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Practical Wireless

NOVEMBER 1982

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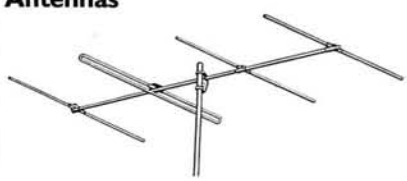

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Practical Wireless

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contents

ok, it was always a good receiver, but now with FM the **SRX 30D**, todays rig, yesterdays price.

- Extended coverage 200KHz-30MHz.
- Digital readout in large green display units which give true unambiguous frequency information – even when you switch sidebands or use the clarifier.
- All new frequency synthesis using Plessey SL 1600 series ICs for a new high standard of performance.
- All new audio system which produces outstandingly good quality on the built in speaker, and is capable of driving external hi fi speaker units for even better sound.
- All new IF filters with optimum bandwidth for mode in use. Automatic filter selection from mode switch.

We predict that the SRX30D will be a landmark in low cost, high performance SWL receivers. Just consider how much you should pay for a receiver covering 200KHz-30MHz with accurate digital readout; high performance FM/USB/LSB/AM with switched filters; drift cancelling frequency synthesis; built in mains supply and built in speaker; high quality construction and advanced design – and so much more.

SRX30D Now with FM but still **ONLY £215 Carriage £5.00**

The TR-2500 is a compact 2 metre FM handheld transceiver featuring an LCD readout, 10 channel memory, lithium battery memory back-up, memory scan, programmable automatic band-scan and Hi/Lo power switch.

TR-2500 FEATURES

- Extremely compact size and lightweight 66 ($2\frac{5}{8}$) W x 168 ($6\frac{5}{8}$) H x 40 ($1\frac{5}{8}$) D, mm (inches) 540g, (1.2lbs) with Ni-Cd pack.
- LCD digital frequency readout, with memory channel and function indication.
- Ten channel memory, includes "MO" memory for non-standard split frequencies.
- Memory scan, stops on busy channels, skips channels in which no data is stored.
- UP/DOWN manual scan in 5kHz steps.
- 2.5W or 300mW RF output. (HI/LOW power switch.)
- Programmable automatic band scan allows upper and lower frequency limits and scan steps of 5kHz and larger (5, 10, 15, 20, 25, 30kHz . . . etc) to be programmed.
- Repeater reverse operation.
- Keyboard frequency selection across full range.
- Frequency coverage, 144.000 to 145.995MHz.
- Two lock switches for keyboard and transmit.

TR-2500 HANDHELD £207 Carriage £5.00

handability TR 2500

LOWE IN LONDON, Open monday to saturday, six days a week lower sales floor, Hepworths, Pentonville Rd, London. telephone 01.837.6702
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AF606K

DAIWA ALL MODE ACTIVE FILTER £56.50

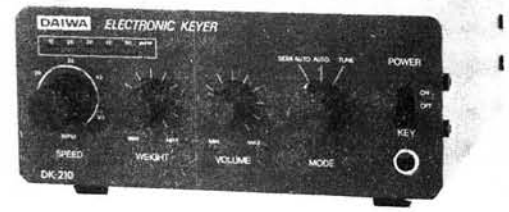
From Daiwa yet another aid to operating. In addition to the notch, SSB and CW filters, the AF606K is equipped with a PLL tone decoder; when the tone frequency of the CW signal and the free running frequency of the PLL tone decoder are the same, a locked signal is generated. This locked signal keys an audio oscillator which then reproduces the received CW signal. However, there is a tremendous difference between the produced signal and the received one – no noise and, of course, no fading. ANOTHER PIECE OF EQUIPMENT TO ENHANCE YOUR LISTENING.

DK 210

DAIWA ELECTRONIC KEYER £42.00

With so many electronic keys and keyers on the market, it's hard to describe one that is better than the rest. Inevitably it is a matter of "feel", and the feel of the New Daiwa DK210 is superb. Being Daiwa, the quality of design and construction has to be of the best, but it's in use that the DK210 is so impressive. Designed to be used with an external paddle, to give greater personal choice, the DK210 is otherwise self contained, even to being battery powered (PP3). It offers a speed range of 10 to 50 w.p.m., built in sidetone, facilities for semi auto, or fully auto keying, and a tune position for adjusting your transmitter, but the outstanding feature is the adjustable "weight" control. This control gives an amazing improvement in the character of the sending, and completely removes that mechanical sounding "electronic morse" characteristic. Those experienced CW users who have tried out the DK210, have all said how good it sounds – and have usually purchased one. So will you if you try it out.

DK210 from DAIWA – A truly nicer Keyer.



DON'T FORGET OUR FULL RANGE OF DAIWA METERS, ROTATORS, ETC.

Now from Daiwa, a new 2 metre monitor receiver. Using PLL synthesized circuitry, the SR1000 E covers the entire amateur band in 5 KHz steps.
It provides for today's amateur a small convenient means of monitoring activity on the busy 2 metre band. Compact and supplied with earphone, mounting bracket, the SR1000 provides for you mobile or fixed your contact with the 2 metre band.

SR100E 2 METRE RECEIVER £72.50 CARRIAGE £2.25

DAIWA SR 1000 E

With the arrival of the TS780, the dual bander rig has come of age, giving the two band multimode facilities of the original concept, plus a wealth of additional operating facilities. Taking a trip across the front panel of the rig we have the repeater facilities, a non-locking tone switch, ideal now that most repeaters are tone accessed and carrier maintained. The tone, of course, only works whilst the rig is in the FM mode. Below the tone switch is the TX offset switch giving plus or minus 600 KHz or 1.6 MHz, depending on whether 2 metres or 70 cm is selected and last, but certainly not least, reverse repeater – to my way of thinking proof that the TS780 was designed for amateurs by amateurs.

