August 2007 £3.35 ISSN 0141-0857

Practical WIRELESS

Now in its 75th year!
pw
...ing Amateur Radio Magazine

Kenwood TM-V71E

Dual-band Mobile Transceiver Reviewed

The SOTA-1

A 7/14MHz Binaural c.w. Transceiver

100W Balanced Z-Match Tuner for 1.8-30MHz

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Model	Freq.	El.	L. (m)	dBi	Price +P
20505	6m	5	3.45	10	£89.95 D
20804	2m	4	0.93	8.9	£47.95 C
20808	2m	2x4	1.03	8.9	£69.95 D
20809	2m	9	3.47	13.1	£57.95 D
20089	2m	9/P	3.47	13.1	£59.95 D
20818	2m	2x9	3.57	13.1	£87.95 D
20822	2m	2x11	4.62	14	£119.95 D
20811	2m	11	4.56	14.2	£84.95 D
20817	2m	17	6.57	15.3	£99.95 D
20317	2m	17	10.45	17	£199.95 D
20899	2m/70cm	9/19	3.70	13/16	£89.95 D
20909	70cm	9	1.24	12.9	£45.95 D
20919	70cm	19	2.82	16.2	£59.95 D
20938	70cm	2x19	2.82	16.2	£65.95 D
20921	70cm	21	4.6	18.2	£74.95 D
20922	70cm	21	4.6	18.2	£117.95 D
20635	1296MHz	35	3.07	20.8	£64.95 D

CREATE RC5-1

*Rotation Torque: 6kg/m *Brake Torque: 80kg/m *Max. vert load: 400kg *Max. horz load: 800kg *Mast size: 48-63mm *Weight: 5kg

£339.95 D

CREATE RC5-1

*Rotation Torque: 6kg/m *Brake Torque: 90kg/m *Max. vert load: 400kg *Max. horz load: 800kg *Mast size: 48-63mm *Weight: 5kg

£419.95 D

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FlexRadio Systems — Flex-5000 HF Transceiver 100W 160m - 6m

NEW - Performance Packed Radio

This new software transceiver brings you performace and features no other radio in the world can offer!

SSB CW AM FM from milliwatts to 100W. 105dB dynamic range at 2kHz! 33dB intercept point. Single Firewire cable to PC. No sound card needed. 24 but sampling at 192kHz, TCXO 0.5ppm ref. xtal, True plug and play with PC or laptop, Self-test and calibrate, Many contest & DXing features - www.flex-radio.com

£1442.55 ex VAT
£1695 inc VAT

Order now for July Delivery

YAESU

FT-2000 Buy Now Pay Later! 0% Interest!*

1.8-30MHz +6m 100W

FT-2000D £2399 Phone!

*100W RF Output Power built-in mains power supply
*IF DSP with WIDTH/SHIFT and Contour Tuning
*First IF Roofing Filters *Dual In-band Receive
*Robust Receiver Front End with optional High-Q μ-Tune Preselector

£1945 D

FT-897D Buy Now Pay Later! 0% Interest!*

* HF + 6m, 2m, 70cm
* CW, SSB, AM, FMN, FMW, PACKET, DIGITAL
* HF/6m 100W, 2m 50W, 70cm 20W

£599 D

FT-857D Buy Now Pay Later! 0% Interest!*

NEW LOW PRICE!

* Tx: 160-6m(100W), 2m(50W), 70cm(20W)
* USB, LSB, CW, AM, FM. (WFM Receive)

£499 D

FT-817ND Buy Now Pay Later! 0% Interest!*

LOW PRICE!

* TX: 160-10m, 6m, 2m, 70cm
* USB, LSB, CW, AM, FM, WFM, Digital (AFSK), Packet (1200/9600 FM)

£349 D

FT-DX9000D Buy Now Pay Later! 0% Interest!*

Deluxe Base Station HF Transceiver. 1.8 -30MHz, 50-54MHz (160m-10m + 6m Amateur Bands) Tx

FT DX-9000D 200W internal PSU **£7,299 D**
FT DX 9000MP 400W ext. PSU **£8,299 D**
FT DX-9000 Contest 200W no TFT **£3,799 D**

KENWOOD TS-2000 Package Deal

Package:
TS-2000uk
25 Amp AC PSU
1.8 - 430MHz Pwr Meter
RG-213 patch lead

All-Mode Multi-Bander

*1.8MHz - 440MHz *1200 MHz Option *100W 1.8 - 146MHz
*50W 70cms 10W 23cms *Dual Watch HF/VHF
*Comprehensive DSP *DX Cluster Auto Tune *Built-In TNC
*Auto ATU 1.8MHz - 52MHz *Transverter Display

Package Price £1379 D
Radio alone £1295 D

NEW PRODUCTS - NEW PRODUCTS

KENWOOD TM-V71E 0% Interest!*

NEW

EchoLink Memories & NODE Terminal
50W on 2m & 70cms!

£269 D

NEW

Bluetooth

YAESU FTM-10R/E

New 2m/70cm Mobile with Bluetooth option
50W 2m 40W 70cms
Removeable front
Built-in PTT & Microphone!
11 x 3.7 x 17 cm!

£249 D

YAESU FT-450

NEW

160m - 6m 100W
SSB CW AM FM
IF DSP
Voice Memories
23 x 8.4 x 22 cm

Budget Class with Performance! **£tba**

ICOM IC-7700

NEW

Billed as a Contest Radio, the design takes fearures from the IC-758 and IC-7800 to give you a hefty transceiver packed with features. Available towards end of the year.

160m - 6m 200W
SSB CW AM FM
+40dBm Intercept
7" Colour TFT
Spectrum Scope

£tba

Carriage Charges: A=£3, B=£4, C=£6.95, D=£10, E=£12

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ICOM

IC-7800 — Buy Now Pay Later!

The Ultimate Icom! **0% Interest!***

FREE SP-20 Base Station Speaker with Filters worth £164.95

200W HF Built-in AC PSU

£6,395 D

IC-756PROIII — Buy Now Pay Later!

0% Interest!*

HF + 6m 100W All-Mode

£1989 D

IC-7000 — Buy Now Pay Later!

0% Interest!*

HF/VHF/UHF All-Mode Transceiver

Rig Only £895

With TFT PAL TV screen £989.95
With TFT + Power-Mite PSU £1009

IC-7400 — Buy Now Pay Later!

0% Interest!* 100W HF-VHF

Includes Base Mic

£1199 D

IC-718 — Buy Now Pay Later!

0% Interest!*

100W HF Transceiver

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IC-706 — Buy Now Pay Later!

0% Interest!*

HF/VHF/UHF 100W Transceiver

Includes Travel Mite Dual Voltage PSU

£599 D

IC-703 — Buy Now Pay Later!

0% Interest!*

£449 D

10W QRP HF-6m built-in Auto ATU

KENWOOD

Exclusive to Waters & Stanton!

NEW RADIOMATE

Keyboard For FT-817, FT-857 & FT-897

Rig not included

- *Direct frequency entry*
- *Mode change*
- *Carrier tune mode*
- *VFO A/B*
- *20 Memories*
- *Self-Powered*

RadCom Review (Feb 2007) "A pleasure to use - - has transformed my FT-817"

£99.95 C

TS-480SAT — Buy Now Pay Later!

0% Interest!*

100W HF+6m

£679 D

*1.8MHz - 52MHz 100W *Built-In Auto ATU
*Removeable Front Panel
*Comprehensive DSP
*Speech Processor *Quad RF Mixer
*CW Message Recorder *PSK31 Compatible

TS-480HX - As Above but 200W and no ATU **£765 D**

bhi DSP Noise Cancelling

bhi NES10-2 MkII SPECIAL OFFER!

Speaker and programmable DSP unit. Offers dramatic noise reduction.

Was **£99.95** Now **£89.95 C**

bhi ANEM

"Noise Away" Amplified Noise Elimination Module. Fits in-line between the equipment & speaker.

£119.95 C

bhi NEIM-1031

Noise Eliminating In-Line Module.

£129.95 C

bhi NEDSP-1061-KBD

Noise Eliminating DSP module designed for retro-fit in a number of transceivers, FT-817, TS-50, IC-706MkIIG, FRG-100, DX-77. With Keyboard.

£89.95 C

bhi NEDSP-1062-KBD

Noise Eliminating DSP module simply fits into Loudspeaker path, features a small keyboard to control functions.

£99.95 C

FREE Watson W-7700HB whip with all mobile radios - ends 31/8/07 PW offer

Icom VHF/UHF Mobile/Base

ICOM IC-E208

VHF/UHF FM Dual Band Mobile Transceiver
*Freq range 144-146MHz, 430-440MHz Tx
*55/50W (3 pwr steps each band)
*Wideband Rx 118-173, 230-549 & 810-999MHz

£215 D

IC-910H £1085 D
2m / 70cm 100W Base station all - modes Option for 23cm module (**UX-910 £359**)

IC-910X £1229 D
As above but with 23cm module ready fitted and a big saving as well.

IC-2200H £179 D
2m 55W FM mobile with rugged construction and with digital option.

IC-2725E £269 D
2m / 70cm radio. Easy to operate and install and a lovely detachable head.

Kenwood VHF/UHF Mobile/Base

KENWOOD TM-271E

2m FM 60W Mobile Transceiver. MIL-SPEC DTMF Mic. Built-in CTCSS & DCS encoder / decoder.

New Low Price! **£149 D**

TM-G707E £199 D
Dual Band 2m & 70cm with detachable front

Yaesu VHF/UHF Mobile/Base

YAESU FT-7800E

*2m/70cms Dual Band Mobile
*High power 50W 2m /40W 70cms
*Wide receive inc. civil & military air-band *CTCSS & DCS with direct keypad mic.
*Detachable front panel *1000 memories

YSK-7800 Remote Cable Only £24.95

£169 D

FT-1802E *Low Price!* £99 D
*2m FM Mobile transceiver *5, 10, 25 50W *DTMF Mic Supplied as standard

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*2m/70cmDualband FM Mobile transceiver *50W 2m, 35W 70cm *Wideband receiver

FT-8900R *Low Price!* £249 D
*2m, 70cm, 6m & 10m Quadband FM Mobile transceiver *Independent dial for each band

Yaesu ADMS Software

Programming Software For Your Radio
Programme Memories and all your radio's functions from your PC. Includes XP software, serial lead and adaptor for your Radio.

ADMS-1F for VX-110/1 / **ADMS-1G** for VX-7 **ADMS-1H** for VX-2E / **ADMS-1J** for FT-60E **ADMS-2H** for FT-8900 / **ADMS-2I** for FT-8800 / **ADMS-2J** for FT-2800 / **ADMS-2K** for FT-7800 / **ADMS-3** Programming Kit for VR-500, **£39.95** with FREE Data Lead. **ADMS-4A** for FT-817 and **ADMS-4B** for FT-857/8 both **£29.95**, both these items require a seperate CT-62 lead at **£29.95**

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FREE Watson speaker mic with all ICOM handhelds! Exclusive to PW readers. Offer ends 31/8/2007

ICOM IC-E91

Latest dual-band hand-held transceiver. receiver that covers 0.495 to 999MHz.

Limited Offer! **£199.95 C**

IC-V82 7W 2m Digital £159 C
IC-U82 70cms Digital £159 C
IC-E90 6/2/70cm £189 C
IC-T3H 2m 5W £129 C
IC-E7 2m/70cm Wide Rx £139 C

Kenwood VHF/UHF Handhelds

KENWOOD TH-F7E

- 144-146MHz Tx/Rx: FM
- 430-440MHz Tx/Rx: FM

Up to 6W out with Li-ion battery and **"scanner" style coverage from 100kHz to 1300MHz** including SSB on receive!

£199.95 C

TH-K2E 2m 5W £99 C
TH-K2ET 2m 5W FM £145 C
TH-K4E 79cm 5W FM £139 C

Yaesu VHF/UHF Handhelds

YAESU VX-7R

LIMITED SPECIAL OFFER

Totally waterproof, Wide frequency coverage 500kHz-900MHz AM/FM.

£209 C

VX-6E 2m/70cm wide rx 5W £169 C
FT-60E 2m/70cm wide rx 5W £129 C
VX-2E 2m/70cms miniature £99 C
VX-120 2m 5W w/ 8-key pad £99 C
VX-170 2m 5W w/ 16-key pad £109 C

Enquiries 01702 206835 / 204965

Carriage Charges: A=£

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MFJ

MFJ

MFJ-929 £199.95 D
Compact IntelliTuner Compact 200W 1.8-30MHz, Coax or Random Wire Auto ATU

MFJ-927 £229.95 D
Remote IntelliTuner Compact 200W 1.8-30MHz Auto ATU with Power Injector

MFJ-976 £429.95 D
Balanced Line ATU 1.8-30MHz 1500W Balanced Line Antenna Tuner

MFJ-948 £109.95 C
1.8030MHz ATU 300W, large cross needle meter

MFJ-993B £189.95 C
Auto ATU 1.8-30MHz, 300W SSB, 150W CW, Matches 6-800 Ohms

MFJ-945E £89.95 C
Mobile ATU 1.8-54MHz, 300W max, VSWR & 30/300W pwr meter

MFJ-949E £124.95 C
ATU / Dummy Load 1.8-30MHz, 300W, large cross needle meter

MFJ-901B £74.95 C
VERSA TUNER 1.8-30MHz, 200W, 135x150x60mm. weight 760g

MFJ-902 £65.95 C
Travel Tuner 3.5-30MHz, 150W, Mobile & portable use. 90x60x80mm

MFJ-259B £199.95 C
HF Digital SWR Analyser Coverage: 1.8-170MHz, Freq Counter, SWR & Impedance meters. Connectors: SO-239 (Ant), BNC (Counter).

MFJ-269 £269.95 C
HF/VHF/UHF Analyser Coverage: 1.8-4, 4-10, 10-27, 27-70, 70-114, 114-170, 415-450MHz. Freq Counter, SWR & Impedance meters. Connectors: N-socket (Ant), BNC (Counter).

SGC

SG-231 £349.95 D
SmarTuner 1.8 to 60MHz, 3 - 100W (PEP) VSWR: <1.4:1 typical

SG-237 £269.95 D
Compact ATU 1.8 to 60MHz, 3 - 100W (PEP) 40W max CW, VSWR: <1.4:1

SG-239 £189.95 D
Mini SmarTuner 1.8 - 30MHz, 1.5 - 200W (PEP) VSWR: Typically less than 2:1

SG-230 £339.95 D
The Original Long Wire SmarTuner - 1.8 - 30MHz, Power Input 3 - 200W

HEIL

PR-780-PTT £159.95 C
Deluxe Base Microphone Dynamic cardioid studio mic w/ CB-1PTT base (needs CC-1-XLR) lead.

HC-4 £29.95 A
Dx Quality Mic Insert Response from 500Hz to 3.5kHz with a 10dB mid-range peak.

HC-5 £29.95 A
Normal Quality Mic Insert Response from 350Hz to 4kHz with a 6dB mid-range peak.

HTSS £49.95 C
Traveler Single Side Headset & Boom Mic Requires HSTA patch lead

HTDS £59.95 C
Traveler Double Sided Headset & Boom Mic Requires HSTA patch lead

HSTA £17.95 A

Patch Leads for HTSS & HTDS.
HSTA-YM for Yaesu modular
HSTA-706 for Icom modular
HSTA-KM for Kenwood modular
HSTA-K8 for Kenwood 8-pin
HSTA-IC8 for Icom 8-pin
HSTA-KHT for Kenwood
HSTA-IHT for Icom handhelds
HSTA-VX for Yaesu handhelds

Power Supplies

WATSON

W-25XM
*9.7 - 17V DC (13.8v notch)
*Input 230V or 115V AC
*25 Amps peak, 22 Amps cont.
*Dual output terminals *Dual metering volts & current
*Over voltage & current protect *Removable AC lead
*1.65kg *170w x 180d x 65h mm
£99.95 C

W-3A £22.95 C
Output 3A, 13.8V DC, supply 230V AC

W-5A £29.95 C
Output 5A, 13.8V DC, supply 230V AC

W-10AM £59.95 D
Output 10A, 0-15V DC, supply 230V AC

W-25AM £89.95 D
Output 25A, 0-15V DC, Dual meters

W-30AM £119.95 D
Output 30A, 0-15V DC, Dual meters

W-25SM £79.95 C
Output 22A (25peak), 13.8V DC, supply 230V / 115V AC

PS-122 £21.95 A
Output 2.2A, 13.8V DC, supply 230V AC

DIAMOND ANTENNA

GSV-3000
*Output voltage: 1 - 15V DC
*Output current 30A continuous *Built-in cooling fan
*Supply 230V AC 50Hz *Size 250 x 150 x 240mm
*Weight 9kg
£149.95 D

GZV-2500 £119.95 D
Output 25A, 5-15V DC, supply 230V AC Switch mode over volts protected. 21 x 11 x 22cm

GZV-4000 £159.95 D
Output 40A, 5-15V DC, supply 230V AC Switch mode over volts protected. 21 x 11 x 30cm

GZV-6000 £299.95 D
Output 60A, 1-15V DC, supply 230V AC Switch mode over volts protected. 21 x 11 x 36cm

MANSON

EP-925
A general purpose 3-15V DC, 25A (30A peak) power supply able to provide the needs of the modern 100W HF transceiver.
£99.95 D

HF Antenna's

CUSHCRAFT
COMMUNICATIONS ANTENNAS

MA5V £239.95 D
Vertical 5-band 20m - 10m. No separate radials needed. 250W. Self-supporting. 4.48m tall.

A3-S £469.95 D
The classic 20 15 10m 3-el beam. 2kW 8dB gain. 8.45 el. Turn radius 4.72m. F/B ratio 25dB.

A3-WS £379.95 D
Dual Band 3 el beam for 17m & 12m. 2kW. El length 7.66m. Turn radius 4.4m. Gain 8dB. F/B ratio 25dB.

A4-S £569.95 D
Tri-band 4 element Yagi. for 20m - 10m. DXers delight. 2kW . 8.9dB gain F/B 25dB. Turn radius 5.49m

R-8 £469.95 D
8-band vertical 40m - 6m. No separate radials needed. 1.5kW. Height 8.7m

R-6000 £329.95 D
6-band vertical 20m - 6m. No separate radials needed. 1.5kW. Height 5.8m. Great small garden ant.

MA5B £399.95 D
5-band 2 El mini beam. 20m - 10m 2kW. Elements 5.2m Turn radius 2.7m. (Dipole on 17/12m) 5dB gain

HUSTLER

6-BTV £229.95 D
*6-band vertical, 7.3m tall, 1kW.
*Coverage: 80, 40, 30, 20, 15, 10m
Can be used at ground level with earth stake. Ideal for small gardens

5-BTV £199.95 D
*5-band vertical, 7.64m tall, 1kW.
*Coverage: 80, 40, 20, 15, 10m
Can be used at ground level with earth stake. Ideal small gardens

4-BTV £169.95 D
*4-band vertical, 6.52m tall, 1kW.
*Coverage: 40, 20, 15, 10m
Can be used at ground level with earth stake. Ideal small gardens

Watson Power Supplies

The UK's Power Supply Specialist.

WATSON POWER-MITE
*11-15V Variable.
*20A continuous
*23A peak, 100 - 260V
*AC in. 2 x Meters
*150 x 55 x 165 mm
£49.95 C

WATSON W-25SM
*13.8V Fixed.
*23A continuous
*25A peak
*115 / 230v AC in.
*229 x 180 x 73 mm
£67.95 C

ABM-1 Airband Monitor

Passengers can now hear the crew's VHF transmissions - Anywhere - Anytime No tuning required!

NEW "PASSIVE" AIRBAND MONITOR - HEARS WHAT OTHERS MISS!

Safe to use inside aircraft cabin!

The new Ramsey ABM-1 is like nothing else! It is a passive airband monitor with no oscillator or IF - so no risk of interference even inside an aircraft cabin. It is highly sensitive (2uv) and will hear all local aircraft overhead or at airfields plus the pilots transmissions from inside an aircraft cabin. That's right, as a passenger you can now safely monitor the crew's radio transmissions. The radio is only available in kit form (but small components are ready mounted on board) and it takes around 3 hours maximum to build. Kit has everything you need including smart case and earbud phones. Controls are on/off, volume and squelch. Antenna is via headphone cable. PP3 battery required - not included.

£79.95 C

Carriage Charges: A=£3, B=£4, C=£6.95, D=£10, E=£12

Practical Wirelesscontents

August 2007
On Sale July 12th
Vol. 83 No. 8 Issue 1204
(September 2007 Issue on sale August 9th)

60 Practically Yours
75 Years of Heritage & History
Looking back at some rather special news items, articles and other material covering the period from 1930 to 1939 in *Practical Wireless*.

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August Regulars

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Cover Subject
Richard Newton G0RSN found the new TM-V71E dual-band mobile transceiver to be extremely versatile! Also this month, why not have a go at building the SOTA-1 transceiver and the 100W Balanced Z-Match Tuner for 1.8 30MHz.

Design: Steve Hunt
Main Photograph: Courtesy of Kenwood Electronics UK
Inset Photographs: Geoff Cottrell G3XGC and Hannes Coetzee ZS6BZP

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Welcome! Each month Rob introduces topics of interest and comments on current news

Keylines

Rob G3XFD introduces another issue of great radio reading as he discusses the problems with nuisance stations.

There's not much that can really make me really 'red-faced' angry nowadays. Despite this, I became very angry indeed on the evening of Monday, June 18th, while listening to the Special Event (SE) station **GB25FC** (commemorating the 25th anniversary of the conflict) during which a persistent nuisance transmitter attempted to disrupt the activities.

I had decided to mention the nuisance station's antisocial activities even before **Ron Horner** from Cheshire E-mailed me (see letters pages) to express his own anger. Ron had been listening on the very evening I contacted the station.

The GB25FC transmissions were very strong in Bournemouth as I'm only around 55km (34 miles or so) away from the **Wyke Regis** club in Weymouth, who were hosting and operating the SE station. However, the nuisance transmitter was also a very strong signal and I also understand the signal was just as strong several hundred kilometres away towards the north.

Despite the strong signals the nuisance transmitter did not disrupt the QSOs and most Amateurs calling GB25FC (very sensibly) didn't mention the disturbing behaviour of the (possibly psychologically ill) operator. It was at this point, I became so angry I did the same as Ron Horner and switched the rig off. However, I quickly realised that, as Ron also mentioned in his letter, by switching off – the nuisance transmitter had 'won'. So, I quickly switched on the rig to listen as Amateurs all over the UK called in, despite the nuisance operator.

Although I have covered this sad topic previously, I have no qualms in mentioning it again, although a good friend and colleague assures me that our hobby is not alone in suffering from antisocial behaviour. He considers it as a possible reflection of the problems of modern society and I (sadly) have to agree with his reasoning.

However, although the nuisance transmitter doesn't normally break up a QSO, I think it's now essential for us to act positively and help locate that person. From my own observations of the characteristics of his audio waveform's 'fingerprint' displayed on my shack oscilloscope, I think there's one main offender attempting to disrupt our reputable and honourable pastime.

There are many things we can do together to assist the authorities to remove the nuisance and I suggest that *PW* readers operate in the following fashion. First and most importantly **– never acknowledge the presence of the nuisance transmitter**. Secondly, when you are actually transmitting during a QSO, I suggest you briefly break your transmission (just release the push-to-talk button) and equally briefly listen on your operating frequency.

If you hear the characteristic scratching and whistling, ensure you leave the frequency clear for as long as you can, with the nuisance transmissions exposed. This will enable direction finding (DF) bearings to be taken quickly and accurately.

I also suggest that if you have E-mail facilities and often talk to Amateur friends 'off air' (or off the h.f. bands) you can advise them of the procedures. **Please don't discuss it over the air – for obvious reasons!**

If the unfortunate individual behind the nuisance transmissions reads Keylines or gets to know of (and understands) the actions we're undertaking, it can only work to our advantage because they'll be forced to transmit for shorter periods. Despite this, with many legitimate Amateurs monitoring the nuisance operator's actions I'm very confident that by acting together we can rid ourselves of what can be compared to a parasite, actively feeding from our hobby. Once we have enough bearings the authorities can act on our behalf.

Next month, I'm hoping to update you all on some tests we'll have done in conjunction with two supportive authors. I'm sure that these experiments will help us eradicate the unpleasant parasite from the Amateur bands.

Vintage *PW* Material

The letters (letters pages) from *PW* author **Alan Ford VK2DRR** and **ZL1VL** in Australia, prompted me to mention that the (perhaps not so well known nowadays) propaganda role played by *PW* during the 1939 – 1945 War.

Replying to Alan, I'm sure that far from being an 'enemy' plan to produce extra-heavy radio equipment for the armed forces, the photograph and news story was itself aimed at making 'the other side' think that we didn't have any truly lightweight equipment!

The subtle (sometimes not so subtle!) propaganda role of *PW* was helped because although it was difficult to find in the UK, it was relatively common in neutral countries. The magazine was on sale in Portugal, Spain, Sweden, Switzerland and the Irish Free State (now the Republic of Ireland).

Interestingly, because of *PW*'s long-term availability in Portugal and Spain, even before the advent of the Spanish 'Costa Del Retirement' the magazine was regularly on their bookstalls. However, although we're delighted to have regular readers in the Iberian Peninsula, they often 'bend my ear' regarding the fact that *PW* arrives a few says later than in the UK and they miss the best 'Bargain Basement' items. My standard question is then, "Which do you prefer – missing the occasional bargain in *PW* or your lifestyle living in the Sun?" (You'll probably realise what the standard reply is!).

Rob Mannion G3XFD/EI5IW

services

Subscriptions
Subscriptions are available at £37 per annum to UK addresses, £45 Europe Airmail and £55 RoW Airmail. See the Subscriptions page for full details.

Components For PW Projects
In general all components used in constructing *PW* projects are available from a variety of component suppliers. Where special, or difficult to obtain, components are specified, a supplier will be quoted in the article.

Photocopies & Back Issues
We have a selection of back issues, covering the past three years of *PW*. If you are looking for an article or review that you missed first time around, we can help. If we don't have the whole issue we can always supply a photocopy of the article. See the Book Store page for details.

Placing An Order
Orders for back numbers, binders and items from our Book Store should be sent to: PW Publishing Ltd., Post Sales Department, Arrowsmith Court, Station Approach, Broadstone, Dorset BH18 8PW, with details of your credit card or a cheque or postal order payable to PW Publishing Ltd. Cheques with overseas orders must be drawn on a London Clearing Bank and in Sterling. Credit card orders (Access, Mastercard, Eurocard, AMEX or Visa) are also welcome by telephone to Broadstone 0870 224 7830. An answering machine will accept your order out of office hours and during busy periods in the office. You can also FAX an order, giving full details to Broadstone 0870 224 7850. The E-mail address is bookstore@pwpublishing.ltd.uk

Technical Help
We regret that due to Editorial time scales, replies to technical queries cannot be given over the telephone. Any technical queries by E-mail are very unlikely to receive immediate attention either. So, if you require help with problems relating to topics covered by *PW*, then please write to the Editorial Offices, we will do our best to help and reply by mail.

Send in your thoughts and win a voucher!

letters

Send your moans, groans and even praise when it's due to the editorial address or E-mail: pwletters@pwpublishing.ltd.uk

A great deal of correspondence intended for 'letters' now arrives via E-mail, and although there's no problem in general, many correspondents are forgetting to provide their postal address. I have to remind readers that although we will not publish a full postal address (unless we are asked to do so), we require it if the letter is to be considered. So, please include your full postal address and callsign with your E-Mail. All letters intended for publication must be clearly marked 'For Publication'. **Editor**

The Star Letter will receive a voucher worth £20 to spend on items from our Book Store or other services offered by Practical Wireless.

Star Letter

The IBP PIC Clock Project

● **Dear Rob**

Thank you for providing the features in the April and May editions of *Practical Wireless*. In the April edition the descriptions of **Phil Cadman G4JCP's** PW IBP electronic clock led me to purchase, construct the Velleman K8048 Programmer and to use it to program the supplied PIC with the demo flashing l.e.d. programs!

The two features in the May edition also provided an interesting review of the PIC and G4JCP's description the Beacon Clock circuits has made me even more determined to complete what is a very interesting and useful the project.

I have recently returned to Amateur Radio and decided to build a series of kits to assist in the re-learning process before venturing onto the bands. All of the kits I have completed (Elecraft, Ramsey, Maplin, Velleman, RSGB) have used printed circuit board techniques, whereas the PW IBP Beacon Clock is using strip-board, of which I have no experience.

I write to enquire if there will be additional information on the building the strip board IBP circuit in the July edition of *PW* or alternatively will a third party be authorised to produce a p.c.b. as this service would greatly assist me and in all probability many other Amateurs in complete this exciting project.

Thank you again for developing such an interesting feature, together with the 'links' on your website to the to **Northern California DX Foundation**, the originators of the International Beacon Project system. They (along with many others) do so much voluntary work on behalf of Amateurs worldwide. I do hope that you get support to publish many more PIC-based projects. With kind regards

Allen Gawne GD7LAV
Port Soderick
Isle of Man

Thanks for your comments Allen! There's much of interest to discuss in your letter Allen! Please join me on the Topical Talk pages. ***Rob G3XFD***

Contest Take Over On 7MHz

● **Dear Rob**

Like you, I too heard the take over of the complete c.w. section on 7MHz by s.s.b. stations taking part in the March 24th-25th weekend contest. I agree with most of your comments, and it was really dreadful contest operating behaviour.

As I have been QRT for 23 years I found it rather sad that a wonderful hobby such as Amateur Radio had degenerated to this level of poor behaviour.

What can be done about it? I don't know myself, but surely any operator who gains an s.s.b. section award having abused the c.w. section of the band has gained an unfair advantage over operators who kept to the band plan. In such cases surely their award must be morally worthless?

Roy Bolton G4VXV
Stamford Bridge
York

I'm sure that the experience will not deter you from our hobby Roy! Please persevere – it must be stressed that very few contest operators behave in the manner you and I heard in March. However, we can do something about it ourselves – we can note the callsigns of the offending stations and perhaps make a mental note to avoid working them ourselves in future. We can also contact our national society (for the country we live in) and ask for their help. The national societies are all members of the International Amateur Radio Union (IARU) and act on our behalf. Personally, I think that we can only act against the bad behaviour of this minority via our national societies and the IARU. I urge all our readers to please remember that only a few contesters are mavericks! ***Rob G3XFD***.

Contests Are Great!

● **Dear Rob**

Just a short note to voice my own opinion on the 'Contests debate'. I love contests, they are a great way for those of us with a modest set-up to make contacts with distant (DX) stations that would not normally be possible.

However, when it comes to 40m (7MHz), I do feel that the band is simply too narrow to cope with the demands of international contests, so perhaps this band should be exempt from contests?

There are plenty of other more suitable bands with wider bandwidths available. Another idea might be to introduce a 'band plan' for contests, so that all users could be accommodated. Just my thoughts! Best wishes.

Jonathan Kempster M5AEO
London E14

I'm sure you'll be able to continue to enjoy them Jonathan! Please join me on the Topical Talk page for further discussion. ***Rob G3XFD***.

Something For The Newcomer?

● **Dear Rob**

Thank you for your E-mail correspondence, answering my first mail to you and giving me the opportunity, by your suggestion that I write a letter, to see if the younger/or people just entering the hobby would be interested in a 'back-to-basics' section. I've been made aware your magazine has covered this including the original Getting Started The Practical Way (now Carrying On The Practical Way, written by the **Rev. George Dobbs G3RJV**). **Tony Nailer G4CFY's** current Technical For The Terrified and that your own series Radio Basics was successful in it's time but became less popular over the years with readers showing less of a interest, maybe due to the Internet.

After some lengthy QSOs with local Amateurs and reading about the new influx of new enthusiasts, I have come to the conclusion some form of back-to-basics article is once again needed, this would include articles like correctly setting up your station, getting the best from 10W, how and why to keep a Log of your QSOs including electronic methods and many other ideas from basic wire antenna to big beams. Running *Echolink* or setting up a Simplex voice Gateway and constructing an antenna tower and maybe how to use a voice repeater could be covered.

letters

So, I ask readers if you're new to the hobby, or like me would like to see some 'back-to-basics' wireless related articles to help the newcomer, please contact *PW* and show your interest, this would also be a good opportunity for the veterans or wireless to pass on there vast knowledge to the 'newbie'. Yours sincerely.
Rob Styles 2E0TFO
Bath
Somerset

Thank you Rob! I now ask interested readers to join me on the Topical Talk page for further discussion. ***Rob G3XFD***

Vintage Blooper!

● **Dear Rob**
I'm much enjoying the reprints of early material in the Practically Yours section. But on page 72 of your July issue a minor blooper of the time is revealed, I feel. The Hill (twin sisters) serving in the ATS are shown "testing portable wireless sets used by the army". If I'm not mistaken, that's an R107 they have on the bench.

The idea of that as 'portable' suggests skullduggery by the enemy. It doesn't weigh as much as the famous AR88 but all the same it is **VERY** heavy! I always felt that the 38 Set 'walkie-ta kies' (virtually ineffective, unlike the 18 set) were designed by the enemy to lower the morale of British troops. Now, with this latest revelation I'm sure there was an enemy department charged with doing exactly that!

On the subject of *nommes de plume*, F J Camm certainly had very strong opinions. I always suspected that 'Thermion' was really F J Camm in (thin) disguise. He had **extremely** set ideas, which he expressed in his regular column and, for example, he had an intense dislike of "young men in brown corduroy jackets" at the BBC!
One thing that distinguished *PW* from other journals of the time was that the magazine tended to keep publishing early designs (for example 2V tuned radio frequency receivers (t.r.f.s) when everyone had moved on and continued using valves when everyone had moved to transistors), so much so that it was in some circles irreverently known as 'Camm's Comic'. I wonder whether that was the tendency of some staff to cling to the past, or else a big backlog of previously submitted articles? Whatever the reason, it was still a good read and I enjoyed it and many of the designs for many years.
Alan Ford
Salamander Bay
Australia

Very interesting Alan! Please join me on the Keylines Editorial page for my thoughts on the matter! ***Rob G3XFD***

Deliberately Jamming GB25FC

● **Dear Rob**
I write to you in sheer desperation asking for your help as I have just heard **GB25FC**, run by the **Wyke Regis Club**, Weymouth, Dorset, being deliberately jammed by a nuisance station on Monday evening June 18, including the time when you worked the station using your own callsign G3XFD. As I type this E-mail I also hope you get it in time for the August issue because something really has got to be done to help our wonderful hobby recover from this sick behaviour.

Although I passed my RAE many years ago I have preferred to listen while working in the shack. I find the GB Special Event Stations to be fascinating and I look forward to the QSL card to return the one I sent you when you were operating on 20 metres from G3LDI's QTH in Norwich on June 6th. There were some odd conditions on the bands that day as I heard you all the time, although I live in Cheshire and all the stations working you, including the American Amateur in New York State.

The nuisance station – I won't call him a 'Scratcher & Whistler' because the term makes him sound less of a menace – was very persistent and amazingly strong. Although few operators mentioned his attempts (the best defence tactic), the nuisance continued and it was obvious he was determined to ruin GB25FC's last evening's operations.

I was so angry I just switched off, but soon realised that meant the nuisance operator had won! Surely Rob, isn't it time everyone acted against his poisonous behaviour? I look forward to building the Huff Duff 7 loop antenna you have mentioned and hope you publish it soon, so we can advise the Amateur Radio Observation Service and Ofcom of the bearings we obtain.

Something has got to be done and done very quickly and *PW* seems to be very aware of the problem. My thanks to everyone on the magazine!
Ron Horner
Macclesfield
Cheshire

I can understand your frustration Ron! I too was angered at the behaviour of the nuisance station trying to jam GB25FC. However, I think that the nuisance operator seems to target Special Event stations in general and the Falklands commemorative station was not (in my opinion) singled out for such crass, insane behaviour. I now invite readers to join me on the Keylines page for further discussion. ***Rob G3XFD***.

rallies

Radio rallies are held throughout the UK. They're hard work to organise so visit one soon and support your clubs and organisations.

