FOR THE RADIO ENTHUSIAST . . .

NOVEMBER 1981

Practical Wireless

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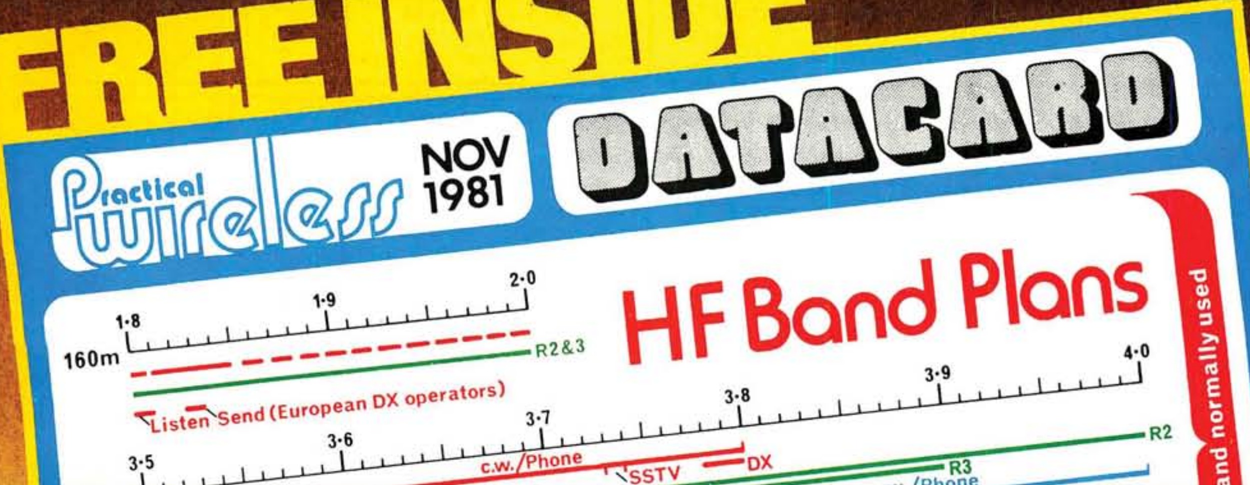

Build our

HF CONVERTER

& 70cm/2m CONVERTER

EXTRA

A GLOSSARY OF RADIO TERMS PART 1

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Practical Wireless

NOVEMBER 1981 VOL. 57 NO. 11 ISSUE 896

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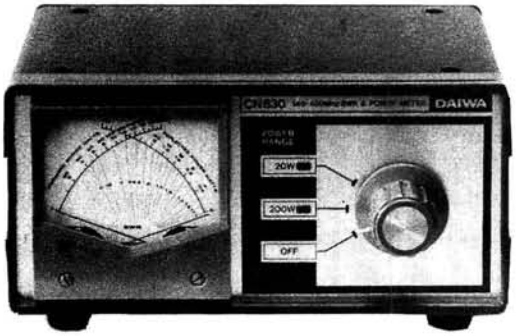
DAIWA POWER METERS

CN620A	1.8-150 MHz up to 1KW	**£52.81** inc VAT
CN630	140-450 MHz up to 200W	**£71.00** inc VAT
CN650	1.2-2.5 GHz up to 20W	**£95.00** inc VAT

Until recently, the in-line measurement of RF power and SWR involved calculation or the use of two instruments. Now, DAIWA have introduced a range of power meters which provide an elegant solution to the whole problem of RF measurements. Utilising two toriodal current transformers to detect true forward and reflected power, and feeding the outputs to a twin movement meter with crossed pointers, it is now possible to measure forward power (LH scale), reflected power (RH scale) and SWR (where the pointers cross) at a single glance. The DAIWA CN series power meters represent the ultimate power meter for the professional and amateur alike, and are indispensable in the fully equipped station. Three models are currently available covering frequencies right up to 2.5GHz so there's one for you whatever your interests.



KRT100 KRT500 KRT200

CARRIAGE ON METERS **£1.25**
CARRIAGE ON MIKE SYSTEM **£1.50**

POWER SUPPLIES

Meet the
HONOR *family*

KRT100 11 RANGES	**£5.35** inc. VAT
KRT200 18 RANGES	**£9.85** inc. VAT
KRT500 43 RANGES	**£15.60** inc. VAT
carriage KRT100 £1.00	KRT200 & 500 £1.50

THE 3 MODELS

ALL MODELS 240 VOLTS A.C. INPUT.

the PP1305 4 amp 13.8 volts d.c. ***£18.40*** *inc. VAT.*
the PP137 7 amp 13.8 volts d.c. ***£32.00*** *inc. VAT.*
the PP1310 10 amp 13.8 volts d.c. ***£49.50*** *inc. VAT.*

Carriage £2.00

JRC *Japan Radio Co., Ltd.*
Since 1915

NRD 515

The NRD 515 is a PLL-synthesised communications receiver of the highest class featuring advanced radio technology combined with the latest digital techniques.

The new NRD 515 is full of performance advantages including general coverage, all modes of operation, PLL digital VFO for digital tuning, 24-channel frequency memory (option), direct mixing, pass-band tuning, etc. JRC's 65 years of radio communications experience will give you "the world at your fingertips".

The NRD 515 is but a single item from the JRC product range which extends all the way to full marine radio installations for supertankers.

NRD 515 SYNTHESISED HG RECEIVER	**£948.75** inc VAT
NHD 515 MULTI CHANNEL MEMORY UNIT	**£161.00** inc VAT
NVA 515 LOUDSPEAKER	**£27.60** inc VAT
CFL 260 600Hz CW FILTER	**£34.50** inc VAT

LOWE ELECTRONICS

CHESTERFIELD ROAD MATLOCK DE4 5LE TEL 0629 2817

Once again from Trio an absolutely fantastic 2 metre FM Mobile Transceiver. Compact, simple to operate, full 25 watts output – a truly dazzling piece of gear.
Designed by Trio to provide a miniature transceiver, the TR7730 measures 6in wide by 2in high by 8in deep.
In providing both first class performance in transmission and reception Trio engineers have again triumphed.
Switch on your Rig and listen for the outstanding signal from a TR7730.
The five memories, the band and memory scan facility, together with the up/down mike and comprehensive mobile fixing kit make this the rig you have been waiting for.

- 25 watts output in high power position for good mobile communications – 5 watts in low position.
- Five memories for either Simplex or repeater operation. The fifth memory is capable of non-standard
- Memory scan. Automatically locks on an occupied memory channel and resumes scanning when the signal disappears or when the scan switch is pushed. Scan hold or mike push to talk switch cancels the scan function.
- Band scan. The Rig scans the band in either 25 or 5kHz steps and locks on an occupied channel.
- Both mobile mounting bracket and up/down microphone included with the equipment.

the new compact 2 metre fm transceiver

TR-7730 £238 inc VAT carr £4.50

TRIO

pacesetter in amateur radio

Trio 8400 the new way to 70cm FM mobile, a fully synthesized 430 440MHz 10 watt output, mobile transceiver with memories, 2 separate VFO's all in a truly amazing compact package. Complete with up/down frequency shift microphone and car mounting bracket the TR8400 is the way to go . . . 70cm is on the move.

TR-8400 *70cm FM mobile*

£329.13 inc VAT. Securicor carriage £4.50

TR-9000 The exciting TR-9000 2-metre all-mode transceiver combining the convenience of FM with long distance SSB and CW in a very compact, very affordable package. Because of its compactness the TR-9000 is ideal for mobile installation, add on its fixed station accessories and it becomes the obvious choice for your shack.

TR-9000 *2 Metre Multimode*

£371.91 inc VAT. Carriage by Securicor £4.50

The TR9500, a 70 cm multimode mobile giving SSB, FM and CW operation in a compact rig based on the phenomenally successful 2 metre 9000. Combining the convenience of FM with the "DX ability" of SSB on the 70 cm band this is the rig all discerning VHF and UHF amateurs have been waiting for. Used alongside your existing 2 metre equipment a new spectrum of contacts becomes available. Repeaters, satellite working, simplex and with the addition of your 2 metre rig Duplex communications are at your finger tips. Of course the matching accessories SP120 speaker, BO-9 system base and PS20 power supply are all available to enable you to build a base station system second to none.

The TR9500 features:
- FM, USB, LSB and CW.
- Similar in size to the TR9000.
- Two digital VFOs.
- Multiple scan facilities for various modes.
- 6 memories, 5 for simplex or repeater shift – and the sixth memory for a non-standard offset.
- Digital frequency display.
- Covers 430 to 440 MHz.
- Up/down microphone for manual band scan.
- RIT (Receiver Incremental Tuning) for SSB and CW.
- RF gain control.
- Mobile mounting bracket.
- Led indicators for on air and busy.

the new 70cm FM, SSB & CW mobile

TR-9500 £472 inc VAT carr £4.50

TR-7800 Trio's remarkable TR-7800 2-metre FM mobile transceiver provides all the features you could desire for maximum operating enjoyment. Frequency selection is easier than ever, and the rig incorporates new memory development for repeater shift, priority, and scan. The TR-7800 by Trio, the only FM mobile.

TR-7800 *The Ultimate 2 Metre Mobile FM rig*

£276.00 inc VAT. Carriage by Securicor £4.50

PRICES & SPECIFICATION SUBJECT TO CHANGE WITHOUT NOTICE

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IN RADIO COMMUNICATIONS FOR THE ENTHUSIAST

FREE AERIAL & DC KIT WITH EVERY FRG7700 & R1000 RECEIVER

1200 CHANNELS! AR22 VHF FM MONITOR

AMATEUR MODEL **£83 inc. VAT**

(Marine version £86)

Truly amazing! The AR22 tunes across the 2 metre FM band 142-148mHz (also includes Police and Fire Brigade) in 5kHz steps. So small it will fit into a shirt pocket and yet nothing is sacrificed in terms of performance. Price includes rechargeable batteries, mains charger, fly aerial etc. You won't find a smaller monitor anywhere.

PROFESSIONAL AIRCRAFT MONITOR R517 £49.50

(as supplied to pilots, ground crew etc.)

The R517 is a professional aircraft monitor receiver, having superb sensitivity and capable of tuning across the entire aircraft band 118-143mHz. For easy tuning there is both a coarse and fine tuning control. In addition there is a 3 position switch for selecting xtal controlled channels (xtals £3.00 extra) for your local airport. The unit is completely portable running off self-contained batteries.

TRIO R1000 COMMUNICATIONS RECEIVER

OUR PRICE **£305** (Free Securicor Delivery)

The R1000 has really caused a stir in the receiver market! Its performance matches professional receivers costing many times more and with our new competitive price of £305 it must be the best value on the market today. Full digital readout from 200kHz (actually it operates right down to 20kHz but with reduced sensitivity) means accurate tuning and the 30 position band selector switch means really good bandspread for easy operation. Other features include noise blanker (a really good one!) built-in speaker, digital clock/timer and both 230v AC/12v DC operation. (Yes we include the 12v DC kit free!) Each model is fully checked and delivered anywhere in the U.K. within 24 hours of receipt of payment!

YAESU COMMUNICATIONS RECEIVER

FRG7700 £299

FRG7700MEM £380

Free Securicor Delivery

The FR7700 is a new model from Yaesu that replaces the FRG7000. Full coverage is provided between 200kHz and 30mHz with bright digital readout that also doubles as a clock. Features include noise blanker, FM detector, internal speaker, 230 volt AC operation and built-in timer. As an optional extra there is also a memory unit which enables up to 12 selected frequencies to be stored and selected.

SR9 VHF RECEIVER AMATEUR/ MARINE

£46 inc. VAT

The SR9 must be one of the most popular monitors for 2 metre amateur radio enthusiasts. (Also available as a marine version at the same price). It is fully tuneable across the band with the option of also installing up to 11 xtal controlled channels. Power requirements are 12v DC negative earth at 200ma approx. The unit comes complete with mobile mounting kit and built-in speaker.

NO MORE TV INTERFERENCE FROM CB OR AMATEUR! GLOBAL HP4A £5.95

Post free.

If you're suffering T.V. interference, here's a brand new device specially designed and made for us in Japan. The HP4A now offers about 100% cure against TV interference because of its advanced design, yet it has no effect on the picture. Be prepared, keep one handy!

28MHz FM!

NEW AZDEN PCS2800

£179 inc. VAT

Here's an exciting new 20 watt input (10 watts output) transceiver with a host of features to put it head and shoulders above the competition. Compare its features:– 200 channels, high/low power switch, computer control touch pad, 6 programmable memory channels, automatic band searching, automatic memory scanning, microphone frequency control button, priority channel, digital frequency readout, removable control panel (permits main transceiver to be mounted remotely), slide in mobile bracket, built in speaker and a host of other features. Its high power and very sensitive receiver gives it better coverage than its competitors. Send for details today or come and see our demonstration model.

M161 FM SCANNER AMATEUR OR MARINE MODEL

£59 inc. VAT

This highly compact monitor can be supplied either for the 2 metre amateur band or the marine band. It has the capability of scanning up to 16 channels and hunting out and locking on to any signal that appears. Ideal for mobile or base operation an external 12v DC supply is required but unit has built-in speaker, mobile mounting brackets, etc. The receiver comes with the national calling channel. Additional crystals for channels are £3 each.

SEND 14P FOR OUR FULL CATALOGUE OF EQUIPMENT

MAIL ORDER SLIP to: Waters & Stanton Electronics, Warren House, Main Road, Hockley, Essex.

Name .... Goods required ....

Address ....

Please rush me the above. Cheque enclosed for £............/Please charge to credit card No ....

TWO YEARS WARRANTY ON ALL EQUIPMENT

IC-730

£586

ICOM'S answer to your HF mobile problems – the JC730. This new 80m-10m 8 band transceiver offers 100W output on SSB, AM and CW.

Outstanding receiver performance is achieved by an up-conversion system using a high IF at 39MHz offering excellent image and IF interference rejection, high sensitivity and above all wide dynamic range. Built in Pass Band Shift allows you to continuously adjust the centre frequency of the IF pass band virtually eliminating close channel interference. Dual VFO's with 10Hz, 100Hz, and 1KHz steps allows effortless tuning and whats more a memory is provided for one channel per band. Further convenience circuits are provided such as Noise Blanker, Vox, CW Monitor, APC and SWR Detector to name a few. Provided the IC730 is kept connected to its supply its CPU will remember your instructions even when turned off! Built in fan keeps the finals cool and remember there is no tuning to be done. A built-in Speech Processor boosts talk power on transmit and a switchable RF Pre-Amp is a boon on todays crowded bands. Full metering, WWV reception and connections for transverter and linear control almost completes the IC730's impressive facilities. Use this rig as a high class mobile or with a suitable 13v psu as your main base station. Give us a ring and ask for a full spec. to be sent to you.

IC-202S

£169

The IC-202S is a very well designed 2m SSB portable. It offers 3W pep output on USB, LSB and CW. Large battery capacity (HP11 type) or Nicads if you wish. A special VXO circuit to provide smooth tuning and crystal stability needed for SSB operation on 2m; Each of the four 200kHz band positions allows operation anywhere in 2m (Supplied with 144-144.2 and 144.2-144.4). Top of the band Oscar xtals available for "crosspond working".

It has a DC socket and SO239 sockets for mobile or base station working barefoot or as a prime mover. Mobile mounting brackets, Nicad packs chargers, cases all available options. You must agree, a very versatile well proved rig. The 70cm twin of the 202S having very similar feature covering the frequency range of 432-435.2MHz. Their versatility is well worth an enquiry.

IC-24G

See us at Castle Donington The Big One!!

£169

The famous IC240 has been improved given a face lift, and renamed the IC24G. Many thousands of 240s are in use, and its popularity is due in part to simplicity of operation, high receiver sensitivity and superb audio on TX and RX. The new IC24G has these and other features. Full 80 channels (at 25kHz spacing) are available and read out is by channel number – selected by easy to operate press button thumbwheel switches. This readout can clearly be seen in the brightest of sunlight. Duplex and reverse duplex is provided along with a crystal controlled tone call Hi-10W and low-1W RF output is available along with a 12½kHz unshift should the new channel spacing be necessary. The old IC240 proved to be the most reliable ng we have ever sold – the IC24G, because it is so similar, looks like following the same pattern.

Remember, for mobile use a rig MUST be easy to operate to be safe. Send for technical details.

Thanet Electronics

143 RECULVER ROAD,
BELTINGE, HERNE BAY, KENT
TEL: 02273 63859

ICOM

ICOM

the amateur's professional friends

Several new products from Icom will be introduced onto the market shortly and when we recently saw the prototypes in Japan we realized just how popular they are going to be. Just to wet your appetites here are a couple of examples:–

See us at Castle Donington The Big One!!

IC-290E

£366

IC-25E

See us at Castle Donington The Big One!!

£259

IC-290E TWO METRE MULTIMODE MOBILE

The IC-290E incorporates all the features you could want in a multimode mobile to make it easy to use when driving. A standard 6000kHz repeater offset shift is built into its computer's memory but if necessary this can be altered from the front panel for unusual shifts that may be required (such as say 1.6MHz for some transvertors). There are five programmable memories and these can be used in either simplex or duplex mode. Any one of these memories can also be designated as a PRIORITY CHANNEL which can be checked once every five seconds if you wish for that private message you may be expecting. Scanning can be controlled either from the front panel or from the HM10 microphone. There are options to scan the whole band, any selected part of it, or just the memory channels. You do NOT lose the repeater shift when scanning or using either of the VFOs in simplex. Unlike many of its competitors you do have TWO VFOs which can also prove a very useful feature. Further improvements include a brighter frequency readout, a LED bar-type S-Meter and power output meter and the ideal tuning rates of 25kHz per step on FM and 100Hz per step on SSB. Both these rates can be changed to 1kHz steps by use of the TS button on the front panel. For repeater operation both + and – shifts are available and it is possible to listen on the repeater input channel merely by pressing a button. Internal controls allow you to vary scan speed, scan delay time etc. Semi break-in CW and CW sidetone are also available.

Put all these features into an attractive case, add the world wide renowned ICOM quality and performance, and you must see that this is the choice for you. And just as an extra remember that you get a full two year's warranty if you purchase your transceiver direct from THANET or one of our agents listed in this advertisement.

ICOM HAVE GOT IT RIGHT AGAIN!

Again ICOM seem to have got everything right with its new 25W FM mobile. It is one of the smallest around and yet is packed with features which make it really handy to use while still maintaining the very high quality expected in ICOM transceivers.

Like its bigger multimode brother, the IC-25 has TWO VFOs, FIVE MEMORIES (which can be used in either simplex or duplex mode), a PRIORITY CHANNEL (which can be any one of the frequencies stored in the memories), full DUPLEX and REVERSE DUPLEX operation, and a crystal controlled tone burst. Again the display is brighter and there is a LED Bar-type S-Meter and relative power outputer meter. The choice of the frequency steps is 25kHz and 5kHz. Like the IC-290 multi-scanning functions are available either from the front panel or remotely using the HM-10 scanning microphones.

Again we feel that this beautifully designed and constructed piece of equipment is bound to "sell like hot cakes" – and again remember that if you buy one directly from Thanet you will get a full two year's warranty and any work will be carried out in our excellently equipped workshop. One of our engineers has been out to ICOM in Japan for a two week course to learn the "tricks of the trade".

What about other new products? – well you may well ask but we won't be giving too much away just yet. But how about a 70cm version of the IC-2E and a fully automatic antenna tuner to start off with?

Buy direct from us and get two years warranty on all equipment

WE STOCK CUSHCRAFT ANTENNAS

H.F.			INC. VAT
A3	20/15/10	3ele Beam 8dB gain	£147.00
ATV5	80-10	Trapped Vertical	£74.40
ATV3	20/15/10	Trapped Vertical	£34.00

VHF (144MHz)		
A3219	19ele Long 'Boomer' Yagi 16.2dB gain	£62.00
214B	14ele Jnr 'Boomer' Yagi 15.2dB gain	£49.50
ARX2	Ringo Ranger 6dB gain vertical	£24.75
A144-4	4ele Yagi 9.0dB gain	£16.25
A144-7	7ele Yagi 10.0dB gain	£20.31
A144-11	11ele Yagi 11.3dB gain	£25.72
DX120	20ele Array 13.2dB gain	£47.20
ARX2B	Ringo Ranger II	£28.75
ARB2K	Conversion Kit for Ringo to Mk II version	£12.75

WE ALSO STOCK:–

J-BEAM ● MICROWAVE MODULES ● YAESU ● WESTERN RSGB BOOKS ● BEARCAT ● JIL ● TAL ANTENNAS ● VIDEO GENIE

TRANSFORMERS +VAT 15%

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Overseas postage extra.
Voltages stated are on full load
Continuous Ratings

30 VOLT RANGE (Split Sec)
Sec Voltages available 3, 4, 5, 6, 8, 9, 10, 12, 15, 18, 20, 24, 30V or 12V-0-12V or 15V-0-15V.

Ref.	Amps 30V	Amps 15V	Price	P&P
112	.5	1	**2.90**	1.00
79	1	2	**3.93**	1.00
3	2	4	**6.35**	1.20
20	3	6	**7.39**	1.44
21	4	8	**8.79**	1.60
51	5	10	**10.86**	1.60
117	6	12	**12.29**	1.72
88	8	16	**16.45**	1.96
89	10	20	**18.98**	1.84
90	12	24	**21.09**	O.A.
91	15	30	**24.18**	O.A.
92	20	40	**32.40**	O.A.

50 VOLT RANGE (Split Sec) Pri 120/240V Sec 50V Voltages available 5, 7, 8, 10, 13, 15, 17, 20, 33, 40 or 20V-0-20V or 25V-0-25V

Ref.	Amps 50V	Amps 25V	Price	P&P
102	.5	1	**3.75**	1.20
103	1	2	**4.57**	1.20
104	2	4	**7.88**	1.44
105	3	6	**9.42**	1.60
106	4	8	**12.82**	1.72
107	6	12	**16.37**	1.84
118	8	16	**22.29**	2.20
119	10	20	**27.48**	O.A.
109	12	24	**32.88**	O.A.

MAINS ISOLATORS (SCREENED)
Pri 0-120: 0-100-120V (120, 220, 240V) Sec 60-55-0-55-60 twice to give 55, 60, 110, 115, 120, 125, 175, 180, 220, 225, 230, 235, 240.

Ref	VA	Price	P & P
*07	20	**4.84**	1.20
149	60	**7.37**	1.20
150	100	**8.38**	1.44
151	200	**12.28**	1.72
152	250	**14.61**	2.04
154	500	**22.52**	2.20
155	750	**32.03**	O.A.
156	1000	**40.92**	O.A.
157	1500	**56.52**	O.A.
158	2000	**67.99**	O.A.
159	3000	**95.33**	O.A.

*Pri 0-240V Sec 115 or 240V
State sec. volts required

CASED AUTO TRANSFORMERS
240V cable in 115V USA flat pin outlets

VA	Price	P & P	Ref
20	**6.55**	0.95	56W
75	**8.50**	1.20	64W
150	**11.00**	1.44	4W
250	**13.39**	1.44	69W
500	**20.13**	2.04	67W
1000	**30.67**	2.20	84W
2000	**54.97**	O.A.	95W

60 VOLT RANGE (Split Sec)
Pri 120/240V. Voltages available 6, 8, 10, 12, 16, 18, 20, 24, 30, 36, 40, 48, 60 or 24V-0-24V or 30V-0-30V.

Ref	Amps 60V	Amps 30V	Price	P&P
124	.5	1	**4.27**	1.20
126	1	2	**6.50**	1.20
127	2	4	**8.36**	1.60
125	3	6	**12.10**	1.72
123	4	8	**13.77**	1.96
40	5	10	**17.42**	1.84
120	6	12	**19.87**	2.04
121	8	16	**27.92**	O.A.
122	10	20	**32.51**	O.A.
189	12	24	**37.47**	O.A.

12 OR 24V OR 12-0-12V
Pri 220-240 volts

Ref	Amps 12V	Amps 24V	Price	P&P
111	0.5	0.25	**2.42**	0.95
213	1.0	0.5	**2.90**	1.00
71	2	1	**3.86**	1.00
18	4	2	**4.46**	1.20
85	5	2.5	**6.16**	1.20
70	6	3	**6.99**	1.20
108	8	4	**8.16**	1.44
72	10	5	**8.93**	1.60
116	12	6	**9.89**	1.60
17	16	8	**11.79**	1.72
115	20	10	**15.87**	1.84
187	30	15	**19.72**	2.04
226	60	30	**40.41**	O.A.

SCREENED MINIATURES

Ref	mA	Volts	£	P&P
238	200	3-0-3	**2.83**	0.50
212	1A, 1A	0-6, 0-6	**3.14**	1.00
13	100	9-0-9	**2.35**	0.50
235	330, 330	0-9, 0-9	**2.19**	0.60
207	500, 500	0-8-9, 0-8-9	**3.05**	0.95
208	1A, 1A	0-8-9, 0-8-9	**3.88**	1.20
236	200, 200	0-15, 0-15	**2.19**	0.60
214	300, 300	0-20, 0-20	**3.08**	1.00
221	700 (DC)	20-12-0-12-20	**3.75**	1.00
206	1A, 1A	0-15-20	**5.09**	1.20
203	500, 500	0-15-27	**4.39**	1.20
204	1A, 1A	0-15-27	**6.84**	1.20
239	50	12-0-12	**2.88**	0.50
234	500	6-0-6	**2.19**	0.44

Send 20p stamps for Catalogue. Prices correct 1/1/81.

AUTO TRANSFORMERS
Voltages available: 105, 115, 190, 200, 210, 220, 230, 240, for step up and step down.

Ref.	VA (Watts)	£	P&P
113*	15	**2.73**	1.00
64	80	**4.41**	1.20
4	150	**5.89**	1.20
53	350	**10.00**	1.44
67	500	**12.09**	1.84
84	1000	**20.64**	2.20
93	1500	**25.61**	O.A.
95	2000	**38.31**	O.A.
73	3000	**65.13**	O.A.
80S	4000	**84.55**	O.A.
57S	5000	**98.45**	O.A.

*0, 115, 220, 240.

TRANSFORMERS OFFERS

"New" Constant Voltage Transformers (1%)

For "clean" mains to computers or peripherals. No transient spikes to damage I.C.'s etc.

AK250 .... **£98.00**
AK500 .... **£129.00**
AK1000 .... **£149.00**

Appointed Distributors of Galatrek stabilisers & Voltsafe cutouts.

15V CT Range (7.5V-0-7.5V)

Ref			P & P
171	500 mA	**2·30**	0.60
172	1A	**3·26**	1.00
173	2A	**3·95**	1.00
174	3A	**4·13**	1.20
175	4A*	**6·30**	1.20

NEW RANGE TRANSFORMERS
Pri 120/240V
2 windings 0-36V-48V/36V-0-36Vm 48V-0-48V 72V or 96V.

Amps	Ref.	Price	P&P
1.0	431	**8.12**	1.44
2.0	432	**13.35**	1.22
3.0	433	**16.17**	1.96
4.0	434	**20.65**	2.04
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6.0	436	**36.69**	O.A.
8.0	437	**40.03**	O.A.

Split Bobbin Type. Pri 0-115, 0-115. Sec 0-12-15-20-24-30 to give 3, 4, 5, 6, 8, 10, 12, 15, 18, 20, 24, 30V, 2 amps **£4.65.** P&P £1.10 + VAT.

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P.W. Purbeck oscilloscope transformer 250-0-250; 6·3V; 12·9V (author approved) **£9.42** £1·04

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43mm - 43mm		82mm - 78mm	
0 50μA	**6·20**	0 50μA	**6·70**
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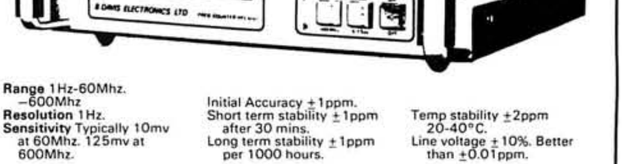
600 MHz Digital Frequency Counter

The basis of the design is an LSI chip which is a seven decade counter. This is extended to full 8 digits by feeding the processed signal to a single decade counter that is then decoded and fed to the least significant digit (LSD), for display. The LSI then counts, decodes and feeds the digit drivers for the other seven most significant digits (MSD's).
A further LSI chip which performs the functions of Xtal oscillator, gating dividers and driver, multiplexing signal generator, etc.
Other complex discrete circuitry provides for signal conditioning, shaping, amplification and protection.
A pre-scaler and amplifier provide facilities for extending the 8 digit counter block to 600MHz. This is switched in from the front panel. Also provided is switching for gate time and power. A 'gate open' LED indicates when the count is active.
Power supply required is 100-240V AC 40-60Hz, feeding a 5 volt IC stabiliser and filter. A facility (rear jack socket) is provided for input to the stabiliser for powering with 9-16 volts DC for mobile use. Reverse polarity protection is included.
Display is an optically filtered multiplexed 8 digit presentation of 0.5" LEDs driven to high brightness by discrete and IC display drivers. The displays are of the latest reflector technology types with sculptured segments giving a pleasing, easily read display even under high ambient lighting.



Range 1Hz-60Mhz. –600Mhz
Resolution 1Hz.
Sensitivity Typically 10mv at 60Mhz. 125mv at 600Mhz.

Initial Accuracy ±1ppm.
Short term stability ±1ppm after 30 mins.
Long term stability ±1ppm per 1000 hours.

Temp stability ±2ppm 20-40°C.
Line voltage ±10%. Better than ±0.01ppm.

MODEL NUMBER UK522

Input	1MΩ in parallel with 15pf at 60Mhz. 50Ω with pre-scaler.
Protection	Up to 200V pp.
Gate	Xtal. 5.24288Mhz. 1.0 or 0.1 sec. by push button selection.
Power	100-240V AC 40-60Hz ± 10% at 10 watts. 9-16V DC at 800ma Typical

£108 inc. VAT

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95 TOROIDAL TYPES From 30va to 625va

TYPE	SERIES NO.	SECONDARY Volts	R.M.S. Current	PRICE
30va 70 × 30mm 0.45 Kg regulation 18%	1X010	6 + 6	2.50	**£4.48** + 0.87p P&P + 0.80p V.A.T.
	1X011	9 + 9	1.66	
	1X012	12 + 12	1.25	
	1X013	15 + 15	1.00	
	1X014	18 + 18	0.83	
	1X015	22 + 22	0.68	
	1X016	25 + 25	0.60	
	1X017	30 + 30	0.50	
50va 80 × 35mm 0.9 Kg regulation 13%	2X010	6 + 6	4.16	**£4.93** + £1.10 P&P + 0.90 V.A.T.
	2X011	9 + 9	2.77	
	2X012	12 + 12	2.08	
	2X013	15 + 15	1.66	
	2X014	18 + 18	1.38	
	2X015	22 + 22	1.13	
	2X016	25 + 25	1.00	
	2X017	30 + 30	0.83	
	2X028	110	0.45	
	2X029	220	0.22	
	2X030	240	0.20	
80va 90 × 30mm 1.0 Kg regulation 12%	3X010	6 + 6	6.64	**£5.47** + £1.43 P&P + 1.04 V.A.T.
	3X011	9 + 9	4.44	
	3X012	12 + 12	3.33	
	3X013	15 + 15	2.66	
	3X014	18 + 18	2.22	
	3X015	22 + 22	1.81	
	3X016	25 + 25	1.60	
	3X017	30 + 30	1.33	
	3X028	110	0.72	
	3X029	220	0.36	
	3X030	240	0.33	
120va 90 × 40mm 1.2 Kg regulation 11%	4X010	6 + 6	10.00	**£6.38** + £1.43 P&P + £1.17 V.A.T.
	4X011	9 + 9	6.66	
	4X012	12 + 12	5.00	
	4X013	15 + 15	4.00	
	4X014	18 + 18	3.33	
	4X015	22 + 22	2.72	
	4X016	25 + 25	2.40	
	4X017	30 + 30	2.00	
	4X018	35 + 35	1.71	
	4X028	110	1.09	
	4X029	220	0.54	
	4X030	240	0.50	

Also available from ELECTROVALUE, MAPLIN, MARSHALLS, TECHNOMATIC and WATFORD.

TYPE	SERIES NO.	SECONDARY Volts	R.M.S. Current	PRICE
160va 110 × 40mm 1.8 Kg regulation 8%	5X011	9 + 9	8.89	**£8.44** + £1.43 P&P + £1.48 V.A.T.
	5X012	12 + 12	6.66	
	5X013	15 + 15	5.33	
	5X014	18 + 18	4.44	
	5X015	22 + 22	3.63	
	5X016	25 + 25	3.20	
	5X017	30 + 30	2.66	
	5X018	35 + 35	2.28	
	5X026	40 + 40	2.00	
	5X028	110	1.45	
	5X029	220	0.72	
	5X030	240	0.66	
225va 110 × 45mm 2.2 Kg regulation 7%	6X012	12 + 12	9.38	**£10.06** + £1.73 P&P + £1.77 V.A.T.
	6X013	15 + 15	7.50	
	6X014	18 + 18	6.25	
	6X015	22 + 22	5.11	
	6X016	25 + 25	4.50	
	6X017	30 + 30	3.75	
	6X018	35 + 35	3.21	
	6X026	40 + 40	2.81	
	6X025	45 + 45	2.50	
	6X028	110	2.04	
	6X029	220	1.02	
	6X030	240	0.93	
300va 110 × 50mm 2.6 Kg regulation 6%	7X014	18 + 18	8.33	**£11.66** + £1.73 P&P + £2.01 V.A.T.
	7X015	22 + 22	6.82	
	7X016	25 + 25	6.00	
	7X017	30 + 30	5.00	
	7X018	35 + 35	4.28	
	7X026	40 + 40	3.75	
	7X025	45 + 45	3.33	
	7X033	50 + 50	3.00	
	7X028	110	2.72	
	7X029	220	1.36	
	7X030	240	1.25	

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TYPE	SERIES NO.	SECONDARY Volts	R.M.S. Current	PRICE
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	8X018	35 + 35	7.14	
	8X026	40 + 40	6.25	
	8X025	45 + 45	5.55	
	8X033	50 + 50	5.00	
	8X042	55 + 55	4.54	
	8X028	110	4.54	
	8X029	220	2.27	
	8X030	240	2.08	
625va 140 × 75mm 5.0 Kg regulation 4%	9X017	30 + 30	10.41	**£21.54** + £2.20 P&P + £3.56 V.A.T.
	9X018	35 + 35	8.92	
	9X026	40 + 40	7.81	
	9X025	45 + 45	6.94	
	9X033	50 + 50	6.25	
	9X042	55 + 55	5.68	
	9X028	110	5.68	
	9X029	220	2.84	
	9X030	240	2.60	

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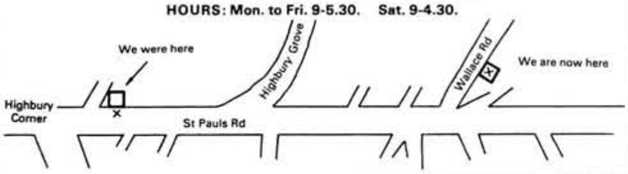

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PT4555	8	25w	12	150	**£4.00**
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PT4556	7	40w	12	80	**£4.50**
PT4236A	10	1w min.	12	175	**£0.75**
PT4236B	10	11w	12	88	**£3.00**
PT4236C	6	35w	12	88	**£4.50**
2N5070	13	25w pep	24	30	**£5.00**
BFW16A	10	1w	12	175	**£0.75**
2N3866	10	1w	28	175	**£0.75**

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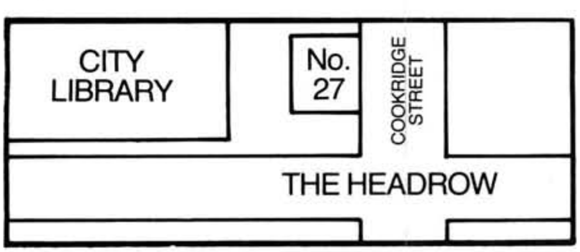

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comment...

Patience

IT TOOK a lot longer than we hoped, but this month we are very pleased to be able to restart the *PW* "Winton" tuner project. This, you may remember, foundered in the middle of part one, back in our April issue, when the a.m. tuner head was discontinued by the manufacturers. Unfortunately, that particular module incorporated control circuits for other parts of the tuner, and it was not an easy thing to find another to do the same job.

We are now indebted to Hart Electronic Kits Ltd., a famous name in the d.i.y. hi-fi field, who have designed and produced a replacement a.m. heao. They will be offering kits for both the *PW* "Winton" tuner and the *PW* "Winton" amplifier, which we published in 1979. See their advertisement for further details.

★ ★ ★ ★ ★ ★

As I write this leader in late August, speculation and rumour continue on the question of a launch date for the UK CB Radio Service, of just how easy or how difficult it will be to meet the equipment specifications, of likely prices, of how many manufacturers or importers **really** have rigs developed to meet the UK specifications, etc., etc!

The Home Office seems uncertain of its attitude towards home construction of CB transceivers, but how anyone can guarantee that the finished products, assembled by individuals whose radio expertise is a completely unknown quantity, will comply with all the requirements of the specification, is completely beyond me.

One manufacturer has demonstrated 27MHz f.m. transceivers to the press, but resolutely refused to allow the equipment covers to be removed. Another firm has announced a modification service to convert **any** a.m./sideband CB rig to meet the UK 27MHz f.m. specification, although there has been no news yet on how the Duty and VAT problem is to be overcome on the illegally imported transceivers.

And while I'm on the subject of illegal imports, how did it come about that the responsible powers-that-be drafted the rules prohibiting anyone from bringing 27MHz CB equipment into the UK in such a woolly fashion, leaving a large loophole through which sets are being imported, with Duty and VAT paid, and proudly proclaimed as such in shop windows and CB magazines?

I suppose it will all sort itself out in the end, though frankly I'm beginning to wonder. As the saying goes: Patience is a virtue.

Geoff Arnold

services

QUERIES

While we will always try to assist readers in difficulties with a *Practical Wireless* project, we cannot offer advice on modifications to our designs, nor on commercial radio, TV or electronic equipment. Please address your letters to the **Editor, "Practical Wireless", Westover House, West Quay Road, Poole, Dorset BH15 1JG,** giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components for our projects are usually available from advertisers. For more difficult items, a source will be suggested in the "Buying Guide" box included in each constructional article.

PROJECT COST

The approximate cost quoted in each constructional article includes the box or case used for the prototype. For some projects the type of case may be critical; if so this will be mentioned in the Buying Guide.

CONSTRUCTION RATING

Each constructional project will in future be given a rating, to guide readers as to its complexity:

Beginner

A project that can be tackled by a beginner who is able to identify components and handle a soldering iron fairly competently. Generally this category will be used for simple projects, but sometimes for more complicated ones of wide appeal. In this case, construction and wiring will be dealt with in some detail.

Intermediate

A project likely to appeal to a wide range of constructors, and requiring only basic test equipment to complete any tests and adjustments. A fair degree of experience in building electronic or radio projects is assumed.