The meter functions on receive as S. meter, ALC meter or as a centre meter, the functions being controlled from a panel switch. On transmit the meter reads relative RF output. Immediately above the digital frequency and memory/VFO indicator are indicating leds: a "busy" led indicating in FM mode whether the squelch is open thereby, assuming the squelch level is correctly set, that the other station is transmitting. A "frequency lock" led tells that the F lock switch is pressed and the VFO knob inoperative. The "on air" led indicates the rig is transmitting and the "offset" led reminds you that the TX offset switch is set to repeater.

The memory operation has been updated: instead of having to progressively move through the memory content in sequence, by means of a rotary switch any of the ten memories (two more than the TS770's) can be selected at will. Entering frequencies into the memory is easier, as anyone who has a TS770 series will explain. Two priority frequencies are included: 9 and 10. Push buttons to the left of the VFO knob allow either of the two programmed frequencies to be quickly selected, immediately cancelling the previous instructions given to the rig. Just the thing for local net frequencies. SSB mic gain needs no explanation, as does the AF/RF gain control.

On the same control knob as the squelch level is a switch enabling the frequency width of scan to be determined. Briefly, when the rig is set to scan either in FM, FM step or SSB mode you can determine the amount of band to be covered.

The ranges are 0.5, 1, 3, 5 and 10 MHz, thus you can limit the rig to scan just the section of the band used by the mode you have selected. Example: scan width 0.5 MHz, VFO set at 144.000, coverage – 144.000 to144.5, mode side band – result: free scanning of the SSB portion of the band. On FM the scan locks if a signal is present. On SSB the scan does not stop but you are made aware that there is activity on the band.

Another new control on the TS780 is the IF shift. Available for some time on HF equipment to cope with crowded band conditions, obviously the Trio design engineers have recognised that the 2 metre SSB end of the band can become crowded during contests or when there is "a bit of a lift on". At these times a rig that has the "IF shift" facility will certainly "score points".

The send/receive Vox/Man, meter function, NB, low/high power switches are all well known and have been found on previous generations of Trio base station equipment and again require no explanation. I could say the same thing about the mode switch but here you will notice alongside the standard FM position another marked FM CH. Put the mode switch in this position and instead of a free-running VFO you have a mechanical "click" step feel, the frequency now moving in either 12.5 KHz or 5 KHz steps. Of course the rig will also scan in these steps, controlled either by the scan switch or the up/down shift microphone. Again the Trio amateurs who design the equipment have here a major triumph.

By now you may be seeing why I am so enthusiastic about the TS780 but there is still more to come. How about a memory scan system that will scan either the 2 metre frequencies stored in the memory or the 70 cm ones or, if you wish, both. Well that's another feature of the TS780. Add to this list variable VFO steps of either 20 Hz or 200 Hz, a selectable braked feel to the VFO knob, rapid up and down MHz switching and you have the most comprehensive rig ever seen.

Too complicated some may say. Rubbish say I. Trio thrive on rigs designed to be simple to operate. Do you remember what John wrote in Radcom about the TR7500 and its competitors? And, finally, how about a rig that without resorting to a MHz switch will, by use of the VFO knob, tune from 144 to 146 MHz and from 430 to 440 MHz – only one rig –

the TS 780

£748 inc VAT carr £5.00

LOWE ELECTRONICS

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BNC COUPLER 50 OHMS

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M458	'X' 3 female 1 male	£2.13	0.50

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S0/35	UHF socket – 3.5mm jack	£0.79	0.50
S0/NF	UHF socket – N socket	£1.96	0.50
UG146	UHF socket – N plug	£2.25	0.50
UG83	UHF plug – N socket	£1.96	0.50

UHF CABLES

PL36PL	3.0' RG58 PL259 ends	£1.85	0.50

N PLUG 50OHMS

UG536	Small type 5.5mm	£2.82	0.50
UG21	Standard type 11.2mm	£1.55	0.50

N SOCKET 50 OHMS

UG58	Standard 4 hole fix	£0.94	0.50
UG1052	Free cable end 5.5mm	£2.86	0.50
UG23	Free cable end 11mm	£1.70	0.50
MX913/C	Dust cap c/w chain	£0.46	0.50

N COUPLER 50OHMS

UG107	'T' 2 female 1 male	£3.74	0.50
UG28	'T' 3 female	£3.16	0.50
UG57	Double male adaptor	£2.70	0.50
UG29	Double female adaptor	£2.13	0.50
UG27	Elbow male – female	£2.24	0.50

N INTERSERIES ADAPTORS 50 OHMS

UG201	N plug – BNC socket	£3.28	0.50
UG349	N socket – BNC plug	£3.16	0.50
UG606	N socket – BNC socket	£2.59	0.50
UG146	N plug – UHF socket	£2.25	0.50
UG83	N socket – UHF plug	£1.96	0.50
S0/NF	N socket – UHF socket	£1.96	0.50

