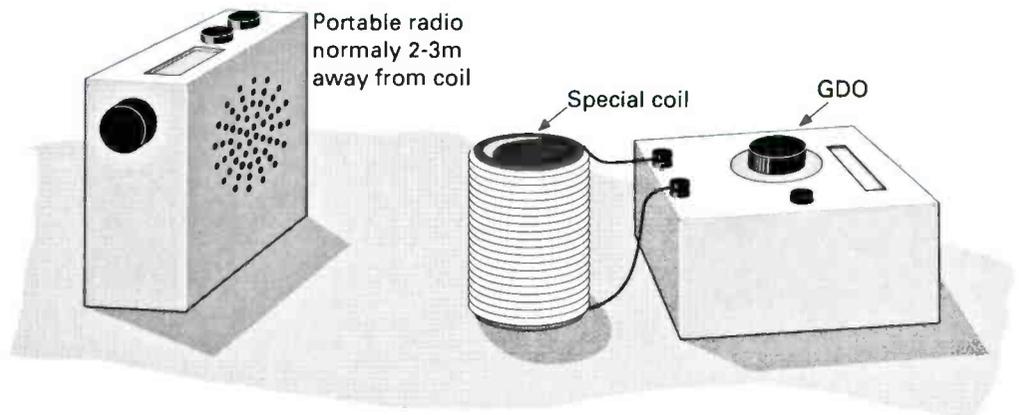


Fig. 4: Showing the method used to calibrate the dial for any new coil. The portable radio can be almost any good receiver, with suitable frequency coverage, of known accuracy.

How Much? Approximately £8 (depends on your junk-box)
How Difficult? Intermediate

Shopping List

Resistors

1W 10% Carbon Film

100kΩ 1 R1

0.25W 10% Carbon film 1 R2

3.3MΩ 1 R2

Capacitors

Polycarbonate 630V d.c. working

10n 1 C3

0.1μF 2 C5, 6

Compression trimmers

50pF 1 C4 (See text)

100pF 1 C2

Variable air-spaced

500+500pF 1 C1a, b (see text)

Valves

EM81 1 V1 (see Table 1 for pin-outs)

Alternatives See Table 1.

EM84

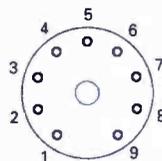
EM85

EM87

Table 1 (Valve base details from below)

pin	1	2	3	4	5	6	7	8	9
EM81	G1	k	-	H1	H2	-	A1	-	At
EM84	G1	k	-	H1	H2	At	Gt	-	A1
EM87	G1	-	k	H1	H2	At	Gt	-	A1

The electrode pinouts for some alternative magic eye valves. The small drawing represents the base of the valve as if looking onto the pins from underneath.



Miscellaneous

Suitable box (see text), B9A valve-holder, nuts, bolts, washers, aluminium for chassis (p.c.b. blank laminate can be used to make a chassis if required. See *PW* July issue, page 25 for information on this technique). Knobs, wire (for coils), coil formers with appropriate plug-in connectors. Salvaged valve bases, attached with adhesive to plastics tubing are suitable. The valve base then plugs into corresponding base on g.d.o. International Octal valve bases are ideal for this application. Guidelines for winding coils can be found in 'Getting Started The Practical Way', April *PW*, Table 1, page 36. Connecting wire, valve and suitable power supply. Power Supply: The GX15 (250V d.c.) transistorised inverter from Garex Electronics mentioned in *PW* June issue is suitable, and will enable the g.d.o. to be independent of the mains supply.

The magic eye indicator valves can be obtained from various suppliers including: Colomor (Electronics) Ltd., 170 Goldhawk Road, London W12 8HJ. Tel: 081-743 0899 or FAX 081-749 3934. The EM80 costs £1.80, EM81 £2.60 including VAT, postage extra, and at the time of publication are in stock.

Radio Amateurs Go

Richard Q. Marris G2BZQ, was 13 years old when *Practical Wireless* was first published in 1932. He takes the opportunity to pay tribute to the efforts of the many radio amateurs who used their expertise and enthusiasm in the many theatres of war between 1939-45.

On 3 September 1939, the Second World War commenced between the United Kingdom and its Allies, against Germany. In the days and weeks before, radio amateurs who were reservists in the Navy, Army and Air force, were 'called-up'.

Some of us, after a chaotic few days, found ourselves unceremoniously dumped on the shores of France. In that beautiful country we found that the French mobilisation was even more chaotic than it was in Britain.

To the delight of everyone, we found that a bottle of wine cost much less than the beer back home. It was also reputed to be the coldest winter for 190 years in eastern France. However, in the meantime back in Britain, 'they' (the Post Office) had taken possession of all amateur radio gear for the duration.

Funny Jobs

Within a few months of the outbreak of war, a high percentage of UK amateurs were in one of the armed services. They were also in industry, government

establishments, or in organisations doing 'funny jobs'.

It should be remembered, at that time, radio amateurs with their c.w. and technical skills were urgently needed. Most amateur radio gear in use up to that period, had been home constructed. Oriental 'black boxes' had not yet been invented!

So, that's how round one of the Second World War, Allies versus the Axis powers conflict started. The USA was neutral, and the American Federal Communications Commission (FCC) had restricted amateur radio to QSOs within its borders.

From time to time, I had the opportunity to swing the dial of a services receiver across the h.f. bands. In the early part of the war, I was able to hear American stations happily working each other. However, in 1941 just over two years and two months later, things were very different.

Pearl Harbour

On 7 December 1941, Emperor Hirohito's Imperial Japan

attacked the United States Navy at Pearl Harbour, and in the Philippines. They also attacked many British and Dutch Pacific territories.

As a result, the USA entered World War Two on the side of the Allies. Thus began round two of the Allies versus the Axis powers conflict. As a result, the FCC issued an order which stated that all US amateur radio transmitters must close down immediately.

It's interesting to note, that even a few days later when listening to the h.f. bands, it was still possible to hear active American amateur radio stations. Apparently it took a little time for the FCC order to percolate throughout that vast country.

Amateurs Encouraged

As had happened in the UK in 1939, all available American radio amateurs were 'encouraged' to join one of the armed forces, government establishments or industry. Such was the demand for their c.w. and technical skills, that

the US navy even offered radio amateurs the rank of Petty Officer, and every opportunity of obtaining a full commission.

It was quite amusing to find, that during the early few days when British and American military radio stations first worked together, they had some difficulty in understanding their different operating procedures! However, if there happened to be a radio amateur at either end, they speeded the traffic along with a bit of 'our' procedure.

I think this was probably a Court Martial offence, but it worked! The authorities quickly rationalised procedures, and it was then possible for British and American military wireless telegraphy stations to use the same language. More or less!

War Emergency

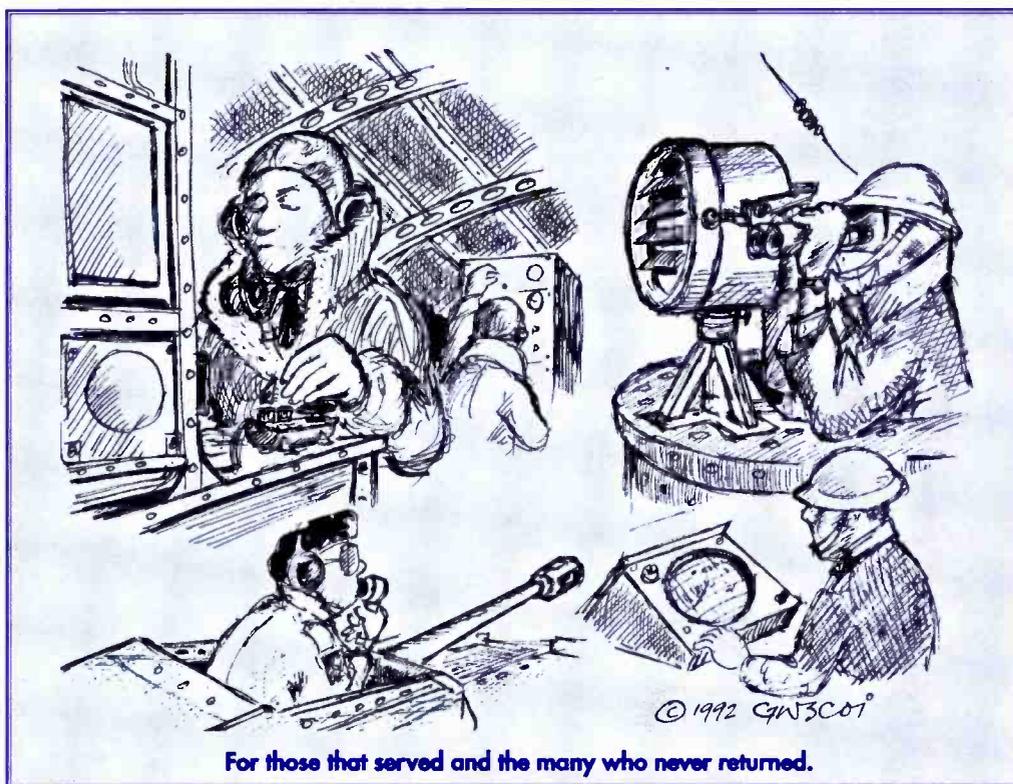
The War Emergency Radio Service was started in the USA, for use in the event of enemy air raids, or invasion. The WERS was operated by radio amateurs who were not in the armed forces, and it was worked under the auspices of the American Amateur Relay League (the ARRL is the National Society in the USA) acting as agents for the US Government.

For the purposes of the WERS, the USA was divided into areas of about 25 square miles. Each area had a headquarters station located roughly in the middle.

The headquarters station had a controller plus a deputy, and it was their job to organise a network of stations. They also had to organise and have 'on the air' training sessions and take part in periodic exercises.

There was also a requirement that extra personnel should be trained, using young people who were recruited locally. Their training included Morse operation and technical instruction. I've no doubt that the armed services then quickly recruited the ready-trained operators!

Before the war there was an increase in American amateur radio activity on the 11.2-11.6MHz v.h.f. allocation (the old 2.5 metre



For those that served and the many who never returned.

o To War



Sometime in the Second World War, Richard Q. Marris G2BZQ serving as an RAF Technical Officer.

band). As a result this band was used for the WERS, employing home-brewed transmitters and receivers together with their owners.

Less often, the 244 and 400MHz bands were used. The maximum transmit input power was 25W.

News Transmitted

It's interesting to note, that when the Japanese over-ran some areas, there were occasions when the first (and only) news of the event was transmitted by some local radio amateur. This was done at great personal risk to the operator, until the station was discovered and obliterated, often along with the operator.

Some of these brave individuals escaped into the interior, and maintained clandestine low-powered c.w. transmitters. These operators provided vital information to the Allies until the end of the war. Others, were

eventually caught by the enemy, and executed as spies.

In Retrospect

In retrospect, I think that the radio amateur in the UK, USA and Germany was of necessity technically and Morse proficient. They had been largely ignored by respective governments, who suddenly found that they urgently needed the radio amateur's undoubted skills.

During the conflict radio amateurs enthusiastically and efficiently provided engineering support, vital communications and radar duties in all parts of the world. Many lost their lives, were wounded, and many were taken prisoner.

Some of these enthusiasts had very distinguished military and technical careers, in the armed forces, industry and government establishments. And quite a large number are still paounding their Morse keys, but nowadays it's purely for pleasure.

G2BZQ

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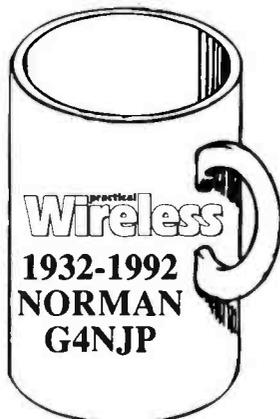
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Early Television

The 30-Line Days

When *PW* was first published, television was in its infancy. Ray Herbert G2KU looks back over 60 years to the scanning discs and mirror drums of 'mechanical' television. They were operated by the pioneers we have to thank for creating the interest which led to modern day high definition TV.

Television is now so much part of everyday life, that it's difficult to visualise that 60 or more years ago, the only moving pictures to be seen by most of the public were on the cinema screen. These often depicted events which had taken place days or even months earlier.

The ability to see, as well as hear what was on the wireless, captured the imagination of the public. At the time, people did not say 'what's on the television tonight?', it was a case of 'television is on tonight, we must look in'.

First Television Broadcasts

The first television broadcasts started in September 1929, from the Baird company studios in Long Acre, London. For the first few months, the broadcasts were sent out from 2LO, then located on the roof of Selfridges store.

From March 1930, the new medium wave station at Brookmans Park transmitted the vision signals on 356 metres. The sound channel was transmitted on the London National wavelength of 261 metres. Between five and seven half-hour broadcasts were made each week, until the summer of 1932.

It's not generally appreciated that the Baird company financed the whole operation. They provided equipment, studios and staff, besides engaging and paying for the performers. They also had to meet the BBC's bill of £5 per half hour for the use of their transmitters!

The BBC felt that they should venture into television themselves, and they decided to assume complete responsibility for future programmes. Arrangements were then made with the Baird Company to install equipment in Broadcasting House.



Fig. 1: Ray Herbert in 1933, about to play in his school dance-band. The badge in the left blazer lapel depicts Ray's membership of the Television Constructors Circle, run by the magazine *Television*.

Television facilities were then installed in studio BB, located in the basement of the recently completed Broadcasting House. And at precisely 11pm on 22 August 1932, this new service was launched.

The System

The 30-line system with vertical scanning and 12.5 frames per second, was established by John Baird for his Long Acre transmissions from the middle of 1932. They were transmitted using the company callsign G2TV.

The system choice represented the maximum definition, which could be squeezed into the internationally agreed spacing of 9kHz for broadcasting stations on the medium waves. Pictures were tall and narrow, and had an

aspect ratio of 7:3 designed to cater for head-and-shoulder shots and small groups of standing performers.

In those days, the BBC did not take television seriously. Because of this, the programmes were put out at times when the transmitters would normally have closed down. From the inaugural broadcast until April 1934, the timings were 11pm to 11.30pm on Monday, Tuesday, Wednesday and Friday.

At the conclusion of the evenings entertainment those people who did not switch off heard the peculiar warbling note characteristics of the 30-

line vision signals. This became a challenge to many listeners to turn these strange noises into a picture, and in this way the new medium gained many devotees.

High Costs

Due to the high cost of commercially available televisions (which amounted to about five weeks average wages) 90% of the receivers were home built. Mechanical television, as it has been called, represented a fascinating blend of wireless, mechanics and optical techniques.

Obtaining a picture did not pose many problems. Even I, as a then 15 year-old schoolboy, accomplished the feat in three weeks from a standing start.

A 'Century' superhet, donated by a relative, provided the vision signal from the London National transmitter. The sound channel required a separate receiver, tuned to the Midland Regional station on 391 metres (the wavelength changes were made when the BBC took over).



Fig. 2: Ray Herbert G2KU in 1992.