Advanced

A project likely to appeal to an experienced constructor, and often requiring access to workshop facilities and test equipment for construction, testing and alignment. Constructional information will generally be limited to the more critical aspects of the project. Definitely not recommended for a beginner to tackle on his own.

SUBSCRIPTIONS

Subscriptions are available to both home and overseas addresses at £13.00 per annum, from **"Practical Wireless" Subscription Department, Room 2613, King's Reach Tower, Stamford Street, London SE1 9LS.** Airmail rates for overseas subscriptions can be quoted on request.

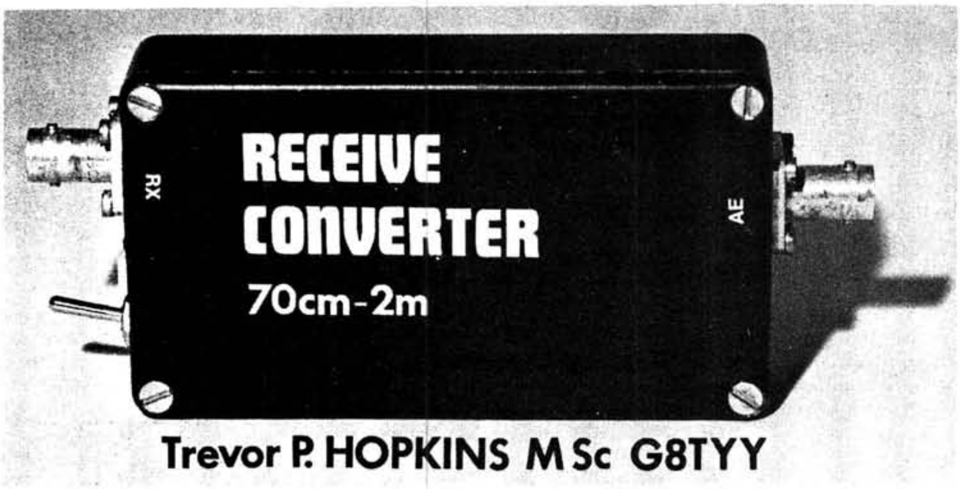
BACK NUMBERS AND BINDERS

Limited stocks of some recent issues of *PW* are available at 95p each, including post and packing to addresses at home and overseas.

Binders are available (Price £4.30 to UK addresses and overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

Please make cheques, postal orders, etc., payable to IPC Magazines Limited.



RECEIVE CONVERTER 70cm-2m

Trevor P. HOPKINS M Sc G8TYY

The 70cm amateur band, 430-440MHz, is a very interesting band and is becoming more popular, perhaps because of the overcrowding sometimes encountered on 2m, 144–146MHz. Single side-band (s.s.b.) activity is increasing, while for the f.m. operator there are a large number of repeaters, several times the number found on 2m, and simplex activity is on the increase as well. With similar power, receive sensitivity and size of antennas, the results on 70cm can be comparable with those on 2m, and the u.h.f. signals are particularly good at getting out of extremely screened locations (e.g. built-up areas, tunnels, etc.).

In order to encourage still further interest in the 70cm band, the author attempted to design an inexpensive receive converter from 70cm down to 2m, so that prospective operators could listen around before deciding to invest in a transceiver or transverter for the band. Design aims were for an easily reproduced and aligned converter with reasonable performance at modest cost. Other uses for such a converter include "listening through" local repeaters (listening to one's own signal coming from the repeater) and in conjunction with a tunable or synthesised 2m receiver, aligning and testing other 70cm equipment.

Circuit Description

The circuit used in Fig. 1 is fairly conventional, and no claims for originality are made. The r.f. amplifier uses a BFR34A stripline transistor Tr1 in a grounded-emitter configuration, and uses printed circuit stripline tuned circuits. Even on standard epoxy glass fibre board, these are reasonably stable and are readily produced as part of the printed circuit board. The amplified output signal is tapped off and fed to gate 1 of the mixer transistor, a dual-gate MOSFET type 3N204. The local oscillator signal is fed to gate 2. This transistor is somewhat underbiased in this circuit for use as a mixer stage, as the source is connected directly to ground. However, this has the advantage that the metal encapsulation, which is internally connected to the source, may be soldered directly to the ground-plane on the p.c.b. This aids stability and will be described in more detail later. The "intermediate frequency" at 144MHz is selected by the tuned circuit L3/C9 in the drain, and the output is taken from a tap on the coil.

The oscillator chain starts with a crystal oscillator, Tr3, using a 96MHz 5th overtone crystal XL1. This is available ex-stock from several suppliers. An alternative crystal may be used, XL2, selected by switch S1; this will be discussed later. Preset resistor R11 adjusts the output level from the crystal oscillator, and therefore the local oscillator injection level into the mixer. Transistor Tr4 provides a stabilised supply for the oscillator. The 96MHz signal is tuned by L4/C13 and coupled to a common base tripler stage Tr5. The output frequency at 288MHz is selected by L6/C20 and inductively coupled by L7/C21 to a buffer amplifier Tr6. The output of this is tuned by L8/C25 and a signal is tapped off via C26 and fed to gate 2 of the mixer transistor Tr2. Note that the inclusion of three tuned circuits at the final local oscillator frequency minimises the generation of spurious products and keeps the apparent noise level low.

Construction

The converter is constructed on a single epoxy glass fibre printed circuit board, intended to fit inside a standard diecast aluminium box, 114 × 64 ×30mm. Alternative mounting arrangements may be used, but it is strongly recommended that the converter is completely screened, as this reduces the pick-up of strong unwanted signals. As with any piece of r.f. equipment, the tuned circuits are extremely important. The front-end inductors L1 and L2 are

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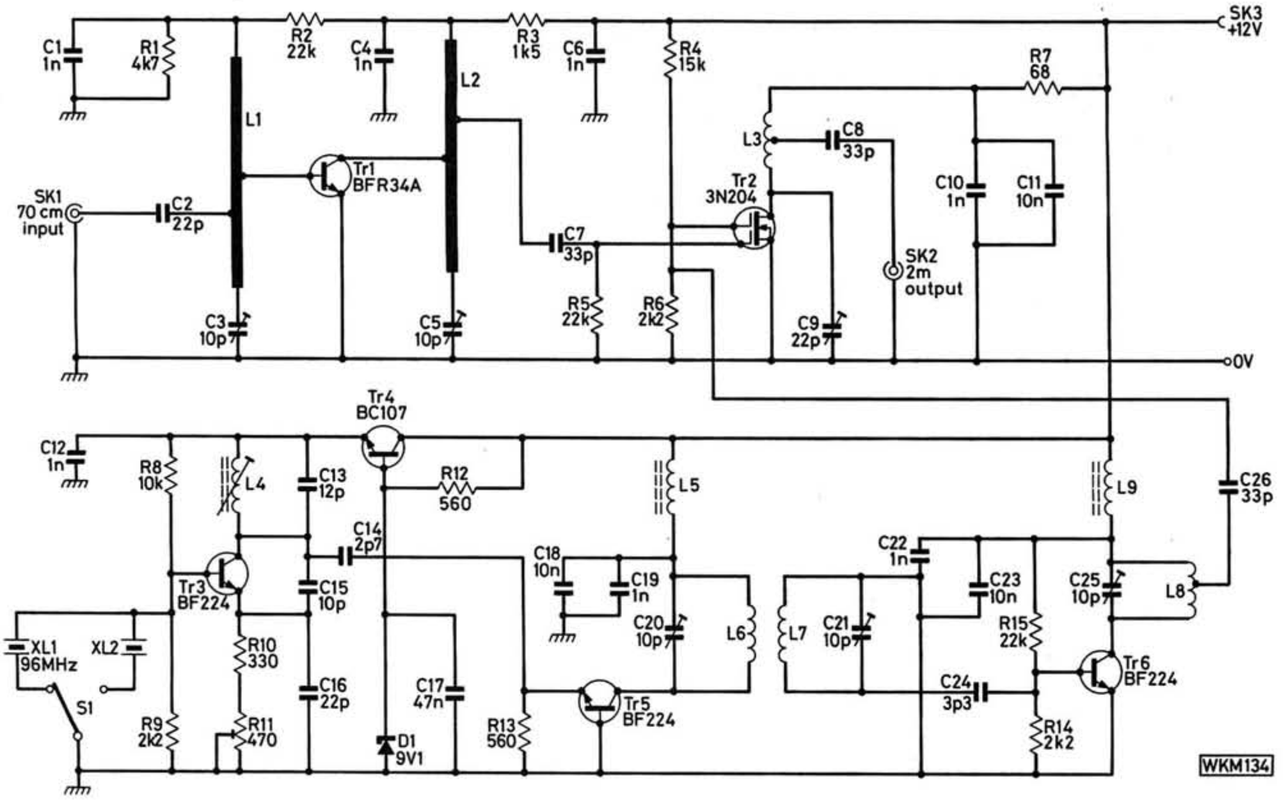


Fig. 1: Circuit diagram of the converter

etched onto the p.c.b., but all the remaining coils are wound in the conventional manner. To aid construction, details of the coils are shown below.

Coils L3, 6, 7 and 8 are wound with 18 s.w.g. tinned copper wire with their axes parallel to the p.c.b., while L4 is wound on a vertically mounted coil former. The former is glued from the underside into a 5mm hole in the p.c.b. Coils L5 and L9 are wound with enamelled copper wire on 6-hole ferrite beads. The self-supporting coils are most easily wound on drill shanks of the appropriate size.

The p.c.b. track side layout is shown full size in Fig. 2. This should be followed carefully if the converter is to function correctly. Note that the top (component) side of the p.c.b. is a copper ground-plane; double-sided p.c.b. material will be necessary. If a home-etched printed circuit board is used and only one side is etched, it will be necessary to remove some of the copper around many of the holes using a 3mm drill bit or similar. The component layout is shown in Fig. 2. Small modern components should be used, and mounted as close as possible to the p.c.b. Where indicated in Fig. 2, component leads should be soldered to **both** sides of the board, to ensure good earthing. Otherwise the leads should not touch the ground-plane.

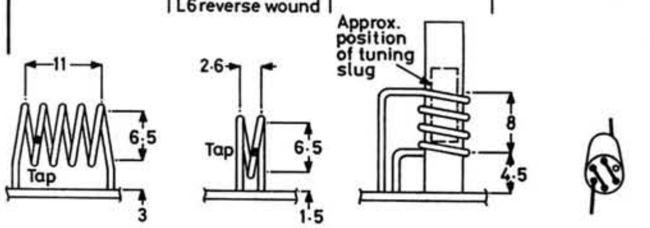
The p.c.b. requires two 3mm fixing holes and two 5mm holes for mounting the former for coil L4 and transistor Tr1. Note that Tr1 is a stripline mounting "T" package, and should be mounted from the track side of the board, with the emitter lead bent up and soldered directly to the ground-plane. The base and collector leads are soldered to the printed circuit inductors. Note also that one side **only** of components R1, C1 and C4 are soldered to the ground-plane side of the board. Transistor Tr2, which is a TO-72 metal can type, is mounted flush with the ground-plane and soldered to it. This improves the stability of the converter and is unlikely to damage the transistor. One side of capacitor C26 is connected directly to the tapping point on coil L8.

After the board is completed and double-checked, it should be mounted in a screened enclosure. Suitable connectors, preferably 50 ohm b.n.c. sockets with 4 fixing holes, should be used for antenna and receiver connections, and should be as close as possible to the input and output pins on the p.c.b. Power supply connections may be of any suitable form; the author used 2mm plugs and sockets for this purpose. It is important that a gap of at least 5mm remains between the underside of the p.c.b. and the metal case, otherwise the operation of the stripline tuned circuits will be impaired. If only one crystal is fitted, switch S1 may be omitted, and a wire link soldered to the appropriate pins in its place.

WKM135

COIL WINDING DETAILS

L3	L6 L7 L8	L4	L5 L9
5 turns 18 s.w.g. tinned copper wire.	1½ turns 18 s.w.g. tinned copper wire.	3½ turns 18 s.w.g. tinned copper wire.	2½ turns 26 s.w.g. enamelled copper wire.
Tapped 1¼ turns	Tapped 1 turn L8 only	5mm former	FX1898 ferrite bead 6 hole type
	L6 reverse wound		



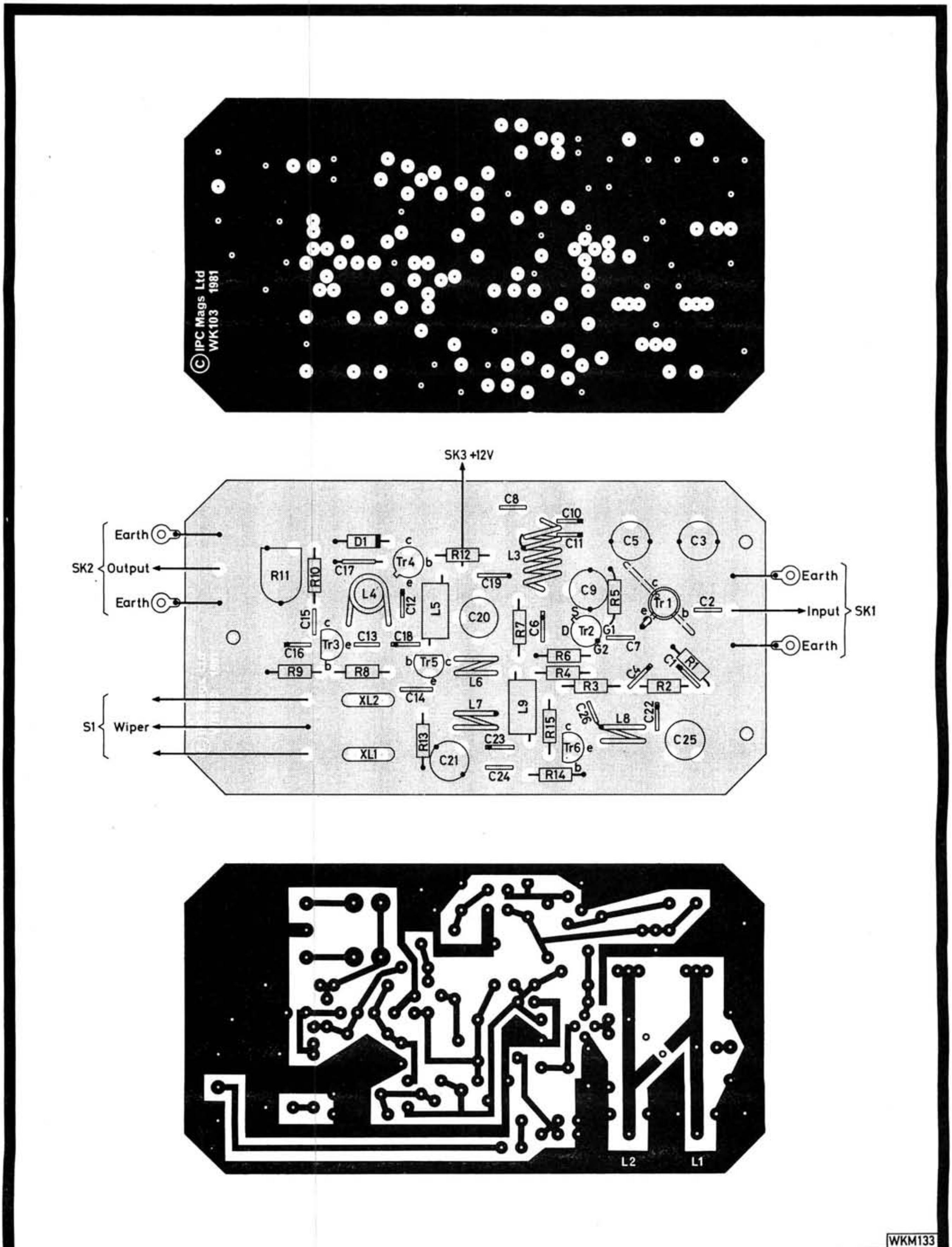


Fig. 2: Track patterns and component layout, both shown full size. Component leads to be soldered on both sides of the p.c.b. are indicated by dots on the component layout drawing

★ components

Resistors

¼W, 5% Carbon Film

68Ω	1	R7
330Ω	1	R10
560Ω	2	R12,13
1·5kΩ	1	R3
2·2kΩ	3	R6,9,14
4·7kΩ	1	R1
10kΩ	1	R8
15kΩ	1	R4
22kΩ	3	R2,5,15

Miniature horizontal preset

470Ω	1	R11

Capacitors

Miniature metallised ceramic plate

2·7pF	1	C14
3·3pF	1	C24
10pF	1	C15
12pF	1	C13
22pF	2	C2,16
33pF	3	C7,8,26
1nF	7	C1,4,6,10,12,19,22
10nF	3	C11,18,23

Disc ceramic

47nF	1	C17

Miniature trimmers

10pF	5	C3,5,20,21,25
22pF	1	C9

Semiconductors

Transistors

BFR34A	1	Tr1
3N204	1	Tr2
BC107	1	Tr4
BF224	3	Tr3,5,6

Zener Diode

BZY88–C9V1	1	D1

Miscellaneous

S1 s.p.c.o. miniature toggle switch; SK1,2 50Ω b.n.c. sockets, four hole fixing; XL1 96MHz 5th overtone crystal in HC18/U can; XL2 see text; diecast box 114 × 64 × 30mm; cores type FX1898, 6-hole type (2); 5mm × 27mm coil former and core; p.c.b.; sockets for power supply.

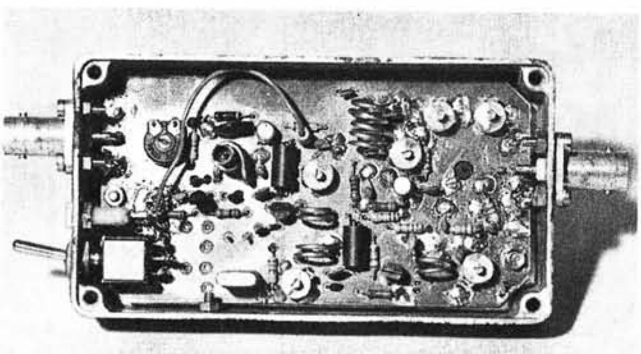


Fig. 3: Internal view of the prototype

Alignment

After assembly, the various presets should be set to the positions indicated in Table 1, except for R11, which should be set to minimum resistance (fully anti-clockwise). A suitable 2m receiver should be connected to the output and a 70cm antenna to the input socket (a wire rod of λ/4, 175mm long, should be adequate). A 12 volt power supply should also be connected preferably via a 100mA meter. The power supply current should not exceed 30mA.

With the presets in the positions given, it should now be possible to detect a strong local signal, such as that from a nearby 70cm transmitter fed into a dummy load. In the absence of this, the third harmonic output from a 2m transmitter may be used. All variable capacitors should be peaked for maximum signal strength.

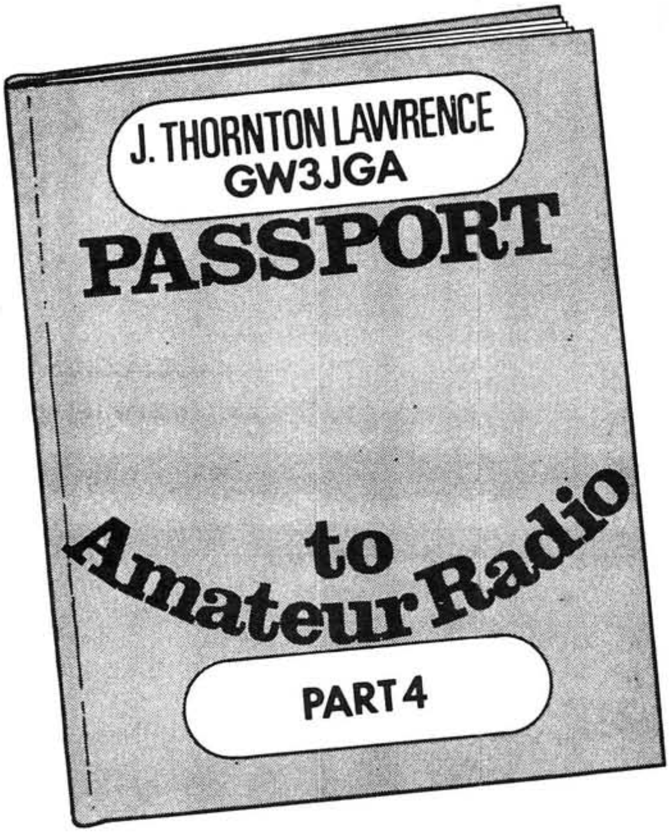
Table 1

Component	Initial Setting
C3	45% enmeshed
C5	35% enmeshed
C9	30% enmeshed
C20	35% enmeshed
C21	35% enmeshed
C25	35% enmeshed
L4	Core approximately half-way inside coil
R11	Set to approximately 20% resistance.

Adjusting coil L4 will cause the crystal oscillator to vary its frequency over a small range; outside this, the oscillator will stop, or oscillate at another crystal overtone (e.g. the third overtone, 57·6MHz). If a sensitive wavemeter or a digital frequency meter is available, the frequency of the crystal oscillator can be checked. Lack of oscillation is the most likely cause of no detectable signal. Coil L4 should be adjusted for exactly 96MHz output, so that a 433·000MHz signal input corresponds precisely to 145·000MHz on the 2m receiver.

As the capacitors are adjusted, it will become necessary to move to progressively weaker sources, such as, first, a local repeater or nearby amateur, and finally on to a distant beacon or repeater. When no improvement in received signal strength is obtained from further adjustment, resistor R11 can be set up. While listening to a weak signal, increase the resistance of R11 until the signal can no longer be heard, and then decrease the resistance again to a point where no further increase in signal to noise ratio is gained. This adjustment sets up the optimum level of oscillator injection into gate 2 of the mixer transistor Tr2. This completes the alignment.

Provision is made in the circuit to add a second crystal in order to increase the tuning range available with a normal 2m receiver tuning 144–146MHz. If a crystal of 96·6667MHz is used, then the range 434–436MHz will be converted down to 144–146MHz. Alternatively, if a crystal of 96·5333MHz is used, the range 433·6–435·6MHz will be covered. This latter option allows the user to listen to the input frequencies of 70cm repeaters immediately by operating S1. (70cm repeaters in the UK have the input frequencies 1·6MHz **higher** than the outputs, rather than 600kHz lower as with 2m repeaters.) Crystals XL1 and XL2 should be of the same type and specification, otherwise it will be impossible to get them to oscillate on the correct frequency. ●



So far on the technical side we have covered d.c. and resistance, here an explanation of some of the properties and effects is helped by using a familiar analogy. As we move into the area covering inductance and alternating current it is less easy to find suitable analogies, and greater effort is required if you are to get a clear mental picture of what is happening in a particular circuit.

In addition, because space is limited, it is essential that you read around the subject in the literature which has been recommended. Some very helpful explanations are given in *Uncle Ed's Page* in *Practical Wireless* and should be included in your "essential reading" list.

Magnetism

Almost everyone has played with magnets at some time, picking up paper clips or placing a piece of paper with iron filings on it over a magnet and seeing the "lines of force". Perhaps even making an electromagnet, by taking an iron nail and winding a few tens of turns of insulated copper wire on it and connecting it to a battery.

If you haven't, then details of these and similar experiments are given in an excellent little book, *Magnets, Bulbs and Batteries* from the Ladybird Junior Science series. If you are a family person then perhaps your children will lend you their copy!

To continue, a magnet has two areas where its magnetism is concentrated, these are at the poles. One is the north-seeking pole or simply the north pole (that's the end of a compass needle which "seeks" the earth's magnetic north pole) and the other, the south-seeking pole or south pole.

When two bar magnets are brought close together, the magnetic fields interact and the result is that like poles physically repel each other and unlike poles attract. Permanent magnets are made of magnetic materials which, once magnetised, retain their magnetism almost indefinitely.

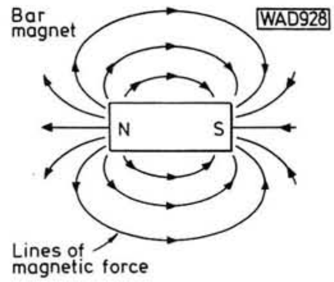
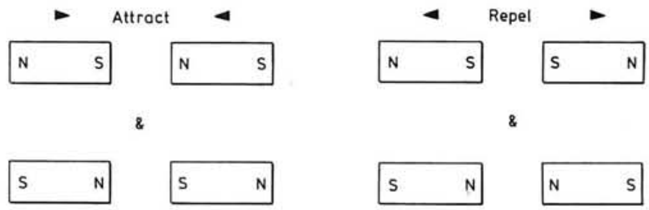


Fig. 9: Like poles repel and unlike poles attract



The Magnetic Effect of an Electric Current

Whenever an electric current flows in a circuit it produces a magnetic field. If you imagine a copper wire which is carrying a current, passing vertically downwards through this page, then the direction of the associated magnetic field will be as shown in Fig. 10 (*conventional* current flow). An easy way to remember the direction is to think of a right-handed corkscrew, screwing into the page — the "corkscrew rule". Reversing the direction of the current reverses the direction of the magnetic field.

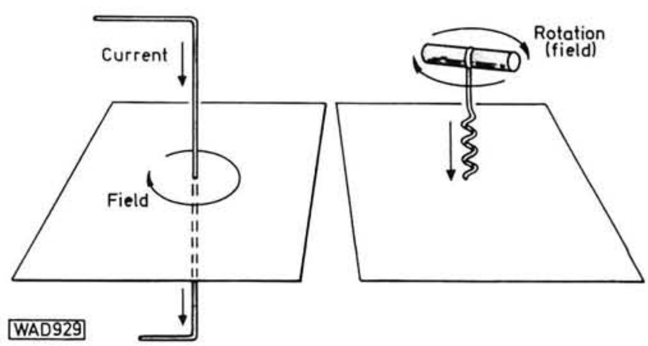


Fig. 10: The direction of a magnetic field shown by the corkscrew rule

The magnetic field of a single wire is relatively weak, but it can be increased by winding the wire into a coil or solenoid, so that the same current flows through each turn and the magnetic field produced by each turn adds to that of the next.

The magnetic field can be concentrated still further by winding the coil in the form of a solenoid on a core of soft iron, as in an electromagnet. The overall magnetic field will be similar to that of a bar magnet. The strength of the magnetic field is directly proportional to the strength of the current and the polarity of the field depends on the direction of the current.

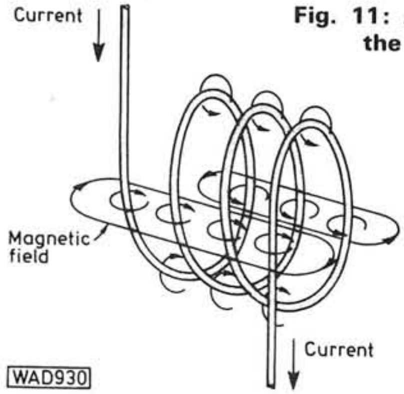


Fig. 11: A coil concentrates the magnetic field

By adding little arrows to the letters "N" and "S", to indicate the direction of the current, you can then easily remember which direction causes a south or north pole.

Soft iron is used for electromagnets because it does not remain magnetised when the magnetising current is switched off. A typical use of an electromagnet is in an electrical relay, where a current in one circuit is used to energise a solenoid and move electrical contacts to switch a current in another circuit.

The same reaction that occurs between the like and unlike poles of permanent magnets also takes place between a permanent magnet and a coil or electromagnet and similarly between two coils or electromagnets. A practical example of this is the loudspeaker. In this, a current flowing through the voice coil causes a magnetic field which reacts with the field from the permanent magnet. This produces a force which moves the voice coil and the attached cone. A varying audio signal current causes the coil and cone to move in and out in sympathy with the signal, thus making sound waves in the air.

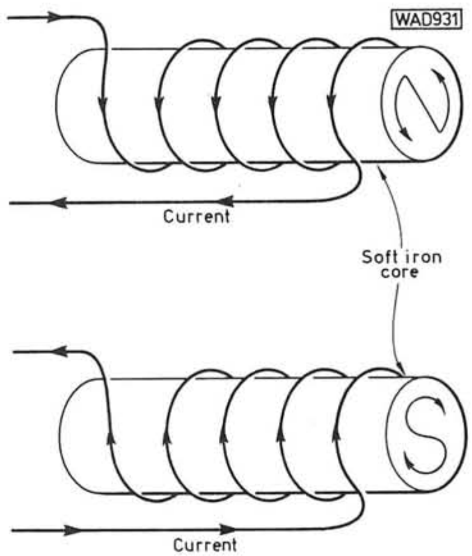


Fig. 12: Field direction in a solenoid

Other examples of this are the moving coil ammeter and, of course, the electric motor which converts electrical energy into mechanical movement.

We have looked briefly at electromagnets, the interaction of magnetic fields and the physical force produced. Now let us look at the converse effects.

Electromagnetic Induction

When a conductor moves across a magnetic field or a magnetic field is moved across a conductor, a voltage or e.m.f. is induced in that conductor. The polarity of the induced e.m.f. depends on the polarity of the field and the direction of movement. The size of the e.m.f. depends on the strength of the field and speed of movement or rate of change.

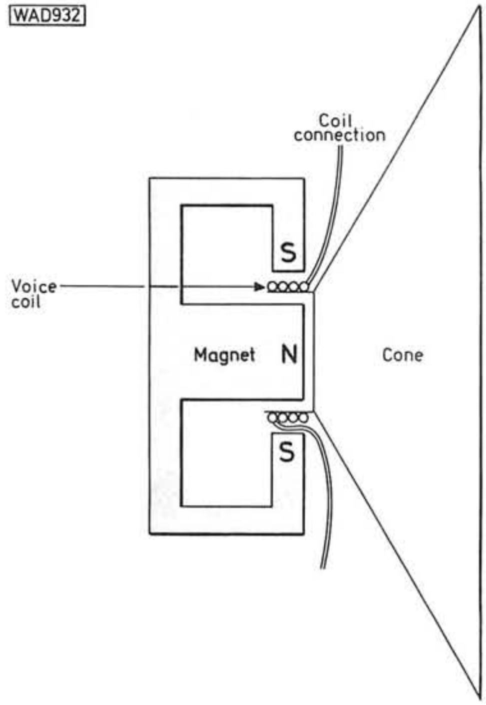


Fig. 13: Loudspeakers use the effects of electromagnets to produce their sound

This effect can best be demonstrated by moving a bar magnet in and out of a solenoid so that the field from the magnet cuts across the conductors in the solenoid, as shown in Fig. 14.

When the magnet is moving into the solenoid, the e.m.f. induced in the coil drives a current around the external circuit and produces a deflection on the current meter. When the magnet is being withdrawn it induces an e.m.f. of the opposite polarity and the meter deflects in the opposite direction. The faster the magnet is moved the faster the magnetic field changes and the greater is the induced e.m.f. With the magnet stationary, there is no movement of the magnetic field, no induced e.m.f. and therefore no deflection of the meter.

Try it for yourself, make a solenoid by winding about 50 to 100 turns of insulated wire on a toilet-roll tube, connect it to a milliammeter, then push a bar magnet in and out and see what happens. You could equally well hold the magnet still and move the coil!

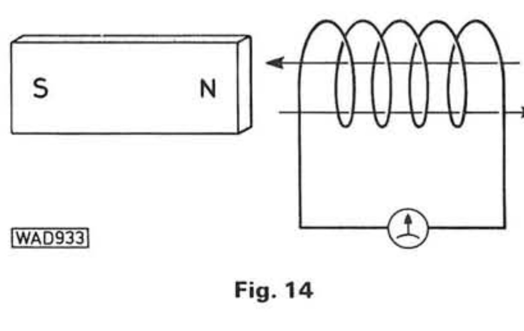


Fig. 14

Dynamos and generators operate by electromagnetic induction, converting mechanical energy into electrical energy.

Self Inductance

The symbol for self inductance is L and the unit the henry, symbol H. We have seen that a steady current flowing through a coil produces a steady magnetic field. If, however, we try to increase this current by increasing the applied e.m.f. then any rise in the current will induce a counter e.m.f. in the coil which tends to oppose the applied e.m.f. to prevent the current increasing.

Similarly, if we try to reduce the current then any fall will induce a counter e.m.f. which adds to the applied e.m.f. to try to maintain the existing current.

The counter e.m.f. opposes the applied e.m.f. when the current is rising and aids the applied e.m.f. when the current is falling. This effect is known as **self inductance,** often abbreviated to inductance.

A coil is said to have an inductance of 1 henry if an e.m.f. of 1 volt is induced in it by a current flowing through it which is changing at the rate of 1 ampere per second.

If we replace the moving permanent magnet in our previous experiment with an additional coil, fixing it inside the original outer coil, we have an arrangement as shown in Fig. 15.

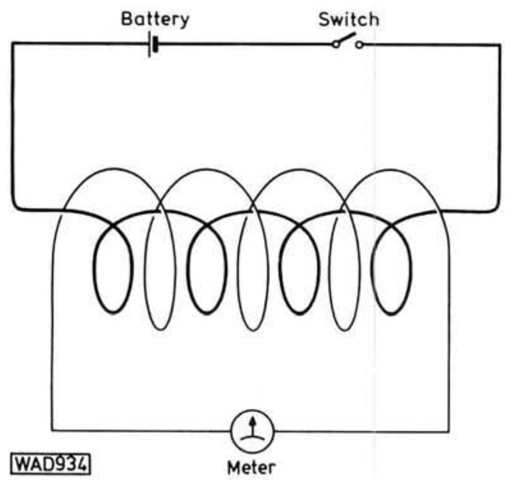


Fig. 15

Closing the switch will cause a current to flow in the inner "primary" coil which, in turn, will cause a magnetic field to be built up. This increasing field, because it also passes through the "secondary" coil, will induce an e.m.f. in it. Once the field has reached a steady state the induced e.m.f. will fall to zero. Switching off the current will cause the magnetic field to collapse and an opposite polarity e.m.f. will be induced in the secondary coil. The induced e.m.f. is only present while the field is actually changing.

This arrangement is the basis of the transformer, where a changing current in the primary coil induces a voltage in the secondary coil. The "tightness" of the magnetic coupling between the two coils affects the strength of the e.m.f. induced in the secondary coil.

Mutual Inductance

The tightness of the coupling is expressed as the **mutual inductance** (symbol M) between the coils and is also measured in henrys. The mutual inductance is 1 henry when an e.m.f. of 1 volt is induced in the secondary coil by a current in the primary coil which is changing at the rate of 1 ampere per second.

Construction of Inductors and Chokes

In a practical circuit the actual value of the inductance and its construction are governed largely by the frequency and the characteristics of the circuit in which it is to be used.

Low frequency laminated iron-cored chokes, having an inductance of several henrys, are used for filtering purposes in d.c. power supplies. The winding is carried on a bobbin, through which the core is assembled. In audio frequency circuits chokes may be wound and enclosed in a ferrous material "pot-core" and have an inductance of tens or hundreds of millihenrys.

Intermediate and low radio-frequency coils are usually wound in layers on a former or tube, sometimes in several sections, to reduce self capacitance. Tuning coils are wound on a small former having a threaded core of iron dust material inside it which can be screwed in and out to adjust the inductance to the exact value required (in the microhenry range).

Coils for h.f. and v.h.f. are usually made of thicker wire and wound on low-loss formers, or are self supporting with an air "core". At u.h.f. inductors may be in the form of strips or lines of flat strip or rod, and bear little physical resemblance to a conventional coil.

Inductors in Series and Parallel

Note the inductors are not mutually coupled.

$$\text{Series} \quad L_{(total)} = L1 + L2$$

$$\text{Parallel} \quad \frac{1}{L_{(total)}} = \frac{1}{L1} + \frac{1}{L2}$$

or where there are only two inductors,

$$L_{(total)} = \frac{L1 \times L2}{L1 + L2}$$

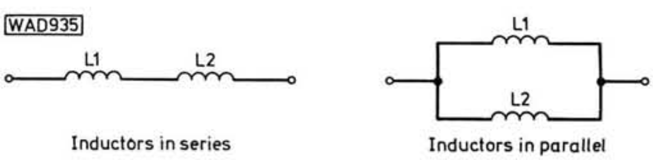


Fig. 16

The arithmetic is the same as for resistors; in series they add and in parallel the total value is always equal to or less than the smallest.

Energy in an Inductor

In a d.c. circuit which contains an inductor, the steady value of the current is determined by the resistance of the circuit and not the inductance. That is $I = \frac{V}{R}$

When the circuit is switched on, the counter e.m.f. generated in the inductor equals the supply voltage, and for an instant the current is zero. The current then builds up exponentially to the final value, determined by the resistance.

On switching off, a counter- or back-e.m.f. is induced in the inductor by the collapsing field. The e.m.f. generated can be very high if the field collapses rapidly.

In a practical circuit where a transistor is controlling the current through a relay coil, the steady "on" current would be determined by the coil resistance.

$$I = \frac{V}{R} = \frac{12}{120} = 0{\cdot}1 \text{ amps}$$

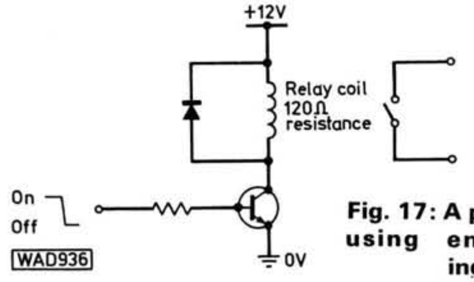


Fig. 17: A practical circuit using energy in an inductor

When the transistor is switched off, the counter e.m.f. in the coil could reach a value of several hundred volts positive at the transistor collector and damage the transistor. To prevent this happening a "catching" diode is connected across the coil, as shown, and conducts when the counter e.m.f. occurs at switch-off. The counter e.m.f. then drives a current through the coil and the energy is dissipated in its resistance.

Incidentally, because the induced e.m.f. at switch-off is restricted by the catching diode then the field can only collapse slowly and in these circumstances the relay may take a little longer to release.

Capacitance

Capacitance may be defined as the ability of a conductor to store an electric charge and is measured in farads, symbol F.

If we place two metal plates close to one another and separate them with a piece of insulating material, we have an arrangement which will store electricity in the form of a charge. The capacitance of the arrangement depends on a number of factors:

a) The area of the plates
b) The distance between the plates
c) The nature of the insulating material occupying the space between the plates (specifically the dielectric constant or relative permittivity)

The unit of capacitance is the farad — an uncommonly large unit for the purposes we require — so that the values found in radio work are microfarads (10^{-6}), nanofarads (10^{-9}), and picofarads (10^{-12}).

Dielectric Constant

If we measure the value of capacitance of two metal plates, separated by certain insulating material, and repeat the measurement keeping area of plates and distance apart the same but having a vacuum separating them, then the ratio between the two values of capacitance will be equal to the dielectric constant of the insulating material. This constant is usually denoted by the letter K and the capacitance of a capacitor is given by the relationship:

C is proportional to $\frac{KA}{d}$ where A is the area of the plates and d is the spacing between them

A capacitor is classified by the material used as the dielectric, and the table below shows types of dielectric used, together with their dielectric constants.