ANTENNAS HF FIXED

HY GAIN

12AVQ	Vertical 10-15-20M	14.0'H		£50.60	2.20
14AVQ/WB	Vertical 10-15-20-40M	18.0'H		£64.40	2.20
18AVT/WB	Vertical 10-15-20-40-80M	25.0'H		£109.25	2.20
14RMQ	Roof mount kit for above			£36.22	2.20
18V	Vertical 10-15-20-40-80M, tapped	19.0'H		£29.78	2.20
103BA	3 Ele Yagi 10 metres	17.0'LE	8.0'B	£67.85	2.20
105BA	3 Ele Yagi 10 metres	18.5'LE	24.0'B	£143.75	3.95
153BA	3 Ele Yagi 15 metres	23.0'LE	12.0'B	£90.85	2.90
155BA	5 Ele Yagi 15 metres	24.5'LE	26.0'B	£217.35	5.90
203BA	3 Ele Yagi 20 metres	35.0'LE	16.0'B	£166.75	4.90
204BA	4 Ele Yagi 20 metres	36.5'LE	26.0'B	£286.35	7.30
205BA	5 Ele Yagi 20 metres	36.5'LE	34.0'B	£362.25	9.40
402BA	2 Ele Yagi 40 metres	43.0'LE	16.0'B	£247.25	6.50
DB10/15A	3 Ele Yagi 10-15M	23.0'LE	13.0'B	£146.05	4.80
TH3JNR	3 Ele Yagi 10-15-20M	24.2'LE	12.0'B	£194.35	3.10
TH2MK3	2 Ele Yagi 10-15-20M	27.3'LE	6.0'B	£169.05	3.20
TH3MK3	3 Ele Yagi 10-15-20M	27.0'LE	14.0'B	£274.85	5.30
TH5DXX	"Thunderbird" 5 Ele	31.0'LE	18.0'B	£378.35	6.70
TH6DXX	"Thunderbird" 6 Ele	31.1'LE	24.0'B	£281.75	8.50
TH7DXX	"Thunderbird" 7 Ele	31.0'LE	20'TR	£458.85	8.75
18TD	Dipole Tape 10-80M		132'	£113.85	2.80

JAYBEAM

VR3	Vertical 10-15-20M. DC Short 6lb	13.5'H		£46.00	2.30
TB3	3 Ele Yagi 10-15-20M PEP	14.6'TR	14.1'B	£181.70	5.40

MINI BEAM

C4	Vertical Mini 10-15-20M	8lb	11.5'H	£54.99	2.30
HQ1	"Mini" Quad 10-15-20M	11.0'LE	4.5'B	£119.00	4.00

G4MH MINI BEAM

	Mini Beam 10-15-20M			£82.50	4.00

MOSLEY

TA32JRE	2 Ele beam 200W	13.7'TR	6.0'B	£106.95	3.20
TA33JRE	3 Ele beam 200W	14.7'TR	12.0'B	£161.00	3.40
TA33JRHPE	3 Ele c/w Balun H.P.	14.7'TR	12.0'B	£181.70	3.70
MUSTANG2	2 Ele beam 1KW	14.7'TR	6.0'B	£161.00	3.40
MUSTANG3	3 Ele beam 1KW	15.0'TR	12.0'B	£200.10	3.70
RD5	Trap dipole, 10-15-20-40-80M		69.0'E	£46.00	1.80
SWL7	Trap dipole, B.C. bands		40.0'E	£46.00	1.80

SMC DIPOLE

SMC10MD	10M 7029H	max	17.5'	£14.38	0.90
SMC12MD	12M 7029H	max	19.7'	£14.55	0.90
SMC15MD	15M 7029H	max	23.4'	£14.61	0.90
SMC17MD	17M 7029H	max	27.2'	£14.95	1.05
SMC20MD	20M 7029H	max	35.2'	£15.87	1.40
SMC30MD	30M 7036	max	48.7'	£17.25	1.80
SMC40MD	40M 7036	max	70.3'	£19.38	2.10
SMC80MD	80M 7036	max	140.6'	£24.96	2.10
SMC160MD	160M 7044	max	273.3'	£49.28	2.10

SMC MANPACK

LW8A	3-30MHz, c/w 9M RG58 80' halyards	£48.00	2.20

SMC TRAPPED DIPOLE 10-15-20-40-80M

SMCTD/HP	14SWG, hard drawn Cu, 1000W PEP	£40.83	2.30
SMCTD/P	Portable, Cu/terylene, c/w 75' coax.	£52.33	2.30
SMCHPT	High Power, 1kW, 7MHz	per pair £13.80	1.10

SMC – HS ANTENNA

SMCHF5V	Vertical 10-15-20-40-80M	15.7'H		£40.25	2.30
SMCHF5R	Radial kit loaded	6.5'-7.3'		£29.90	2.30
SMCHF3VNB	Vertical 10-18-24MHz 1KW pep	16.0'H		£47.90	2.30
SMC3Y1015D20	3 ele 10-15, Dipole 20M	13.2'B		£134.95	5.00

CABLES, RADIO FREQUENCY

COAXIAL 50 OHM CABLE

URM95	Solid centre 2.2mm	p/m	£0.23	
UR43	Solid centre 5.0mm	p/m	£0.25	
UR43/100	Drum 100m UR43	100m	£24.15	2.20
UR76	Stranded core 5.0mm	p/m	£0.28	
UR76/100	Drum 100m UR76	100m	£26.45	2.20
RG58U	Stranded core 5.0mm	p/m	£0.29	
RG58U/100	Drum 100m RG58U	100m	£27.60	2.20
RG213	Low loss 10.2mm	p/m	£0.62	
RG213/100	Drum 100m RG213	100m	£57.50	4.50
UR67	Low loss 10.2mm	p/m	£0.67	
UR67/100	Drum 100m UR67	100m	£62.10	4.50

COAXIAL 75 OHM CABLE

307EP	Economy 4.3mm	p/m	£0.21	
307EP/100	Drum 100m 307EP	100m	£18.40	2.20
UR70	Stranded light	p/m	£0.30	
UR70/100	Drum 100m UR70	100m	£27.60	2.20
UR39	Medium duty 7.8mm	p/m	£0.44	
UR39/100	Drum 100m UR39	100m	£41.40	3.40
UR57	Low loss 10.2mm	p/m	£0.69	
UR57/100	Drum 100m UR57	100m	£65.55	4.50

BALANCED TWIN CABLE

302	75 ohms light duty	p/m	£0.17	
302/100	Drum 100m 302 (75)	100m	£14.95	2.20
306	300 Ohms Ribbon	p/m	£0.20	
306/100	Drum 100m 306 (300)	100m	£17.25	2.20