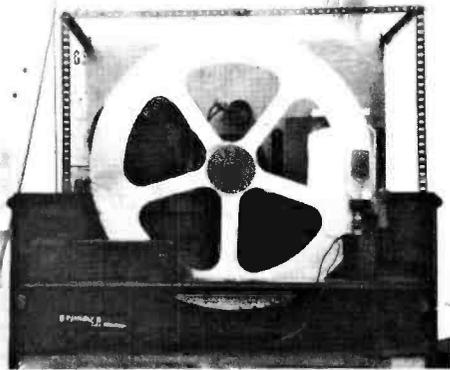


Fig. 3: Home-constructed 30-line mechanical scanning television, built by Ray Herbert G2KU as a schoolboy in 1933. The flat plane neon tube for picture illumination is shown on the right.

Main Components

There were three main components necessary for home construction. You needed a scanning disc, having a single spiral of 30 accurately positioned tiny holes, a motor to drive it and a neon lamp providing illumination proportional to the depth of modulation.

Motors were salvaged from old vacuum cleaners, fans and sewing machines. Beehive neon lamps cost 3/- (15p).

The flat plate variety of neon lamp, specially made for the job, provided better light distribution and they were worth the extra cost. Scanning discs, which varied from 1.5 to 20in diameter, were fabricated from cardboard or aluminium.

Temperamental Whiskers

In common with early wireless equipment, featuring

temperamental cat's whiskers and swinging coil reaction, these basic television receivers had to be set up by the man of the house. About 10 minutes before the programme was due to start, the motor would be warmed up.

After the vision signal had been tuned in on the loudspeaker, the output would be switched over to the neon lamp. The disc had to be run at 750r.p.m.

precisely, keeping in-phase with the studio scanner.

If the scanning disc ran too fast, the broken picture lines swept upwards, and if it was too slow the reverse applied. When you finally resolved the image, it frequently appeared split down the middle. This could be corrected by 'slipping' frames until the picture appeared in one piece.

Synchronising devices of the 'phonic wheel' type were available. These refinements required extra output power for the field coils, and a motor with a shaft extended at both ends.

Most 'lookers-in' kept the motor speed constant by means of a friction brake, or low value variable resistance. The orange-pink images were small, barely the size of a credit card, but a magnifying lens could be used to give some enlargement.

Remarkable Selection

The amateur constructors were well served with kit sets, and a remarkable selection of specialised component. For example, a constructional article in 1933 described a television set which could be built for 10/- (50p).

The receiver consisted of a cardboard scanning disc driven by a gramophone turntable. A year later, the *Daily Express* was promoting a receiver for their readers at a price of £5-10s. (£5.50).

In 1933, mirror-drum receivers became available. Designed by

Company for the BBC transmissions. It overcame the problem of the light lost through the small holes of the disc scanner used previously.

In practice, it had 30 mirrors positioned around the periphery of a dynamically balanced, cast aluminium drum. Each mirror was set at a slightly different angle to its neighbour, so that the light beam would be deflected by an amount equal to one line.

Banks of photo-electric cells detected the degree of scattered reflected light, producing a current proportional to the level of illumination. The effect of side or top lighting could be obtained at



Fig. 5: Engineer Douglas Birkinshaw at the television control panel at studio BB, Broadcasting House in August 1932. (BBC Photograph).

the Baird Company and produced by Bush Radio, they provided a bright and steady, black and white picture on a 9 x 4in screen. Even in kit form the price was considerable, and much greater output power from the receiver had to be provided.

Flying Spot System

The flying spot system was used universally for the transmission of pictures during the 30-line era. This arrangement called for the performers to be in a completely dark studio, except for shaded lights required by the pianist or small orchestra.

Through a hole in the studio wall, a mirror-drum scanner, projected a sharply focused beam of brilliant light. The beam scanned the scene in sequential vertical strips.

The new flying spot apparatus was specially designed by the Baird

will, by altering the gain of each photocell amplifier independently.

Captions and test cards could be transmitted. They were generated by using a small disc scanner situated in the control room.

The Opening Show

For the opening show, the BBC decided to call upon the services of artists with previous experience from the Long Acre studios. Betty Astell sang dance-band tunes of the day, Betty Bolton gave a song and dance act, while Louie Freear provided musical comedy numbers.

Within a very short time, the producer tested the limits of the techniques available by introducing much more ambitious acts. 'Pal', the performing sea-lion, honked away on a saxophone, and 'Red Fred' scooted around on his unicycle.

The pantomime 'Dick Whittington' was put on for Boxing Day. Jugglers, cartoonists and instrumentalists appeared



Fig. 4: The BBC television control room at 16 Portland Place in London in 1935. Caption machine in foreground, with disc scanner on the left, with twin monitor receivers above. The mirror-drum scanner (the camera) is pointing into the studio.

regularly.

It wasn't easy though, as the accompanist had to manage as best he could in the dim studio. He had to watch the acts through a car driving mirror fixed to the piano!

Entertainment Value

The question of entertainment value was often raised. The limitations of a low definition system coupled with a small picture size can be appreciated.

However, it's important to remember that in those days few people had ever seen television. The entertainment aspect was that of actually being able to see a picture, regardless of the programme content.

Various changes in the television broadcasting times were made, unfortunately not for the better. In spite of improved studio techniques, and the unflagging efforts of the technical and production team, in 1934 the BBC decided to reduce an already meagre allocation to only two short sessions each week.

Favourable

The late evening transmissions had one advantage. Because of favourable night time propagation, reception reports were received regularly from 'lookers-in' situated in Iceland, Germany, Austria,

Holland, Czechoslovakia, Denmark, Yugoslavia, Italy and Spanish Morocco!

Even 1500 miles away in Funchal, Maderia, an enthusiast sent frequent reception reports to the magazine *Television*. He mentioned that during a few months at least 90 people 'looked-in' to London on his receiver.

Limitations

There are unavoidable limitations concerning a television system confined to audio frequencies. Despite this, the 30-line service gave a great deal of pleasure and satisfaction to a large number of people. They seemed well pleased with the pictures they were able to receive.

It's been estimated that between 8000 and 10 000 'televisors' were in operation. This compared very favourably with the 9000 high definition receivers in use during 1938.

However, the writing was on the wall for the pioneers of 'mechanical' television. And on the 11 September 1935, the 30-line television days came to an end after they had proved people did want to 'see' programmes sent by wireless.

Acknowledgement

I would like to thank Nicholas Moss and the BBC for their help in providing the photographs taken at Broadcasting House and Portland Place.

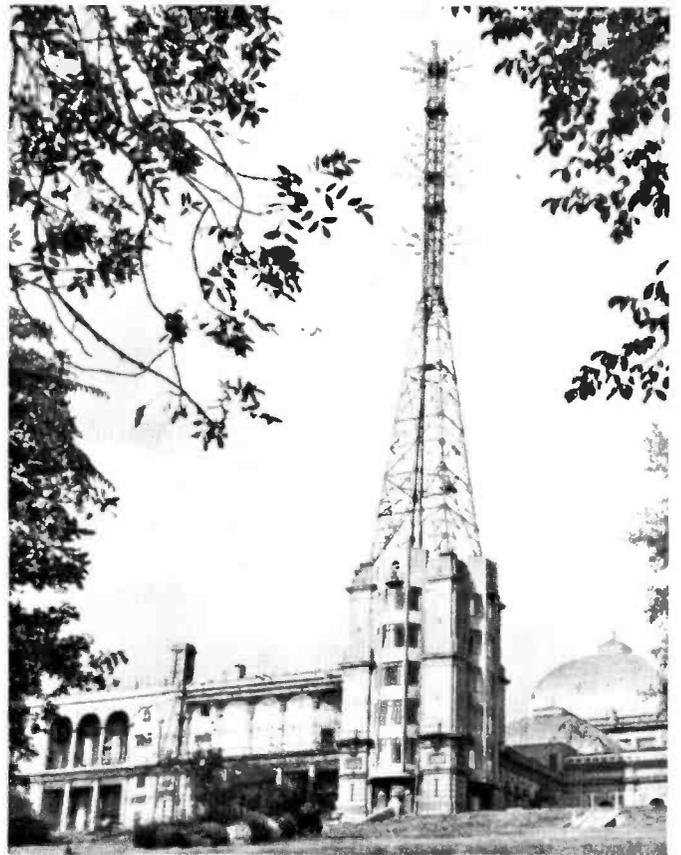
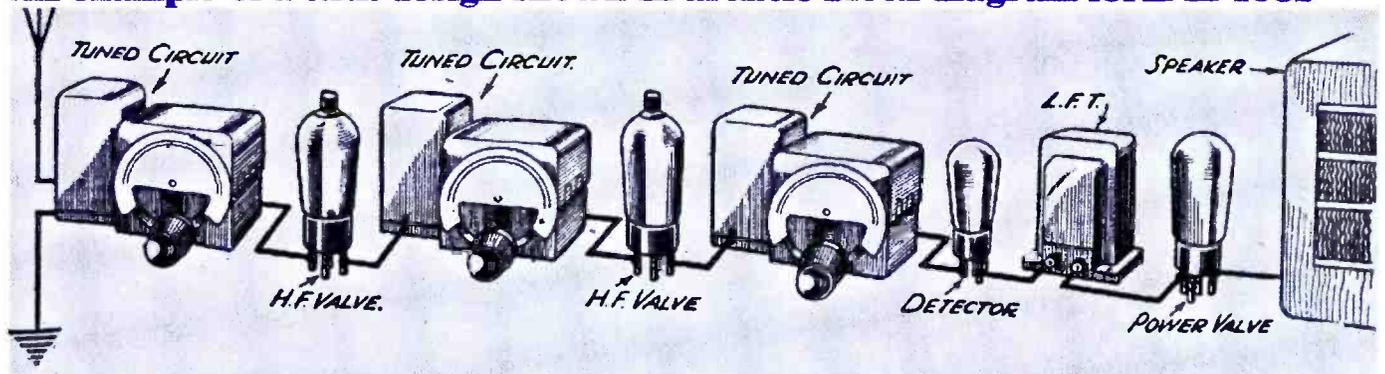


Fig. 6: The famous Alexandra Palace transmitting tower, shown in 1936 complete with v.h.f. antennas.

An example of a t.r.f. design shown in artistic block diagram form in 1932



'Professor Boffin'

PW October 1957



Reflections

Ron Ham looks back at his own early days in the hobby and his introduction as a specialist freelance writer.

Although I am one of your regular authors and 'part of the firm', hi, I want to begin this time by saying, many, many congratulations *Practical Wireless* on your 60th birthday. You really are a grand bunch of people to work for and I feel honoured to play a part in this 'once in a lifetime' issue.

I am sure that the policy of successive editors, from Fred Camm to Rob Mannion, to help readers more fully understand a complex and rapidly developing subject, is why the magazine still enjoys a wide circulation today.

Encouraged By Uncle

My mother's harmonic had been oscillating for about 18 months when *PW* was first published. At the age of 10, encouraged by an uncle, I built my first one-valve receiver. When I first saw *Practical Wireless*, around the age of 12, I never dreamt that one day my name would occupy one of their regular 'by-lines'.

My first copy of *PW* cost me nine old pence from my weekly income of 30 old pence earned by delivering newspapers. Twelve months later, a job change increased my earnings to 36 pence (15p) for assisting in the workshops of a cycle and wireless dealer on Saturday mornings.

Original Simple Set

My original simple set, that worked somewhere in the short wave bands, took priority over almost everything else in my life. This one-valve treasure, my pride and joy, was driven from a 120V

high-tension battery and a 2V accumulator.

I remember those strange 'metallic' noises in the headphones as the Mullard PM2DX valve came to life. There were two knobs, tuning and reaction, on the front ebonite panel. These variable capacitors were connected to a single plug-in coil and a few components surrounding the valve holder.

All the bits, plus four terminals, were screwed to the wooden base plate. A long-wire antenna and ground-spike earth occupied one pair of terminals and the headphones utilised the others. For many years mother kept my choir boy's Psalter with a circuit of the set drawn inside.

Drizzling Over Adverts

Two years later, and like several of my contemporaries, I was drizzling over the adverts in *PW* for ex-service wireless equipment. It was often 'new and boxed', as sold off from a military stores.

Now I'm going to make the mouths of you other collectors water. Various advertisers, who became 'household names' when ever radio folk met, were offering such sets as WS-38, complete with accessories, for around £3, BC342 (£20), R1155 (£14), M.C.R.1 (£8), WS-22 (£7), CR100 (£24-10s) HRO (£27-10s), R107 (£22-10s), plus loads of head-sets, microphones and Morse keys for a few shillings (5p).

First Contribution

My first contribution to 'Wireless', as we

affectionately call it, was 'punched' out, a long time ago. It was done on a portable typewriter and the copy was posted to the London office, to meet the deadline date, on sheets of A4 paper.

The magazine has kept up with technology, and they introduced their authors to the fascinating world of desk top publishing (DTP). Some of what you are reading now, was written on my Tandy WP-2 'lap-top' word processor while I was working at an exhibition entitled 'Six Centuries of West Sussex in Europe'.

On arrival home, the text was transferred electronically, via the RS-232 ports, to my Amstrad PC2286/40, Fig. 1. Prior to transmission the file was converted to ASCII on the Tandy, and received by the Amstrad through a specially written 'link' program. Finally, before posting the completed column, on a 3.5in disc, to the editorial office in Poole, the work, written in LocoScript 1.5 on the Amstrad, is also converted to an ASCII file so that the *PW* computers can read it.

For the benefit of the growing numbers of computer buffs among our readers, I used the 'Paint' program of Windows 2.03 and a mouse to draw the cartoon style explanation seen in Fig. 1.

Bread-board To Computers

From bread-boards to printed circuit-boards, from valves to 'chips', from a.m. to packet and calculators to computers, 'Wireless', like a super 'Elmer', has always been there. In addition to the latest news about tools, components and manufacturers, *PW*

accompanied the growth of almost all aspects of the radio industry during times of peace and war.

In the valve era the subjects ranged from early communications receivers, like the Hallicrafters 'Sky Buddy', Fig. 2, to the miniature 'all-dry' personal portables made by Ever Ready, Marconiphone, Fig. 3, Pye and Vidor.

The magazine also saw the start and finish of the British 405-line television system in Band I (40-68MHz) and followed its progress from the mirror-viewing sets of the late 1930s, to the 9in single channel (45MHz) monochrome receivers of the late 1940s. *Practical Wireless* also saw through the opening and use of Band III (175-230) in the 1950s, and the introduction to u.h.f. colour receivers and video recorders in use today.

Protected By Radio

'Wireless' was a few years old when Robert Watson-Watt (later Sir) and his colleagues, developed a system of detecting approaching aircraft or ships with a radio wave. Briefly, this was achieved by sending a pulse type signal in a given direction and then watching for its reflected image to appear on the 'Y' axis of a cathode-ray-tube display.