July 15th
The McMichael Rally & Boot Sale
Website: www.radarc.org/MMRally.htm
The McMichael Rally & Boot Sale will be held at the Reading RugbyFootball Club, Holme Park Farm Lane (for GPS users) SU 753 747, Sonning Lane (B4446), Sonning on Thames, Reading RG4 6ST. Just off the A4 East of Reading, Berkshire. Gates open at 0930 and admission is £2. Boot Sale pitches are £10 per pitch (no booking required) and set up is from 0830. Hall Traders have access from 0830 and tables are £10 booked (book early due to ensure a space) or £12 per table on day.

July 29th
Colchester Radio and Computer Rally
Contact: James McGinty
Tel: (01255) 242748
E-mail: James@M0ZZO.com
The Annual Colchester Radio and Computer Rally will be held at St. Helena School, Sheepen Road, Colchester CO3 3LE. Doors open between 1000 and 1500hours. There will be all the usual traders, an RSGB Bookstall, car boot stands and a Bring & Buy. There is ample parking in the college opposite and limited disabled parking on the field.

August 10th
The Cockenzie & Port Seton ARC Annual Junk Night
Contact: Bob Glasgow GM4UYZ
Tel: (0187) 811723
E-Mail: bob.gm4uyz@btinternet.com
Website: http://www.cpsarc.com/
The Cockenzie & Port Seton Amateur Radio Club is holding its 14th Annual 'Junk' Night in the Community Centre, Main Hall, South Seton Park, Port Seton, East Lothian EH32 0BQ from 1830 to 2130hours. Bring along your own 'junk' and sell it yourself. Tables are on First Come First Served basis. There is disabled access, catering and the raffle will be drawn at 2100hours. The entrance fee is £1 for everyone. All money raised will be donated to the British Heart Foundation.

August 12th
The Flight Refuelling ARS
Contact: Mike M0MJS
Tel: (01202) 883479
Website: www.frars.org.uk
The Flight Refuelling Amateur Radio Society Hamfest will be held at Cobham Sports and Social Club Ground, Merley, Near Wimborne, Dorset BH21 1RJ. There is free car parking and the doors open at 1000.

August 26th
The Milton Keynes ARS 21st Annual Rally
Website: www.mkars.org.uk
The Milton Keynes Amateur Radio Society's 21st Annual Rally will be held at Holne Chase School, Buckingham Road, Bletchley MK3 5HP. Doors open at 1000 hours. Visitors' entry fee will be £2, outdoor pitches £10 (or £7 in advance), indoor stands £12 (advance booking only).

If you're travelling a long distance to a rally, it could be worth 'phoning the contact number to check all is well, before setting off. Look out for representatives from *Practical Wireless* and *RadioUser* at rallies printed in bold.

news & products

Send all your news and club info to Donna Vincent G7TZB at the *PW* editorial offices or E-mail: **pwnews@pwpublishing.ltd.uk**

Mast Winch

Goodwinch Ltd, claim that "You can raise or lower your radio mast at the touch of a button with a Superwinch S-Series 12V winch. The kit enables users to stand back and operate the remote handset to raise or lower your telescopic mast for re-rigging your antennas, general maintenance or simply to reduce the height when high winds are forecast.

The kit is easy to install and comes complete with everything you need, other than a battery. It includes the mounting spacer plates, 9m (30') remote hand control, standard battery cables, isolator plug and socket and battery terminals. These winches are fitted with permanent magnet reversible motors.

The S4000 has a 1.8HP motor and the S5000 has a 2.1HP motor. Both models have a gear ratio of 159:1. Winch control is by means of high quality Albright sealed solenoids. Both winches are equipped with dynamic and mechanical braking giving no run-on when stopping whilst powering up or lowering down."

A complete S4000 winch tower kit costs £350 plus carriage and VAT and the more powerful S5000 is £385 plus carriage and VAT. For more information contact: **Goodwinch Ltd., East Foldhay, Zeal Monachorum, Crediton, Devon EX17 6DH. Tel: (01363) 82666.**

Trophy for Training

The **Chelmsford Amateur Radio Society** (CARS) was honoured to receive the **Kenwood Trophy for training** recently. This trophy is awarded to those making a significant contribution to UK Training and Development in Amateur Radio within the United Kingdom.

The presentation was made at the 80th Annual General Meeting of the **Radio Society of Great Britain** (RSGB) in the picturesque city of Edinburgh. The CARS Training team members able to attend were **Trevor M5AKA, Clive G1EUC, Martyn G1EFL, Chris G0IPU, Murray G6JYB** and **Anthony M1FDE**. The RSGB President, **Angus Annan MM1CCR**, presented them with the Kenwood Trophy. The CARS began running courses in January 2002 and as a result more than 200 people have passed their Radio Communication exams.

Sunrise Ceremony

On August 1st, 2007, a vast network of Amateur Radio stations around the world will support Scouting's Sunrise into the new Centenary. Starting in the East and continuing towards the West as time progresses, several countries will organise a get-together and ceremonies in the morning.

The stations taking part are aiming at transmitting sound and images from the 'sunrise zone' to **GB100S** at Brownsea Island and to **GB100J** at the 21st World Scout Jamboree site in Chelmsford, using short wave Amateur Radio and/or the *Echolink* system. As time evolves during that day, Brownsea Island will have a growing overview of the Scouting Sunrise activities around the world, starting, for example, with Kiribati in the East and ending 24 hours later in Samoa in the West.

news snippets

Scout Expedition
The West Lancashire Scouts Expedition to Renland East Greenland 2007 will be taking place from the 23rd July to August 20th. A party of 50 Scouts and leaders from West Lancashire will be exploring the ice cap and mountains of Renland East Greenland. As well as mountain exploration a number of scientific and wildlife studies and experiments are being carried for various academic bodies.

The Expedition will also be operating an Amateur Radio station for a considerable period of time. Operation will be on the 7, 10 and 14MHz bands, s.s.b., data and some c.w. and will use the the callsign **G3WGU/OX**. For more information take a look at: **www.greenland.westlancashirescouts.org.uk**.

Bolsover ARS
The **Bolsover Amateur Radio Society** will be operating as **GB2PF** on Saturday August 11th and Sunday August 12th to commemorate the birthday of local man **Peter Fidler**, who was a famous surveyor in Canada in the 1790s. The club intends to operate on as many bands as possible, h.f., v.h.f. and u.h.f. from the new club shack located at the Coalite Sports and Social Club, Moor Lane, Bolsover.

AMSAT-UK
In support of the **AMSAT-UK International Space Colloquium**, which is being held at the University of Surrey over the weekend of July 20th - 22nd, **GB0AUK** will be on the air from the second week in July 2007 until the second week in August 2007.

All QSL cards should be sent via the RSGB bureau. For more details check out: **http://www.uk.amsat.org/Colloquium**

South West Astronomy Fair
The Norman Lockyer Observatory Amateur Radio Group will be participating at the 2nd South West Astronomy Fair due to be held in the grounds of the Norman Lockyer Observatory, Salcombe Hill, Sidmouth, Devon. Members of the group will be operating on August 1st using the callsign **GB2NLO** from 0900 to 1800 hours. They will be working s.s.b., c.w., SSTV and PSK31 as appropriate on the 3.5, 7, 14, 50, 70 and 144MHz bands.

New Contest for the RAIBC
A new RAIBC contest is to run for the week of July 30th to August 5th. The contest is open to all members of the RAIBC and will run for one hour a day. All frequencies and modes are permitted, with extra points available for working other RAIBC members. They believe this is the first contest to also allow Internet assisted QSOs. This is to help some of their members who may be in sheltered accommodation with restrictions on antennas or in other challenging environments.

The contest is open to Radio Amateurs and short wave listeners (s.w.l.) alike and the leading s.w.l. station will win the Constance Hall Trophy and a £20 voucher, whilst the leading Amateur station will also receive a £20 voucher and the Jonny Clinch Cup. For further details look in the Spring 2007 edition of *Radial* or the RAIBC website at **www.raibc.org.uk/**.

news & products

Send all your news and club info to Donna Vincent G7TZB at the *PW* editorial offices or E-mail: **pwnews@pwpublishing.ltd.uk**

New SOTAbeams SB5

The Summits On The Air (SOTA) beam SB5, described by SOTA "as a superlight 5-element 144MHz for portable use and builds on the key features from the design and success of the 3-element 144MHz SOTAbeam, which was introduced in 2003 and quickly became the 144MHz antenna of choice for hundreds of portable radio operators across the UK."

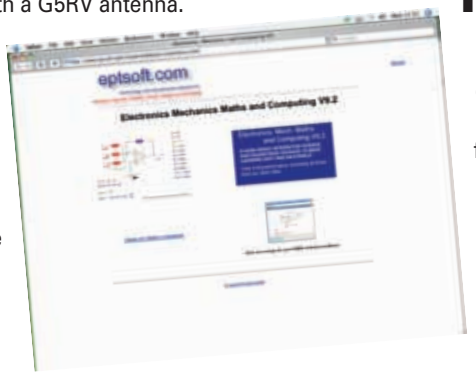
"Increased gain, coupled with an amazingly clean radiation pattern make the SB5 ideal for many types of portable work. The SB5 has already been tested on SOTA activations as well as in contests and the new features have proven to be popular.

The option to be able to use the SB5 as a 5 or 3-element beam, allowing portable operators to choose what is most appropriate for the conditions on the mountain, is thought to be unique. Weighing in at under 400g and with rapid assembly, it's designed to be able to go anywhere. The beam has brackets for both vertical and horizontal use and is supplied with a feed-line choke kit. A contest upgrade kit allowing two SB5 beams to be stacked on a fibreglass mast will be available soon."

The SB5 is designed and made in the UK. It is supplied complete with a mast, guying kit and feeder system making it superb value for money at just £69.95 plus £8.50 P&P. To order yours contact SOTAbeams at **89 Victoria Road, Macclesfield SK10 3JA Website: www.sotabeams.co.uk**

Houndation Training!

The photograph shown here was taken on Sunday, June 17th during the Museums on the Air weekend when members of the **Kilmarnock and Loudon Amateur Radio Club** were operating **GB0BWT**, at Barnweil Tower near Tarbolton in South Ayrshire.
The dog's name is **Jade** and she was 'operating' the club's Yaesu FT-757GX with a G5RV antenna.
It's not known if Jade actually managed to get a reply to her calls (despite keeping doggedly at it without a paws) but the station managed 393 QSOs in 38 countries and a good time was had by all!



New Software

Clive M0DXJ from **eptsoft** has informed the newsdesk that the latest version of *Electronics, Mechanics, Maths and Computing V9.2* is now available from their website for free download. The package is complete without any install or time restrictions.

Electronics, Mechanics, Maths and Computing V9.2 covers all electronics required for the foundation, intermediate and advanced Amateur Radio examinations plus much more. It also includes links to electronics and educational suppliers websites. Download it today at: **http:www.eptsoft.com/StudentHobbyist/electronics.htm**

Can You Help?

Andy Young M0FYA has contacted the Newsdesk with a plea for help.

Andy writes; "I recently bought a Denco DCR19 receiver on E-bay, which seems to be in a very tidy condition. Unfortunately, I have no information on it, whatsoever, which is hopefully where you can help. I've searched on Google and almost drew a blank - a picture of a rather bedraggled example in a museum in New Zealand and an observation that it was, along with the Radiovision Commander, a post-war receiver aimed at the Amateur, was all I could find. So, if anyone has any information, a manual or circuit diagram I would be very grateful."

If you can help Andy in his search please contact him direct at: **39 Thornton Drive, Hoghton, Preston, Lancashire PR5 0LX. Tel: (01254) 854490.**

Museum of Communication

The **Museum of Communication** in Burntisland, Fife, is about to open its doors to yet another ambitious exhibition. Entitled 'From Big Band to Broadband', this year's event takes visitors through the changing face of home entertainment in the last 80 years.

From the gramophone to iPod, from candlestick telephone to mobile with Bluetooth. From Baird's TV to HDTV and from crystal set to Internet, all within the span of a lifetime.

From Big Band to Broadband is open from 1100 to 1700 hours. on Saturdays and from 1300. until 1700hours on Sundays and Wednesdays from July 21st until September 16th. Admission, which includes refreshments, costs £3 for adults, £1.50 for an accompanied child and £8.50 for a family. For further details, tel: **(01506) 823424** (Secretary) or E-mail: **mocenquiries@tiscali.co.uk** .

Norfolk's National Field Day

There was much more to Field Day than usual for one club this year. When **Norfolk Amateur Radio Club** (NARC) suddenly discovered that its traditional field was no longer available, it used the opportunity to move site and turn the event into NARCs first **Radio Active weekend** on June 2nd and 3rd!

Although NARC members meet weekly in an ideal social club setting for presentations and talks overlooking aircraft and runways, they can rarely practice serious operating or construction because of its proximity to the airport. The club's radio courses are already held at local business premises over weekends and being in a rural location near Attleborough with a couple of big fields close by, the members soon realised that this could be the base for something more adventurous. Two traditional Field Day stations were set up in the nearby fields, one main 24-hour A station and one B QRP station in the restricted section.

To compliment the Field Day activities, a programme of informal workshops run by club members ran through the weekend. On Saturday, there were packed sessions on Micro components, SSTV, Packet and Data modes and General Construction workshops – and the first day ended with a take away supper and a family film – *Short Circuit*, of course!

Whilst the A station battled through the night for those elusive points some members camped or slept in spare offices, before the

second day's hands-on programme of APRS/GPS, Getting started with c.w. and live Amateur Television workshops started. By midday nearly everyone had arrived, as had the Hog Roast, which had been rashly offered as a 'free lunch' by the chairman if 100+ came to support the event (and they did!).

So the weekend's main aim of bringing contesters, newcomers and families together for some real hands-on radio and electronics with a great social gathering really worked, with men and women, boys and girls of every age from 7 to 70.

Even a BBC reporter fulfilled his producer's challenge to prove that Amateur Radio and Morse are not just for the stereotypical older male. He met plenty of lady Amateurs and youngsters from the clubs 'Bright Sparks' youth group.

So, Field Days don't have to be rugged events for just a few die hard enthusiasts – why don't you try it next year?

club news special

On The Road With GB75PW

On **June 6th**, **GB75PW** was on the air from the superb radio QTH of *PW* author **Roger Cooke G3LDI**. Most activity was on 14MHz where, due to unusual propagation conditions, we worked many UK and Irish stations and into the USA. It was an enjoyable but busy day that ended with an exceptionally enjoyable visit to the **Norfolk Amateur Radio Club**!

Saturday, June 23rd saw us once again at the **Poole Amateur Radio Society** (PARS). Most activity took place on 7MHz – with some excellent UK/Irish and Dutch contacts being made. The next event from the PARS takes places on July 21st.

The GB75PW call will be active at the **Worcester Amateur Radio Club** on **July 10th**, from mid-morning until late afternoon. In the evening, I'll be providing a 'club visit'.

On **Tuesday, August 7th**, GB75PW will be on the air from mid-morning until late afternoon, at the **Barry Amateur Radio Club** in South Wales on the h.f. bands from their excellent site, alongside the Bristol Channel. A club visit will take place during the evening.

On **Wednesday, August 8th,** I'll be joining the **Blackwood Amateur Radio Club**, in Gwent, South Wales, to help celebrate their own 75th anniversary with a *PW* talk. It seems 1932 was a busy year for Amateur Radio!

Rob G3XFD

silent key

Ted Rhodes G2ADN 28/10/1907 – 24/04/2007

Horace Edward Rhodes (Ted) was born in Darleston and went to Derby in 1926. After a spell in the army he joined General Electric Services, a company owned by **Colonel A K Haslehurst G5HT**. Ted eventually purchased the company in his own right and it remained in his ownership, selling and servicing radio television and domestic appliances.

He had many interests including photography, music, tape recording, theatre organs and was an active member of **Derby & District Amateur Radio Society,** Nunsfield House Amateur Radio Group and RAOTA. Ted could often be heard on the Barometric Net and the local 144MHz nets during the morning and evening.

He will be sadly missed by all his many friends. *Our sympathies go to his family and frends*. Editor

Technical for the Terrified!

This month, Tony Nailer G4CFY sets out to remove the mysteries associated with band-pass circuitry.

This month I'm planning to remove some of the mysteries associated with band-pass tuning and we'll start by looking at the single tuned circuit. The classic tuned circuit comprises a capacitor in parallel with an inductor, as in **Fig. 1a**. It can be used as shown only where the circuit to which it's connected is high impedance.

In cases where the loading would be a problem, the circuit can be modified in a number of ways. Splitting the capacitor into two in series is one solution; another is adding a tapping point on the coil, or by adding a few turns of link coupling on the coil, as shown in Figs. 1**b**, 1**c**, and 1**d**.

Circuit Losses

Most capacitors have dielectric losses, which are insignificant, so it will be assumed that the dominant losses come from the coil. In many applications the current flowing into and out from the circuit and between the capacitor and inductor is very small. Nevertheless resistance of the wire in the coil can be represented as a low value resistance Rs in series with the coil.

Alternatively, the loss resistance can be shown as a high value resistance Rp in parallel with the coil. (See **Fig. 2**).

The *Q* Factor

The effect of the loss resistance is to set the quality or *Q* factor of the circuit. This is easily determined for the series arrangement as $Q = XL/Rs$, where XL is the inductive reactance of the coil at its operating frequency. I am sure you remember that $XL = 2*\pi*f*L$, ohms $(\Omega)\pi$.

The series resistance Rs of a coil can be found using an accurate ohmmeter. The alternative parallel resistance Rp cannot be measured but can be calculated. For example, a coil with an inductance of 5μH and a measured resistance Rs (of 5Ω) is to be used at 14MHz, so let's now determine the *Q*.

Now $XL = 2*\pi*14*10^6*5*10^{-6}$.

The 10^6 and 10^{-6} cancel to leave $XL = 2*14*5*\pi = 439.8\Omega$.

$Q = 439.8/5 = 87.96$. (Call it 88).

For the parallel arrangement $Q = Rp/XL$. If the *Q* and XL are known then $Rp = Q*XL$.

For this coil, $Rp = 88*439.8 = 38{,}702\Omega$.

Fig. 1a.

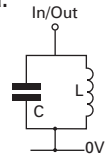


Fig. 1b.

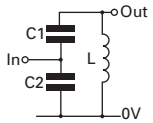


Fig. 1c.

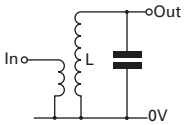


Fig. 1d.

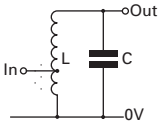


Fig. 2.

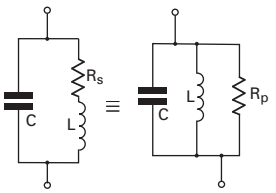
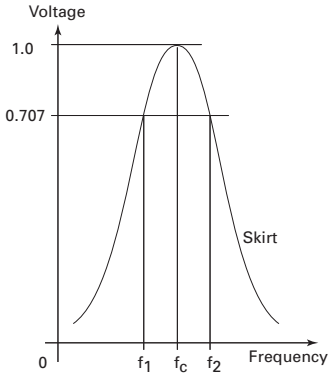


Fig. 3.



Circuit Bandwidth & *Q*

What does all this mean? Well, in answering I must point out that the *Q* also coincides with the ratio of the centre frequency and the bandwidth of the circuit $Q = Fc/Bw$. (See **Fig. 3**). The bandwidth is defined as the frequency difference between points each side of the curve, where the voltage has dropped to 0.707 of its peak value. In the figure, $Bw = f2 - f1$.

If you know the *Q*, the bandwidth can be found by changing the formula to $Bw = Fc/Q$.

In this case $Bw = 14*10^6/88$,

For simplicity $Bw = 14{,}000{,}000/88 = 159090$Hz, (call it 160kHz).

If the series loss resistance is lower, then the bandwidth would be narrower. Conversely, if the resistance is higher the bandwidth would be wider. Unfortunately, if the circuit is damped to achieve a wider bandwidth then the skirt of the characteristic widens also and this means that selectivity is lost.

Measuring Bandwidth

The bandwidth of a coil can be found with the aid of a simple test jig, a signal generator and an oscilloscope (see **Fig. 4**). If the tuned circuit has a low impedance capacitive or inductive tap, or a link winding the test jig can be dispensed with and the signal generator applied to it. **Note:** It's important that the 'scope probe is of the high impedance type and very low capacitance, so its damping effect is small.

Apply a signal to the circuit and tune around for the maximum envelope display on the 'scope. Next, adjust the timebase of the 'scope to enable the sinewave to be observed. **Note:** This is important to ensure the generator is tuned to the fundamental resonance of the circuit.

Set the Y sensitivity of the scope to 0.5V per division. Adjust the signal generator so the scope exhibits a good quality sinewave of three graticule divisions exactly. Record the frequency corresponding to this peak envelope.

Next, you should adjust the signal generator down until the envelope is 2.1 divisions exactly while noting the frequency. Then tune the signal generator to the high side of resonance until the envelope is again 2.1 divisions and note the frequency.

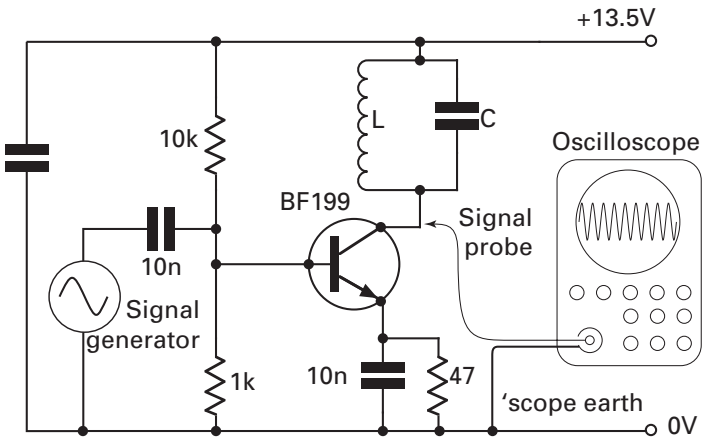
Knowing the centre frequency and bandwidth, the *Q,* series resistance, and parallel resistance can be measured.

Band-pass Coupled Circuits

One solution to the basic selectivity problem is to employ two tuned circuits coupled together. There are a number of ways of doing this but the most common is using top coupling and I have shown this with coils using link windings for In and Out connections, see **Fig. 5**.

The resulting characteristic is determined by the amount of coupling between the two circuits. Providing both

Fig. 4.



Tony Nailer G4CFY
To subscribe to my readers' list, send a blank e-mail to: **pw-g4cfy-on @pwpublishing.ltd.uk** with the word subscribe in the subject box. When you receive confirmation from the server you can then send e-mails to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by myself or the *PW* team.

Fig. 7.

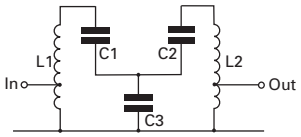
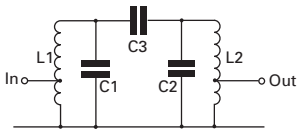


Fig. 5.



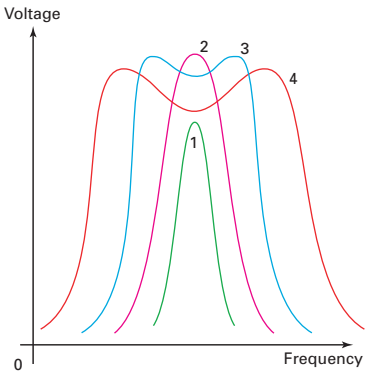
are tuned to exactly the same frequency, typical curves are shown in **Fig. 6**.

If the coupling is too light, then the bandwidth will stay narrow and there's some loss between input and output. If the coupling is 'just right' (this is called 'critical coupling'), very little is lost and the bandwidth is increased. However, if there's too much coupling (called 'over coupling') there's a significant dip at the centre frequency.

The calculation of the value of coupling capacitor is beyond this series (but it is within the remit of Doing it By Design!). A good rule of thumb is to use 1/15th the value of the tuning capacitor as a coupling capacitor.

At v.h.f. the coupling capacitor can be a problem as the smallest capacitance value now available is 1pF (if you can get it!). Indeed, in some of my circuits where only 0.5pF or 0.6pF is required I actually use two 1pF values in series, or a 1pf in series with a 1.5pF.

Fig. 6.



Although I have not widely used it, an alternative arrangement called 'common impedance coupling' overcomes the problem of tiny values (see **Fig. 7**).

Practical Application

When I was first licensed and active using 144MHz amplitude modulation (a.m.) I had the usual problems with TVI, particularly on Band III around 200MHz. My transmitter used a 48MHz oscillator tripled to 144MHz, but of course it also produced the quadruple on 192MHz!

The Post Office Radio Investigation Service (RIS) man came down and did some tests. He put me off the air for a month and instructed me to build a band pass filter to put in the feeder from transmitter to my antenna.

There were a number of circuits available in the **Radio Society of Great Britain** (RSGB) *VHF Manual*, which consisted of two or more lines or coils parallel tuned to earth and coupled inductively. I built one of these and he took it away for evaluation. Fortunately he approved it, but I was still not allowed back on the air until the month was up! (It cured the problem though).

Clearly, some kind Radio Amateur had done lots of experimentation to find the optimum spacing for the two open wound coils to achieve critical coupling. Incidentally, the other popular method is to put the coils closer than they should be and fit a screen between them with a cut-out 'iris' to allow the required coupling.

That's for this time and if you wish to correspond regarding this article or previous ones subscribe to the list **pw-g4cfy-on@pwpublishing.ltd.uk** by sending a blank E-mail with the word subscribe in the subject box. When you receive confirmation from the server you can send an email to **pw-g4cfy@pwpublishing.ltd.uk** and your comments will be answered by myself or the *PW* team. Cheerio for now! ●

Dayton Hamvention - THE radio show for enthusiasts!

The World's Biggest Radio Show

Roger Hall G4TNT joined the almost 20,000 people who came from all over the world to visit the 56th Dayton Hamvention.

New Radios

Three new radios caught my eye at the show. The first was the **Yaesu** FTM-10R. This novel mobile dual-band (2m/70cm) transceiver, which was designed by **Mr S Fujiki**, who is better known for his work on v.h.f./u.h.f. hand-helds, has a unique detachable, water resistant, dustproof front panel.

At the show, this panel was shown attached to the handlebars of a motorcycle where it can be used in conjunction with the supplied Bluetooth headset that can be recharged simply by plugging it into the front of the radio. It will also work with other standard Bluetooth headsets. It also features an independent broadcast band a.m./f.m. receiver so you can listen to your favourite station when you're not on the air.

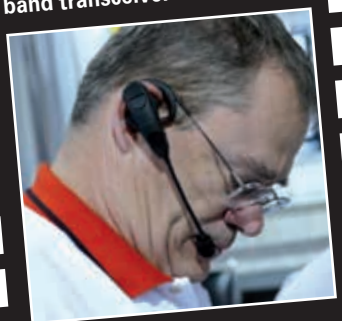
The big new radio at the show came from **Icom**. They showed their new IC-7700 but it was securely encased in a plastic box and no-one was allowed to twiddle. Icom describe this as the contester's rig but those who have had a chance to play with it are calling it the IC-7800's smaller brother. It's a self-contained, top-performance h.f./6m transceiver that shares many features with the IC-7800. For example, its two independent DSP units are the same type as used in the IC-7800 – one DSP is dedicated to the transmitter and receiver, the other to the spectrum scope. It has built-in switch-mode mains power supply and a m.o.s.f.e.t. equipped p.a. that can deliver 200W at full duty cycle.

The IC-7700 isn't expected to be on sale until the end of the year and the price has yet to be finalised but it will probably be under £5,000.

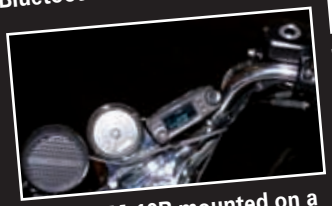
Elecraft already has a big following for their K2 radio and now they've introduced the K3, an h.f./6m, 10 or 100W all-mode transceiver that's available either factory assembled or as a modular, no-soldering kit, they're bound to gain some new fans. Prices start at under $2,000 for the 100W assembled model (K3/100) and the rig is comparable in both features and performance to transceivers costing a lot more.

Yaesu

Yaesu FTM-10R Novel Dual-band transceiver.



Bluetooth headset



Yaesu FTM-10R mounted on a motorcycle.

Mr S Fujiki (left).

Visitor numbers might have been down a bit this year, probably because petrol now costs an unheard of $3 a gallon, but this is still the biggest and best Amateur Radio show in the world. There were 451 stands inside the Hara Arena and another 1,930 vendors outside in the flea market!

The Flea Market

The flea market fills almost the entire massive Hara Arena car park and for some, me included, it's the most interesting part of the show. Here you can buy an amazing assortment of goods, everything from microscopes to guitars, lock picks to flashing blue lights for your police cruiser.

Luckily, this year the weather was fine and I was able to look around for all three days but I know I still missed a lot. Towards the end of the show, it's not unusual for vendors to give away the stuff they don't want to take home. I was tempted by the pile of computer cables that were free to anyone who could be bothered to untangle them.

Phil Godbold of Adur Communications admiring his latest purchase – a stapler!

It's been a long day!

Not a present for the XYL, they mean braces.

Famous Visitor

NASA astronaut **Bill McArthur KC5ACR** (UA1SS) (left) conducted a forum on the Friday morning and spent the rest of the day chatting to visitors on the **American Radio Relay League** (ARRL) stand. He has made many contacts with schoolchildren and Radio Amateurs around the world from aboard the *International Space Station* and from the Space Shuttle so some of you might heard or worked him. He was very popular with visitors and he was constantly surrounded but he still found time to wish *Practical Wireless* a happy 75th birthday and the issue he signed for me is now safely tucked away in our archives.

If you're thinking about visiting the Dayton Hamvention next year, the dates are May 16th, 17th & 18th, 2008. Return flights to Cincinnati should be between £300 to £400, car hire for a week will be about £120 and a hotel room (for up to four people) will be between £50 and £150 per room.

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N-Type plug (Large entry) £3.00
PL259 Chassis socket (Round) £1.00
PL259 Chassis socket (Square) £1.00
N-Type Chassis scoket (Round) £3.00
N-Type Chassis scoket (Square) £3.00
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PL259 Double male adapter £1.00
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Please add just £2.00 P&P for connector only orders

PLEASE PHONE FOR LARGE CONNECTOR ORDER DISCOUNTS

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CS401N Same spec as CS401 but with N-type fittings £49.95

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Telescopic Masts (aluminium/fibreglass opt)

TMA-1 Aluminium mast ★ 4 sections 170cm each ★ 45mm to 30mm ★ Approx 20ft erect 6ft collapsed £99.95
TMA-2 Aluminium mast ★ 8 sections 170cm each ★ 65mm to 30mm ★ Approx 40ft erect 6ft collapsed £189.95
TMF-1 Fibreglass mast ★ 4 sections 160cm each ★ 50mm to 30mm ★ Approx 20ft erect 6ft collapsed £99.95
TMF-1.5 Fibreglass mast ★ 5 sections 200cm each ★ 60mm to 30mm ★ Approx 30ft erect 8ft collapsed £179.95
TMF-2 Fibreglass mast ★ 5 sections 240cm each ★ 60mm to 30mm ★ Approx 40ft erect 9ft collapsed £189.95

HF Yagi

HBV-2 2 BAND 2 ELEMENT TRAPPED BEAM FREQ:20-40 Mtrs GAIN:4dBd BOOM:5.00m LONGEST ELEMENT:13.00m POWER:1600 Watts £399.95

ADEX-3300 3 BAND 3 ELEMENT TRAPPED BEAM FREQ:10-15-20 Mtrs GAIN:8 dBd BOOM:4.42m LONGEST ELE:8.46m POWER:2000 Watts £329.95

ADEX-6400 6 BAND 4 ELEMENT TRAPPED BEAM FREQ:10-12-15-17-20-30 Mtrs GAIN:7.5 dBd BOOM:4.27m LONGEST ELE:10.00m POWER:2000 Watts £599.95
40 Mtr RADIAL KIT FOR ABOVE £99.00

Mini HF Dipoles (Length 11' approx)

MD020 20mt version approx only 11ft £39.95
MD040 40mt version approx only 11ft £44.95
MDO80 80mt version approx only 11ft £49.95
(slimline lightweight aluminium construction)

HF Verticals

VR3000 3 BAND VERTICAL FREQ: 10-15-20 Mtrs GAIN: 3.5dBi HEIGHT: 3.80m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £99.95
OPTIONAL 10-15-20mtr radial kit £39.95

EVX4000 4 BAND VERTICAL FREQ:10-15-20-40 Mtrs GAIN: 3.5dBi HEIGHT: 6.50m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £119.95
OPTIONAL 10-15-20mtr radial kit £39.95
OPTIONAL 40mtr radial kit £14.95

EVX5000 5 BAND VERTICAL FREQ:10-15-20-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 7.30m POWER: 2000 Watts (without radials) POWER: 500 Watts (with optional radials) £169.95
OPTIONAL 10-15-20mtr radial kit £39.95
OPTIONAL 40mtr radial kit £14.95
OPTIONAL 80mtr radial kit £16.95

EVX6000 6 BAND VERTICAL FREQ: 10-15-20-30-40-80 Mtrs GAIN: 3.5dBi HEIGHT: 5.00m RADIAL LENGTH: 1.70m(included) POWER: 800 Watts £299.95

EVX8000 8 BAND VERTICAL FREQ:10-12-15-17-20-30-40 Mtrs (80m optional) GAIN: 3.5dBi HEIGHT: 4.90m RADIAL LENGTH: 1.80m (included) POWER: 2000 Watts £319.95
80 MTR RADIAL KIT FOR ABOVE £89.00

(All verticals require grounding if optional radials are not purchased to obtain a good VSWR)

Trapped Wire Di-Pole Antennas
(Hi grade heavy duty Commercial Antennas)

MDT-6 FREQ:40 & 160m LENGTH: 28m POWER:1000 Watts £59.95
MTD-1 (3 BAND) FREQ:10-15-20 Mtrs LENGTH:7.40 Mtrs POWER:1000 Watts £49.95
MTD-2 (2 BAND) FREQ:40-80 Mtrs LENGTH: 20Mtrs POWER:1000 Watts £59.95
MTD-3 (3 BAND) FREQ:40-80-160 Mtrs LENGTH: 32.5m POWER: 1000 Watts £99.95
MTD-4 (3 BAND) FREQ: 12-17-30 Mtrs LENGTH: 10.5m POWER: 1000 Watts £49.95
MTD-5 (5 BAND) FREQ: 10-15-20-40-80 Mtrs LENGTH: 20m POWER:1000 Watts £89.95

(MTD-5 is a crossed di-pole with 4 legs)

ALL PICTURES ARE FOR REFERENCE ONLY

The Kenwood TM-V71E Dual-Band Mobile

The Kenwood TM-V71E is a dual-band v.h.f. and u.h.f. rig covering the 144 and 430MHz Amateur bands. The rig offers extended receive capabilities and includes the amplitude modulation (a.m.) air band and the v.h.f. marine band frequencies.

Once I had collected it from the *PW* office I soon found that the Kenwood TM-V71E is a solidly built rig and is finished in black and charcoal metal and plastic and weighing in at 1.5kg made it feel to me that it's a rig that 'means business'!

The rig offers 50W (**High Power**) on both bands. This can be reduced to 10W (**Medium Power**) and 5W (**Low Power**).

The Kenwood TM-V71E has a detachable front control panel 'head'. However, it's necessary to buy a separation kit to be able to use the detachable front panel but (as I discovered!) this feature is really useful when trying to get a rig in a modern car.

Another rather wonderful little touch regarding the front panel is that it can be turned upside down, but why I hear you ask would that be needed? Well again it comes down to flexibility; the modular style microphone socket is on the side of the rig, when temporarily putting the rig in the car I found that the microphone – in effect – was coming out of the wrong side of the rig.
No problem! I just inverted the rig and inverted the front panel; effectively placing the microphone socket on the side I needed for my installation requirements.
Perfect! (Obviously you wouldn't actually operate it with the head upside-down, it's the body that's inverted!
So the internal loudspeaker can be facing up or downwards, depending on installations needs).

The rig is supplied with a mobile mounting bracket and a Kenwood MC-59 dual-tone multi-frequency (DTMF) equipped microphone. This can be configured via the rig's menu to allow you to use the DTMF key pad to input a direct entry frequency – this is a very useful feature.