ANTENNAS VHF/UHF MOBILE

ASCOT

340	Base Stand ¼λ 60-550MHz		£2.30	0.50
310	Base Swivel ¼λ 60-550MHz		£4.20	0.50
344	Base Sprung ¼λ 60-120MHz		£6.38	0.60
440	Base Stand ⅝λ 3dB½ 145MHz		£2.70	0.50
330	Base Swivel ⅝λ 3dB½ 145MHz		£5.00	0.50
341	Base Sprung ⅝λ 3dB½ 145MHz		£7.30	0.60
350	Base Fine tune ½λ 3dB½ 145MHz		£7.30	0.60
351	Base Sprung ½λ 3dB½ 145MHz		£8.05	0.80
057	Whip tapered SS 127 Cms		£1.96	1.20
056	Whip parallel SS 63 Cms		£0.75	0.80
085	Mount cable ⅜ & ½ c/w 4.5M cable		£3.05	0.80
085LR	As 085 (but for Tupperware cars!)		£3.85	0.80
092	Mount bag ⅜ ' ½ c/w 4.5M cable		£10.75	1.00
084	Mount cable ½λ, c/w 4.5M cable		£5.00	0.80
088	Mount cowl ½λ, to S0239		£5.75	0.50
091	Mount Magnetic ½λ, c/w 4.5M cable		£10.75	0.95
089	Gutter Clip adaptor	all bases	£5.00	0.80
093	Boot lip adaptor	all bases	£3.80	0.60

BANTEX

42SS	Ele Stainless 42" 70MHz ¼λ		£2.53	1.30
40GF	Ele Glassfibre 40" 70MHz ¼λ		£4.62	1.30
20SS	Ele Stainless 20" 144MHz ¼λ		£2.09	0.90
18GF	Ele Glassfibre 18" 144MHz ¼λ		£3.80	0.90
B5	Ele ⅝ Glassfibre 144MHz		£9.68	1.30
BGASS	Ele ½ Stainless 144MHz		£9.23	1.30
BGAGF	Ele ½ Glassfibre 144MHz		£10.95	1.30
B5U	Ele ⅝ Stinless 432MHz		£3.36	0.90
UCL	Ele Mid load coln 432MHz ½ + ½λ		£10.95	1.00
UDL	Ele Mid base load 432MHz ⅝ + ½λ		£18.09	1.00
BM	Base standard ⅜" hole		£2.91	1.30
BA	Base snap-in type ⅜" hole		£3.80	1.00
BC	Base claw fixing 11-16mm hole		£5.06	1.20
BD	Base trunk lip 2 screw fitting		£9.36	0.80
BMM	Base Magnetic c/w 12' cable		£16.01	1.40

SMC-HS

SMC118M	Colinear 2M 11/8λ	7dB½	9.7'	£28.35	2.20
SMC6P2T/PL	Telescopic 2M PL259	0dB½		T.O.S.	0.50
SMC6P2T/BNC	Telescopic 2M BNC	0dB½		£3.97	0.50
SMC2H/PL	Helical 2M PL259			£3.45	0.50
SMC2H/BNC	Helical 2M BNC			£4.43	0.50
SMCHS430	½λ 432MHz "Handie" 2.5dB½			£5.75	0.60
SMC4	Ele 70MHz ½λ	ϕdB½	3.4'	£7.65	1.80
SMC2QW	Ele 144MHz ½λ	ϕdB½	1.6'	T.O.S.	1.30
SMC2NE	Ele 144MHz ⅝λ	3.ϕdB½	4.3'	£6.90	1.80
SMC2VF	Ele 144MHz ½λ	3.ϕdB½	3.5'	£8.63	1.80
SMC78F	Ele 144MHz ⅝λ	4.5dB½	5.7'	£12.25	1.80
SMC78B	Ele 144MHz ⅝λ ball		5.6'	£12.65	1.80
SMC78SF	Ele 144MHz ⅝λ short		4.7'	£12.25	1.80
SMC88F	Ele 144MHz ⅝λ	5.2dB½	6.5'	£16.10	1.80
SMC258	Ele 432MHz 2× ⅝	5.5dB½	3.1'	£11.50	1.80
SMC358	Ele 432MHz 3× ⅝λ	6.3dB½	4.7'	£14.95	1.80
SMC70N2M	144 and 432MHz	2.7dB½–5.1dB½		£14.20	1.80
SMCHS770	144/432 duplexer, 50W, 30dB, 0.5dB			£13.40	1.30
SMCSOMM	Magnetic base c/w 4M cable			£8.45	1.20
SMCSOWM	Wing mount base			£3.45	0.72
SMCGCCA	Gutter clip, c/w 4M RG58, PL259			£8.80	1.20
SMCTMCAS	Trunk mount c/w 6M cable			£7.65	0.95
SMCSOCAL	Cable assembly 239M, 6M cable			£4.20	0.50
SMCBSD	Bumper strap stainless			£7.71	1.00
HS88BK	Bumper mount 144MHz extension tube			£16.50	1.50
MX913/M	Dust cover fits SMCOCA			£0.46	0.50
YCGA	Cable grip adhesive (5 off)			£0.45	0.50

ANTENNA PARTS

ANTENNA WIRE

CU14SWG	Hard Drawn Copper	p/m	£0.20	
CU7/029H	Hard Drawn Stranded	p/m	£0.22	
CU7/036	CAD Copper Stranded	p/m	£0.32	
CU/TER	CU/Terylene Braid About 3mmD	p/m	£0.20	
CU/029S	Soft Copper Stranded (Radials)	p/m	£0.19	

BALUN TRANSFORMERS

BN86	Hy-Gain 1:1 3-30MHz	Ferrite	£15.53	0.90
H1Q1	Van Gorden 1:1 3-30MHz	Air	£10.00	Free

DIPOLE CENTRE PIECE

CCJ2BNC	Standard c/w fittings UG88 etc		£5.69	0.65
CCJ2UHF	Standard c/w fittings PL259 etc		£5.69	0.65
CCJ1UHF	HD type c/w fitting PL259 etc		£7.99	0.80
AJU	Polyprop. clamp and lug type		£1.09	0.55