The system was first called radio direction finding (r.d.f.) and was later given its title of Radar. Joan's arm (thank you dear!) can be seen holding a typical WWII radar tube in Fig. 4. Note the letters 'A' &

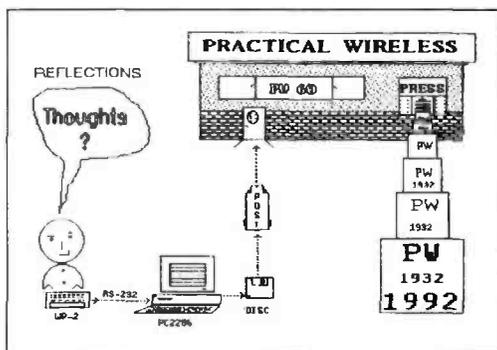


Fig. 1.

Fig. 2.



Fig. 3.



Fig. 4.



Fig. 5.

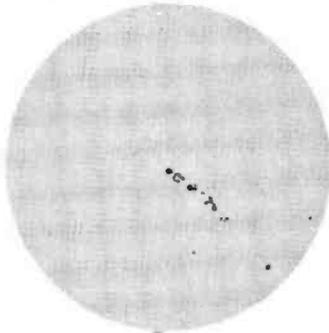


Fig. 6.



Fig. 7.

Fig. 8.



'M' (Air-Ministry) and the crown, embossed in the glass just below her thumb.

By the time war was declared, in September 1939, there were a number of remote stations in operation. They had a variety of 'unusual' antenna masts, like those on the Trundle, Fig. 5, near Chichester, and were installed at strategic positions along the South coast from the Isle of Wight to Dover.

Trundle Hill-Fort

The Trundle, an iron-age hill-fort, overlooking Chichester to the South and Goodwood racecourse to the East, was one such ideal site. It was used in the radio communications and radar network, that guarded the south coasts of England against German air-attacks.

Originally there were two installations, like those in Fig. 5, on the hill. However, from the remaining evidence, it seems that each one was inside a barbed-wire compound containing two wooden masts, a long equipment building, below masts, Fig. 5 and two smaller buildings for the generator and toilet facilities.

Although two of the original masts have gone from the Trundle, both compounds, with their buildings are still there. The one with the remaining masts, Fig. 5, has been used for many years by the South-Downs Astronomical Society for observational purposes.

On July 12, as part of Chichester's Annual Festival, the Society opened its 'Trundle Observatory' to the public, and Joan and I were among the 45 or so visitors who went to see their show.

During the afternoon, John Mason, President of the British Astronomical Association, back row right in Fig. 6, gave a well illustrated talk, inside the original equipment building, about the solar system.

At the same time the principle officers of the SDAS, Ian Wood (Chairman), John Palmer (Secretary), John Green (Treasurer) and Dick Barton (Newsletter Editor) demonstrated various telescopes to their visitors. Many people were so fascinated to see a chain of sunspots appear on the screen inside the projection box that was attached to the eye-piece end of a refractor telescope, Fig. 7.

Not far away, in Selsey, Patrick Moore was also following the progress of this chain, and he kindly sent me a drawing of its position on the sun, Fig. 8, as he saw it, via his projection unit, at 0710 on the 12th.

Other Society members were available to explain the finer points of astronomy and to demonstrate the various instruments on display. Interestingly, 1992 is the 21st year of the Society's existence and the 15th time they have held their 'exhibition' meeting on The Trundle.

The story of the development of radar since WWII for both civil and military use is well documented, so let's take a brief look at radio as a scientific instrument in another field. Of course there are many more.

Milky Way Radio

Back in 1931, Karl Jansky, an American radio engineer, discovered that radio waves were being emitted by the Sagittarius arm of the Milky Way galaxy. In fact he was detecting the combined output of radio noise from the millions of stars, like our sun, that make up the galaxy.

I believe that the great interest in solar activity today, dates back to the strange 'hissing' heard on the 28 and 56MHz bands in the mid-1930s, and to some interference seen on British radar during WWII. Between 1935 and 1938, three prominent

radio operators, Dennis Heightman (G6DH), Nell Corry (G2YL) and Barbara Dunn (G6YL) had no doubt that this

'hissing' noise was coming from the sun. This was because it only occurred during daylight hours and usually preceded an aurora or an ionospheric disturbance. The latter both resulting from solar activity.

Further evidence came in 1942, when British radar receivers, working around 60MHz, were flooded by noise from a giant sunspot group. From then on, a link has been gradually forged between the visual astronomer, whose interest is primarily in keeping sunspot records, and the radio astronomer/engineer wanting to know when the sun is active and likely to disturb radio communications on earth. This may be caused by a radio-blackout on the h.f. bands, and/or an aurora which has a strange effect on signals in the lower v.h.f. bands.

Great Strides

The past half century has seen great strides in v.h.f. and u.h.f. communication, in fact its technical progress has advanced more rapidly as each decade passed by. Within those years, the frequency range of 40MHz to 1GHz and higher, has been pioneered and put to use, especially with the ever increasing demand for frequency space for broadcasting and mobile communications.

Although Bands I and III are no longer employed in the UK for television, they are used for this purpose in other parts of the world. Band II (87-106MHz) has been developed since the mid-1950s for f.m. broadcasting, and is now packed with local and national stations.

At present, many of our readers are reporting the test transmissions from the new independent national radio service, 'Classic FM'. They can hear strong signals on several spots between 99.9 and 100.9MHz. Added to this, there's a multitude of low and high power stations throughout the world transmit



domestic television pictures in Bands IV (471-608MHz) and V (615-856MHz) and because of the great demand they have to share the limited frequency space available.

Propagation

In general terms, the normal range of radio and television signals between 40 and 150MHz can be increased by Sporadic-E and from 100MHz to above 1GHz by ducting in the troposphere. The former is most likely to occur during the mid-summer months (May to August) and the latter at anytime when the atmospheric pressure is high and a period of settled weather is about to change.

Fortunately within this vast frequency range there are specific allocations for amateur use which have the same propagation problems as their nearby domestic bands. For instance, signals transmitted in the 50, 70 and 144MHz amateur bands can also be influenced by Sporadic-E and the 144 and 432MHz bands by disturbances in the troposphere. For example, it often happens that an amateur spots co-channel patterning on the home TV and then rushes to the shack to find some interesting and unexpected DX on 432MHz.

There is more to say about 'Wireless' and its special place in the history of communications, but, like the radio frequency spectrum, I have limited space.

Sixty years ago, when *Practical Wireless* was born, G3IOR (to be) was not. (Well, not quite anyway!) However, at the age of 10 years, an addiction to *PW*, or 'Camm's Comic' as it was then more familiarly known, resulted in my building progressively more 'complex' circuits.

Examination And Morse Test

In 1953 (AD) I took my RAE examination and Morse test, to become G3IOR, limited to 10W of c.w. only for the first year. The world was my oyster! Using just 8W to a 6V6 crystal oscillator, at a time when the h.f. bands were quite dead. I worked my first W and ZL stations on 3.5MHz. By 1954 I had my 'phone licence, used a home-brew 'Elizabethan' transmitter with a pair of glowing 807s in the final. This was soon modified to a single 813 valve p.a., permitting me to accomplish an early DXCC on c.w. and a.m. 'phone. The s.s.b. mode was then unknown to me!

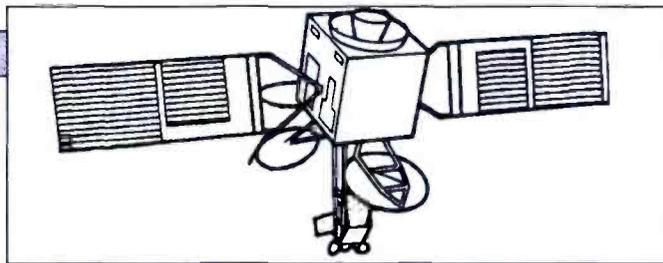
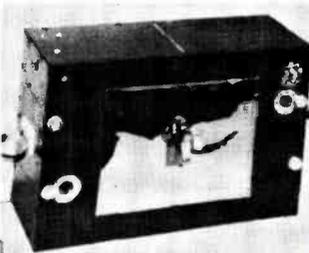
The photograph Fig. 1, was taken at this time. All of the shack gear, with the single exception of the world globe and the much prized Hallicrafters S.20-R receiver (the unit with my hand on the tuning knob) was entirely home-brew. On top of the S.20-R sits the single valve receiver pre-amplifier.

In front of the control panel is the Morse key, performed by a 'beetle'. This was the first Eddystone semi-automatic 'bug' key, which evolved long before the electronic keyers of today. The much modified 'Elizabethan' 3.5 to 28MHz transmitter is on the far left, and between this and the control panel is wedged my old 7W 1.8MHz transmitter surmounted by



Fig. 1.

Fig. 4.



Satellite Scene

by Pat Gowen G3IOR

For this month's special 60 year anniversary issue, Pat Gowen G3IOR enters into the early history of his own station, and the first satellites that led to the advanced amateur radio satellites that we can use today.

a home-made oscilloscope.

Below the bench, well screened apart from a Perspex window, sat the lethal power supplies. The reason for the screening was that the main transmitter 1250V supply used a pair of GU-50 mercury vapour rectifiers. These produced such a level of ultra-violet radiation that severe 'sunburn' could result to the operator's knees if the screening was absent. The little Perspex window by my (non-sunburned) knee was a visual observation port allowing viewing but preventing cataract!

No Satellites

Of course, in those days there were no satellites in orbit other than the Moon. Satellites then existed only in the realms of speculative science-fiction. It was October 1957 when Doug Mallett G3HUL and myself became involved in tracking the 20MHz beacon of the very first man made orbiter, the Soviet *Sputnik-1* on 20MHz. We saw it, we heard it, and like the professionals, we could hardly believe it was possible.

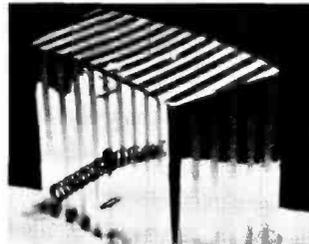
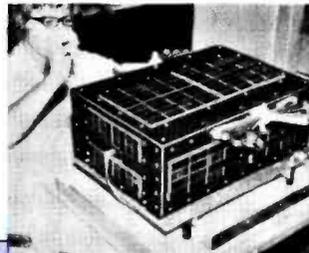


Fig. 2.

Fig. 5.



Amazed

As requested by various equally amazed authorities, we did the sums necessary to find the height, inclination and period, and found the orbital period to be 41 minutes. We wondered why we could hear *Sputnik-1* but couldn't see it on alternate orbits. We all then assumed that the signals couldn't penetrate the ionosphere, so it just had to be up there somewhere.

Without knowing it, we had discovered the first antipodal reception! In fact, the period was some 82 minutes, but we were hearing *Sputnik-1* from the exact opposite side of the world.

Antipodal reception is a satellite phenomena still not fully understood today!

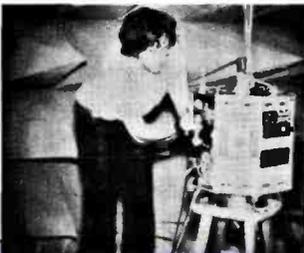
Repeater In Orbit

When the USA began to put up their first small exploratory satellites, an American amateur half jokingly wrote to *QST*'s letter column, extolling the wonders that



Fig. 3.

Fig. 6.



could result if an amateur radio 'repeater' could be placed into orbit. This was picked up by a group of amateurs, working for the early NASA organisation, who pointed out that this idea could in fact be brought to fruition on the strict proviso that the amateur satellite could be made to replace the weight, size and dimension limitations imposed by equating the spare payload balance requirements.

OSCAR-1

Just four years after *Sputnik-1*, the world's first amateur radio satellite, OSCAR-1 was built by a group of Californian amateurs who formed themselves into 'Project Oscar'. It weighed just 10lbs and had to be shaped to adapt to the nose-cone of the US Thor-Agena rocket, as you can see by Fig. 2, which also shows the ejector spring and the external silver back barring to maintain temperature regulation.

It went aloft on 12 December 1961, and commenced sending 'Hi Hi' from its two-transistor stage 140mW 145MHz beacon. The era of amateur-radio satellites had begun!

OSCAR-2

OSCAR-2 was launched six months later on 2 June 1962. This was a very similar satellite to its predecessor, but with a few improvements in temperature regulation and battery life.

Mylar Balloons

Attempts were made to bounce signals off the orbiting 120 foot aluminised mylar Echo balloons that were launched in 1962, but few amateurs had a sufficiency of power and antenna gain to sustain effective QSOs. Similar disappointment resulted from amateur attempts to bounce signals off the highly controversial USA 1963 launch of a belt of copper needles into low earth orbit. Fortunately for later satellites and manned space missions, they decayed out of orbit rapidly! Amateurs like Perry Klein W3PK and Ray Soifer W2RS decided to see if they could bounce signals off some of the low orbiters, despite the fact that the path loss and reflection co-efficient calculations showed this to be impossible with amateur powers. As with most impossible things for radio-amateurs, they got

results, although it was later concluded that the effect was due to the ionised trail of the passing spacecraft.

OSCAR-3

The OSCAR-3 satellite was launched on 9 March 1965 and lasted 18 days, as like its predecessors it too had primary batteries. It had a 50kHz wide repeater with an uplink near 146MHz and a downlink close to 144MHz.

Despite the low sensitivity caused by in-band blocking, over 1000 amateurs in 22 countries worked through it. The OSCAR-3 satellite also possessed two beacons, one a continuous signal for tracking, and making Doppler measurements and propagational studies, the other sending telemetry on the temperature of the p.a. and battery as well as its voltage.

OSCAR-4

The OSCAR-4 satellite went up on a *Titan-III-C* rocket in December 1965 to get to a 21 000 mile high apogee, but due to the failure of the launcher third stage only with a 100 mile perigee. It was thus doomed to a very short lifetime before re-entry.

The satellite carried the first true crossband transponder, operating from 144 to 432MHz to give a 3W p.e.p. 10kHz bandwidth downlink. The first UA to W satellite QSO was made with this spacecraft. OSCAR-4 under manufacture and test is shown in Fig. 3.

OSCAR-5

The OSCAR-5 satellite, shown with its metal tape antennas folded in Fig. 4, involved the Australian WIA group and the first main AMSAT collaboration. It provided a 50mW 144.050MHz and 250mW 29.450MHz beacons, a 7-channel analog telemetry system. It flew in late January 1967, and despite its short lifetime, all systems worked well, so paving the way for OSCAR-6.

OSCAR-6

Next came OSCAR-6. With solar cells re-charging NiCad batteries, highly flexible ground command, easily decodable Morse code c.w. telemetry, magnetic stabilisation, high sensitivity and excellent output, it became a highly

popular amateur satellite.

The satellite was the first one to be easily useable by all amateurs. It had a 100kHz wide passband using a 145MHz uplink to give a 1W robust shared 29MHz downlink. Fig. 5 shows OSCAR-6 with its deployable 10m tape measure antenna, folded ready for lift-off on 15 October 1972.