Material	Dielectric Constant
Air	1
Dry paper	2·5 approx.
Polyester	5 approx.
Mica	5–7 approx.
Aluminium oxide	7·5 approx.
Ceramic (low K)	up to 20.
Ceramic (high K)	up to 10 000.

The **dielectric strength** is the voltage at which the dielectric breaks down and this as well as its thickness determines the maximum safe working voltage which may be applied to the capacitor.

Capacitor Ratings

The two most important practical ratings of a capacitor are its capacitance and its working voltage, and these are almost invariably marked on the capacitor. The required value of capacitance depends on the purpose for which it will be used, and the voltage rating on the maximum voltage that will be present across the capacitor under all operating conditions.

The required accuracy or tolerance of the capacitance value depends on how critical the circuit is to this. For example, the capacitance of an electrolytic capacitor, providing the smoothing in a power supply, could be greater or less by 20 per cent of its stated value without causing any significant change in performance, but a silvered mica capacitor in the oscillator tuning circuit of a communications receiver would cause serious tuning errors if its value was in error by this amount. In some applications therefore, the tolerance is also an important factor.

There are other factors too, such as insulation resistance, temperature stability, physical size, etc., which affect the suitability of a particular type of capacitor for a particular use.

Air Dielectric Capacitors

These are usually in the form of variable tuning capacitors having a set of fixed plates with a set of moving plates that swing into mesh between the fixed plates. This enables the effective area of the plates, and so the capacitance, to be varied.

Air dielectric tuning capacitors for use in receivers, where the maximum voltage may be only a few volts, can have very close spacing between the plates, but types for use in transmitters, where high voltages are present, must have significantly greater spacing to avoid voltage breakdown or flashover. The breakdown voltage of air is about 25 000V/cm and the spacing between the plates of a tuning capacitor for a receiver would be about 0·2mm (mainly limited by the mechanical accuracy) and for a 150W h.f. transmitter about 1·5mm.

Mica Capacitors

The mica capacitor uses thin sheets of mica as the dielectric and offers the best electrical properties possible, but for a given capacity it tends to be large and fairly expensive. Mica is naturally a very stable material, after all it has been lying in the ground stabilising for millions of years, so the capacitor using it as a dielectric will also have excellent stability. The mica capacitor is therefore ideal for use in tuning or other critical circuits.

The silvered mica capacitor has the electrodes deposited as a film of silver on the surfaces of the mica, and so enables very thin blades of mica to be used. The blades are stacked with interconnecting foils and are then clamped or riveted together which gives them their characteristically flat "postage stamp" shape. Silvered mica capacitors are available in values from 1pF to about 10 000pF and usually have a voltage rating of 250 to 500V, although higher voltage ratings are available for use in transmitters. They are very stable for use in r.f. tuned circuits up to several hundred megahertz and will carry appreciable r.f. currents in transmitter applications. Some "compression type" trimmer capacitors use mica as a dielectric, and in these the mica is sandwiched between spring foil electrodes. The capacitance is varied by squashing the sandwich with an adjusting screw, and so changing the dielectric from partly air and partly mica to just mica. These capacitors, which were once seen only in radio receivers, are now being used in transistor v.h.f. and u.h.f. transmitters where their very low inductance and low losses make them ideal.

Ceramic Capacitors

Ceramic capacitors are made in various forms, the most popular being the tubular and disc types. The tubular type consists of a small ceramic tube which has silver deposited on the inside and outside surfaces, the capacitance being determined by the area of the surface, the tube wall thickness and the ceramic dielectric constant. The disc type consists of a flat disc of ceramic with silver deposited on each side of the disc. Ceramic dielectric material can be made to have particular characteristics by adjusting the proportions of the ingredients.

The low-K ceramic material usually used in the tubular capacitors provides good stability with a fairly low and a predictable temperature coefficient (change of capacitance with temperature), so that in some circumstances they can be used with advantage in a tuned circuit to compensate for the opposite temperature effects on other components in the circuit. Their small physical size and low inductance makes them suitable for use in receivers and low power circuits in the v.h.f. and u.h.f. range.

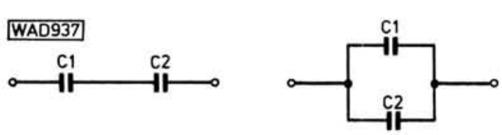
Tubular ceramic capacitors are also made in a lead-through form for decoupling supplies passing through a screening box or plate and they have a soldering flange or screwed bush for mounting. Variable tubular ceramic capacitors have the internal silvering replaced by a concentric adjusting screw and these are suitable for operation up to several hundred megahertz.

Disc ceramic capacitors are usually of the high-K ceramic type, and have the advantage of very high capacitance with small physical size and very low inductance. High-K ceramic material has a high temperature coefficient which makes these capacitors unstable in value and so unsuitable for use in tuned circuits. They suffer from losses at high frequencies but can be used successfully in bypass and decoupling applications up to a gigahertz.

Wound Capacitors

Polystyrene, polyester, polycarbonate and paper capacitors are made by winding two strips of metal foil into a roll, insulated by two strips of dielectric film or paper. Connection strips or edges are brought out to form suitable lead-out connections. Polystyrene is a high-grade dielectric having characteristics approaching those of mica and such capacitors are used in l.f., m.f. and h.f. circuits where stability is important. Polyester and polycarbonate capacitors are suitable for most l.f. and m.f. applications up to a few megahertz. Paper capacitors are mainly used in l.f. applications and for high voltage power supply use, where working voltages up to several thousand volts are available. Capacitors of this type are usually hermetically sealed in a can with special high voltage terminals.

Polystyrene capacitors are available in values from 10pF to 1µF, and polyester, polycarbonate and paper capacitors from 1000pF to 10µF approximately.



Capacitors in series   Capacitors in parallel

Fig. 18

Capacitors in Series and Parallel

Series $\frac{1}{C_{(total)}} = \frac{1}{C1} + \frac{1}{C2}$

Parallel $C_{(total)} = C1 + C2$

In parallel they add and in series the total value is equal to or less than the smallest.

Please Note

Unfortunately in Part 1 of this series we made an error in the dates of two reviews we did on the SRX-30 and the FRG-7. The dates should be August and July **1979** not 1980 as we said.

Another thing to remember is that it's not long now before you should be making arrangements to pay your examination fees for the May exam. You should check with your local technical college etc., as to the date for booking. If you miss the date a late booking can be more expensive — if they will accept one at all.

RAE Practice Questions

Once again here are some typical questions on this section, which you may like to try.

1. When the current in a coil changes at the rate of one ampere per second and induces in a second coil an e.m.f. of one volt there is said to be:
   a. A self inductance of one henry
   b. An inductive reactance
   c. A mutual conductance between the coils
   d. A mutual inductance of one henry
2. Capacitance is:
   a. The name given to any component or circuit capable of storing a charge of static electricity
   b. The property exhibited by a component or circuit of being able to store a charge of static electricity
   c. A measure of the opposition to the discharge of a body with static electricity
   d. The quantity of electricity required to charge a given component

Next month we will continue with alternating current and frequency

Answers:
1. d., 2. b.

A monthly look at some aspect of the radio/electronics hobby that seems to bug the beginner, or occasionally a more advanced topic seen from an unusual angle.

DECIBELS

The dreaded decibels—a term to strike terror into the heart of many a radio student or enthusiast! Which is a great pity on three counts: first, they're such a useful concept; second, they're so widely encountered; third, they're not really all that difficult to understand.

I guess many people, certainly those without a mathematical bent (if you'll pardon the expression), are frightened off when they encounter the equation:

$$N_{dB} = 10 \log_{10} \frac{P2}{P1}$$

And even more confused to find that this is closely pursued by another:

$$N_{dB} = 20 \log_{10} \frac{V2}{V1}$$

with often no real effort made to explain how one relates to the other.

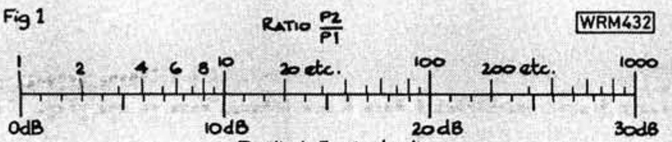
Now, just for the moment, I want to forget the decibel and go back to the bel, which is ten times as big ("deci" is a multiplier meaning "a tenth of"). The bel is what Alexander Graham Bell, of telephone fame, devised as a means of specifying changes in sound power levels. It turned out to be rather too large, which was why the decibel came into common use.

However, by using the bel, I can reduce the first equation I quoted to:

$$N_B = \log_{10} \frac{P2}{P1}$$

which is a whole lot simpler-looking. The little $_{10}$ after the word log is only there to tell you that they are "logs to the base ten", the old-fashioned school-book sort, rather than "natural" logs (base "e") or any other sort.

Fig 1



The first thing to notice is that P2/P1 is a ratio of power P2 to power P1. P1 is "what it was before" and P2 is "what it was after". Before and after what? Well, **before** you turned the volume control on your radio up (or down), and **after** you had done so. Or at the input (before) of an amplifier (or attenuator) and at its output (after).

The second thing is that having found the ratio, you then take the logarithm of it. Incidentally, there is, as often happens, a very good physical reason why the equation takes the form it does, and that is simply that if a sound is suddenly increased in strength the listener gets an impression of increased loudness which is roughly proportional to the log of the ratio of the two acoustical powers.

When P2 is 10 times as great as P1, their difference is 1 bel, since the log of 10 is 1. This represents a change of 1 watt to 10 watts, or 100 watts to a kilowatt (1000 watts). Note that it is not the **difference** between the two powers but their ratio that matters. In the two examples I just gave, the differences are 9 watts and 900 watts, but the ratio is 10:1 in each case.

For many of the sort of comparison measurements we want to make in radio, where we will often be looking at a change of perhaps 2:1 or even 10% (1·1:1) or less, the bel is rather large. Hence the almost universal use of the decibel as the base unit.

The decibel has another useful relationship to human hearing, and that is that most people can just **not** detect a sudden change of sound level of 1dB, whereas they **can** detect a sudden change of 2dB.

Don't fall into the trap of thinking that if 1 bel represents a ratio of 10:1, then 1 decibel (1dB) represents one tenth of that ratio, i.e. 1:1, which means no change at all. The log of 1 is zero, and so there is 0dB difference between two signals of the same power level.

I expect you can see now how we got the first equation:

$$N_{dB} = 10 \log_{10} \frac{P2}{P1}$$

The 10 after the equals sign simply says that, because there are 10 times as many decibels as there are bels, you have to multiply the answer by 10 to convert it to decibels.

The relationship between power ratios and decibels up to 1000:1 (30dB) is shown graphically in Fig. 1. You could extend the scales to the right, so that 10 000:1 = 40dB, 100 000:1 = 50dB, 1 000 000:1 = 60 dB, etc. The form of the ratio scale is known as logarithmic, the distances between 1 and 10, between 10 and 100, and between 100 and 1000 all being equal.

To conclude this month's session, let's look at the second formula I gave:

$$N_{dB} = 20 \log_{10} \frac{V2}{V1}$$

Why that 20 instead of 10? Well it's really quite simple, and is due to the fact that power dissipated in a circuit is proportional to the square of the voltage applied:

$$P = \frac{V^2}{R}$$

Therefore, if you apply 10 times the voltage across a resistor, it will have to dissipate 100 times as much power. Another

continued on page 63▶▶▶

RADIO SPECIAL PRODUCT REPORT

STANDARD C58

2m TRANSPORTABLE TRANSCEIVER

It seems like only yesterday that we were testing the latest 2 metre, multi-mode, mobile offerings from the land of the rising sun. Now they are producing a new generation of multi-mode rigs that are neater, smaller yet easier to operate and offer much more than their immediate predecessors.

The Standard C58 was the first of this new breed to become available for review, pipping the Yaesu FT-290R to the post. At first sight it looks just like its close relation the C78, which we reviewed last June, and in fact it uses most of the C78 accessories such as the mobile bracket and carrying case. The similarities extend to the major features of the rig and I do not intend to repeat them for this review but recommend that you read the C78 tests. We can therefore concentrate on the performance and user aspects of the C58.

★ specifications

Frequency range:	144·000 to 147·999MHz
Modes:	FM(F3-F3E); SSB(A3J-J3E); CW(A1-A1A)
Antenna impedance:	50Ω
Supply:	13·8V d.c. external 10 off HP7 NiCad cells or 9 off HP7 dry cells
Operating supply range:	9·6 to 16V d.c., negative earth
Power consumption:	600mA transmit (1W, 50Ω)
Dimensions:	52 × 129 × 191mm
Weight:	1·45kg (with batteries)
RECEIVER	
Sensitivity:	0·4μV 12dB SINAD (f.m.) 0·5μV 20dB quietened signal (f.m.) 0·3μV 10dB s/n (s.s.b. and c.w.) *(0·15μV, 0·25μV, <0·1μV p.d. respectively)*
Adjacent channel selectivity:	60dB *(62dB)*
Intermodulation distortion:	*55dB*
Squelch threshold:	*0·12μV p.d.*
Squelch hysteresis:	*3·5dB*
Audio output:	1W into 8Ω, 10% t.h.d. *(1·5W, 1W at onset of clipping)*

TRANSMITTER	
RF output power:	1W into 50Ω *(1·2W f.m.)* 25W with p.a. *(25W)*
Spurious outputs:	−60dB *(better than −60dB)*
Modulation:	Reactance modulation (f.m.) Balanced modulation (s.s.b.)
Deviation:	±5kHz max.
"S" meter calibration:	*S1=−105dBm (1·3μV)* *S5=−98dBm (2·8μV)* *S9=−93dBm (5μV)* *S9 + 20=−77dBm (32μV)*

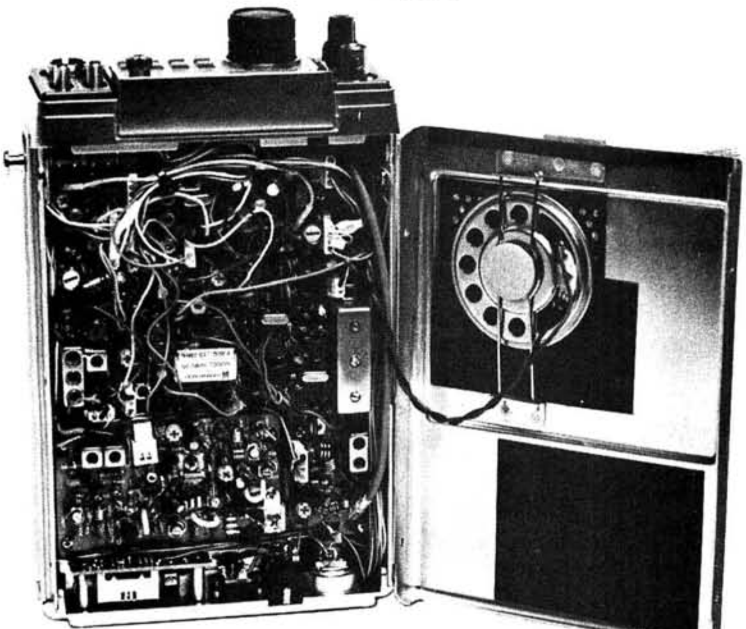
Test equipment

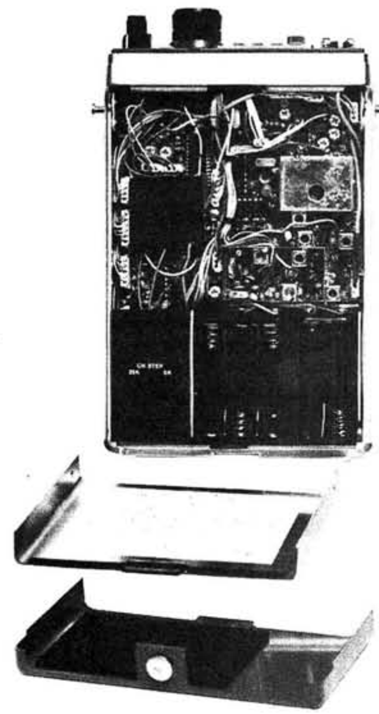
Marconi TF2011 signal generator; Marconi TF2370 spectrum analyser; Marconi TF2373 frequency extender; Racal 9081 synthesised signal generator; Sinadder SINAD meter, Bird Thru Line power meter.

Test results are shown in italics.

STANDARD

C58





Although small in comparison to previous mobiles, especially multi-modes, this rig proved to be very easy to drive. The five memories are easily programmed and have the added facility of remembering the mode and frequency steps, so that if you have programmed, say three f.m. channels and two s.s.b. frequencies, the memories will indicate this when reselected. On MEMORY SCAN the MPU will ignore those memories programmed for a different mode to that selected. If you have selected, for example, USB then the rig will ignore any memories programmed for FM.

A 25W linear power amplifier is available as an extra and this screws to the underside of the mobile mounting bracket. Four rubber feet allow the combined assembly to be used as a base station, yet it is still easily slipped into the conventional mobile mount in the car.

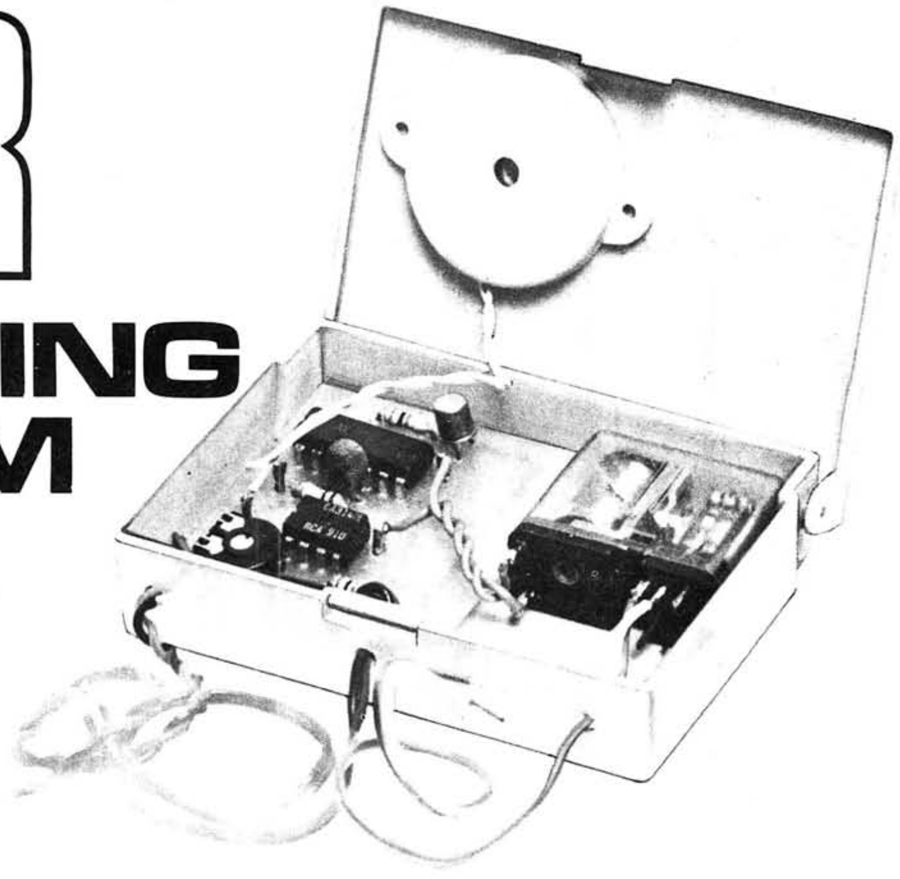
The test of a mobile multi-mode rig must be how it behaves under mobile conditions in the s.s.b. mode. The C58 comes out with flying colours; apart from the need to check on the frequency there is no need to look at the rig to operate it. The RIT control is very simple and effective with the datum position marked by a flat on the small knob. The range of this control is ±1kHz. The three tuning rates are easily selected by sequential operation of the push button marked STEP on the front panel. The rates are 5kHz, 1kHz and 100Hz in s.s.b. and 25kHz, 1kHz and 100Hz in f.m. mode.

On switching on, the display reads 6.000 indicating that the frequency is 146·000MHz. It is possible, indeed all too easy, to operate outside the UK amateur allocation and it

continued on page 58▶▶▶

SWR WARNING ALARM

Stephen IBBS G4LBW



One of the main worries of a radio operator is of transmitting either without an antenna or with a faulty antenna connection, resulting in a high s.w.r. and, often, a useless p.a. stage. This design provides an alarm in such circumstances, with the option of automatically switching the transmitter off.

The alarm uses few components, 13 including the optional relay, and is mounted on a small p.c.b. A piezo transducer is used for economy of space, whilst providing a piercing note.

The Circuit

The simplest, and therefore the most reliable according to Murphy's law, way of using an op-amp is as a voltage comparator, and this configuration is used here.

When a high s.w.r. occurs, current flows through the s.w.r. meter, and a voltage is developed across the meter terminals. This voltage is fed to the non-inverting terminal (pin 3) of the op-amp IC1. The inverting input (pin 2) is held at a voltage just below the desired threshold by R1. When the voltage on pin 3 rises above the threshold the output swings high, gating the oscillator arranged around IC2a and b. The resulting square wave is fed to the piezo sounder. The pitch of the note can be altered by changing C1. At the same time the output from IC1 is fed via IC2c and d to Tr1 which switches on the relay RLA/1.

Construction

Construction can be on either Veroboard or a p.c.b., a suggested design for which is given in Fig. 2. Make sure that the polarities of the i.c.s are correct. (Fig. 3.) The prototype was mounted in a small plastics box, with the piezo sounder mounted on the lid. The normally closed contacts of the relay were wired in series with the p.t.t. switch, so that when the relay operated, the p.t.t. circuit became open and turned the transmitter off.

CONSTRUCTION RATING **Beginner**

BUYING GUIDE

The photograph used in the heading is of the author's prototype, but all other illustrations used in the article are of the revised board.

Constructors of this project should have no difficulty in obtaining components from advertisers in this magazine.

APPROXIMATE COST **£3·50**

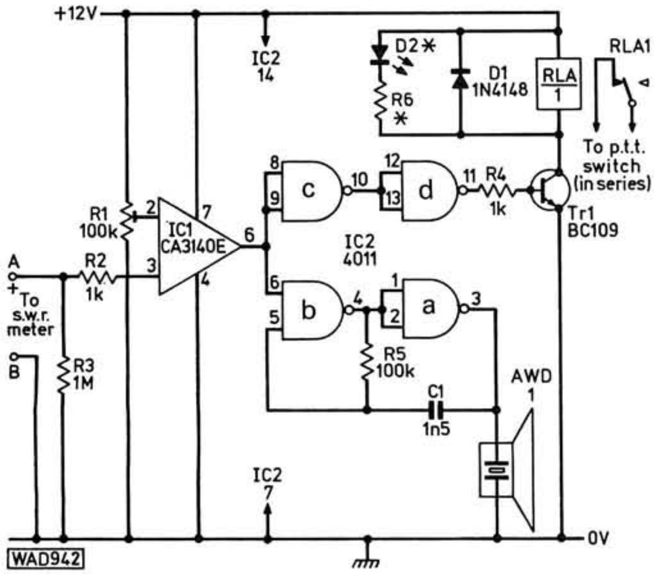
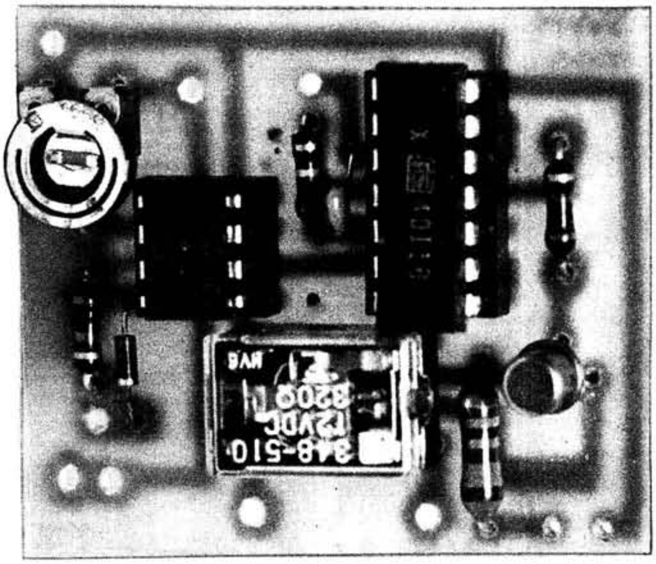


Fig. 1: The circuit diagram of the s.w.r. warning alarm

★ components

Resistors		
¼W 5% Carbon film		
1kΩ	3	R2,4,6
100kΩ	1	R5
1MΩ	1	R3
Min. horizontal preset		
100kΩ	1	R1
Capacitors		
Ceramic		
1·5nF	1	C1 (see text)
Semiconductors		
Diodes		
1N4148	1	D1
Red l.e.d.	1	D2 (see text)
Transistors		
BC109	1	Tr1
Integrated circuits		
CA3140E	1	IC1
4011B	1	IC2
Miscellaneous		
Piezo warning device; printed circuit board; Sub-miniature relay, 12V (RS348-510); Box; 8 pin d.i.l. socket; 14 pin d.i.l. socket.		



The revised p.c.b. of the s.w.r. warning alarm

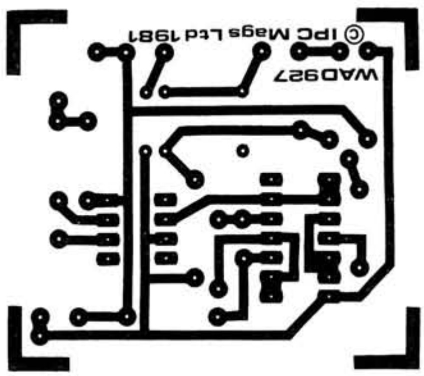


Fig. 2: The track pattern of the p.c.b., shown full size

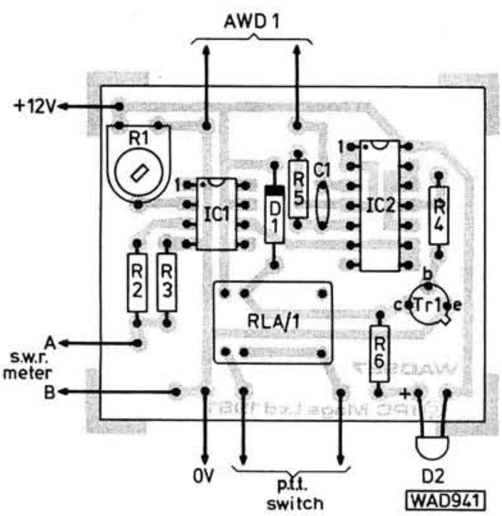


Fig. 3: Component layout

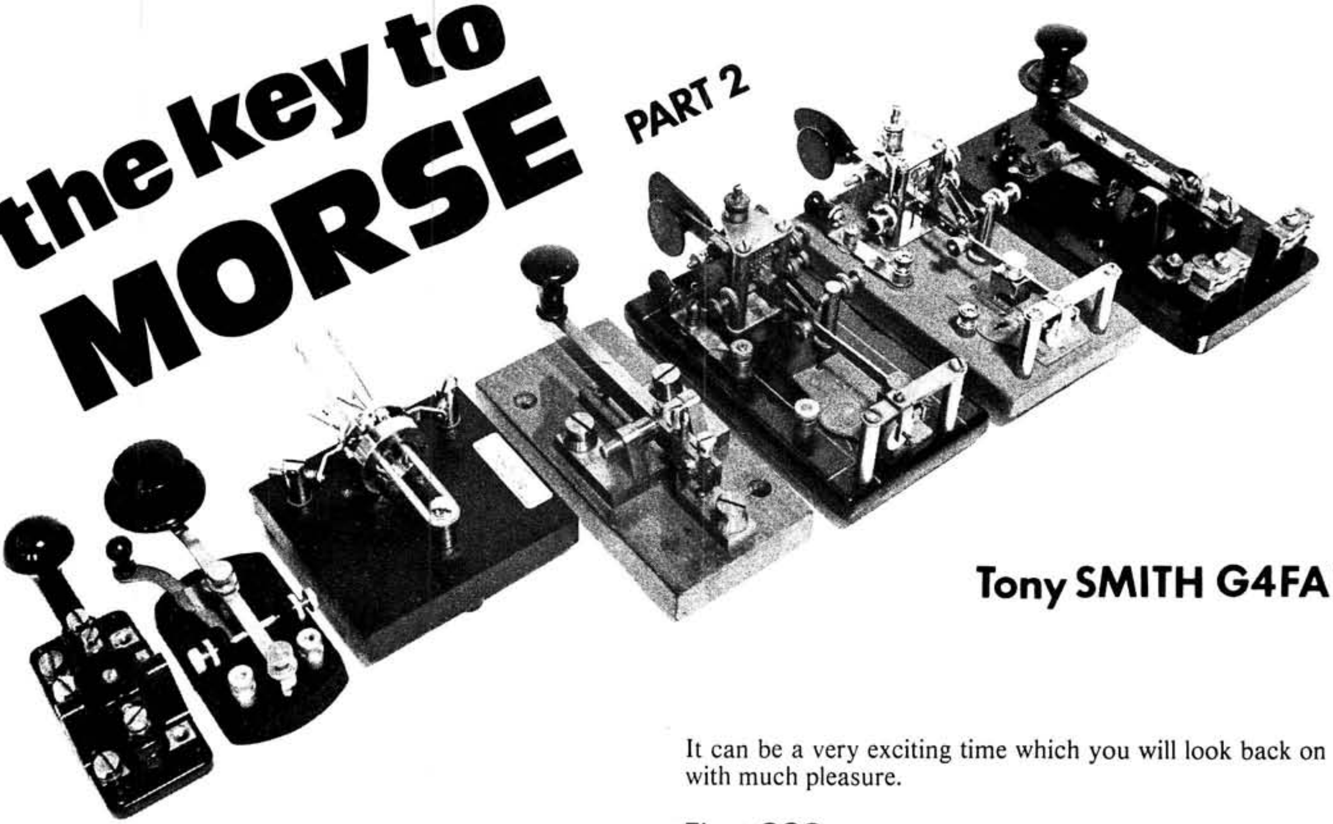
Setting Up

Take two wires from the s.w.r. meter and connect to points A and B. Adjust the meter until it gives the required threshold reading. To do this switch to FORWARD POWER and turn the power output down until the desired reading is obtained. R1 is then adjusted until the piezo sounder comes on. Switch back to SWR and the sounder should turn off.

When designing this project the author accidentally operated the transmitter without an antenna. Luckily the alarm sounded, saving the p.a. transistors. For approximately £3.50 (less without the relay option), this project will pay for itself, if only in terms of the reassurance it gives. If you do not want to use the relay option, replace the relay with an l.e.d. (D2), with a 1kΩ resistor (R6) in series as the collector load to give a visual as well as an aural warning.

My thanks are due to Lionel, G4JLI, for his assistance with the prototype unit. ●

the key to MORSE PART 2



Tony SMITH G4FAI

Last month we dealt with learning Morse and the passing of the Morse test. Now comes the moment you have been waiting for, your first QSO.

You've got your brand new amateur Class A licence and callsign and you're ready to try your Morse on the air. If you have been listening to on the air QSOs you will know that c.w. communication is really an international language. You will probably know quite a lot of it already, particularly if you have been working with a Class B licence. The Q code, or at least part of it, is probably the best known, and there are many c.w. abbreviations used on telephony as well such as xyl, 73 and so on.

Perhaps you have been worrying that you won't be able to cope with the speed of the other stations. Actually most of them will gladly come down to your speed, particularly when they realise that you are a beginner. Make sure that you send at a speed which you can read: if you send at 20 w.p.m. the other stations will likely send back at the same speed.

Rubber Stamp QSOs

You will find that most QSOs to begin with will be of the "rubber stamp" type, especially those with foreign stations who have no great command of English. Although c.w. is international they are hesitant about getting involved in extended contacts, especially when English is not their first language. Be grateful for these QSOs, they will help you get started and give you confidence to progress.

Don't try anything complicated and send slowly. Typical rubber stamp contacts consist of mutual greetings, an exchange of reports, name, QTH, details of rig and antenna and possibly details of the weather. It doesn't sound much, but to begin with you will find it more than enough, and you will get a great feeling of achievement as you complete each QSO. Starting from scratch you will also be getting new countries almost every time you go on the air. It can be a very exciting time which you will look back on with much pleasure.

First QSO

For your first QSO you have a choice of calling CQ, looking for another station calling CQ or finding an existing reasonably slow QSO and waiting for it to end so that you can try calling one or other of the stations involved.

It will probably be easier to start by calling CQ yourself, that way you are taking the initiative, and having been using the key for the call you won't be launched into your first contact entirely "cold". Don't send an endless series of CQs so that a potential contact has to wait impatiently to find out what your callsign is. Send slowly and if a station replying to you is too fast send "pse agn es QRS" (please send again and slower).

Your first call should look something like this:

$\overline{CT}$ QRL? CQ CQ CQ de G4FAI G4FAI G4FAI CQ CQ CQ de G4FAI G4FAI G4FAI $\overline{AR}$ K

"Is this frequency in use? General call to all stations from G4FAI. End of message. Over."

You should always send QRL? before beginning to transmit. There may be a QSO taking place on the frequency and whilst you may not hear the transmitting station the receiving one will reply QRL (this frequency is in use) and you should change frequency, known as QSY, and start again with another QRL?

Now You Are In Business

Let's assume you have found a clear frequency, you have put out your call and back over the air comes your first reply:

G4FAI de ON6ZZZ ON6ZZZ ON6ZZZ $\overline{AR}$ K

Now you must reply:

ON6ZZZ de G4FAI = ge om es tks fer call = ur rst 579 in qth london = my name tony = hw cpi? ON6ZZZ de G4FAI $\overline{AR}$ $\overline{KN}$

"Good evening old man and thanks for your call. Your report is 579 in my location of London and my name is Tony. How do you copy me? End of message. Over to ON6ZZZ only."

G4FAI de ON6ZZZ = ok dr om tony all ok hr es ge = ur rst 569 qth nr antwerp my name is john = ok? $\overline{AR}$ *G4FAI de ON6ZZZ* $\overline{KN}$

"Received with no problems here dear old man Tony and good evening. Your report is 569. My location is near Antwerp and my name is John. Is that alright? End of message. Over to G4FAI only."

Notice also "dr om tony". Continental stations in particular use this form of greeting which comes quite naturally to them although it sounds strange to British ears. Don't worry, you will soon find yourself quite automatically sending "ok dr john" or "dr om" without even thinking about it. It is not usual however to use this form of address when communicating with countries where English is the everyday language.

Back to the QSO. It's your turn again:

ON6ZZZ de G4FAI = ok dr john solid cpi hr. my rig is 50 watts input es ant is dipole = wx is rain = my qsl $\underline{\textit{is sure}}$ *via buro. hr qru so hw cpi? ON6ZZZ de G4FAI* $\overline{AR}$ $\overline{KN}$

"All ok dear John, solid copy here. My rig is 50 watts input and my antenna is a dipole. The weather here is raining. I will send my QSL card to you via the bureau. That's about all from here so how are you copying me?"

G4FAI de ON6ZZZ = r r solid dr tony es tks fer all info. hr my rig 100 watts es ant gp = wx clear = qsl ok via buro. mni tks fb qso hpe $\underline{\textit{cuagn sn}}$ *= 73 es gud dx dr tony* $\overline{AR}$ *G4FAI de ON6ZZZ* $\overline{VA}$ $\overline{KN}$

"Received with good solid copy dear Tony and thanks for all information. My rig here is 100 watts and my antenna is a ground plane. The weather is clear. I will send my QSL also through the bureau. Many thanks for the good (fine business) contact. I hope to see you again very soon. Best regards and good DX dear Tony. End of message. End of work."

ON6ZZZ de G4FAI all ok agn dr john. tks nice qso es hpe $\underline{\textit{cuagn vy sn}}$*. 73 es gl cheerio dr om bcnu. ON6ZZZ de G4FAI* $\overline{AR}$ $\overline{VA}$ *e e*

"All ok again dear John. Thanks for the nice QSO. I hope to see you again very soon. Best regards and good luck. Cheerio dear old man, be seeing you. End of message. End of work. Pip Pip."

At the end of that John will almost certainly come back with "e e". It doesn't mean anything but most stations finish with it and it is translated here as pip pip. It is just a friendly way of finishing the contact.

Every QSO is Different

So that's the end of your first QSO. If you analyse it there's not a great deal in it but it was probably more than enough to be getting on with! When you have written up your log, made out John's QSL card, and generally settled your nerves you will probably want to get on with some more contacts to see what you can do. But before that a few more words about that first QSO. What was included was only an example of the sort of exchanges that take place, and some of the more important information is usually repeated once or twice although that hasn't been shown here. Every QSO is different in some way, even the rubber stamp ones. Sometimes you send and receive more information, sometimes less. There is nothing official about c.w. procedures, codes and abbreviations and if you do go wrong it doesn't really matter. The other station will often understand you even when you do get in a mess. Most abbreviations have originated from commercial or military sources, and some are entirely of amateur origin passed down from the earliest days of radio communication. None of them are obligatory apart from the fact that the best way to communicate with others is the way they understand best. If you want to spell out every word completely in full grammatical sentences you are welcome to do so, but this is not recommended due to the time it would take.

Many of the codes which amateurs use have a different meaning to the original. Most reference books on amateur radio for instance show the Q-code with its official meanings rather than the colloquial amateur ones. The table below shows some of the comparisons.

Finishing an Over

The endings of the overs need some explanation. "K" is an invitation to any station to transmit whereas $\overline{KN}$, sent as one character, is an invitation to only the station named

The Q Code

Original Meaning		Amateur Use
QRL?	Are you busy?	Is this frequency in use?
QRM?	Is my transmission being interfered with?	Interference from other stations
QRN?	Are you troubled by static?	Interference from static or electrical equipment
QRO?	Shall I increase transmitter power?	High power
QRP?	Shall I decrease transmitter power?	Low power
QRS?	Shall I send more slowly?	Send more slowly
QRT?	Shall I stop sending?	Closing down
QRU?	Have you anything for me?	That's all from me
QRX?	When will you call me again?	Stand by
QRZ?	Who is calling me?	Who is calling me?
QSB?	Are my signals fading?	Fading
QSL?	Can you acknowledge receipt?	Confirmation of information/QSL card
QSO?	Can you communicate with . . . direct?	Contact between stations
QSY?	Shall I change to transmission on another frequency?	Change frequency
QTH?	What is your position in latitude and longitude?	Location

If you wish to turn the meaning into a statement then deleting a question mark turns each question into a statement. These are the most common Q codes used by amateurs who, as can be seen, adapt the original meanings to meet their own requirements.