INSULATORS END STRAIN

SMCP2	Polypropylene 3 inch		£0.55	0.45
PORC3	Porcelain 3 inch		£0.67	0.45
SMCP1	Polypropylene 8.5 inch		£2.25	0.45
EG38	Porcelain Egg 1.5 ins		£0.44	0.45

LIGHTNING ARRESTORS

SMC566	Spark S0239/PL259 in line		£2.99	0.55
SMC567	Spark SO239/SO239 in line		£2.99	0.55
LA1	Gas Discharge Bulkhead		£48.19	0.90

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ANTENNAS HF MOBILE

G WHIP			
TRIBANDER	Element, 10-15-20M, slide switch	£25.88	1.00
GWBASESTND	Base standard type	£5.75	0.80
LF40	Loading coil 40M	£6.56	0.60
LF80	Loading coil 80M	£6.56	0.60
LF160	Loading coil 160M	£6.56	0.60
LFWHIP	Telescopic whip	£4.26	0.60
MULTIMOBILE	Mast/head 10-15-20M self selecting	£30.48	1.40
GWBASESTND	Base standard type	£5.75	0.80
MM40	Loading coil 40M	£6.56	0.60
MM80	Loading coil 80M	£6.56	0.60
MM160	Loading coil 160M	£6.56	0.60
MMWHIP	Telescopic whip	£4.26	0.60
FLEXIWHIP	Mast/Whip (10M basic)	£18.11	1.00
GWBASESTND	Base standard type	£5.75	0.80
FF15	Loading coil 15M	£6.56	0.60
FF20	Loading coil 20M	£6.56	0.60
FF40	Loading coil 40M	£6.56	0.60
FF80	Loading coil 80M	£6.56	0.60
FF160	Loading coil 160M	£6.56	0.60
THREAD	Thread adaptor G Whip to USA Base	£0.92	0.50
EXTENDAROD	Mast extension 39"	£12.08	0.90
SMC35	Base heavy duty Ball type	£6.32	1.80
HY-GAIN	ACCS		
492	Spring mini, whips to 52"	£3.39	0.90
415	Bumper strap, c/w base	£12.42	2.10
498	Body mount split ball 90°	£13.23	1.40
511	Spring heavy duty 3lb 4.5"L	£10.93	1.80
417	Spring medium duty 2lb 4.5"L	£9.78	1.40
SMC			
SMCHW/4/A	Antenna (spot f) complete, 2-30MHz	£67.85	2.00
SMCHW/4/A1-2	Coil/Whip (spot f)	£16.10	0.80
SMC-HS			
SMC20SE	Ele 20M 1.72M 'fold over' 100W PEP	£15.35	1.80
SMC17SE	Ele 17M 1.915M 'fold over' 200W PEP	£14.20	1.80
SMC15SE	Ele 15M 1.72M 'fold over' 130W PEP	£13.80	1.80
SMC12SE	Ele 12M 1.915M 'fold over' 200W PEP	£13.40	1.80
SMC10SE	Ele 10M 1.72M 'fold over' 200W PEP	£12.65	1.80
SMCSOWM	Adjustable wing mount SO239/SO239M	£3.45	0.72
SMCGCCA	Gutter clip, c/w 4M RG58, PL259	£8.80	1.20
SMCTMCAS	Trunk mount c/w 6M cable	£7.65	0.95
SMCSOCAL	Cable assembly 239M c/w 6M cable PL259	£4.20	0.50
SMCBSD	Bumper + strap deluxe stainless band	£7.71	1.00
SMC35	Mount ball type	£4.89	1.40
THREAD	Thread adaptor fits SMC35 to UK	£0.92	0.50
MX913/M	Dust cover metric fits SMCSOCA	£0.46	0.50
UNITOWER			
HT30M	Tower 30ft 10ft lattice	£339.25	Dist
HT40M	Tower 40ft	£437.00	Dist
TELETOWER			
TT17	Tower 17m c/w Rig	£391.00	Dist
TT24	Tower 24m c/w Rig	£569.25	Dist
TT30	Tower 30m c/w Rig	£690.00	Dist

MASTS AND TOWERS

VERSATOWER MINI TOWER (10M10 SERIES)

10M10P30	30ft	£388.36	Dist	**10M10BP30**	30ft	£411.13	Dist
10M10W30	30ft	£373.18	Dist	**10M10FB30**	30ft	£360.53	Dist

VERSATOWER STANDARD (13M20 SERIES)

13M20P25	25ft	£318.78	Dist	**13M40T120**	120ft	£1960.75	Dist
13M20P40	40ft	£436.43	Dist	**13M20BP25**	25ft	£373.18	Dist
13M20P60	60ft	£533.83	Dist	**13M20BP40**	40ft	£492.09	Dist
13M20P80	80ft	£1018.33	Dist	**13M20BP60**	60ft	£586.96	Dist
13M20SP25	25ft	£371.80	Dist	**13M20BP80**	80ft	£1071.46	Dist
13M20SP40	40ft	£488.29	Dist	**13M20W25**	25ft	£256.80	Dist
13M20SP60	60ft	£586.96	Dist	**13M20W40**	40ft	£374.44	Dist
13M20SP80	80ft	£1071.46	Dist	**13M20W60**	60ft	£471.85	Dist
13M20M25	25ft	£1715.34	Dist	**7M20FB**	25ft	£179.00	Dist
13M20M40	40ft	£1877.26	Dist	**13M20FB25**	25ft	£237.82	Dist
13M20M60	60ft	£1993.64	Dist	**13M20FB40**	40ft	£354.20	Dist
13M20M80	80ft	£2527.47	Dist	**13M20FB60**	60ft	£451.61	Dist
13M40T85	85ft	£1435.78	Dist	**13M20FB80**	80ft	£934.84	Dist