I think it's important to mention that the Kenwood TM-V71E has an elegant simplicity about its design, which to be honest understates the actual reality of what the rig can achieve. The build quality and finish is excellent.

The TM-V71E has really been designed with the mobile operator in mind. All the controls are well labelled and although it's menu driven the main functions that a mobile operator may want at their fingertips are, in fact, at their fingertips. The reverse function for checking a repeater input frequency is there; the output power adjustment is there, memory channel and v.f.o. selection are there.

The transceiver is indeed a well thought out rig. It's uncluttered, having essential controls available and well labelled and less used functions selectable from the easy to access menu system. It is largely controlled by a multi functional and ergonomically superior

Richard Newton G0RSN discovered that the Kenwood TM-V71E dual-band transceiver is much more than a mobile rig!

Richard Newton G0RSN has been trying out a new dual-band mobile from Kenwood, thoroughly enjoyed using the rig and the rather special extras that come with it!

rotary control, which has reassuring clicks when operated and can be pushed in to access tuning in 1MHz steps. When used in conjunction with the F button this also gives access to the set up menu.

Each Band Independent

Each band can be independently controlled and the operator can have both bands set to v.h.f. or both to u.h.f. if so wished. Each band enjoys the services of separate rotary volume and squelch controls.

On the rear of the TM-V71E there's an N-type 50Ω antenna connection. There's also a data connector; a 6-pin mini DIN connector. This is for use with a TNC for packet operation or used when operating the Voice over the Internet Protocol (VoIP) software.

There is also an 8-pin mini DIN socket for connecting the rig to a personal computer. I also used this in conjunction with the optional PG-5H PC interface kit when trialling the rigs built in VoIP capabilities, more on this later.

There are two 3.5mm jack sockets for mono speaker use on the rear of the rig. These are set to output each band separately but their function can be easily configured via the rig's menu.

Easy Use & Flexibility

Ease of operation and flexibility are a must as far as I am concerned and the TM-V71E scores highly on these points as well. An example of how easy it is to operate must be the input of memory channels and this is worth a few words of explanation.

While I was making provisional notes for the review, I wanted to listen to the marine band. Entering a memory involves pressing two buttons – the rig will give a clear indication if the memory you have selected already has data in it by displaying a black arrow head – useful for a scatter brain like yours truly! Within 30 seconds I had programmed my six favourite marine band frequencies and was scanning away.

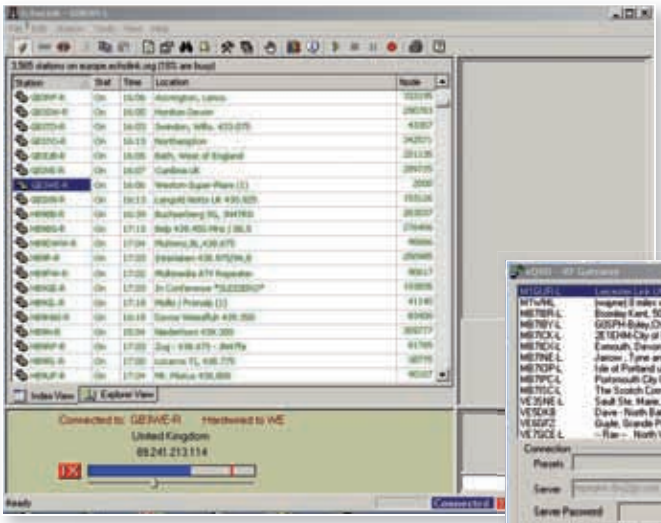

Fig. 1: Using Echolink software with the TM-V71E.

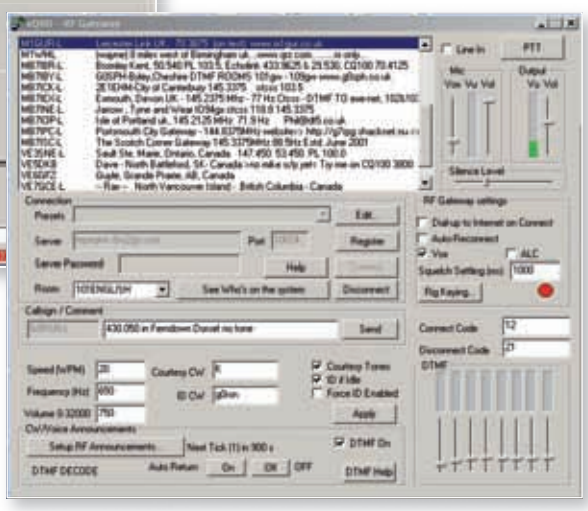

Fig. 2: Using eQSO software with the TM-V71E.

The transceiver offers the user 1000 memory channels. These 1000 memories are sub divided into ten banks of 100 memories for ease of scanning. This means that the user has the flexibility to have all simplex frequencies in one bank, all air band frequencies in another and perhaps repeaters in another. Finally, by using the various scan configurations all memories can be scanned, or just one bank can be scanned.

Another way in which this rig offers flexibility are the two **Programmable Function** (PF) keys on the rig and the four PF keys on the microphone. As the name suggests these are keys that can be configured to do a huge list of functions, depending on what's required.

Operating mobile

I decided to see if the TMV71E would perform as well as I expected when operating mobile. Installing it in the car was a 'breeze' and the rig was mounted under the driver's seat. Using the optional PG-5F separation kit I then mounted the front panel on the centre of the dashboard console, just under the vehicle's ashtray.

The transceiver proved sensitive enough to enjoy several simplex contacts with local stations from my home in Ferndown, Dorset. It coped well with local well-known areas of r.f noise near local industrial estates where electrical noise and r.f. problems abound.

Using the ability to run a decent output power I was able to work the **GB3DR** South Dorset repeater on 145.7375MHz with ease. This repeater is situated on The Ridgeway, on high ground between Weymouth and Dorchester on the west side of Dorset. I was working this repeater from my home area on the north side of Poole on the east side of the county.

I then set the TM-V71E up at home on the main station antenna. On 145MHz I had a very enjoyable simplex chat with **Andy G0JZW** who was mobile in the New Forest, about 16km (10 miles) or so away. Andy said, "the quality of the audio seems OK Richard, you are 5 & 9 with me."

Looking to test the rig a little more I listened round and spoke to **Carl G0TQM** who was operating portable on Brighstone Down on the Isle of Wight, about 48km (30 miles) away from me on the English Channel side of the Island, south of Newport the Island's administrative centre. Carl gave me a 5 and 2 report, "you are fully readable Richard," said Carl, he went on," a bit of smooth noise but nice clear audio, perfectly good." Carl was using a Yaesu FT-817 running 5W into a home-brew G2BCX 'Slim Jim' antenna made from ribbon feeder.

My final contact that day with **Klaus G7AUF**, just down the road in Corfe Mullen, only about 8km away from me and close to the *PW* office. Klaus said, "Brilliant audio Richard, no problem at all."

I was delighted to get one more contact on 145MHz while I was actually writing the last bits of the review. I was monitoring 145.500MHz and heard a station calling "CQ", no one else replied so I took time out and replied to his call.

It was **David G0LCN** from Bitterne in Southampton, about 55km (34 miles) away from me. He gave this report on the TM-V71E audio as, "deviation is good and narrow Richard, audio itself is nicely cropped, not too excessively so a very natural audio, very nice to listen to."

I'd quickly discovered that the TM71E is a very smart and capable dual-band mobile rig with extended receive and good ancillary functions, such as memories, scan features, full continuous tone squelch control system (CTCSS) and a flexible user menu, etc. But what sets it apart from some of the other

Fig. 3: The head may be operated with the main body either way up. It may also be operated remotely with the cable kit.

radios? To start answering the question, apart from the distinctive Kenwood audio and build quality there's the built-in Voice over Internet Protocol (VoIP) operation, so let's now see what that's all about!

What's VoIP?

What's VoIP? (You may ask!). "Well what a huge subject to answer simply", must be my reply! I can only scratch the surface here and it's also subject that is the basis of much debate. I know there are some who see it as Amateur Radio's salvation in the modern world and some see it as an insult to the hobby.

I have to say I take a more middle of the road approach in that I see VoIP as yet another way I can use radio to meet new friends who have a like interest the world over. It's just another a tool in the toolbox and just another way in which to enjoy our wonderful hobby.

The VoIP mode is a method where audio is passed over the Internet and I'm sure many of you will be familiar with skype and msn and other software packages that allow you to talk to other people using your PC. There are also software packages available for Radio Amateurs, such as *EchoLink* and *eQSO*, which enable you to interface a radio to a PC and therefore give you a voice portal to the Internet.

Here's a quick run down on how it works: Firstly, a link station radio receives your audio and using a simple connection between speaker output and the PC sound card, the audio gets passed over the Internet and received by a remote station's PC. Via a simple interface, the audio is then transferred from the remote stations PC to the transceiver connected to it before being transmitted over the air. Stations offering this facility are called 'gateways', 'links' or 'nodes'.

If someone has set up such a gateway in my area, all I need to know is the frequency and any CTCSS tone it may require. This then makes it possible for me to be on a v.h.f. or u.h.f. hand-held rig walking down my road, or in my car driving around and chatting to another Amateur doing the same thing in Coventry, Birmingham, New York or anywhere else in the world that has an Internet gateway attached to a radio.

The Kenwood TM-V71E is advertised as having *EchoLink* memories included and being able to work an *EchoLink* node or link. The memories and the ability to be a link or node are two completely different functions. Additionally, by using the proprietary name *EchoLink,* Kenwood may have caused a little confusion. I will now try and explain!

EchoLink, is in fact, a software programme available from **http://www.echolink.org** using Voice over Internet Protocol and is just one of several Amateur Radio software packages available. Perhaps the most well known alternative is *eQSO* and this is available from **http://www.eqso.net**

The difference between the two software programs is that *EchoLink* is a series of point-to-point nodes using unique number identifiers (seen in the screen shot down the right hand column in **Fig. 1**). Normally, one station connects to another and it would be unusual for more than two or three to be connected together.

In practice the *eQSO* system is more like a 'chat room' where many stations connect to one central point and everyone hears what's going on and everyone hears everyone else! I actually prefer *eQSO* as I find it easier to use as you do not need to link nodes and the software seems to cope with computer firewalls (computer security protection systems) a lot easier than *EchoLink*.

However, I do like *EchoLink* when I need to make a connection with a specific station. In fact, I use this to connect my station to the GB3WE repeater in Somerset; this enables me to contact my brother, **William G7GMZ** who monitors this, as it's his local repeater.

If your local VoIP node on 430.050MHz and is running *EchoLink*, you would call up on that frequency and take pot luck that it was connected to another node across the Internet. If, however, you knew the unique number given to the node you wanted you could send a connect request over the air using DTMF tones and the EchoLink software will them connect to that remote gateway station and you'll be able to communicate with anyone who can hear that gateway, disconnecting when you've finished.

Echolink Memories

Using this term, Kenwood mean that by *EchoLink* memories, the user can store up to 10 dedicated memories representing the code numbers of favourite remote nodes. The operator would use this when they're TM-V71E is accessing someone else's node, which is an *EchoLink* node.

If, however, the local node, link or gateway is running *eQSO* the operator will call up in the same way as though they were listening through a repeater. This is because the repeater has worldwide coverage depending on the gateways that are connected at the time of the call (as can be seen from the screen shot in **Fig. 2**). Gateways from all over the country and all over the world are linked in and some of these are actual voice repeaters in their respective areas as well.

Ready To Go!

The interesting point for me was that the TM-V71E had a VoIP interface built-in and ready to go. But please bear in mind that this is not referring to the TM-V71E accessing a node, but instead actually acting a node itself. Where Kenwood has described it as *EchoLink* they could have caused confusion because it's equally useful as an *eQSO* gateway. The protocol is the same; it's just the software and what's actually on offer that's different.

To set up a gateway in the UK you have to have a Notice of Variation (NOV) from Ofcom. Fortunately, I have one and already run a modest local link on 430.050MHz.

I'd actually been using a simple interface I had built from bits, which cost me less than £10. To achieve this I had used an old crystal controlled PMR rig re-tuned to 430.050MHz and had quite good results but it took me a long while to get it all set up!

With the Kenwood TM-V71E all that's required is a PC (I used my laptop) the software (either *eQSO* or *EchoLink*) and I used both for this review and the PG-5H PC interface cable. All I needed to do was to just tune to the correct frequency, set up the rig menu to EchoLink sysop and adjust the software settings on the PC. I was actually up and running in less than 30 minutes having configured both software packages. For the review contacts I used *eQSO*, but remember the rig is in the same setting and mode as it would be if you ran *EchoLink*.

Product Kenwood TM-V71E Dual-Band VHF/UHF Mobile Transceiver

Company Kenwood Electronics UK Ltd.

Contact (01923) 655284

Pros & Cons

Pros Extremely versatile transceiver, a very easy-to-use mobile that's 'operator friendly'.

Cons Computer required for VoIP/eQSO use. If you don't have a computer you're missing a great deal with this rig's extra facilities!

Price £250 approximately

Supplier My thanks for the loan of the review unit go to Kenwood Electronics UK, (Communications Division), Kenwood House, Dwight Road, Watford, Hertfordshire WD18 9EB.
Tel: (01923) 816444,
FAX: (01923) 212477,
E-mail: **comms@kenwood-electronics.co.uk**

Fig. 4: The remote operational kit allows the unit to be placed in a more convenient place.

Fig. 5: The simplier remote head mounting kit.

To ensure the best quality, audio settings between the rig and the computer must be optimised; adjusting sound card settings can do this. However, as the system depends on the rig to do 'it's bit' as well, judging by the reports I received TM-V71E was a well adjusted radio, more than I can say for the user!

Having configured the TM-V71E and connected it to my laptop, the **G0RSN-L** link was on air. I used my Kenwood TH-G71 hand-held transceiver and put it on 500mW, tuned it to 430.050MHz and worked into the TM-V71E's VoIP link in my shack.

My first contact was with **Grant VA7GO** in the Pacific North West, near Victoria in Canada, we were also in QSO with **Marco N2YN** in the Bronx area of New York City. They both gave me favourable reports and we all enjoyed a good old 'chin wag'. Note: We were all using hand-held transceivers to talk into local gateways.

Next, was **Rob 2E0CRW** in Portsmouth and another enjoyable chat with great report on the audio, remembering that is an amalgam of the hand-held, computer and the TM-V71E.

Perhaps the most exciting contact I made was with **Chan DS1OHQ** from near Seoul in South Korea. Chan was very complimentary about the audio quality from the station.

So there it is, the Kenwood TM-V71E is a very enjoyable to use and extremely capable rig. It will give you hours of enjoyment over a good cross-section of the v.h.f./u.h.f. bands chatting on the local repeater, a bit of hill-top f.m. DXing, listening to the air band or the marine band. You can also connect it to a computer and speaking to friends in far away areas of the world, or linking to a local repeater on the other side of the UK. The Kenwood TM-V71E will do it all, as it's an extremely versatile transceiver. Have fun!

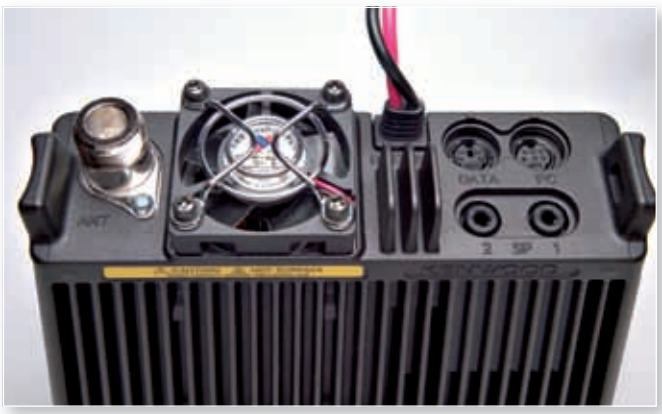

Fig. 6: The rear panel, with its N-type dual-band antenna socket, two audio jack sockets and two DIN sockets for use with computers.

accessories at ml&s

MP-1 10 Band Dipole

From Super Antennas USA

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Chris Taylor says:

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Chapstick MP-1 40-10M 100W Portable Antenna **£74.95**
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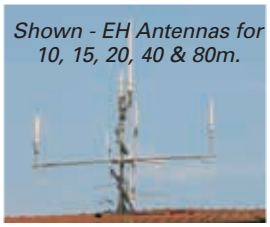
The complete range of Super Antenna products and accessories can be found on our web site



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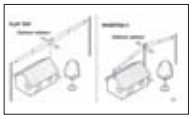
CN-801S11 0.9-2.5Ghz 200mW/2W /20W **£169.95**

New! Yaesu YA-30 Broadband Antenna



The Yaesu YA-30 pre-assembled multi-band, commercial-grade folded dipole is designed to get HF operators owners on the air fast. 80.3 feet (24m) long, 150W. The YA-30 can be installed as a Flat Top or an Inverted-V. This antenna is identical to the Icom IC-AH710.
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A power supply for Life? Probably. 25-30 Amp.

Twin Meter, fixed 13.8V Crowbar protected with low current terminals & Cigar socket.

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The SOTA-1

7/14MHz binaural c.w. transceiver

The finished project.

This project is a binaural (two sound channels) Morse (c.w.) transceiver covering the 7 and 14MHz Amateur bands. In South Africa (ZS), for country-wide contacts, 7MHz is ideal, while 14MHz offers the opportunity for DX contacts. Power levels of up to 10W on 7MHz and up to 5W on 14MHz ensure reliable contacts with reasonable power drain when battery operation is required.

The design has been optimised for reproducibility by relatively inexperienced builders having access to only the minimum amount of test instrumentation. It's ideally suited as a club project, or for Amateurs wishing to construct their own gear for Summits-on-the-Air (SOTA) [‡1] activities. This transceiver was the winning entry for the 2005 **Amateur Radio Development Trust** of the **South African Radio League's** design competition. It was named SOTA-1 due to its suitability for portable operation.

The Performance

When the achievable performance of the various receiver architectures is compared to the complexity, cost and availability of components as well as reproducibility, few can beat the direct convertion (DC) receiver configuration. But, unfortunately, the basic DC receiver is not without its limitations and shortcomings.

The major drawback of a DC receiver is the lack of image suppression. It's very apparent in a busy band with closely spaced c.w. signals. Despite this failing, they're very popular for home-brewing and low power, portable equipment. The method's popularity may be an indication that the image problem may not be as serious as I (Hannes) first thought. And that, despite the DC receiver's inherent drawback it's possible to enjoy using such a rig.

We decided to make use of a Binaural DC [‡2] receiver design to help overcome some of the drawbacks. The design can also form the basis for a full featured, phasing method single side band (s.s.b.) transceiver.

Basic Receiver

Let's take a look at a basic DC receiver **Fig. 1**. The local oscillator (l.o.) signal, operating very close to the frequency of interest, is mixed directly with the received signal (with or without r.f. pre-amplification). The results of this mixing process are two frequencies: the sum component, at almost double the operating frequency, and the difference component at audio or base-band frequencies are both produced.

I'll ignore the sum component from the mixer. But the wanted difference (audio) component is filtered out or selected and amplified to a suitable level.

Binaural I-Q Receiver

In the Binaural I-Q DC receiver, **Fig. 2**, the mixing process is taken one step further, in that the incoming signal is first divided into two paths, each feeding a separate mixer. The local oscillator signal, again operating very close to the received frequency, is also divided into two paths, but with a 90° phase difference imposed between the two samples of the l.o. signal.

The I-Q refers to the 'In-phase' and the 'Quadrature' (90°) components of the l.o. Each of the two l.o. signals is mixed with one of the two incoming r.f. signals. Once again the difference (audio) component from each mixer is separately filtered and amplified to suitable levels. These two outputs are fed to a stereo headphone or two loudspeakers.

The 90° phase difference between the two signals allows the human mind to create a virtual stage of signals. The mind now not only classifies signals in terms of frequency but also in terms of 'position'. This additional 'positional' information makes it now much easier to focus on individual c.w. signals, especially in a crowded band.

The binaural effect helps to overcome the inherent drawback of the basic DC receiver. The basic Binaural DC receiver design is now extended to provide solid performance on the sometimes-challenging 7 and 14MHz Amateur bands.

Band-Pass Filters

A selectable band-pass filter is required at the input of the receiver to ensure that the receiver only responds to the signals in the band of interest. But band-pass filters normally require alignment,

Hannes Coetzee ZS6BZP and Christo Pelster ZS6AHQ brew-up a 7/14MHz binaural c.w. transceiver that can also be used as the basis of a software defined radio. You can use it on a mountain top with earphones or in the shack coupled up to a computer!

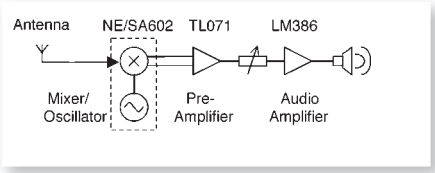


Fig. 1: Basic direct conversion (DC) receiver

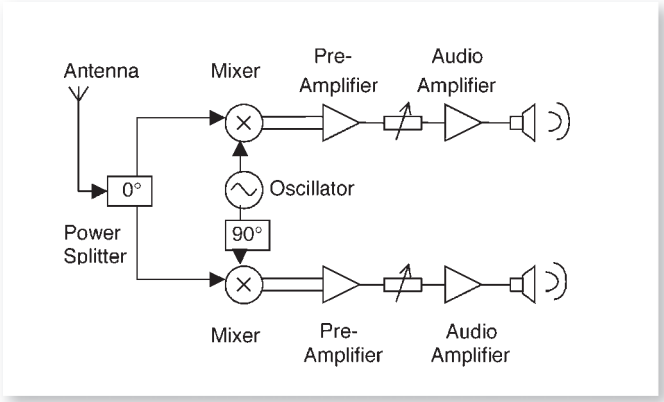


Fig. 2: Basic binaural I-Q DC receiver

implying that some additional test equipment may be required, a requirement that's in contrast to the design goals of simplicity and reproducibility.

The solution to the filter problem is to use separate high and low-pass filters. A 6.8MHz, fifth-order Chebyshev high-pass filter and a 14.5MHz, fifth-order low-pass filter are permanently in the signal path. When operating on 7MHz, an additional 7.5MHz low-pass filter is switched into the signal path. For operation on 14MHz, a 13.6MHz, fifth-order high-pass filter is switched into the signal path.

The wider-than-absolutely required filter bandwidths ensure reproduceability while still protecting the receiver from strong, out-of-band signals. The same filter combinations are used in the transmit path.

Some high voltages exist on a band-pass filter with the planned 10W power level. Once again this will require special (high voltage and high *Q*) components. But the separate high and low-pass filter combinations do ensure a clean output signal.

Use is made of IM-5 commercial moulded inductors within the design. The *Q* values of these inductors are adequate for the power levels and the requirements of the ilter arrangements. Capacitors are low cost ceramic units with a zero temperature coefficient (also referred to as NP0), with 50 or 63V ratings, which are more than adequate for the required power levels.

A 100k□, 1W resistor at the antenna terminal bleeds any static build-up to ground. This helps to protect the transceiver against electrostatic discharge (ESD) damage without influencing the functioning of the set.

Specific Mixer

Deciding on the specific r.f. mixer to implement was also a difficult decision, as so many options are available. Suitable candidates include a selection of passive, double balanced mixers from Mini-Circuits, active mixers from Analog Devices and a balanced mixer using c.m.o.s. i.c.s (developed by Hannes [‡3, ‡4]).

The ease of implementation, low noise figure and medium gain eventually swung the decision in favour of the NE602/612 family. These are old favourites among Radio Amateurs. Balanced input and output conditions are required to get the '602 to perform at its best. On the input side this is easily implemented with a r.f. transformer wound on a balun core.

Impedance matching from the filter's 50Ω to the high impedance of the '602 is also implemented on the same r.f. transformer. Power dividing of the received signal is accomplished by simply paralleling the inputs of the two '602s. So, there's no need for exotic power dividers at the input.

Audio Buffers

The balanced outputs of the '602 are converted to a single ended audio signal with the aid of a low cost, low noise op-amp implemented in a differential amplifier configuration. The 1.5kΩ impedance of each of the '602's outputs defines the gain of the audio stage in conjunction with the 22kΩ feedback resistors.

A simple audio high-pass filter with a corner frequency of 300Hz is implemented with the aid of the 330nF d.c. blocking capacitors. To limit the upper level of the audio bandwidth, 4.7nF capacitors are placed across the feedback resistors.

Using larger value capacitors across the feedback resistors can reduce the bandwidth even more, but the audio quality may suffer when monitoring s.s.b. signals. The 100nF capacitor across the input of each differential amplifier prevents breakthrough of very strong commercial a.m. broadcasts.

Audio Amplifiers

A stereo 10kΩ potentiometer works as a volume control and each audio signal is fed to another old faithful, the LM386 audio power amplifier i.c. There's nothing special about the implementation. The RC combination at the output ensures that the amplifier is properly terminated at high frequencies and prevent r.f. from breaking through on the audio.

An RC feedback network between the output pin (5) and pin 8 reduces the bandwidth of the LM386 and helps to save the ears from the notorious high frequency hiss generated by the chip. The sidetone signals are fed via another 10kΩ potentiometer to the normally grounded input.

The output level of the '386 is adequate to drive a small 8Ω loudspeaker to comfortable levels or earphones to ear-splitting levels. The outputs of the two '386s drive two small loudspeakers mounted on either side of the enclosure to give the binaural advantage even when earphones are not used.

Rock Bound

As the basic design of the SOTA-1, **Fig. 3**, (and the the full circuit of the transceive side of the rig, **Fig. 4**) wasn't to be 'rock-bound' there was the need for a variable frequency l.o. (v.f.o.). Generating a clean, stable, variable local oscillator and displaying the operating frequency can be prove to be more complex than the transmitter and receiver circuitry. Once again many options were investigated, ranging from free-running v.f.o.s with variable capacitors to exotic phase-locked-loop circuits under microprocessor control.

The simplest solution seemed to be a dedicated voltage controlled oscillator i.c., the LTC1799. On paper at least, this seemed to be a viable option but measurements with a sample prototype very clearly highlighted the shortcomings of this device. Its stability, phase noise and 'purity of note' are simply not good enough for communications purposes.

Generating the l.o. signals with the required 90° phase difference at the operating frequencies of both seven and 14MHz is done with the aid of dual 'flip-flop' logic gates (SN74AHC74) clocked at four times the l.o.'s operating frequency. The quadrature outputs of the flip-flops are terminated in two resistor divider networks that ensure a modest load current of 5mA/gate and the correct drive levels for the mixers [‡5].

The l.o. drive frequency required for operation at 14.350MHz has to be 57.4MHz . Free-running oscillators operating at such a high frequency tend to drift a lot. Unfortunately, techniques that limit the drift to acceptable values often require lots of complicated circuitry.

It was decided to use a low frequency oscillator operating at between 6.2 and 6.4MHz followed by two frequency triplers (x9) to generate the required clock signal to feed the quadrature generator (dual flip-flops). Operation on 7MHz requires an additional divider, implemented with a flip-flop, ensuring easy band selection with the aid of a 74AHC251 multiplexer.

The two, frequency tripler stages (low-left in Fig. 4) are implemented with a single c.m.o.s. hex buffer (SN74AHC04). The output of the v.f.o. is 'squared' before driving the first tripler. A

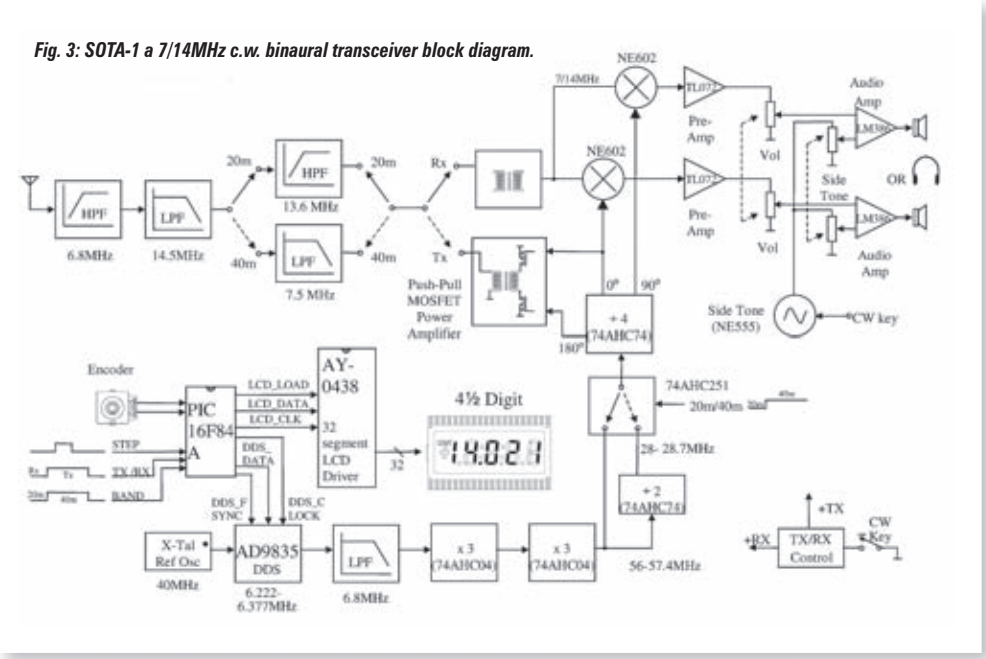


Fig. 3: SOTA-1 a 7/14MHz c.w. binaural transceiver block diagram.

square-wave can be considered as the fundamental (sine-wave) and a large number of odd harmonics added together.

The fundamental is suppressed by a tuned circuit formed by a capacitor and inductor L9/C63). Then the third harmonic is selected by the tuned circuit formed by the same inductor and the other capacitor (L9/C61). The output signal is once again squared by one of the c.m.o.s. inverters and the process repeated for the next tripling action[4-6].

Sidetone Oscillator

For the sidetone generator, another old faithful is called up for duty as the oscillator. The 555 type oscillator chip is probably the world's most versatile i.c. A low power, c.m.o.s. version (the 7555 type) is preferred for this application but any version will function in the circuit. The output is fed via a simple low-pass filter to the audio amplifiers. The levels are adjustable via the pre-set potentiometers.

A sidetone is generated whenever the key is pressed, independent of the radio being in transmit mode or not. The side tone generator thus serves double duty as a test oscillator for debugging the audio stages and as a c.w. practise aid.

Direct Digital Synthesis

A low cost Direct Digital Synthesiser (DDS) controlled by a PIC processor is probably the simplest way to generate a very clean and stable l.o. signal, **Fig. 5**. The PIC can then also display the frequency on a low cost, 4½-digit liquid crystal display. The readability of these displays is better than the 2-rows of 16-character types. A low cost rotary encoder is used for frequency adjustment purposes.

An Analog Devices™ AD9835 complete DDS synthesiser chip is well suited for the requirements. Most modern DDSs generates a clean output if the clock frequency is at least four times higher than the highest output frequency. Direct digital synthesisers with a 40MHz clock input are cheap and easy to procure at relatively low cost.

An Elliptical low-pass filter using standard, off-the-shelf, components follows the output of the DDS. This ensures a spectrally clean signal to drive the frequency tripler chain. The output frequency of the v.f.o. is shifted down by about 800Hz during transmission to ensure that the transmitted signal is on the same frequency as the received signal.

Programming Commands

A PICMicro™ 16F84A manufactured by Microchip™ is used to calculate and send the programming commands to the DDS. This microprocessor is also used to display the frequency and handle other functions such as frequency adjustments from the rotary encoder, band selection, tuning step changes and transmitter-receiver offsets. The internal RC oscillator is used reduce component count. The 32-segment display driver (AY-0438) is also manufactured by Microchip™

The DDS l.o. uses a 40MHz crystal oscillator as a reference source. The calculation of the output frequency of the DDS is based on this reference frequency and the programming word in the following relationship:

$$F_{out} = (F_{clk} \times F_{req})/2^{32} \quad [1]$$

Where F_{out} is the output frequency, F_{clk} is the clock frequency (40MHz) and F_{req} is the required frequency.

The DDS frequency for 14MHz must therefore be 4/9 of the displayed frequency (F_{disp}) and 8/9 of F_{disp} for 7MHz.

To calculate F_{reg} using F_{disp} requires floating point number calculations. While it is possible to perform this using an Assembly Language program, it requires extensive coding and longer execution times. A more elegant solution is to handle the fraction by making it part of the conversion factor called OscCal as follows for 7MHz:

$$F_{reg} = \{(4 \times 2^{32} \times F_{disp})/OscCalc\} \quad [2]$$

Where $OscCalc = 9 \times F_{clk}$ [3]

and for 14MHz:

$$F_{reg} = \{(8 \times 2^{32} \times F_{disp})/OscCalc\} \quad [4]$$

This means that a different OscCal value has to be loaded for either 7 or 14MHz operation. This change of OscCalc value is performed during band switching when the PIC updates the display to the newly selected band.

The PIC has a few other tasks (housekeeping) that it needs to perform, almost at the same time, but independent of each other (so, it's not strictly multi-tasking). These tasks are:

Check Band Selection switch
Check TX/RX mode
Check Step Change input
Check for changes in the shaft encoder (increment or decrement)
Check frequency limits
Calculate the values to be displayed and send them to the display driver
Calculate the DDS word and send it to the DDS chip

The DDS word is only calculated and sent to the DDS chip when the frequency has changed (including band change) and when the TX/RX mode changed. When no user input is received, the DDS retains the previous generated frequency. This avoids the generation of additional output spurious signals.

The frequency limits for the 7 and 14MHz bands are set into the PIC code so, ensuring that out-of-band transmissions are not possible. The display flashes to indicate when the lower or higher band limit was reached.

The Power Amplifier

To feed the r.f. power amplifier on transmit, two square wave signals with an 180° phase difference are available from the flip-flops. The frequency of these signals is either at 7 or 14MHz, depending on the selected band. One inverting gate in two SN74AHC04 (Hex inverters) are used to buffer these out-of-phase signals.

The remaining inverting gates within each '04 i.c. are used in parallel to drive a pair of power f.e.t.s normally used in switched

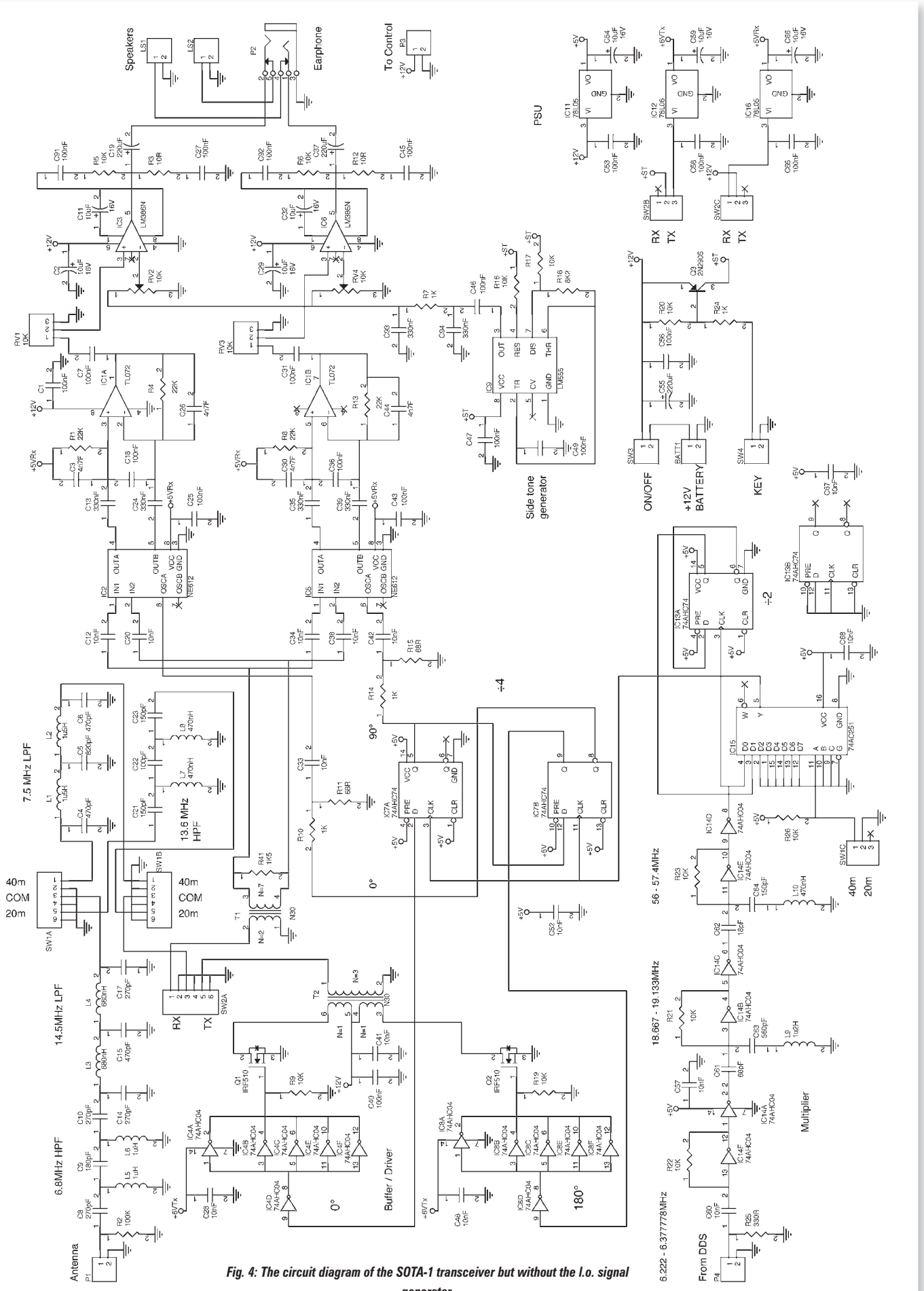


Fig. 4: The circuit diagram of the SOTA-1 transceiver but without the l.o. signal generator.