It worked well for four and a half years, providing tens of thousands of QSOs to amateurs in over 100 countries. I worked over 80 countries through it using a converted Pye base station and a 'rubberised' crystal, with stations as far as 6000 miles distant.

Next Step

The AMSAT organisation's next step was to employ amateur u.h.f. and v.h.f. So OSCAR-7 in addition to a Mode A 145 to 29MHz also carried a 432 to 145MHz linear transponder using DJ4ZC's AMSAT-DL 'HELAPS' (High Efficiency Linear Amplification Power System). It had beacons on 29, 145, 435MHz and 2304MHz, but permission to switch this latter 100mW s.h.f. source on was never given.

Many nations, whose flags can be seen on the satellite beside AMSAT Engineer Jan King W3GEY, testing the antennas in an anechoic test chamber in Fig. 6, pooled their cash, expertise and constructional energies on this highly popular satellite, the first to really enhance u.h.f./v.h.f. DX communications. Launched in late 1974, OSCAR-7 operated until mid-1981, when eclipse thermal stress produced an open circuit NiCad battery cell.

OSCAR-8

Now I come to OSCAR-8. Funded by a grant of \$50 000 from the ARRL, with hardware provided by Project OSCAR, AMSAT and the newly formed Japanese JAMSAT group, OSCAR-8 went into orbit at 1754UTC on 5 March 1978. The satellite is shown under test by Dick Daniels W4PUJ and Jan King W3GEY in Fig. 7. OSCAR-8 used 'A' mode similar to OSCAR-6, but additionally carried a 'J' mode transponder with a 145MHz uplink giving a 435MHz downlink.

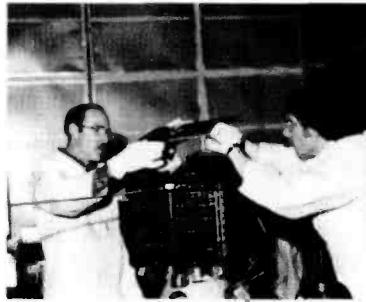


Fig. 7.

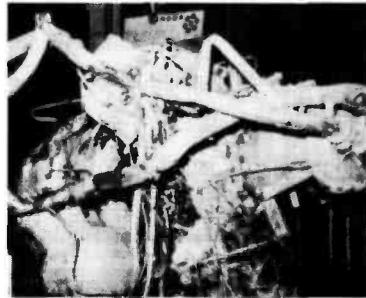


Fig. 9.



Fig. 8.

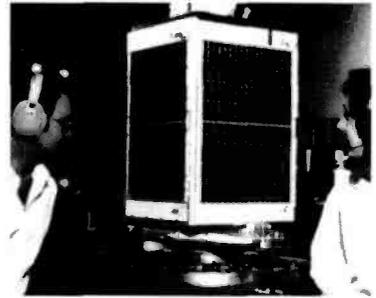


Fig. 10.

Sensitive Satellites

The USSR launched their first 'A' mode satellites RS-1 and RS-2 on 26 October 1978. They were very sensitive satellites and were placed in very high polar orbits, permitting DX QSOs up to 7000 miles distant for amateurs using only 5W on 145MHz to very simple antennas.

The initial effort was followed on 17 December 1981, by the launch of six RS satellites in one cluster. They too used Mode A, contained codestore units, gave Morse code telemetry of many channels, and had a Robot function that provided automatic c.w. QSOs to callers.

A typical single spacecraft RS-7 is shown by Fig. 8.

Advanced Communication

Having passed through the Phase I short life primary powered initial spacecraft stage, followed by the Phase II more advanced communications satellites with ground control systems and rechargeable batteries, AMSAT went on to the first Phase III satellite. It was to be a highly elliptical Mode B 435 to 145MHz transponder with many state of the art functions.

Nine years of planning and four of building culminated with its intended launch by ESA on ARIANE at 1430UTC on Friday 23 May 1980. It did not make orbit, as the launch vehicle had to be destroyed by ground control due to failure.

Phase-III-A can be seen in Fig. 9, a wreck that was dumped into the South Atlantic off the coast of French Guiana. Unfortunately,

AMSAT was almost wrecked too, but thanks to generous donations from many amateur radio organisations and individual amateurs around the world, went on to provide Phase III-B, the OSCAR-10 we still have active today, as well as the current OSCAR-13.

Space Age University

Britain came into the space age on 6 October 1981. The event was achieved with OSCAR-9 (also known as UoSAT-1) a scientific satellite built by the University of Surrey AMSAT Group led by Martin Sweeting G3YJO. It carried beacons on 7, 14, 21, 29, 145, 435, 2400 and 10470MHz, had radiation detectors, magnetometers, a camera, particle impact detectors, speech synthesis, and ran the first experimental digital communications. It has re-entered now, but the UOS have put up many more satellites since then, one of which (OSCAR-11) can be seen with G3YJO to the left in Fig. 10.

Satellite Progress Detailed

The rest of the story you will know, as AMSAT satellite progress has been detailed in this column for many years now. AMSAT, with its various groups, members and supporters all over the world will continue to design, build and arrange the launch of future, even more advanced satellites, for the amateur radio community on the proviso that funding can continue to be provided by those that use and enjoy them.

PACKET PANORAMA

Roger Cooke G3LDI takes a look back at the days when he was delighted by the whirring and oily machinery involved with the old mechanical teleprinters. He even discovered brand new ones in a junk-yard!

This month I'm travelling back in time as part of the Diamond Jubilee celebrations. So, stand by and let us see what was happening in the hi-tec age of the 1950s and 60s which is as far back as I can go!

Trying to remember back nearly 30 years isn't easy, but the following is roughly what was happening at that time. Please don't laugh too loudly!

Latest Digital Mode

The latest piece of equipment to arrive at G3LDI in 1957, is the AR88D. I've been saving up for two years for this receiver, and it replaces the old R1155 that's been my main station receiver for four years.

It has superb selectivity, and covers all the amateur bands (as I remember it, the 14MHz band covered a whole quarter of an inch of dial space!!) Obviously, to become operational on the air, transmitters have to be constructed.

There are quite a few designs around, one of the most popular being the Elizabethan. This uses wide-band multipliers and a main v.f.o., running into a pair of 807s in class C, with a π -network in the p.a. tuning stage.

The photograph in Fig. 1,

shows my home-brew rig and on the top Z-match a.t.u. This is quite a popular design, and has proved useful for matching just about anything.

The latest addition to the station is the Eddystone bug key. I've now replaced the old straight key with the bug, and it has proved invaluable in this form of 'digital' mode.

The mode is called c.w., or Morse. The method consists of keying the transmitter on and off at different mark/space ratios, called dots and dashes.

Different formats of these dots and dashes form the letters of the alphabet, and world-wide communication is possible with simple equipment. The only problem is the stability of the v.f.o.

I use a Clapp v.f.o. circuit, and even this has proved difficult to tame. Discussions and debates go on endlessly at the club regarding the stability of the Clapp versus the e.c.o. oscillators.

If the QSO lasts longer than 10 minutes, I have to compensate for a frequency drift of about 1kHz by moving the transmitter dial. However, with this equipment, I managed to win the local club contest, as witness the cup on top of the

AR88D (I wonder what happened to that cup?).

A Mini DXpeditions

In 1959, a mini DXpedition was organised by G3IOR, G3LDI, G3CQE and G3MPN. It was to the Isle of Man and used the callsign GB3GD.

Nowadays, this is the call of the Isle of Man repeater. But for one week in 1959, it caused some pile-ups on both c.w. and 'phone!

Some 5000 contacts were made, and the latest logging techniques used can be seen in Fig. 2. This shows Pat G3IOR, and myself ploughing through some of the expedition logs, before transposing them to the main log.

The photograph in Fig. 3, shows us giving our cabaret performance during the evenings. We stayed at a place called the Alex Inn, which was virtually empty at the time.

On reflection, this could have had something to do with the quality of our performance! I understand that the Alex Inn has since been demolished. I leave you to decide quite why that should be!

Scroby Island

Another major DXpedition we undertook, was to Scroby Island in 1958. Scroby is a sand bank, just a few miles off-shore from Great Yarmouth in Norfolk.

We only went for a day, as the island is covered by high tide. I think we made about 15 contacts in total, as it was not easy to set up the station.

Most of the gear had to be transported by small boat. However, some of the amateurs were at the time in the RAF and that proved to be useful. Since the coast is patrolled by the rescue helicopters, they took the opportunity of dropping in for the day. The photograph in Fig. 4, shows a group of those amateurs that made the trip.

Major Planning

We had to undertake some major planning for contests such as National Field Day, as you can see in Fig. 5. Using my next generation of transmitting equipment, still with my trusty AR88D, this NFD took place in 1964 near Norwich.

The transmitter was an s.s.b. rig. It used a G2NH crystal filter type s.s.b. generator, driving a miniature 807 in the p.a.

For this contest, we also used an antenna tuner made by Donny G3JIE, and full relay control and muting together with an audio filter, as I remember!

The tortoise-shaped Eddystone Morse-paddle belonged to Pat G3IOR, and I saw another recently when I was in Canada! I saw the paddle in question, when I was in Victoria last year. I was attending the 'Ham Happenings' (a rally of sorts) where they had a display of Morse keys.

The owner of the display was

Fig. 2: Pat Gowen G3IOR (wearing glasses) and Roger G3LDI 'cooking the books' from the Isle of Man DXpedition.

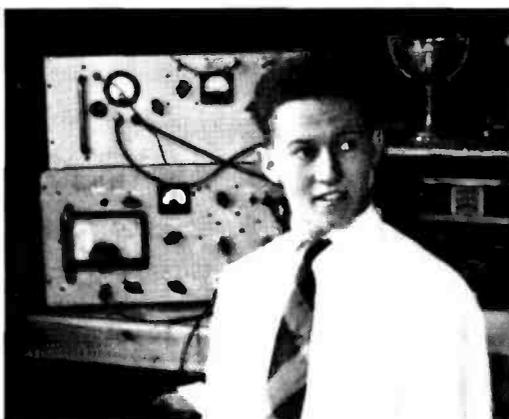


Fig. 1: Roger Cooke G3LDI, operating his station in Norwich during 1958. The receiver is an AR88D, transmitter is a home-brew rig with a pair of 807s in the p.a., Z-match a.t.u. feeding into an end-fed Zepp antenna.



PACKET PANORAMA

extremely proud of his latest acquisition, an Eddystone bug-key! If you have one of these, then hang on to it, as they are a collectors item now.

RTTY Arrives

In the late 1950s and early 1960s, RTTY arrived on the scene. In fact, Bill Brennan G3CQE, seen in Fig. 3, was the first UK station to operate on that mode.

At the time of the GB3GD expedition, all three of us were operating on RTTY. This was using Creed 3X tape printers.

We were encouraged by James Hepburn VE7KX, now a silent key, who was one of the first RTTY operators on h.f. Gradually, we obtained more RTTY equipment, usually by looking round junk-yards, believe it or not, and most of us ended up using Creed 7B printers.

I well remember a major find of Creed 7B printers. They were boxed and fully wrapped in waxed paper, fully-serviced and were in a junk-yard near Norwich. They were all around £10 each at the time!

The photograph in Fig. 6, shows Ted Double G8CDW, who also now lives in Norfolk, operating his station using a Creed 7B. On top of his receiver can be seen a couple of old terminal units that were the standard of the day. This photograph dates back to 1965.

Regular Contests

Operating RTTY on h.f. became more popular, and regular contests were organised each year, and are still running to this day. However, we had problems becoming recognised, and obtaining a slice of the spectrum in which to operate.

Sounds familiar doesn't it? Well, I shall leave the question of band-planning alone, because I am obviously fighting (and losing) a lone battle.

I hope you have enjoyed the trip down memory lane. It's ironic how time seems to improve standards in equipment, providing new modes to use, such as Amtor and packet.

The passage of time increases the availability of commercially produced gear, although I sometimes wonder



Fig. 3: Cabaret stars on the Isle of Man! Pat Gowen G3IOR and Bill Brennan G3CQE vocalising and Roger Cooke G3LDI playing piano and vocalising. Unfortunately we can't confirm the rumour whether or not they were singing 'Red Sails In The Sunset' as the Hotel has since been demolished!



Fig. 4: Marooned on Scrobby Island 1958 (temporarily at least!). Back row, left to right) RAF Air crew-member, Sid G3MFQ, Paul G3XPT, Fred G3HRE, G3LFU (silent key), Ted G3IVH, and youthful-looking Pat Gowen G3IOR on far right. Front row (left to right) Charles G3JPT, s.w.i. friend, Dave G3MPN, very young-looking G3LDI, and Ray G2YU (silent key).



Fig. 5: National Field Day 1964, with G3IOR making final adjustments. An example of the rare Eddystone mechanical paddle Morse key is ready for use.



Fig. 6: Ted Double G8CDW busy on RTTY in 1965. Ted is now retired, lives in Norfolk and is active on packet @ GB7TLH.

Wrongly Referred

In the August issue, Fig. 2 was wrongly referred to. So I'll be adding some text next month to accompany this diagram. It is about direct access for users to satellites. That should bring us back up to date with a jolt!

It's time to say 73, and happy packeting. Send the wheel-chairs and crutches to G3LDI @ GB7LDI, QTHR, FAX on (0603) 787534 or messages on (0508) 70278

whether this is an advantage to the hobby or not. Yet the human frame has to tolerate the slow but, nevertheless unavoidable, deterioration in physical condition.

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September Shuttle SAREX Mission

by Pat Gowen G3IOR

The STS-47 space shuttle *Endeavour* is due to be launched into a 300km 57° inclination orbit on 11 September 1992 at 14:23:00UTC. It will carry a 'SAREX' (Shuttle Amateur Radio Experiment) which will be operated for six days by flight engineer Dr. Jay Apt N5QWL and Mission Scientist Dr. Mamoru Mohri 7L2NJV, who will provide opportunities of QSOs to all earth stations between 70°N to 70°S.

Both Jay and Mamoru will use f.m. voice, and will also be sending packet radio beacon messages containing details of the daily mission activities. They'll also be using Robot operations that will provide serialised contact numbers with the callsign W5RRR-1. To minimise QRM they will employ split frequency operation, with the downlink on 145.550MHz and three separate uplinks. Whilst the rest of the world will be calling on 144.95, 144.91 and 144.97MHz, Europe will use 144.80, 144.75 and 144.70MHz.

Endeavour's planned attitude is to orbit with the tail facing earth and the payload bay facing south. As the SAREX antenna will be in the right forward window, most earth operators should have an unrestricted path from the time that the shuttle first comes over their horizon, until it is at the highest point, the time of closest approach.

Passes will occur over the northern hemisphere in daylight hours, and thus will not be visible. The operators will make every attempt to make contacts when they are not engaged with experiments or when the sky is cloudy, when their

photographic work is limited. It is hoped that SAREX operations will commence three hours after lift-off to continue for a duration of six days and five hours.