VERSATOWER HEAVY DUTY (16M20 SERIES)

16M20P40	40ft	£650.21	Dist	**16M20SP100**	100ft	£1414.27	Dist
16M20P60	60ft	£738.76	Dist	**16M20M40**	40ft	£2179.60	Dist
16M20P80	80ft	£1113.20	Dist	**16M20M60**	60ft	£2306.10	Dist
16M20P100	100ft	£1342.17	Dist	**16M20M80**	80ft	£2834.87	Dist
16M20FB40	40ft	£511.06	Dist	**16M20M100**	100ft	£2929.74	Dist
16M20FB60	60ft	£604.67	Dist	**16M20BP40**	40ft	£662.86	Dist
16M20FB80	80ft	£951.28	Dist	**16M20BP60**	60ft	£766.59	Dist
16M20FB100	100ft	£1163.80	Dist	**16M20BP80**	80ft	£1141.03	Dist
16M20SP40	40ft	£705.87	Dist	**16M20BP100**	100ft	£1370.00	Dist
16M20SP60	60ft	£809.60	Dist	**16M20W40**	40ft	£521.18	Dist
16M20SP80	80ft	£1185.31	Dist	**16M20W60**	60ft	£611.00	Dist

ANTENNAS VHF/UHF FIXED

JAYBEAM

4Y/4M	Yagi 4 ele	7.5'B	7dBd	£22.43	2.20
PMH2/4M	Harness 2 way			£13.23	1.70
HO/2M	Halo head only	1' sq	ϕdBd	£5.18	0.70
HM/2M	Halo with 24" mast	1' sq	ϕdBd	£5.75	0.95
UGP/2M	Ground plane	1.7'	ϕdBd	£10.93	2.20
C5/2M	Colinear	13.1'	7.1lb 4.8dBd	£47.73	2.20
5Y/2M	Yagi 5 ele	5.2'	7.8dBd	£12.08	2.20
8Y/2M	Yagi 8 ele	9.2'	9.5dBd	£15.53	2.20
10Y/2M	Long Yagi 10 ele	14.4'	11.4dBd	£33.35	2.20
14Y/2M	Long Yagi 14 ele	17.5'	12.8dBd	£36.23	2.20
D5/2M	Yagi 5 over 5 slot	5.2'	10.6dBd	£21.85	2.20
D8/2M	Yagi 8 over 8 slot	9.2'	12.3dBd	£29.33	2.20
PBM10/2M	10 ele parabeam	12.9'	11.7dBd	£39.68	2.20
PBM14/2M	14 ele parabeam	19.5'	13.7dBd	£48.30	2.20
Q4/2M	Quad 4 ele	4.9'	9.5dBd	£25.88	2.20
Q6/2M	Quad 6 ele	8.7'	12dBd	£33.93	2.20
Q8/2M	8 ele quad	11.6'	13.8dBd	£39.10	2.20
5XY/2M	Yagi 5 ele cross	5.5'	7.8dBd	£24.73	2.20
8XY/2M	Yagi 8 ele cross	9.2'	9.5dBd	£31.05	2.20
10XY/2M	Yagi 10 ele cross	11.8'	10.8dBd	£40.83	2.20
PMH2/C	Circular polarisation harness			£8.05	1.20
PMH2/2M	Harness 2 way			£10.93	1.20
PMH4/2M	Harness 4 way			£25.30	1.20
X6/X12	6 ele 2, 12 ele 70	7.2'	8.5/12	£41.40	2.20
C8/70	Colinear	10.5'	6dBd	£54.05	2.20
D8/70	Yagi 8 over 8 slot	3.6'	12.3dBd	£22.43	2.20
PBM18/70	Parabeam 18 element	9.2'	14.0dBd	£27.60	2.20
PBM24/70	Parabeam 24 element	14.8'	15.1dBd	£36.80	2.20
MBM28/70	28 ele multibeam rear mount		12.5dBd	£18.40	2.20
MBM48/70	Multibeam 48 ele	6.0'	14.5dBd	£31.05	2.20
MBM88/70	Multibeam 88 ele	13.1'	16.3dBd	£42.55	2.20
8XY/70	Yagi 8 ele crossed	8.5'	10dBd	£36.80	2.20
12XY/70	Yagi 12 ele crossed	8.5'	12dBd	£46.00	2.20
PMH2/70	Harness 2 way			£9.20	1.00
PMH4/70	Harness 4 way			£19.55	1.50
D15/23	15 over 15 slot length 2.8'		15dBd	36.80	2.20
CR/23	Corner reflector		14.8dBd	£35.08	2.20
SBM4	Yagi 4 ele Band 2			£16.45	2.20
SBM6	Yagi 6 ele Band 2			£24.04	2.20
SMC					
GP2U	Ground Plane: folded radiator		1.7'	£5.75	1.70
SMC-HS					
GDXA	Discone 100-440MHz			£34.90	2.20
SMCGDX1	Discone 80-480MHz 3dB¼		3.3'	£41.40	2.20
SMCGDX2	Discone 50-480MHz 3dB¼		6.2'	£47.95	2.20
SMCVHFL	Discone 65-520MHz, Rx only		5.0'	£16.85	2.20
SMCGP144W	Colinear 2M, ⅝λ, 6.5dB¼		10.2'	£24.90	2.20
SMCGP2M	⅝λ, 2M ground plane, 3.4dB¼		4.6'	£15.70	2.20
SMCSQ144	2M Swiss Quad. Vertical polarised			£52.90	2.20
SMCGP432X	Colinear 70cm, 3×⅝λ, 6.8dB¼		5.6'	£25.70	1.70
SMC70N2V	Vert. 2.8dB¼ 2M, 5.7dB¼ 70cm		3.6'	£25.70	2.20
SMC2HB6	6M, 2ele, HB9CV Beam			£19.95	2.20
TELEWAND					
TW435D	Discone 400-1200MHz		1.2'	£26.45	0.85