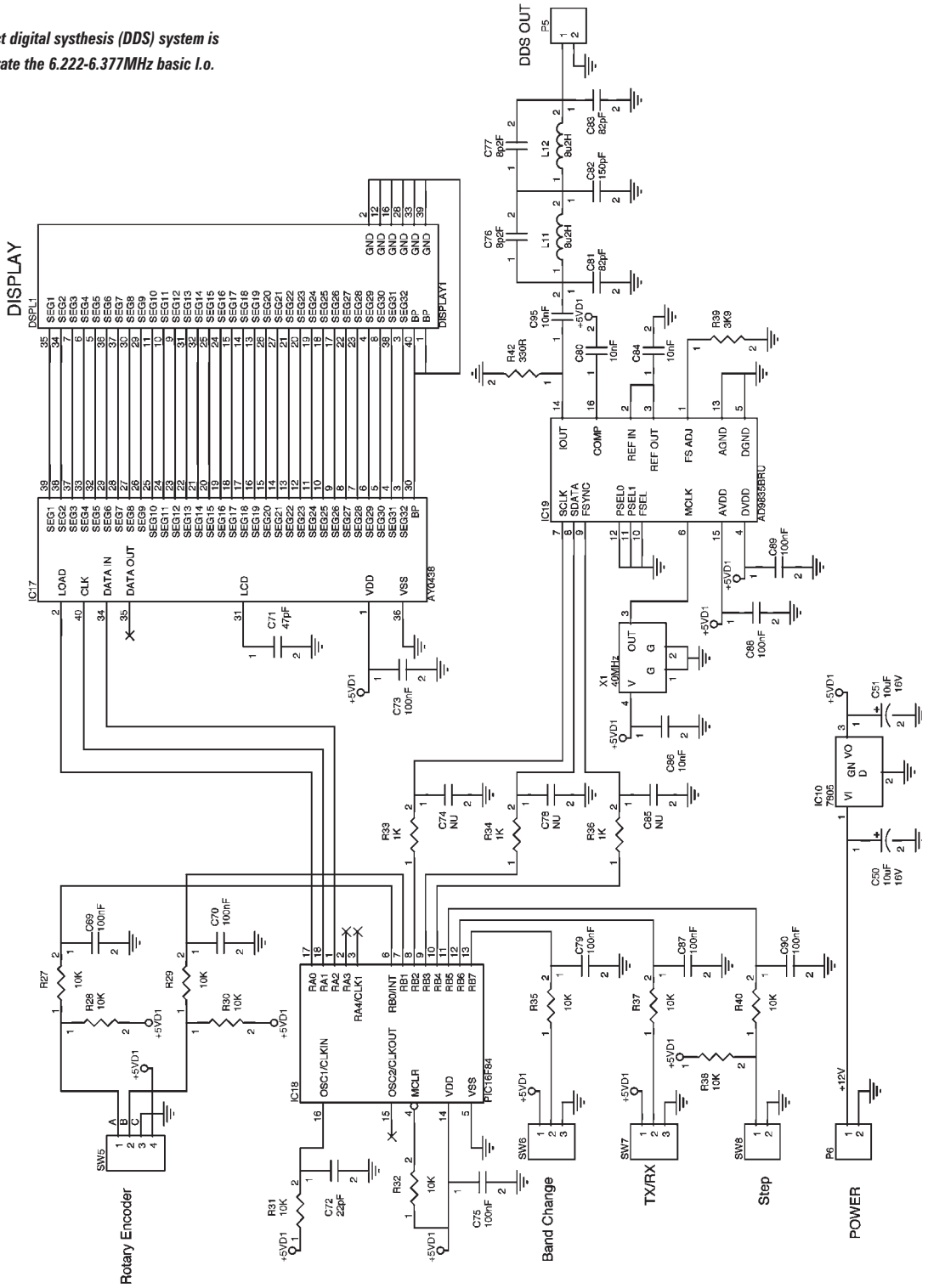


Fig. 5: A direct digital systhesis (DDS) system is used to generate the 6.222-6.377MHz basic l.o. frequency.

mode power supply applications. The push-pull output signals are coupled via a balun cored transformer to the applicable (shared) band-pass filter combination.

Power to the f.e.t.s is supplied via a centre tap on the transformer. The balanced configuration prevents d.c. saturation of the transformer core. The driver inverting gates are only powered during the transmission and are run from a 6V supply to ensure that the power f.e.t.'s are properly switched on. Although this voltage is slightly higher than normal,it's still with-in the manufacturers absolute maximum rating of 7V.

Gate resistors ensure that the power f.e.t.s are properly switched off during reception.The diodes that are built into the f.e.t.s provide reverse polarity protection in case the supply to the transceiver is accidentally connected the wrong way round.

Component Availability

It may be difficult to obtain some of the components in low quantities. Agents for all the components can be found on the Internet and they will be more than willing to supply larger quantities, for example, they're ordered by a club, when it's a club project. An alternative is mail-order suppliers (e.g. RS and Farnell) but the costs may then be slightly higher.

Not For Beginners

Though this transceiver isn't that difficult to build, it's definitely not a beginner's project. This is not due to the complexity but rather because many of the components used are only available as surface mounted devices (SMD). A double sided, through-plated printed circuit board (p.c.b.) considerably eases the construction of the transceiver.

The prototype p.c.b. uses a standard Euro card (100x160mm) size. The microprocessor and DDS portion was separated from the main board to enable it to be mounted on the front panel of a suitable enclosure.

It's recommended that the output audio stages are built and tested first. Then connect loudspeakers and a suitable power supply. Touching the inputs of the amplifiers will result in a loud hum or noise, indicating that there is a good chance that the output stage is functioning correctly.

The next step is the completion of the sidetone oscillator. To test this when it's finished, shorting of the 'key' connections should result in an 800Hz (approximately) tone on the loudspeakers.

Next, we have to be brave and take on the mixed technology (through-hole and SMD components) microprocessor and DDS board. This board can easily be tested on its own once completed. The rest of the transceiver can now be completed with the experience gained working with SMD. (**Note**: *At the time of writing this article Hannes had a few full kits available. For more details see the panel at the top right of this page*. **Editor**)

Operation

Operation of the transceiver is very simple due to the lack of bells-and-whistles. The transmitting frequency is 800Hz lower than the received frequency. It is easiest to start at the low frequency side and tune through a signal until it becomes audible in the operator's left ear. This ensures that the correct side band is selected and that the transmitted frequency is nearly zero-beat with the station you wish to contact.

The binaural effect is also very apparent as the c.w. signal 'moves' from in-front of you, in an elliptical fashion, to the right, comes back in-front of you and then moves slightly to the left again as the received frequency is increased. It's a unique and enlightening experience on a crowded c.w. band.

The frequency tuning increment is changed by pressing the STEP button. The default step size is 10Hz, which is useful for c.w. tuning, while the coarsest step size is 1kHz. The step size cycles through 10-100-1000-1Hz. It is easiest to search for activity with the bigger tuning increments and then use the small increments for fine-tuning.

The receiver unfortunately suffers from a few spurious responses. These are probably caused by the clock signals of the DDS and the PIC as well as the multiplication and divider circuits. Very strong a.m. broadcasts signals may also cross modulate the '602 mixers.

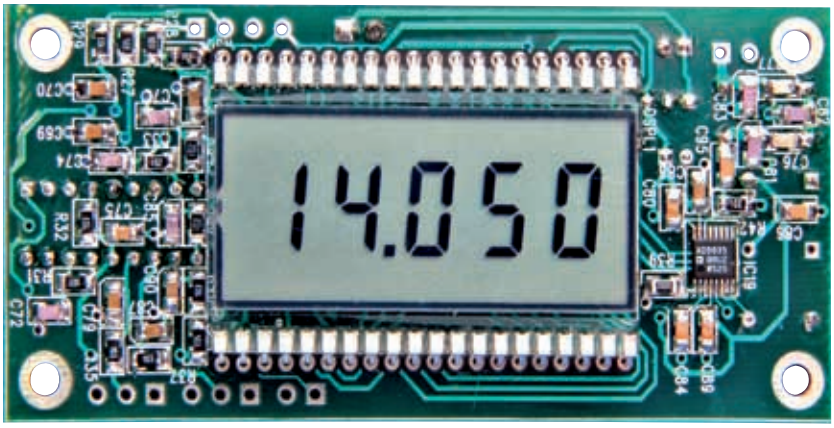


Fig. 6: The DDS and controller p.c.b. produced at full size. With time and care this board can be made up, but a good magnifier and strong lighting are a must.

Note: at the time of going to press, Hannes had a few complete kits available, Please contact him via E-mail for price and availability **hcoetzee@ewation.co.za**

For those with access to commercial p.c.b. manufacturing capabilities, the 'Gerber plots' of the various layers are available via E-mail from ourselves. Send the request to **tech@pwpublishing.ltd.uk** with the words 'SOTA Plots' as the subject text.

However, despite these problems the receiver was found to be more than useful.

Interfacing With A PC

When it comes to interfacing the signals to a PC's soundcard, the I-Q outputs of the receiver can be fed to the stereo line inputs (line-In) of a sound card. With suitable software, that's freely available on the Internet, a simple software defined receiver (s.d.r.) can be implemented. Suitable software is available from I2PHD (Winrad [‡7]) among others.

The cut-off frequency of the audio filters implemented in the receiver will limit the s.d.r. performance. If improved s.d.r. performance is required, the audio bandwidth of the receiver can be increased by changing the various capacitor values. This is at the cost of stand-alone performance (but life itself is a compromise!)

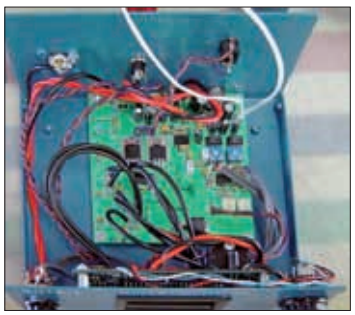
Effective Transceiver

So, there you have it, an effective, dual-band, binaural c.w. transceiver. One of the main drawbacks of a direct conversion receiver (lack of side band suppression) is turned into an operator aid with the implementation of the binaural I-Q principle.

To reduce the component count and enhance repeatability, 'luxuries' such as an a.g.c. system and an S-meter have been omitted. The design focusses on solid r.f. performance with readily available components. It's also a transceiver that's ideally suited as a club project or for personal construction. ●

References

‡1 The SOTA name is used with permission of the SOTA Management Team.
‡2 A Binaural I-Q Receiver. Rick Campbell, KK7B. *The ARRL Handbook for Radio Amateurs 2002*. p17.70 – 17.75.
‡3 A Low-Cost, High Performance Mixer for HF Applications. P J Coetzee, *Engineer's Notebook*, RF-Design, June 1995
‡4 Multi-band, direct conversion receiver. Hannes Coetzee, ZS6BZP. *Electronics World*, February 1998. p138-143.
‡5 Circuits, Systems & Standards. Edited by Ian Hickman. *Electronics World + Wireless World*. November 1991. p 939 – 943.
‡6 CMOS Frequency Multiplier. Gert Baars. *Elektor Electronics*. 7-8/2004. p34 – 35.
‡7 **www.winrad.org**



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In the Shop with Harry Leeming G3LLL

Harry Leeming G3LLL suggests an alternative to the 6JS6C valves for early FT-101s.

The 'mystery' picture shown in this column in the July issue was in relation to **David Kemplen**'s answer to the question: 'What will happen when supplies of suitable 6JS6C valves run out for the early FT-101s?'

After reading articles in the May and September 1999 issues of *QST*, David had successfully converted his early FT-101 to run with 6146B valves in the p.a. stage instead of 6JS6Cs. Along with one or two other helpful souls, David sent me a copy of the original article.

I haven't carried out the modification myself but I've seen a rig after having been converted in a similar way, come in for repair that worked okay. So, throwing in my own pennyworth, I would suggest going about the modification as follows.

First, make sure that the p.a. valves grid coupling capacitor C13 has been replaced with a 100pF capacitor of 3KV or more voltage working. Do not leave the original capacitor in circuit; it will almost certainly go leaky.

Whatever you do, **don't** borrow someone else's p.a. valves to test the rig without ensuring that C13 has been replaced; if it leaks it will blow the borrowed valves, even on receive! Next, establish that the rig is in perfect order and in correct alignment; you will end up in total confusion if you try and modify a faulty rig.

Now, you are ready to start the work. Disconnect the rig from the mains, wait two minutes for the h.t. to discharge and then short circuit the top caps of the p.a. valves to chassis just to be sure. Replace the nine pin valve holders with a couple of international octal bases, (check that the valve holders physically fit the valves, Mazda Octal holders look identical but will not fit 6146 valves!) and then wire the leads to the correct pins, as shown in **Fig. 1**, and in David's photo (**Fig.1a**).

Next, to allow for the reduced inter-electrode capacity of the 6146B's, wire a 25pF variable capacitor between the grid and cathode of one of the p.a. valves and then, to make the neutralising less critical, wire a 2000pF capacitor in parallel with the 200pF bottom capacity neutralising feedback capacitor C11.

Then, you can 'fire up' the rig without any valves fitted, (**with one hand in your pocket, there are some dangerous voltages around**) and check the voltages on the 6146B valve connections. In the receive mode you should have about -70V on the p.a. valves control grids, +180V on the screen grids, and around +750V on the top cap connectors.

If all seems ok, pull the mains plug out, wait two minutes, short the top cap connectors to chassis again and then fit the 6146 valves. At this point, set the neutralising capacitor at half capacity, the new 25pF trimmer capacitor at almost maximum and refit any screening covers you have removed.

Next, you should run the rig into a dummy load on 3.5MHz, it should tune up and provide some output. With the pre-selector set at the point where maximum receive signal strength is obtained, peak the new 25pF trimmer for maximum drive.

Set the neutralising capacitor so that peak r.f. output into the dummy load coincides with minimum p.a. current and then work gradually higher in frequency, resetting it as you go, as described in this column in the July Issue.

Once the rig is working you should get about 50-60W r.f. out into the dummy load. If the rig was in correct alignment before you started the modification, the alignment should now be more or less correct but final adjustments will be needed on 28MHz.

Tune to the crystal calibrator in the centre of the band and peak the pre-selector for maximum. In the transmit mode peak the new 25pF trimmer for maximum drive as its setting will be more critical on this band. If you are short of drive re-peak this trimmer whilst trying the pre-selector first slightly to the left and a little to right of peak, for the best results.

Next, try the rig on all bands and see that you get good a.l.c. action. If you are short of drive on any band, do not touch the new 25pF trimmer but repeat the above operation using the trimmers TC6 to TC10, as shown in the alignment section of the manual, on the various bands. Once every thing seems okay and the neutralising has been rechecked on 21 and 28MHz, it's time to increase the power.

Disconnect the rig from the mains, wait two minutes, then remove and insulate the 160V screen grid h.t. feed wire from L13. Take a new lead from L13 to the 300V h.t. rail and the job is done. You should now get around 100W out with a pair of 6146B valves or a little less if you use 6146A valves.

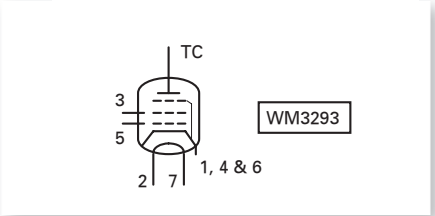
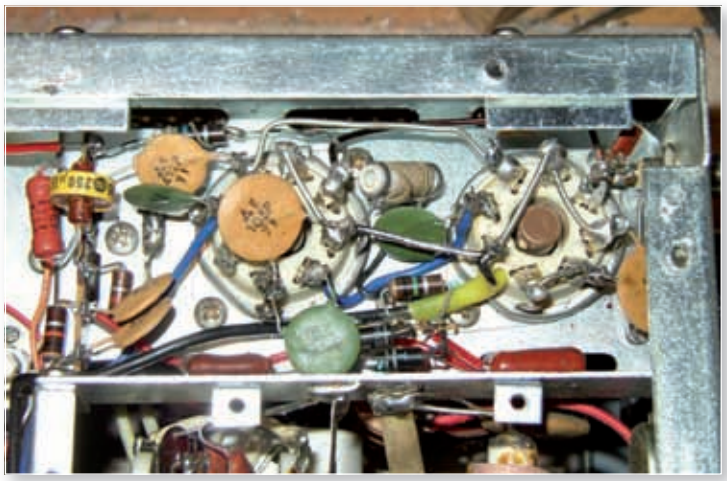


Fig. 1: Make sure you wire the leads to the correct pins (above).

Fig. 1a: David Kemplan's FT-101 with modification complete (below).



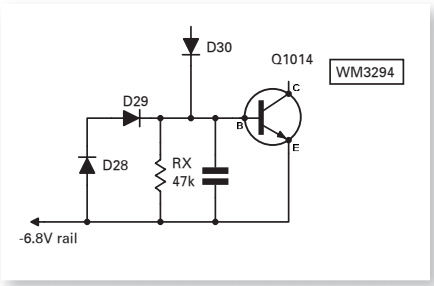


Fig. 2: To cure an a.g.c. problem on older FT-290MkI rigs, try fitting on receive, a 47k resistor in the circuit as shown here.

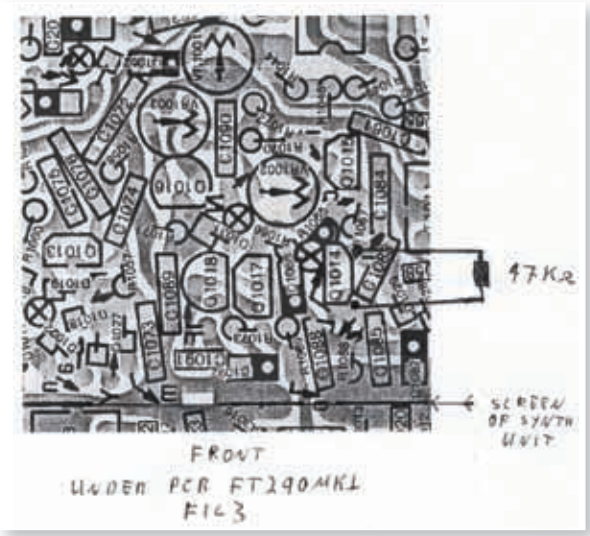


Fig. 3: This page from Harry's workshop notebook should help you with the fitting of a 47kΩ resistor as shown in Fig. 2.

Receive Problems FT-290 Style

Over the last 20 years, I have had several FT-290MkIs brought to me with the symptom that intermittently, or when they're cold, the S meter drifts to half or sometimes full scale. And that at the same time the receive sensitivity drops to a very low level. Several of theses rigs seem to have cured themselves during servicing without any apparent reason, cleaning the p.c.b. has cured others, some have seemed to recover if the diodes D28, D29 and D30 were replaced, or even if Yaesu's rubber glue was removed from certain points. (The exact cause has frankly remained somewhat of a mystery.)

The FT-290MkI is a small multi-mode 144MHz portable rig and not being as young as I was, I find them quite difficult to work on these days. Swapping the diodes, for instance, is nearly impossible without destroying them and so I cannot test the removed diodes for leakage. With such an intermittent fault on the FT-290, I never knew if I had cured it or if it has just decided to be on its best behaviour for a few days!

When, last year, an FT-290 was brought to me with the fault I've described last year, I was tempted to give up and return it unrepaired. But as I tried to measure the voltage between base and emitter of Q1014, I found that the fault disappeared while the meter was connected! The 20,000 OPV test meter I happened to be using was on the 2.5V range and so I was able to calculate that it had a resistance of 50kΩ.

I started experimentally wiring various resistors between base and emitter and found that any resistor lower in value than 150kΩ would cure the fault. I then dismantled my own FT-290, which did not have the fault and tried soldering a selection of resistors between base and emitter of Q1014. I found that as long as they were higher than 20kΩ, they had no effect at all on the performance of the rig or the automatic gain control (a.g.c.) action at all. I, therefore, 'cured' the faulty rig by adding a 47kΩ resistor.

As the FT-290 rigs get older the a.g.c. problem seems to become more common and several readers have E-mailed me about this complaint. I have cured a few myself and advised others how to cure them by the simple action of fitting, a 47kΩ resistor (RX) in the circuit as shown in **Fig. 2**.

The idea might be simple and Q1014 is identified in the photo on page 34 of the FT-290MkI manual but finding the connections is not so easy. The scan, **Fig. 3** should help. Please note, that the base and emitter connections of Q1014 are the outer ones, and that if checks are made on the low ohms range of a test meter, the emitter connection should show a dead short to the –6.8V rail. I would be interested to hear of other occurrences of this fault and whether the modification I've mentioned, solves it every time.

Low-loss Coaxial Cable

Blackburn in Lancashire, where we had our shop, was once the biggest cotton weaving town in the world, for a very good reason. As clouds come in from the west they lift to go over the Pennines and then tend to drop their very wet contents on Lancashire. Cotton weaving becomes very inefficient if looms frequently have to be stopped because a cotton thread has broken but a damp Blackburn atmosphere, very much reduces the incidence of such breakages, hence the location.

What may have been good for weaving, is not so good for antenna systems though and a large proportion of the faults we had to deal with were due to water. In fact, I once heard from TV engineers who were sent to houses because of the complaint 'Our TV is leaking' all turned out to be rainwater coming down the inside of low-loss coaxial cable!

'Joe' came in the shop to buy 20m of low-loss coaxial cable. He explained that he was replacing the feeder to his 144MHz collinear as he was not getting his signals out very well and that he suspected that he had got water in it. A few days later, he was back with the new coaxial cable complaining that it was faulty and that whilst his signals had improved a little, the s.w.r. had shot up from 1.5/1 to 5/1.

Most readers will realise that the s.w.r. is an indication of the amount of transmitted signal that is reflected back to the transmitter. Joe, however, did not appreciate that as a length of lossy cable attenuates the signal that is reflected from the antenna, it reduces the reflected signal measured by the s.w.r. meter, making the s.w.r. seem much better than it actually is. The original feeder was badly corroded and full of water but the high s.w.r. measured with the new feeder in place, turned out to be caused by his collinear antenna, which had also been attacked by rain water.

Losses can be very deceptive, as people tend to think that the s.w.r. is the 'goodness' factor of an antenna system. This can be far from the truth; a low s.w.r. only means that most of the transmitted signal is not being reflected, it does not necessarily mean that it is being radiated. More about this next month.

By The Way

By the way, did you hear about the (rather dense) English Amateur living in Ireland who rang his local paper?

English Amateur: *"Hello, is that the advertising department?"*

"To be sure sir, how can we help you"?

English Amateur: *"How much do you charge? I want to advertise a radio tower for sale?"*

" Happy to oblige sir, we charge £15 an inch".

English Amateur: *" Oh no, never mind, that will cost far too much, the tower is 30 feet high"!* ●

Harry Leeming G3LLL
The Cedars
3a Wilson Grove
Heysham
Morecambe LA3 2PQ
Tel: (07901) 932763
E-mail: G3LLL@talktalk.net

Harry's waiting to hear from You!
As I am now retired, I like to hear about problems with older equipment, particularly pre-1990 Yaesu rigs. If you want a direct reply please remember to send me your E-mail address or enclose a stamped addressed envelope. Send your letters to the address above.

Remember the mains supply is potentially lethal. Unless you really know what you are doing, always pull the mains plug out, do not just switch off at the wall socket, when working on equipment.

Feature

St. Brandon

The Great DXadventure for everyone!

Expedition Website:
3B7C: **www.3b7c.com**

Welcome to Part 2, where I'm planning to give you much more helpful information! I'll start by mentioning that in a magazine article, which preceded our Five Stars DXers Association D68C expedition, the team recommended that those wishing to work the DXpedition should focus on one band at a time.

We also recommended that the resonant sloping dipole, **Fig. 1**, orientated towards the DX station should be installed. This led to a great deal of positive feedback after the expedition because many operators discovered that such an arrangement worked much better on that specific band than their multiband system. The simple antenna allowed them to work the expedition much more easily. Because of the success, our recommendation is very much the same again!

A full-size, resonant dipole, cut according to the standard dimensions, out in the clear, ideally sloping and orientated towards 3B7C is an excellent starting point for those of you without Yagis or other high gain antennas.

Suitable dimensions are given in **Table 2** (you may need to modify them slightly to achieve the best standing wave ratio (s.w.r.) results, as lengths can be affected by surrounding objects and so on. The antenna can perhaps be suspended from a chimney or gutter.

You should feed the system with 50 or 75Ω coaxial cable, with the centre conductor to the higher half and the outer (braiding) to the lower half. Make sure you seal the feed-point to keep out moisture and – with good insulators at either end – you'll have an excellent single-band antenna.

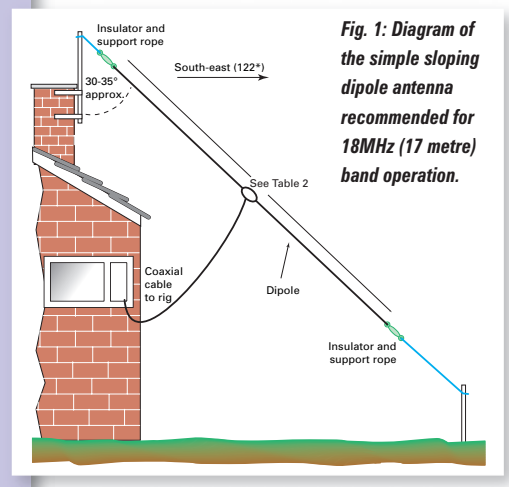


Fig. 1: Diagram of the simple sloping dipole antenna recommended for 18MHz (17 metre) band operation.

Low Bands Alternatives

On the low bands, of course, the sloping dipole arrangement starts to get prohibitively large, so other approaches and alternatives have to be tried. As it's in the Indian Ocean, 3B7 is a long way from most centres of population, so transmission arrival angles will be low.

Even on 7MHz (40m), the half-wave above ground required to achieve low angle radiation from a horizontal antenna is 20m (67ft). As a result it's much easier to use some sort of vertical. Actually, on 40m, that then becomes quite easy!

A full-size quarter-wave vertical is just 10m (33ft) high and takes up almost zero ground space! Of course, like any vertical, it will only work properly with an effective ground system but for practical purposes this means running out as many radials as you can, of whatever length, in whichever directions they can go.

Very few of us have the space to put down a textbook radial mat with, for example, 120 quarter-wave radials at exact spacings of 3°! But you can do well by placing as many as you can in your situation.

In the past, I have had great success on 7MHz with an elevated ground-plane consisting of a 10m glass-fibre fishing pole. The quarter-wave radiator wire ran up its length (held on with insulating tape) and was mounted on an insulating support (old fence post, or whatever) just a metre or so high, with two elevated quarter-wave radials (if you use elevated radials don't use an earth connection in addition). Feed the centre of the coaxial cable to the vertical radiator and attach the outer to the radials.

Rigs & Operating Techniques

Having discussed the antenna system, the next question is, 'What about your transceiver'? The simple answer is that most transceivers these days are more than capable of doing the job and almost all elderly ones are equally capable.

The only feature you'll need that you may not be using in your day-to-day operating is split-frequency capability. The 3B7C station, like almost all DXpeditions, will operate split-frequency at all times in the early parts of the expedition. However, it may revert to co-channel working later, when the pile-ups diminish, for those without the capability of split-frequency working.

You may now ask, "What's split-frequency operation and why is it used?" The answer is quite simply, that DXpeditions transmit on one frequency and listen on a different frequency. For example, they may transmit on 28.495MHz and listen between 28.500 and 28.520MHz. There are two reasons:

This month, in Part 2, Don Field G3XTT explains how to successfully work 3B7C, suggests a simple antenna ideas and discusses rigs and the all-important operating techniques.

1: If the DXpedition station listens on the frequency on which it is transmitting, it will not be heard by those calling because of the pile-up on that frequency.

2: The DXpedition operator will be faced with a huge barrage of calls and will not be able to differentiate between them, if they are all calling on the same frequency.

Experienced DXpeditioners will tune slowly up and down their listening band. Listen to the stations working the DXpedition and establish the operator's tuning pattern. Work out where they are likely to be listening next, and then call, and you'll probably work them!

Warning: You should never transmit on the DXpedition's transmitting frequency unless the DXpedition operator announces, "Listening this frequency."

When using c.w. (Morse), generally all you will need to do is set your receiver to the 3B7C frequency and then use XIT (transmitter-incremental tuning) to offset your transmitter by the necessary split (see your transceiver manual if you haven't had occasion to do this before). Activating RIT (receiver incremental tuning) will also allow you to hear the calling stations, while leaving your main receive frequency on 3B7C.

The RIT and XIT usually only work for splits of up to 10kHz, which may not be sufficient for s.s.b. operation. In this case you'll need to bring your second variable frequency oscillator (v.f.o.) into operation. Set, let's say, the A VFO on the 3B7C frequency. Then set the B VFO on the frequency where 3B9C is listening and activate 'Transmit on B, receive on A'. Again, your transceiver's manual will explain how to do this (if you have a more expensive transceiver, with dual-receive capability, you can listen to both the DX station and the callers simultaneously).

When 3B7C responds to your call, the exchange will consist simply of an exchange of signal reports. Make sure the 3B7C operator also has your callsign correct. The reason for the short, contest-style exchange is simple – the expedition operators want to maximise the number of people who get a chance to work 3B7C! Because of this contacts are kept as short as possible.

Information such as the QSL route, etc., have been announced in this magazine and elsewhere and there will even be a 'log look up' facility on the 3B7C web page so you can be sure that you are in the log okay. If not, then do feel free to have a second attempt. If your contact is, indeed okay, then please try to work 3B7C on other bands and modes.

Where On The Bands?

So, where on the bands will you find 3B7C? The plan is to focus initially on the frequencies listed in **Table 1**, subject to change for technical or operational reasons.

In any case, the team is well aware that band plans in some countries, including the USA, restrict certain classes of operator to sub-sections of the band. This will not only be reflected in the range of listening frequencies used, but in transmitting frequencies as the DXpedition progresses.

With widespread use of the Cluster network (via v.h.f./u.h.f. and the Internet) and the DX Summit Web pages, even if you don't hear 3B9C immediately, you should always be able to find out very easily where the expedition is currently operating.

Regarding the frequencies in Table 1, we have to bear in mind that there may well be other DXpeditions active at the same time, or perhaps interference on any of the pre-announced frequencies, so the team may decide to change transmitting frequencies to avoid confusion. However, with access to the Cluster system you should, in any case, be able to find out very easily the frequencies on which 3B7C is being worked at any given time.

Typically, a DXpedition s.s.b. station transmitting on 21.295MHz will listen up in the range of, say, 21.300 to 21.320MHz. If 3B7C finds itself operating on the same transmit frequency as another DXpedition it will, for example, move down around 5kHz typically to 21.290MHz and will then listen **down**, say, between 21.265 and 21.285MHz to split the pile-ups and avoid confusion.

Listen Carefully!

Listen to the operator carefully. Each operator has been briefed to give the 3B7C callsign at least after every two QSOs and to announce the listening frequencies every five QSOs. Incidentally, 3B7C will not work 'by numbers' (for example, asking for 'W1' or G1 stations only' for example) as we believe that with good ears and equipment this is quite unnecessary!

There really isn't the space in *PW* to discuss how to get started with the more specialist bands and modes, but the everyone involved with the St. Brandon team wants to encourage readers to have a go – so please do!

There have also been many articles written about getting started on RTTY and PSK, which is straightforward using a personal computer and its built-in sound card. There is a section on the 3B7C website giving some hints and tips, with links to useful references and we hope you'll find them useful.

We very much hope this article has inspired those of you who are inexperienced in DXing to have a go and work 3B7C. You could be pleasantly surprised at what is possible. We look forward to putting your call in the log – good luck to you all! ●

Useful URS & E-mail Addresses URLs

3B7C: **www.3b7c.com**
DX Lab (includes PropView): **http://www.qsl.net/dxlab/**
DX Summit (DX spots): **http://oh2aq.kolumbus.com/dxs/**
DX Zone (List of propagation prediction programs): **http://www.dxzone.com/catalog/Software/Propagation/**
VOAcap Download: **http://elbert.its.bldrdoc.gov/hf.html**
W6EL Propagation Software: **http://www.qsl.net/w6elprop/**

Sponsorship: A significant number of sponsors, led by Principal Sponsor **Yaesu**, are already supporting this DXpedition. A colour brochure has been prepared about the project and has recently been circulated to DX clubs throughout the world. If any club is interested in sponsoring 3B7C, please contact **Bob Beebe GU4YOX** (E-mail **gu4yox@cwgsy.net**)
Don Field G3XTT (don@g3xtt.com), 105 Shiplake Bottom, Peppard Common, Henley on Thames RG9 5HJ.

Table 1

MHz	CW	SSB	RTTY
1.8	1822	1842	N/A
3.5	3502	3795	3570
7	7002	7047	7035
10.1	10102	N/A	10137
14	14022	14145	14085
18	18072	18145	18100
21	21022	21295	21085
24.9	24892	24945	24920
28	28022	28595	28075
50	50102	50145	N/A

Note: PSK31 activity will be around 10.140, 14.071, 18.100, 21.071, 24.920 and 28.071MHz.

Table 2: Lengths of half-wave dipole antennas

Band	Dipole length	
MHz	feet	metres
7	66.0	20.1
10.1	46.3	14.1
14	33.0	10.0
18	25.8	7.86
21	22.0	6.70
24.9	18.8	5.73

Editorial note: Everyone on *PW* wishes you and your team well Don. Bon voyage to you all and you can be sure that I will be listening for you!
Rob Mannion G3XFD

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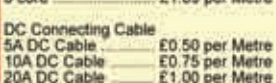

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This month, the Rev. George Dobbs G3RJV is under taking some 'Simple mixer experiments' and unusually provides an appropriate quote and some

"Life is not hurrying on to a receding future,
nor hankering after an imagined past."
R. S. Thomas

It's rare to begin a *PW* article with poetry but that is what I'm doing this month! I now spend quite a lot of time in Wales and during that time I have come to enjoy the poetry of R. S. Thomas (sometimes called the 'Grumpy Welsh Vicar!). Perhaps my favourite piece of writing by R. S. Thomas is *The Bright Field* and so I quote it in full.

"I have seen the sun break through
to illuminate a small field
for a while, and gone my way
and forgotten it. But that was the pearl
of great price, the one field that had
treasure in it. I realize now
that I must give all that I have
to possess it. Life is not hurrying
on to a receding future, nor hankering after
an imagined past. It is the turning
aside like Moses to the miracle
of the lit bush, to a brightness
that seemed as transitory as your youth
once, but is the eternity that awaits you."