In addition to unlisted radio amateurs, they also plan to work two US schools, three Australian and one in Europe and Africa. No orbital manoeuvres are planned after the first six hours of flight, so the Keplerian elements should hold well for accurate tracking.

Jay N5QWL requests that standard international phonetics be used for giving your callsigns, as they will not respond to any callers using non-standard phonetics. As they will be recording all QSOs on an audio-tape recorder, full callsigns should be used, without giving the callsign of the shuttle operator in order to save valuable time during the short 10 minute maximum passes.

N5QWL advises that if you can decrease your transceiver f.m. transmit frequency by 3kHz at signal acquisition, it will compensate for the offset doppler shift. If you cannot do this, then wait until a minute or two after they come over your horizon before calling, as by then you will be within the spacecraft's i.f. bandwidth limits. Similarly, if you listen 3kHz below 145.550MHz at acquisition of signal, they will be a far better signal with you. The above applies to both voice and packet transmissions.

The pre-launch Keplerian element set for the mission provided by the Johnson Space Flight Centre is shown in the table above.

Satellite:	STS-47
Catalogue number:	00047
Epoch time:	92255.65952351
(Date/Time 11 September 1992 at 15:49:42.83UTC)	
Element set	JSC-004
Inclination:	57.0019°
Right Ascension of Asc. node:	106.3148°
Eccentricity:	.0009301
Argument of perigee:	264.7374°
Mean anomaly:	95.2615°
Mean motion:	15.90241453 rev/day
Decay rate:	9.2000e-04 rev/day ²
Epoch rev:	2

Transmitting Information

Throughout the mission W5RRR, the Johnson Space Centre ARC at Houston, Texas, will be found transmitting information on 7.215 l.s.b. and 14.280, 21.360 and 28.400MHz u.s.b. WA3NAN, the Goddard Spaceflight Centre ARC at Greenbelt, Maryland, will re-transmit NASA Select Audio of the mission and SAREX bulletins, giving updated tracking and activity information. They will be heard as a good signal on 3.860 and 7.185MHz l.s.b., plus 14.295, 21.395 and 28.650MHz u.s.b. The AMSAT-UK Net which meets on 3.780MHz each Sunday at 1015BST, and on Mondays and Wednesdays at 1900BST on the same frequency, will also be providing pass times for the UK.

Those with scanners, or other suitable receivers, may wish to monitor direct transmissions as the

shuttle flies over them, the frequencies for which are as follows:

145.550MHz: SAREX (Shuttle Amateur Radio Experiment)
259.000MHz: Air to Ground or Suit to Orbiter
259.700MHz: Shuttle Primary Air to Ground, also Suit to Orbiter
279.000MHz: Suit to Orbiter and Suit to Suit

All QSL cards should go to N5QWL, 806 Shorewood Drive, Seabrook, Texas 77586, USA. Include on your card the callsign worked, the date, UTC time, the mode and the frequencies used. For packet QSOs include the QSO number issued by the Robot. Any s.w.l. cards should append the callsign heard, date, UTC time, mode and frequency. Incorporate a s.a.s.e. with \$0.50 of US postage stamps or two IRCs.

Errors & Updates

Getting Started The Practical Way Pages 22-24, PW September 1992

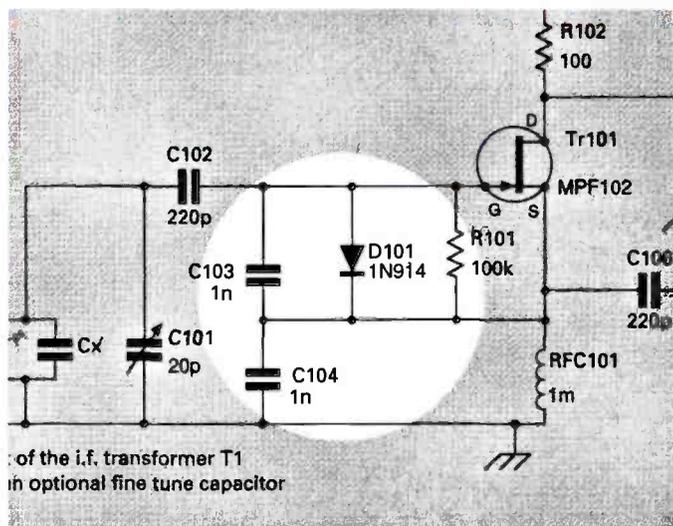
A small error crept into the circuit diagram of Fig. 4 on page 23 of the September issue of *PW*. The error was a misplaced diode connection. Look at the corrected part-diagram reproduced here. Notice the diode, D101, has its cathode connected to the junction of RFC101 and C106. This connection is correct.

Please modify the diagram (Fig. 1) in September's issue, to agree with the diagram above. The p.c.b. layout, of Figs. 5 and 6 are correct, so no changes need to be made to these overlay and track patterns.

The photograph shown on page 23, is of George Dobbs G3RJV's original (simpler) prototype, and so is slightly different in layout. Although simpler in design, the circuit functions the same.

I apologise for this error. *Editor*.

Practical Wireless, October 1992



Back-Scatter

HF Bands

Reports to

Paul Essery GW3KFE

287 Heol-y-Coleg, Vaynor, Newtown, Powys SY16 1RA

Since this issue is an anniversary one, the Editor asked for a bit of nostalgia and history. I got my first intimation of the existence of amateur radio when a childhood friend moved to Easmore Road in Redditch, where a neighbour was licensed. While I forget the callsign I do recall the large sign alongside the door proudly announcing the callsign and of course the open-wire feeder.

The Second World War came and I had started to learn a little about radio. This was largely through my father's old radio books from the 1920s, when he had thought to build himself a set. A few bits came my way, and I recall at least one home-brew receiver of that time that worked(!). That was my first meeting with a 'Jeremiah' - a guy named Phil Higgins told me the circuit wouldn't work - **AFTER** I had logged some signals with it!

Soon it was time for work, with the Post Office Engineering Department, and then call-up to a thorough training in radar at Arborfield. It was hereabouts I first came across *PW* and *Short Wave Magazine*, and an article about the 'No-Cost Five' from Jack Hum G5UM. Between that and a meeting with the late Harry Griffiths G3BQQ, at the time he was first licenced, I had determined on a 'ticket'!

On demob I started my s.w.l. career, with a BC348, bought from G2AK's shop in Dale End, Birmingham. However, the first licence was as a /T, up on u.h.f., in 1954 and it was several years later before I got around to taking the Morse test.

The very first rig after the Morse test covered 'Top Band' and was a New Zealand ZC1, followed by a home-brew a.m./c.w. Top Band transmitter with receiving by, if memory serves right, an R1155. The transmitter was persuaded to go on 3.5Mc/s in due course and even on 7Mc/s, although here it was horribly short of drive.

This was about the time when Fred Judd G2BCX, shook us all rigid with his stereo operation on Top Band using two transmitters, one each end of the band. It was also about then we first heard stereo 'properly,' when H.A.M. Clark G60T, brought stereo to Southgate Radio Club - with a pantechicon and a technician to carry the equipment in and set it up!

Later there was a CR100 and a Panda 'Cub' transmitter, as well as the home-brew rig. By now the hobby had the first hints of s.s.b.

gear, though it was around 1962 before I actually sighted such. It was 1965 before I got sideband myself, by way of a G3EKX 'Sphinx' transmitter - my first ever bit of new gear. What that did for me was recorded for posterity by way of a three-part offering in *Short Wave Magazine* on modernising the HRO, which all happened 'cos I couldn't hold sideband signals between oysters! In turn, that led to meeting G6QB and on his sad death to my becoming involved with *Short Wave Magazine*, a connection which has lasted to the present day.

But enough of me. What about a real-pre-WWII story. **Don G3NOF**, started reading *PW* as early as 1935, his family having had a wireless set for years, possibly as far back as 1924. By 1929, they had a Cossor Melody Maker with 100ft of inverted L up at 40ft in deepest Cornwall, on which Don started DXing on the medium waves.

Then they moved to their present home -Yeovil - in 1934, where a Ferranti superhet was used with a similar antenna. Medium wave stations closed at midnight, so then you could look out for the DX, by way of, for example, KDKA in Pittsburgh, WGY Schenectady, WLW, Cincinnati. When a few QSLs started to come in, Don was hooked!

The G3NOF-to-be had three special chums at school, and lo! all of them later took out calls. By 1935 they were building designs from *Practical Wireless*, and then Don's father bought a Ferguson all-wave set, which included 7 and 14Mc/s. Hooked to the same antenna, it yielded much a.m. 'phone. One card from that era was from ES5D, who in 1992, was worked and sent a second card.

In 1937 came the first 'communications receiver', by way of a Hallicrafter Sky Champion S20, coupled to a 33ft doublet fed with open-wire line.

After WWII, Don bought an AR88LF and a Hallicrafters SX28 Super Skyrider. He coupled them to a brace of VS1AA-fed thirty-three footers, for some of the excellent DX around at the top of that first post-war sunspot peak.

By 1956, Don had his first post-war receiver, by way of an Eddystone 888 - one of the best from the Eddystone stable. By now, of course, thoughts were turned to transmitting, and the G3NOF call opened up in August '59 with a Heathkit DX-100 and a G4ZU Minibeam.

By February the following year

Don was on sideband, with the SB10 sideband adaptor for the DX100. The next move in spring 1961 was to a TA33Jr beam which continued in use apart from the odd trap change till 1985.

Various rigs followed, notably the Drake line, until today G3NOF uses a TS940, plus - still going strong after 19 years - the Drake L4B linear. Up aloft nowadays is a TET HB33SP at 57ft, while three feet higher is a Cushcraft A3WS for 18 and 24Mc/s; the tower cranks up and tilts over. To cover 3.5 and 7Mc/s Don has a Butternut HF2V vertical, and a Sagant end-loaded device covers the same bands for the close-in stations.

What about G3BDQ? John makes no mention of pre-WWII days, but got his call on 10 December 1946, the first QSO being with G3AMG in Kent on 7Mc/s. The rig was built, ready and waiting for when the ticket fell through the letter box. It was a Franklin twin-triode v.f.o., buffer/doubler and 807 p.a. running 15W on 3.5 and 7Mc/s. He did well with a sea-front location in Hastings, 1155 receiver, antenna W3EDP just above the roof of the 60ft high boarding-house and a home-brew antenna tuner, with flashlight bulb as an indicator.

By early January 1947, John had gone north and bought a Harvey UHX10; this had a metal 6L6 oscillator which could be a straight crystal oscillator or a Tritet or an e.c.o. v.f.o. Another 6L6 served as a p.a. with plate-and-screen modulation using a carbon mike. This beast covered Top Band right to 5 metres - which we were soon to lose to TV. Power input, was 25-40 watts depending on the power pack, the antenna after a bit of climbing the 68ft VS1AA. LU8AK was first real DX into the log, on January 29, for a RST 569x report.

By March, he worked VK and shortly after, ZL. On April 24, G3BDQ made a WAC in a 12-hour period, by way of W2CBBY, G2S0 (still around as today Z23JO), VK6DN, CR7VAL, LU7DN. No 28Mc/s receive coverage (and no 21Mc/s band then) meant it was all being done on 14Mc/s.

On 2 March 1947, was the first-ever Hastings net on Top Band, with Tommy G6QB, (perhaps better known as Howard Thomas at the BBC cinema organ and writer of the *Short Wave Magazine* 'DX column' until his death in 1966), G5RO, and G4FV; next day it was Pim G2AX, who was a baritone soloist on G2LO even before the BBC had formally started operations.

In the photograph, you can see the G3BDQ station of that time in the attic of the sea-front QTH. The 1155 sits on the marble-topped table with its power supplies and speaker on top; the rack is made of bed-iron and has power packs at the bottom, the UHX10 above that, a PT15 p.a. above that and above again the antenna tuner circuitry. The key, (ex-RAF) is on the table and the headphones, bought in 1946 and made by Ericsson, are still in use today. John left Hastings for college in October 1947, by which time he had some 694 QSOs in 79 countries.

Next we head up North, where **GM3JDR** was licensed in August 1952, and has been on almost daily ever since. For the first year, like everyone else, Don had to stay on 25W and c.w. The very first contact was a DL6. The transmitter ran a 6V6 crystal oscillator into an 807 p.a. on 7Mc/s only. This was in due course modified into a v.f.o., and then came the first all-band transmitter; the KW Vanguard, with a Geloso v.f.o. unit as a sub-chassis into a 6146 p.a., with plate-and-screen a.m. modulation. Next came a home-brew v.f.o. set-up into Labgear wide-band couplers to a pair of 807s with two more giving modulation.

Like so many of us, GM3JDR tried phase modulation and indeed f.m. on 3.5 and 7Mc/s - much touted as the only answer to TVI, but with precious little success in that area at least where GW3KFE was concerned. By now, sideband was the thing, so Don built the G2DAF receiver and transmitter designs. With them, he was the first GM to make WAZ on sideband, as the certificate testifies.

Later GM3JDR built all the G2DAF designs up to the gang-tuned version. When the WARC bands came along it was decided to 'go commercial', and a new FT101ZD was installed, and is still in use.

On the antenna front, Don has always had to contend with the gentle breezes (120m.p.h.!) that appear from time-to-time up north of Inverness. However, ground planes, ZL Specials, dipoles, Bobtail curtains and so on, have all been tried out. At Auckland now there is a three-element Yagi beam and a half-rhombic.

Don, like so many more of the old-timers did several years apprenticeship as a listener before graduating to a callsign, and had to teach himself Morse. This was done by listening to trawlers working Wick Radio, on 1631kc/s. Don reckons that at that stage he knew

every street in Cleethorpes, Grimsby and Hull!

Eric Masters GOKRT, started off as a schoolboy in the 1950s, reading *PW* when the editor was F. J. Camm. Eric joined the RSGB, built simple crystal valve and transistor receivers, and used them on the broadcast and the amateur bands.

However in the mid 1960s, Eric developed other interests and left the hobby. In 1985 though, he came back, took up *PW* again, joined the G-QRP Club and at the end of 1988 got his A licence.

A Howes 80 metre receiver had been built up and a Lake DTR3 was on the stocks; but when the 'ticket' arrived, Eric was far too eager to finish off the receive half, so he operated from Welling with the transmit half of the Lake rig, and the Howes receiver, into 75ft of wire, end-fed against a quarter-wave

Back-Scatter

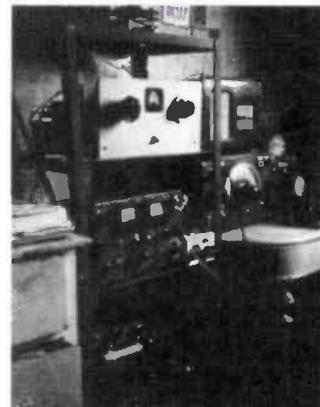
counterpoise with a Lake tuner, from a back-bedroom shack.