ANTENNA ROTATORS

KR500	Kenpro, elevation Meter calb ± 90°	£86.25	Free
KR400	Kenpro bell, box as KR500	£86.25	Free
RLD3	SMC, Bell Auto control	£38.53	Free
AR30	CDE, Offset Turn and Push	£51.75	Free
9508	Channel Master, offset	£74.75	Free
9502B	Channel Master, offset	£54.63	Free
KR250	Kenpro, Bell Twist Switch	£44.85	Free
AR40	CDE Turn and Push	£65.55	Free
KR400RC	Kenpro Round meter 360°	£90.85	Free
AR50	CDE 5 position pre-selector	£113.85	Free
CD45	CDE 8 × 4cm meter readout	£113.85	Free
KR600RC	Kenpro Round meter 360°	£132.25	Free
Ham IV	CDE 8 × 4cm meter readout	£189.75	Free
KR2000RC	Kenpro Heavy Duty 360° meter	£241.50	Free
T2X	CDE 8 × 4cm meter readout	£270.25	Free
H300	Hy Gain Digital readout	£451.95	Free

ROTOR ACCESSORIES

CD562	Bearing CDE AR30 etc.	£7.76	1.25
AK 121	Adaptor Kit, CDE Bell to plate	£4.60	0.90
50425	Clamps/U Bolts ST CDE AR40 etc	£4.95	1.25
50463	Clamps/U Bolts HD CDE CD45 HAM4	£7.36	1.85
51472	Mast Mount Kit ST CDE HAM4 etc.	£12.08	2.10
51467	Mast Mount Kit HD CDE T2X etc.	£24.15	2.10
9523	Support Bearing Channel Master	£14.38	1.70
9525	Rotary Bearing Channel Master	£14.38	1.20
KS050	Rotary Bearing 1⅛" Kenpro	£12.25	1.40
KS065	Rotary Bearing 2" Kenpro	£17.65	1.85
KC038	Lower Mast Clamp KR400, KR600	£9.95	1.70
RC5W	5 Way AR30 AR40 KR400RC	p/m £0.35	
RC6W	6 Way KR250/400/500/600RC	p/m £0.48	
RC8W	8 Way CD45 Ham 4 T2X KR2000RC	p/m £0.52	

ANTENNA/MAST FITTINGS

CABLE GRIPS					
CG5	Bulldog Grip 5mmD (0.1875") Galv.		£0.17	0.55
CG6	Bulldog Grip 6mmD (0.125") Galv.		£0.18	0.55
HD9	Brass Line Clamp for copper wire		£0.55	0.55
WALL BRACKETS (STAND OFF'S)				
W12	12" c/w 2" U Bolts T Section	Pr	£7.75	2.60
W18	18" c/w 2" U Bolts T Section	Pr	£10.06	2.60
W21	21" c/w 2" U Bolts T Section	Pr	£10.92	2.60
W21HD	21" HD c/w 2" U Bolts D with Brace	Pr	£12.92	2.10
W24	24" c/w 2" U Bolts T Section	Pr	£13.23	2.80
W24HD	24" HD c/w 2" U Bolts with Brace	Pr	£15.48	2.80
D SHACKLE (PIN SIZE)				
DS6	6mm (¼ins)		£0.32	0.55
DS8	8mm (⁵⁄₁₆ins)		£0.37	0.55
DS10	10mm (⅜ins)		£0.47	0.55
DS11	11mm (⁷⁄₁₆ins)		£0.75	0.55
GUY ROPES				
HTS3	HT Steel 3mmD 1×19 BS 720Kg	p/m	£0.26	
HTS4	HT Steel 4mmD 1×19 BS 1285Kg	p/m	£0.32	
HTS5	HT Steel 5mmD 1×19 BS 2000Kg	p/m	£0.25	
HTS6	HT Steel 6mmD 1×19 BS 2875Kg	p/m	£0.48	
X150	Rustproof 3mmD Multistrand	150m	£20.59	2.60
FE7X18G100	Galvanised 7 by 18 Gauge	100'	£6.90	2.80
FE7X18G300	Galvanised 7 by 18 Gauge	300'	£20.13	4.20
TPS3	Terylene 3mmD BS 70Kg	p/m	£0.10	
TPS4	Terylene 4mmD BS 295Kg	p/m	£0.15	
TPS6	Terylene 6mmD BS 570Kg	p/m	£0.22	
TPS8	Terylene 8mmD BS 1110Kg	p/m	£0.37	
GUY STAKES				
GS18	18" 'T' section 38×38×5mm Galv.		£4.08	2.10
GS27	27" 'T' section 38×38×5mm Galv.		£5.64	2.50
GS36	36" 'T' section 51×51×6mm Galv.		£10.64	3.70
GUY TENSIONERS				
TPR933	Turnbuckle 115×8mm, 4.5"		£2.70	0.90
RS150X10	Turnbuckle 150×10mm, 6"		£5.12	1.30
MAST FITTINGS (2" MASTS)				
SMCMP3	Guy Plate 3 hole		£1.38	0.75
SMCMP4	Guy Plate 4 hole		£2.19	0.75
SMCMB3	Guy Band 3 hook		£1.61	0.85
SMCMB4	Guy Band 4 hook		£2.24	1.05
SMCMC1	Cap. Cast Alloy		£3.74	0.80
SMCMBP1	Base Plate Alloy Shoe		£5.58	0.95
THIMBLES				
THIM30	Galv. 30mm OA (1.25") for Wire		£0.18	0.50
THIM38	Galv. 38mm OA (1.5") for Wire		£0.21	0.50
THIM44	Galv. 44mm OA (1.75") for Wire		£0.23	0.50
THIM51	Galv. 51mm OA (2.0") for Wire		£0.28	0.50
F1235	Nylon 30mm OA (1.25") for Terylene		£0.20	0.50
F985	Nylon 38mm OA (1.5") for Terylene		£0.24	0.50
MASTING				
AL32X16G	Aluminium 1.25" 16 Gauge	p/m	£1.83	
AL38X16G	Aluminium 1.50" 16 Gauge	p/m	£2.21	
AL49X7G	Aluminium Nom 2" 7 Gauge	p/m	£4.54	
MISCELLANEOUS HARDWARE				
RB6	Rawlbolt 6mm Bolt		£0.32	0.50
RBD20	Rawlbolt 8mm Bolt		£0.51	0.50
RBE19	Rawlbolt 10mm Bolt		£0.61	0.60
RBG20	Rawlbolt 12mm Bolt		£1.08	0.70
RB16	Rawlbolt 16mm Bolt		£2.66	1.30
PSS25	Pulley 25mm winch		£0.76	0.50
PSS38	Pulley 38mm winch		£0.94	0.50
55904	Cable clip 10-14mm		£0.10	0.50
55903	Cable clip 7-10mm		£0.08	1.10
SMC53	Mast to boom clamp 1-2" to 1"		£1.73	1.40
SMC63	Mast to boom clamp 1-2" to 1-1.25"		£2.19	2.10
SMC73	Mast to boom clamp 1-2" to 1" H.D.		£2.82	2.10
SMC59/15	Mast sleeve 15" for 2"		£6.61	2.10
SH63	Shap hook 63mm O/A		£0.99	0.50
UBOLT2	'U' Bolt 2" Centre 9mm Galv.		£0.46	0.60
ER4	Earth rod copperweld 4', c/w Clamp		£6.15	2.10
SMC2LK	Double lashing kit		£13.80	2.50
SMCCP1	Cross over plate 5"×5"×¼"		£4.77	1.90