Popular abbreviations

abt	about	hr	here
agn	again	hv	have
ant	antenna	hw	how
bcnu	be seeing you	mni	many
bk	break	nr	number/near
buro	QSL bureau	nw	now
b4	before	om	old man
conds	conditions	pse	please
cpi	copy	pwr	power
cud	could	r	received
cuagn	see you again	rpt	repeat
cul	see you later	rx	receiver
de	from	sed	said
dr	dear	sigs	signals
dx	long distance	sn	soon
es	and	sri	sorry
fb	fine business	stn	station
fer	for	sum	some
ga	good afternoon	tks	thanks
gb	goodbye	tnx	thanks
ge	good evening	tx	transmitter
gl	good luck	u	you
gm	good morning	ur	your
gn	good night	vy	very
gud	good	wid	with
hi	laughter	wud	would
hpe	hope	wx	weather
		73	best regards

There are many more abbreviations but this shortened list serves as a useful introduction for the beginner. A longer list of abbreviations can be found in the RSGB publications, *A Guide to Amateur Radio* eighteenth Edition by Pat Hawker G3VA and *Amateur Radio Operating Manual* by R.J. Eckersley G4FTJ.

Signal Reports—RST System

Readability	
R1	Unreadable
R2	Barely readable
R3	Readable with considerable difficulty
R4	Readable with practically no difficulty
R5	Perfectly readable
Signal Strength	
S1	Faint, barely perceptible
S2	Very weak
S3	Weak
S4	Fair
S5	Fairly good
S6	Good
S7	Moderately strong
S8	Strong
S9	Extremely strong
Tone	
T1	Extremely rough
T2	Very rough
T3	Rough
T4	Rather rough
T5	Modulated
T6	Trace of modulation
T7	Near perfect tone, smooth ripple
T8	Near perfect tone
T9	Perfect tone

A report of RST 599 means a perfectly readable, extremely strong signal with perfect tone. Readability is easy to interpret, but signal strength is usually read off from the receiver's "S" meter and this can vary from one receiver to another. Originally it was intended that the signal strength should be assessed by the operator receiving the signal; a signal can sound very strong and yet only give a meter reading of "S8". Most stations seem to give T9 reports irrespective of what they are hearing, they seem to fight shy of telling the other operator that he has some fault on his transmission. Always try to send an honest report to let the other station know just how you are copying him.

to transmit. Not all stations end their overs with $\overline{\text{KN}}$, many simply send K at the risk of other stations only hearing the end part of their transmission, assuming they are calling CQ and replying to them. Another use for $\overline{\text{KN}}$ when calling CQ is to use it to indicate that you only want replies from certain places. Examples are CQ DX (i.e. outside Europe) CQ Asia, CQ JA (Japan) and so on. In all these cases the call would be terminated $\overline{\text{AR}}$ $\overline{\text{KN}}$ or just $\overline{\text{KN}}$.

$\overline{\text{AR}}$ indicates the end of a transmission, e.g. the end of an over, and $\overline{\text{VA}}$ the end of a QSO. Whilst these are shown as being sent as the final part of an over, some operators send them before the callsigns, some omit the $\overline{\text{AR}}$ altogether. You will find variations in procedure in different countries, but they can all be understood when you are receiving them.

As you go on this will become as familiar and as natural as breathing air, and there is no need to worry too much about it at this stage. The old saying "Practice makes perfect" is very true when thinking of c.w. procedures.

A World of its Own

CW is a world of its own and once you are in it you are hooked! It may be hard to believe that if you have only just started and are struggling to get your speed up, but many have found that once they have been on the air with Morse code they have discovered some of the lost magic of amateur radio. It is a compelling, absorbing world but it is virtually impossible to demonstrate this to anyone who doesn't understand Morse. The learner who is just beginning to make sense of what he hears over the air may get some glimmering of it, but you try demonstrating a string of dots and dashes to anyone else and note the yawn of the century!

It's not really surprising as working with c.w. is a totally personal thing as far as the individual operator is concerned. He is concentrating on what he is doing to the total exclusion of everything else at that moment in time. The learner, unfortunately, has to take it on trust during the early days of learning all the enjoyment that can be had using Morse. Just listen to a couple of c.w. operators talking together, if you can catch them away from their rigs! Many of them live, eat and sleep c.w., and listening to

continued on page 47▶▶▶

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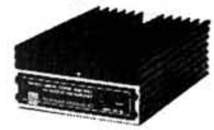

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PW 'STOUR' TOP-BAND TRANSCEIVER

PART 6

David G. BARRELL G4BMC

In this concluding part we present the remaining v.f.o. board details together with board switching and layout and final alignment details

Relay and Front Panel Switching

Two six pole changeover relays were available from scrap equipment and these were utilised to switch the d.c. voltages required. The r.f. switching, apart from the antenna changeover and Tune facility, was accomplished using diode switching.

The circuit diagram showing all relay connections and front panel switches is shown in Fig. 40. This circuit shows the transceiver in the following modes:

1) The ON/OFF switch is set to ON.
2) The TUNE switch is in the OFF position.
3) The transmit-receive switch is set to receive.
4) The r.i.t. switch is set to ON.
5) Relays RLA and RLB are in the receive position (i.e. the relays are at rest).

As mentioned previously the block labelled r.i.t. circuitry is not a printed circuit board and the components associated with this board are located on a tag strip.

The two blocks labelled 8a and 8b are in practice one board, i.e. board 8 the voltage regulator and a.g.c. sections of the transceiver.

The meter shunt, required during transmit, is not shown on this diagram. (See Fig. 7.)

There are three spare sets of contacts on relay RLB which may eventually be used for other functions but are not as yet used.

Wiring and Internal Layout

The prototype layout of the transceiver is shown in Figs. 41 and 42. The layout did not appear to be at all critical. During testing the various boards were gradually mounted onto an old aluminium chassis, with eventually the v.f.o., p.a. and driver boards "hung in" on the bench; it was quite a sight! This proved to be a successful method for the initial testing of different prototype boards. One point worth noting is that "filter ringing" occurred on three totally separate filter boards unless they were firmly mounted to the main chassis along with the other boards.

If the layout shown is used then a screen will be required between the 9MHz oscillator board and the balanced modulator. It is further suggested that the crystal end of the board is adjacent to the modulator board, as the lowest power level occurs here. The screen improved the carrier balance by about 10 dB!

Either in this design or in any other layout attempted, the following points should be borne in mind:

1. As stated earlier in the article all r.f. connections must be made using 50Ω coaxial cable, earthed at both ends.

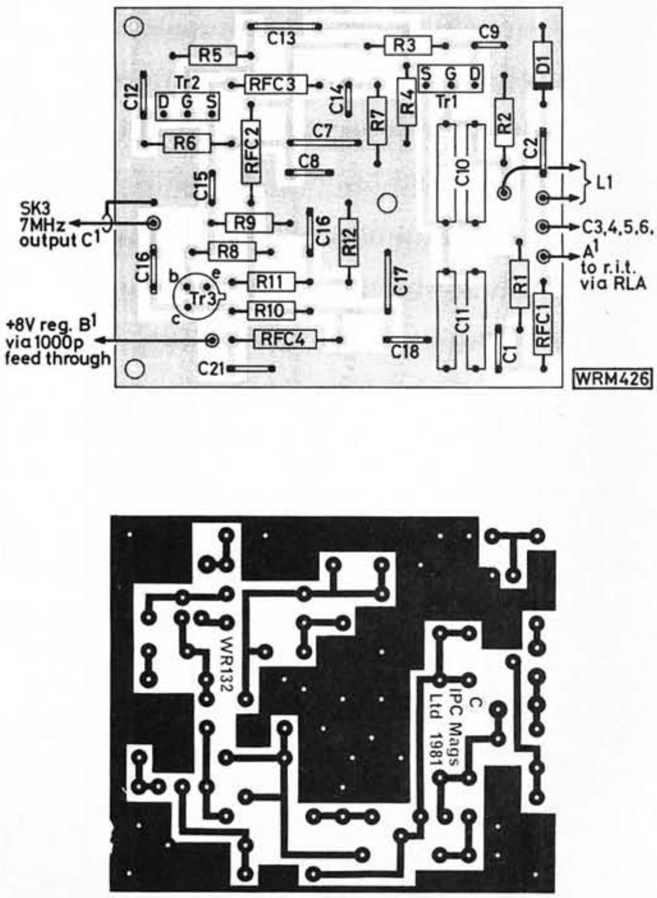


Fig. 39: Board 10 (v.f.o.) component layout and p.c.b. track pattern, shown full size

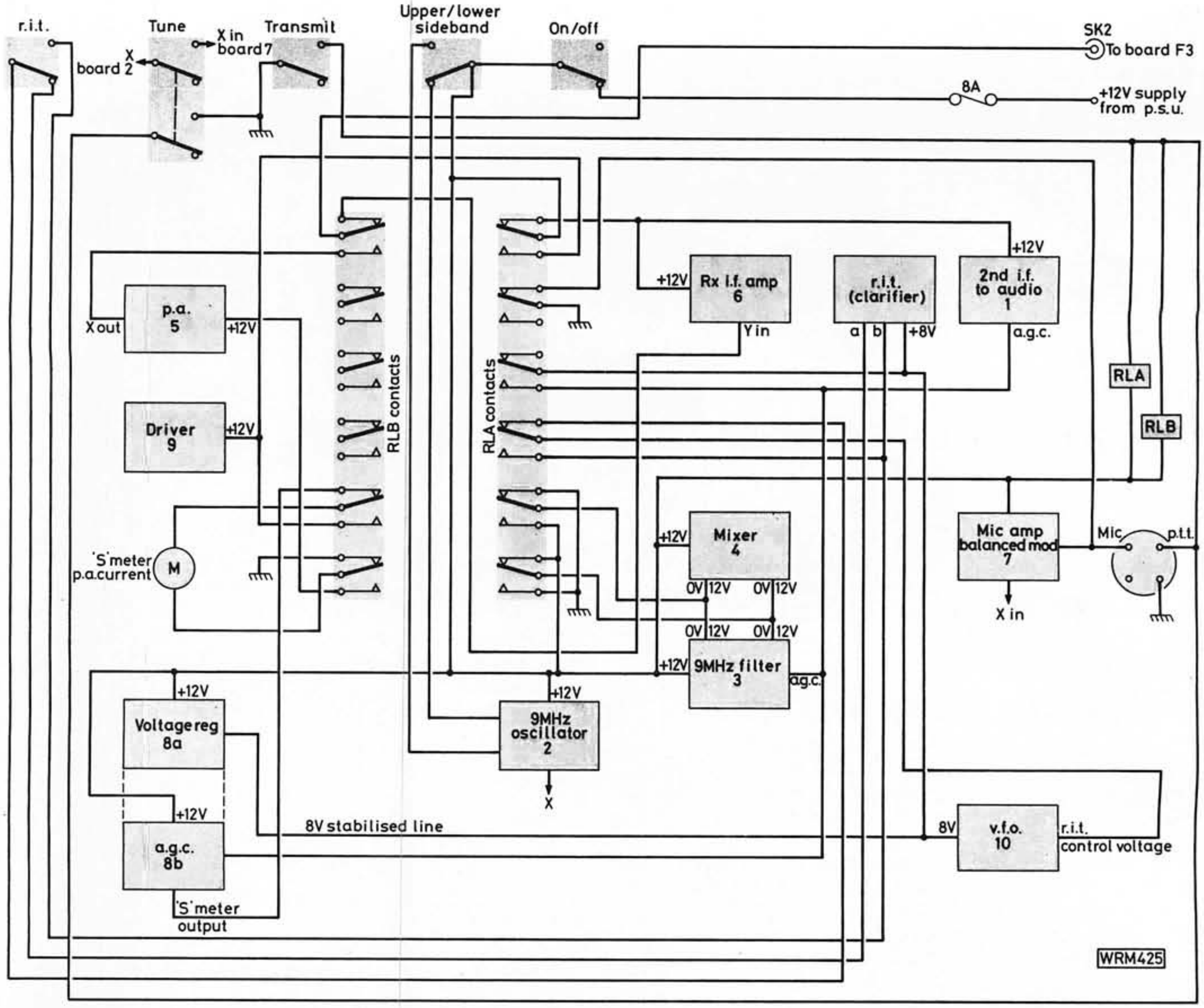


Fig. 40: Relay and front panel switching diagram

2. The earth connection between relay RLA and the microphone input on board 7 should either be very short or via screened cable.
3. Screened cable should be used to wire both the volume control connections and the microphone input.
4. The driver board and p.a. should not be able to "see" the balanced modulator, filter board, mixer board or filter F1.
5. It is a great help if the p.a. board is made as a plug-in unit. This was accomplished by using "flying" leads with miniature b.n.c. connectors for the r.f. connections. Simple phono plugs of the in-line variety were used for the +12 V and speaker connections. This allowed the top cover to be completely detached whilst working on other sections of the transceiver. (The top cover had the p.a. board and speaker attached to it.)
6. Large bunches of wires should be laced together wherever possible for neatness; waxed cotton works well for this if available.
7. Use thick cable for all wiring which will feed the p.a. (This applies right from the cable entry point.)
8. All wiring of d.c. leads to boards should be as direct as possible without crossing back and forth over the boards themselves.
9. Avoid the use of an all-aluminium box if possible as the warp on such boxes can never enhance stability.
10. The v.f.o. unit should be made as a totally separate unit and then bolted to the main chassis.

Readers who intend to operate the Stour should be in possession of the appropriate licence issued by the Home Office to those who have passed the City and Guilds Radio Amateurs' Examination. Details may be obtained from: The Home Office, Radio Regulatory Department, Amateur Licensing Section, Waterloo Bridge House, Waterloo Road, London SE1 8UA.

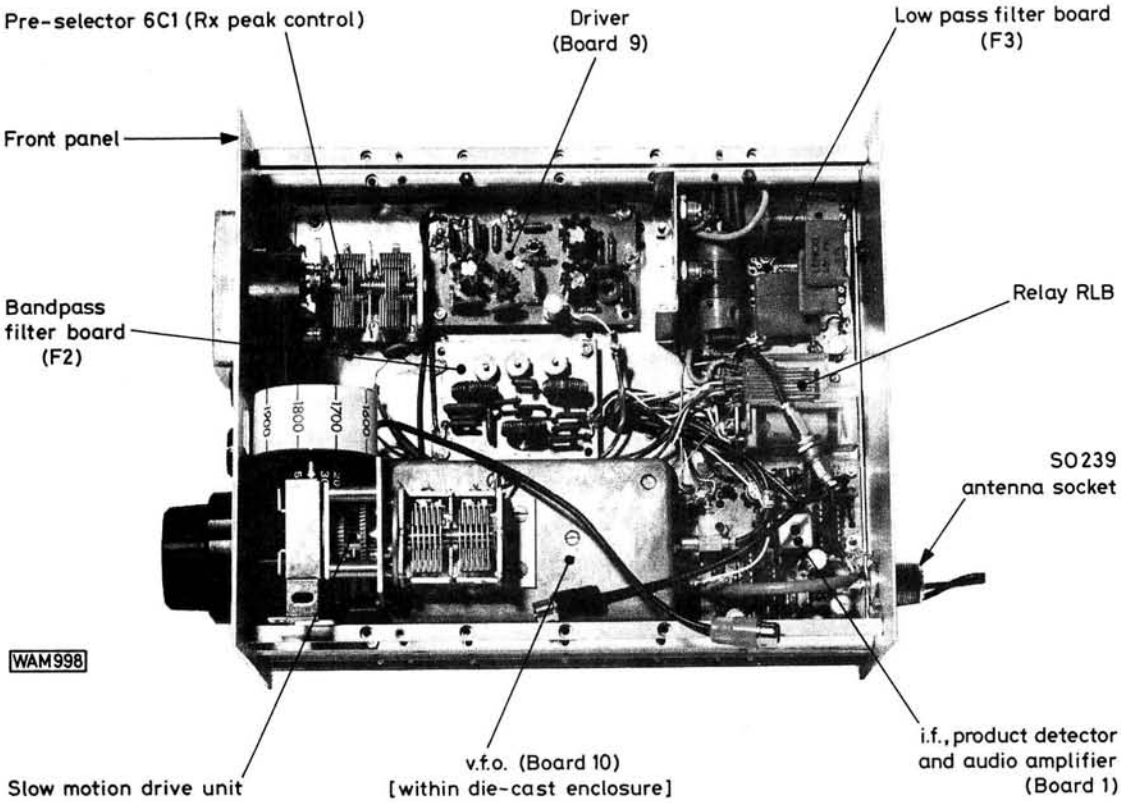


Fig. 41: General layout plan view of the transceiver upper side

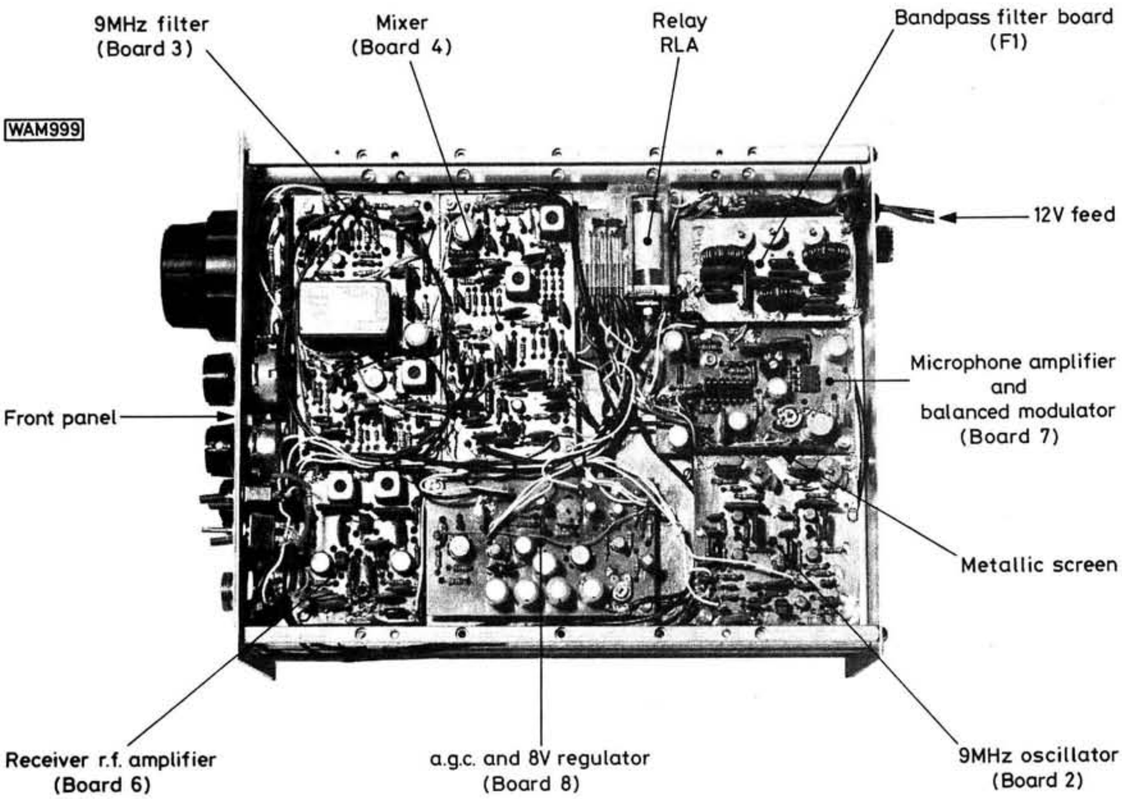


Fig. 42: General layout of the transceiver under side

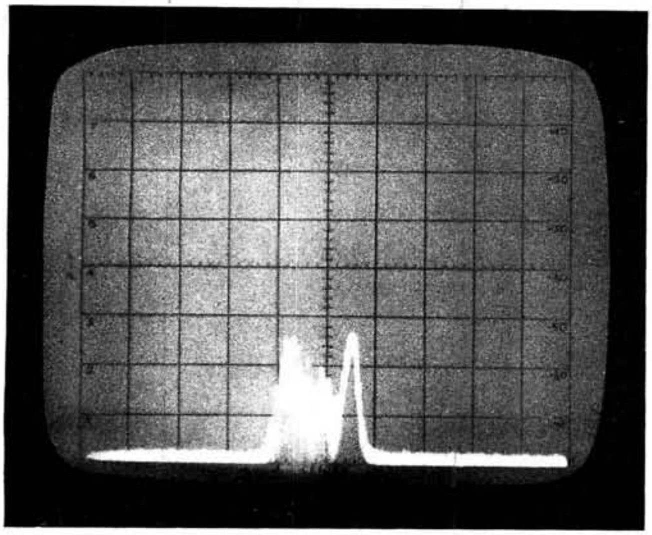


Fig. 43: Photograph showing spectrum of suppressed carrier plus noise

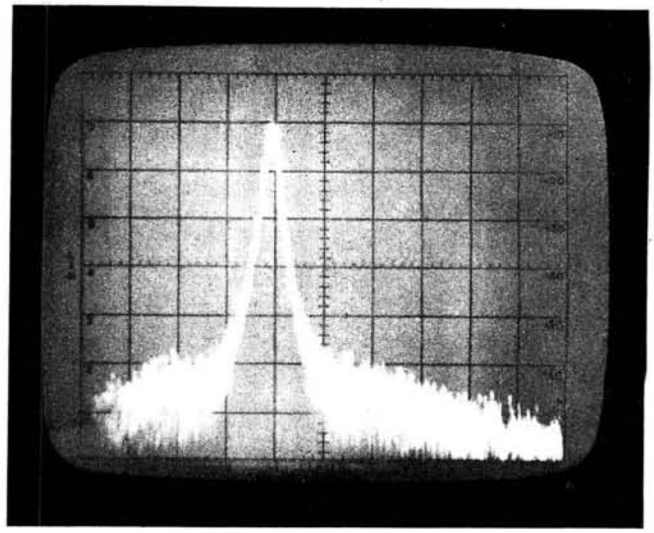


Fig. 45: This photograph shows a single tone at 18W output. The difference between Figs. 43 and 45, the carrier suppression, may be seen to be approximately 45dB

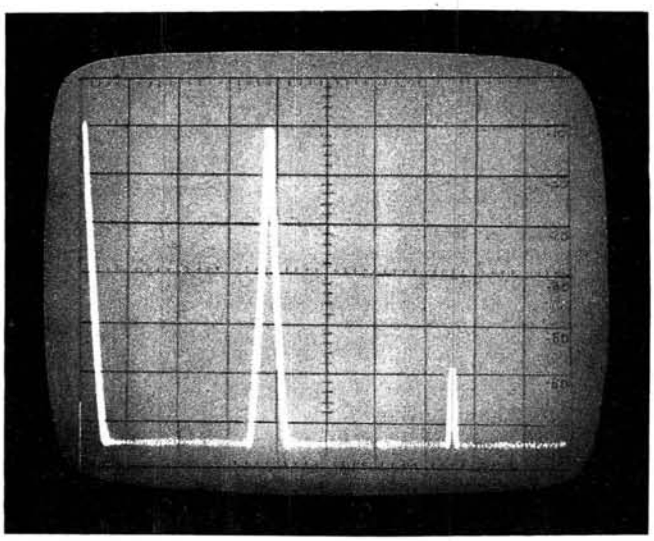


Fig. 44: The fundamental frequency plus the second harmonic at 80m. This may be seen to be approximately 50dB down on the wanted signal. The noise floor at about 65dB down is the only other signal present; all other spurii are therefore >60dB down

11. All p.c.b.s should be mounted using spacers which, if possible, should be soldered to the boards. This makes removal and fitting very much simpler.
12. On the prototype the boards were initially mounted on the underside of the chassis using nuts and bolts which were fixed to the chassis. The protruding bolt then passed through the spacer and p.c.b. where a further nut secured the board itself. When all the boards beneath the chassis had been mounted they were removed to enable the holes to be drilled for the top board.

This method would only be necessary if the boards were all mounted either side of the centre chassis plate. In order not to waste the space beneath the v.f.o. box the latter was mounted on rubber spacer washers which also gave some vibration protection to the v.f.o.

Correction

On the circuit diagram, Fig. 27, of the Microphone amplifier board 7, there is no link between pins 4 and 10 of IC2. The p.c.b. and overlay are correct.

Additional Alignment Details

Board 1 Peak L1 during receive for maximum output.

Board 2 Adjust 2C2 and 2C2a to obtain the correct frequency of the upper and lower sideband crystals. If no measuring equipment is available then on receive tune in to a fairly strong s.s.b. signal and adjust 2C2 to obtain a clean sounding signal. Further adjustments may be carried out on the air during transmit with the aid of a local station. This adjustment is fairly critical but the author set the rig up on the air without any problem.

Board 3 Adjust 3L1 for maximum output during receive.

Board 4 Adjust 4L4 and 4L6 during receive for maximum output.

Board 5 Adjust 5R7 to obtain a 250mA standing current (measured at the input to the p.a. board).

Board 6 Adjust 6L1 and 6L2 for maximum output during receive.

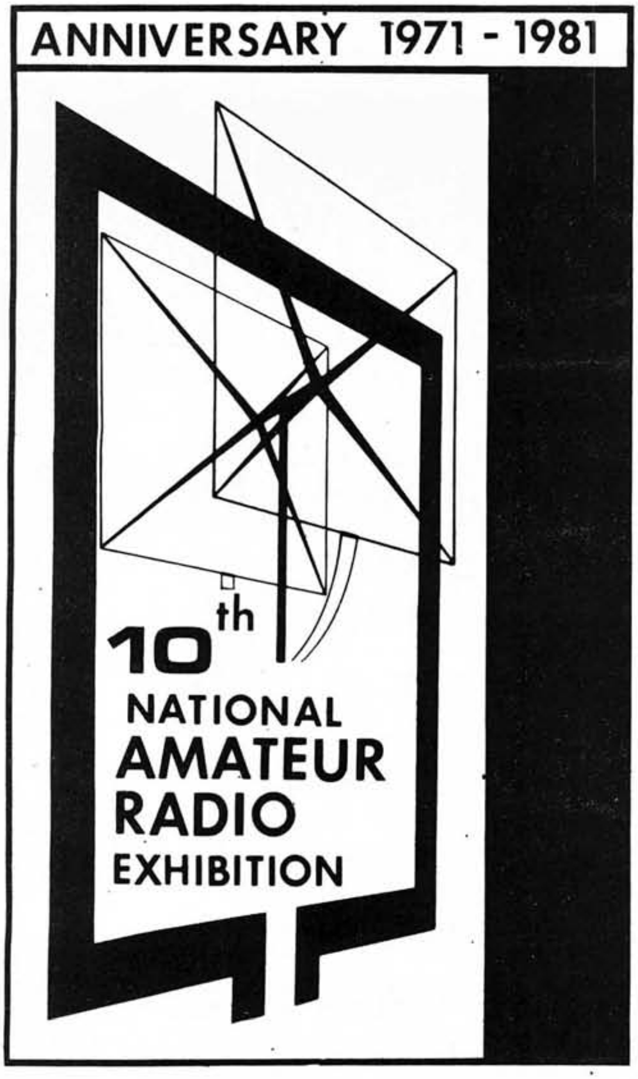
Board 7 7R10 should be adjusted for minimum carrier output by either of the following methods (carrier balance).

1. If a receiver covering 160m is available then listening to the carrier whilst adjusting 7R10 will show a definite carrier null. This should be quite pronounced.
2. If no receiver is available then the p.a. current should be monitored and minimum current should be obtained at the null point when adjusting 7R10.

For both the above tests the microphone should be removed and the transceiver set to s.s.b. transmit (upper and lower sideband).

7R1 should be set up so that normal speech peaks drive the p.a. meter to around 2 amps.

ALL the adjustments were made at the author's QTH and the test results are those obtained with the rig set up in this way, a test meter and 160m receiver being all that was used. ●



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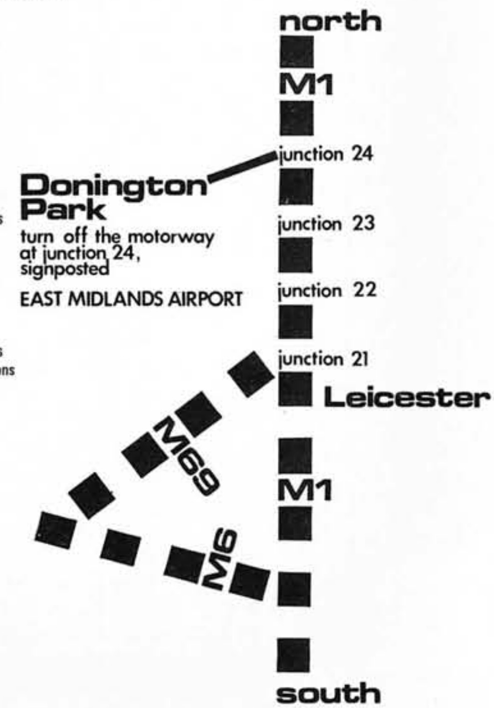


the Nunsfield House A.R.G. will provide

talk in on S22 & SU8

Key to Morse Part 2

▶▶▶continued from page 38

them gives at least some idea of the involvement which is possible in this branch of the hobby. A branch incidentally which at one time *was* amateur radio!

Improving your Speed

As you acquire confidence try to read as much of the received signal as possible without writing it down. Obviously you need your report, the other operator's name and QTH etc. for your log. As you learn to recognise the standard phrases such as "tks fer call", "ur sigs fb hr", or "73 gud dx es gl", there really is no need to write them down as long as you understand them.

You can improve your effective sending speed by technique rather than by actually keying faster. Reduce the number of times you repeat the information you are sending. If you are sending fairly slowly anyway there is really no need to send your QTH, for instance, more than twice. The other station can always ask you to repeat it if necessary but the chances are he will have copied it first time.

Don't use punctuation more than is necessary. The whole thing is highly abbreviated and non-grammatical anyway. Why worry about punctuation and add unnecessarily to the length of an over? Think carefully while you are sending and try to condense what you want to send as much as possible. Use standard abbreviations whenever you can but, as already mentioned, don't make them up yourself.

When calling another station don't send his callsign a number of times before sending yours, he knows his own callsign, he wants to know yours! When commencing an over send his, and your, callsign once only. You are already in contact, you are sending superfluous information if you send them more than once. All of this assumes that conditions between you and the other station are reasonably good. If they are poor then of course it may well be necessary to repeat the information more times to ensure effective communication, and it is often helpful to reduce speed in such circumstances.

Constant Challenge

Remember a good operator is not necessarily a fast one. It is what he sends, and how he sends it, that marks him out from the crowd. Effective communication with the minimum of time and effort, coupled with a constant striving for improvement, is the challenge facing you every time you go on the air.

You have had your first QSO and the world of c.w. is waiting for you. Now you can go and make the most of this new mode of operation for you.

Next month we will look at some of the Morse aids that are on the market.

MICROWAVE MODULES MMT 432/144 TRANSVERTER

The current upsurge in activity on the 70cm band, together with the increasing availability of low power multimode 2m transceivers, provides an ideal opportunity to review the well proven linear transverter series MMT 432/144, from Microwave Modules.

When driven by a 2m multi-mode transceiver covering the frequency range 144 – 146 MHz, the transverter can be set to provide coverage of 432 – 434 MHz or 433·6 – 435·6MHz s.s.b., a.m., f.m or c.w., which encompasses the bulk of activity modes up to the low end of the amateur satellite service sub-band. Simple toggle switch selection of the transmit and receive frequency local oscillators allows access to the UK 70cm repeater network, without the need for "odd" 2m drive frequency offsets to obtain the required 1·6MHz shift.

On the transmit side the 2m r.f. drive is mixed with a 116MHz local oscillator and down converted to 28MHz. A second local oscillator, running at 101MHz is multiplied and mixed with the 28MHz signal to produce the required 432MHz output. A further local oscillator running at 101·4MHz may be selected to produce a 1·6MHz offset at the output for semi-duplex repeater use. The double conversion technique results in a substantially spurious-free output, with measured levels at 404MHz and related frequencies, all better than −65dB.

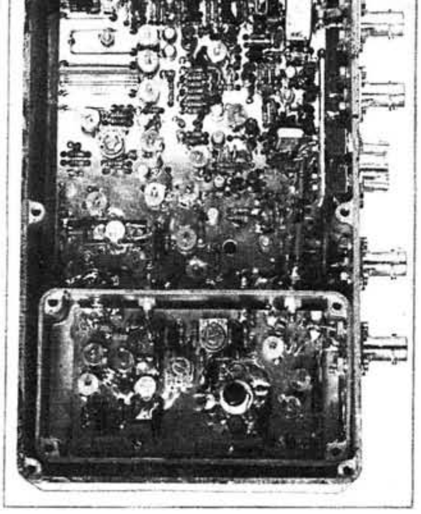
Frequency stability measurements of the review sample confirm the makers specification of drift to be within 2kHz/hour, and on both the reviewers MMT 432/144 and the review sample frequency errors of within ±2kHz are typical, and more than adequate.

The transverter is supplied complete with a discrete 15dB in-line power attenuator to allow up to a maximum of 10W applied 2m r.f. drive. For use with lower levels of drive the "π" network within the attenuator may be altered to produce the equivalent power level at the transverter 144MHz transceiver port. On test, with an applied 10W drive, an output power level of 14W was measured, with a slight reduction

at the extremities of frequency coverage.

On the receive side the MMT 432/144 features a low noise BFR34A first r.f. amplifier, BFY90 second r.f. amplifier stage and 3N204 dual gate MOSFET mixer. An overall conversion gain of 10dB, when connected via the in-line attenuator on the transceive port, is the quoted typical figure. An additional, non-attenuated, 144MHz receiver output port is provided on the transverter, with a typical gain of 25dB, and is suitable for use in conjunction with an independent 2m receiver. An overall noise figure maximum of 3dB is quoted.

Under test in conjunction with the Standard C58 multi-mode portable



(basic sensitivity 0·2μV) the transverter produced a 12dB SINAD figure at 0·12μV p.d.

Following their standard format, the transverter is constructed within a matt-black painted die-cast aluminium box, measuring 188 x 120 x 60mm, with all input/output ports and frequency selection switches mounted along the front face.

Internal construction is to the usual high standard and features a single, double-sided p.c.b., containing all stages with the exception of the p.a. which is housed in its own fully screened enclosure. An r.f. VOX circuit is provided or, alternatively, use may be made of the separate p.t.t. pin on the DIN plug power line input. Antenna switching is accomplished by a *pin* diode changeover network.

During some 18 months' operation, the reviewer's own MMT 432/144 transverter has been used in conjunction with several f.m. and s.s.b. 2m rigs, such as the Trio TR-2300 and Icom 202-S and lately the Yaesu FT-290 multi-mode portable. In all cases results have been comparable with those obtained from "dedicated" 70cm transceivers of equivalent power output. Good results have been obtained when used mobile, via the extensive 70cm repeater network, and also for reception at the home QTH of Oscar series satellite downlinks and beacons. Best DX to date, when feeding into a 20 element quad loop Yagi antenna at 25m a.s.l, was West Yorkshire using s.s.b. during a recent contest, a distance of 450km over a very obstructed path.

In conclusion the MMT 432/144 transverter series is a cost effective means of operation on 70cm for those in possession of a 2m transceiver.

Our thanks go to **Microwave Modules, Brookfield Drive, Aintree, Liverpool, L9 7AN, Tel: 051-523 4011,** for the loan of the review model MMT 432/144R which is available at £184.00 direct from MM or their approved distributors.

H F converter

Michael TOOLEY BA G8CKT & David WHITFIELD MA MSc G8FTB

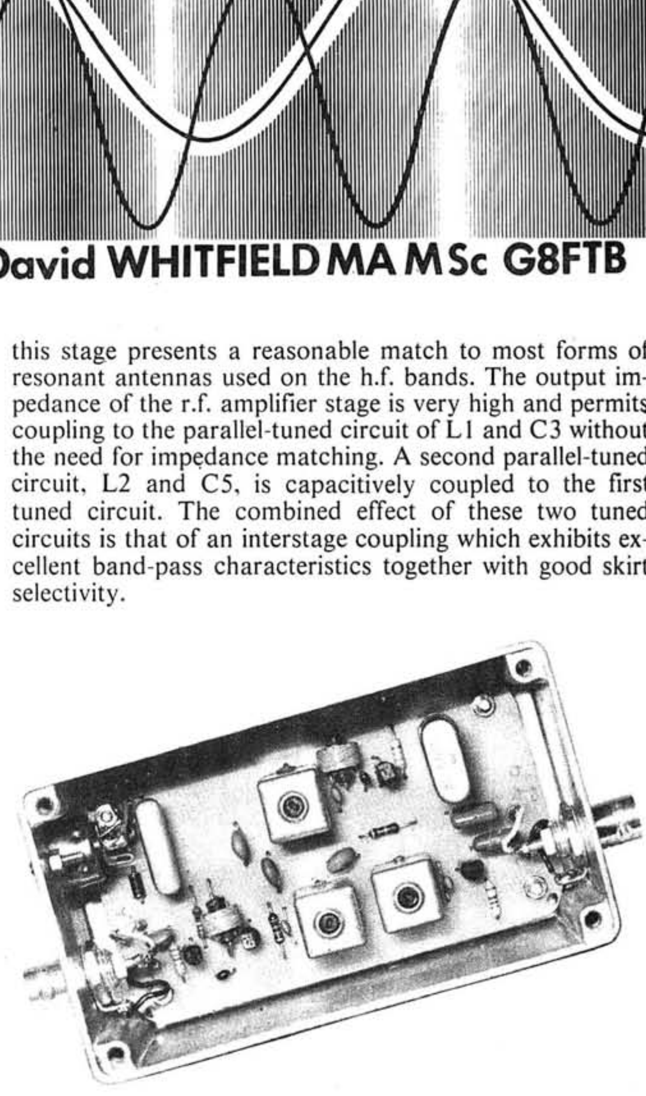
The High Frequency Converter described in this article was originally designed for use with the *PW* Hythe Multimode Marine Band Receiver, which appeared in the January 1979 issue. The converter may, however, be used with almost any general purpose short-wave or communications receiver in order to provide extended coverage. In this regard, the converter has been found to be particularly useful in improving the performance of older valved receivers, the gain of which often falls markedly at higher frequencies. The addition of the h.f. converter makes possible a double-conversion reception system with excellent front-end characteristics. The existing receiver will then act as a tuneable first i.f. stage.

The converter offers high gain coupled with low noise and low cross-modulation performance. It is designed to operate over any tuning range up to 2MHz wide, between 14MHz and 30MHz; details of necessary component changes are given for the different range. The i.f. output of the converter can be either 1·5MHz to 3·5MHz for the *PW* Hythe or 3·5MHz to 5·5MHz for general use. The segment 3·5MHz to 4MHz is covered on almost all amateur-band receivers.

An excellent application of the h.f. converter is to enable reception of the 10m amateur band (28MHz to 30MHz) on a receiver which does not already cover these ranges. The world of 10 metres will be found to be quite exciting, particularly with the current "high" in the sunspot cycle. Stations can be heard world-wide on these bands at the present time, even with the most modest of antenna systems.