After a week of trying, the first contact was made, with G4JIZ in Bakewell. It was found the counterpoise had to be clear of ground, and clear of snow, or the system wouldn't produce contacts. The couple of watts worked France Germany, Belgium, Holland and the odd Italian and Danish station.

In 1991, Eric moved from Welling to the present place, where 'the boss' allocated him a spare ground-floor room at the front of the house. A Lake DTR7 was built (completely,

this time!) and a W3EDP antenna erected. This goes round the house from front to back, stood-off the walls by nylon fishing-line attached to the side fence, and down the garden to a tree.

The short counterpoise of the W3EDP has now been replaced with a quarter-wave one, around the front garden for improved results. Two watts output on 7Mc/s covered all of Europe nicely on this antenna, with the odd Asian contact as well. I have no doubt that by picking the right time, the occasional W contact would appear in the log.



The station of John G3BDQ in Hastings circa 1947.

Those were the days when radio was fun!

Sixty Years of VHF

For this special edition I want to take you on a trip down memory lane. Although it's not my intention to give you a potted history of the v.h.f. bands (I'm only a recorder of v.h.f. happenings, not a historian!) I want you to relive or learn about some of the major v.h.f. events of the past 60 years which occurred on the 56Mc/s and 70Mc/s bands, details of equipment that were used and to give you some details of v.h.f. personalities past and present. In next months column I'll be covering similar events regarding the 144Mc/s, 430Mc/s and microwave bands.

So, while you sit in your cosy shack with an array of state of the art equipment, with lots of flashing l.e.d.s, dual v.f.o.s, 100 memories and a choice of s.s.b., c.w. or f.m., I'll try to recreate the excitement of those early v.h.f. contacts. At the same time, try to make you realise that nothing is new in the world of v.h.f. DXing!

Ultra-Short Wavelengths

Very many theories and assumptions have had to be changed since the time when radio amateurs first took an interest in the ultra-short wavelengths. Chief of these, in 1922, was the original assumption that because the 20 metre band was better for DX working than the longer wavelengths, it followed that the 5 metre allocation (56-60Mc/s) would be better still.

However, just getting on the 5 metre band was a major problem. Transmitters were crude unstable c.w. oscillators using valves with bases removed to reduced lead inductance, and the receivers were regenerative detectors. These were very hard to operate and prone to hand capacity problems.

Back-Scatter

VHF Up

Reports to
David Butler G4ASR
Yew Tree Cottage
Lower Maescoed, Herefordshire HR2 0HP

In the 1920s it was an achievement to make equipment work satisfactorily on 14Mc/s, let alone 56Mc/s! But a handful of experimenters did just that and having made a few local contacts they were ready to work the world.

However, after a number of fruitless years, the discovery that rarely was there even reliable contact over more than a few miles, and the subsequent disappointment this caused, quickly spread among the amateur experimenters, making them turn their attention to the 28Mc/s band which they had heard was becoming usable for DX work.

It was in the early Thirties, that a real revival of interest was shown in the 56Mc/s band by a small group of pioneers in both the UK and USA. Once again, it very quickly became clear that propagation at these elevated frequencies was considerably different from that of the short wave bands. The v.h.f. experimenters thought that the 56Mc/s band was useful for contacts up to 30 miles or so at almost any time. But with the much improved techniques being discovered it was proved that communication was possible over much greater distances during periods of Sporadic-E or aurora.

Lower Power Oscillator

The equipment in use around 1932 would consist typically of a low power push-pull oscillator, using

perhaps a pair of LS5 or '71-A triodes in the famed 'TNT' (fixed-tune grid) circuit, modulated with a pair of pentodes connected in parallel.

The high tension supply would be in the order of 200-300 volts, supplied from either a dynamotor (low voltage batteries driving a motor and generator), or from a series of 120 volt batteries that were common in those days. Adjustment was a fairly simple matter of setting up the grid coil, so that the point of minimum anode current (when the anode-tune capacitor was rotated) occurred at the desired working frequency. Then, in adjusting for maximum output, it was merely necessary to tune the anode capacitor carefully for a sudden peak in anode current.

The receiver would probably be a variant of the 1922 Armstrong design, in a super-regenerative configuration of two triodes feeding a tetrode audio amplifier. This provided a very sensitive receiver with only a tuning knob and a regenerative control.

The aerial system normally consisted of a dipole, or a quarter wave vertical fed with open wire feeder (no UR67 in those days!). This arrangement was reasonably satisfactory if operating from a conventional location, but tests performed at the time indicated that propagation was mainly quasi-optical. So if you wanted to work long distances, you should be located high up, maybe in a car on top of a hill, or even in an aeroplane.

This obviously presented some problems in feeding the aerial, but with some ingenuity this was overcome.

Finding The Band

One of the major problems was actually finding the band, and to ensure that both the transmitter and receiver were set up on the correct frequency. In order to do this, wavelength measurements were made using Lecher-lines, and then using this to calibrate a simple wavemeter. This was then passed around local groups of experimenters so that they all operated on similar frequencies.

It is interesting to note that some amateurs in isolated localities had difficulty in locating the band, and indeed it has even been rumoured that in some large cities there were two independent '5 metre' bands, the operators on one having no knowledge of the other!

Incidentally, a Lecher-line measuring system consists of a pair of parallel wires, spaced about an inch or so apart, to form an open wire transmission line, and a bridge to short circuit the wires.

The lines were coupled into the transmitter and the shorting bridge was slowly moved along the line until a deflection was seen on the anode current meter. The position was noted, and then the shorting bar was moved down the line until a similar deflection was observed. The distance between the two points was one-half of the wavelength at which the transmitter was oscillating, and by dividing the number of inches by 5905, the frequency in megacycles per second could be obtained. In the case of the 5 metre band it was not uncommon to use Lecher-lines in excess of 25ft long!

To encourage experimentation in the use of ultra-short wavelengths, the Radio Society of Great Britain

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ONE REASON

WHY WE ARE HERE

Radio Shopper this month has a personal message for the Radio Amateur. As you may be aware if you are an avid reader of this column we have relayed various pieces of information supplied to us by customers.

Unfortunately we have been **TOLD** by a certain publisher that our actions must stop as they feel that our column is biased in some way. Failure on our part would, I am sure, see the auto editing of our column by the publisher of that certain magazine (name and address withheld) This is in our opinion just another attempt to stop Radio Shopper from supplying the oh so stitched up marketplace with Amateur gear at the correct price. Furthermore a restriction in free press is an undemocratic and illegal action. Maybe, just maybe, some amateurs will write very strong words and demand justice otherwise it's back to the old mob once again. Remember, the most powerful thing the amateur has is to vote with your purchase.

Tony McKenzie
Managing Director

Did you know....

We are able to reserve any piece of equipment from our stocks for just a £10 non-returnable deposit. This will enable you to reserve the rig of your dreams without any supply difficulties. This deposit will hold your rig for up to 30 days.

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Back-Scatter

(originally formed in July 1913 as the London Wireless Club, changing its name to the Wireless Society of London in October 1913 and subsequently to the RSGB in October 1922) sponsored many tests to take place on the 56Mc/s band. An article in the *News Chronicle* dated 4 May 1933 describes one such test and I reproduce it verbatim.

Crystal Palace Tower Radio

The North Tower of the Crystal Palace, reaches a height of 550ft above the level of the Thames. The tower commands a view into eight counties, and it is to be used as an ultra-short wave transmitter during a series of investigations into certain ultra-short waves.

The sanction of the Postmaster General has been obtained and yesterday Sir Henry Buckland, General Manager of the Crystal Palace, agreed to permit the broadcasts to begin on Sunday 21 May 1933. Amateurs over a wide area around London will pick up the transmissions.

Five Metre Assistant Organist

Mr L. H. Thomas, assistant organist of the Crystal Palace, told me yesterday that it will be his own amateur transmitter (G6QB) which will be used. He is already arranging for the apparatus to be taken aloft to the top of the 282ft North Tower.

"The wavelength to be used is 5 metres," said Mr Thomas. "Such a short wavelength behaves almost like light and, roughly speaking, one can only send as far as one can see. Amateurs have experimented with these wavelengths for a long while, but have seldom obtained ranges of more than 15 miles. From the top of the Crystal Palace we hope to transmit between 50 and 100 miles. My transmitter will have a power of only 10 watts obtained from the electric light supply at the top of the tower. The aerial will be slung out from the tower on bamboo poles."

to the BBC. Hitherto, the BBC with their very powerful 7 metre transmitter on the roof of Broadcasting House, have only obtained a range of about 10 to 15 miles. They are anxious to develop the use of these short waves, so that the whole of London can receive their transmissions.

The photograph, Fig. 1 shows 'Tommy' Thomas MBE G6QB with his 5 metre transmitter consisting of a pair of LS5s as a push-pull (tuned-anode, tuned-grid) oscillator. With this equipment he conducted a number of ground-to-air experiments with an aeroplane during the middle-thirties. (Details of these tests are included in the book *The World At Their Fingertips*.)

Fig. 1: 'Tommy' Thomas MBE G6QB and his 56Mc/s transmitter used for ground to air tests. Photo supplied by G3BDQ.

Experiments Continued

The experiments on the 56Mc/s band continued regularly throughout the 1930s. With the urge to work DX forgotten, the aim was now to work reliably over paths in excess of 100 miles. And just like our v.h.f. contest groups of today, many stations went out to operate their equipment from elevated sites as the QSL cards in Fig. 2 and Fig. 3 show. Among the stations participating in these tests during September 1937 were GW2KD, G2DCP, G5CD, G5MQ,

G5WW, G6GL, G6OM, G6SQ and G8NV.

operated on 47Mc/s with a programme of gramophone records and announcements.

The reception report was sent to **Ralph Sachs G2CZS** on 25 January 1937, whose first experience of v.h.f. was as a 14-year old listener



BSWL200, and as an Artificial Aerial licence holder on the 56Mc/s band. The receiver was a single valve super-regen using a PM2 or LP2 triode and the aerial was a dipole in the attic.

By 1938, improved equipment and techniques was allowing fixed stations as well as ideally situated portables to make QSOs in excess of 100 miles (a bit like 10GHz nowadays). Some of the longest distances over which signals were heard, were covered by using 80 metre or 40 metre horizontal aerials for receiving, but these had to be lined up quite accurately because they become very directional when used at higher frequencies.

One station, G2AAH, operating portable, logged G6LI, G6FO and G6VF at 166, 110 and 96 miles away. Another station G2DFG, also operating portable, heard G6LI, 166 miles away, six times and also heard G6FO, 132 miles away, 11 times. All this on a 135ft long-wire!

The latter station G6FO was operated by **Austin Forsyth OBE**, the original editor of *Short Wave Magazine*, ('Tommy' Thomas G6QB mentioned earlier was the Assistant Editor). Austin G6FO reported making many contacts with G5BY, 126 miles away, and feels that while a superhet may have many advantages, an efficient straight regenerative receiver will find anything coming in on the aerial on 56Mc/s. He has yet to see a commercial superhet on this band which will do better than even a

moderately good detector and one audio stage, even without an r.f. stage.

Into The Modern Era

In 1939, all amateur radio activity in the UK was suspended until the re-issue of licences, initially for 3.5, 7.0, 14 and 28Mc/s, by the G.P.O. in 1946. Later in that year permission was again granted to UK amateurs for access to the 56Mc/s band, although in the USA that allocation was changed to one at 50Mc/s.

Some of the UK amateurs active on 5 metres at that time included G2AK, G2MR, G2QY, G2WS, G2XC, G3BY, G3CQ, G5IG, G5JU, G5MA, G5TX, G5YU, G6DH, G6KH, G6LK, G6US and G6VX. **Jack Moseley G2CIW** became active on the band in August 1947, and he recalls that he made his first DX contacts one year later, working G13ZX via aurora in August 1948, and stations in Czechoslovakia via Sporadic-E in the same month. Later that year he made contacts with stations in Algeria, Italy and Switzerland.

During the war years great strides had been made in equipment design at both v.h.f. and microwave frequencies. Many radio amateurs were involved in that development and they were also raring to try out their new-found techniques on the amateur v.h.f. bands. Trans-atlantic crossband tests from 50Mc/s to 28Mc/s were quickly arranged, and stations at both ends of the path were particularly hopeful of positive results, as not only had BBC TV transmissions on 45Mc/s been received in the USA, but commercial North American signals as high as 47Mc/s had also been received in the UK.

The scene was therefore set for that famous day, 24 November 1946, when **Denis Heightman G6DH** heard Ed Tilton W1HDQ on the 50Mc/s band and the first v.h.f. communication across the Atlantic was made. A few moments later, G5BY became the second UK operator to make the record breaking crossband contact. One year later, in 1947, 6 metre permits were issued for a short period to a number of UK stations and one of the leading pioneers, G6DH, was the first British station to make a two-way QSO across the Atlantic on the 50Mc/s band. History was made - the modern era had surely arrived!

Admiralty Scheme

Immediately following the war, the RSGB negotiated with the Admiralty a scheme whereby members and other interested parties could purchase surplus electronic equipment. It cost 50 shillings (£2.50p) per hundredweight!

Bill Miller GM5VG, recalls that the Admiralty opened up a depot in Dalry, Ayrshire for radio amateurs to visit and select certain items of equipment, including transmitters, receivers, valves and other accessories. Having paid for the equipment, it was transferred by

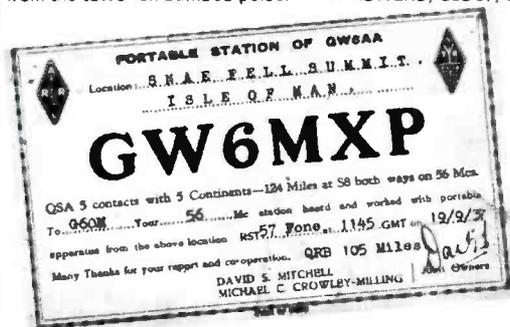


Fig. 2: The 56Mc/s tests from Snae Fell, Isle of Man. The QSL was supplied by G3BDQ.

BBC Interest

Although the Crystal Palace test will be made for their scientific value only, they will be of great importance

Test Transmissions

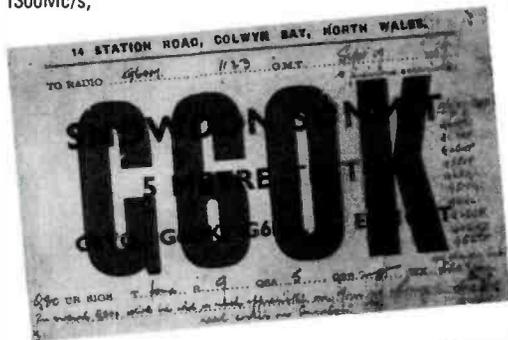
Not all of the experimental transmissions at this time were confined to the amateur bands and a number of stations were granted permission to radiate test transmissions on other v.h.f. frequencies. The QSL card, Fig. 4, shows that the station of G8YB was

Back-Scatter

Admiralty lorry to the amateur's house!