After reading the poem you may now ask, "Where does that fit into an Amateur Radio column?" In my reply I would say that Amateur Radio, like most hobbies, should be a therapeutic pursuit. In the noise and rush of modern life "turning aside like Moses" is important. It seems that the Hebrew word used in the Moses and the burning bush story for "turn aside" is 'soor' which means 'put away' or "leave alone'. So, I suggest that you 'put away what you are doing and reflect on this'!

The Greeks had two ways of expressing time, kairos (pronounced ky-ros) and kronos. Kronos is clock time (chronological time); the way we measure linear time in our 'real' world. For most of human history, the question 'what time is it?', was nonsense. The modern obsession with linear time needed the invention of timepieces and standardised time. So these days we can hurry on to a receding future and hanker after an imagined past with some accuracy!

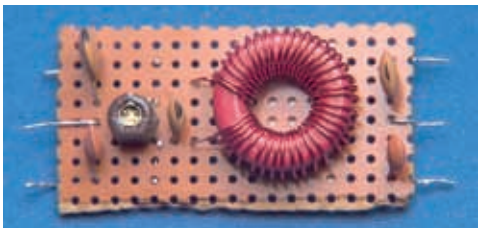
Kairos time is special time; time that absorbs us in the moment. We all know those periods when time becomes non-linear; when 'time stands still' or at least slows down! This is when we turn aside and become totally absorbed. We usually leave kairos time saying, 'Is that really the time?' Such is the value of Amateur Radio to me and, I suspect, many others.

I am a radio constructor and an ideal way to turn aside is to plug in my soldering iron and join together some electronic components. My spare time is sporadic so I tend to do little things and maintain the thread in spite of interruptions. And what I'm going to describe this month is the fruit of a free evening and a little kairos time.

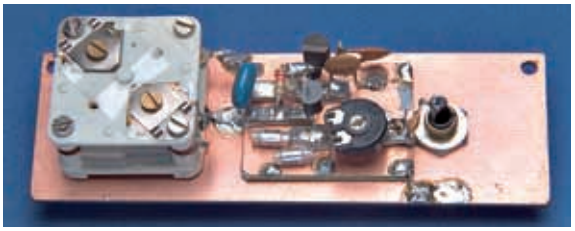
Simple Mixers & Receivers

I have some printed notes from the work of **Miguel Bartié PY2OHH**, on using very simple mixers in direct conversion (DC) receivers, so I set about trying some of them for myself. As faithful readers of this column know, I have an interest in minimalist radio construction, seeing what can be done with a few inexpensive parts.

Usually, simple mixers using a single transistor or f.e.t. are poor performers. They lack dynamic range and give little suppression of the local oscillator signal. With this in mind I wondered if a single f.e.t. mixer would be useful for a 'bare bones' receiver, so I plugged in the soldering iron and gathered some parts.



This month's simple mixer project also had poetry as an accessory!



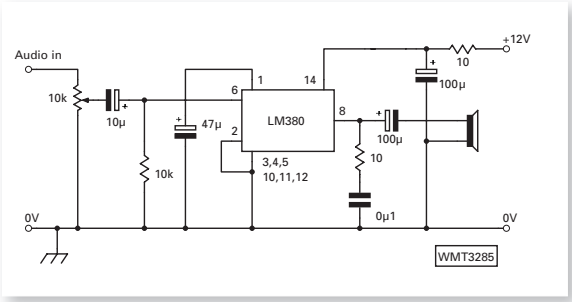


Fig. 1: Audio amplifier circuit using an LM380 i.c.

The first thing I required was an audio frequency (a.f.) amplifier. As most, and sometimes all, of the gain in a d.c. receiver occurs in the audio stages, the amplifier requires a fair amount of gain. I have a test bench audio amplifier but decided to press a board from a previous *PW* article into service.

The circuit, **Fig.1**, is for a standard LM380 audio amplifier. These are inexpensive integrated circuits (i.c.s) chips and I prefer them to the more common LM386 amplifiers. They're more stable and lend themselves to the 'ugly' style of point-to-point wiring.

The middle three pins on each side of the chip are connected to ground and act as a heat sink. I also usually bend the other pins upwards and solder those grounded pins directly to a piece of printed circuit board (p.c.b.). The other parts are soldered around the secured chip. The voltage gain is set at about 50, so it's just adequate for a simple receiver. **Note:** Avoid the lower powered LM380-8 8-pin version of the i.c.

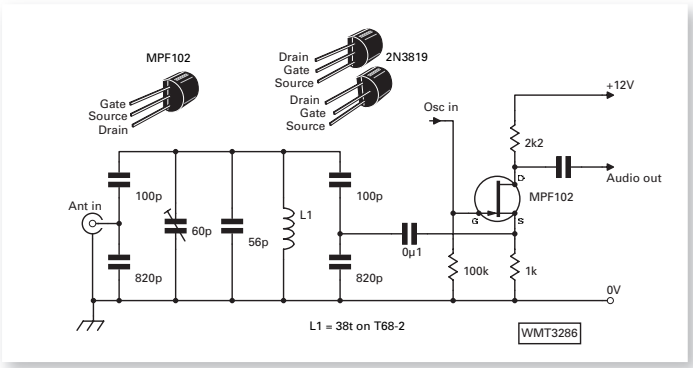


Fig. 2: The first simple f.e.t. mixer and band-pass filter design.

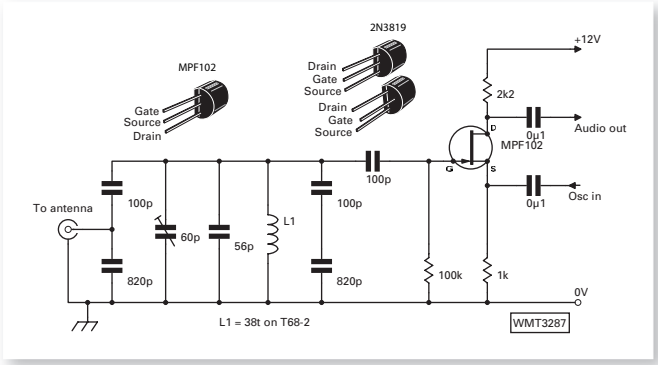


Fig. 3: Simple f.e.t. mixer design 2, showing inset pin-out diagrams for the MPF102 and 2N3819 devices.

On The 80 Metre Band

I decided to try the simple f.e.t. mixers on the 80 metres (3.5MHz) band on the basis that this would be a less critical part of the radio frequency (r.f.) spectrum. The band also has a relatively high background noise level, so gain is less critical.

The requirements for a d.c. receiver mixer are straightforward. The mixer needs to accept an input signal from the antenna, a signal from a local oscillator and produce the difference (an audio signal) at the output. Armed with only one f.e.t. the permutations are few and include which terminal (source, gain or drain) for which input and the output!

My first configuration is shown in **Fig. 2**. In this case, the local oscillator feeds the gate, the input signal feeds the source and the output signal is extracted from the drain. I used the MPF102 device but I am sure the 2N3819 would produce similar results. Take care though – these devices don't use the same pin-out connections and Fig. 2 shows the connections for both devices.

Input Tuning

Many simple DC receivers rely on input tuning as the only means of selectivity and Fig. 2 also shows a minimalist band-pass filter built around the inductor L1. This inductor is made up by winding 38 turns of 26 s.w.g. wire wound on a T68-2 core. The capacitance of the tuned circuit is shared by several capacitors.

The input and output uses series capacitors to provide a capacitive divider that allows a low impedance input or output. Note that in this case both the input (from the antenna) and output (to the mixer) of the band-pass filter are connected to the centre of the series capacitors for low impedance in and out of the filter.

A 60pF trimmer capacitor is used to peak the filter on the desired part of the 3.5MHz band. (I used a 5mm Murata trimmer – the brown ones are 60pF).

Lashing up a temporary d.c. receiver on the workbench can give poor results and, taking care, my f.e.t. mixer was built 'ugly' style on a small scrap of p.c.b. material. Warning: Please remember that the mixer is being put on the input of a relatively high gain audio amplifier. Just attaching a length of wire to the audio amplifier will yield a few broadcast stations and probably some mains hum depending upon what is close by!

Whenever possible, use very short leads between the input filter and the mixer and the mixer and audio amplifier. Connecting the board with screened leads is also a good idea. Whatever you do use as a test layout on the bench will probably be improved a lot by finally mounting the circuit boards inside a screened box.

In my first tests I used the workbench signal generator as a local oscillator. This mixer certainly works and I heard a fair number of 80 metre band Amateur signals and some broadcast breakthrough that could be improved with the trimmer capacitor.

The mixer requires a fair amount of drive – at least a 1V of local oscillator signal. With better construction and mounted in a proper screened case, it would probably make a useful simple receiver.

Optional Input

The diagram, **Fig. 3.**, shows the option of feeding the input to the gate of the f.e.t. with the oscillator fed to the source. I did not bother to make another mixer board and merely re-configured the one used for Fig. 2.

Notice that in the Fig. 3 version, the output from the band-pass filter comes from the top of the series capacitors via a 100pF coupling capacitor, to provide a high impedance input for the gate of the f.e.t. The output is from the drain as in the first configuration.

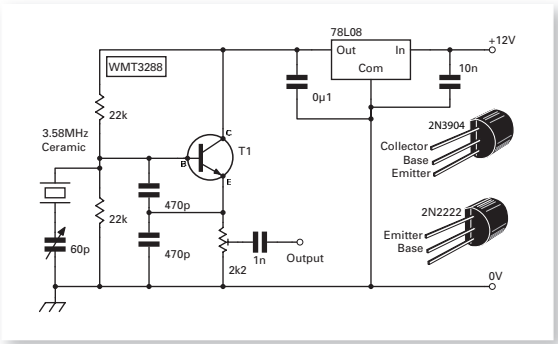


Fig. 4: A suitable 3.5MHz variable frequency oscillator (v.f.o.) signal source using a 3.58MHz ceramic resonator. Pin-out diagrams for the 2N2222 and 2N3904 devices are also shown.

This version of the mixer proved to be a somewhat better performer, required less local oscillator injection and showed some conversion gain. Even with the untidy, 'breaking all the rules, lash up on the bench', I heard a good many Amateur signals.

Even the simple band-pass filter did a reasonable job in eliminating the broadcast breakthrough. I made a mental note to try to produce a minimalist receiver based on this mixer at some future date. Incidentally, I also tried a single f.e.t. common gate mixer but this proved to be so lossy that I gave it up as non-viable alternative.

Signal Source

Some *PW* readers may not have a readily available suitable signal source for a 3.5MHz local oscillator, so the circuit in **Fig. 4** provides an easy-to-build option. It is a variable frequency oscillator (VXO) based on a 3.58MHz ceramic resonator. (I already had it ready-built from a previous project).

Using a Colpitts type oscillator, the output from the emitter has a trimmer potentiometer to allow experimentation with local oscillator output level. This little circuit worked well with the second f.e.t. mixer.

A combination of Figs 1, 3 and 4 could produce a useful simple receiver. Finally, I suggest again that you 'turn aside' and spend an evening of kairos time with your soldering iron. If you do, you'll find that time does stand still and you might learn something! ●

A 100W Balanced Z-Match Tuner for 1.8-30MHz

Operating position at St Anthony's Point, Cornwall in May 2006, when a 61m doublet was tuned by the balanced EZ-match tuner (right), in its K2/100-matching box.

I have spent some excellent holidays on the Devon/Cornwall coast, including lighthouse cottages where, close to the sea, h.f. propagation is enhanced and radio operation can be very satisfying. The popular Elecraft K2 rig is an excellent compact transceiver for such ventures but there's always the question of what antenna to put up.

Perhaps, the simplest effective multi-band antenna for temporary operation is a simple doublet, fed with balanced feeder. For this, I have used 300Ω ribbed feeder but 450Ω flat ribbon or open wire feeders should work equally well. I often put up temporary doublet antennas with end-to-end lengths of up to 82.5m, allowing efficient operation from 1.8 MHz upwards.

I'm about to describe the construction of a compact 100W all-band (h.f.) Z-match tuner, to match 'balanced' antennas and sit alongside the K2/100 transceiver. One major issue is how to match the varying impedances at the end of the balanced feeder to the standard 50Ω unbalanced impedance at the output of the transceiver. A common solution is to use an unbalanced 'antenna tuning unit' (a.t.u.) and feed the balanced transmission line via a 4:1 balun. Typically, these units are often an integral part of modern rigs.

While the a.t.u. setup may yield reasonable results if the impedance at the feeder side of the balun is close to 200Ω, it is much more likely that, on some bands, impedances of several thousand ohms may exist at the rig end of the feeder. This sort of impedance usually leads to significant r.f. losses at this point and unacceptable heating of the balun. For this reason, I decided to build a balanced Z-match to enable me to match a doublet antenna (including a G5RV) directly to my K2.

The tuner described here will also cope with horizontal multi-band loop antennas. My design goals included: a minimum capability of 100W, coverage of all h.f. bands as well as visual indication to help in finding a match.

The starting point of the design is the traditional and classic Z-match circuit, as described in many editions of the RSGB's *Radio Communications Handbook*. **Neill Taylor G4HLX** kindly lent me his vintage KW EZ-match for inspection. This unit covers the 3.5-28MHz bands, and, although this tuner is fairly bulky, most of the interior is empty. If you have an old one of these units (or can pick one up cheaply at a rally, for example) then the coils and capacitors can be used in the present design.

I have checked the size of these components and they will fit in the Elecraft EC2 enclosure, possibly with a slightly different layout to the one I finally adopted. So, if you are prepared to cannibalise an old bit of kit (as this will perhaps cause screams of agony from some – it's perhaps not for the purists) that route could be simple. The loss of a vintage tuner will be outweighed by a more compact and feature-rich version.

Design & Construction

The whole tuner fits neatly inside the EC2 enclosure (it's the same size as the K2), **Fig. 1**. As with all other projects, it's advisable to collect all the main parts of the tuner together and see how they will all fit in the enclosure before cutting any holes. Once this is done, the various holes in the EC2 enclosure can be marked and cut. Before final assembly, each of the enclosure panels was brought into electrical contact with the others.

I used 'sandpaper' to remove the grey paint from small areas of the interior aluminium panel surfaces where they are bolted to each other using the supplied Elecraft joining blocks. I also included a ground terminal on the rear panel using a 3mm bolt and a 'wing' nut as can be seen in **Fig. 2**.

I also decided to extended the original design, adding 1.8MHz to the standard coverage by adding an extra inductor (L1) shown in **Fig. 3**. I have also incorporated a three-position ceramic wafer switch to change between the three tuning

Geoff Cottrell G3XGC decided he needed a matcher unit for his K2 transceiver, here's the one he created to put St. Anthony's Point, Cornwall on the air when he worked Hawaii on 7MHz c.w!

Fig. 1: The tuner with top panel removed.

Fig. 2: And seen from the back.

ranges easily. The ranges are: 1.8, 3.5–10 and 10–30MHz. Tuning and loading adjustments are performed using two reduction vernier drives (6:1) attached to variable capacitors C1 and C2. Note that both ends of C1 are 'hot' and so an insulated shaft coupler is required.

I happened to have an old Yaesu FC-902 a.t.u. in the 'junk box', which provided the variable capacitors C1 (430pF) and C2, a split stator (2x290pF) unit, as well as the wafer switch. The FC-902 unit is rated at 500W and it's therefore possible (although untested) that my Z-match could also handle this power.

Transformers T1 and T2 were wound using 1.65mm (16s.w.g.) tinned copper wire on a piece of 32mm pvc plumbing pipe covered with cling-film and attached to the inside (primary) and outside (secondary) of 4x4mm hollow square section pvc tubes using hot melt glue.

Covered Pipe

The primary is wound on the covered pipe first, then the support tubes are glued in place. This is then followed by winding and gluing the secondary turns in place. The central pipe former was later removed (made easier by the cling-film), leaving an air-cored assembly supported by the pvc tubes.

The coil details are: T1 primary, 5-turns 32mm diameter, with 6mm spacing. This is overwound with the secondary, consisting of 5-turns of 40mm diameter, also with 6mm spacing. For T2 its primary of 8-turns of 32 mm diameter with 6mm spacing, is overwound with 6 turns 40 mm diameter with 6mm spacing for the secondary winding.

The 1.8MHz inductor, L1, is formed from 16-turns wound to 36mm diameter, with 3mm spacing. I used a ceramic former for L1, but an air-cored version would work just as well. The wafer switch is operated using a 6mm diameter fibreglass rod shaft extender, running through the centre of T1 to the front panel. This layout enabled all the components to fit inside the enclosure with the minimum of internal wiring lengths.

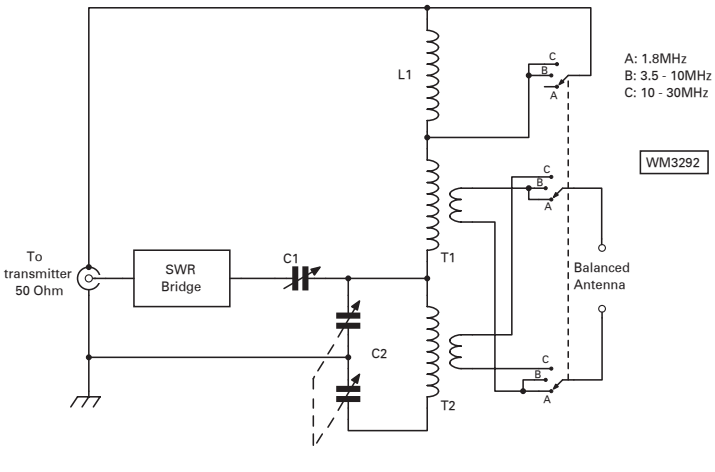
Match Making

An indication of the state of the antenna match made is given by the front-panel reflectometer analogue display derived from a conventional bridge circuit (**Fig. 4**). The circuit is a modified version of the one used in the Elecraft KPA100. Meter M1 simply displays a 'reflected power' signal to assist in finding the optimum match.

If your transceiver has adequate s.w.r. monitoring facilities, then the reflected power circuit could be omitted. But the analogue meter display is easy to use and very helpful.

Inside the rear panel, a length of RG58 coaxial cable is connected to the SO239 'TX' socket, where its screen is grounded. This passes through the centre of the bridge transformer toroid T3, forming a single turn r.f. coupling link s.w.r. sensor, **Fig. 5**. At the 'Z-match end', only the central conductor of the cable is soldered

Fig. 3: Circuit diagram of Z-match.



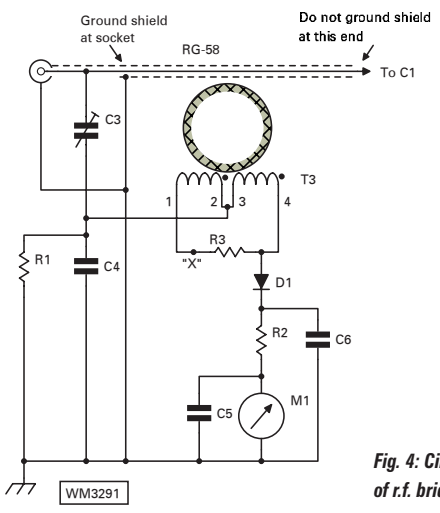


Fig. 4: Circuit diagram of r.f. bridge.

to C1. It is important **not** to ground the cable screen on this side of T3. A short piece of heat-shrink sleeve insulates the screen connection near the cable connection with C1.

The bridge was built on a small (70x50mm) rectangle of copper-clad printed circuit board (p.c.b.) material. The board is bolted and grounded to the input socket rear face. The bifilliar wound toroidal transformer T3 is easily constructed using two 280mm lengths of 0.45mm (26 s.w.g.) enamelled wire, one red and one green (**Fig. 6**). Loosely twist the red and green wires together over their whole length.

The wires should cross over each other about every 10mm. Wind 12 turns on the ferrite core, covering about 80% of the core exactly as shown in Fig. 6. Clip the wires to a length of about 30mm and strip and tin the last 10mm of the wires, making sure there are no shorts. T3 was secured vertically on the board at one point on its perimeter with a blob of hot melt glue.

The other components are then added allowing space to pass the RG58 link through the centre of the core (it will just fit). The coaxial cable screen is grounded to the board. One end of trimmer capacitor C3 is connected directly to the centre terminal of the TX socket, (**Fig. 7**).

To calibrate the s.w.r bridge, apply a c.w. carrier through the sensor into a matched dummy load and adjust C3 to give zero reading on M1 when the s.w.r. is 1:1. Either use the transceiver or an external s.w.r. meter to verify this. Once set, I found the null to be consistent over the whole frequency range covered. If no null is obtained check the connections of T3!

The value of R2 can be changed to suit the particular meter and power level used. You could add a front panel 'high-low' power toggle switch, to vary the meter sensitivity. Such a switch would simply change the value of the 'resistor' R2.

It's also possible to use this bridge to obtain a 'forward power' signal. To do this, just duplicate the detector and metering circuit on the right hand side of R3, at the point marked 'X'. In practice, however, the reflected power reading gives all the information necessary to achieve a repeatable match of 1:1 s.w.r. (as validated with an external commercial s.w.r. meter).

In practice...

The unit operates extremely well. At home, with an 18m span doublet antenna at a height of 9.2m and fed with 300Ω ladder line, I could obtain matches on all bands 1.81-29MHz with s.w.r values of 1:1. Using the vernier controls on the tuning capacitors, C1 and C2, is highly recommended, as on some bands the resonances can be extremely sharp.

Component List

C1	430pF variable capacitor
C2	2x290pF split-stator variable capacitor
C3	30pF miniature preset variable capacitor
C4, C5	10nF (often marked '103') r.f. decoupling
S1	Ceramic wafer switch (3-pole, 3-way)
T1, T2	(see text)
T3	12t bifilliar wound on FT 50-43 ferrite core
L1	(see text).
R1	3.3kΩ 0.25W
R2	22kΩ 0.25W
R3	200Ω 1W
D1	Diode IN4148 or equivalent

M1 miniature 50μA panel meter (thanks **Derek M0BNZ** for the meter!)
Vernier (2 off): 60mm diameter Jackson Brothers 6:1 reduction vernier dials. These were obtained from **www.mainlinegroup.co.uk/jacksonbrothers/4080.htm**.
Enclosure: EC2 (with 1in stand) from Elecraft direct **www.Elecraft.com/**
1.65mm dia. tinned copper wire for winding T1, T2 and L1.
SO239 panel mount socket, two screw terminals, 3mm bolt and wing nut assembly, heat shrink.

I also keep a tabled record of the TX frequency and C1 and C2 vernier settings (on a scale of 0-100) as this make returning to a match quick and easy. these day-to-day settings are surprisingly reproducible.

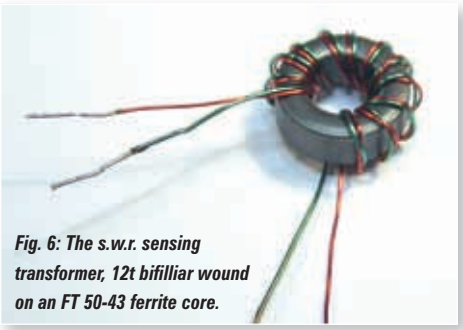


Fig. 6: The s.w.r. sensing transformer, 12t bifilliar wound on an FT 50-43 ferrite core.

In May 2006, the Z-match was put through its paces at a portable location in Cornwall with a 61m doublet (at a height of a little over 10m) fed by 19.6 of 300Ω ribbed feeder and facing west out over the sea. I obtained excellent results, including some USA west-coast stations worked. The best DX being a QSO with Hawaii on 7MHz c.w. In fact, the unit is so handy that I am considering using it full-time at my home location! ●

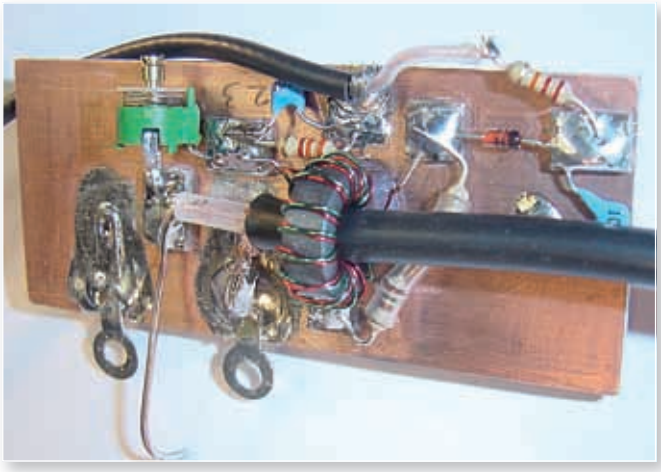


Fig. 5: Bridge board ready for installation. The protruding solder lugs will be bolted and grounded to the inside of the SO239 socket on the rear panel. The thin coaxial cable (to the left) leads to the front panel meter M1, the cable to the right goes to C1.

Fig. 7: The s.w.r. sensing p.c.b. is mounted on the back of the input socket.

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Antenna Workshop

Roger Cooke G3LDI, tells of his experiencing 'Antennas Through The Ages' (16 to 68)

I got my licence in August of 1956 (an awful long time ago now!), having been a short wave listener (s.w.l.) for several years and a member of my local club since I was 14. In those days, you had to glean information from the older Amateurs, read a lot and listen on the air as much as possible. The first piece of equipment to obtain then was a communications receiver, the heart of any station at that time. Following that acquirement, an antenna was next on the list, to get the signals into the precious receiver.

With most receivers, the first antenna is usually a 'long' wire, plugged straight into the antenna socket of the receiver, as it was in my case with my R1155B receiver. Propagation at that time was tremendous. A local 'Elmer', **Doug G3HUL**, helped me with an RF27 unit converter for 21/28MHz. Even with just a random piece of wire, I was logging stations from all over the world. One station, a ZL, told of his rhombic antenna that was creating an enormous signal. I vowed that one day, I would have a rhombic too!

Fig. 1.

Better Antenna

My first two-valved transmitter meant I needed an a.t.u. and put up a better antenna. Another 'Elmer', **Pat Gowen G3IOR** and myself, paid a visit to the local wood yard on our bicycles. I purchased a 30ft (9.2m) pole and we had to walk that back home amongst the traffic. That's a story I'll not enlarge on here but you can imagine the problems!

The new pole went up at the back of my shack, an 8x6ft shed, supporting a 20m length of wire, fed with a feed line, using wooden dowelling spreaders. My mother allowed me to waterproof the spreaders, by boiling them up in some paraffin wax on her cooker. A series of antenna tuning units followed, and the final and most effective design used was the Z-match.

After a couple of years, I was keen to improve my antenna situation again so, when my parents went on holiday for a week, I paid another visit to the wood yard. I purchased two 12.2m poles. Luckily, this time, they were delivered. These were put up, one beside the house and the other at the bottom of the garden, each in a tabernacle made of two concrete posts with the pole between them.

Fig. 2.

Fig. 3.

The concrete posts had holes through them as they were fencing posts so, all I had to do was drill a hole through the pole and use a piece of metal rod to swivel the pole on, clamping the top with two plates, bolted together.

Putting the end-fed Zepp antenna up that high, really made a difference as I worked lots of DX, including 'Ws' on 3.5MHz. Most of the contacts were on c.w., using my newly home constructed Elizabethan transmitter in its 5ft (1.5m) rack. This used a pair of 807s in the power amplifier stage that I was very happy with. But my parents were less than happy when they returned from their holiday! Luckily, neither they, nor the neighbours complained!

Classic Zepp

When fed with open wire feeder and a suitable a.t.u., the classic Zepp antenna should be usable on most bands with little problem. But should there be problems (such as extremely high s.w.r. or evidence of r.f. on equipment in the shack), change the feed-line length, by adding or subtracting $\lambda/8$ sections at the problem frequency. A few such adjustments should yield a workable solution. Incidentally the antenna was originally used on Zeppelin airships, with the antenna trailing from the feeder, which hung from the airship cabin, hence the name.

When I was about 24, I bought a TA33jr antenna, a Mosley three-element tri-band Yagi. I had an old TV rotator and mounted the antenna on a 6m alloy scaffold pole underneath my Zepp antenna. Towers were not generally available in those days;

in fact I don't think there were many at all in the UK. However, even at 6m, this tri-bander made quite a difference on the main DX bands, lifting my country score considerably. I also changed my receiver to an AR88D and sold my original h.f. transmitter and had made a crystal filter s.s.b. exciter, **Fig. 1**.

The next few years involved discovering the opposite sex and working lots of summer seasons, with my own band*. In 1966, we moved to a bungalow in Wymondham with a large garden (a pre-requisite of any house purchase!) There I bought my first tower, a Heathkit 9.8m tower, adding a 3m top section to take it to 12.8m. I do remember mixing the concrete by hand, as it took a whole weekend and 27 barrow loads to fill the hole!

After selling my TA33jr, I set about making a tri-band cubical quad antenna with bamboo poles 5m long, prepared with tape and coated with varnish. I made up a centre mounting for all the poles and set out the spacing for each band, tuning the elements with some small variables that I had. This worked extremely well, with my G2DAF linear using a pair of 813s. Now, DX became easier to work, and I also ran regular 'skeds' with friends in the USA, Canada and Australia, several of whom have became life-long friends. One of them, **Ian VK3MO**, called in one day - on his bicycle tour of the world!

One day, the cubical quad antenna fell apart in a gale so, I decided to return to Yagi antennas. I replaced the Heath tower, with a four section Strumech one. I also bought a 'Tail-twister' rotator and arranged for the feeders and control cables to be fed underground into the shack. I bought a Mosley Elan, a 21/28MHz three-element beam, and bought enough aluminium to make a three element Yagi for 14MHz. This took ages to set up as I wanted it, mostly a good back to front ratio. I finally ended up with a result that I was very happy with.

I mounted the Elan on the top of a 6m scaffold pole in the head unit, 4.6m above the 14MHz beam. I then strung a 3.5MHz delta loop, corner-fed, just under the 14MHz beam. This worked well, as I used to go on the band from about 0100, working USA stations on 80m. I also had a quarter-wave vertical on 3.5MHz with about 150 radials. Fitting radials, is a time consuming and boring project if ever there was one! But it paid off. Though, from memory, there wasn't much difference between the vertical and the delta loop. I had replaced my gear with the Drake C-line by this time.

**Note: Roger is a noted jazz musician.* Editor.

Big Or High Enough

The Americans have a saying – 'If your antenna didn't come down last winter,

Fig. 4.

Fig. 5.

it wasn't big or high enough'. Well, obviously mine was big enough. But I'd used polypropylene rope to guy the tower, a big mistake in hindsight! I received a call at work one morning, saying that the tower had collapsed in a gale, **Fig. 2**. Luckily, it was covered by insurance, so I had a big job replacing it. I kept the top two sections that were bent, and a friendly blacksmith managed to straighten and repair them. They form the basis of my data tower now.

I was around 42 by this time and I spent a year at my parent's house again, looking around for another house. My mother found it in the paper one evening, saying that she'd found just what I wanted – 'a shed in a field' – a derelict old nursery with 8 acres of land. I managed to buy it and I'm still here today.

When I moved in, a tower was needed, so along with a friend of mine, we paid a visit to Louth and bought a couple of Western Electronics towers. I had to install the concrete base, together with the guy rope anchors, all on my own, although I had the help of a large delivery lorry full of concrete. This took all one morning to sort out and my tower, the 36.5m version, arrived on a low-loader. It needed a rather large crane to erect it. After a week or so to allow the concrete to harden, I mounted the 14MHz beam and the Elan on the top and cranked it up. It looked great, and worked well too!

After a few years, I replaced the antennas with one Yagi, a TH7DXX. At 33.5m this really performed well, **Fig. 3.** I set about realising my teenage dream of having a rhombic antenna. I managed to acquire an old commercial crank-up tower that needed some work. My son is a welder and he did the necessary repairs, using tower sections that we bought.

Although there were one or two sections that needed some work, we assembled four 12.25m towers. We made the concrete bases and again hired a crane to help with the erection, **Fig. 4.** I now have a 4λ per leg rhombic for 14MHz. It works very well; in fact 2 S-units better than the TH7DXX, but only in one direction of course! Pity it wasn't rotatable. However, it is very useful to have a high gain antenna in one direction and also be able to rotate the beam to any other.

High-Gain Collinear

I've now replaced the TH7DXX with a Stepplr 4-element Yagi and am in the process of replacing the steel guy wires with Phyllistran. I also have a high-gain collinear on the top of the big tower for BBS/Cluster access from the north Norfolk coast. The data tower has other vertical antennas for local access. The satellite array was for Satgate operation, but the Satellite Gateway Network is now unfortunately closed down due to lack of support, most Amateurs preferring to use the Internet.

My latest antenna is a low-slung horizontal 3.5MHz dipole at 30ft especially for the RSGB Cumulative contests. This works very well as a NVIS antenna for inter-G contacts, much better than loading up the rhombic.

As you see, an antenna system is an evolving situation, and one that has to be that way, unless you win the lottery! Over the years, I've made many friends around the world, and we have visited one another, USA, Canada and Australia being the main ones. Unfortunately, I have lost two good friends in Canada and my lifelong friend and his wife in Seattle. But, new friends are made, and life goes on, although at this age my future is much less than my history!

Nirvana

I have found my *Nirvana*, and I'm unlikely to move again, unless forced to! Incidentally, I still have those two 40ft poles, and they're in as good a condition as they were 45 years ago. Though I've a few grey hairs now, I still climb the towers with no problem and still enjoy the hobby as much as ever, **Fig. 5**. ●

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Valve & Vintage

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Ben Nock G4BXD takes his regular tour of duty in the *PW* vintage 'shop'. This month he's chatting about an interesting Japanese set, an OSS clandestine unit and tells us how much he enjoyed the Yeovil Club's Somerset Supper.

A big 'hello' to you all once again as it's my turn at the Valve & Vintage 'shop' where I specialise in veteran military and marine radio equipment. The big wheel keeps turning and I've been busy and several new additions have been gathered in at the 'Kidderminster Kollection'.

I was recently really pushed for space and this meant the purchase of yet another shed. Into this went the cardboard boxes stuffed with leads, plugs and all the myriad bits that plug into the equipment, in fact, all the little 'extras' that these old military sets need. It's one thing to collect sets but, as we collectors know, trying to get all the little accessories that are needed to finish off a station requires a lot of extra space!

Having generated a bit more storage space I managed to sort out a few duplicate sets, which I disposed of. This gave me more room but just as water seeps into every crack and crevice, sure enough after only a few days, replacement items were once again filling that hard won ground. Collecting is a strange hobby isn't it?

Japanese Handy Set

I'll start this session by mentioning a very rare and interesting set. It's a Japanese Second World War receiver transmitter, Navy Model TM Handy Radio Set, apparently produced for the Japanese Navy and their Marines. The set, **Fig. 1**, is a two valve continuous wave (c.w.), for Morse telegraphy, and is also provided with modulated continuous wave* (m.c.w.) equipped set covering around 4.5 to 11MHz.

I've found it very difficult to get any detailed information on TM Handy Set and it's certainly an early design, incorporating breadboard construction and using solid wire and point-to-point wiring. Two websites give information on different valves, one states that a pair of UY-27 2.5V heater valves while another states type UX-112A, which is a 5V heater type. Both are triodes so there might be a way either can be used. I don't have an actual circuit diagram but I believe the set runs both valves in parallel on transmit and as a triode detector and separate triode audio stage on receive.

The TM set is housed in a plywood case, **Fig. 2**, covered in some sort of fabric. The radio is on a wooden tray that fits into the centre of the carrying box. At both ends of the case is a compartment, one holding a reel of wire, the other a reel of cord, both with small folding handles on the ends of the case. Apparently, the operator paid out the cord and threw it over a tree or similar support then attached it to the end of the wire reel. Using the two winding handles the wire could then be paid out by winding in the cord until the required length of wire was reached.

The case lid holds a Morse key and tuning chart while leads and spares were carried inside the case under the main set. There's a large multi-pin plug on the side, which goes to the power pack (most probably batteries) obviously carried by another member of the communications team. Despite the lack of detailed information, I'm sure you will agree though it's a most interesting set indeed.

***Note:** The use of m.c.w. enabled receivers not equipped with beat frequency oscillators (b.f.o.s) to be used for `Morse telegraphy reception.