Circuit Description

Tr1, a junction gate f.e.t. operated in common gate mode, acts as an r.f. amplifier. The low input impedance of this stage presents a reasonable match to most forms of resonant antennas used on the h.f. bands. The output impedance of the r.f. amplifier stage is very high and permits coupling to the parallel-tuned circuit of L1 and C3 without the need for impedance matching. A second parallel-tuned circuit, L2 and C5, is capacitively coupled to the first tuned circuit. The combined effect of these two tuned circuits is that of an interstage coupling which exhibits excellent band-pass characteristics together with good skirt selectivity.



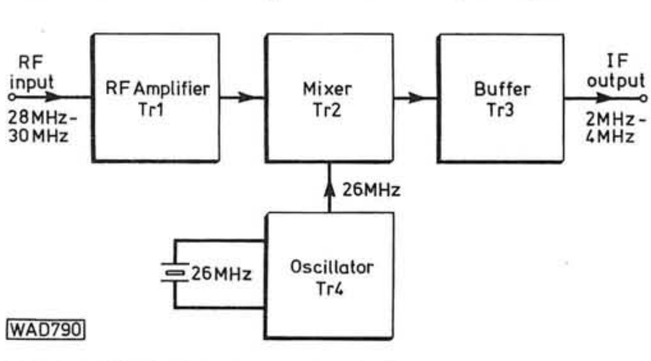


Fig. 1: Block diagram of the h.f. converter. Frequencies shown for 10m amateur reception

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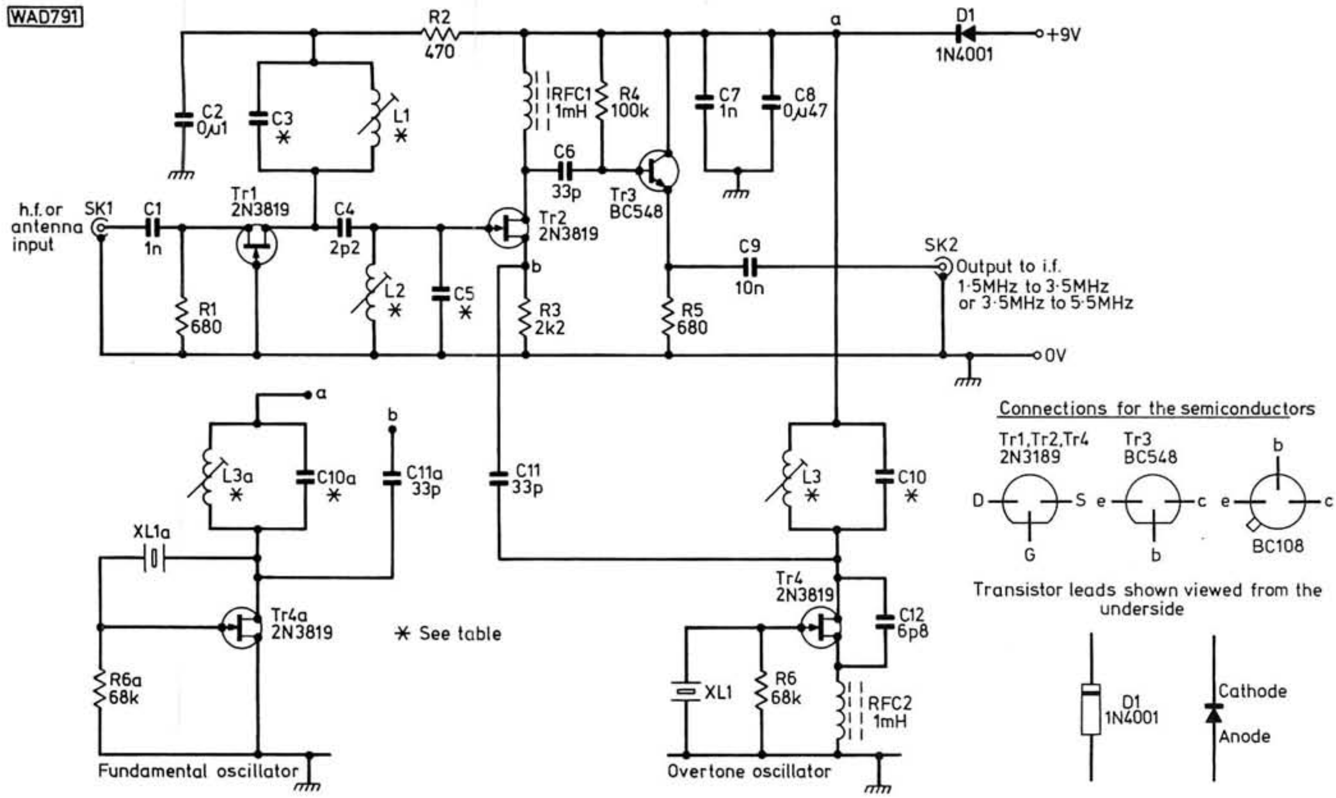


Fig. 2: Circuit diagram of the h.f. converter

The local oscillator for signal frequencies above 24MHz uses a junction gate f.e.t., Tr4, operating on the third overtone of the frequency determining element which is a quartz crystal. L3 and C10 are tuned to the overtone frequency and feedback, from drain to source, is provided by C12. For signal frequencies below 24MHz, the local oscillator operates on the fundamental frequency of the quartz crystal. In this case, C10a and L3 tune to the fundamental frequency and the quartz crystal is connected in the feedback path between drain and gate.

A further junction gate f.e.t. is used as the mixer, Tr2. The signal frequency is applied to the gate; local oscillator to the source; and the difference, intermediate frequency, extracted at the drain. An emitter follower using a bipolar transistor, Tr3, is incorporated to act as a buffer between the mixer and the output. This stage also provides a match to the low/medium input impedance of the main receiver.

Construction

The h.f. converter is built on a single-sided printed circuit board which is housed in a small diecast aluminium box. The use of a printed circuit is highly recommended since constructors may experience instability if point-to-point wiring techniques are adopted. Care should be taken to mount all the components flush with the board. Transistors may, however, be spaced off the board using plastic mounting pads. The inductors, L1, L2 and L3 should be mounted inside aluminium screening cans. The quartz crystal may be soldered directly to the printed circuit board or, alternatively, an HC6/U socket may be employed. In the former case, care should be taken so as not to overheat the crystal leadout wires since damage will result if excessive heat is applied from the soldering iron.

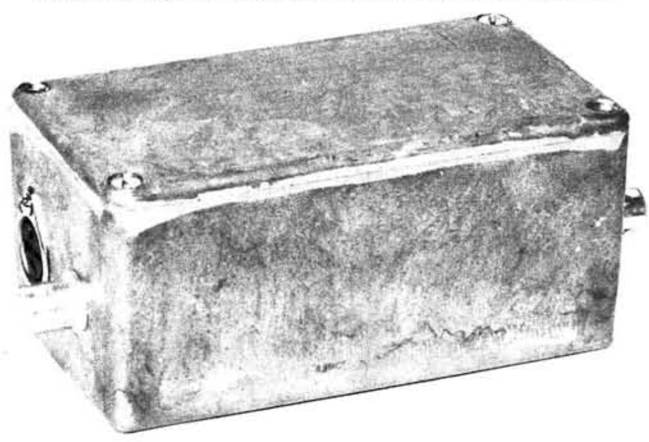
Coaxial sockets should be used for the input and output connections, the choice of socket type being left to the individual constructor in order to match with the rest of his

Table of Test Voltages

Tr1	s g d	1·4V 0V 7·4V
Tr2	s g d	2·8V 0V 8·4V
Tr3	e b c	5V 5·5V 8·4V
Tr4	s g d	0V 0V 8·4V
D1	cathode	8·4V

All the above were measured using a 1MΩ input d.c. voltmeter with the converter operating from a 9V supply.

The r.f. voltage at the source of Tr2 is 2V r.m.s. (typical).



receiving station. Belling Lee or BNC types should be adequate for most purposes. If an internal battery, PP3 or similar, is used, a supply on/off switch, slide or s.p.s.t. toggle, should be incorporated in the positive 9V line. Where an external supply is used, input may be made using 3mm or 4mm colour-coded banana, 3·5mm jack, or DIN sockets. The converter is diode protected against inadvertent reversal of the supply polarity. The external supply need not be regulated but should be between 6V to 12V, of smooth d.c.

Alignment

The h.f. converter can readily be aligned with the aid of a signal generator and a second receiver or alternatively a grid-dip oscillator may be employed. The first step in alignment is to check that the local oscillator is functioning correctly at the frequency marked on the crystal. The receiver or g.d.o. is tuned to the oscillator frequency and L3 is then adjusted to provide a maximum indication on the signal strength or dip meter respectively. If an r.f. signal generator is available, this should be adjusted to give a modulated carrier in the centre of the desired frequency range: 29MHz for 28MHz to 30MHz coverage. The converter should then be connected to the main receiver using a short length of coaxial cable. A slight increase in noise level will be noticed with the gain controls of the main receiver turned to maximum. L1 and L2 should then be adjusted for maximum output, or signal strength indication, with the signal from the generator coupled loosely to the input of the converter. During this part of the alignment process it may be advantageous to progressively reduce the output level from the signal generator. Finally, L3 should be re-peaked for maximum output, or signal strength meter indication on the main receiver, and only a slight adjustment should be necessary.

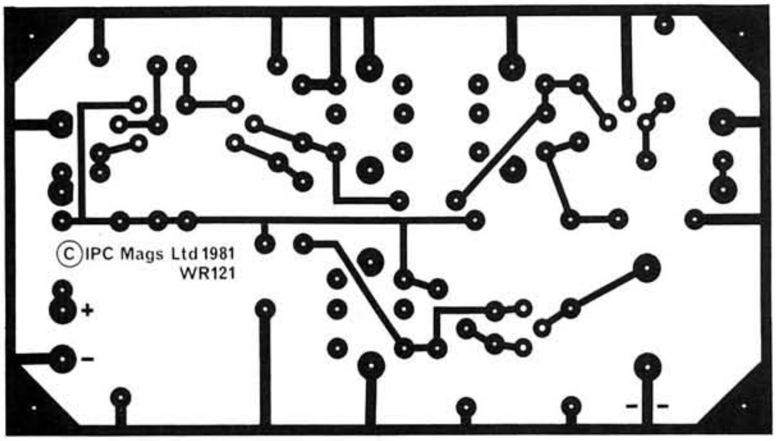


Fig. 3: Track pattern of p.c.b. shown full size

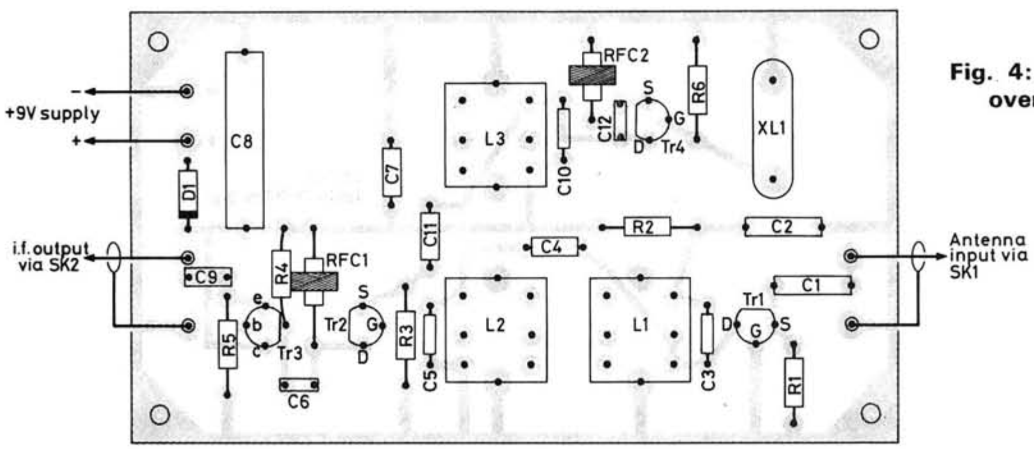


Fig. 4: Component overlay for overtone crystal oscillator

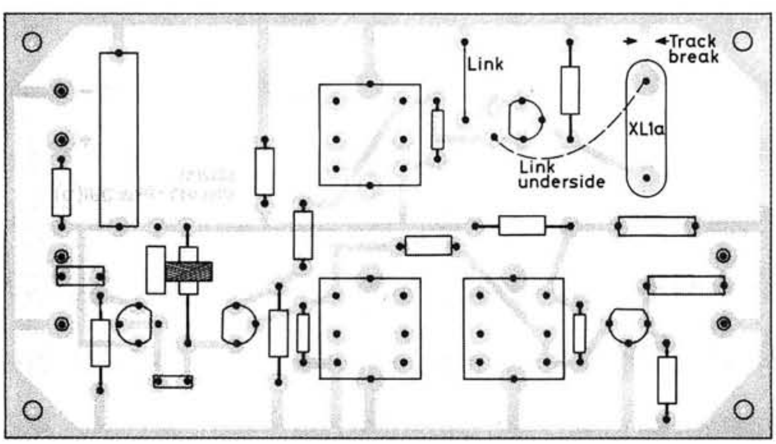


Fig. 5: Required modification for fundamental operation of the crystal oscillator

Table of component changes for different frequency ranges

Frequency range	Crystal for 2–4MHz i.f.	Crystal for 3·5–5·5MHz i.f.	L1 and L2	L3	C3 and C5	C10
14 to 16MHz	12MHz	10·5MHz	30 turns	34 turns	47pF	33pF
16 to 18MHz	14MHz	12·5MHz	26 turns	30 turns	47pF	33pF
18 to 20MHz	16MHz	14·5MHz	26 turns	26 turns	33pF	33pF
20 to 22MHz	18MHz	16·5MHz	24 turns	24 turns	22pF	33pF
22 to 24MHz	20MHz	18·5MHz	26 turns	24 turns	22pF	22pF
24 to 26MHz	22MHz*	20·5MHz*	22 turns	22 turns	22pF	22pF
26 to 28MHz	24MHz*	22·5MHz*	18 turns	18 turns	22pF	22pF
28 to 30MHz	26MHz*	24·5MHz*	18 turns	18 turns	22pF	22pF

*** Third overtone operation.**

Inductors L1, L2 and L3 are wound using 30 s.w.g. enamelled copper wire closewound on 4·8mm diameter formers with ferrite dust cores and screening cans. C3, C5 and C10 are all ceramic disc capacitors.

★ components

Resistors
¼W 5% carbon

470Ω	1	R2
680Ω	2	R1,5
2·2kΩ	1	R3
68kΩ	1	R6
100kΩ	1	R4

Capacitors
Ceramic disc

2·2pF	1	C4
6·8pF	1	C12
33pF	2	C6,11
1nF	2	C1,7

Polycarbonate

10nF	1	C9
0·1μF	1	C2
0·47μF	1	C8

(NB: see table for values of C3, C5 and C10)

Semiconductors

BC548 (or BC108)	1	Tr3
2N3819	3	Tr1,2,4
1N4001	1	D1

Miscellaneous
Printed circuit board; 4·8mm diameter coil formers and dust cores with screening cans L1, L2, L3 (see guide box for supply source); Crystal HC6/U, XL1 (see table for frequencies); Coaxial sockets to suit constructor's preference SK1, SK2; 4mm sockets (2) or PP3 battery connector; RFC1 and RFC2 1mH chokes; Case, diecast aluminium 114 × 89 × 55mm.

Using the Converter

The converter should always be coupled to the main receiver using coaxial cable which, by virtue of its inherent screening, will help eliminate the effects of breakthrough at the first intermediate frequency (i.e., the frequency to which the main receiver is tuned). The length of the interconnecting cable should also be kept short and attention should be placed on ensuring good low-resistance screen connections at each end. If breakthrough is still a problem, which may be the case with an i.f. around 5MHz, a separate earthing link should be introduced between the converter common rail and the chassis of the main receiver.

Choosing the Antenna

An antenna system should be utilised which is appropriate to the band chosen. On 14MHz, for example, this could take the form of a centre-fed dipole (approximate overall length 10 metres) or alternatively a vertical quarterwave (approximate length five metres) can be used.

In the former case, some form of balun, balanced-to-unbalanced transformer, should be employed for correct matching to unbalanced coaxial feeder, but in the latter case coaxial feeder will provide a match to the input of the h.f. converter. On the higher frequency bands (above 21MHz) some form of beam antenna may become realisable due to the reduction in physical size of antenna elements at the shorter wavelengths. A 3-element beam, consisting of a dipole with one reflector and one director, will give excellent results on 28MHz. It should be mentioned, however, that quite satisfactory results can be achieved, giving world-wide reception on the 14MHz, 21MHz and 28MHz bands, using only random length wire antennas. One of the author's receiving antennas consists simply of six metres of wire strung across the roof on his QTH! ●

AMATEUR RADIO EXCHANGE

October again, and that means Leicester Exhibition time. This year – for rather complicated, "political" reasons – there will be two shows in the month, the official A.R.R.A. one, and the independent one in the Granby Halls on 23rd, 24th and 25th October where we shall be exhibiting.
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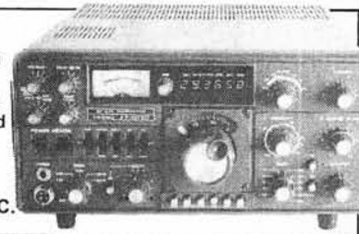

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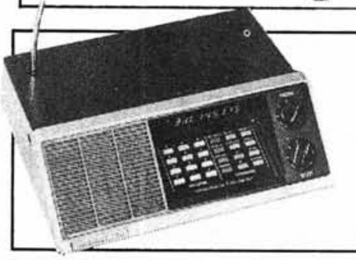

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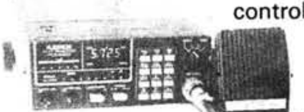

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MODS

IMPORTANT—The ideas presented here are suggestions only, and as they are untried by this magazine, we cannot accept responsibility for any resultant damage, however caused. Before alterations are attempted, care should be taken to ensure that any guarantee is not invalidated, and it should also be borne in mind that modifications usually have an adverse effect on resale prices. In cases where specialist skills or equipment are needed, most dealers will undertake the work for a reasonable fee.

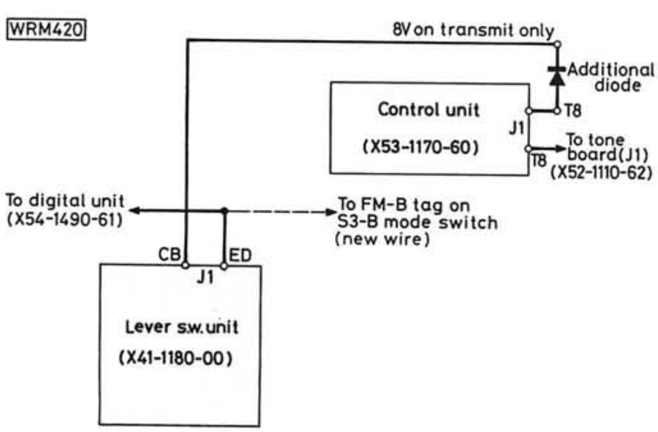
Roger Hall G8TNT (Sam)

No. 10

Mr. J. E. Hunt has written in from Thrapston in Northants because he has a new use for the tweezers that we gave away with our December 1980 issue. Along with quite a few other people he still prefers to wind his own coils, repair, convert and even make transformers. This means that he often has to solder Litz wire, or very fine enamelled wire that is difficult to solder because the enamel must be removed first. I have tried using a pair of very sharp sidecutters or a razor blade to scrape it away and when that fails, and it usually does, I often resort to burning it off with a cigarette lighter, and that is not very often successful. Mr. Hunt's suggestion is that two small pieces of sandpaper or emery cloth should be glued to the inside of the jaws of the tweezers and then, when the wire that is to be cleaned is stroked with the tweezers with an upward twisting motion, the enamel will come off quite easily. He has three pairs of modified tweezers, each with a different grade of abrasive, and he can now clean wires down to 40 s.w.g. without breaking them. Thanks for the idea Mr. Hunt.

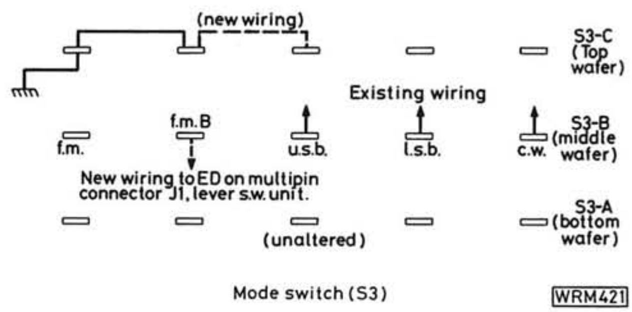
Trio TS-770E

The next mod, full reverse repeater for the Trio TS-770E, has been sent in by Chris G8KCP, and as it involves the fitting of only two wires and a diode it is very easy to do.



There are no external changes to the set as the mode switch (S3) is used to initiate the reverse repeater function by using the FM-B position to activate the correct shifts on both 2m and 70cm, −600kHz and +1·6MHz respectively. The FM-A position provides reverse repeater operation when the "SHIFT" button is depressed. The alternative shifts that were available are disabled by the mod to the mode switch.

To carry out the mod, remove both the top and bottom covers from the set and then fit an additional wire to the "ED" wire that is on J1 which in turn is on the Lever SW Unit (X41-1180-00). Run this extra wire to the unused FM-B tag on the S3-B wafer of the mode switch. Then fit an additional wire strap between tags 2 and 3 on the S3-C wafer. The extra diode should then be fitted between T8 on J1 on the control board (X53-1170-60) and "CB" on J1 on the Lever SW Unit. Almost any diode, such as a 1N4148 or 1N914, can be used. The mod is now done and when you set the mode switch to the FM-A position you will have reverse repeater.



Alan G6BLO, has written in following the page in the June 1981 issue in which I passed on several mods for the Icom IC-2E. He has carried out the reverse repeater mod successfully but he has one or two comments to make about one of the others. He thinks that fitting the 7812 voltage regulator inside the battery pack is a good idea but he has pointed out that fitting a diode in series with the batteries is bound to drop the voltage slightly and this in turn must reduce the output power. He does say however that the difference is probably too small to worry about and I agree. Alan then goes on to say that he has carried out this mod as well but he has made one or two slight alterations. He has fitted the regulator and its aluminium heatsink into just one of the battery compartments and that has left the other five compartments available to house batteries, i.e. the best of both worlds. A standard switching socket was also mounted and Alan has said that it is a tricky job making it fit and then glueing it in place. There is a wire that runs between the two halves of the battery case and as it runs from the negative side of the bottom AA cell in the back half, it should be connected to the switched (negative) contact on the power socket. Alan has raised a point that was not mentioned in the original article and that is that by choosing the appropriate regulator, it is possible to raise the voltage and thus the output power. Alan suggests 11·5 volts for an output of 2 watts, although for some reason he says that his runs at 10·7 volts. Thanks for writing Alan.

Wanted

In Mods 8 I published a request for information on the Trio 9R59DS which came from Mr. Woodard of Sheppey. Ron G8FHH surprised me with his response because he has

continued on page 58▶▶▶

PRODUCTION LINES

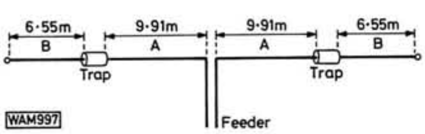
ALAN MARTIN G8ZPW

Antenna Equipment

One of the simplest and least expensive ways of producing a comprehensive broadband antenna is to use a trap dipole which can be erected as either a horizontal or inverted V antenna.

LAR Modules Ltd. has recently introduced a trap dipole kit, comprising two 7MHz weather-proof traps with 500W rating, a pair of lightweight end insulators and full instructions for making a 5-band trap dipole covering the h.f. bands.

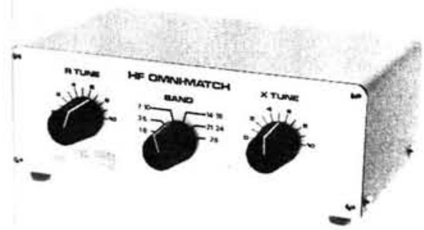
In constructing this form of centre-fed dipole, for the 80, 40, 20, 15 and 10 metre amateur bands, the inner sections AA with traps attached should be brought to resonance at 7·05MHz by trimming the length of each A section. The B sections are then attached and the complete antenna resonated in the 3·5MHz band by similarly adjusting the lengths of the B sections. Please note that dimensions shown in the diagram are given as a guide.



Operating on 7MHz, section AA forms the dipole with the traps functioning as high impedance isolators. On 3·5MHz the traps become inductors, connecting to the outer B sections, together forming an inductively loaded dipole. At the higher frequencies the antenna becomes an odd number of half waves, centre fed. Three half waves on 14MHz, five on 21MHz and seven on 28MHz.

The VAT inclusive price of the 7MHz antenna traps kit is £12.50, plus £1.75 p&p.

As the trap dipole is a compromise antenna, the impedance at the feed point varies from band to band. Standing waves will be present on the feeder and for the best results an antenna tuning unit (a.t.u.) should be used. The new LAR HF Omni-match is ideally suited to this application.



The unit is an impedance matching device designed to improve the match between a transmitter/receiver and its load.

In operation, a v.s.w.r. bridge should be used to indicate when the matching adjustment is optimum. Using only sufficient r.f. power to give a satisfactory reading on the v.s.w.r. bridge, operate and R and X tuning controls concurrently until there is a drop in indicated v.s.w.r. Continue tuning, aiming always for the lowest possible reading. This represents maximum load power. Providing the initial v.s.w.r. is not greater than 5 : 1 then it should be possible to approach very close to 1 : 1.

Measuring 190 × 150 × 75mm the VAT inclusive price is £69.25, plus £1.75 p&p.

Both units are available through dealers or direct from: *LAR Modules Ltd., 60 Green Road, Leeds LS6 4JP. Tel: (0532) 782224.*

Economy Slim Jim

The CQ Centre in Merton is already well-known for the unusual 2-element HB9CV 2 metre beam and now they have introduced an economy version of the extremely popular Slim Jim. It is made from 300Ω ribbon cable and is sealed inside a length of plastics tubing. It is supplied with 4 metres of coaxial cable and yet it still costs only £6.50 from: *The CQ Centre, 10 Merton Park Parade, London SW19, telephone 01-543 5150.*

Useful Tools

The recently introduced range of Paramo Files are typical of the extremely high quality tools manufactured in the Sheffield region. Made to conform to BS specifications, they are guaranteed to give high performance and long life.

The range of seven 200mm long files are fitted with virtually unbreakable orange, plastic handles designed to provide a comfortable secure grip and to be easy to find on a crowded work bench.

The range includes most popular types of file and the VAT inclusive prices range from £2.61 to £4.29, and are available from leading tool stockists.

The Paramo Tools Group Ltd., Hallamshire Works, Rockingham Street, Sheffield S1 3NW. Tel: (0742) 25262.

Now Hear This

Claimed to be the first multi-band radio designed specially to receive the new UK CB channels from 27·60125–27·99125MHz f.m., the Hira H863 also covers the broadcast bands from 535–1605kHz a.m. and 88–108MHz f.m., the marine band 1·6–4·4MHz, the air band 108–135MHz, and a.m. CB.

The H863 operates from a.c. mains or internal dry batteries, and uses internal ferrite rod antennas up to 4·4MHz and telescopic whips above that. A world map and time zone calculator dial are provided inside the hinged dial-cover.

Priced at £38·75 including VAT, the H863 is available from: *Packer Communications, Unit 4, Station Industrial Estate, Coniston, Cumbria, telephone (096 64) 678.*

PRODUCTION LINES

ALAN MARTIN G8ZPW

If you please

Please mention "Production Lines", when applying to manufacturers or suppliers featured on these pages.

Welz Meters

Just starting to appear in the shops is the Welz range of meters. These attractively designed meters are made in Japan and imported into this country by Waters and Stanton Limited. Shown here is the SP-15M s.w.r. and power meter which covers 1·8—150MHz and can handle up to 200 watts, mounted on top of its companion AC-35M antenna tuning unit, which matches 50Ω transceivers to unbalanced antenna feeders with impedance values between 10 and 500Ω, and is designed to combat TVI problems too. The AC-35M operates on the 3·5, 7, 14, 21 and 28MHz amateur bands and can handle a maximum of 200W carrier or 400W p.e.p.

Moving up-market, we come to three s.w.r. and power meters intended for base-station use and with larger-scale meters. The SP-200 covers 1·8-160MHz at powers up to 1kW, and the SP-400 130-500MHz at 150W. The SP-300 (also shown here) is really

three instruments in one, with separate sensors and input/output sockets for ranges of 1·8-160MHz at up to 1kW, 1·8-200MHz at up to 200W, and 130-500W at up to 150W (all carrier powers).

Prices for these units are: SP-15M £29; AC-35M £49; SP-200 £59.95; SP-300 £79.95; SP-400 £59.95. All are inclusive of VAT, post and packing.

Further details from: *Waters and Stanton Electronics, 18/20 Main Road, Hockley, Essex, telephone Southend-on-Sea (0702) 206835.*

Boot Mount for $\frac{7}{8}$ths

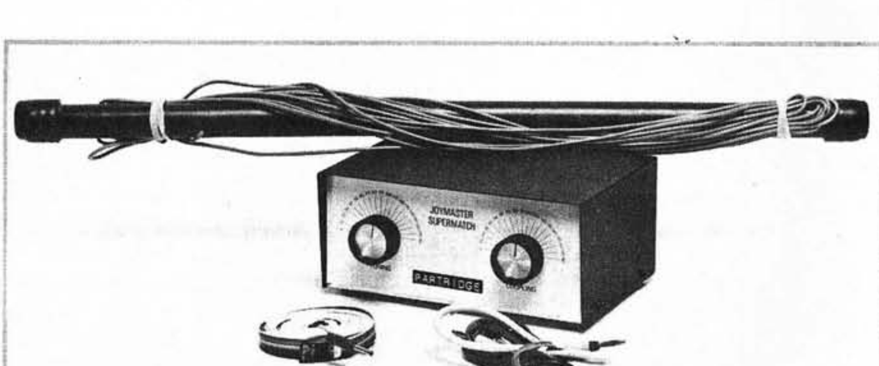
One of the most popular antennas of recent times is the $\frac{7}{8}\lambda$ 2 metre whip — it may even replace the ubiquitous $\frac{5}{8}\lambda$. The major problem with it is that it is usually gutter mounted. This not only looks a little strange, it also means that the antenna is working with half a ground plane, which in turn means that the radiation pattern is severely distorted.

To overcome this problem, Bredhurst Electronics have introduced the R.A.C. Boot Mount. This ingenious device clips onto the edge of the bootlid and this allows you to mount the antenna very near to the centre of the car. This not only looks better, it produces a far more balanced radiation pattern. The mount, which is supplied complete with grub screws to hold it in place and a plastics cover, costs £3.50, and a matching cable assembly also costs £3.50. The assembly consists of 4 metres of cable with a PL259 at one end and a heavy duty socket at the other. This socket has been designed to withstand the terrific pressure that is applied to it by the antenna when the car is travelling at speed.

Both of the above items are available from: *Bredhurst Electronics, High Street, Handcross, West Sussex, telephone (0444) 400786.*

Multi-Mini

New from George Partridge G3CED, is the Multi-Mini Antenna. This is a small rod (610mm long) that is connected to the Supermatch a.t.u. and which will then work on all the h.f. bands and also on 2 metres. For the s.w.l. it will also receive all the broadcast bands. The antenna has a low angle of radiation which should make it DX sensitive, and because the a.t.u. can be used to reduce the s.w.r. to a negligible amount, it should work well. The transmitting version can handle up to 500 watts and it is supplied complete with separate radials for use on the different bands. The s.w.l. version costs £35.00, the transmitting version

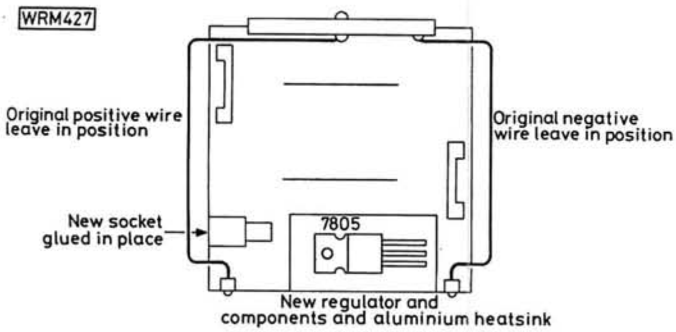


£80.00 and both these prices include VAT and postal delivery within the UK.

For more information on this unusual device contact: *Partridge, 188 Newington Road, Ramsgate, Kent CT12 6P2, tel: (0843) 53073 (Sales and Administration), (0843) 62839 (Technical Enquiries).*

MODS 10

▶▶▶continued from page 55



sent in not just one or two suggestions but instead a complete book. He has collected together an enormous amount of information and then bound it together into a book, which he has asked me to pass on to Mr. Woodard. I have done so Ron and may I thank you on his behalf for your generosity. Ron also reiterated Mr. Pellegrini's plea for help with extending the frequency coverage of the SX200 and although I don't know of such a mod just now, I have been promised one from someone who does. I will of course pass it on as soon as it becomes available.

The same answer applies to a request that I received from Mr. J. M. Greenwood of Bolton. He has written in to ask if I know of a mod that will extend the frequency range of the Trio TR-9000. Hopefully Mr. Greenwood, next month's column will be devoted entirely to the TR-9000. I have been promised mods that will not only extend the frequency range but will also give you a switchable choice of channel spacing, i.e. 5kHz and 10kHz or 10kHz and 20kHz or 12·5kHz and 25kHz. There should also be a mod that will allow either the entire band to be scanned or just the 5 memories and another one that will provide a battery back-up for those memories so that they are not lost when you disconnect the set from the power supply. There may even be one for semi-reverse repeater (listen input) but this one is still at the experimental stage and it may not be finished in time.

Steve G8NTN telephoned me because he would like some mods for his Icom IC-255E. He has not asked for anything specific and so anything will probably be of interest.

Last but not least I would like to thank Gregory ZL2TOY for writing in with a clearly written and well explained mod for the Icom IC-2E. It is unfortunate that the same mod appeared in the issue that came out about a week before I received your version Gregory because had I received yours while I was actually writing this page it would have made my job a lot easier.

If you have written to me and not yet seen anything appear in print it is because I now have a very fat file of mods and my eventual aim is to be able to cover just one set per month. With this in mind I am filing everything away under the appropriate headings but as yet I don't have enough material to fill a page with just one set and so please, if you have any mods that you would like me to pass on or if you would like to know of a mod for your rig please write to me, R. S. Hall at: Practical Wireless, King's Reach Tower (Hatfield House), Stamford Street, London SE1 9LS.

73's
Sam G8TNT

RADIO SPECIAL PRODUCT REPORT

▶▶▶continued from page 33

would be better if the rig was at least inhibited in the transmit mode above 146MHz. I understand that Standard have been asked for this facility to be incorporated, but users should be aware of the dangers of inadvertently operating in this sensitive area.

Only one v.f.o. is fitted to the C58, the alternative one having been lost in the fitting of reverse repeater facilities. This last feature is very useful and for the application for which the rig is intended the lack of the second independent v.f.o. is no hardship. The repeater shift is fixed at 600kHz in either direction.

The l.c.d. readout is a compromise as must be the case with a portable rig. The need for a small front panel leads inevitably to a small display. The various functions are indicated by a series of dots, which take a bit of getting used to. I found it simplest to ignore them, a quick push of the STEP button is sufficient to restore the full display of, say, 4.300 for 144·300MHz instead of .3000 in the 100Hz step condition. Other dots show the operation of the noise blanker, while the memory state is indicated by a small number, preceded by M, below the frequency display and an indication of scanning for busy frequencies.

A small analogue "S" meter also doubles as a power indicator and battery check meter. A calibration of the "S" meter function is given in the specification table.

The noise blanker, effective only in the s.s.b. modes, did reduce, but not eliminate, ignition noise from other vehicles, and was particularly useful in traffic jams with noisy motorcycles alongside. The blanker is introduced by pushing the volume control once and taken out by another push.

The instruction manual is very comprehensive indeed, giving full servicing information as well as operating instructions. The English is good with few of the usual strange phrases one is used to with Oriental instructions.

The performance is good with reports of very good audio quality being received. One of the problems when running s.s.b. mobile is that the antenna is vertically polarised and most s.s.b. base stations tend to use horizontal polarisation. The alternative is to use a "halo" antenna on the car, but who wants such a weird device adorning his car—a vertical seven-eighths is bad enough! I feel that with the advent of the new breed of multi-modes, such as the C58 and FT-290R, vertical s.s.b. will become the usual polarisation mode for mobile use.

The best s.s.b. contact obtained mobile was another mobile in Stevenage, Herts while motoring down the M3 near Basingstoke.

The output power of the C58 is nominally 1W, but as a result of being led astray by a faulty power meter the output was increased to what subsequently proved to be 5·75W. Even at this level the output was very clean and the output has since been reduced to the rated 1W and the output from the linear is still 25W.

Price

The Standard C58 costs £235·00. the p.a. £75·00, bracket £17·75 and case £6·95 all inc. VAT.

The Standard C58 was loaned by **Lee Electronics, 400 Edgware Road, London W2, tel: 01-723 5521** and we would like to thank them for their co-operation.

Dick Ganderton

THE PW 'WINTON' Stereo Tuner

Part 2

*E. A. RULE

It took a lot longer than we'd hoped, but this month we're glad to be able to restart the *PW* Winton Tuner series.

Our thanks go to Hart Electronic Kits Ltd., who took on the job of designing and checking out a replacement for the original a.m. tuner-head, and will be supplying complete kits for this project. They have also taken over the supply of kits for the very popular, super-quality *PW* Winton amplifier (see advertisements).

Circuit Changes

The first thing we need to deal with is all the changes that have been made to the circuit diagrams. The four diagrams concerned all appeared in our April 1981 issue.