One item that GM5VG purchased was the 8C Admiralty transmitter, consisting of five 19 inch wide panelled units which operated on the 2 metre band and claimed to have an output of 150 watts amplitude modulation. Bill mentions that the Admiralty had 'wonderful juicy watts' and what the real power was he would not like to guess, but he had great difficulty holding the final output to less than 200 watts!

The irony about this transmitter was that the 2 metre band had not been allocated at this time, and so all the tuning systems were altered, and with the aid of plug-in coils it was put on the air on 56, 28, 14 and 7Mc/s. During 1948 and 1949, several new band allocations were released to UK amateurs including 144-146Mc/s, 420-460Mc/s, 1215-1300Mc/s,



2300-2400Mc/s, 5650-5850Mc/s and 10000-10500Mc/s.

But with the introduction of a 405-line television service, the 56Mc/s allocation was removed. Being a v.h.f. operator at heart, GM5VG then had to reverse the procedure to get the 8C transmitter back onto the 2 metre band after all the trouble of moving it off in the first place!

With the release of surplus equipment (unfortunately the scheme was abandoned in November 1946 because of abuse by traders!) many new operators were finding their way onto the v.h.f., u.h.f. and microwave bands with sensitive and stable gear. Receivers such as the R208, R1132, R1392 and R1626, all covering the v.h.f. spectrum.

Converters such as the RF25, RF26 and RF27 units were being pressed into service, as were transmitters like the SCR522, with its amazing channel tuning mechanism. You just had to see it to believe it! Valves such as the 932 acorn series, 829B, 832A and 723A/B klystrons for 10Gc/s were plentiful, as were the essential accessories like the BC221 and BC906 frequency meters and the W1239 wavemeter.

The Four Metre Band

Following the demise of the 5 metre band in 1949, a number of enthusiasts lobbied the RSGB to negotiate with the GPO to allow access to a frequency slot somewhere in the lower v.h.f. spectrum. Finally, in November 1956, the Post Office announced that

British amateurs could operate in the band 70.2-70.4Mc/s, but that no operation would be allowed within 50 miles of Jodrell Bank Radio Observatory.

The evidence of DX possibilities on the 70Mc/s band came almost immediately, when on 19 January 1957, W2ZKE claimed to have heard G3EHY, and later in the same year, on November 23, W2IDZ heard UK amateur signals around 1445GMT but was unable to identify any of the callsigns.

In fact, it was not until 1627GMT on 17 November 1980, when the first authenticated trans-atlantic crossband contact took place between **Gordon Pheasant G4BPY** on the 4 metre band,

1640GMT GW4ASR/P (guess who!) worked 5B4AZ over a distance of 3475km, as the QSL card in Fig. 5 shows.

Unfortunately, pressure by commercial broadcasters meant that by 1962, virtually no country in Europe or Africa remained with a 4 metre amateur allocation. In 1964, the UK band was increased by another 400kc/s to extend from 70.1 to 70.7Mc/s. At a later date the i.f. edge was moved down to 70.025Mc/s, but the h.f. edge was lopped by 200kc/s down to 70.5Mc/s. More changes were made on 1 June 1987, with the bottom of the band being extended to 70.0Mc/s, giving a full 500kc/s, and, more importantly, the band was made available to Class B licensees, thereby increasing UK activity. A very welcome move.

John Hunter G3IMV recalls that he first became active on the band in January 1964, using all home-made equipment, except for a

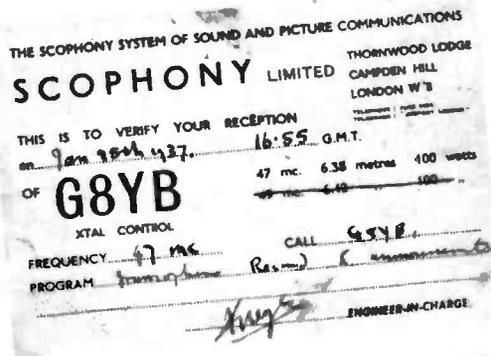
member of the RSGB, I was given an RF27 unit by **Roger Fenton G3NQF**, and I promptly used it to receive signals with a 4-element J-Beam Yagi. The RF27 unit was a down-converter covering the frequency range 65-80Mc/s, with an i.f. output around 7Mc/s, which I connected into an R109 receiver. Very simple equipment but sufficient to receive many stations on a.m. and c.w.

Martyn Vincent G3UKV first got going on the 4 metre band by building the Jack Hum G5UM tobacco-tin converter (described in *Short Wave Magazine*) and using it with a dipole up on the Cotswold Hills. Pye ex-p.m.r. rigs on 70.260Mc/s a.m. were the 'norm' in the late 1960s, but after hearing a marvellous talk by **Tom Douglas MBE G3BA** about how easy it was to build a transverter, G3UKV did just that. He began making s.s.b. contacts from the early 1970s and has not forsaken the band since. Coincidentally, his first s.s.b. contact was with G3BA!

Thank You

I must thank G2CIW, G2CZS, GM5VG, G3BDQ, G3IMV, G3UKV, GM3W0J and G4BYV for providing valuable material for this month's column.

Next month I'll continue the theme with details of 50MHz t.e.p. tests, early e.m.e. and meteor scatter experiments, the 144MHz and 430MHz bands, Microwave frequencies and much, much more!



and **Andy McLellan VE1ASJ** on the 6 metre band, over a distance of 4591km. Almost one year to the day, 4 November 1981, the trans-atlantic path was again broken with VE1ASJ on the 10 metre band, working G4JCC at 1356GMT and GW4HXO, for the first GW, at 1422GMT. Further contacts were made on December 8 with VE1ASJ, this time on the 6 metre band, working EI6AS, EI6DT, G2AOK, G3APY and GW3MHW.

By the end of the 1950s, a number of other countries were active on 4 metres. These included stations in Austria (70.3-70.4Mc/s), France (72-72.8Mc/s), Germany (70.3-70.4Mc/s), Holland (70.3-70.4Mc/s), Algeria, Ireland, Kenya, Morocco and Norway.

Records were quickly established, and on 22 June 1958 **Major Ken Ellis G5KW** worked FA9VN (Algeria) to set up a new record distance. This was succeeded, two years later, on 25 May 1960, when G5MR worked CN8MG in Casablanca and this record was to stand for over 20 years, until 7 June 1981, when at

Hammarlund SP400

receiver which was used as a tuneable i.f. The transverter used a 6CW4 nuvistor in the r.f. stage, 12AT7 oscillator, QQV03-10 mixer and a QQE06-40A double-tetrode as the power amplifier feeding into a home-made 5-element wide-spaced Yagi.

Both a.m. and c.w. were used in those days and most operators were crystal controlled using surplus FT243 crystals ground to a frequency of their choice by the 'Vim and glass plate' method! John mentions that the band was good for inter-UK and county hunting, but once you had worked ZB2BL via Sporadic-E, that was it!

I can remember that my first introduction to the world of v.h.f. was in 1964, when as A4242 (Associate

DATE		TIME	FREQ	MODE	REPORT	To AMATEUR RADIO STATION
Day	Month	Year	GMT	MHz	Two-way	RST
7	6	81	1640	70.113	A1	449

Tx solid state Input 20 W Pwr QSL Via C.A.R.S. Bureau
 This P.O. Box 1387 Limassol
 Rx Collins 51J4-Conv. Remarks Many thanks for second
 Ant. Tx: dipole Rx: 4 el. Yagi 4m qso to UK OH!

5B4AZ
 NEOCLIS KYRIASIS P.O. BOX 219 LIMASSOL, CYPRUS

Fig. 3 (far left): The 5 metre tests from the summit of Snowdon in September 1937. The QSL was supplied by G3BDQ.

Fig. 4 (centre): A 47Mc/s reception report from G8YB. The QSL was supplied by G2CZS.

Fig. 5 (above): 70MHz World Record, 5B4AZ-GW4ASR/P. The QSL was supplied by G4ASR.

Back Scatter

Broadcast Round-up

Reports to Peter Shore via the PW Editorial Office

One of the most interesting stories to emerge since my last column in *Practical Wireless* comes from Burma - and Norway. Out of the blue came an announcement that the National Coalition Government of the Union of Burma, essentially the Burmese government in exile, was to start broadcasting in Burmese from a foreign radio station.

The transmitters for the Burmese service were to be provided by the Norwegian government on the facilities of Radio Norway International at Kvitsoey. The inaugural 25 minute broadcast was heard at 1430GMT on July 19 on 17.84MHz with an identification of the "Democratic Voice of Burma".

In time, transmissions may be expanded to an hour. The initial agreement with the Norwegian government runs until the end of September this year.

Last month I reported that a British company planned to start a radio station in Lithuania. More details were carried on Radio Netherlands' *Media Network* programme when Paul Rusling, one of the proponents of the new station, was interviewed.

Rusling was connected with ill-fated Laser 558, but now sees Baltic Radio International as a potential commercial money-spinner. Broadcasts will be in English, beamed not just at Lithuania, but at Sweden and Denmark, two affluent consumer markets which advertisers will be interested in talking to on radio. Sweden is particularly significant as it currently has no commercial radio stations.

A 200kW medium wave transmitter is planned, and a low-powered transmitter will be given to the Lithuanian authorities as a gift. Even this might prove more audible than the current 500kW sender operating on 666kHz which, according to Rusling, has an appallingly inefficient antenna system.

The earliest that the new station will be on the air is early 1993. 'Broadcast Round-up' will keep you informed of developments.

The BBC World Service has entered into a new rebroadcasting agreement in Lithuania where Polish language broadcasts will be heard for the first time in many years. There is a significant Polish community in Lithuania which will benefit from the programmes.

If you are a regular listener to Radio Netherlands' *Happy Station* on Sundays, you'll be sad to learn that Tom Meyer, presenter of the programme and its sister Spanish-language *La Estacion de la Alegria*, will be leaving the station soon.

News and a variety of features and entertainment will make up the Sunday schedule later in the year, although *Happy Station* will continue in a slightly different format presented by Pete Myers.

Tom Meyer will be going on a world tour later this year and if we learn of a visit to the UK, we'll let you know!

Several readers have written to say that relays of Radio Havana Cuba from Russian transmitters seem to have ended, and similarly Radio Moscow is no longer heard, with a second's delay, from Cuban transmitters.

Digitally Tuned Receiver

A brand new digitally tuned short wave receiver for less than £40? An impossibility, you might have thought. But British company Lowe Electronics has introduced a portable receiver sourced from the Far East for five pence less than £40!

Just two days before my copy date, I was kindly sent a sample by Lowes and put it through some quick listening tests. It offers medium wave and long wave, together with f.m. (and stereo through the headphones provided with the set) and continuous short wave coverage from 5.90 to 15.50MHz.

The receiver performed quite well, picking up Radio Australia on 13MHz in the evening without difficulty, with just about the correct bandwidth filters, it seems, for comfortable broadcast listening. The set is also attractively designed, has five memories on each band, a clock and alarm facility and an easy-to-read digital display.

The SRX-50 could be an ideal budget receiver for enthusiasts and casual listeners, and perhaps a useful present for a budding short wave listener.

European Stations all times GMT=UTC)

Roy Merrall (RM) starts his regular contributions, reporting the English service schedule from Albania:

0330-0400 on 11.825 (variable) and 9.58MHz
1430-1500 on 9.76 and 7.155MHz
2200-2230 on 11.825 (variable), 9.76 and 1.395MHz

The North American transmission at 0330 can rate up to SIO433 on the variable 11.818-11.824MHz channel (rarely 11.825!!).

The European transmissions are best heard at 2200 on the medium wave frequency, with the h.f. outlets usually cluttered. The afternoon transmission suffers QRM from

BBC Skelton on 9.76, whilst the mediocre signal on 7.155 is partly blocked by Radio Liberty in Belorussian.

Radio Yerevan in Armenia has a news summary in English at 2145 on 11.92 and 9.45, and at 2240 on 17.66, 12.05 and 11.92MHz.

Croatian Radio is heard by Roy throughout the day on 6.21, 9.83 and/or 13.83MHz. During late afternoon 6.21MHz is affected by a distant jammer, probably in the Middle East whilst 13.83MHz can rate up to SIO443. A very strong 'numbers' station operates in the evening, disturbing reception of Croatia.

Radio Vilnius continues to ask for reception reports of its broadcasts. Transmissions are currently at 2130 on 9.71 and 9.675MHz and at 2300 on 11.885 and 13.645. Transmitters are at Krasnodar, Khabarovsk, Moscow and Petropavlovsk in disparate parts of the former Soviet Union.

The station says that only 60 letters and reports were received during June, about a quarter of the normal volume. It seems that reception is not that good at the moment. The address for reports is Radio Vilnius, Vilnius, Lithuania.

Polish Radio Warsaw has expanded its English language service with a new transmission at 1830 on 9.525 and 7.145MHz. It is a repeat of the 1700 transmission.

Radio Galaxy in Russia has cut back its transmissions and is now heard on 11.88 between 1900 and 2000 only.

Radio Nadezhda has been noted on 15.34 from before 2000 with strong steady signals in parallel with slightly better 7.28. The station concentrates on women's issues and family matters (Roy).

Test transmissions from Radio Exterior de Espana's new relay station in Costa Rica have started. Tests are broadcast between 2200 and 0500 with programmes fed by satellite from Madrid.

Frequencies will be in the 6, 9 and 11MHz bands, with tests in the 5MHz (or 60 metre) tropical band following.

Meanwhile the relay agreement reported in previous 'Broadcast Round-ups' with Romania have not yet started, but talks are progressing well and transmissions should start later this year.

Vatican Radio has recommenced Estonian language broadcasts after an absence of many years. Estonian programmes will be heard at the end of Finnish broadcasts at 1900 on 7.365 or 6.185 and at 0420 on 9.755 or 7.365MHz.

Radio Yugoslavia's present schedule for English from studios in

Belgrade is:

1830-1900 on 7.20 and 6.10MHz
2100-2130 on 7.20 and 6.10MHz

Roy reports a *Radio Hams Corner* noted on Friday July 3 and July 17 at 2120, indicating the programme is aired every fortnight.

African And Middle Eastern Stations

The Angolan clandestine Vorgan is currently heard quite strongly on 7.10MHz often as early as 1700, according to Roy, mainly in vernacular at this time, with Portuguese news.

The Voice of Rebellious Iraq was strongly heard in mid-July up to orchestral sign-off at 1900 on 7.10MHz.

The identification "Saut al Iraq al Tha-ir" was clearly heard at 1857 with SIO233. After the close of the Iraqi rebel station, Vorgan rated up to SIO333 and remained audible to well after 2030.

Interestingly, the Arabic has not been heard since, although on July 17 at 1645 to 1850, improving French signals were heard, clashing with the Portuguese. An OM/YL dialogue with records and news items was clearly heard and leads Roy to surmise that this is probably La Voix de Zaire in Kinshasa. He listened in vain for an id to fade out at 1850.