For The Marines

On to another set now and this one was designed for use by the American Marine Corps. A quick search of the Internet* found this: "*Concerning Marine radios – Going into Saipan there were 6 TBYs in service. At the battalion headquarters level we had one TBX powered by a generator. It usually was carried by 4 men and consisted of antennae, generator, transmitter, and receiver. Efficient, but the antennaehad a tendency to be seen from a distance, and getting 4 men together after the Tarawa landing proved to be impossible.*"

The model I have is the TBX-2, this is an early model, it's more common to find the later TBX-8, which I believe is slightly different electrically. The TBX-2, **Fig. 3**, is a single valved unit, using a type 837 and a transmitter with a 5-valved receiver using one 1C6 and four type 34 valves, in a standard superhet design.

The transmitter-receiver can operate in c.w. or amplitude modulation (a.m.) modes with approximately 3 or 9W on transmit. The receiver has a self-oscillating mixer, no radio frequency (r.f.) amplifier, a single stage of intermediate frequency (i.f.) amplification followed by a detector and audio stage. A further type 34 is used as the beat oscillator (b.f.o.) for c.w. reception and **Fig. 4** shows the internal view.

The TBX-2 set was designed for portable

Fig. 1: The Japanese Handy set.

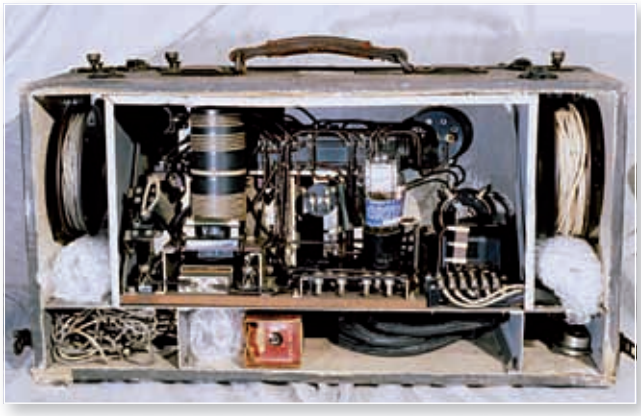

Fig. 2: Internal photograph of the Handy set, the two wire reels clearly visible.

operation by troops landing on beaches and on patrol. A battery pack (supplying 3V for heaters, 90 and 135V for anodes and a small negative grid bias supply was used) on the receiver, while the transmitter was powered from a hand-cranked generator supplying 12 and 500V. The antenna used in the field would have been a 7.3m (24ft) guyed whip but extra length could be added using a wire attached to the whip top.

*** http://www.tarawaontheweb.org/usmcradio.htm**

American OSS Equipment

Quite a few readers will know the British spy set called the B2, it's a well known unit. Less familiar are the sets used by the Office of Strategic Services (OSS) – later to become the Central Intelligence Agency CIA, the American equivalent to the Second World War British Special Operations Executive (SOE). One of the suitcase sets used by the OSS agents was the SSTR-1.

The SSTR-1 is a three-unit station, comprising of a receiver, transmitter and power supply. In the field the set could be powered from batteries, a hand-cranked generator or even a clever unit called a thermocouple, this produced voltage when heated (perhaps over a gas ring, etc.). The set, **Fig. 5**, has a basic coverage of 3 to 14MHz and the single valve transmitter using a 6L6, which could deliver 10 to 15W of c.w. depending on frequency. It was envisaged the set could have a 480km to 1600 (300 to 1000 miles approximately) range making it ideal for use in Europe and the near East.

Rather than employing plug-in coils (as used on the British B2 transmitter) the SSTR-1 transmitter incorporated a clever 'roller coaster' type coil. Additionally, a large multi-holed pad allows various types of crystal mountings to be used with the set while the receiver tuned 2.7 to 17MHz in two switched bands.

The receiver I have is the SSR-1-G, which uses 7V7, 7Q7 and 7F7 valves (five in all) as a superhet design with a 455kHz i.f. stage. The transmitter is the SST-1-D using a 6L6 or 6L6G and the unit also has a built-in Morse key, which is surprisingly 'operator friendly'. The power supply that came with my set, the SSP-1-D, allows operation from mains voltage between 90 and 230V, together with a 6V supply for running off a standard 6V car battery of the period.

My sets came without a suitcase, so I found a suitable one to house them for display. I thought the B2 was heavy enough to carry but the SSTR-1 with its mains power unit is a close match! I've since re-housed the set is a larger suitcase giving enough room for the spares box which I shall need to build.

Fig. 3: The TBX-2 transmitter receiver, transmitter, tuning centre and receiver tuning, visible at the top right.

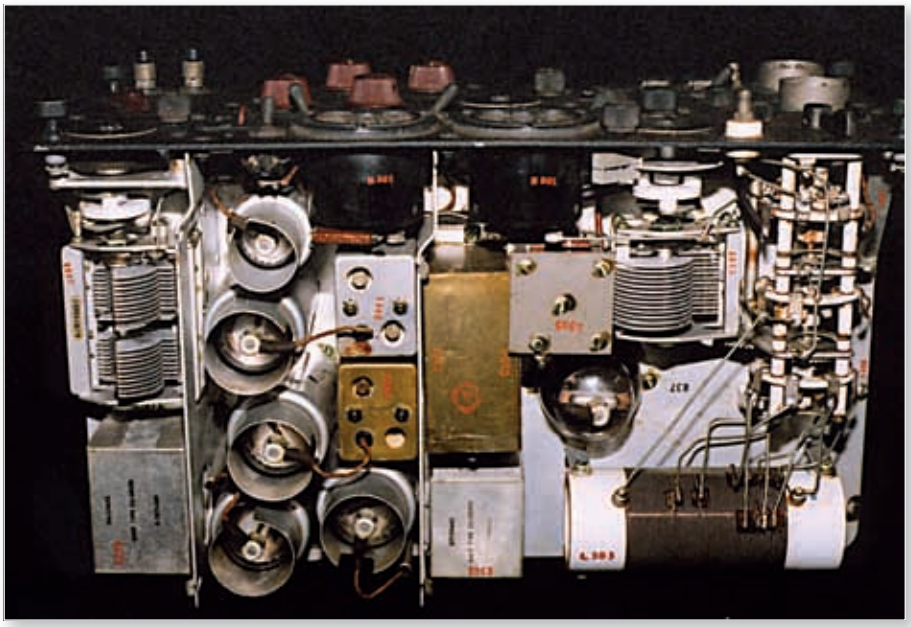

Fig. 4: An internal view of the TBX, with the single transmitting valve on the right together with the tank coil switching.

Fig. 5: The OSS suitcase set, receiver on the left, transmitter in the centre and the power supply unit on the right.

Somerset Supper Enjoyed!

Finally, My thanks go to **Tim Walford G3PCJ, George Davis G3ICO** and all the guys at the Yeovil QRP convention's Somerset Supper April 14th (held on the Saturday evening before the main event) for a very pleasant meal and rally where I was asked to judge and give a short lecture. It was a most enjoyable weekend.

Well that's about it for this stint at the V&V shop. I hope you have enjoyed the selection I've presented this time and I hope it has whetted your appetite for things old and valved! As always I can be contacted directly at **62 Cobden Street, Kidderminster, Worcestershire DY11 6RP** or via E-mail at **military1944@aol.com** or even Skype now at **Militarywirelessmuseum**.

Cheerio for now! ●

VHF DXer

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This month, David Butler G4ASR has reports of Sporadic-E openings on all v.h.f. bands and of a tremendous 2600km tropo opening on the 144MHz band.

The summer is finally here and the v.h.f. bands are full of DX signals. Propagation in May got off to a flying start with many Sporadic-E (Sp-E) openings on the 50MHz band that also included some multi-hop events to the Caribbean, South America and North America. A few Sp-E events also linked into a southerly trans-equatorial propagation (t.e.p.) path with contacts being made into deep into the African continent.

There were also a number of Sp-E openings on the 70MHz band and one event that reached as high as the 144MHz band. In addition to all this, was an exceptional tropospheric (tropo) opening on the 144MHz band with contacts being made up to 2600km from the UK. Add in the occasional aurora and you can see that summer really has arrived!

The 50MHz Band

It has been an excellent start to the 50MHz Sporadic-E season with single-hop openings of around 1200-1500km being reported throughout the month of May. This enabled QSOs to be made with stations all over Europe. Some of the more interesting contacts made from the UK included the stations CU2AF (Azores), HV0A (Vatican City), SV9CVY (Crete), T93Y (Bosnia-Hercegovina), YU60BCD (Montenegro), ZA/UT7DW (Albania), Z37M (Macedonia), 3A2MW (Monaco) and 4O5A (Serbia).

At times double-hop paths formed that extended the skip distance up to 3000km and this gave contacts into northern Africa and the nearer parts of Asia. Your reports mentioned the African stations of CN8KD (Morocco), EA8CDX (Canary Islands), EA9IB (Ceuta), SU1SK (Egypt), 5A9RC (Libya), 7X4AN (Algeria) and the Asian stations of A71CT and A71EM (Qatar), TA2ZAF and TA7OM (Turkey), 4X4DK (Israel) and 5B8AD/P (Cyprus).

Peter Taylor G8BCG (Cornwall IO70) reports that on May 7th he heard the first transatlantic signals of the summer season. Between 2000-2230UTC he was copying the 9Y4AT beacon (Trinidad FK90) peaking up to 579 on 50.015MHz. At 2106UTC he worked the station of FM5JC (Martinique FK94) with a 599 report. This was followed by QSOs with 8R1WD (Guyana), WP3UX and WP4G (Puerto Rico FK68).

The transatlantic path was briefly open for a few minutes at 1800UTC on May 17th with stations in eastern England hearing the station of KP4EIT (Puerto Rico FK68). A much better transatlantic opening occurred between 1800-1930UTC on May 20th with **David Gillies MM0AMW** (Argyll IO75) working the South American stations of FY1FL (French Guiana), YV4DDK (Venezuela) and 8R1WD (Guyana). Other stations worked from the UK during this opening included FM5JC, PJ4/PA3CNX (Netherland Antilles), K1AC, K1NA, K1SIX and K2ZD (USA). Between 1200-1330UTC on May 25th G-stations experienced an excellent opening to Trinidad & Tobago (9Z4BM), Martinique (FM) and Puerto Rico (KP).

Ken Osborne G4IGO (Somerset IO80) mentions that there was also some trans-equatorial propagation (t.e.p.) on the 50MHz band during May. The station of ST2A (Sudan KK13) was heard on May 2nd, 8th, 9th, 10th, 13th, 14th and 15th between the times of 1600-1900UTC. The signal strength was generally quite weak and never peaked higher than 559. Ken G4IGO also reported that on May 8th at 2015UTC and 9th May at 2030UTC he heard the station of Georges Schleger 9Q1EK (Democratic Republic of Congo JI75). Georges works for the United Nations and has been active from Congo since January 2007.

There was an excellent t.e.p. opening that occurred between 1530-1740UTC on May 14th. It was reported initially by the station of **Neil Carr G0JHC** (Lancashire IO83) who spotted the beacon station S9SIX (Democratic Republic of Sao Tome & Principe) peaking 419 on 50.079MHz. A report from this far north is relatively unusual at this point of the solar cycle, as it is normally only stations in southern England and the Channel Islands that link easily into the southerly t.e.p. path. Indeed, the following reports only come from stations situated in locator squares IN89, IO80, IO81, IO90 and JO01.

Stations further north may hear occasional signals but these will generally be much weaker than those received a few hundred kilometres to the south. By 1558UTC the S9SIX beacon was peaking 579 at the QTH of G4IGO (IO80). At 1614UTC the station of G0CHE (IO90) heard the TR0A beacon (Gabon JJ40) on 50.048MHz and then two minutes later made a c.w. QSO with the station of TR8CA (Gabon JJ40). Other UK operators reported to have worked this station included G3SED (IO90), G3VYF (JO01), G7RAU (IO90), GW7SMV (IO81) and MU0FAL (IN89).

Fig.1: The v.h.f./ u.h.f. antennas at the QTH of DF9IC.

A few minutes later, G4IGO heard the Namibian beacon V51VHF (50.020MHz JG87) over a distance of 8380km. Another African station, 5A9RC (Libya) was copied by **Mike Devereux G3SED** on 50.100MHz at 1700UTC. Stations in southern England continued to hear these DX signals until the opening faded out around 1740UTC. More t.e.p. openings were reported during the month with 5T5SN (Mauritania IK28), 6W/IZ2DPX (Senegal IK14), 9Q1D (Democratic Republic of Congo JI75) and TZ6PVI (Mali IK62) being worked from the UK on May 15th, 17th, 19th, 21st, 22nd and 23rd.

Stations also reported an auroral backscatter opening on the 50MHz band that occurred between 1600-1800UTC on May 7th. At the station of **Chris Tran GM3WOJ** (Inverness IO77) contacts on

c.w. and s.s.b. were made with DH6JL (Germany JO31), EI5FK (Ireland IO51), EI7IX (IO53), LA4ANA (Norway JO59), OZ1DJJ (Denmark JO65), G4IFX (IO91), G4IGO (IO80), G7RAU (IO90), GM3SEK (IO74), GW3MFY (IO81) and GW8IZR (IO73). Other auroras were reported on May 22, 23, 24, 25 and an Auroral-Es opening on May 24 to JX7SIX (Jan Mayen), JW7SIX (Svalbard), TF3SIX (Iceland), VE8BY (Canada), Finland, Norway and Sweden.

The 70MHz Band

The 70MHz band was in good shape during the month of May with many Sp-E openings being reported. There were three events on May 9th the first of these being reported between 1340-1350UTC by the station of **Joe Kraft CT1HZE** (Portugal IM57). The UK beacons, GB3ANG (70.020MHz), GB3BUX (70.000MHz), GB3MCB (70.024MHz) and GB3WSX (70.007MHz) were copied very well but unfortunately CT stations are now not allowed access to the band. Hopefully. this situation will change very soon.

The second opening of the day commenced at 1715UTC with stations in the north of England and Scotland working into Croatia (9A) and Slovenia (S5). Contacts were made on f.m. and s.s.b. with the stations of 9A1Z, 9A2SB, 9A2ZH, 9A6Z and S51DI. Scottish stations reported an opening into Croatia around 2020UTC but the event only lasted less than five minutes. There are now a considerable number of European stations with 70MHz receive capabilities that operate cross-band to either 50 or 144MHz. Such stations worked from the UK during May included; CT1FFU, DL3YEE, F5DQK, LA4ANA, OE5MPL, PE1MZS and SP9HWY.

The 144MHz Band

I've had reports that in the period May 1st to May 5th tropospheric propagation was excellent with c.w. and s.s.b. contacts being made on the 144MHz band over some very long distances. The best tropo paths during May 1st to May 4th were from England, Scotland and Wales to stations in northern Germany, Denmark (OZ), Norway (LA) and Sweden (SM).

There was considerable activity on May 1st as this coincided with the regular Tuesday night Nordic activity contest. Some of the DX stations worked from the UK on the 144MHz band included LA1BM, LA3BAA, LA7H, LA8AW, OZ1ALS, OZ2TF, OZ4VW, OZ5AGJ, OZ7EDR, OZ9HBO, OZ/DG3XA and SK7MW.

Tropo conditions were reported to be spectacular on May 5th when a marine duct formed between south west England and Wales to stations in the Canary Islands (EA8), Madeira Islands (CT3) and mainland Spain (EA). **Tim Fern G4LOH** (Cornwall IO70) mentioned that as the EA1VHF beacon had been temporarily turned off for a 144MHz contest later in the day it was difficult to ascertain exactly what tropo conditions were like. However, once the contest had started s.s.b. contacts were quickly made with Spanish stations EA1EBJ, EB1DNA, EA1DKV/P, EA1FDI/P and EE1URO.

Signals were so strong that EA1FDI/P was 59+50dB even when the transmit power was reduced to 50mW output. The sea duct didn't seem to go any further than northern Spain but when Tim was beaming towards Sweden he heard the station of CT3KN/P over 2000km away off the back of the beam. Signals came up to 59+40dB once the beam was pointing in the correct direction and a number of stations in the Madeira Islands and Canary Islands were then contacted. These included CT3HF (IM12) at 2162km, CT3KN/P (IM12) 2165km, EA8BWY/P (IL18) 2579km, EA8BPX (IL18) 2589km, EA8AVI (IL28) 2597km, EA8TX (IL18) 2603km, EB8CDX (IL18) 2611km and EA8BUE/P (IL18), his best DX at 2613km. Contest station CT3KN/P was a great signal for many hours and managed to work a number of UK stations that included G4RRA (IO80)) at 2275km, GW4DGU (IO71) and GW6TEO (IO71) both at 2300km and GW7SMV (IO81) at 2380km.

The first 144MHz Sp-E opening of this summer season was reported on May 13th by stations in eastern England and south Wales. In the short event between 1145-1200UTC the s.s.b. stations of G4FUF (Essex JO01) reported hearing EB6ADS (Menorca JM29) and GW7SMV (Gwent IO81) heard EA6VQ (Majorca JM19). Both Spanish stations were operating on 144.300MHz, the s.s.b. calling frequency.

By the way, it's still not too late in the season to work stations via Sporadic-E. Last year, there were 144MHz openings on July 1st, 5th, 6th, 7th, 9th, 12th, 13th, 14th, 16th, 17th, 20th, 23rd and 26th and one final event on August 13th. So, keep tuned to 144.300MHz for the next few weeks!

Deadlines

That's it for this month. It's still the Sporadic-E season so keep a close watch out for DX signals on the 50, 70 and 144MHz bands and please let me know what you heard or worked. Send any information to the address given at the head of the page before the last Saturday of each month.

73, David G4ASR

75 Years Celebration - The 1930s

Every month during 2007, I'm celebrating the 75 years of *Practical Wireless* by looking at recollections or notable achievements and this time around I'm looking at the period between 1930-1939.

In 1927, at a radio conference in Washington, USA a world-wide Amateur allocation of 50 to 60MHz was created. In the 1930s, the only v.h.f. allocations for UK Radio Amateurs was in the band 56 to 60MHz (Five Metres) and a temporary allocation at 112MHz. In those days, the Five Metre band was referred to as 'ultra high frequencies' and it was in this area of the spectrum that much experimentation was carried out by like-minded Amateurs.

On May 21st, 1933, tests were carried out by **G6HP**, **G6NF** and **G6QB** from the North Tower of Crystal Palace (South London). Flying in a *Puss-Moth* aircraft the aeronautical mobile station of **G5CV** set a new UK distance record by logging 56MHz signals from Crystal Palace up to a distance of 210km. A month later , on June 18th, 1933, the stations of G5CV and **G6JP** chartered two *Dragon-Moth* aeroplanes to establish two-way communication between them using 56MHz equipment. They were the first European Amateurs to establish plane-to-plane contact and demonstrated the advantages of the Five Metre band for reliable telephony communication.

One of the problems in the 1930s, was the identification of Five Metre signals, which was made more difficult by the presence of harmonics of Amateur stations using the 7 and 14MHz bands. A 'contact bureau' was set up by the Radio Society of Great Britain whereby members working in the same field of experimentation on ultra high frequencies could be put in contact with one another. Log books were correlated in order than an attempt was made to formulate a theory to account for some of the unusually long distances being covered on ultra-short waves.

By the middle of the 1930s, some remarkable DX achievements on the 56MHz band were being notched up. The station of **G5BY** was the first to span the Atlantic Ocean when he was heard by W2HXD (USA) on December 27th, 1936 during the peak of Solar Cycle 17. Two years later, in 1938, the stations of G5BY and **GM6RG** were each heard in the USA. Reception of these signals was made possible by F2-layer propagation although, of course, in the 1930s the word 'ionosphere' had not yet entered the English language.

HF Highlights

Carl GW0VSW rounds up the latest news from the h.f. bands with the help of your monthly logs.

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Once again, there is a lot to get through this month and I will start with a new prefix allocation. Montenegro became a country and a DXCC entity in its own right last June but until May this year did not have an Amateur Radio prefix to call its own. The International Telecommunications Union (ITU) did not want to give Montenegro an entirely new prefix, so the Union asked the states of Montenegro and Serbia to agree upon the use of one or two prefixes from the five allocated to the former Serbia-Montenegro. These were 4N, 4O, YT, YU and YZ. When final agreement was reached on May 11th and Montenegro will use 'Four Oscar' as its prefix running 4O0 to 4O9. Serbian stations will continue to use YT and YU followed by 0 through to 9 for its call districts. The ITU has therefore 'taken back' the former 4N and YZ prefixes for possible reallocation at a later date.

DX News

The **Islands On The Air (IOTA) Contest** will run over the weekend of 28th and 29th of July and there will be many operations from Island locations around the globe. One of these will be **CU8T,** operating from from the Albarnaz Lighthouse on Flores Island EU-089 in the Azores. Outside the contest they will operate on all the h.f. bands using c.w., s.s.b., RTTY and PSK31 and the QSL manager will be via the bureau or direct to **Antonio Guerreiro CT1GFK, Toze Apartado 1111 - Zona Industrial P-8700 240, OLHAO, Portugal.**

Also in the contest will be Canadians, **Claude Du Berger VE2FK** and **Jean-Pierre 'Pete' Couture VA2SG** who will be active from the Isle-aux-Coudres NA-128 as **VE2FK**. The island lies in the middle of the Saint-Lawrence River and was discovered by Jacques Cartier during his second voyage in 1535. For many years, it was a halt for ships arriving from Europe and is now accessible by a ferry sailing from Saint-Joseph-de-la-Rive. They will operate c.w. only on 3.5, 7 and 14MHz and if the weather and propagation are good they may stay a further day to concentrate on RTTY. All QSLs will be via the bureau or direct to **VA2SG, 3372 Des Orchidees, Saguenay Jonquiere, QC G7S 6B9, Canada.**

On the same weekend, in Florida, **Ron Larson W9QGB** and **Wilson Smith W7GAM** together with other members of the **St. Augustine Amateur Radio Society** will operate as **N4AUG** from the Talbot Island Group NA-138 about 32km east of downtown Jacksonville. Listen for them on 7 and 14MHz during the contest and QSL via the bureau or direct to **N4AUG, PO Box 860084, St Augustine, FL 32086, USA**. Further details of the IOTA Contest and stations operating in the event can be found at **www.rsgbiota.org**

The Pitcairn Group consists of four islands in the Southern Pacific Ocean named Pitcairn, Henderson, Ducie, and Oeno. They are a *'British overseas territory'* and the last remaining in the Pacific and only the second largest of these Pitcairn OC-044 has anyone living on it. Just 45 inhabitants to be precise!

Until early September, **Tom Dixon ZL2HGR** will operate there in his spare time using PSK and possibly some c.w. as **VP6TD**. Tom works as a prison officer and would like to hear from any other fellow officers who are also Radio Amateurs. You can contact him **C/O 6 Kelly Grove, Upper Hut 5081, New Zealand.**

A group of Russian Amateurs, including **Dmitry Karpov RV3ATS,** will operate on 3.5, 7, 14, 21 and 28MHz as **RV3ATS/P** activating 16 mountains and three regions for the Russian Mountains Award (RMA) and the Russian District Award (RDA) until July 21st. Further details can be found at **www.rv3ats.com** and details of the RMAs at **www.mountain.ru/radio/rma/engl.shtml** and the RDA at **http://rdaward.org/** QSL via RV3ATS through the bureau or direct to **Lineyniy proezd 3-46, Moscow, Russia.**

Scouting Event

News now from **Geoff Pendrick M5GAC** who say's, "As I am sure you all know this year sees the Scout Movement celebrating its Centenary and there will be Jamboree stations operating world wide between July 27th and August 8th. My old Troop had its first camp on the Isle of Arran EU-123, back in 1956 and to celebrate my wife and I are going back in July to set up a special station at Whiting Bay representing my old troop as well as the Scouts on Arran. I will operate as **GB5BBS** daily on 3.5, 7, 14 and 21MHz and look forward to working as many readers as possible." There is an award available from the Scout Movement, which began on January 1st and runs until the end of the year. Details can be found at **www.scouting100award.org/**

Your Reports

Once again, it is the log of **Leighton Smart GW0LBI** in Trelewis, Mid-Glamorgan who starts your reports this month, with 1.8MHz. Calls worked here between 2100 and 0030 include C31LJ (Andorra), OK2SK (Czech Republic), DL3ZM (Germany), AO5AUB (Spain), TM6M (France), RP3W (European Russia) and EV4DP (Belarus) with c.w. and just 5W QRP from a Yaesu FT-100 and a 52m sloping long wire antenna.

On 3.5MHz Leighton used a newly acquired Ten Tec Century 22, kindly given to him by **David Griffiths GW0JUJ**, for more QRP QSOs and lists T95LWO (Bosnia-Herzegovina), SJ30LW (Sweden), LY7M (Lithuania) and other calls from around Europe around 2200UTC.

On 7MHz **Martin Addison 2E0MCA** added a Heil Pro-set Plus to his station and has been very pleased with the reports received so far. He worked IE9/IQ9PA (Italy) on Ustica Island EU-051 at 0610, AO5MB (Spain) a special call for the 32nd Americas Cup at 0619, OK1AY Czech republic) 0634, DL0LP (Germany) 0835, OZ0JX (Denmark) on Falstar Island EU-029 at 1001 and ON4HIL (Belgium) 1912UTC made his log using a Yaesu FT-840 and folded half-size G5RV.

The 10 & 14MHz Bands

On 14MHz, **Peter Leng G0SVO,** Gosberton, Lincolnshire caught 5T5JA (Mauritania) tuning up at 1953, worked him and settled back to listen in to the huge pile-up that followed, EN62EN (Ukraine) a special call marking the end of the Second World War at 2000 QSL via UR4EYN, 4L4CC (Georgia) 2026 QSL via RV1CC, 5Z4ES (Kenya) 2037 and ZP8VAO (Paraguay) at 2056UTC using a Yaesu FT-1000MP Mark V at 100W to a G5RV.

Martyn Medcalf M3VAM, Chelmsford, Essex used his Icom IC-746 at 10W to a long wire antenna with SGC-237 auto tuner,

once again listing s.s.b. stations 9H5DH (Malta) EU-023 at 1006, 5C5Z (Morocco) 1112, IT9RBU (Italy) 1143, K3LR (U.S.A.) Tim in West Middlesex, Pennsylvania at 1225, ZA/UT7DW (Albania) 1341, OM3LA (Slovak Republic) 1409 and ZB2/4O3AL (Gibraltar) 1751UTC.

New reporter, **Lee Carberry M0HOK,** in Stockton-on-Tees has been using his Yaesu FT-817ND and a simple dipole cut for the band and running East/West at around 3m in height. He is doing well with PSK31 at 5W working KP4DS (Puerto Rico) NA-099, N4CI (U.S.A.) Scott in Warner Robbins, Georgia, VE3NOO (Canada) Mike in Bath, Ontario, EK3GM (Armenia), OK2ZU (Czech Republic) as well as calls in Belgium, Germany, Italy, Portugal, Spain and Russia around 2100UTC.

Lee say's "My dipole is not running in the best direction but it works! It just goes to show that with simple equipment there are ways of making contacts even at this stage of the solar cycle so I am now trying to see just how I can reduce my power and still have a QSO." Incidentally, Lee won his subscription to *PW* in a raffle on the **Southgate Amateur Radio Club's** website.

In Biggleswade, Bedfordshire **Owen Williams G0PHY** used a Yaesu FT-747 and 100W to an inverted 'L' antenna working s.s.b. station OX/NA1SA (Greenland) NA-018 at 1350, NN7ZZ (USA) The West Lee Contest Club in Mendon Utah at 1705, YW3AJ (Venezuela) 2023 and 5H0RS (Tanzania) at 2054UTC.

Also on the band in Worcester Park, Surrey was **Eric Masters G0KRT** who used a Kenwood TS-570DG with SGC-230 tuner and 5W QRP to a W3EDP antenna working DL9CE (Germany) at 1847UTC, while a change to 10MHz found Italian station IK3VUT at 1804UTC again using low power.

Also on the 10MHz band and on the Isle of Sheppy in Kent, was **Ted Trowell G2HKU** who describes the band as "very poor with the odd opening in the evenings." He managed c.w. contacts with CX7CO (Uruguay) QSL via KA5TUF, 8P9NX (Barbados) NA-021, PY7RP (Brazil) and 9H3RT (Malta) around 2100UTC using his Ten Tec Omni V and 100W to a G5RV.

The 18 & 21MHz Bands

In Athens, Greece, **Panos Dadis SV1GRN** repaired a damaged vertical antenna and added a trap for the 18MHz band with help from **Christos Nikolaou SV1EIA**. It works well and OD5NH (Lebanon) 0721, M3ROJ 1931, 5H3RK (Tanzania) 2001 and PY2OMS (Brazil) all made his s.s.b. log.

Owen G0PHY logged 4L4FK (Georgia) 1007 and later 9U0VB (Burundi) at 1820 while Peter G0SVO worked JR1BLX (Japan) AS-007 in Hitachinaka City, Ibaraki at 1056, 7X4AN (Algeria) 1813 and PY2DV (Brazil) at 1821UTC.

Jim Pedley GM7TUD worked TI8II on 18MHz and HV0A on 21MHz.

North of the border, **Jim Pedley GM7TUD,** Dumfries used a Kenwood TS-450S, Cushcraft MA5B beam and 100W working s.s.b. calls EY7AD (Tajikistan) 0915, XU7TZG (Cambodia) 1530, TI8II (Costa Rica) and EA9BW (Ceuta & Melilla) at 2007UTC. The 21MHz band provided HV0A (Vatican) 1448, 9U0VB (Burundi) 1647 QSL via UA4WHX, ST100S (Sudan) 1700UTC finding the band 'quite lively' for a change.

"Never give up on a QSL card" says *PW* reader **Colin Evans GW0IRP**, Caerau Maesteg, Mid-Glamorgan who was pleased to receive a card from JA7YFH for a c.w. QSO they had on 21MHz 18 years ago! (*Is this a record delay? **Editor***) He uses the same transceiver, a Yaesu FT-101E, which must be 30 years old now and is still going strong. In that time, Colin has only changed the valves and driver once. His antenna is now a vertical for 14, 21 and 28MHz and regularly works Stateside, despite the poor conditions to be found at the moment.

Back in Greece, Panos SV1GRN logged 9Q1D (Zaire) 1001, 9U0VB (Burundi) 1503 QSL via UA4WHX and 5Z4KI (Kenya) at 1710 while Eric G0KRT found IW0GXY (Italy) at 1605 and a c.w. QSO with EA8MQ (Canary Islands) AF-004 at 1651UTC.

Signing Off

Well, that's about it for another month and many thanks to all our reporters for their logs. Please note that any correspondence to me should be addressed to the *PW* offices until further notice, though E-mail should still be good!

As usual, my thanks also goes to **Mauro Pregliasco I1JQJ** and **Valeria Pregliasco IK1ADH** editors of the *425 DX News Bulletin* and **Tedd Mirgliotta KB8NW** editor of the *Ohio/Penn DX Bulletin* for all the DX information. Until next time, have a good DX-filled month. **73, Carl GW0VSW**

75 Years Celebrations

History of the h.f. Operating during the 1930s

In the early 1930s, **Dr Hidetsugu Yagi** and his assistant **Dr Shintaro Uda** of Tohoku Imperial University in Japan developed a new simple directional antenna for short waves made of parallel segments, supported by a boom and placed horizontally above the ground. This gave high performance for its size and a few years later the design was patented as a 'YAGI.

1933 - Astatic Crystal Microphones were introduced and, up until this time, there were at least 1,200 companies producing radios of some kind. The June issue of *QST* magazine announced the start of the 'first' International Field Day activity.

1936 - Edwin H. Armstrong wrote a paper on Frequency Modulation and his analysis of a noise free 'high fidelity' system is the basis of our f.m. broadcasts today.

1937 - The ARRL introduces its now famous DXCC Award programme to encourage Amateurs to contact at least 100 DX stations on the then new list of entities. It was discontinued during the Second World War and started again when the war ended. On July 20th, after more than 40 years in the wireless industry, **Guglielmo Marconi** died in Bezzi-Scali, near Rome, Italy. He was 62 years old and in a tribute that has never been repeated, wireless stations worldwide shut down for one minute and the airwaves became as quiet as it was before his birth.

1939 - **Clarence C. Moore W9LZX**, helped a South American missionary station, HCJB in Equador by designing an antenna that did not discharge from its end elements. The station had used a huge four element parasitic high-*Q* beam antenna at their 10kW, 25 meter station. The effect of operating the beam in the thin evening air of Quito at 10,000 feet caused gigantic coronas to discharge from the tips of the driven element and directors causing the ends of the antenna to drip molten metal. Moore designed an antenna with no ends that could discharge by designing a folded dipole with the loop pulled open. This loop later evolved into the cubical quad antenna.

In Vision

Graham G8EMX has the latest ATV news for your enjoyment.

Graham Hankins G8EMX
84 Shirley Road
Acocks Green
Birmingham B27 7NA
E-mail: g8emx@tiscali.co.uk

A question posted on the **British Amateur Television Club**'s (BATC) website **(http://www.batc.org.uk)** gave me the theme for this month's column, the member asked about an ATV transmitter that was produced in 1984. So, I thought I'd take a look back at how ATV and the BATC has changed over the years.

Issue 1 of the BATC's magazine, *CQ-TV*, was published in October 1949 'for all hams interested in Amateur television transmissions' stated that first front cover. Amateur television was only on 70cm (430-440MHz) and devotees had to be determined, practical and inventive. Nothing except basic materials and components could be bought, wire spiralled around a wooden frame made the helical antenna, producing a circular polarisation, which was an advantage where alignment between transmit and receive antennas could not be closely controlled. Transmitter and receiver circuitry was fairly straightforward, using valves and high voltages, of course, but some experimentation and design had to be given to a wide bandwidth, particularly in the power and tuner stages.

The tricky bit was how does an Amateur generate a picture? Cameras were unknown outside of broadcasting and these were fairly enormous objects.

Of course, most Amateurs didn't produce a moving picture but could transmit a static caption in vision, by building a 'Flying Spot Scanner'. A very bright cathode ray tube just showing a scanned raster would illuminate a transparent slide carrying the caption or image. This was focussed onto a photo-cell and converted into a transmittable electrical signal.

However, the really dedicated ATV experimenters did build their own cameras. There were two big challenges here; producing an acceptable definition and achieving a reasonably linear scan. The principle of the cathode ray tube in reverse produces a camera tube; the Vidicon, the Plumbicon and other variants.

In simplified terms, you would focus an image onto the tube face, scan that image with an electron beam, extract the varying signal as your video. Then you were faced with the first challenge – definition. To deal with this, first find a good enough lens and a new(ish) tube, follow them by sensitive wide-band video amplifiers (the tube output is quite small) and there will be a television output

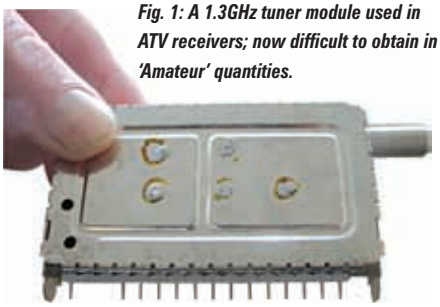

Fig. 1: A 1.3GHz tuner module used in ATV receivers; now difficult to obtain in 'Amateur' quantities.

from your camera.

To meet the second challenge – the scan, the television amateur was winding coils again. If you can still find a tubed television set, the scan coil system has been computer designed and automatically wound. No such luxuries for ATV!

To make matters worse two coils are needed, for horizontal and vertical deflection, also some scanning power in the form of carefully controlled current, not voltage. But the television Amateurs of the time met those goals and were rewarded with a sense of achievement, probably not available today. Life did eventually get easier for Amateur television; small cameras began to appear in the industrial world then inevitably into rallies, anybody remember the Pye Lynx?

New Challenges

New challenges always came along and the 430MHz band was becoming difficult for ATV. Already down to only 432-440MHz, these 8MHz were increasingly being populated by packet radio channels and voice repeaters, so the next step for ATV was the move up from u.h.f. to microwaves.

In 1984, the **Worthing Repeater Group** produced the Solent 1.3GHz transmitter and the first 24cm ATV repeater came on air – **GB3GV** – in Leicester. These were optimistic times; repeaters grew, the BATC's magazine *CQ-TV* changed from the pocket sized A5 to the larger A4 size and carried advertisements for transmitters, receivers and antennas. The club's annual rallies attracted large numbers at popular venues such as Harlaxton, Rugby and Bletchley Park.