Taking Fig. 1 first, the f.m. and TV section, the capacitors C17, 19, 20 and 31 are all 10nF disc ceramics. Resistor R12 had part of its reference missed out; the

★ components

Resistors

½W 5% Carbon

15Ω	1	R151
47Ω	2	R69,113
68Ω	1	R149
100Ω	11	R1,9,35,81,100,114,124,125,150,157,158
150Ω	1	R75
180Ω	1	R80
270Ω	9	R17,18,66,106-111
330Ω	6	R10,11,16,19,22,43
390Ω	3	R83,132,137
470Ω	2	R85,123
510Ω	2	R121,122
1kΩ	4	R44,86,98,99
1·5kΩ	6	R30,39,53,68,76,112
1·8kΩ	1	R73
2·2kΩ	12	R49,72,91,92,95,96,129,152-156
2·7kΩ	4	R29,40,55,104
3·3kΩ	1	R65
3·9kΩ	2	R26,27
4·7kΩ	8	R41,42,51,54,90,93,94,97
5·6kΩ	2	R47,78
6·8kΩ	1	R103
10kΩ	24	R2-8,20,21,24,25,38,70,71,74,79,118,119,120,126,127,128,130,159
12kΩ	3	R28,32,34
15kΩ	1	R131
18kΩ	3	R12,13,102
22kΩ	2	R88,115
33kΩ	4	R46,50,116,117
47kΩ	1	R31
68kΩ	8	R14,15,23,37,77,87,101,105
100kΩ	17	R52,133-136,138-148,160
270kΩ	1	R82
330kΩ	1	R36
1MΩ	1	R84

Pre-set miniature horizontal

4·7kΩ	1	R48
10kΩ	2	R33,89
100kΩ	1	R45

3W multiturn wirewound

100kΩ	1	R56

Cermet multiturn

100kΩ	8	R57-64

Capacitors

Plate ceramic

2·2pF	1	C28

Disc ceramic

0·01µF	19	C2,8,11,12,17,18,19,20,21,22,31,58,89,93,106,107,108,111,117
0·047µF	7	C24-27,32,33,38
0·1µF	10	C5,9,10,13,14,70,71,73,76,77

Polystyrene

47pF	1	C110
68pF	2	C94,96
100pF	5	C56,95,97,98,105
330pF	3	C35,41,82
470pF	2	C91,92
1nF	3	C80,100,102
1·5nF	1	C46
2·2nF	3	C55,86,88
3·3nF	2	C15,16

Polyester

0·01µF	3	C49,50,54
0·047µF	3	C1,45,69
0·1µF	11	C78,83,90,99,101,103,104,115,116,118,119
0·22µF	4	C51,53,64,65
0·47µF	3	C34,48,112

pre-set potentiometer connected between R32 and earth should be R33 (a 10kΩ pre-set). Resistor R33 should then go "to S2". Capacitor C8 is 10nF. C5 is unpolarised.

Pin d36 at the top end of R65 should be d26 and the resistor R67 (330Ω) has been deleted. The polarity of the two meters needs to be reversed. C1 near R3 becomes C7. C67 should be electrolytic (+ve plate upwards), C118 should be C121.

In Fig. 2, taking switch S12a there should be no connection through the middle of that switch. The capacitor connected to the right centre pin of S12a should be C118, 0·1μF. Switch S13 should have its left hand centre pin connected to the top right hand pin of S12a. The top left pin of S13 should go to b23 and then to the f.m. r.f. unit. The bottom left pin should go to b24 and then to the TV r.f. unit. Capacitors C85 and C87 are electrolytics with the positive plates to the emitters of Tr10 and Tr11 respectively. We omitted earth connections at the junctions of R90, FL8 and R93 and of R94, FL9 and R97. The capacitor C68 connected to the a.m. r.f. unit is now C120 and should be connected to earth not pin b9, but the value remains unchanged. Resistor R89 is a 10kΩ pre-set not 20kΩ as previously stated. Diode D22 anode should be connected to b32 not b22. The 2·2nF across R92 is C86. C72 is electrolytic (+ve plate upwards).

Fig. 3 is the power supply diagram and the diodes D15 and D16 are type number 1N4003. Capacitor C117 now becomes C119. C59 should be electrolytic (+ve plate up-

Electrolytic p.c.b. type 63V

1·0μF	1	C7
2·2μF	8	C23,37,59,66,68,113,114, 120
4·7μF	8	C36,40,44,47,52,67,85,87
10μF	1	C84
100μF	6	C39,42,57,60,62,63
220μF	2	C43,72

Electrolytic axial type 63V

2·2μF	3	C3,4,6

Electrolytic single-ended can type

2200μF 63V	1	C61

Miniature single turn

60pF	1	C109

Inductors

TT100	2	L4,5
TT101	5	L6,7,8,9,10
TT102	2	L11,12
TT103	2	L13,14
TT104	1	L15
TT105	2	L1,3
TT106	1	L2

Filters

CFU455F	1	FL7
SFE10.7ML	3	FL3,4,6
SFE10.7MS3	3	FL1,2,5
190BLR3107N	2	FL8,9

Switches

WT2; WT3; S4,5,6,7,8; Rotary 5 position single pole S14; Two pole changeover toggle S15; Push to make—one contact normally open S16,17, 18,19

Semiconductors

Diodes

SMV2012	1	D24
TAA550C	1	D19
TIL209	1	D13 (or similar 3mm l.e.d.)
1N4003	2	D15,16
1N4148	31	D1-12,14,17,18,20,22,23, 25-37
Internal	1	D21

Transistors

BC414	4	Tr3,6,10,11
BC556	9	Tr4,5,9,16-21
BF595	7	Tr1,2,8,12,13,14,15
3N204	1	Tr7

Integrated circuits

HA11223	1	IC2
HA11225	1	IC1
MSL2318	1	IC4
MSM5524	1	IC5
6-LT-09	1	IC6
7805	1	IC7
7812	1	IC3

Miscellaneous

Winton p.c.b.s (3), 1010, 1020, 1030; f.m. tuner FD811U(Alps); a.m. tuner Hart FX811; TV tuner U322(Mullard); Toroidal mains transformer Hart 1000TR; Coaxial sockets (2); 4mm panel mounted sockets 1 red 1 black; Screwdriver release fuse holder (1); 500mA anti-surge fuse (1); Moulded p.c.b. pillars (12); Solid aluminium knobs 16mm diameter (2); Chassis-mounting 5-way DIN socket 180° (1); Cable entry clamp (1); insulated phono plugs black (3); Hart miniature edge indicator meter 100-0-100μA (1); Hart miniature edge indicator meter 0-10, 100μA f.s.d. (1); Aluminium sheet for chassis and fascia panel; Wooden cabinet (1); 40-pin holder for IC5 (1); Heatsink for IC3 (1).

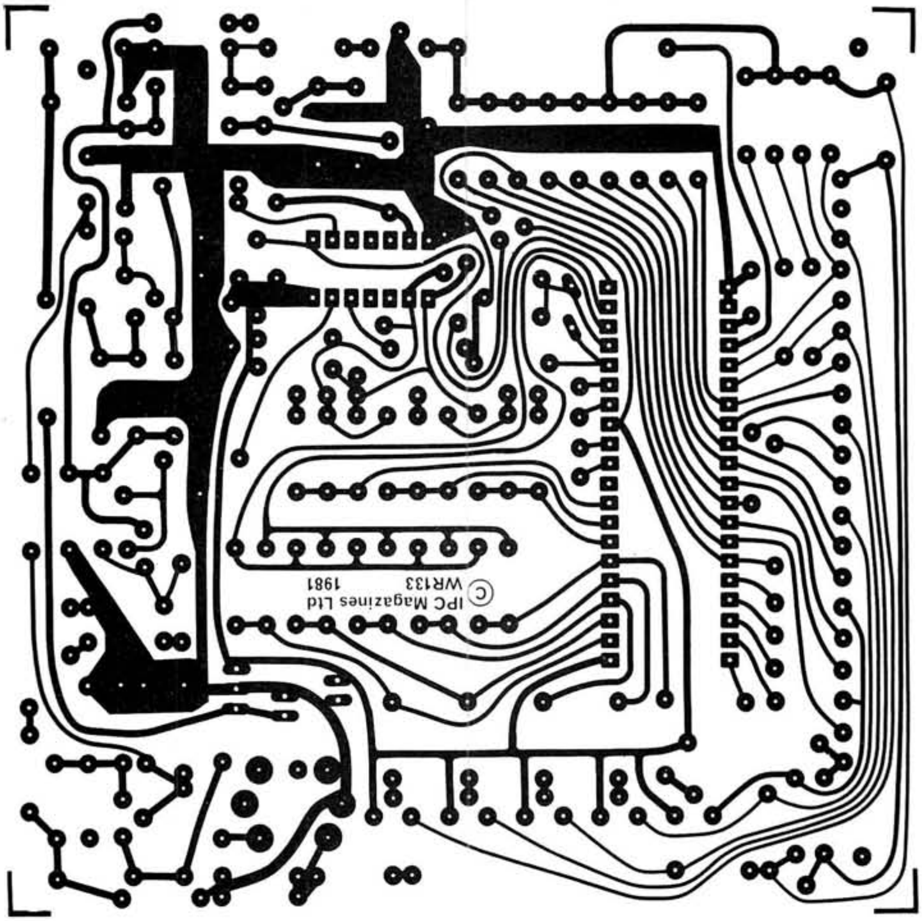


Fig. 6: Track pattern for the digital board, shown full size

wards). IC3 input and output labels should be reversed.

Finally the digital board, D24 is now a SMV2012. Pins c13, 14, 15, 18, 16a, 17 and 16b should all be at the diode matrix end of the resistor concerned, similarly, c10 (which should be c19) with R151. Resistor R110 from the base of Tr15 is now R120. Capacitor C117, 10nF, was omitted and should be between pin 14 of IC4 and earth, resistor R160 was also omitted, connect between Tr21 and pins 15/18 of IC6, value 100kΩ. Resistor R132 is connected to pin 20 and not pin 1 and R137 is connected between pin 20 and pin 1. The capacitor C112 should be connected at c31 to the top end of R137 not the bottom end.

The last change is that the TV band tuner now being used is the U322 and Hart Electronics are supplying them in the kits already modified.

Revised circuit diagrams are available from the Editorial offices at Poole. Please send a 10 × 8in s.a.e.

Printed Circuit Boards

There are three p.c.b.s, and it is not important which one is built first, but it is suggested that the f.m. i.f. board be tackled last, once some experience has been gained. This board is the most critical and care should be taken to make sure all components are fitted as shown and with the shortest practicable lead lengths.

Assembly should start with the terminal pins which should be a tight fit and are inserted from the under side of the p.c.b. and then tapped home with a light hammer. Be sure to support the p.c.b. while doing this, the best way is to lay the p.c.b. across the slightly "open" jaws of a vice so that the protruding part of the pin on the top side of the p.c.b. is between the jaws, the vice jaws will then support the p.c.b. while the pins are hammered home. Once the pins are in place the suggested order of assembly is resistors, small capacitors, transistors, electrolytics, switches and coils etc. Start with the components with the lowest height and after inserting the leads into the correct holes turn the p.c.b. over and rest it on a piece of foam or similar material which will then hold the components in close contact with the p.c.b. while they are soldered.

Be careful to mount all electrolytics the correct way round as indicated on the layout. This also applies to diodes, a mistake here with one of the switching diodes could lead to the most peculiar symptoms which would not be easy to locate. So be warned, check each component before and after inserting into the board. The switches should be inserted into the board by "walking" the pins into the holes, starting at one end with the switch at a slight angle and then gradually lowering the switch pins into the holes as the switch is levelled out. Make sure that the bottom edge of the switch is in close contact with the front panel holes. It must also be parallel with the board; when the switch is in the correct position just solder one pin at each end and recheck the switch alignment, if it is still all right then the other pins can be soldered.

Only use the types of components specified; with audio amplifiers it is quite often possible to substitute without problems but this is not true with r.f. circuits and even a change of type, although the same apparent value, will very often upset the results, sometimes even to the extent of preventing the circuit working at all. Any alternative component should be checked out very carefully to make sure it is suitable for that particular circuit.

A word of warning, IC5 is sensitive to static electrical charges and should not be removed from its wrapper until the digital p.c.b. is finished and it can be plugged into its socket.

Note that on the digital p.c.b. resistors R151, R106-R112 are used vertically mounted INSTEAD of pins. This

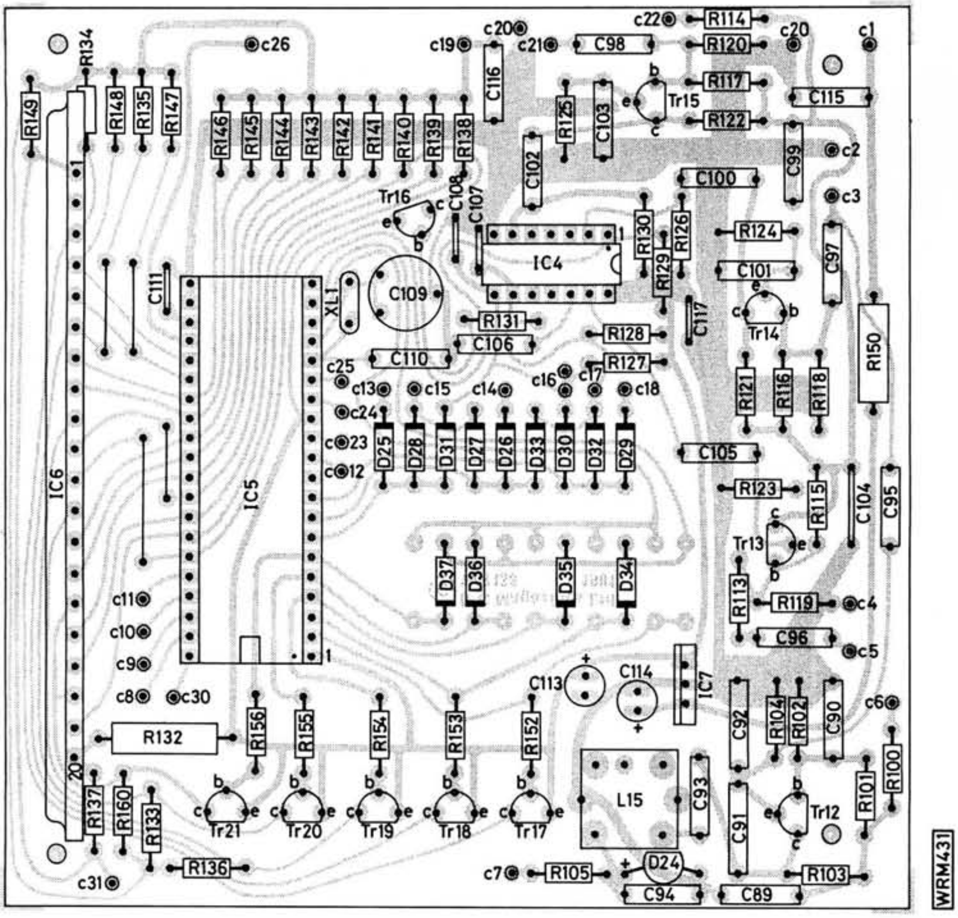


Fig. 7: Component layout for the digital board. See text regarding R151 and R106 to R112

is to isolate the wiring connections from the p.c.b. If pins were used and these resistors mounted onto the p.c.b. there would be enough capacitive coupling from the digital p.c.b. into the wiring to cause r.f. interference in the f.m. r.f. unit. By mounting the resistors as shown they act as "r.f. stoppers" and prevent interference from the digital switching process being coupled into the wiring. For the same reason, all wiring should be kept as far away from the p.c.b., and in particular, the MSL2318 i.c., as is practicable.

Each p.c.b. is mounted onto pillars to hold it at the correct height above the chassis. The f.m. and digital p.c.b.s are mounted on pillars of 12·7mm height. These are plastic and insulate the p.c.b.s from the chassis so that earth loops are avoided. The a.m. p.c.b. has to be mounted at a lower height in order that the r.f. unit switches are at the same height as the other switches (and also so that the completed unit matches the Winton amplifier). The height of pillars required for the a.m. p.c.b. is 4·5mm; as there are no commercial pillars of this height they have to be made; this is made easy by using screws which are held in place by nuts and then using another nut to hold the p.c.b. at the correct height, a final nut holds the board in place. The a.m. p.c.b. does not require insulating from the chassis, but because of its low mounting height all component leads protruding through the p.c.b. must be cut short to avoid shorts to the chassis.

The a.m. r.f. unit has a number of fairly large pins protruding from the bottom and these have to be fitted into the holes of the p.c.b. The best method is to "walk" them into place, in the same manner as the push button switches. Make sure that all the pins are through before soldering. Next month we will deal with the f.m. and a.m. boards.

UNCLE ED

▶▶▶*continued from page 31*

way of looking at it is to say: 10 times the voltage will cause 10 times as much current to flow. Power is equal to voltage times current ($P = I \times V$) and $10 \times 10 = 100$.

As I am sure you'll remember from your school-day log problems, if you want to find the square of a number, you find its log and multiply that by 2, then take the anti-log of the result. When we are dealing with decibels, we don't need to take the anti-log so you can forget that last step.

What it really boils down to is that whatever the ratio of the two voltages is, the two resulting powers will differ by the **square** of that ratio.

$$N_{dB} = 10 \log_{10} \frac{P2}{P1} \text{ becomes}$$

$$N_{dB} = 2 \times 10 \log_{10} \frac{V2}{V1}$$

$$= 20 \log_{10} \frac{V2}{V1}$$

One important point before I close. If V2 and V1 are measured at different points in the circuit, for example at the output and input of an amplifier, then the two circuit resistances must be the same if this relationship between power and voltage is to hold good, as you will see from the equation $P = V^2/R$.

In the next part, I'll talk about negative decibels and also those "special" decibels you see mentioned in specifications—things like dBm, dBV, dBi and lots, lots more. And I'll give some examples of the sort of dB ratios you can expect to find in radio systems.

NEWS NEWS NEWS

Amateurs' Software

Microsystems have recently introduced RADLOG, a software package for radio amateurs in possession of Commodore Pet microcomputer (new ROM) with at least 16k capacity and a 3040 disk system.

RADLOG enables the operator to maintain records of all calls and stations contacted e.g. callsign, name, address, beam heading plus user comments with full log details, date, time, frequency, RST report and QSL acknowledgement.

All details are held on a diskette which can be easily updated when full.

Included with the package, the user guide contains full instructions for editing the contents. Over 2000 calls and 500 stations can be held on a single diskette.

The complete package is priced at £45 and the user guide only £3.50. Both are obtainable from: *Microsystems, 53 Linwood Grove, Leighton Buzzard, Beds. LU7 8RP. Tel: (0525) 370329.*

Lowes in London

Lowe Electronics will be opening a new amateur radio shop in central London. The shop will be run by Andy Beckett G4DHQ and will be in the basement of Hepworths in Pentonville Road, behind King's Cross Station.

Club News

Readers living in the Greater Manchester area may be interested to hear that a RAYNET group has been formed locally called the East Manchester RAYNET Group (EMRG).

The Group is, at the moment, involved in establishing a regular meeting place etc. and would like to extend a welcome to local licensed amateurs and s.w.l.s.

Enquiries should be addressed to: *The Group Controller, Mark Lees G8XQB, 6 Haxby Road, Gorton, Manchester M18 7WW. Tel: 061-223 4200.*

£2M Teletext Order

As further evidence of the growth in the sales of teletext receivers, Mullard have announced an order from Thorn Consumer Electronics worth around £2M for the supply of 120 000 teletext modules and chip sets. The order will be fulfilled by the end of the year.

Currently Thorn is producing teletext sets at an annual rate approaching a quarter of a million.

Mullard manufacture at their Southampton plant about 90% of all the decoder modules and chip sets used in UK produced teletext receivers.

Mullard Ltd., Mullard House, Torrington Place, London WC1E 7HD.

CB Rig

South Midlands Communications are hoping to introduce their own CB rig to the market in the near future. They say that unlike most other rigs, which use similar boards from one manufacturer built into different boxes, they have had a board designed to their own requirements. The result is claimed to be a transceiver with a standard of performance far surpassing the relevant Home Office specification. We hope to be able to give you more details on this next month.

Solent Audio 81

Hamilton Electronics Ltd. of Southampton are the host exhibitor at Solent Audio 81, which is being held in Southampton on 24 and 25 October at the Post House Hotel, Southampton.

In its 5th year, Solent Audio is now established as a major regional Hi-Fi show and this year is supported by thirty leading manufacturers.

Three complete floors have been booked at the Post House Hotel, and each exhibitor will have an individual demonstration room.

Admission is free, the Show will be well sign-posted by the A.A. and there is plenty of free car parking.

Further details from: *Hamilton Electronics Ltd., 35 London Road, Southampton SO1 2AD. Tel: (0703) 28622.*

Feeling Batter(i)ed?

If you have been out to buy a battery recently you may have been faced with a puzzling array of numbers on what used to be an ordinary battery. The familiar SP, HP and PP type numbers are being phased out and replaced with IEC type numbers. Some batteries have been made with both numbers stamped on the case, but now many are arriving in the shops with only the new type numbers.

The table shows a list of the most common and popular batteries along with their IEC equivalents and other relevant information.

We would offer our thanks to Berec (Ever Ready) Ltd., for their co-operation in compiling this table, and for further details please contact: *The Technical Sales Dept., Berec House, 1255 High Road, Whetstone, London N20 0EJ.*

IEC	Ever Ready	Japan	NBS	Length or dia	Width	Height	Suggested current range (mA)
				All dimensions in mm			
10-F20	B121	010	10F20	27·0	16·0	37·0	0·1–1
R6	C7	UM3/SUM3	(AA)	14·5	—	50·5	0–75
R14	C11	UM2/SUM2	(C)	26·2	—	50·0	5–50
R20	HP2	UM1/SUM1	D	34·2	—	61·8	0–2000
R6	HP7	UM3/SUM3	AA	14·5	—	50·5	0–75
R14	HP11	UM2/SUM2	C	26·2	—	50·0	0–1000
RO3	HP16	—	AAA	10·5	—	45·0	0–1000
4R25	PJ996	—	4FD	67·0	67·0	102·0	30–300
4-F100-4	PP1	—	—	65·1	55·6	55·6	5–50
6-F22	PP3	006P(S)	—	26·5	17·5	48·5	0–50
6-F50-2	PP6	S106	6F50-2	36·0	34·5	70·0	2·5–15
6F90	PP7	S206	—	46·0	46·0	61·9	5–50
12F100	PP8	—	—	65·1	51·6	200·8	20–150
R20	SP2	UM1/SUM1	D	34·2	—	61·8	25–100
R14	SP11	UM2/SUM2	C	26·2	—	50·0	20–60
2R10	8	—	—				
3R12	1289	—	—	62·0	22·0	67·0	0–300

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TR-7800	25w 2m FM	**£276.00**
TR-9000	2m Multimode	**£371.91**
TS-130S	HF Transceiver	**£547.40**

COLLINS

KWM-380 Transceiver **£1,897.50**

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INTRODUCING SSTV PART 4

M.J.AXSON BA G8WHG

Part 3 of this series investigated received signal processing. In this, the penultimate part, we consider colour SSTV techniques

Colour TV Principles

Having successfully brought the transmission and reception of monochrome pictures within the reach of the average amateur through the SSTV techniques already discussed, the thoughts of the experimenters turned to adding the further dimension of colour. Whilst conventional fast-scan colour TV does involve some very complex technology, which is almost certainly beyond the resources of all but the most dedicated amateur, the underlying principles are very simple, and depend on the way in which the human eye perceives colour.

Like radio waves, light is an electromagnetic radiation, albeit of a very much shorter wavelength, the visible spectrum lying between 4×10^{-7} metres and $7{\cdot}7 \times 10^{-7}$ metres approximately; variations in the wavelength produce different sensations in the eye which correspond to different colours (Table 5).

The retina of the eye has two types of receptors known as rods and cones because of their physical appearance, and it is the cones that are concerned with colour vision. There are three different types of cones, each sensitive to a different part of the spectrum, which roughly correspond to blue, green and red light (Fig. 19).

Fig. 19

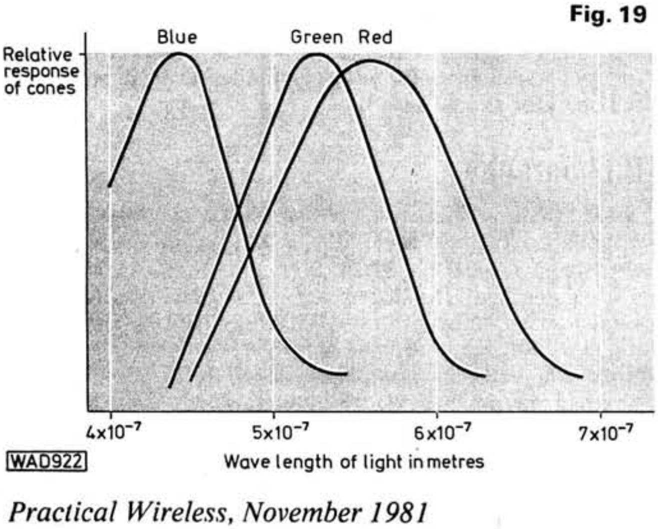


TABLE 5

Colour of Light	Wavelength 10^{-7} metres
Violet	4·000–4·240
Blue	4·240–4·912
Green	4·912–5·750
Yellow	5·750–5·850
Orange	5·850–6·470
Red	6·470–7·000

All of the many different colours that the eye can perceive are made up from varying proportions of these three primary colours. Red and green produce yellow, blue and green produce cyan, red and blue produce magenta whilst all three produce white and obviously each on its own produces blue, green and red. Varying levels of each primary produce different intensities and tones of colour.

It follows that colour TV is possible if blue, green and red pictures are transmitted separately and then recombined at the receiver. This recombination process is carried out by the colour picture tube, which is a very sophisticated piece of apparatus, for it is virtually three c.r.t.s in one.

There are three electron "guns", each of which deals with one of the primary colours. Instead of the phosphor coating on the screen of the tube being a uniform layer, it is broken up into numerous groups of phosphor dots, each group being made up of three different phosphors, one of

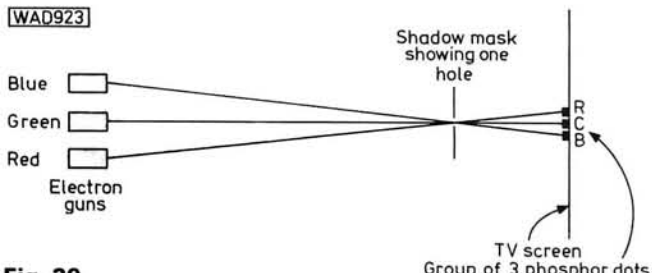


Fig. 20

which glows blue when energised by an electron beam, whilst the other two glow green and red respectively.

Just behind the screen is a shadow-mask screen which is perforated with minute holes, so arranged that the electron beam from each "gun" will only strike the phosphor dots associated with its own colour (Fig. 20). At the normal viewing distance the eye (or more correctly, the brain) will blend the light from adjacent dots, so that in an area where all three are energised the screen appears white. Similarly, if only the red and green guns are activated the result will be interpreted by the brain as yellow, and so on for all the different colours making up the whole picture.

At the transmitting end, the colour TV camera separates the colours of the scene into the blue, green and red components and passes each to a separate camera tube (Fig. 21), and the resulting video signals are then transmitted simultaneously on one carrier. Circuits in the receiver separate the information into its component parts which are then applied to the picture tube. Since for fast-scan TV this process is carried out at a rate of 25 frames per second and each frame is made up of 625 lines, it is not surprising that the technology is complex. However, just as with monochrome, the adoption of SSTV standards greatly simplifies matters.

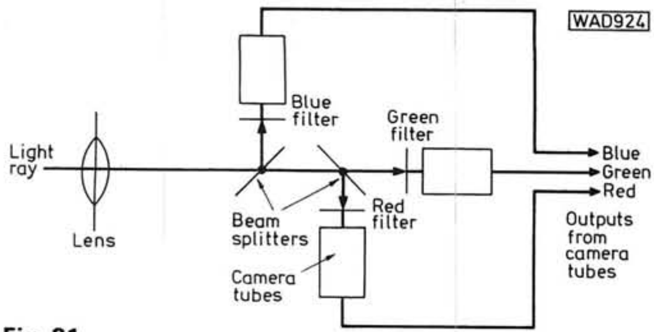


Fig. 21

SSTV Colour

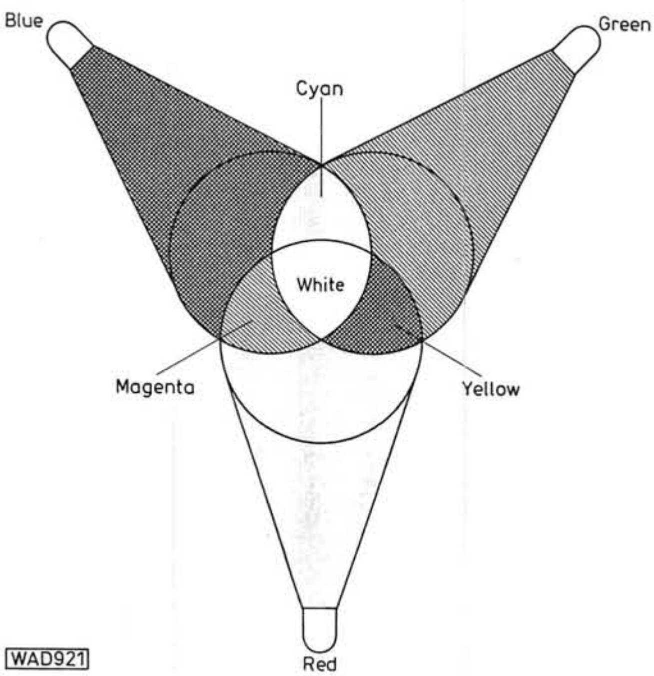
There are a number of possible approaches, but the easiest system both to understand and to set up requires very little alteration to the basic monochrome equipment.

At the transmitting end three colour filters are provided for the normal monochrome fast-scan camera, and the scan-converter main memory size is increased so that it can store three complete SSTV frames, i.e. 48K 4-bit words.

If a red filter is placed over the camera lens, the resulting video signal will contain the information relating to the red portion of the scene. By keeping the digitised information in 4-bit words, 16 tones of red will be accommodated. This single frame information will be loaded into the memory in 1/50 sec. The operation is then repeated with a green filter over the lens and then finally with a blue filter. If the filters are mounted on a colour filter wheel, the whole operation can be performed very quickly (Fig. 22).

The video information can be output from the main memory sequentially, exactly as for monochrome, only now the transmission time will be three times as long, i.e. 21·6 secs., since three complete frames have to be sent to form the whole picture.

It is important to realise that although the video information is different, the form in which it is stored (16K 4-bit words) and transmitted (tones between 1·5 and 2·3 kHz) is exactly the same as for monochrome so the circuits following the main memory are exactly the same.



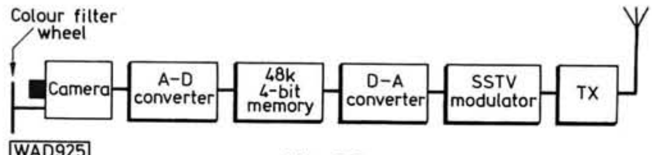


Fig. 22

At the receiving end the slow-fast scan converter also has a 48K 4-bit capacity memory and the incoming SSTV signals are stored in this and then made continually available to the fast-scan monitor, which obviously must be a colour TV set.

In the monochrome system, the output from the main memory was used to modulate a u.h.f. carrier which was then applied to the antenna socket of the TV. Since the standard u.h.f. colour transmissions use a complicated form of modulation to accommodate all the information in the same bandwidth as that used for monochrome TV, it will be found much simpler to output the red, green and blue signals from the memory directly to the respective electron guns on the picture tube. This does require some modification to the colour TV set but it does simplify matters greatly (and does not prevent the TV set being used for the reception of ordinary transmissions).

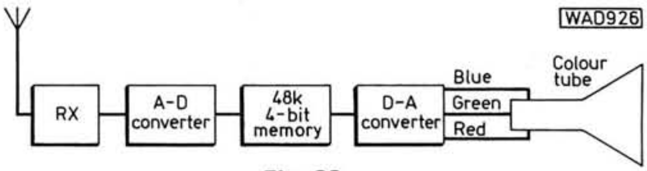


Fig. 23

A lot of interesting work is being carried out in this area at the present time and developments are rapid. One fascinating fact that has emerged from subjective tests is that it does not seem to be absolutely essential to transmit the video information for a blue signal. The same results can be obtained by just transmitting the red and green signals and putting in an overall blue background at the receiver by applying a d.c. bias to the blue electron gun. This not only reduces the size of main memory required to 32K 4-bits, but also reduces the transmission time to a 2 frame period, i.e. 14·4 secs.

This series was deliberately called "Introducing SSTV" because books could be, and have been, written on the subject—see the bibliography at the end of this article. The intention has been to provide background information so that when references to SSTV are heard over the air the reader will at least know something about the subject.

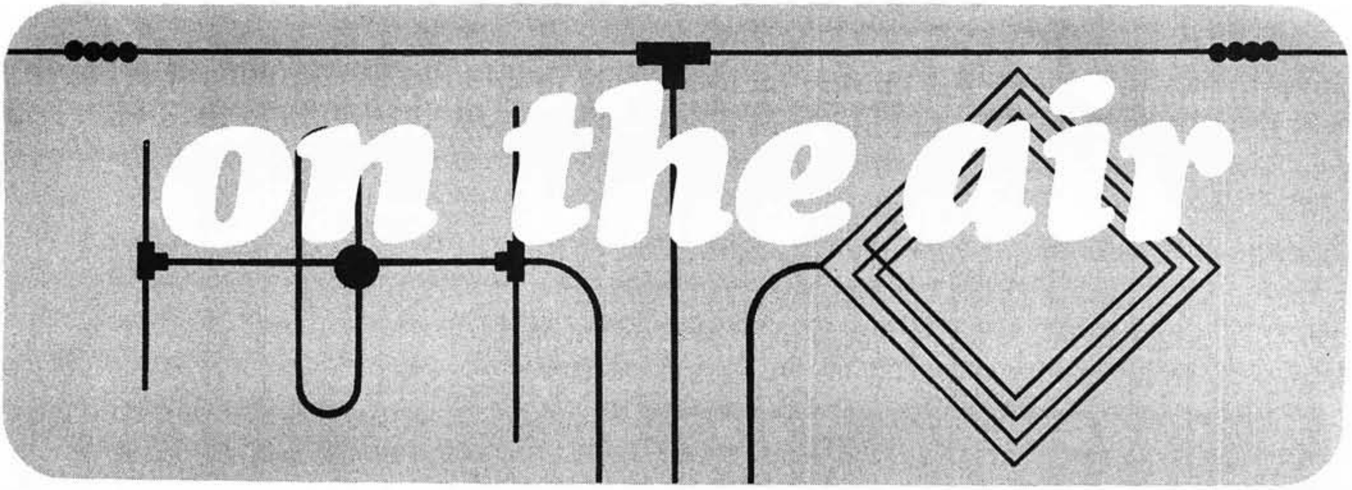
Those who wish to actively participate are strongly advised to contact the British Amateur Television Club (BATC) at 13 Church Street, Gainsborough, Lincolnshire, and also to read the books mentioned in the bibliography.

It should be made clear that any holder of a Broadcast Receiving Licence is entitled to set up a receiving station for SSTV, but that if it is also intended to transmit SSTV the operator should be a Licensed Radio Amateur.

Bibliography

Slow Scan Television Handbook (73 Magazine)—obtainable from Short Wave Magazine, Publications Department, 34 High Street, Welwyn, Herts. AL6 9EQ.
The Complete Handbook of Slow Scan TV—TAB Books—obtainable from RSGB Publications (Sales), 35 Doughty Street, London, WC1N 2AE.
Amateur-Television Handbook—A CQ-TV publication—obtainable from BATC, 13 Church Street, Gainsborough, Lincs.

To be continued



Amateur Bands

by Eric Dowdeswell G4AR

Reports to: Eric Dowdeswell G4AR
Silver Firs, Leatherhead Road,
Ashtead, Surrey KT21 2TW.
Logs by bands in alphabetical order.

Surprise! Surprise! Over 3800 candidates out of a total of some 5600 were successful in the May RAE, an unprecedented number. Hopefully there are a fair number of CBers in this total who have become bored with their radio telephones and now want to get some real satisfaction by moving into amateur radio. They will not be disappointed.

The Home Office has intimated that it will take a good three months to get the new licences issued, so it won't be long before it is still issuing tickets when the following RAE takes place!

Continuing the look at the superhet receiver we can summarise the position by saying, first, that the ability to reduce or eliminate interference from an adjacent channel is largely determined by the first filter in the i.f. stages, at a point where the signal level is still quite low and before the main amplification. It is quite wrong to think that the same result can be achieved by trying audio filters at the end of the receiver chain since overloading, and consequent distortion, could already have occurred in earlier stages.

Secondly, we have second-channel selectivity or the set's ability to cut out the image signal from a station that is operating on a frequency that is the oscillator frequency **plus** the intermediate frequency (assuming the wanted signal is at the oscillator frequency **minus** the intermediate frequency, which is the usual arrangement). Such an "image" appears as interference on a wanted signal or as an apparently normal signal. The frequent cry from readers that "so-and-so broadcast station is operating in an amateur band and what is the Home Office going to do about it" typifies this kind of interference which can only be blamed on the receiver. In general it is due to the lack of tuned circuits and selectivity before the mixer stage.

All these remarks apply equally to the modern triple-conversion receivers, usually incorporating frequency synthesisers and digital readouts. The final i.f. is frequently around 465kHz so the same requirements for good adjacent channel selectivity apply. The introduction of two more oscillators and two more mixer stages makes the risk of spurious signals generated inside the receiver a very real one.

One of the oscillators will probably be on 1MHz, crystal controlled, from which harmonics are generated and amplified as part of the mixing process. Extremely efficient screening of these circuits is imperative if these signals are not to be heard at 1MHz intervals throughout the tuning range of the receiver, appearing as a beat note on any signal operating on a whole number of megahertz. This particularly applies to amateur signals on the band edges 7, 14, 21, 28MHz etc.

Earlier sets using this method of triple conversion were notorious for the spurii every megahertz across the bands and soon lost favour.

All Around

Philip Charlesworth G8SNG is busy swotting at Cranwell and a bit annoyed that he can't get up any decent kind of antenna for his SRX-30 but a simple job for 2m was approved. So it's a bit of wire across the room and an a.t.u. Philip complains of BC stations invading 15 and 20m but I suggest it is the old image problem again!

Happy man is **Geoff Potts** (Ipswich) who started on a 24-session RAE course last October and made the May RAE. He has a lot to say about his tutors and I'd guess they were amateurs themselves. Another to make the grade was **Simon Rodda** BRS47534 (Penzance) aged just 15 so congrats to you both.

Appeal from OAP **Joe Teague** of 40 Spittal Hall Road, Berwick-on-Tweed who has just acquired a Trio JR310 but lacks the crystal for the 10m band and the 10AZ c.w. filter. Can anyone help?

DX-land

Anne Edmondson (now BRS47285) of Edinburgh has got the hang of her Realistic DX200 receiver, with an indoor wire, finding such as PY7WGI on 80m, EA8JO, EK8R (just Box 88 Moscow I'm afraid), HR3JJR, 7X4BL and 9G1AP/P all on 20m s.s.b. The last one said to QSL via I0LCJ. Study continues long into the night for the RAE but the least of her problems will be the code exam in due course as Anne was at a marine radio college for a while.