The RDT GuinÇenne service from Conakry has been consistently audible on 7.125MHz after 1900, but only when the Italian Radio Relay Service is not on channel, although when it is the French and vernacular signals can sometimes be detected under IRRS. The African station has been observed up to 2200 and later at SIO243 on numerous occasions.

Radio Baghdad International from Iraq has added 13.68MHz to its English transmission at 1800 until 2000, which is also carried on 15.21MHz.

Radio RSA has English very strongly at 0300 on 5.96MHz, whilst at 1600 there is a great improvement on 9.555MHz which gives much better reception than either 9.565 or 11.885MHz. Portuguese on 4.965 at 1900 is also propagating well, although the upper sideband is submerged under commercial QRM.

Sudan Radio has been reported on 7.20MHz between 0300 and 2200. Reports on this new frequency have been requested and should be sent to PO Box 572, Omdurman, Sudan. The power of the transmitter is 100kW.

Asian And Pacific Stations

Radio Australia's latest

frequency guide offers recommendations for reception in Europe:

0700-0900 on 21.59MHz
 0730-0830 on 15.24 MHz
 0800-1300 on 21.725MHz
 1430-1900 on 9.54 and 13.755MHz
 1900-2100 on 7.26 and 6.02MHz

The frequency 13.605 between 1600 and 2100 and 13.705 from 2100 to 2300 also provide some hope for UK listeners. The station operates a telephone Open Line on +61 3 881 2360.

KTWR on Guam has English transmissions beamed well away from Europe at:

0755-0927 on 15.20 to Far East (ends at 0912 on Fridays)
 0900-0957 on 11.805 to Australia
 1500-1636 on 11.65 to South Asia (ends at 1654 on Sundays)

The new schedule of Radio Japan includes relays from the BBC World Service transmitting station at Skelton in Cumbria. English to Europe is heard:

0500-0600 on 21.61, 17.86, 17.825, 17.81, 17.765, 15.23, 9.77s, 9.695s

Back-Scatter

0700-0800 on 21.575a, 17.86, 17.81, 17.765, 15.17, 9.77s, 9.67s
 2100-2200 on 17.89, 17.81, 15.43, 11.84, 11.815, 11.735a
 2300-2400 on 17.81, 15.43, 15.195, 11.815, 6.16s, 6.025s

Frequencies suffixed 'a' come from Africa No 1 in Gabon, those marked 's' are from Skelton.

Radio Osk now airs English on a grand scale via Radio Moscow International at 0430-0500 and 2030-2100. This obscure Japanese religious station benefits from 59 outlets in the morning and 50 during the evening transmission, and as Roy suggests, this must rival any other world religious broadcaster with a vengeance! There is a single Japanese broadcast at 1300-1400 on 17.71, although Roy has not yet logged this.

Radio Pakistan has finally dumped the split frequency on 17.9025MHz and now uses 17.90MHz for its Urdu and English transmissions in the mornings.

North, Central And South American Stations

As I mentioned earlier, the Cubans and Russians seem to have parted company. Roy recalls his last logging of Radio Havana Cuba via Russian transmitters was in late June on 17.815 at 2000.

Cuba is currently heard in Europe direct at 2000 for an hour on 17.705MHz. Unfortunately VoA blocks the channel throughout most of the European broadcasts with a series of transmissions to South East European countries, between 1800 and 2045.

The KNLS service now has English at 0800-0900 on 7.365 and 1300-1400 on 11.58, although this will change to 7.265 from September 27.

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Other p.c.b.s, to check availability please telephone Tex Swann on (0202) 678558.

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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) WR295/296 PW BEAVER	Jan 92	O/S
SET	WR297/298 additional Beaver p.c.b.s	Oct 91	£14.00
SET	WR292/293/294	O/S	
SET	CHATTERBOX	Aug-Sep 91	£14.00
SET	WR290/291		
	ROBIN Frequency Counter	Aug 91	£12.75

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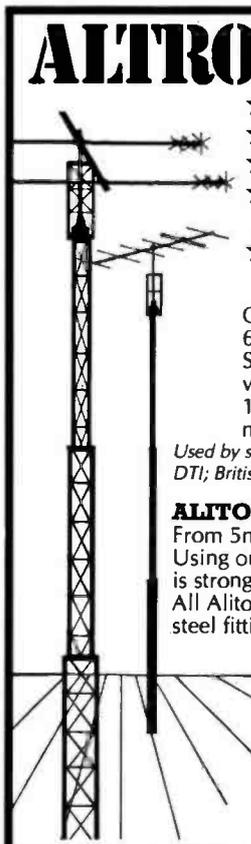
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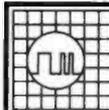
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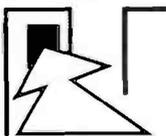
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FEK767(7B)	70cm Module (767)	235.00	(5.00)	AT150	150W ATA (735)	P.D.A.	(16.00)	P852	H/Duty PSU	240.00	(7.00)
FEK767(7C)	6m Module (767)	185.00	(5.00)	P855	Ext PSU (735)	P.D.A.	(16.00)	AT230	All Band ATU/Power Meter	219.00	(7.00)
SP7K7	Speaker	71.67	(5.00)	IC229E	2m 25W FM Mobile	P.D.A.	(7.00)	PS50	Power Supply	229.00	(7.00)
FT476X	Budget HF Transceiver	699.00	(11.00)	IC219E	2m 25W Base Stn	P.D.A.	(7.00)	SP31	Speaker	85.95	(5.00)
FT376X	HF Transceiver	1035.00	(11.00)	WZ2	NEW 2m/70cm Handheld	Special price	(7.00)	TL922	10/160 2w Linear	1495.00	(12.00)
FT390	New HF Transceiver	1675.00	(11.00)	IC2400	2m/70cm FM Dual Band Mobile	P.D.A.	(7.00)	TH78	2m 70cm Handheld NEW	P.O.A.	(7.00)
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FT3000Mini	Mini Super 200 2m Multimode 2.5W	429.00	(7.00)	SP3	25-1300MHz Discone	P.D.A.	(18.00)	R5000	General Coverage HF/RX	925.00	(12.00)
FT3000Mini	Mini 6m M/Mode 2.5W	429.00	(7.00)	SP3	Ext Speaker	P.D.A.	(18.00)	VC20	118-174 MHz Converter (R5000)	175.00	(5.00)
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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.

Amazing value, all for an extremely attractive Recommended Retail Price of **£279.00** including VAT.

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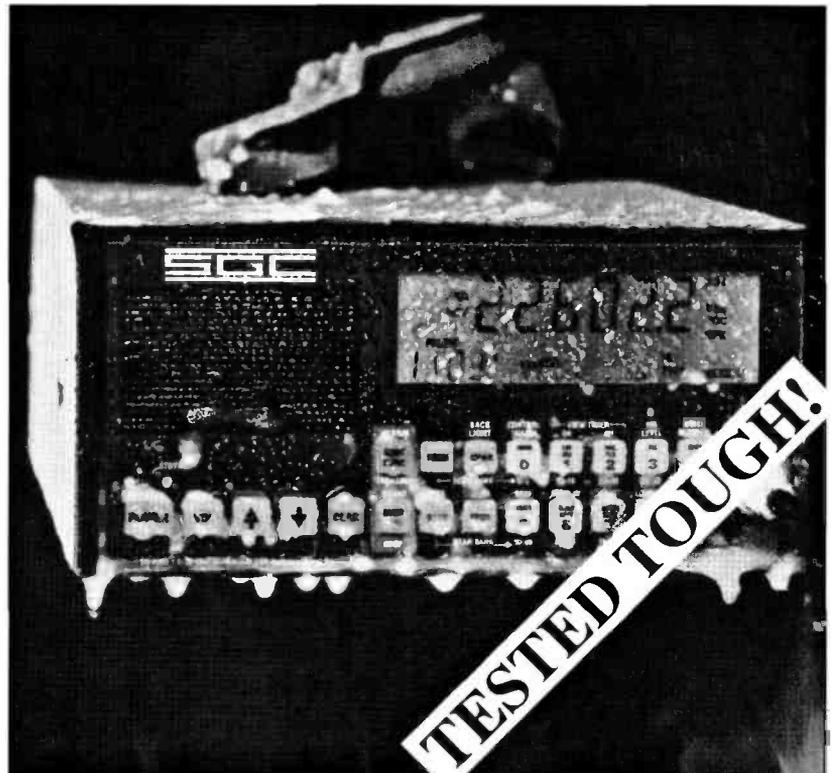


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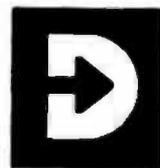
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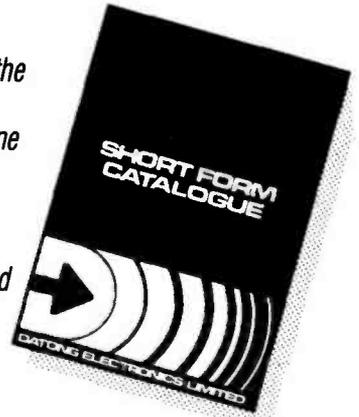
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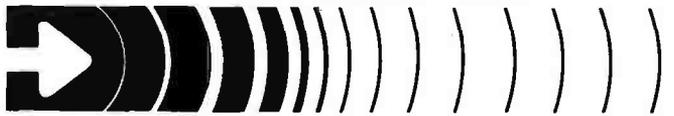
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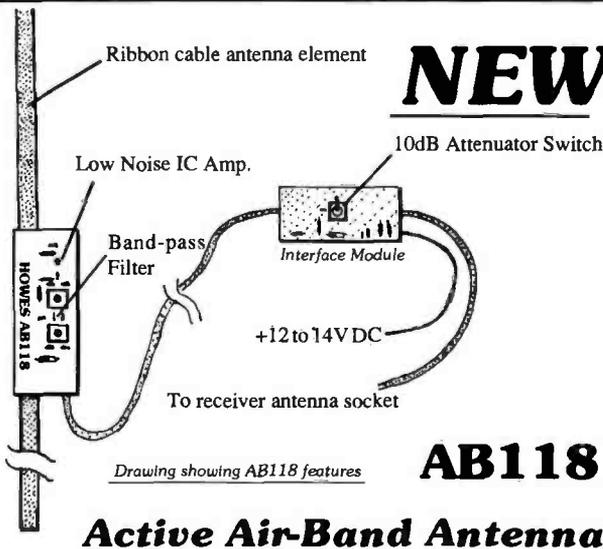


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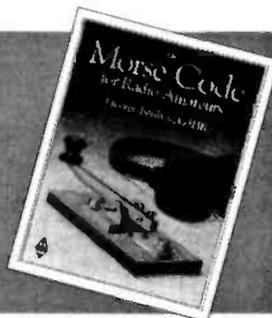
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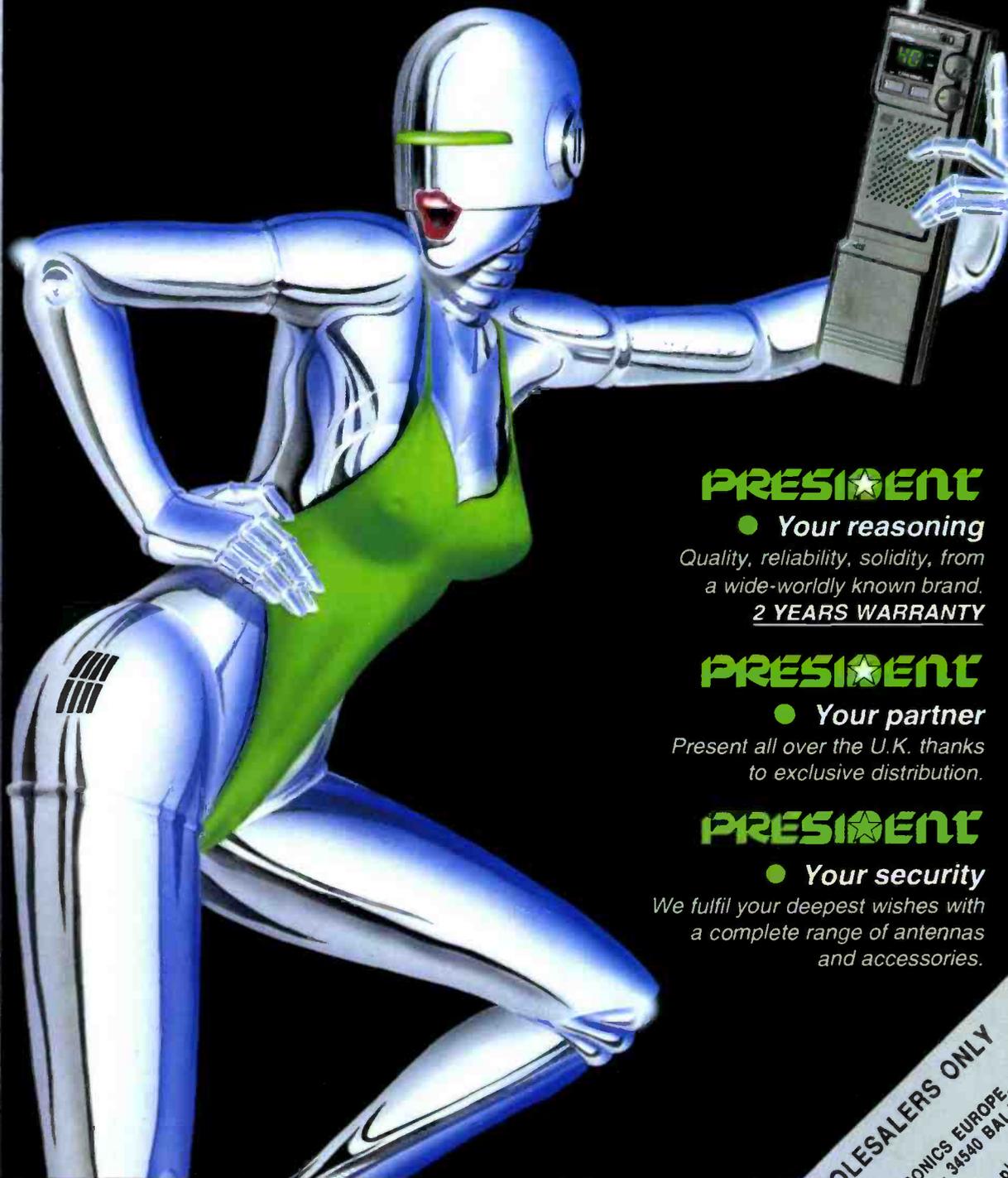
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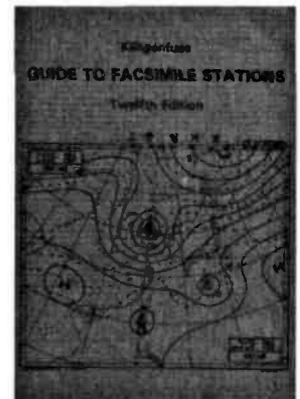
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