So, does holding onto that optimism become the next challenge for ATV? The February 2007 edition of *CQ-TV* carried no advertisements for transmitters, receivers or antennae and as at May 25th, there were no outstanding ATV repeater applications in the system, stated BATC's Repeater Liaison Office **Graham Shirville G3VZV**.

As reported previously in this column, some existing units have closed due to failing interest and/or finance and it is said that there are fewer Radio Amateurs branching into ATV. After all, when pictures can be exchanged all over the world by the Internet or the mobile telephone, some say, why bother with ATV?

Surely this is not the point though? The generation and modulation of a radio frequency carrier to put your own 'television station' on air is an exciting opportunity available to the Radio Amateur. So, why not have a go? You could take part in The International ATV Contest, which takes place over the weekend of September 8th and 9th so, come on, let's have you all on those hilltops!

Graham G8EMX

75 Years Celebration

Looking Back - the 1930s

In the 1930s, the BBC was a wireless broadcaster. The nation huddled together at the the wonder of sounds coming from a box; the music, the news and comedy on the Home Service. Lord Reith, first Director General, insisted that male radio announcers wore bow ties and the ladies evening dresses.

Meanwhile, in his small room a few years earlier, a Scotsman, John Logie Baird, had been shining a bright light onto the head of a dummy, while a spinning disc with a spiral of holes fed the light sequentially onto a photo-electric sensor. Across the room, a lamp responded to the sensor's signal and its light passed through an identical spinning disc, to produce a flickering image on the white screen. The flickering image was recogniseable as the 'face' of the dummy.

Baird 'lobbied' the BBC for broadcast time and in 1930, the Corporation transmitted the first television play. The mechanical system worked but definition was poor, not very bright and the mechanics involved in rotating the two discs at identical speeds and positions was considerable. By 1934, electronic scanning with far more lines was being developed, rendering all forms of mechanical 'television' obsolete and in 1936 the BBC adopted the Marconi-EMI 405 line high resolution service.

Television captured the public and, in 1939, the BBC mounted its first outside broadcast, enabling the nation to witness together the Coronation of King George VI. The BBC's then single television channel continued to inform and entertain up to 1939, when, in the middle of a Mickey Mouse cartoon, the TV service was suspended with the outbreak of the Second World War. Anecdotally, it's claimed that when the service resumed after hostilities, the cartoon was shown from the point at which it had been cut off.

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Introduction

The 1930s – From The Birth of *Practical Wireless* & Onwards!

Rob Mannion G3XFD, the present Editor of *PW* introduces the 16-page section covering the 1930s period. It was an era that saw the introduction of *PW* itself and much development.

The Editorial team – **Donna Vincent G7TZB/M3TZB**, **Tex Swann G1TEX/M3NGS** and I – have found the work associated with preparing the 16-page historical articles and news section to be absolutely fascinating. In fact, I've found it becoming increasing interesting the farther we've ventured into the past! After we have finished our work the really difficult bit starts as **Steve Hunt**, our Art Editor, has to carefully scan in ancient pages to try and re-create the flavour of the chosen decade.

During 2006, with the help of the team, I spent many weeks planning the 2007 issues and the job proved to be very difficult, especially this section! The difficulties were due to the fact that there was much interesting material, which left me with the onerous task, "What must we include, to accurately represent the magazine contents of the period?" However, I think that this month's Looking Back section will prove to be the highlight 'decade' and the selection of news items and other snippets are directly due to Donna G7TZB's efforts. Well done Donna!

First Ever Editorial

The very first editorial to appear in *PW* – obviously prepared by the founding Editor **Fred Camm** himself – could not possibly foresee just how successful the magazine was to be. Even Mr Camm – although he may have already had the ideas for future titles – probably didn't realise just how many 'Practical' magazine titles there would be by the 1950s.

My Two-Valve Superhet

The two-valved superhet design – published using Fred Camm's name as the author – must have seemed a real triumph for *PW* readers at the time. Superhets were (and still are) very difficult to build using so few valves (or semiconductors for that matter!). I speak from experience, as in the past I have tried (unsuccessfully) to build superhet designs using the minimum number of valves, combined with reflexing.

None of my projects were successful, although I have made simple superhet (with a one transistor self-oscillating mixer front end) using the ZN414 integrated circuit as an intermediate frequency (i f.) and audio frequency) a f.) amplifier/output. However, by using a ready-made intermediate frequency stage (the ZN414) I suppose it could be counted as cheating!

Finally, though, I'm left wondering if Fred Camm really did design and build the two-valved superhet himself? I often come up with ideas for article and projects myself but the reality of the situation is that I have to pass them on to specialists authors who can produce what's required for *PW*. Perhaps F. J. Camm had to do the same himself?

Wireless In The Car

The feature entitled Wireless in the Car proves to me that there's nothing new under the Sun! And when this article is combined with the news story about American radio-equipped taxis that Donna G7TZB chose for publication in Looking Back, I'm left with a strong conviction that what we conceive to be modern problems are in fact old problems in a modern setting.

When you read the item about taxis and the their built-in radio equipment, I've no doubt many readers will see the parallel to the 'mobile 'phone in the car' debate that's so much in the news in 2007!

Television For All

The Television For All article (in my opinion), is a truly remarkable 'look in to the future'. I suggest this because when we bear in mind that even though the television service in the UK was in its infancy, and the national service would begin until the early 1950s, it's obvious that many clever minds were already thinking ahead to the problems that would have to be overcome. Even the future use of relay stations is foreseen (although not specifically mentioned) as the author discusses the 'shadow' effects that would be encountered by hillsides.

The v.h.f. Band I service officially only served London before 1939 but it's thanks to the long distance 'viewers' (one term common in those days was 'lookers in'!) that v.h.f. propagation anomalies were soon discovered. I wish I had been present during the time that the first Alexandra Palace sound transmissions had been picked up in Australia – the looks on the listener's faces would have made a memorable photograph!

Everyone on the *PW* team hopes you enjoy this selection from *PW*'s past as much as we did in preparing it for you.

Rob Mannion G3XFD

1930 – 1939

July 13th, 1935
My Two-Valve Superhet
Full constructional details of the most novel and ingenious receiver ever placed before home constructors by F J Camm.

June 1st, 1935
25 Years of Radio Progress
At the time of the King's Silver Jubilee it is interesting to review the progress made by radio during his Reign.

Looking Back
1930-1939
Snippets from the *Practical Wireless* archives.

July 13th, 1935
Readers Wrinkles
A page of practical hints – the Half Guinea page.

April 20th, 1935
Television for All
Republished from the weekly edition of *Practical Wireless* by H J Barton Chapple.

July 6th, 1935
Wireless in the Car
Some precautions to be taken when fitting radio to the car.

Coming Next Month
Join the *PW* team as we take a trip back to the first ever *Practical Wireless* with selected highlights from the September 24th, 1932 issue.

Practically Yours

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Coming up during 2007

- January Issue: 2000 - 2006
- February Issue: 1990 - 1999
- March Issue: 1980 - 1989
- April Issue: 1970 - 1979
- May Issue: 1960 - 1969
- June Issue: 1950 - 1959
- July Issue: 1940 - 1949
- **August Issue: 1930 - 1939**
- September Issue: *PW* Launch in1932
- October Issue: Pre-*PW* Radio Days
- November Issue: Pre-*PW* Radio Days
- December Issue: Pre-*PW* Radio Days

Every month during this eventful year we take a look back at a decade of radio reading in this special 16-page supplement

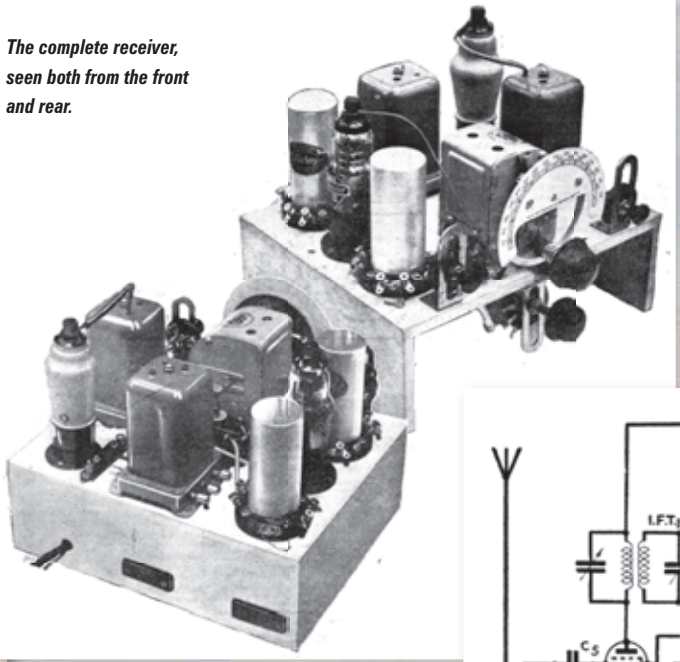
My Two-Valve Superhet

By F.J. Camm

July 1935


My Two-Valve Superhet

First published on July 13th 1935



The complete receiver, seen both from the front and rear.

I explained last week how the superheterodyne feature had been incorporated in a receiver in which the total number of valves had been reduced to only two. It might at first appear that such a scheme could not have the merit of efficiency, but that the principal feature of a receiver embodying such a circuit would be mere novelty.

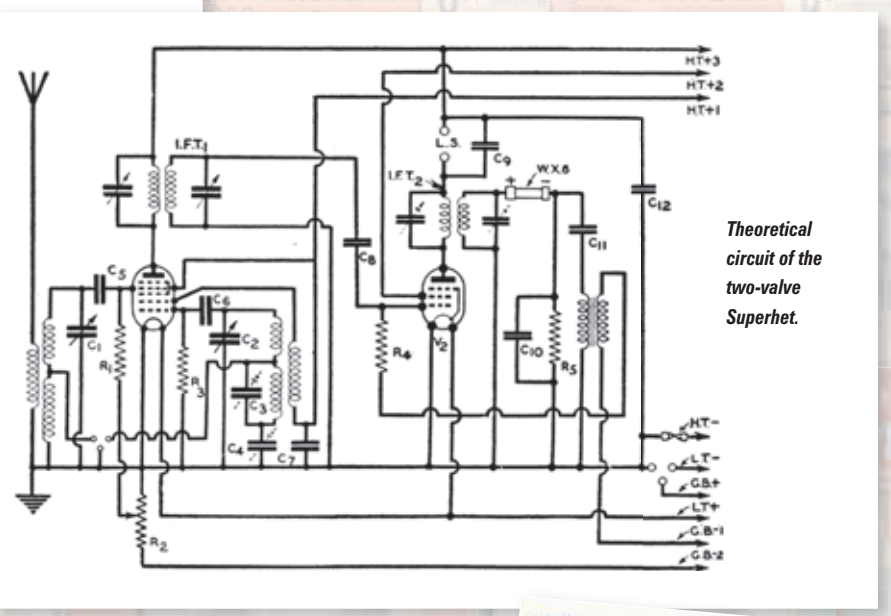
It is not my practice, however, to produce receivers for the home constructor, which are mere novelties, and it will be found that sound theoretical principles are embodied in all the receivers described in these pages. Thus, in the case of my present two-valver the home constructor may be perfectly confident that he has before him a circuit, which will hold its own with any modern receiver. Yet which also has the advantage that the superhet feature which is incorporated gives all the benefits of selectivity which are associated with that feature and at the same time delivers an output on many stations which hitherto could only be expected from twice as many valves.

How It Is Done

It might be thought that some measure of efficiency must naturally be sacrificed to obtain these advantages, but the superhet principle is particularly adaptable to a circuit of the nature of that which I have employed in this two-valve set. Firstly, the main feature of the superhet is the frequency-changer, and the modern pentagrid type of valve carries out this function in a very efficient manner.

Thus you will find a pentagrid filling the first position in this receiver. Associated with it are the input-tuning circuit and the oscillator circuit, the tuning of these two sections being carried out with a two-gang condenser of special design.

The intermediate frequency which has been chosen in this particular case is 465kc/s, and the rear section



Theoretical circuit of the two-valve Superhet.

Full constructional details of the most novel and ingenious receiver ever placed before home constructors.

of the two-gang condenser has specially-shaped vanes to enable the tracking of the two circuits to be maintained at the correct interval.

To avoid complications, I have decided against the use of an input band-pass circuit, and in addition to a simplification of adjustment, there is a consequent saving in cost. The performance does not suffer, as the selectivity is ample for all normal requirements, and except in certain parts of the country there will be no troubles from second-channel interference and similar effects which arise from a heavily-loaded input circuit.

The IF transformers are of the 465kc/s type, and are provided with trimmers, but a fixed coupling. Again, the selection of components has been made with a view to delivering the most useful balance of selectivity and signal strength, and readers should not assume – because the components are not identical with those used in the £5 Superhet Three – that it is possible to use those parts.

The intermediate-frequency in the two receivers is different and has been modified for very good reasons, and disappointment will result if any substitution is made in the list of components, which are specified for this receiver.

The Reflex Valve

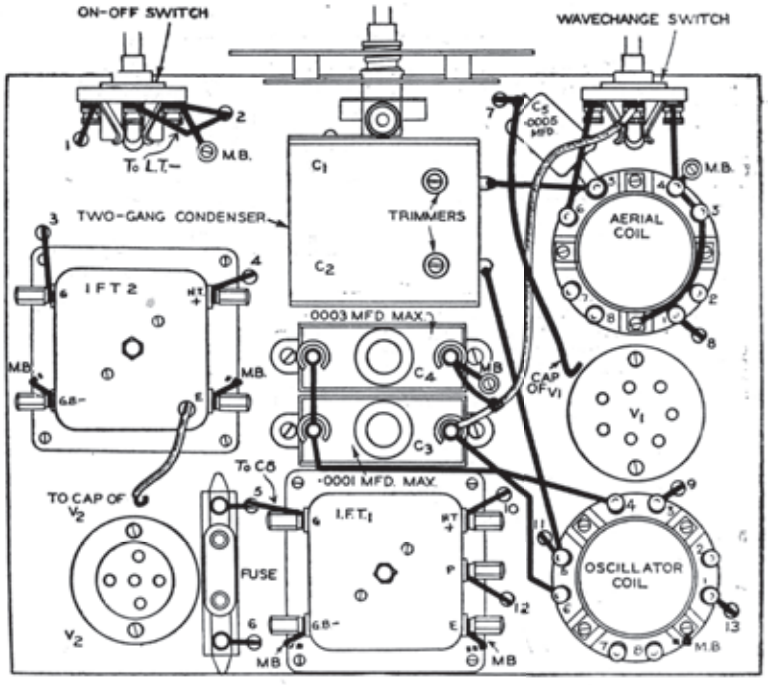
The second valve performs a dual function, and great care must be taken to wire your receiver on the same lines as indicated in the wiring diagram on page 468. The receiver is built, in accordance with my usual custom, on a metallised wooden chassis, and this measures only 10in. Long by 8in. deep.

The components are not actually crowded on this, but they are very compactly arranged, and, therefore, to avoid difficulties when wiring is being carried out I recommend that you place all the components in position, following the wiring diagram just referred to, and mark the position of all screw-fixing holes and those holes through which wires pass. Alternatively, you may obtain a full-size blueprint from our Blueprint Department for 1s., and use this to prick off the holes just referred to.

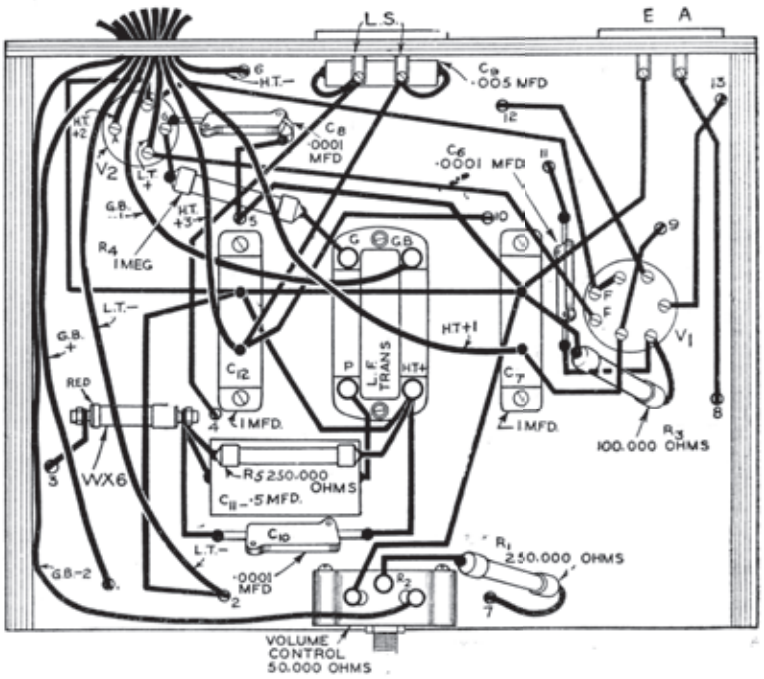
A hole one-eighth of an inch in diameter is ample for the inter-connecting wires, and the various screws may be easily started if a fairly deep hole is made in the wood with a bradawl. You will find it easier to attach the parts on the underside of the chassis first, as the chassis will rest firmly on the workbench or table for this purpose. Then attach the valve-holders, taking particular care with the 7-pin holder, as the arrangement of the pins is not very clear when first examined.

Note that the two filament pins, which are situated close together at one end, must be toward the centre of the chassis. The holes for the valve-holders should be cut with an ordinary brace and bit, unless you obtain a chassis already drilled, and for V1 the hole should be 1⅛in. in diameter, and for V2 a 1in. hole will suffice.

When screwing the valve-holders to the chassis make quite certain that the upper part of the valve sockets is clear of the metallised surface on tip of the chassis. Quite a number of receivers have been received here for examination in which the only trouble was due to a short-circuit arising from this apparently small point.



Top and Sub-Chassis Wiring of Mr. F.J. Camm's two-Valve Superhet.



A Full Size Blueprint may be obtained, price 1/-. Ask for Blueprint No. P.W. 52.

Note: *We no longer have copies of this blueprint.* ***Editor***

Wiring

The rear terminal strips should be mounted, either by drilling small holes to accommodate the individual sockets, or cutting a slot into which the two sockets on each strip will pass. A warning should here be given regarding the mounting of the bracket on the underside of the chassis. This must definitely not come into contact with the metallised coating and therefore short screws must be used when attaching it. If you have a meter and battery handy it will be as well to check this point before mounting the volume control.

Carry out the wiring with fairly stiff wire, either of the insulated variety or bare wire. Ordinary tinned copper is very

convenient and may be soldered from one point to another and then cut off, resulting in a very neat appearance. There is a risk, of course, of a short-circuit being introduced unless care is taken to arrange all wires in such a manner that none can touch, On the other hand, insulated sleeving may be slipped over the wires as they are put into position. It should be noted that the tubular condensers and fixed resistances are held in position by their own wire ends.

The Battery Leads

For the battery leads you may use either one of the commercial ready-made assemblies, or ordinary red and black flex with the wander plugs, which are specified in the list of components below. A hole is drilled in the rear chassis strip and the leads are passed through this. They will naturally be a bit straggly inside the receiver, but they may be anchored, if desired, at various pints by means of cotton.

In general, there will be no ill-effects arising from the battery leads, although they may pass other wiring, but they should not be permitted to wander all over the set. To prevent them from being pulled adrift, a knot may be tied in the cords inside the chassis, or a small cleat may be attached to the wood where they pass out through the rear strip. In the latter case, take the precaution of inserting a piece of fibre or other insulating material between the wire and the cleat to avoid risk of damage due to the edges of the cleat cutting through the insulation of the wires.

Testing Out

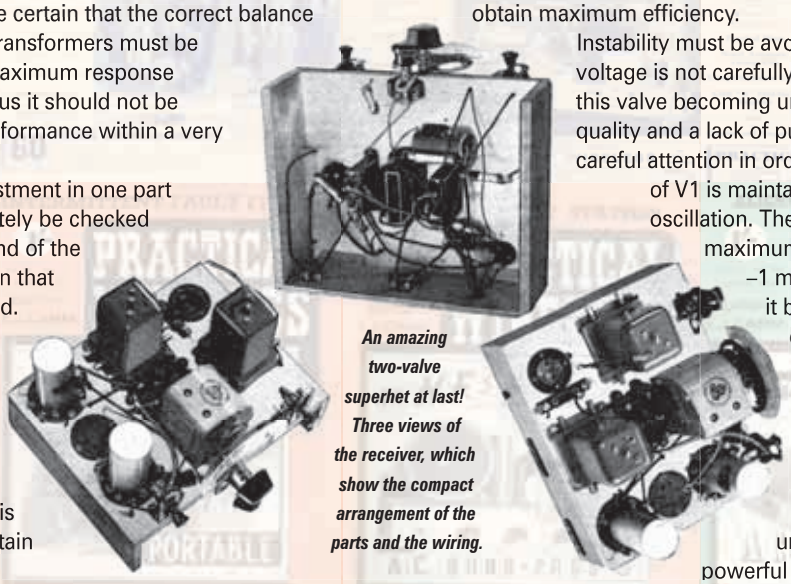
The operating details of the receiver are exactly similar to those of the £5 Superhet. There are only two trimmers to worry about on the gang condenser, and the correct positions for these may be obtained by tuning in any station and adjusting for the loudest results.

As usual take stations at opposite ends of the medium-wave tuning scale in order to make certain that the correct balance has been obtained. The I.F. transformers must be trimmed to give the same maximum response throughout the scale, and thus it should not be difficult to obtain a good performance within a very short space of time.

Remember that any adjustment in one part of the scale should immediately be checked by turning to the opposite end of the scale in order to make certain that a balance is being maintained. If a loud signal is obtained, reduce volume by means of the volume control and work always throughout the trimming operations with the faintest signal, which can be obtained. In this way you are much more certain of obtaining correct results.

On the long waves the only additional adjustment is that of the pre-set condensers C3 and C4. These are adjusted to produce maximum volume on any long-wave station, and in general it will be found that C3 should be set to approximately a midway position, whilst C4 is adjusted for the best position. A slight re-adjustment of C3 may then be made. Do not be tempted to use any gang condenser other than that specified as you will probably find that in so doing it will be impossible to obtain a matching of the tuned circuits throughout the entire medium and long-wave band.

Some little experiment should be carried out with each individual receiver in order to find the optimum values of HT and grid bias. As a guide it will probably be found that 120 to 150 volts for HT3 and 60 to 80 volts for HT2 will give good results, but the latter voltage especially may be found quite critical in order to obtain maximum efficiency.



An amazing two-valve superhet at last! Three views of the receiver, which show the compact arrangement of the parts and the wiring.

Instability must be avoided in the IF valve, and if the voltage is not carefully chosen there will be a risk of this valve becoming unstable with a deterioration in quality and a lack of punch. HT1 should also receive careful attention in order that the oscillator section of V1 is maintained at a suitable degree of oscillation. The GB –2 supply should be the maximum, namely 9 volts, whilst GB –1 must be adjusted for quality as it biases the output valve. When once the correct voltages have been ascertained they will not require modification unless the valves are changed or the batteries are replaced.

A fairly good aerial should be used with the receiver unless you are situated close to a powerful BBC station. In the latter case, if you wish to obtain good reception of long-distance stations it will be worth while to experiment with a good aerial arranged in different schemes in order to avoid swamping by the local station.

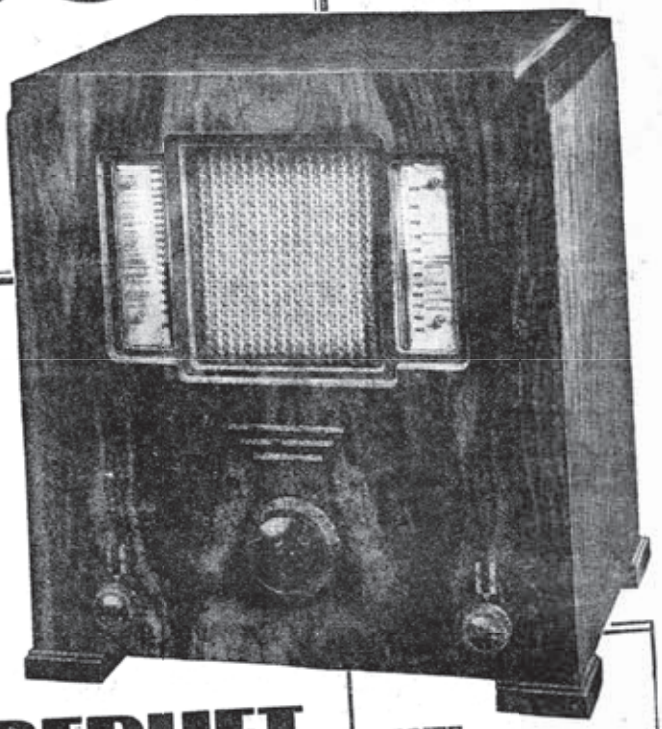
Particular care should be taken not to make the aerial directional on the local station, otherwise it will be found difficult to eliminate whistles on practically every station. If no alternative position can be found for the aerial, then an indoor arrangement should be adopted, and it may easily be found that just as good results are obtainable with a carefully chosen layout, even although the volume on certain distant stations may not be quite so good.

List of Components

Two Coils, Type BP80 and BP87 (Varley).
Two-gang superhet condenser, 465kcs., C1, C2 (J.B.).
Two IF transformers, Type 465 kc. (Wearite).
One LF Transformer (BTS).
Eight fixed condensers: three .0001mfd., C6, C8, C10, Type M; one .0005 mfd., C5, Type M; one .005 mfd., C9, Type 300; one 0.5 mfd., C11, Type 250; two 1mfd., C7, C12, Type 65 (T.C.C.).
Two pre-set condensers: .0003 mfd., C4, and .0001 mfd., C3 (Ward and Goldstone).
Four fixed resistances: one 100,000 ohms. R3; two 250,000 ohms, R1, R5; one 1 megohm, R4 (Dubilier).
One 50,000 ohms R2 potentiometer, VC36 (Bulgin).
One WX6 Westector (Westinghouse).
Two valveholders, one 7-pin, one 4-pin (Clix).
Two terminal strips, LS And AE (Belling Lee).
Two three-point switches, S36 (Bulgin).
Seven wander plugs: HT1, HT2, HT3, HT–, GB–1, GB–2 (Belling Lee).
Two spades, LT–, LT+ (Belling Lee).
Three component brackets (BTS).
One fuse, 60 m.a. (Microfuse).
Two valves, 210 PG, 210 SPT (Cossor).
Metaplex chassis, 10in. By 8in. By 3in. (Peto-Scott).
One 120 volt HT battery (Drydex).
One 9-volt GB Battery (Drydex).
One Stentorian loud-speaker (WB).

May 1935

COSSOR 1935 RADIO



MODEL 364

A NEW A.C. Mains SUPERHET

REPRESENTING SUPREME VALUE

The selectivity of Cossor Model 364 is remarkable. Stations on nearby wavelengths can be separated with ease and due to a special compensated Anti-Fading circuit, held at even volume. Another important feature is the new "Thermometer" tuning—an exclusive Cossor development. All the station names are instantly visible. A rising or falling column shows immediately the name of the station being received. Only the wave band actually in use is illuminated. Ask your dealer to let you examine this remarkable Cossor Superhet.

ANTI-FADING CIRCUIT
•
HIGH SLOPE PENTODE OUTPUT
•
DIODE DETECTION
•

"THERMOMETER TUNING"

BRIEF SPECIFICATION:—

As illustrated with Pentagrid frequency changer, I.F. Amplifier, Double Diode Detector, High Slope Pen. Output, Full Wave Rect. "Thermometer" Twin Scales. Four-way combined On/Off, Wavechange and Pick-up Switch, Vol. Control, Mains Energised M.C. Speaker. Complete with plug and sockets for extension speaker and for pick-up. For A.C. Mains only 200/250 volts (adjust.) 40/100 cycles.

11 GNS.

Hire Purchase Terms: 20/- deposit and 12 monthly payments of 20/-.

Prices do not apply in I.F.S.

To A. C. COSSOR LTD., Melody Dept., Highbury Grove, London, N.5.

Please send me, free of charge, a copy of Folder L143, which gives full details of the new Cossor Super Heterodyne Receiver, Model 364.

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L.143

THIS COUPON BRINGS FULL DETAILS

25 Years of Radio Progress

Editorial note: This double-page feature originally appeared in the June 1st issue of *Practical & Amateur Wireless* (*PW* had absorbed *Amateur Wireless* magazine during this period).

When one reviews the modern marvels of the age, surely one is forced to admit that none has made such tremendous strides in development as the science of radio or, as it is more commonly called, 'wireless'. When we compare the motor-bus of to-day with that of 1910, or the aeroplane of that time with the luxury air liner of these days we admit that marvellous changes have been brought about in twenty-five years but if we go back to 1910 and examine the wireless position of that time, what do we find? Broadcasting unheard of and not even envisaged.

Marconi, who was in that year on a voyage to Buenos Aires on the SS Princepessa Mafaldu, was able to pick up signals sent from Clifden in Ireland over a distance of 4,000 miles in daylight and 6,735 miles at night. This was, of course, with what might be termed 'laboratory apparatus' and the distance created a record and once more revealed the startling effects of the radio signals. By signals is meant the dots and dashes of the Morse code, for at this time it had not been found practicable to transmit the human voice, although experiments carried out in secret had shown that it might be possible when more was understood of the nature of the radio-frequency oscillations.

1910 Thus in 1910 we find that wireless telephony (and naturally the transmission of music by wireless) was not an accomplished fact and that a distance of 4,000 miles for code signals was a record. What was the apparatus like in these days? In general, the crystal detector was in use, although the Fleming valve was being experimented with in complete receivers, and such receivers were being used by the Marconi Company with great success.

The magnetic detector was still in existence, and receivers presented a most frightful appearance, with their array of switch studs and arms. Certain ships had been fitted (from an experimental point of view) with wireless apparatus, and it will be remembered that in this year the first real proof of the value of wireless was furnished to the world with the arrest of the notorious murderer Crippen, who was found on a ship going to America, and the captain of the ship sent a wireless message to the authorities which enabled them to take a faster ship to New York and there to arrest Crippen before he landed.

In this year the first wireless shipping report was published at Lloyds, thus forging another link in the chain, which was establishing radio, as one of the worlds everyday needs.

1911 In the following year the Admiralty interest in the possibilities of radio led them to have a station built in Whitehall. The power of this station was 14kW, and during the same year an army airship took aloft a transmitter and was able to establish communication up to a distance of thirty miles.

In America things were going ahead rather more rapidly, but the world was, in general, taking a much greater interest in the subject, principally owing to the saving of life at sea due to help being received as a result of a wireless call.

1912 This latter use of radio was stressed still more forcibly in 1912, when the *Titanic* struck an iceberg and was able to send for help before finally foundering. In this year a transmitting set designed especially for aircraft was perfected and fitted to military aeroplanes, and in June a seaplane so fitted was able to transmit over a distance to ten miles.

Greater distances were being accomplished by land stations, and it was becoming increasingly evident that there was a future for communication between

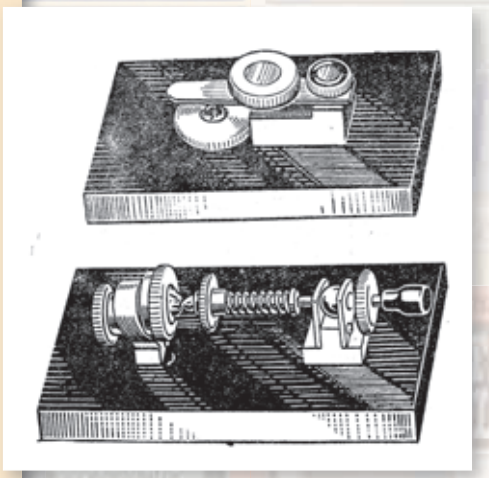


Fig. 1 – Two very early detectors. The upper illustration shows the carborundum detector, in which a flat piece of steel was pressed against a crystal of carborundum. This type of detector was generally employed in conjunction with a small potential, a potentiometer being used in order to vary the applied voltage. The lower picture shows the combination type of detector in which copper pyrites is employed in conjunction with a piece of galena. The pressure applied was a critical factor and thus the small spring holder and milled adjusting knob was provided on one holder.

Fig. 2 – An early army-type tuner. This was designed for use during the early days of the Great War, and employed a flat tuning inductance arranged to tune after the manner of a variometer. Switches were provided to enable the detector and phone to be joined across either the "closed" or the "aerial" circuit.

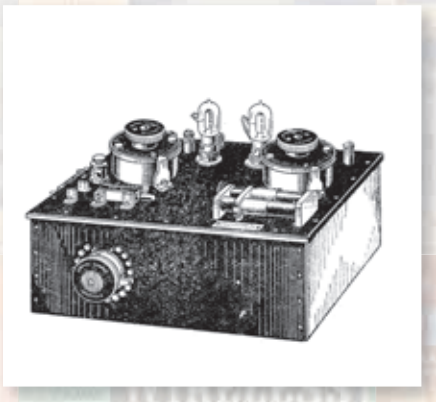


Fig. 3 – In this illustration we see one of the early valve receivers employing two Fleming diode valves. The circuit employed only a single valve, but two were fitted in the interest of reliability, and a switch enabled one or the other to be brought into circuit. Note the massive variable condensers, and compare them with modern components. The dielectric employed in these condensers consisted of plate of thick ebonite, but the components were very efficient.

At the time of the King's Silver Jubilee it is interesting to review the progress made by radio during his Reign. Some interesting details are here given.

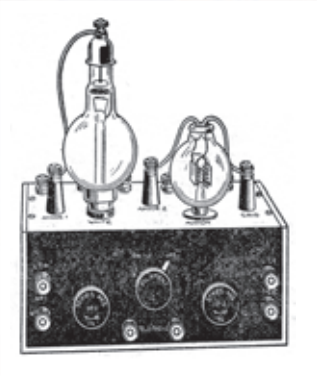


Fig. 4 – An amplifier of 1917. This employed two 'soft' valves in an H.F. and detector circuit, but did not incorporate any tuning arrangements. It was intended for use in conjunction with the Mark III Tuner. The leads coming out from the valve should be noticed, together with the large terminal points for them. It was customary even during recent years to de-cap ordinary standard valves and use them in a similar manner for short-wave work in order to reduce inter-valve capacities.

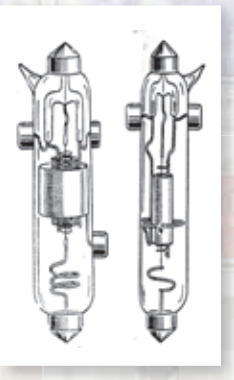
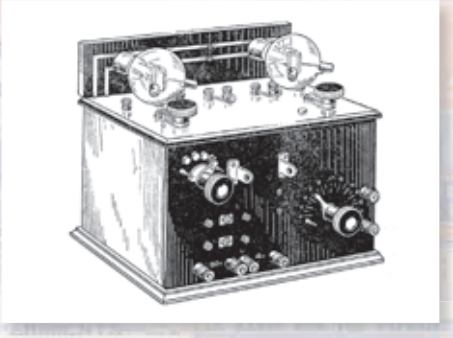


Fig. 7 – Two interesting valves. On the left is the popular V.24, in which the grid and anode leads are taken to opposite ends of the glass container to reduce capacity effects. This valve clipped into a small holder and was not only extremely small, but very efficient. It measured about three inches long by about three-quarters of an inch in diameter. On the right is the first 4-electrode valve, known as the FE.1. There were some novel uses suggested for this valve in 1920, not the least of which was in the construction of a receiver without any high-tension supply.

Fig. 5 – The well-known French 'R' valve. This was extremely popular amongst amateurs immediately after the war, but its performance would be extremely poor compared with modern valves. It formed an ideal detector and was used in its thousands.

Fig. 6 – Here you see a 1918 short-waver. Again anti-capacity valves are being used, and these are the French 'Horn' type, with the grid and anode leads brought out to separate contact points. The term 'Short-wave' only applied, of course, to wave lengths down to 200 metres.