Basil Woodcock BRS44266 of Leeds also has a JR310, with a 20m dipole and 40 metre-long wire. He logged PJ8UQ, HH0N, VS6DD and VQ9PD on 21MHz and JW5NM, JX2BZ, XB1OX, KG6RN, XZ9A, S79WHN and YB2BJM on 14MHz. Newcomer **Stephen Pearson** was jolly glad to report his first VK, on 20m, with his BC348 and 20 metre-long wire plus ZB2BLRV celebrating the Royal Wedding with a couple of extra letters on his call. Stephen went on to find 9H1EU, KA1JE, 6W8IA, VP2MCK and VK7AZ.

John and **Steven Goodier** who, I thought, had left this column on becoming G4KUC and G4KUB respectively in Marple, Cheshire, write to tell of some of the DX worked and lost with their FT-101Z and rotary dipoles. Worked on 15m c.w. was VP8AGY (PO Box 224, Port Stanley, Falkland Is), 8Q7AV on s.s.b., also C31ML, while others on c.w. included KL7HT, VU2PAP, YB3MB, FR7BY. On 20m c.w. CE0ML was booked in but VR6TC was lost, a good one was 7P8BY in Lesotho but an HK0 on San Andres also escaped.

Down in sunny Cornwall, **Bill Rendell** (Truro) reports an autumn touch in the air already and regales me with a report on the daily confrontation of his dog and a couple of local foxes in the garden! Briefly Bill finds 10m poor, 15m excellent and 20m often congested with short skip rubbish, but 10m did open to S. America late evenings sometimes. He got CE0AE on Easter Is, C31WW, OJ0AM on 20m, then J6LOU, KC4AAC on Anvers Is where the temperature was 18°F with a 60 knot wind!, YB2BJM (QSL I8YCP), ZD8TC, and a new island for Bill in ZD9BU on Gough Is, all on 15m. On 10m only report is of GB2EL on the Eddystone lighthouse celebrating the automation of the lighting system! Reckon Bill could just about see that QTH!

Len Stockwell in Grays, Essex has already done part of the RAE and hopes to complete the job in December. His FRG-7 with a tri-bander G-whip antenna stuck to 15m mainly, finding A7XD, C31NL, VQ9AA, VS5DD, 5Z4KM and 9K2DR. Also using an FRG-7, plus a fan dipole for 10, 15 and 20m **Bob Gibson** of Wadhurst, E. Sussex, added the FRT-7700 a.t.u. to be pleasantly surprised at the improvement caused by the elimination of second-channel rubbish. TVI hash is also a problem with Bob so could only recommend he contact Dick Holman G2DYM (see ads.) who has the answer to this particular trouble. Nevertheless 15m produced 5Z4RL, 6W8IH, 9Q5VT, AH6CH/KH3 alleged to be on Johnston Is, EP2TY, HS1AMB, OE8AJK/YK on the Golan Heights, plus HH0N and 4S7EP on 20m, the former seeming to have stirred up a hornet's nest!

Cards from M1C and ZD8RH delighted **David Warr** of Weymouth who now has logged 372 countries on all bands. Not bad for a Trio 9R59DS receiver with a G5RV antenna aided by a ZL-special on 10m and a trapped dipole. On 80m it was C31NC (QSL

PA0OOM). with 20m coming up with EK8R. CO7AM. DU4YF. FY7AN. DF9OO/JW. and PZ8AR. Some excellent catches on 15m included FO0FB (QSL WB6GFJ). HH0N. JT0WA. ST0AS. TL8DC (QSL F6EWM). VP8QP. W4MAT/SV5. 8P6OR and 9X5OW.

First contribution from **Rhys Thomas** of Bridgend. Mid-Glamorgan. on his R-1000 receiver. 30 metre-long wire and a.t.u. plus audio filters. included C31LM and CE3GN on 80m. 8P6HX. HP1XBO. C5AAP on 20m ending with VP2MDG. CE4MT and HH2A on 15m. What happened to HH0N OM? Seems we have weaned Rhys from the BC bands for good! Accompanied by G3VRY **Jon Kempster** BRS45205 of Berkhamsted. Herts. went to the RSGB rally and thoroughly enjoyed himself. Back on the FRG-7 with multiple dipoles to a common feeder or a 20 metre-long wire Jon got FM7AV. XT2AW. F0CH/FC. CS0OF. 5Z4PR. VP8AHS on Adelaide Is. 9X5WP and ED5EIP who said QSL EA5BW but Jon didn't get the QTH. all on 14MHz. then on 21MHz VS5KF. 9M2DW. ZF6XC. HI8GG. KA1FCQ/6W8. VP2MCK. 9Y4VU and D4CBC.

Philip Morris (Swansea) has trouble with stability on his CR100 but helped with a G5RV antenna system he copped HC8KA on the Galapagos Is. JT0WA (QSL OK1DWA). VQ9QA. HS1AMH. XZ9A. ZD7SS and S83H. all on 20m. The 15m band produced 9X5OW. VS5DD and 8Q7BF (QSL JA1ITE). **Dave Coggins** has an FRG-7700 yet still needed to add an FRT-7700 a.t.u. and now "all cross-modulation has disappeared" he reports from Knutsford. Cheshire so it meant he was able to copy something on all bands. like EL2AV. XT2AW. ZD8TC and 9X5PP on 28MHz: VU2TF. FO0FB and a goody in WH8AAJ in US Samoa. all on 21MHz: AH6AY. CE0AE. FO8DH. FP8XX and old stand-by VR6TC on Pitcairn. on 14MHz. while active 7MHz brought forth CP6ID. HI8PGG. plus KA1HCF and HK3YH on c.w.. OE8AJK/YK. XT2AW. YB0TD. CW loggings on Top Band included EZ5WAB. OZ7YY. UK2RDX and UT5AB.

Several readers have "discovered" the W3DZZ or trapped dipole that gives coverage from 10 to 80m with just a pair of traps and low impedance feeder obviating the need for an a.t.u. I have used one for a while with my KW2000 using coaxial feeder but the s.w.r. was always a bit high especially on 20m. Dick Holman G2DYM. mentioned previously. suggested using 33 metres of flat twin 72 ohm feeder which produced an excellent s.w.r. on all bands and an increase of two "S" points generally. The odd feeder length seems to result in low standing waves at the station end on a majority of bands.

Back to the mail and **P. Johnson** (near Grimsby) who reports for the first time wondering whether his HF5 trapped vertical antenna needs ground plane wires. or radials. They are not essential for receiving but highly desirable on transmitting where a low s.w.r. is the target. Radials of say 20 metres length would probably increase signal strength on the low frequency bands but such a vertical usually infers that the listener hasn't much horizontal space! Given such radials the height of the HF5 above ground is not so important. Anyway the SRX-30 brought in KL7Y. OJ0AM. ZD7SE (QSL KA1DR). J22AP. VQ9EL. 7Q2AZ. 6W8AR. 5N9ACO and 9M2MY for the 20m band.

From Halstead. Essex. **Matthew Phillips** BRS47458 says he has just crossed the line from BC bands to the amateur frequencies with much joy. His rather ancient HRO MX is a bit poor on s.s.b. on the 10 and 15m bands but a voltage regulator like the VR150 ought to cure that trouble. Separating the r.f. and i.f. gain circuits can also help considerably with independent controls. I still have a soft spot for the old HRO and dream one day of finding one brand new in its crate! Anyway. DX came in from EA8YO. DU1RNA. FM7PX. J73PP. KG4J. OH0AM. VP2VJ. VP2AZG. 5N6ENU. 9M6MB on 21MHz: CT2DK. FG7BU. FR7CE. HR1JSH. J73PP. J88AQ. M1IPA. SV5FQ in the Dodecanese Is. VP2AZG. VP9HS and VR6TC on 14MHz. all s.s.b. of course.

Still more. if you're still with me! Unusual report from G3OUC. **Pat Painting** of Newbury. Berks. who tells me of his mobile operations using the 10m band and a 40W transceiver in his Ford Escort with DX like 4X6DS. A4XGC. C31NL. EC6BT. HG3KGU. I4TEC. UA9CFC. ZS1CS and ZS1ES. Not bad. eh? But amazingly enough the antenna is just a loaded whip only 460mm high! **Stephen Bowler** of Wakefield is also BRS46105 and possesses an R-1000 plus HF5 vertical to catch such as TI2LLL. VP8AGX. HH0N. HZ1TA/TA1 said to be Prince Aziz in Istanbul. and EK8R on 14MHz. Switching to 21MHz we find ZE7JV. XT2MG. 9M2BB. 5R8AL. PA2WLE/3A who wants cards to PA3ARM. plus VP8ZR with QSLs to G3KTJ.

Such activity! Thought you all went to sleep or on holiday this time of year!

Club Time

Bournemouth RS. First and third Fridays in the Conference Room at the Coach House Motel. Tricketts Cross. Ferndown. around 7.30. via the private entrance at the rear if you wish to avoid the bars! Sec Glenn Lloyd G8GTB. 49 Kingston Road. Poole. Dorset or Poole 83093 can help with details of latest fixtures.

Liverpool & District ARS. Perhaps not too late to tell you about the RAE class now in full swing and run by G4CVZ. Members only. naturally enough. so that's an incentive to join but R. Simmons G3PNS. 62 Daneville Road. L'pool L4 9RG is sec and will fill you in.

Univ. College of N. Wales ARS. Lunchtimes 1pm in Room 261 at the School of Eng. Science. Dean Street. Bangor with Oct 15 devoted to a discussion on policy on contests while the 23rd is dealing with DF trials in the Menai Straits. Licensed bods are particularly welcomed from among the students. threatened with full details and a pint from Simon Brown GW4ELI at the school.

Silverthorn RC. Every Friday 7.30 at Friday Hill House. Simmons Lane. Chingford. London E4 with hon sec C.J. Hoare G4AJA around to introduce new members to the gang. Or write to him at 41 Lynton Road. Chingford. London E4 9EA or risk 5p on 01-529 2282. The owner of the farm where the club has an annual camp managed to get one of the members to build him a pre-amp for a very old valved amplifier. according to club mag *Spurious*!

North Bristol ARC. Club reports it is now full up! Don't know why this item should go in but I'd like to think it's due to the past pubvicity in *PW*! Still. if you are really very keen I'm sure they'd stretch a point. W.E. Bidmead G4EUV. 4 Pine Grove. Northville. Bristol BS7 0SL is the contact.

SE Kent (YMCA) ARC. At the YMCA. Leybourne Road. Dover. every Wed 7.30 with the Oct 7 gathering concentrating on s.w.l. matters. Oct 14 will deal with WX forecasting. "My view of amateur radio" by G3LCK is on the 21st and a slide show is promised for the 28th. Plus. advance notice of a visit by RSGB GM David Evans G3OUF on Nov 25. Club now has very respectable total of 150 members with club president Ken Crouch G8KEN being recently elected as Regional Rep (Region 8) of the RSGB. Morse classes for beginners and advanced types are held on Mondays and Weds. Try A.R.F. Moore G3VSU. 168 Lewisham Road. River. Dover or Kearsney (03047) 2738.

Horsham ARC. Graham Garden G4LJR has copped the job of PRO to the club which meets the first Thursday of the month at the Guide Hall. Denne Road. Horsham. for an 8pm start. Items range from a junk sale in October to a talk on marine satellite communication in November. Contact Graham at 8 Belinus Drive. Billingshurst. Sussex or try (0403-81) 3657.

Ise Valley ARC. Hope I've got that right! Second Tuesdays 7.30 at the Working Men's Club. Finedon St.. Burton Latimer. Northants. where the sec is A.J. Fuller G8WTQ of 2 The Crescent. Burton Latimer. NN15 5NQ or B-L 5586.

Maidenhead & District ARC. CQ Electronics will be putting on a show on Oct 20 at 7.45 at the Red Cross Hall. The Crescent. M'head. where the club meets first and third Tuesdays. and be warned of a junk sale on Nov 5. Wouldn't be surprised if some of the junk finished up on the bonfire! Have a word or ring John Patrick G3TWG. Bedford Lodge. Camden Place. Bourne End. Bucks or (06285) 25275. Ah. yes. must mention old mate Pat Hawker G3VA who chats on direct conversion receivers on Nov 17: not to be missed.

Farnborough & District RS. Plenty of notice of a visit from *PW*'s v.h.f. columnist Ron Ham on Oct 28. Sorry. no more info on news sheet on meeting place. etc.. so ring Ivor G4BJQ on Farnborough 43036 or you can annoy the club's awards manager Mike Hearsey G8ATK at Halcyon. Lawday Link. Upper Hale. Farnham. Surrey being the only full QTH given!

Halifax & District ARS. The club. one of the oldest in the country. has now been reformed. sorry re-formed. after a break of some 12 years with Alan Sayles G4LEC. 70 Dean Lane. Sowerby Bridge. Halifax as secretary. The newly-elected committee decided that the Halifax Constitutional Club. Highfield House. Parkinson Lane. King Cross. H'fax should be the new QTH at 7.30 on the first Tuesday of the month and all interested in any aspect of amateur radio are cordially invited to get along there.

Sutton & Cheam RS. Meets at both the Sutton College of Liberal Arts. Cheam Road. Sutton. and at the Banstead Institute. High Road. Banstead. Surrey. so contact G. Brind G4CMU. 26 Grange Meadow. Banstead for details of what's going on and where. In the meantime I can say that the meeting on Friday Oct 9 is at the College at 7.30 and on the 30th at the Institute when it's junk sale time. Could mention that member Colin. G4CWH. happens to be the bod responsible for the design. construction and installation of the h.f. beacons on the forthcoming UOSAT (University of Surrey Satellite). In his spare time he has taken his finals for a degree in electronics at the University.

Edgware & District RS. Hon Sec Howard Drury G4HMD (39 Wemborough Road. Stanmore. Middx) is scheduled to chat on QRP operating on Oct 22 at the Watling Community Centre. 145 Orange Hill. Burnt Oak. Edgware. where meetings are held on the second and fourth Thursdays at 8pm. Or you can ring him on 01-952 6462. Plotting the polar pattern of the club's 2m 8-element beam seems to have frightened all concerned. bearing not a great deal of resemblance to the expected results!

Barking Radio & Electronics Soc. A nice choice of visiting times like Monday for the constructional types. Tuesday for the code. operating night on Wednesday. and Thursday for the socially minded. from 7 to 10pm. at the Westbury Rec Centre. Westbury School. Ripple Road. Barking. Essex. It's also a pleasure to report that the club magazine *Carrier* results from the efforts of joint editors Christine G8WEN and Helen. More from

Alan Summers G8JZN, 80 Lyndhurst Gardens, Barking.

Wakefield & District RS. It's operating night on Oct 6 for club station G3WRS with home-brew gear taking the stage on the 20th. Note that it's pie and peas at the Rose & Crown Inn at Methley on Nov 3. Yum, yum! So, it's "alternate Tuesdays" (ugh!) work it out from the 6th and 20th, in Room 2, Holmfield House, Denby Dale Road, Wakefield at 7.30 but I'm assured members can be found in the downstairs bar from opening time on! Contact is Rick G4BLT, 1 Wavell Garth, Sandal Magna, Wakefield or W'field 255515.

Cheltenham AR Assoc. Interesting article in club mag *CARA News* on u.h.f. signal combiners and splitters is noteworthy for excellent reproduction of the diagrams, frequently a failing in other newsletters. Meetings at The Old Bakery, Chester Walk, Clarence Street, Cheltenham with Oct 16 being designated natter night and special event on 30th is coach trip to the Donington Park do. Grant Cratchley G4ILI, 47 Golden Miller Road, Cheltenham is sec and awaiting your enquiries.

Wirral ARS. First and third Weds at 7.45, Sports Centre, Grange Road West, Birkenhead. Excellent newsletter tells of a special demo of amateur equipment from club station G3NWR on Oct 7 while new members will welcome the AGM on the 21st and a chance to meet everyone. Special note: Frank Smith G3YGL demonstrates his latest computer on Nov 18. More from PRO who is Gordon Lee G3UJX, 30 Manor Drive, Upton, which is also 677 1518.

South Dorset RS. Anyone interested in any aspect of amateur radio most welcome first and third Tuesdays, 7.30pm, at the Civilian Mess, Army Bridging Camp, Camp Road, Wyke Regis, Weymouth, Dorset. Hon sec is Richard Cridland G3ZGP, 13 Clarendon Avenue, Redlands, Weymouth or Upwey 2893.

Fareham & District ARC. Room 12, Portchester Community Centre, at 7.30pm on Wednesdays. Typically Oct 7 sees G4FJO dealing with MPUs and RTTY, with audio filters the subject of G8VOI on the 14th. Making bits for a 10GHz rig occupies G8HND on the 28th so you can see that there is plenty going on. Brian Davey G4ITG, 31 Somervell Drive, Fareham, Hants, can amplify on Fareham 234904 if you so wish.

Braintree ARS. Monthly communication *Barscom* is another fine effort and, unusually, includes details of other local clubs. So it's first and third Mondays, around 7.45pm, at the Braintree Community Centre, Victoria Street, B'tree, next to the bus station. First meeting is generally of an informal nature with a lecture at the second. Feature of October is the constructional contest offering a trophy and cash prizes, on the 21st. Janet Storey of 33 Redwood Close, Witham, Essex, will gladly give you any information you want on the club and its activities.

Southdown ARS. A pleasure to read their newsletter with all revelant info on meetings and committee bods on the very first page, all very handy for yours truly. Other editors please note! First Monday, 7.30pm, Chaseley Home for the Disabled, Southcliff, Eastbourne, E. Sussex, with secretary R. E. Holtham G4EKS in attendance to welcome new members, or you can find him at 2 Benbow Avenue, Eastbourne, or E'bourne 32777. Had a good laugh at feature in newsletter entitled Uzu in Ammeland with entries like "Jaits" – mysterious primitive tribe from the dark zone, serfs of the Klarsays! And "Ripita" – god of all Jaits!

Southgate RC. Last one over the fence this month with news of great changes in club QTH and meeting times. Now it's the second Thursday of the month at 7.30pm at St Thomas Church Hall, Prince George Avenue, Oakwood, London N14. October's meeting, that's on the 8th, concentrates on RTTY matters with the Nov gathering deciding on who has won the G6QM constructional trophy this year. Publicity Officer is Stuart Lindell G4IEH, 73 Old Park Ridings, London N21 2ER but potential newcomers to club membership should try V. Austin G4MCD, on 01-360 5832 in the first instance.

Don't forget, all info by the 15th of the month. How about an early New Year's Resolution? Every club member to enrol a local CBer into the club!

Medium Wave Broadcast Band DX

by Charles Molloy G8BUS

Reports to: Charles Molloy G8BUS
132 Segars Lane, Southport PR8 3JG.

DXers who have not tried the medium waves before may be surprised to learn that it is possible to listen to domestic broadcasting in Canada and the United States. The maritime provinces of Canada are no farther away from us than the Eastern Mediterranean, and it is only because of the large number of high-power European broadcasters, which mask the weaker North Americans, that they are not more conspicuous on the band. Fortunately, by 2300 there is some reduction in European QRM, though this will not help till we go on to winter time on October 25. This lull continues until about 0300, when broadcasting in Eastern Europe starts up for the day. This is the period in which to look for North American DX, best results being obtained after midnight.

North American DX

Radio waves from North America do not travel along the earth's surface on their journey to Europe but go up into the ionosphere, from where they are bent back to earth at a point some 2000km away, where they bounce back into the ionosphere again. At least two such "hops" are required before the signal reaches the UK and consequently reception is rather variable. Slow fading is a characteristic of DX on this path, caused by signals coming from slightly different angles falling in and out of step with each other at the receiver. Nothing at all may be heard for a number of successive nights and then suddenly the path is open. Perseverance is the quality required of the medium wave DXer.

Where to find the DX

Locate Brussels on 927kHz and wait until that station signs off and the carrier is switched off, which should have happened by 2300. Now tune up in frequency slightly to 930kHz and listen for a minute or two in case there is fading. If conditions are favourable you should hear CJYQ located at St John's in Newfoundland. CJYQ is the station callsign which is used frequently, either complete or in an abbreviated form such as "Q Radio". Local time in Newfoundland is $3\frac{1}{2}$ hours behind GMT (UTC), which is a further aid to identification.

If you manage to hear CJYQ then tune up the band past the European channels 936kHz and 945kHz to 950kHz, where you may hear CHER in Sydney, Nova Scotia. Local time for this station is 4 hours back. Now try for CBM in Montreal, which is on 940kHz. It is weaker than the other two but has been coming in well recently. The time zone in Montreal is GMT –5 hours. If you have been successful up to now, have a look for WBZ in Boston on 1030kHz, WNEW in New York on 1130kHz and CIGO in Port Hawkesbury, Nova Scotia on 1410kHz.

You will have noticed that the frequencies of these stations are multiples of 10kHz, i.e. the last digit is a zero and the channel spacing is 10kHz. This is a great help to the DXer, since the channel spacing in Europe is 9kHz, and consequently there are places in the band where North American channels lie in between two European channels, e.g. CBM on 940 is between European channels 936kHz and 945kHz, which leaves it relatively clear of QRM.

Station Identification

It is easy to identify North Americans since the majority of those likely to be heard in the UK broadcast in English, and all of them are allocated callsigns, like radio amateurs, which they are obliged to use as they identify. Callsigns in Canada start with the letter C, those with three letters belonging to the Canadian Broadcasting Corporation, and those with four letters to commercial stations. In the United States the prefix is W for stations to the east of the Mississippi (with a few exceptions), while K is used to the west. All broadcasting in the United States is commercial.

QSL card from St John's

St Pierre and Miquelon

There is one oddity, for want of a better word, in this area. This is the 20kW broadcaster on the "odd" channel of 1375kHz, which is located in the French possession of St Pierre et Miquelon. These islands lie a few miles south of Newfoundland and are used as a headquarters by the French fishing fleet off the Grand Banks. Listen on European channel 1377kHz to Lille which carries the France-Cultur programme. If there is a 2kHz heterodyne then it will be caused by Radio St Pierre on 1375kHz. This is a good pointer to conditions on the North American path. Now wait until Lille goes off for the night, which usually happens at 2300, and you should then hear Radio St Pierre. Programming is in French and the station does QSL to a report in English which should go to B.P. 1227, 97500 St Pierre et Miquelon. Radio St Pierre is the only broadcaster in this French colony in North America. St Pierre et Miquelon is considered to be a separate DX country and the only way you will log it is on the medium waves or on f.m.

Vintage Receivers

Old timer **George Rose** (Waltham Cross) first started DXing in 1934 using a Lissen 4-valve receiver in a "cathedral" type cabinet. This receiver had a screened grid r.f. stage, a leaky grid detector, and l.f. and power output stages. With this rig he managed to pull in WCAU in Philadelphia, WBT in Charlotte, North Carolina, and the 1kW WIOD in Miami. All three are still on the air. WCAU is on 1210kHz and WBT is on 1110kHz and both are logged regularly by DXers in the UK. WIOD is on 610kHz, but I doubt if anyone hears it these days on account of QRM.

George now uses a much-modified CR100 ex-WD receiver. He changed all the paper decoupling capacitors, which is a good thing to do if you can lay your hands on suitable replacements. Old paper capacitors are prone to leakage and not only do they cause an unnecessary drain on the h.t., they also fail to decouple properly, which can lead to instability and poor performance generally. It is easy to test for leakage. Unsolder the "hot" end of the capacitor and connect it to the negative lead of a voltmeter. Tap the positive lead from the voltmeter onto the h.t. line making sure the range is suitable for the h.t. voltage. The needle should give a kick and return to zero. If there is no kick, or if the meter gives a steady reading, then the capacitor is faulty.

Readers' Letters

Information about possible reception of BBC Radio on the long waves (200kHz) in south Portugal is requested by **R. V. Moore** of Appleton in Cheshire. One rather obvious snag is the 600kW Moroccan station on 209kHz, which might well swamp the BBC on 200kHz. Information about the reception of the BBC abroad is obtainable from the BBC Engineering Information Department, whose address is Broadcasting House, London W1A 1AA. They publish a booklet called *Receiving English Language Programmes in Europe*, for which there is no charge.

Sweden Calling DXers

An Amstrad m.w./l.w./f.m. stereo tuner is in use by **Ted Jones** (Woking), who wonders what sort of antenna could be used with it for m.w. DXing. A stereo tuner, in order to provide good quality audio, must have a wide bandwidth. This inevitably means it will have poor selectivity and consequently such a receiver is not really suitable for picking out DX on the crowded medium wave band.

Broadcasts Heard

Reader **Ian Galpin** of Poole reports hearing an English language broadcast from Radio Algiers from 2000 to 2030 on a frequency of 254kHz on the long waves. His receiver is a Grundig RR400 which was used with its telescopic antenna. Ian also picked up *Sweden Calling DXers* on 1179kHz on the medium waves (254m) at 1850. He says that this English language DX programme is devoted almost entirely to information on station schedules, and copies of the script for the programme are obtainable from Radio Sweden, S-105 10 Stockholm, Sweden. SWCDX is on the air every Tuesday and can be heard at 2315 as well as at 1845.

Your Comments Please

This month *On The Air* is printed in a smaller type face than usual. That way we can fit more into *PW*, but, of course, it's not so easy to read.

Please let us know whether you think that we should make the change permanent.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

Reports: as for medium wave DX, but please keep separate.

An article in a DX bulletin caught my eye recently. The author felt that short wave DXing is a lot less fun than it used to be. He quoted the ease with which the listener can locate a station using digital readout, the reluctance of major broadcasters to QSL, the demise of certain DX programmes, the use of relay stations and so on, as reasons to back up this view. There is something in it when you think of the international broadcast bands, though the change has produced, as a compensation, the new pastime of short wave programme listening. With a modern receiver and telescopic antenna you can easily listen to entertainment from around the globe. There is still DX to be found on these bands if you look for it, but anyone with a nostalgia for the less sophisticated days of broadcasting should turn to the Tropical Bands. Here the situation is entirely different. There is little international broadcasting, few high power stations, no relay stations, reception reports are still appropriate, and station identification is still a problem at times, even with digital readout. In short, if you are looking for a challenge then try the tropical bands.

Tropical Band DXing

Domestic broadcasters in many parts of the world use the medium waves but in tropical regions the high level of noise created by thunderstorms led to the use of frequencies between 2MHz and 6MHz instead. An added advantage of using these frequencies is the larger area covered by quite low power, which is useful in sparsely populated regions.

There are three bands where broadcasting is exclusive to the tropics plus China, Albania, USSR and RSA. The principal one for DXing is 60 metres which extends from 4·75MHz to 5·06MHz. There is also 90 metres (3·2MHz to 3·4MHz) where DXing is more difficult and 120 metres (2·3MHz to 2·5MHz) which is probably the most difficult band there is. Many DXers have never heard a single station on 120m. There is also 75 metres, which is a shared band, the portion 3·9MHz to 3·95MHz being used by Indonesia, China and India for domestic broadcasting.

Propagation

There are similarities and differences between the medium waves and the tropical bands. The difference is interesting. On the medium waves the service area is covered by low angle radiation and the ground wave, while DXing is principally by the E layer in the ionosphere. In the tropical bands the service area is usually covered by high-angle radiation and refraction from the E or F layer while DXing is by the F layer. The reasons for the different angles of radiation are complicated and are to do with reduction of fading in the service areas, but so far as DXing is concerned, you need a path of darkness between transmitter and receiver on both the medium waves and the tropical bands before you will hear anything. No use listening on the tropical bands in the middle of the day for you won't hear anything, unless of course you live in the tropics!

What can be Heard?

At this time of the year listen for the Pacific and Australia at 2000. Indonesia until the 1630 sign-off. India at 1800. East Africa during the late afternoon. Central Africa late afternoon/evening. West Africa in the evening. South Africa during the evening and night. Latin America from 2200 throughout the night. Listen for Fujian in China on 2·34MHz; Korseong, India on 3·355; Zimbabwe 3·396; Radio Nepal 3·425; Indonesia 3·905; India 3·925; ELWA in Liberia 4·765; R. Bolivar, Venezuela 4·77; Jakarta, Indonesia 4·774; Radio Lesotho 4·8MHz; Kenya 4·804; Bukavu Zaire 4·839; Radio Colosal, Colombia 4·945; R. Santa Fe, Colombia 4·965; Ecos del Torbes, Venezuela 4·98; Bangui in the Central African Republic 5·035; Tanzania 5·05; Singapore 5·052MHz.

A complete listing of stations heard on these bands is published annually by the

La Voz Evangelica (4·82MHz) from Paul McKee

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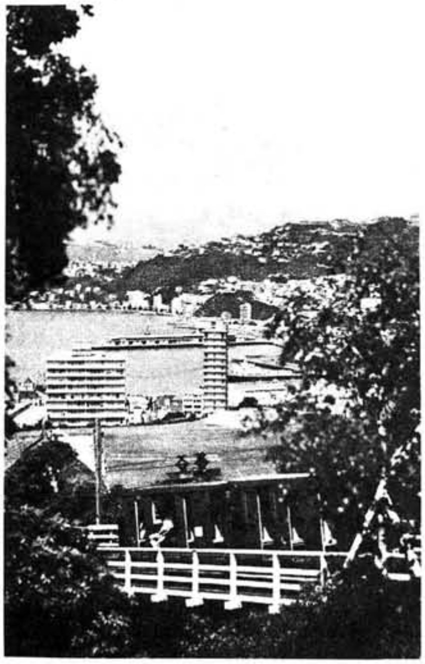
Danish SW Clubs International who will supply copies of this 28-page English language booklet to non-members. Send 8 IRCs to the DSWCI, Fiskernes Vej 6, DK-2670, Greve Strand, Denmark and ask for the 9th edition of the *Tropical Bands Survey*.

QSL Cards

My comments in the September issue about QSL cards brought some useful information from **Michael Thornton** of Romford. In just over two years he has received QSL cards from broadcasting stations in over 50 different countries. After a slow start he decided to augment the reception report with details of his QTH and listening and he sent a picture postcard of a London scene in his letter. The results were interesting, for as well as QSLs he received letters, pamphlets, magazines, badges, car stickers, flags, pennants, and language lessons from a number of countries including Bolivia, India, Brasil and Korea.



Radio New Zealand 15·485MHz (Rhys Thomas)

Michael mentions the Radio Netherlands courses for DXers which are available for the asking and he recommends their Spanish vocabulary which is helpful when reporting to Latin America. He reckons that many Latin Americans throw away reception reports in English and that International Reply Coupons (IRCs) are unknown in this part of the world, hence the success with the more personal approach. From Michael's log comes a selection of stations that have QSLed recently including: Radio Zimbabwe which was heard on 3·396MHz (90m) at 1730; Radio Singapore on 5·052MHz (60m) at 2230; Santo Domingo on 11·7MHz (25m) at 2330; Haiti 11·835 at 2230; Brasil 15·28MHz (19m) at 2000 and Colombia in Spanish on 15·355MHz at 0300.

An alternative to IRCs are unused postage stamps of the country concerned. These are obtainable from stamp dealers and even if you are unsure how many to send, the gesture will be appreciated.

Readers' Letters

Has anyone any suggestions for improving the performance of the National Panasonic DR2800 receiver? Reader **C. R. D. Croney,** Hastings Lodge, St Matthias Road, Hastings CH.CH, Barbados, W.I. would like to hear from any reader with suggestions as he is dissatisfied with his model. Radio West, 2015 South Escondido Boulevard, Escondido, CA 92025, USA supply a kit to upgrade the selectivity of this receiver which involves changing the i.f. filters. Reader **D. Goodman** (North Walsham) is very pleased with his receiver which is a Vega Spidola 250. He thinks it is very good value for money and he runs it from the mains supply instead of batteries. He picked up Japan using the telescopic antenna (band not mentioned).

Broadcasts Heard

A nice log of tropical band DX comes from **Paul McKee** (Belfast) who heard Radio Lara in Venezuela on 4·8MHz at 0355; HRVC La Voz Evangelica in Honduras on 4·82MHz at 0430; Radio Reloj in Costa Rica 4·832 at 0437; Radio Sutatenza, Colombia 5·095/0237; Radio Rural in Brasil 4·765/0330; R. Zaracuay in Ecuador 3·39/0211; Ecos del Torbes 4·98/0248; SABC, South Africa 4·835/2100. Details of antenna and receiver unfortunately not given.

A Realistic DX200 and 3-metre-long indoor antenna pulled in Radio RSA on 26·25MHz in the 11m band, ELWA Liberia 12·35 (25m) at 0723, and Baghdad 9·85MHz in the 31m band at 2239, for **Adrian Mann** of Kinloss. Yes, Radio Luxemburg does transmit on the 49m band. It is on 6·09MHz.

In reply to **G. F. Roberts** (London), the station you were listening to is not a broadcasting station. Sorry I cannot identify it for you as it is illegal in the UK to listen to such stations.

From Merseyside comes a report from **Neil Cummings** who used his Realistic DX100 and 10-metre-long wire to pull in Radio Australia

The Voice of Nigeria 4·99MHz (Rhys Thomas)

on 9·77MHz at 1715, Radio Japan 15·305/2200, and the Voice of Nigeria 11·6/1730. **T. E. Flint** (Skelmersdale) uses his SX-200 with a f.m. tape antenna and he picked up the Voice of America (Greenville, USA) on 26·04MHz on the 11m band at 1500. Finally, **Rhys Thomas** (Bridgend) thanks all those who answered his request for information about audio notch filters (August issue). He sends two QSL cards received recently from Radio New Zealand on 15·485MHz heard at 0730 and the Voice of Nigeria 4·99MHz heard at 0440. The receiver is a R-1000 used with an 8-metre-long random wire antenna.

VHF Bands

by Ron Ham BRS15744

Reports to: Ron Ham BRS15744
Faraday, Greyfriars, Storrington,
Sussex RH20 4HE.

When the active sun causes aurora and a spell of fine weather opens the v.h.f. bands, it means there is DX about. Add this to the sporadic-E season and that means work and no play for my readers, who usually get the most out of such circumstances.

Solar

One of our optical observers, **Ted Waring** (Fig. 2) of Bristol, counted 50 sunspots on July 22, 112 on the 26th, 75 on the 29th, 52 on August 1, 42 on the 11th and 45 on the 13th, so I was not surprised when I received auroral reports for July 25. Both **Cmdr Henry Hatfield,** Sevenoaks and I recorded individual bursts of solar radio noise, at 136 and 143MHz respectively, on July 24, 27, 28, 29 and August 1, 7, 8 and 16, and noise storms on July 22, 23, 25, 26 and August 7, 8, 9, 10, 16, 18, 19 and 20.

Aurora

"On July 25, I found the whole of Band I and part of 88–108MHz was crowded with crazy signals", writes **Henrik Nykvist** from Sweden. This is typical aurora Henrik, and although **Lee Roberts,** Walsall, has yet to install an external 2m beam he did hear a local amateur working DLs, ONs and PEs and another working YU via aurora. During the afternoon, Ted Waring heard the Crowborough beacon GB3SX, and GW4BLE calling CQ, on 10m via the aurora and **George Grzebieniak** who also listened on 10m heard GM5FM and GM8MBP.

The 10m Band

During the 31 days from July 21 to August 20, I received signals from the International Beacon Project stations in Bahrain A9XC on 10 days, Cyprus 5B4CY on 14 days, Germany DL0IGI on 13 days, Hungary HG2BHA on 11 days, Norway LA5TEN on 4 days and Adelaide VK5WI around 0900 on August 19 and 20. Although Ted Waring's beacon log is similar to mine, he also heard signals from the German beacon DK0TE on 11 days and the South African beacons ZS6DN and ZS6PW on 12 and 8 days respectively. Beacon reports are always welcome to support the observations of Ted and myself. Although the band has been generally poor throughout this period, I did hear signals from VK between 0800 and 0900 on July 28 and August 4, 6, 9, 15, 17 and 18.

RTTY

Between July 21 and August 20 I copied 60 RTTY signals on the 20m band, spread over 15 countries: DJ, EA, F, HB9, I, K, OE, OH, OK, ON, OZ, SM, VK, W and Y3. Among the highlights were a two-way QSO between EA8AAY and OZ1CRL at 1007 on August 16, and my first Australian signal, VK2SG working ON at 0810 on August 13. Time permitting I could copy many more QSOs with

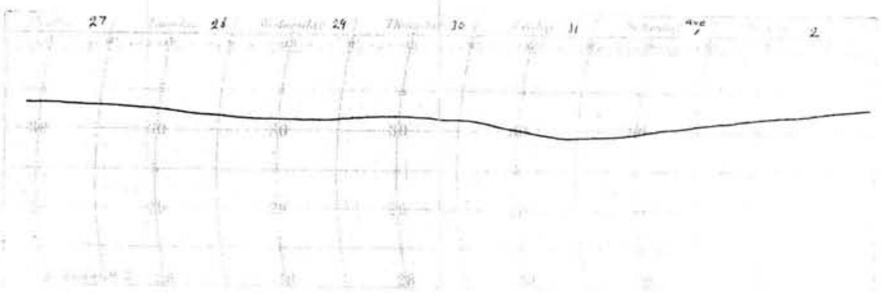


Fig. 1: Atmospheric pressure July 29–31 recorded by the author

my MM2000 converter, for instance there was an RTTY contest on August 15 and in a matter of a few minutes I copied signals from five stations in three countries.

Sporadic-E

During the sporadic-E disturbances on July 21, 24, 29 and August 6, 8, 9, 12, 13, 15, 16 and 18, I received strong signals from 29, 13, 16, 14, 3, 21, 10, 6, 13, 8 and 20, East European f.m. broadcast stations respectively between 66 and 73MHz. Similar results were achieved on several days by **Harold Brodribb,** St Leonards-on-Sea, with his RL85 communications receiver.

Tropospheric

After a spell of fine weather the atmospheric pressure began a gradual fall from 30·35in (1027mb) at noon on July 27 to 30·2in (1022mb) at noon on the 30th. It then fell rapidly to 29·9in (1012mb) on the 31st, and true to form, a tropospheric opening accompanied the fall (Fig. 1).

I first noticed a lift at midday on July 27 when signals from the Bristol Channel repeater GB3BC (R6) opened the squelch on my FDK TM56B receiver. By 0900 on the 28th, mobiles working through both the Birmingham GB3BM (R5) and Bristol Channel repeaters were pounding in and did so in varying degrees throughout the 29th. Early on the 30th, I heard G8WEG in Sutton Coldfield work **Les Sawford** G6APD in Portsmouth via the North Kent repeater GB3KN (R4), and by midnight the repeater network was in chaos. At 2305 a Bristol station called a PE via GB3KN and G6APD/M worked ON1AIT. Around 0845 on the 31st another PE worked via KN to a station in Derby who said that KN was swamping his local repeater GB3HH, Buxton, also on R4.

Later, I heard that someone had worked 2m stations in Czechoslovakia, Germany and Yugoslavia on the key as did **Alan Baker** G4GNX, Newhaven, who made contact with ON7QK, DL9DAK and DK6XY. Around 0100, Alan heard OK1MBS calling on s.s.b. but could not penetrate the pile-up to work him. However at 0150 Alan made a 59+ s.s.b. contact with OK1KHY/P, and at 0240 had a c.w./s.s.b. cross-mode QSO with DK7RC, almost on the Czechoslovakian border. During the 29th and 31st, Lee Roberts heard stations from many parts of the UK working through GB3BM, ONs working through GB3CF and a very strong German in QSO with a station in Lichfield. **Arthur Dorsett** G8YLH, Dogmersfield, Hants, stayed up overnight and was rewarded by making contact with 10 OKs, an OZ and 39 Germans, adding 30 new QRA squares to his score.

Between July 27 and August 3 **George Grzebieniak** heard 2m signals from the Channel Islands, Denmark, Germany, Holland and the Isle of Man, and on the 30th **John Cooper** G8NGO, Cowfold, worked a French station on the Italian border, 26 West Germans including two in Berlin, five OKs, 10 East Germans and also heard two from Poland.

Your Comments Please

This month *On the Air* is printed in a smaller type face than usual. That way we can fit more into *PW*, but, of course, it's not so easy to read.

Please let us know whether you think that we should make the change permanent.

Band II

As expected, Band II did not escape the disturbance and around 0915 on July 25 and 1930 on the 26th **John Williams,** Cheltenham, heard Spanish stations between 97 and 98MHz as well as a marked increase in the general strength of the BBC stations. Over in Cork, **John Desmond** noted the atmospheric pressure was 30·4in (1029mb) and decided to go DXing. For the first time he logged five BBC Radio 2 stations, two Radio 3 and three Radio 4, from transmitters at least 150 miles away. At 1030 on July 31, John Williams again heard strong broadcast signals from Spain between 91 and 92MHz, and during the evenings of July 27, 29 and August 3 **Simon Hamer,** Presteigne, heard strong signals from broadcast stations in Belgium, France, Germany, and from BBC Local Radios London, Solent, and ILR Capital, LBC and Thames Valley.

Harold Brodribb noted adjacent channel interference between 87 and 100MHz on the 31st and counted 12 French stations at 1320 on August 5, and 17 French and 5 editions of BBC Radios 2, 3, and 4 on the 11th, all with a loft dipole. George Grzebieniak, using a Trio KT5500 f.m. tuner and an indoor dipole, received broadcast signals from Brest, Caen and Lille, and **Nicholas Brown,** Rugby, with his Sony STR-232L and an indoor dipole, received strong signals from Belgium and West Germany on July 31.

Station Testing

My thanks to **D. C. Heale** RS46909 (Bolton), Simon Hamer, **Robert Stafford** (Jersey) and **Nicholas Wythe,** Folkestone, who between them told me in great detail that the BRT test transmission on 101MHz, to which I referred in my September column, started some months previously on a lower frequency but as there were some complaints from other broadcasters they are now trying 101MHz for a v.h.f. service, in English, to the UK.

News Items

On Sunday July 26, **Gerry and Margaret Brownlow** were operating G3WMU/P from the Chalk Pits Museum, Amberley, Sussex, on the h.f. bands, and although conditions were generally poor and they only worked a few Scandinavians, they did make contact with the Belgian delegate to the recent Brighton IARU conference who was using the call-sign F0CK/A while on holiday in the Oleron Isles. **Les Sawford** G6APD/P set up a station near the Brownlows and entertained museum visitors, especially a Scout troop, by making several local contacts on v.h.f. with his Icom 255E and 7/8 gutter-mount antenna from his car.

Fig. 2: Ted Waring with his home-brew reflective telescope

Among the museum visitors was **Violet Bryan** G4ESR from Alton, accompanied by her two guide dogs, Cindy and Sheba and her son Chris, G4EHG. At home Violet uses a Trio 120S and a trap dipole for the h.f. bands, and a Trio 7500 and a Hustler colinear antenna for 2m, and although she loves working on the 10m band Violet is often heard on the Hampshire repeater GB3SN (R5), especially during the winter months when she assists Harry Childs G3IOW, by transmitting some of the severe road condition warnings which he prepares. Violet, the XYL of the late Arnold Bryan G2CAJ, lived with amateur radio for 25 years, sometimes winding coils for Arnold, listening on a CR100 communications receiver and entertaining amateurs who visited them from overseas. In the early 1970s, she passed an oral RAE to become G8HRD, and her first QSO on 2m was with Frances Wooley G3LWY, of RAIBC. For some time Violet was President of the UK (Southern) FM Group and as an ex-WREN she is now a member of the RNARS and has operated from the station on HMS *Belfast* (GB3RN or G4HMS). Violet is also a member of the Belfast Group, RAIBC and a DX member of the YLRL of the USA. A number of amateurs have made her life easier by installing a large magnifying glass in front of her digital readout, a device to give her a pip tone every 250kHz and a Braille dial for her 120S. "This is the true spirit of amateur radio," Violet said, "something I really believe in".

I am always pleased to meet readers at the museum on Sundays. On August 2, **Tony Reynolds** from Gillingham told me that he now has a Yaesu FRG-7000 receiver and a long wire antenna, and after many years he still enjoys listening on all bands to both amateur and commercial stations.

On the 9th, **John Chinn** G8HSH, Middleton-on-Sea, Sussex, was looking at the

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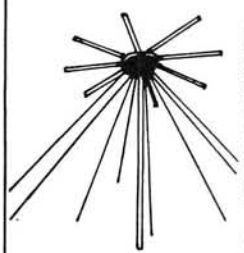

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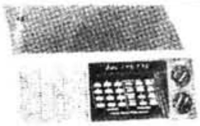

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components on display and said how much he enjoyed building his 70cm equipment from a Wood and Douglas kit. John also has a TS-700G, a 40W Modular Electronics linear amplifier, a colinear array for 2m, an 8 over 8 Yagi and a colinear for 70cm, and is normally heard operating through the Brighton and Hampshire repeaters.

Congratulations to 73-year-old **Len Bridges** who passed the RAE in May, having attended the first RAE course at the local Meirionedd College under the tutorship of **Maurice Fowler** GW3GKZ. Len is a member of the Meirion ARS and has been playing about with "wireless" since the end of WW1.

Congratulations also to 12-year-old **Lee Roberts** from Walsall, who also passed the May RAE with two credits. Lee's 13th birthday present was a Yaesu FT-480R and he is looking forward to next July when he can start transmitting. At present he is studying Morse and hopes to get his G4 licence ready for his 14th birthday.

The UK Horizontal FM Group are holding a contest on October 18 for licensed amateurs and s.w.l.s. In addition to the normal scores, a bonus of 20 points will be awarded for contacting or hearing any of: G8UAV, YLH, WJF, PVH, KBQ, PMT, WQN, WZX, F6FLB and PD0KER. An s.a.e. to Arthur Dorsett, Dogmersfield Park, Dogmersfield, Hants, will secure full details.

A new v.h.f. enthusiast is 15-year-old **Jon Kempster** from Berkhamsted, Herts, who uses a Datong DC144/28 2m converter in front of his Yaesu FRG-7 receiver. So far Jon is using vertical and horizontal dipoles but intends to construct a "ZL Special".

Congratulations to George Grzebieniak, London, who also passed the May RAE with a credit and is now polishing up his Morse ready for a G4 licence.

Members of the South West Herts UHF Group are building a beacon for 3cm and a beacon/repeater for 23cm and are willing to attend club meetings and give talks about these projects. The group is affiliated to the RSGB and are the Repeater Working Group representatives for South East England. Inquiries to Trevor Groves G4KUJ, 62 The Crescent, Abbots Langley, Watford, Herts. WD5 0DS.

TV

by Ron Ham BRS15744

Reports: as for VHF Bands, but please keep separate.

One notable difference between a sporadic-E and a tropospheric disturbance is the number of signals which appear on similar TV frequencies at the same time. It's not uncommon, during an extensive sporadic-E, to see strong pictures from several different countries rapidly changing places on the screen. Often, the only positive identification within this mixture is a brief glimpse of a familiar caption, test card or word.

Sporadic-E

Around 0830 on July 21, I watched the end of a children's film and the "Tele Polska" caption on Channel R1 49·75MHz, followed by part of a programme about police dogs, and by 0925, test cards from MTV-1 Budapest and TVP NTD Poland were very strong. Later at 1802, I saw the captions "TV Reklam" "Tele Journal" and "Hung EXPO", and **George Grzebieniak** RS 41733, London, received pictures from Hungary on Ch. R1 and Yugoslavia on Ch. R2, with just an indoor dipole. Another mixture of pictures appeared on Ch. R1 at midday on the 24th, and at 1345 a picture of a yacht preceded the "PRAHA" caption for Czechoslovakia. At midday on the 27th, I watched a cartoon film on Ch. R1 with "MOCKBA" at the end and at 1336 a test card from Poland.

Another sporadic-E disturbance began during the afternoon of the 29th, and at 1650 I received a strong colour test card from TV1 Sverige and at 1708 a clock appeared showing 1808 with "Hemliga Armien" scribed underneath. Still in that direction, I received very strong test cards, often in colour, from Norge Steigen at 1315 on the 31st and Norge Melhus at 0848 on August 16.

At 2100 on July 26, **John Desmond,** Cork, Ireland, watched a bullfight from RTVE Spain on his monochrome receiver with a dipole, cut for 50MHz, 2·5 metres above the ground at his QTH only 9 metres a.s.l. John also received pictures from Denmark and Sweden around 1000 on the 31st. "The summer of 1981 is my second E-skip season and I must say that it has been very exciting" writes **Henrik Nykvist,** Kungsbacka, Sweden, who uses a DUX 1016 receiver and a Philips LDL 1000 video recorder, fed by two stacked 50MHz Yagis. In addition to being a TV and v.h.f. DXer, Henrik writes the v.h.f. column in the Swedish DX-Magazine *Fading*, and says he would be pleased to have reports about activity outside of Sweden (Gardskullavagen 1a, S-434 00, Kungsbacka). During the sporadic-E disturbances on July 24, Henrik received test cards from "Grunten" and "Saarländischer Rundfunk" on Ch. E2 48·25MHz.

Between July 18 and August 6, **David Appleyard,** Uppsala, Sweden, received test cards from Budapest, Grunten, Italy, Saarl Rundfunk, Switzerland, USSR and Yugoslavia in Band I, and at 1043 on August 6 the very strong signal from Budapest was frequently overpowering Sweden's TV1 on Ch. E2. During his observations, David saw an historic play, a magazine programme with the presenter seated next to a huge flowering pot plant, a pop group with a saxophonist, "Dnevnik" news, the German news programme "Heute", a cartoon film about a snail and the "TV-REKLAM" advertising caption. On August 9, **Fraser Lees,** near Ringmer, Sussex, using a home-brew Band I/III and JVC 3040 UKC receivers fed by a 4-element Fuba beam for Band I and an 8-element Fuba Yagi for Band III, received pictures from Poland and the USSR and a mixture of pictures between ORF-FS1 Austria and RTVE Spain.

I see from the Band I log of **Mike Evans** that he received pictures from Austria, Portugal, Italy (Fig. 1) and Spain on August 8 and 9 with a Plustron TVR5D receiver at his QTH in London.

Mike is one of the founder members of the DX/TV-RX Group, 185 Fleet St, London EC4A 2HS, and says that since their name appeared in *PW* they have received letters from enthusiasts in Barbados and South Africa. During the period August 9 to 12, **T. Ampi,** another group member in London, received test cards and pictures, in Band I, from stations in Austria, Italy, Poland, Hungary, Spain, Norge Melhus, Switzerland (often in colour), USSR and Yugoslavia. At 1915 on July 26, **Brian Renforth** watched *The New Avengers* on RTVE and snips from *The Benny Hill Show, Laurel and Hardy* and *Soap,* and on August 5 he saw a programme about pottery from CST Czechoslovakia. At 2100 on the 6th Brian received strong pictures from Sweden and watched *Tinker Tailor Soldier Spy* with sub-titles, test cards from Czechoslovakia and Hungary on the 7th and perfect pictures from Poland of Anglia TV's Survival programme about whales.

Harold Brodribb watched a Mickey Mouse cartoon, caught a glimpse of the Hungarian clock and the caption "TV HIRADO" on Ch. R1 around 1720 on July 21. Harold saw another cartoon film, the word "MAGYAR" and a news reader around 1730 on August 9, and a conjurer, the word "SPORTKA" and a countryside scene as the background to a clock early on the 10th, and later received test cards from Austria, Czechoslovakia and Poland. Between July 15 and August 15, **Andrew Rogers,** Bristol, received Band I pictures from Austria, Czechoslovakia, Hungary, Italy, Portugal, Russia and Sweden. "All this with a 3-element wideband antenna, a Teleng up-converter and an ancient HMV receiver at a total outlay of £62" wrote Andrew, sending a detailed log of how the signals came and went during each event. At 1600 on July 20, Andrew watched an episode of *The Secret Army* on BBC2 Ch. 64 and later, via sporadic-E, watched another episode on Swedish TV with sub-titles.

One thing I found fascinating around 1800 on August 16 was to see the athletics meeting from Zagreb on Ch. R1 and the same pictures being carried by the IBA on our normal u.h.f. system. At 0820 on August 5, a clock appeared on Ch. R1 showing 1120, and during a more extensive disturbance at 0910 on the 6th, I received test cards from the USSR on Ch. R1 and Poland on Ch. R2 59·25MHz, plus co-channel interference. At 0815 on the 8th, I watched an advert for Air India in cartoon form, a caption from Czechoslovakian TV and the words "Divakov" and "ABC". From 0807 on the 9th, I watched part of a medical film about sick children with a YL presenter introducing different items such as examinations, operations and chiropody. Later from 1715 there was a cartoon film prominent among the mixture of pictures on Ch. R1, the Russian news programme "BPEMR" with a male reader and at 1830 the caption "Polska Program TP1" appeared followed by sport, with a male presenter introducing such items as athletics, football and yachting. This was followed by a weather chart showing the general situation ranging from the UK across Europe to the Italian end of the Mediterranean sea, and just before the event faded out a clock appeared at 1902 showing 2002. Another clock appeared at 1800 on the 10th showing 2100 followed by the Russian news and strong pictures from TP1 Poland.

Like the rest of us, **Nicholas Brown,** Rugby, enjoyed the 1981 sporadic-E season and judging from the two photographs he sent (Figs. 2 & 3) the up-converter in front of his National Panasonic receiver is working very well. For all you camera buffs, Nicholas says that he uses an iris-type shutter for his TV pics and not a focal plane.

During a massive Band I disturbance between 1900 and 2230 on August 18, I received strong pictures, sometimes in colour, from Poland and the USSR with, at times, co-channel interference from other stations.

Tropospheric

At 1335 on July 30, I received a strong test card from BRT-UTU 1 Belgium on Ch. E10, a news bulletin with YL reader on Ch. E11, and at 2310 a caption from the German station ARD-ZDF was followed by a programme list for the 31st, then at 2314 their closedown clock showed 0014. At this point I was just settling down to a good DX session when the electricity supply went off for about three hours. By 0900 Band III was wide open and as I tuned my JVC 3060 between Chs. E5

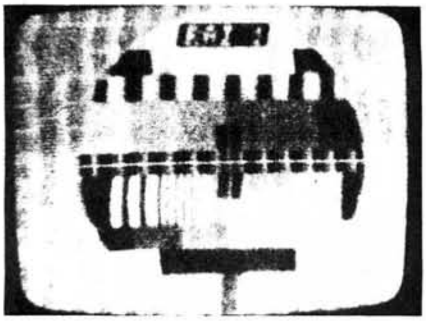

Fig. 1

Fig. 2

Fig. 3

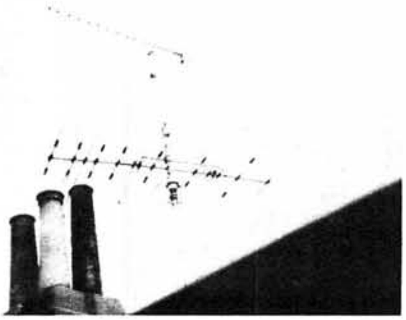

Fig. 4

Fig. 5

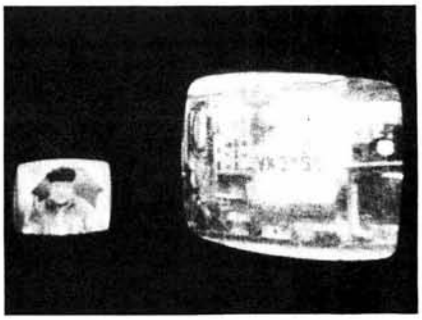

Fig. 6

Fig. 7: Received by Norman Reynolds

and 12 I found strong test cards from PTT NED-1. NDR-1. WDR-1 and WDR1 TV11. During another tropospheric opening on August 3 and 4. I received strong pictures from the IBA transmitter at Lichfield on Ch. 8 and a test card from RTBF-1 on Ch. E8 and a warning from the IBA on their u.h.f. channels about "atmospheric interference". On July 30/31. T. Ampi enjoyed the good conditions and received pictures from a variety of German stations on about a dozen spots between Chs. 30 and 58. During the u.h.f. opening on August 5/6 he received pictures from east and west Germany and Holland and in his letter, T. Ampi tells me how pleased he is with his new antenna system (Fig. 4).

In Chippenham, **Brian Renforth** received patterns on Ch. 42 from a French station on July 27 and pictures from Channel TV on the 28th. "A massive improvement on the 30th" wrote Brian, who received pictures from Anglia TV on Ch. 41 and heard Southern TV's announcer warn viewers about the prevailing interference. In view of this, Brian set his alarm for 0730 and was pleased that he did, because when he got up on the 31st he received very strong signals from Belgium, Holland and Germany and at 0930 he saw the Thames-IBA caption periodically blocked out by a German news programme on Ch. 23. Brian also received the Anglia-IBA caption followed by a picture of "The Anglia Knight" on Ch. 41 and said: "The Mendip Ch. 64 station was totally shattered by the Dutch test card PTT-NED2."

A similar story came from **Simon Hamer,** Presteigne, who watched Thames news on Ch. 23 on July 28 and around midnight on the 30th he received pictures from the London IBA station at Crystal Palace, and Anglia from Sandy Heath on Ch. 24. Between 1655 and 1755 the BBC gave a warning about the interference and Simon watched BBC-East on Ch. 31 with a YL announcer saying: "This is BBC1 for the eastern counties", then came the programme *Look East* in full colour. George Grzebieniak also did well on August 3 when, with an indoor dipole, he received pictures from the IBA stations Anglia and Southern and from Germany on Ch. 32 and Holland on Chs. 29, 31, 46 and 52.

During the morning of July 31, Nicholas Brown, using a National Panasonic TR 1401G, a Jostykit pre-amp and a Wolsey Colour King antenna, received pictures from Belgium on Ch. 28, France on Chs. 21 and 39, Germany on Ch. 48, Holland on Chs. 27, 29 and 32, and Tyne Tees on Ch. 29. **Paul Drinkwater,** Sutton Coldfield, using a Ferguson 3653 and a home-brew folded dipole stuck to the inside window-sill, received a test card, scribed "Wavre Canal" from RTB Belgium at 0948. Paul was also using a Bush BM 6514 portable with its own antenna and received pictures from HTV around Ch. 50.

Amateur TV

On July 25, **Ron Bray** G8VEH, Shoreham, joined the nearby Worthing TV net and sent colour pictures from a Wood and Douglas 70cm transmitter over a distance of about 8 miles to Robin Stevens G8XEU (Fig. 5), using a power of 200 milliwatts. Ron is often seen at radio functions with his Akai VC30 colour camera, and his video recordings of the Brighton and District Radio Society's VHF NFD station and the Sussex Mobile Rally were transmitted on this occasion. Other stations monitoring these signals in monochrome were G4GUO, G6AIW, G8KOE, G8DHE and G8XRX. Ron uses a Sharp 14in monochrome portable and a Microwave Modules ATV converter as his main station receiver.

Amateurs in Australia use repeaters for their ATV signals and **Wenlock Burton** sent a photograph (Fig. 6) of a signal received on April 20 from VK3YSS via their VK3RTV repeater on Ch. 35.

Equipment

I am always pleased to hear from overseas readers and Wenlock Burton has sent details of the TV equipment used by himself and two of his fellow Australian DXers, **Robert Copeman** and **Norman Edge.** Robert has an Australian Philips P45 and three National Ranger 5in receivers, a Labgear wideband pre-amplifier and a 22-element crossfire antenna mounted on a rotator, while Norman uses home-brew Yagis to feed a Philips 26in receiver. Wenlock has a combined band I/III array and a Yagi especially for Ch. A6 to feed his two Philips receivers, a P60 12in and a P45 4·5in. These three lads are in Victoria but Wenlock says there are two more, **Todd Emstie** and **John Schache** in NSW, who I hope to hear from in the future.

Among those receiving sporadic-E warnings from Simon Hamer is **Michael Byrne,** Credenhill, Herefordshire, who uses one of Hugh Cocks' TV receivers modified for Band I and fed by a 4-element Yagi mounted on a rotator.

"What type of antenna do I need for SSTV"? writes **K. Miosga** from N. Durban, RSA. Well OM, to be brief, this could be as simple as a long wire or as complicated as a big rotatable beam. Obviously you want the best signal possible, so whichever antenna you choose, do make sure it is designed for the particular band you want to work on and that you use a good-quality feeder between the antenna and your set.

Another addition to the SSTV gear of **Norman Reynolds** G8YXL, London, is a Hitachi TV camera which he often uses to demonstrate his receiver by filming himself and a friend. Norman also has a Trio TS10V, a Telford TC10 2m transmitter and a Microwave Modules transverter from 10 to 2m and 2m to 70cm.

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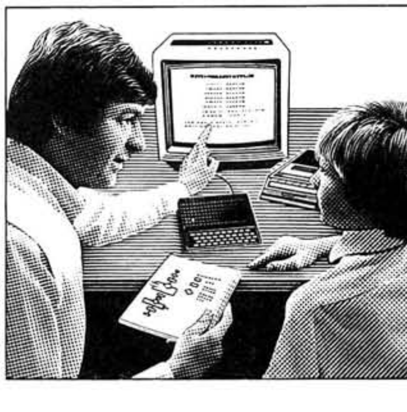
Kit and built versions come complete with all leads to connect to your TV (colour or black and white) and cassette recorder.



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2N3439	£0.67	2N5448	£0.12	BC1731B	£0.11	BD138	£0.40	MJ481	£1.20
2N3440	£0.80	2N6109	£0.30	BC174B	£0.15	BD201	£1.00	MJ490	£1.20
2N3441	£0.90	2N6123	£0.53	BC182/L	£0.10	BD204	£1.20	MJE370	£0.37
2N3638	£0.15	2N6124	£0.50	BC183/L	£0.10	BD235	£0.35	TIP29A	£0.39
2N3642	£0.15	40254	£0.50	BC184	£0.10	BD240	£0.36	TIP30A	£0.47
2N3643	£0.15	40312	£0.50	BC205	£0.17	BD241	£0.50	TIP31A	£0.44
2N3702	£0.10	40316	£0.75	BC212/L	£0.10	BD242	£0.42	TIP41A	£0.50
2N3705	£0.10	40363	£0.20	BC213/L	£0.10	BD243	£0.50	TIP54	£1.40
2N3706	£0.10	40389	£0.20	BC214/L	£0.10	BD244	£0.60	TIP110	£0.67
2N3708	£0.10	40512	£0.50	BC238	£0.10	BD433	£0.32	TIP115	£0.50
2N3709	£0.10	AC127	£0.20	BC239	£0.10	BD535	£0.45	TIP117	£0.60
2N3711	£0.10	AC128	£0.24	BC250	£0.12	BD536	£0.45	TIP34A	£0.85
2N3714	£1.00	AC132	£0.21	BC251/B	£0.10	BD538	£0.44	ZTX301	£0.15
2N3716	£1.30	AC152	£0.35	BC253/C	£0.10	BD539	£0.37	ZTX303	£0.24
2N3732	£1.50	AC176K	£0.36	BC256A/B	£0.10	BD540	£0.40	ZTX501	£0.14

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CA3053	£0.90	LM741C14	£0.57
CA3054	£2.00	LM923	£0.44
CA3075	£2.05	LM1453N	£0.44
CA3080	£1.70	LM1801	£2.04
CA3089	£2.00	LM1871	£3.75
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LM137K	£11.52	LM78L15CZ	£0.50
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LM304H	£1.35	LM78L05CH	£0.77
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LM320T24	£1.85	NE544	£1.75
LM337K	£3.15	NE555	£0.25
LM337MP	£0.80	NE550	£0.60
LM341P5	£0.77	NE558	£3.12
LM341P2U	£0.77	NE565	£1.10
LM342P12	£0.56	NE566	£1.53
LM348	£0.90	NE570	£4.25
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LM380N14	£0.75	SAA5010	£7.11
LM381N	£1.44	SAA5012	£7.11
LM383	£1.60	SAA5020	£5.23
LM389N	£0.95	SAA5030	£8.26
LM340T5	£0.25	SAA5040	£15.14
LM716	£0.95	SAA5050	£8.51

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CD4030B	£0.45	7448N	£0.45
CD4042B	£0.55	7453	£0.15
CD4043	£0.61	7454	£0.15
CD4044	£0.62	7460	£0.15
CD4045	£1.30	7470	£0.30
CD4046B	£0.74	7472	£0.28
CD4048B	£0.43	7473	£0.28
CD4051B	£0.60	7474	£0.28
CD4052B	£0.60	7475	£0.29
CD4063	£0.94	7476	£0.30
CD4066B	£0.35	7483	£0.60
CD4068	£0.20	7484	£0.95
CD4077	£0.23	7485	£0.75
CD4093B	£0.42	7486	£0.25
CD4094	£1.65	7489	£2.00
CD4098B	£0.85	7490AN	£0.28
CD4099B	£0.93	7491AN	£0.60
CD4503	£0.47	7493N	£0.30
CD4510B	£0.65	7495	£0.58
CD4515	£1.95	7496	£0.34
CD4516	£0.70	7497	£1.74
CD4522	£1.10	74107	£0.28
7404	£0.10	74118	£0.84
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7407	£0.27	74121N	£0.25
7411	£0.22	74122N	£0.50
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R0	4.0277	8.0555	12.0833	14.9888	18.1250	44.9666
R1	4.0284	8.0569	12.0854	14.9916	18.1281	44.9750
R2	4.0291	8.0583	12.0875	14.9944	18.1312	44.9833
R3	4.0298	8.0597	12.0895	14.9972	18.1343	44.9916
R4	4.0305	8.0611	12.0916	15.0000	18.1375	45.0000
R5	4.0312	8.0625	12.0937	15.0027	18.1406	45.0083
R6	4.0319	8.0638	12.0958	15.0055	18.1437	45.0166
R7	4.0326	8.0652	12.0979	15.0083	18.1468	45.0250
S8	—	—	12.1000	14.9444	18.1500	44.8333*
S9	—	—	12.1020	14.9472	18.1531	44.8416*
S10	—	—	12.1041	14.9500	18.1562	44.8500*
S11	—	—	12.1062	14.9572	18.1593	44.8583*
S12	—	—	12.1083	14.9555	18.1625	44.8666*
S13	—	—	12.1104	14.9583	18.1656	44.8750*
S14	—	—	12.1125	14.9611	18.1687	44.8833*
S15	—	—	12.1145	14.9638	18.1718	44.8916*
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S20	4.0416	8.0833	12.1250	14.9777	18.1875	44.9333
S21	4.0423	8.0847	12.1270	14.9805	18.1906	44.9416
S22	4.0430	8.0861	12.1291	14.9833	18.1937	44.9500
S23	4.0437	8.0875	12.1312	14.9861	18.1968	44.9583

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	4	200 (total)	100 to 999.999 kHz	—	£6.00
	5	50	1.00 to 1.499 MHz	£9.00	£6.00
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AF125	0.32
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AF239	0.42
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BC107	0.10
BC107B	0.10
BC108	0.10
BC109B	0.10
BC140	0.31
BC141	0.25
BC142	0.21
BC143	0.24
BC147	0.09
BC148	0.09
BC149	0.09
BC157	0.10
BC158	0.09
BC159	0.09

BC160	0.28
BC170B	0.10
BC171	0.08
BC172	0.09
BC173B	0.10
BC182	0.09
BC183	0.09
BC184LA	0.09
BC212	0.09
BC212L	0.09
BC213	0.09
BC213L	0.09
BC214	0.09
BC214L	0.09
BC237	0.09
BC238	0.08
BC307	0.09
BC327	0.10
BC337	0.10
BC461	0.30
BC478	0.20
BC547	0.10
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BC557	0.07
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BD132	0.35
BD133	0.40
BD135	0.30
BD136	0.30
BD137	0.28
BD138	0.30
BD139	0.32
BD140	0.30
BF179	0.34

BF180	0.29
BF183	0.29
BF194	0.11
BF195	0.11
BF196	0.11
BF197	0.11
BF198	0.10
BF199	0.14
BF200	0.30
BF258	0.25
BF259	0.26
BF336	0.34
BFX29	0.30
BFX84	0.26
BFX85	0.28
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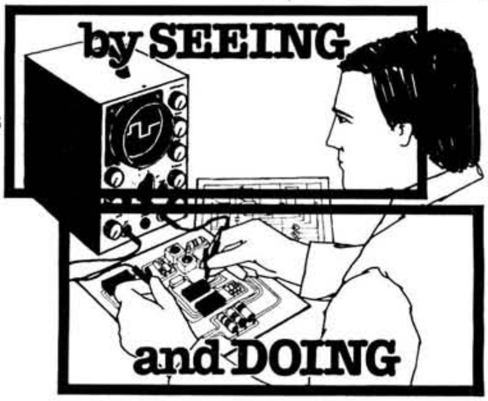

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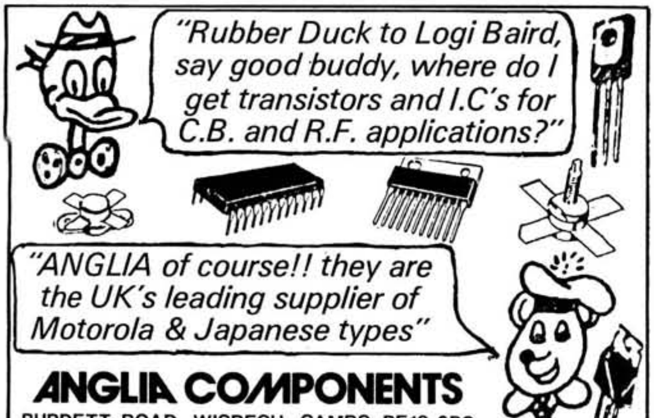

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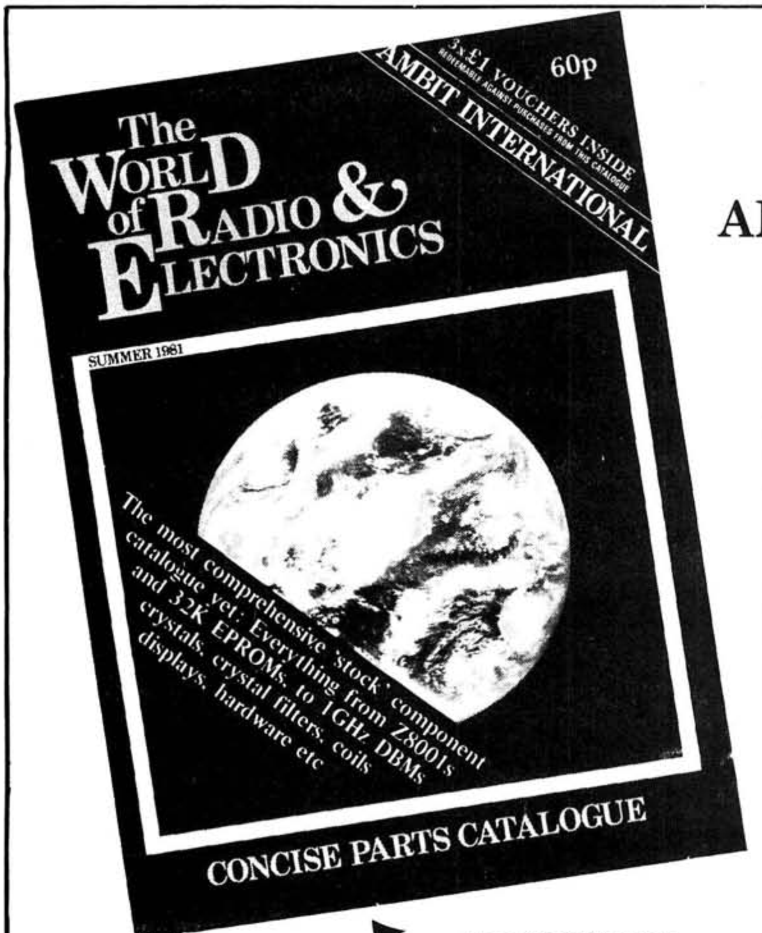

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U.H.F. Rx COLLINS Mil Type R278 normally used at RAF ground stations, provides up to 1750 channels spaced 100Kcs from 225 to 400Mc/s any 10 of these plus one service channel can be pre set at front of Rx (use of ext c.u. adds another 10 chan) the Rx is a triple conversion using 38 int crystals to give 1750 chan, no ext crystals are required. Rx is made for 19" rack mounting and 230v mains supply uses 30 valves with 600 ohm O/P at 3 watts, all controls RF LF gain phone & power jacks are on front panel, weight about 50Kg. These Rx are supplied untested with circ & handbook. **£87.**

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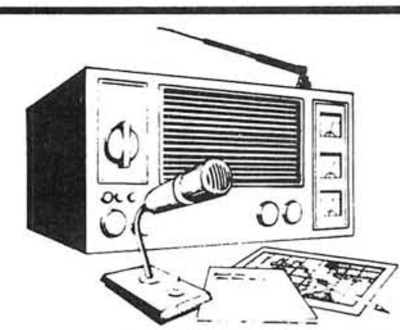

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7417	27p
7420	17p
7421	40p
7422	22p
7423	34p
7425	30p
7426	40p
7427	34p
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74100	130p
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74111	70p
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74119	210p
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74121	28p
74122	48p
74123	48p
74125	55p
74126	60p
74128	75p
74132	75p
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74141	70p
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74156	90p
74157	70p
74159	190p
74160	100p
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74163	100p
74164	100p
74165	130p
74166	100p
74167	200p
74170	240p
74172	720p
74173	120p
74174	93p
74175	85p
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74185	150p
74186	500p
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84192	100p
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74LS174	110p
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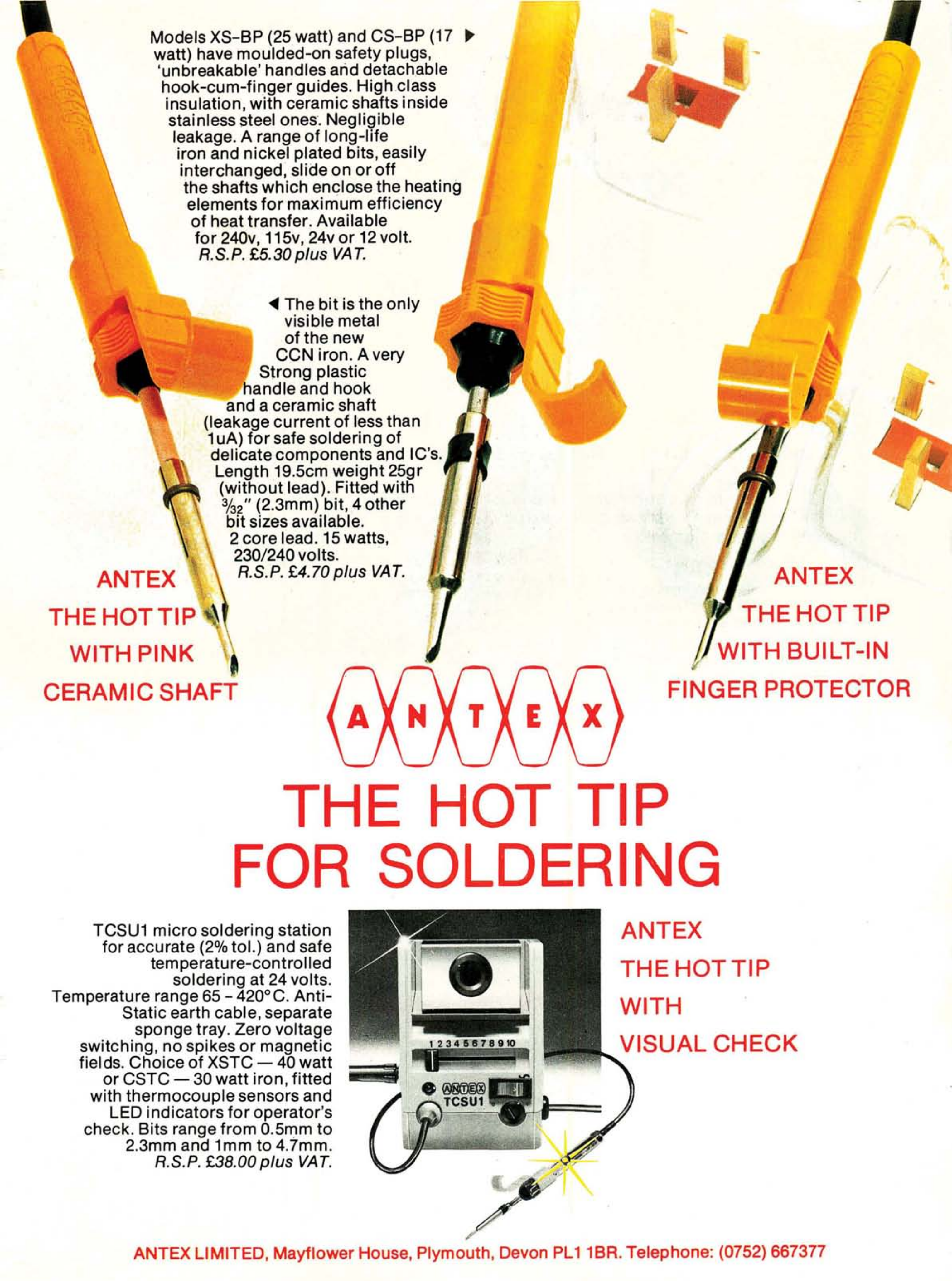

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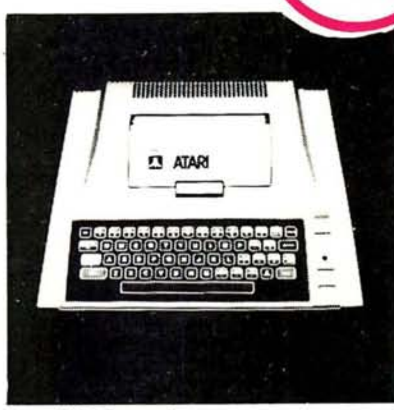

Atari 400 Console

Atari 800 Console

Look at what you get:

* Background colour, plotting colour, text colour and border colour settable to any one of 16 colours with 8 levels of illuminance!
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