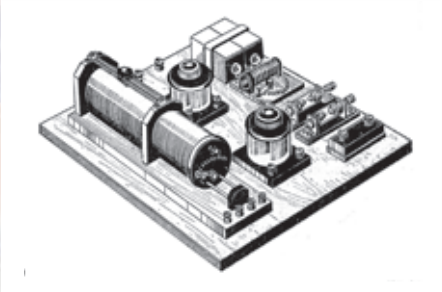


Fig. 8 – A 1922 crystal receiver. There were many good points about the form of tuner here shown. A primary and secondary winding were employed , the primary being tapped at a number of places whilst the secondary was provided with a sliding contact. The adjustment of wavelength could be made by the variable contacts, and the degree of coupling between primary and secondary could be varied by sliding the primary in or out of the secondary.

Fig. 9 – One of the earliest and at the same time one of the most popular loud speakers – the Magnavox. This employed an energised magnet requiring an applied voltage between 6 and 10 and the diaphragm was of the conical type. This was operated by a moving coil and was used on many occasions for public address demonstrations.

one country and another by means of wireless signals.

1913 In 1913 the Government, seeing the importance of the subject, entered with the Marconi Company for the erection of a chain of high-powered stations for Imperial communication. Early in the year the first three-electrode gas-filled valve was developed by a Marconi engineer, and from this point receiver design progressed by leaps and bounds.

Many amateurs were taking up the study of the hobby, and as a result of the growing interest the Radio Society of Great Britain was formed in this year in the interests of such amateurs.

1914 With the arrival of the War, the military development of radio was very marked, and those amateurs who were experimenting at the time will remember that under Government orders the apparatus had to be sealed up and could not be used, in case of communication with the enemy!

Fig. 2 shows the Mark II Long-wave Tuner of these times, and **Fig. 3** is the first valve receiver. In the front may be seen a peculiar form of tuning condenser (known as the Bili), whilst the tapping switch for the tuning coil is visible in the front. Direction-finding stations were erected in France, and, although not to be compared with modern D.F. Apparatus, it was found possible to trace enemy ships.

1915 Owing to the necessity of communication between the various arms of the Service, great strides were now being made in the design and efficiency of apparatus. Communication between aeroplanes and gunners was necessary, and by the end of 1915 600 aeroplanes were fitted for the job, and there was a complete wireless telegraph arm attached to the Royal Engineers.

The three-electrode valve was still further improved, and the first 'reflex' circuit was evolved during this year, in which the valve was employed. Records also show that night-fading was first discovered in this year. A patent was taken out for the push-pull method of L.F. Coupling.

1916-1919 The entire War period may be said to show rapid stages of development. Telephony was adopted in field service sets, the beam method of transmitting was developed from the laboratory to the practical stage and hard valves were being manufactured.

In 1919 the first transmission in this country of speech and music for public reception was carried out from Chelmsford. Unfortunately, this station was closed down by order of the Postmaster-General as it was stated to be interfering with 'legitimate services'.

It was found in 1919 that the self-capacity of a valve was a drawback to good functioning, and as a result the well-known V.24 valve was introduced (Fig. 7). As will be seen from the illustration, the leads were brought out at various points of the glass container.

1920 This year saw broadcast entertainment introduced as a reliable feature, the Chelmsford station again being the source of the transmission. The wavelength used was 2,800 metres, and in June of this year Dame Nellie Melba gave her famous broadcast, Using an ordinary carbon hand microphone with a small wood and paper trumpet round the mike to improve matters. She had to hold it whilst she sang!

The transmission was picked up by a ship at sea over 1,000 miles away. A well-known London daily newspaper had a receiver installed in order to pick up items of news transmitted from Chelmsford and a number of important transmissions of this nature were made during the year.

1921 The P.M.G. Authorised a limited broadcasting service from Writtle with a power not exceeding 200 watts in 1921, and some interesting receivers began to come into existence to pick up these transmissions.

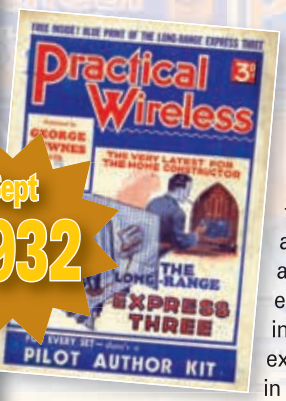
1922 The now historic 2LO came into existence in 1922, and the British Broadcasting Company was formed. Crystal receivers appeared on the market, and one of these is shown in Fig. 8. This was the Apollo and cost £4 10s. with one pair of 'phones. Notice the two crystal detectors which were fitted in the interests of reliability, and the large tuning coil with the sliding primary winding.

Towards the end of the year valve receivers were obtainable the popular Marconi V2, which employed two valves only, but in a reflex circuit, costing £20.

1923 Now that broadcasting had arrived, the strides were really rapid, and it is only possible to indicate some of the interesting developments of the past decade. Looking through old catalogues I find a 5-valve receiver was on sale in 1923 at a price £83 7s 6d.This was fitted with a frame aerial in the interest of selectivity!

Feature

News, Views and Memories from 1930-1939



Sept 1932

September 24th, 1932
The Very First Editorial Introducing Ourselves

Practical Wireless makes its debut in the confident belief that it will receive a hearty welcome from the large and ever-growing circles of wireless enthusiasts, more particularly those interested in home construction and the experimental side of wireless. Although in the brief space of a very few years the knowledge of this fascinating new world of the ether has grown to large proportions, we are still little more than on the threshold of the intriguing possibilities the future holds forth.

Rapid as the advances have been, the near future will bring forth new discoveries, new ideas and new techniques just as certain as day follows night and every wireless enthusiast, if he is to derive full pleasure and interest from his hobby, will require as an absolute necessity that his knowledge be kept right up-to-date.

It will be part of the policy of *Practical Wireless* to keep its readers abreast of everything new. Writers, acknowledged as authorities in various branches of wireless and in touch with every new development will contribute on a every subject that has a practical value to the reader. Skilled designers with many successful sets standing to their credit, will exercise their ingenuity in the design of the new sets combining for the constructor and experimenter the essentials of novelty with efficiency, bearing in mind also the important question of cost. Everything that is news, when tested and proved in its practical worth, will find its way into the pages of *Practical Wireless.*

Oct 1933

October 21st, 1933

Home Construction Holding Its Own

There are many Amateurs who believe that the art of home-construction is dying out. A recent census was taken by a well-known weekly and it shows that no less than 25 per cent of the receivers in uses in 25,000 homes are home-constructed.

A further illuminating fact was that over 50 per cent of receivers in use were not more than two years old, which means to say that home construction is still being pursued with great interest. The advantages of making your own set have often been set out in these pages and it is very gratifying to see that so many listeners take such a keen interest in the hobby and we have played no small part in the fostering of this interest.

February 29th, 1936

Polish Ham Saves Shipwrecked Crew

An experimental amateur in Myslowitz (Poland) recently picked up an SOS call from the Soviet steamer *Lozinski,* which had been wrecked on a reef near the island of Sakhalin. The radio operator had sent out calls for several days but had received no reply. Passing the information over to the post office authorities, the amateur secured help from the Soviet Authorities with the result that the crew and passengers were rescued within a few hours.

May 6th 1939

Wireless Licences

At the end of March the approximate number of wireless receiving licences in force was 8,588,676 at the end of March 1938. The increase since January 1st was 59,700.

Aug 1935

August 17th, 1935

Visit the *Practical and Amateur Wireless* Stand

Mr F. J. Camm and members of the technical staff will be in attendance daily to answer queries, Readers are cordially invited to inspect the special *Practical and Amateur Wireless* receivers, blueprints an books exhibited.

A selection of what was happening between 1930-1939 in the Amateur Radio hobby – how much do you remember?

Sept 1938

September 24th, 1938

Pilot Model BT.530

The illustration given here shows the new five valve all-wave a.c. push button Pilot receiver. This is a superhet with Pilotune control and utilitises octal valves. The most interesting feature is the new Eaziread station scale, calibrated in station names and wavelengths. Six buttons are provided, with the usual manual control and the output is rated at 4W. The price of this model is 12 guineas or 12½ guineas if required for a.c./d.c. use.

November 6th, 1937

Nov 1937

New Police Transmitting Stations

We give on this page an illustration of the control room of the new Metropolitan Police transmitting station recently erected at West Wickham, Kent. Control is exercised from the Information Room at New Scotland Yard, just as effectively as if the station was still operating there, by means of a system of remote control. Apart from the transmitting side of the new building at West Wickham, provision has also been made fro experimental workshops and garage accommodation to enable police cars to be fitted with wireless apparatus.

The control table for the transmitters of the new Police Radio Station at West Wickham, Kent.

May 12th, 1934

Television Apparatus Being Despatched By Aeroplane

A consignment of Cossor cathode-ray tubes and receivers being taken aboard an Imperial Airways air liner at Croydon to fill a rush order on the Continent.

November 19th, 1938

More Novel Uses

We recently mentioned that short wave radio transmitters were being employed in locating harpooned whales and we now hear of another development in this direction. A method has been devised whereby harpooned whales are inflated and small short wave transmitters mounted on the inflated body. This is then left in the water and by this means many more whales may be killed , to be afterwards collected by a special ship, which locates the floating bodies by picking up the signals transmitted from them.

February 5th, 1938

An Amateur Diver

On February 17th the Regional Programme will include a broadcast from an amateur diver who will enter a tank and endeavour to carry out some of the tasks met with by a real salvage man. The tank has an observation window through which a member of the Outside Broadcast department will watch proceedings and add his comments to the performance. Rescue arrangements will be be handy and the broadcast will end with amateur diver – John Snagge – breaking surface and having his helmet unscrewed to tell listeners that all is well.

March 31st, 1934

March 1934

Radio-Belgrade's New Station

A record in the rapid moving of a complete wireless transmitting station was accomplished when the Marconi broadcasting at Belgrade was dismantled, transported to a new site, re-erected and tested within five days at the end of last month. The old Radio-Belgrade was situated in centre of the city and it was decided for technical reasons – particularly to secure a more efficient aerial system – to move the entire transmitting plant into the country.

For this purpose, a site was chosen some time ago at Makis, ten kilometers from Belgrade, where the necessary buildings were erected, together with a new aerial system carried by two 100m insulated steel towers. By working day and night the engineers succeeded in reassembling the station by 9pm on Wednesday February 28th, when the first test transmissions were made from the new site, The transmitter, which was the subject of this rapid and successful removal ia a Marconi type Q of nine kilowatts power. The illustration on this page shows the aerial masts of the new station.

The aerial masts of the new Radio-Belgrade station at Makis, about 10 kilometres from Belgrade.

Nov 1937

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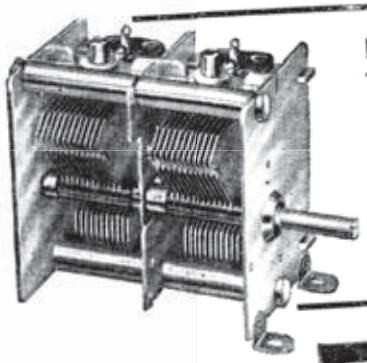

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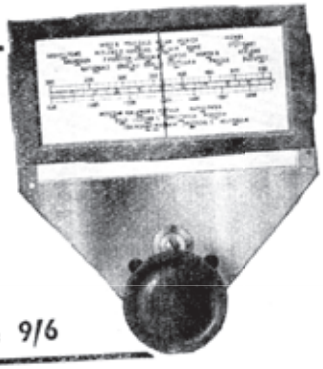

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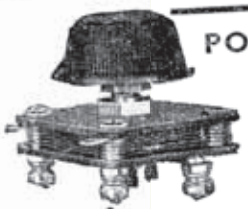

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Feature

A PAGE OF PRACTICAL HINTS

SUBMIT YOUR IDEA — READERS WRINKLES — THE HALF-GUINEA PAGE

Jul 1935

That Dodge of Yours

Every reader of *Practical and Amateur Wireless* must have originated some little dodge, which would interest other readers. Why not pass it on to us? We pay £1-10-0 for the best wrinkle submitted and for every other item published on this page we will pay half-a-guinea. Turn that idea of yours to account by sending it in to us addressed to the Editor.

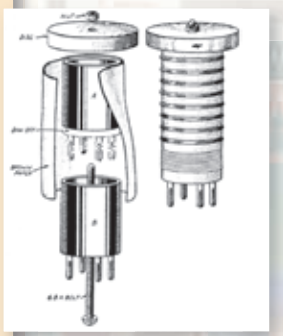
Editorial note and information: The contents of this page were first published on July 13th 1935. The Guinea £1-1s (one pound, one shilling or 21 shillings) is still used in 'up market' action sales and in association with horseracing. Nowadays it's equivalent to £1-5p.

Fashioning 4-pin Coil Formers

For most of the general short wave work done today the 'tube base' type of coil is largely used. Low cost, high band efficiency, small size (with narrow external field) and quick interchange are some or its advantages. Complete coils of this type are and blank 4-pin formers are available at reasonable prices but to the enthusiast who prefers to make his own the following particulars will be helpful.

A 4-pin coil, comprising reaction and grid windings could certainly be wound on a single valve base but the single base has too many limitations for general work and the coils are easily damaged. Here is a better way:

Take two plain bases, A and B. Saw off part of A where shown; drill a centre hole between the pins on B and cut a hardwood disc 1.5in diameter with centre hole. Push a long round-head 6 BA bolt through B, attach part A and disc and align carefully. Fix the nut tightly and glue on three layers of thin brown paper and let the whole set. To wind the coils, remove the nut and disc, afterwards tightly replacing. Cut off surplus part of bold; finish off by painting disc red, blue or green as desired to indicate wave-range of the finished coil in the modern 'colour-coded' style. — F. J. G. (Ellesmere)



A simple and neat method of constructing short wave coil formers from valve bases and brown paper.

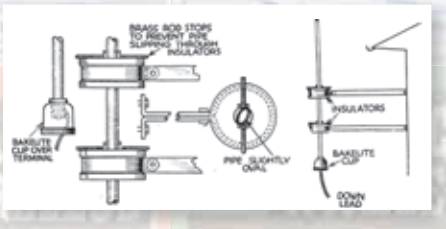
A Vertical Short Wave Aerial

Seeing in the pages of *P & A W* that a vertical aerial often gives good results on the short waves, I obtained an 8ft length of copper pipe from a local plumber and a couple of stand -off insulating brackets, which have the reel type of insulator clamped to them. The brackets should be at least 2ft long and of a substantial nature and also have a fairly large opening in the insulators themselves. The copper pipe is chosen of a thickness, which is a near fit in the opening.

In my case the diameter of the pipe was slightly smaller and I made a proper fit by carefully hammering it to a slight oval shape until there was no play between it and the insulator. To prevent the pipe from falling through the insulators a 3in length of brass rod was put through a small hole drilled in the pipe just above each insulator and secured with a nut on each side, as shown in the illustration.

A small cap should be screwed on both ends and the one at the lower end drilled and fitted with a fair-sized terminal to take the down lead to set. A Bakelite cup from 6d stores clamped under this terminal will serve to protect it from the weather.

The completed aerial should be mounted with the topmost bracket just under the eaves if possible. — D. G. Robotham (Leicester)



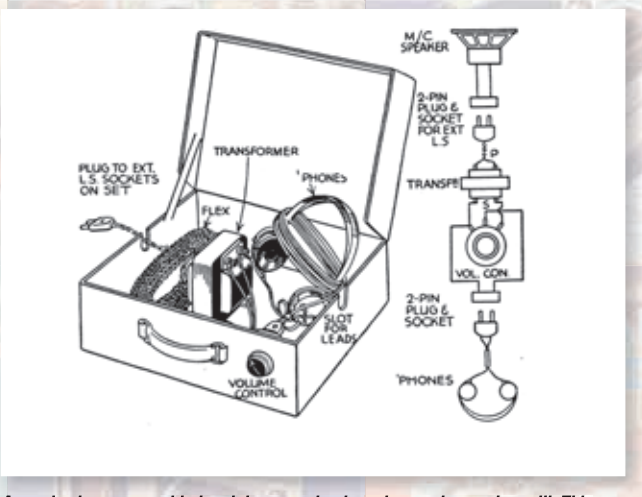
A vertical short wave aerial system, using standard insulators and a length of copper tubing.

Headphones For Mains Sets

Sometimes it is necessary to discontinue listening in on account of sickness – the powerful speaker being too loud for the invalid. By using headphones you may continue your interest in the broadcast, particularly if the set speaker has no universal input transformer, as is often the case.

Connect a short pair of leads from the terminals (for external speaker) to a 2-pin socket – at the back of the set; from thence a 2-pin plug to the primary of a 1 to 5 transformer (app resistance 600:3,000□). The secondary to the headphones .

By putting the equipment in a cheap 6d attaché case it is made convenient to handle and very useful. The diagram will make the scheme clear. A volume control can be used with the headphones externally if desired. — **G**. M. Doubleday (Southampton).



A good scheme to enable headphones or loudspeakers to be used at will. This arrangement is particularly valuable in the case of illness.

Radio Reception and Television

April 1935

by H. J. Barton Chapple, B.Sc., A.M.I.E.E

(Re-published from the weekly edition of *Practical Wireless* published on April 20th, 1935).

This week our subject is to be changed somewhat, inasmuch that the intimate considerations of the cathode-ray tube and its auxiliary equipment are to give way to problems associated with the radio reception of the radiated television signals. Although primarily our intention is to deal with questions made important as a result of the propose high-definition television service, it must not be overlooked that the cathode-ray tube is a very versatile piece of apparatus and adapts itself to the reception of the present low-definition signals with ease.

Whereas with the high-definition signals the scanning is horizontal, with a picture ratio which is likely to be settled upon as 6 horizontal to 5 vertical, with the existing BBC transmission scanning is vertical with a 7 to 3 ratio. Then, of course, line dissection and pictures per second are different. These separate items are easily accommodated, however, by altering the values of the discharge condenser in parallel with the gas-filled relay in both the low frequency and high frequency time bases, while the picture ratio is met by adjusting the 'sweep' voltages by means of the bias potentiometer on the grid of the gas-filled relays. Scanning directions are altered by interchanging the time base connections to the deflector plates.

A Debatable Point

This case of adaptation is always cited as one of the principal advantages of the cathode-ray tube for television picture presentation. It is generally conceded, however, that the low-definition images, as seen on the tube's fluorescent screen, are not up to the standard of good Kerr cell mirror-drum combination.

As a result, however, they are much easier to synchronise, and a steady image, even if not 'clean cut', is regarded by many as superior to a bright sharp picture which floats or hunts about a mean position. When it comes to high-definition images, however, at the present stage of development the cathode-ray tube undoubtedly gives infinitely better results than mechanical methods.

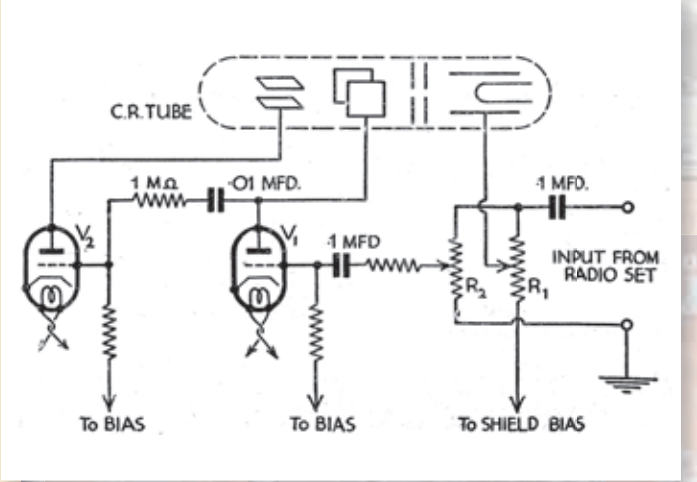


Fig. 1: One arrangement for linking signals from the radio receiver to the C.R. tube.

Whether this condition will continue to hold is, of course, still a debatable point, and the onus is now on the mechanical system protagonists to improve or modify their designs to meet the more stringent conditions imposed by the television pictures which have 180 or 240-line definition, and a picture repetition frequency twice that of the present BBC service. At first sight it appears that the mirror-screw scanner stands the best chance of achieving this with an intensely bright strip light source capable of adequate modulation.

Low-definition Pictures

Reverting now to the radio receivers suitable for linking to a cathode-ray tube when it is desired to look in at low-definition pictures, it may be stated straight away that, provided the set employed is a good quality one with even a moderate output power, than the results obtained will be quite satisfactory.

It is common practice to resistance-capacity feed the output valve to the cathode-ray tube, and although there may be several detailed schemes in this connection, the skeleton arrangement shown in **Fig. 1** give a general idea of how this is done.

The signal input from the set is fed via a 0.1mfd. high-working-voltage condenser (1,000 to 1,500 volt) to one end of a potentiometer R_1 whose function is to control the depth of modulation applied to the tube shield. The other end of the potentiometer connects to the negative shield bias, while the moving arm connects direct to the shield. The television signal also includes the synchronising signal as well as the picture modulation and, in the case of the low-definition operation, Fig. 1 indicates how these synchronising pulses of 375 per second are fed to the grid of one of the gas-filled relays V_1 of the dual time base to ensure a correct triggering action.

Time-base Locking

A potentiometer is connected across the signal input and the moving arm is joined through a resistance and 0.1mfd. coupling condenser to V_1. This valve, therefore, receives a regularly-timed impulse (its value is controlled by R_2) from the television scanner, and the anode is joined to the 'sweep' plate of one pair of the deflector plates.

Now there is a definite ratio between the line dissection pulse of 375 and the picture repetition pulse of 12.5, so the two separate time bases are "locked" together ensuing that one frequency is exactly thirty times the other. If this is not done there is a tendency for the picture lines built up on the fluorescent screen to wander across the screen and so upset the viewing conditions.

The simplest method for this is to introduce some of V_1's 375 pulse signal into the grid of V_2 which controls the picture repetition tuning. A .01mfd. fixed condenser and one megohm resistance, therefore, links the anode of V_1 with the grid of V_2. Of course, the gas-filled relay discharge frequencies are really independently controlled by the constants of their circuits, but their separate actions must be steady for proper working, and the triggering effect imparted to both grids of V_1 and V_2 ensures that this steadiness, once set to the required values, is maintained.

Ultra-short Waves

Coming now to the radiation and reception of the high-

definition television picture signals, the problem is not quite so easy of solution. First of all, the extremely wide frequency range demanded by these pictures rules out the use of medium- or long-wave broadcasting stations.

The only available channels for accommodating these rigid requirements are those provided by ultra-short waves, that is, wavelengths below the figure of 10 metres. To the majority of readers this introduces an entirely new radio technique, while even those who have worked with what are commonly termed short waves will find that conditions differ when a migration is made to this lower region of the wavelength scale.

These waves of such short length (relatively speaking) and extremely high frequency (wavelength and frequency are linked by the standard formula of wavelength multiplied by frequency equals 300 millions) establish communication from point to point by means of the direct ray. That portion of the electro-magnetic disturbance, which goes in a vertical or inclined direction, that is, above the line which is tangential to the earth's surface, is not reflected back by the Heaviside layer as is the case with other wavelengths.

A Serious Problem

It is for this reason that they are said to possess quasi-optical properties resembling uniform directed beams from a light source, which sheds its rays in all directions. From this reasoning it is easy to see that the higher the location of the transmitting aerial with reference to the surrounding country, the greater will be the range over which the signals will extend.

This is one of the problems, which is so seriously engaging the attention of the television technical advisory sub-committee. They are anxious to decide on a situation somewhere round London which has high ground, so that the aerial can be still further raised on a tower or mast, and this ensure that the signal radiations will be receivable over the widest area at a strength adequate for operating the television apparatus above mush level.

The necessary aerials or radiating structures are not bulky or costly, and as an example of one form of construction, which radiates the waves in all directions with equal intensity, mention may be made to the umbrella type aerial on the top of the South Tower or the Crystal Palace. On the other hand, these ultra-short-wave radiations can, when desired, be confined to a concentrated beam somewhat like that from a searchlight.

An aerial structure for this purpose can take several forms, but usually a network similar to the radiating network is placed one quarter of a wavelength behind it. This then acts as a tuned reflector and quite effectively neutralises any signal radiation to the rear of the beam. This scheme is also in operation at the Crystal Palace, where the dipole aerial equipment, designed for experiments of this character, projects from the Tower balcony.

Other Advantages

Since the carrier wave itself has an extremely high frequency (a 6-metre wave corresponds to 50 million cycles) it can be modulated quite readily with a very wide band of frequencies. As television progress is made and pictures with greater line definition become possible, the wavelengths, which will be employed, will become progressively lower, but at the present time from 5 to 7 metres form a very convenient medium for the work.

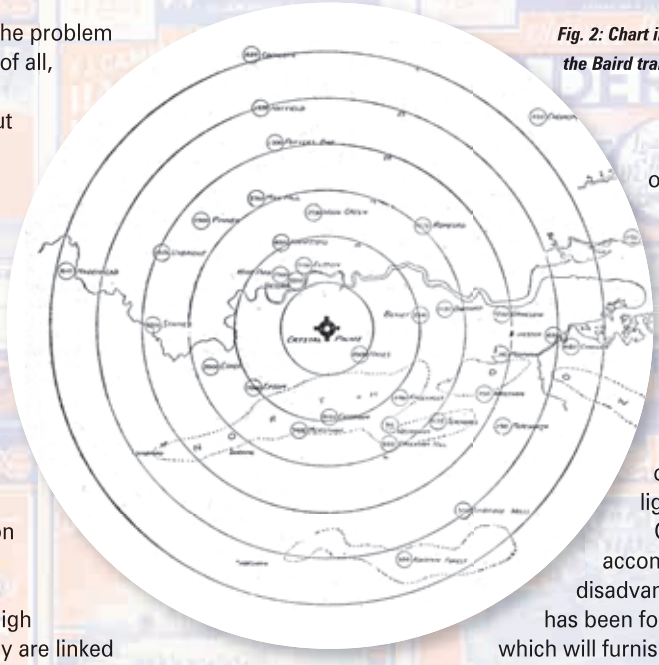


Fig. 2: Chart indicating field strength data in microvolts from the Baird transmitter at the Crystal Palace.

Although, as has just been pointed out, in these ultra-high-frequency bands no ground waves exist owing to the high absorption while 'sky waves' are lost, the direct ray which is used is free from fading, and this is an outstanding advantage. Furthermore, this advantage is supported by the fact that there are practically no atmospheric disturbances to mar or mutilate the picture in the form of light striations.

Of course, every advantage is accompanied by a corresponding disadvantage, and with ultra-short waves it has been found more difficult to build valves, which will furnish very high powers, owing to the limitations imposed by the high-frequency effects in the valve construction. This is being overcome, however, and stations with rated powers of between 10 and 20 kilowatts have been built and tested with quite remarkable results.

Field Strength

Then, again, these waves are liable to be easily reflected from high buildings or objects in the path of transmission. This causes complicated interference patterns and standing waves, the latter being conspicuous as shadows when hilly districts are present.

Tests have shown that a receiver will pass from a region of high signal strength on a hillcrest to one of almost negligible pick-up in a valley, and then emerge into strong signals again when out of the 'shadow' cast by the hill from the transmitting aerial site. This is shown quite clearly by referring to **Fig. 2**, which furnishes field strength data in microvolts from the Baird transmitter at the Crystal Palace, working on a wavelength of 7 metres and a power of 10 kilowatts.

Under any condition of environment a cathode-ray-tube receiver will portray a good television picture where the field strength is above 1,000 microvolts, while for those locations giving measurements of between 250 and 1,000 microvolts, a good picture is possible provided the receiving aerial is not within fifty yards of an arterial or main road. From 100 to 250 microvolts, results worth looking at will only be secured in quiet locations.

These latter considerations arise partly from the fact that 'man made' electrical disturbances, particularly those derived from the ignition systems of motor-cars or aeroplanes, as well as those induced from transmission lines, telephone lines, high-frequency or X-ray machines, and so on, cause trouble.

In view of the very intensive campaign of attack against electrical interference of any man-made form, which is now being conducted, it is reasonable to expect that the troubles from this direction will soon disappear. In any case, proper precautionary measures applied in the radio receiver itself can do much to neutralise the observable effects.

On the question of the radio receiver itself, there are three forms open to choice on these ultra-short waves – straight, superhet, and super-regenerative. Naturally there are protagonists of each class, and each have their own advantages and disadvantages, but as yet there is not much available data to work on owing to the comparatively short length of time that has elapsed since experiments in this class of work were undertaken. Those features, which can be examined, however, will be dealt with in the next article.

Reprinted Advert from Dec 1937

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As the person responsible for the advertising in *PW*, I've been surprised by the number of readers who have called me and others in the office asking about products and advertisers in this section of the magazine. We've heard from people wanting to know how they can reach companies they've seen here, where they can get the products being advertised and so on and they've been very disappointed by our response. It might seem obvious to most of you but the past few months have shown us that not everyone has realised that this is the historic section – the place where we look back at the history of *PW*.

Everything printed here is from the past, articles ***and*** advertisements. We've reprinted some of the more evocative advertisements simply to bring you a flavour of the various decades and they are not current – the products are no longer available and, in some cases, the companies have ceased trading. So please, just read and enjoy them but do not try to buy from them. **Roger Hall G4TNT**

Originally published July 6th, 1935

Wireless in the Car

Some precautions to be taken when fitting radio to the car

When a complete car radio equipment is installed in the car by the makers' agents, suitable interference suppressors are fitted at the same time and as a matter of course. This point should be considered by those who propose to use an ordinary portable set whilst travelling by car and suppressors must be fitted.

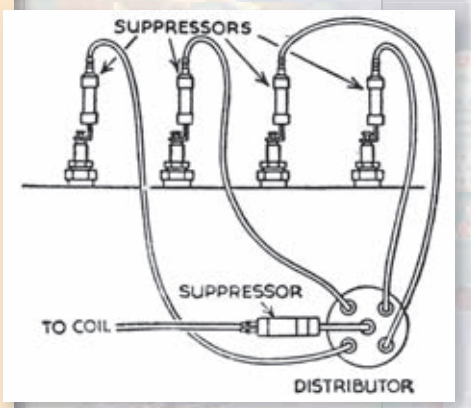
These consist of resistances made to fit between the high tension leads and the sparking plug terminals and also in the lead between the ignition coil and the centre terminal of the distributor, as shown in the accompanying illustration.

Fitting Interference Suppressors

Sets of interference suppressors are available from the number of firms but those who wish to observe the effects of fitting them can, temporarily, use a set of non-inductive fixed resistances of the ordinary type. These should each have a value of, approximately, 20,000Ω and may be connected in the same manner as the special suppressors above referred to.

Care must be taken to insulate the metal ends, since any short-circuit would lead to misfiring of the engine or might prevent the engine from starting. In most cases it will be found that the fitting of suppressors does not affect the normal running of the engine in any way; if it does, resistances of lower value should be tried and the insulation should be carefully checked.

After the resistances have been fitted there should be no more than a trace of interference with normal reception, although in some cases it is necessary to fit a fixed condenser to the dynamo. Here, again, special condensers are available but an ordinary high-quality tubular condenser of about 0.5mfd. can be connected between the positive terminal of the dynamo and the engine casing (earth).



The method of fitting noise suppressors.

Arranging The Aerial

The aerial for the portable receiver used in the car often presents a difficulty, since if it is within the body it will probably be screened by the metal panelling and will, therefore, be practically ineffective. A simple method of arranging it is to run an insulated wire in zig-zag fashion backward and forward along the underside of the running board. Another method is to fit a similar wire on the luggage grid. In every case the chassis of the car can be used as a fairly efficient earth connection.

When the receiver is to be installed as a fixture in the car it is well to make provision for a permanent source of high tension supply; dry batteries are satisfactory, of course, but it is more convenient and economical to employ a converter of some kind. There are several suitable units on the market and these are fed from the 6 or 12V car battery, supplying a d.c. output, of say, 200V or 50mA. Various models are available, however, according to the actual voltage and current required by the receiver. In all cases the low tension supply can be taken from the car battery, as explained in an article last week.

It is worthy of note that it is not necessary to obtain separate licence to use an ordinary portable set in the car but such a licence is required if the receiver is made a permanent fixture. The licence is obtained, like any other receiving licence, from the Post Office and in filling in the from provided, the registered number of the car must be stated in place of the address of the house in which the normal set is used.

There is just one other point, which should receive attention in connection with the car-radio when the car battery is used as a source of power. The connections must be well made so that there is no chance of sparks occurring between loose wires, for these might easily result in fire.

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You should state clearly in your advert whether equipment is professionally built, home-brewed or modified.

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YUPITERU MVT-7100 mint. Eddystone EC-10, Heathkit valve volt meter. All first class condition. Surplus to requirements. Sensible offer secures. Tel: 01234 711 538 (Bucks).

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GRUNDIG SATELLIT 1400SL Rx. Require circuit diagram manual. Also, a duff one for spares. Tel: Tony 07932 574846 (Swansea).

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OLD HALF INCH FERRITE RODS must be half inch (12.7mm) in diameter and be six inches long or more. Will pay very good money for the rods. Tel: Peter Tankard 0114 2316321 between 9am and 10pm (Sheffield).

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□/Σ No.46 Tx/Rx working. Old walkie talkie, no accessories. Exchange for a W/S No.68 receiver section. Write to D S Wild, 25 Normanton Avenue, Salford, Nr Manchester M6 8BS.

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B.B. Aug '07

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01202 490099

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Rob's chance to air his views!

Topical Talk

This month, Rob G3XFD discusses some interesting topics that have arisen from letters published in this issue's letters pages. The subjects range from contests, beacon clocks and a request 'something extra' for beginners!

It's a struggle to be a truly ethical journalist nowadays but I really do try to get a selection of varied opinions published via our letters pages. However, achieving a good (and fair) editorial balance has always been rather difficult. Because of this I was pleased when an old broadcasting colleague of mine – **Jonathan Kempster M5AEO** – wrote in to support contests on the h.f. bands.

Jonathan happens to live in an apartment where antennas are not at all popular and I admire him for his perseverance! So, I was delighted to prove – hopefully – to any doubting readers that opinions of all shades are welcome in *PW*.

In fact, I think that eventually – when the broadcasters migrate away from the extended 40 metre band – that our final 200kHz bandwidth should help the situation. However, it's a case of 'let's wait and see'! Good luck in your contest operating Jonathan!

Strip Board Projects

Allen Gawne GD7LAV, from Port Soderick on the Isle of Man, has only recently returned to Amateur Radio (welcome back Allen) and has never tried a strip board (Veroboard) project before. Allen is obviously not aware that the IBP PIC Beacon Clock is also our first project featuring Veroboard for many years but his letter raised some interesting points.

We published the Veroboard project after a number of readers made it clear that this technique is not as difficult to work with as I have been led to believe from my own failures. Another reason behind our choice for the Veroboard was that the author, **Phil Cadman G4JCP**, suggested that he use it, as it was ideal for the project. Knowing that Phil is extremely experienced (I much value his opinions) it seemed sensible to agree.

But, as always we like to offer our readers a choice of construction techniques. And to offer a choice now, I would ask that anyone interested in a printed circuit board (p.c.b.) for the IBP PIC clock project to contact me.

I had assumed the readers would use the completed Veroboard project photographs to help them build their versions. If these weren't adequate, I would again be pleased to hear from constructors who would find additional assistance (perhaps in the form of a diagram rather than photograph) to be published with such article. Any feedback on how we present constructional projects in *PW* would be much appreciated. We do our best to ensure that full circuits, p.c.b. designs (with the option of buying ready made boards) are available. However, there's always the possibility that there's something extra we can do for you!

Something For The Newcomer?

The letter from **Rob Styles 2ETFO**, from Bath in North-East Somerset, raises some important points. When he first contacted me, I explained to Rob that we had run the type of article he was suggesting, for many years. But on reflection I realised that what he was actually suggesting was a general 'how to do it' series aimed at the beginner, rather than a purely technical series.

Many years ago we ran special series called Novice Natter (written by **Elaine Richards G4LFM**), which covered the topics Rob is now suggesting. The series ran for a while but due to the lack of interest and feedback we dropped the column. Is it now time to run something similar in *PW*? If you think it is please write in and make your opinion known. If there's enough interest we can find space but it does depend on reader feedback. Thank you!

Rob Mannion G3XFD/EI5IW

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