CARRIAGE

Carriage charges (shown after the item price) are for the mainland only (excluding post) and the rates shown are for one off of the item. Where more than one article is ordered, total freight charge is likely to be *much* lower than the sum of the individual charges.

Cables, ropes and masting are normally despatched by Roadline. Carriage is £2.00 to 7Kg thereafter add an extra £0.15 per Kg. (Mainland.)

Where Securicor delivery on an item, or any number of items combined, is possible (i.e., less than 25Kg/55lbs and 5'6" long) it is charged at £4.49 per lot.

If in doubt of carriage send a cheque crossed, "not more than £ . . . ."

ALL PRICES INCLUDE VAT @ 15%.

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Buckley (0244) 549563
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76 High Street,
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Kidsgrove (07816) 72644
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247A Freeman Street,
Grimsby, Lincs.
Grimsby (0472) 59388
9.30-5.30 Tues.-Sat.

SMC AGENTS

Neath	John	GW4FOI	(0639) 55114 Day (0639) 2942 Eve	
Stourbridge	Brian	G3ZUL	(03843) 5917	
Bangor	John	GI3KDR	(0247) 55162	
Tandragee	Mervyn	GI3WWY	(0762) 840656	
Edinburgh	Jack	GM8GEC	(031657) 2430 Day (031665) 240 Eve	
Jersey	Geoff	GJ4ICD	(0534) 26788	

AMATEUR RADIO EXCHANGE

Brenda G8SXY and Bernie G4AOG invite you to see them on their Stand at Leicester for the warmest welcome, the widest range, the best deals... and if you can't get to the Granby Halls, phone or write for our helpful and efficient Mail Order service.

First, our scanning receivers, and to lead off, the **MAXIMAL MK-4000** (right) with FM coverage of 70-87.9875MHz and 140-175.9875MHz in 12.5kc steps on both bands. Sensitivity is 0.5µv S/N 20dB, and selectivity ±15KHz at –50dB, and its AF output is more than 1.3W. All that, plus a built-in digital clock, for just **£99.00.**

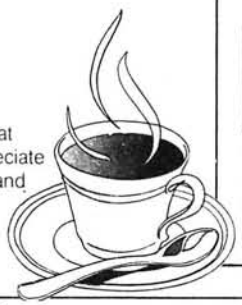
Next, two really first-class digital-readout scanning receivers, the **CORONA CD-3000** and **CD-4000** (pictured). Their identical format presentation conceals totally different specifications as follows.

CD-3000 Professional-standard air-band receiver covering 110-139.995MHz on AM in 5kc steps. With sensitivity of 0.5µv S/N 10dB, this is tremendous value at **£89.00.**

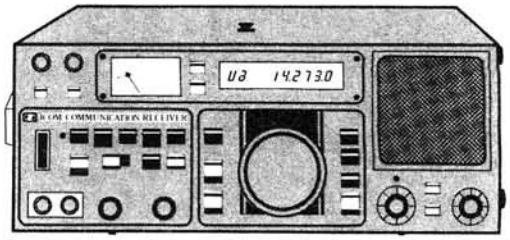
CD-4000 (left) For full coverage of public services, amateur and marine bands between 140 and 159.995MHz on FM at a price of only **£69.00.**

Finally, the **FAIRMATE AS-10960** (below), which covers VHF from 140 to 175.995MHz and UHF from 275 to 410MHz and is programmable to 10 selected frequencies in 5kc increments. Also featuring memory and priority channels, it is tremendous value at **£95.00.**

Reading specifications and looking at pictures are all very well, but the best way to appreciate the quality of these exclusive imports is to come and hear them if at all possible... and that way you'll get a cup of Brenda's coffee too while you're making up your mind which one (ones?) to buy!



Another item seen on our trip to Japan... the new ICOM general coverage receiver. Having tried it, we are convinced that this could well become the market leader in its field. With features like these, everyone who wants the best in today's receiver technology will now be asking for ICOM.



ICR-70
- **Tunable from 100kc to 30MHz**
- **AM/SSB/FM right across the range**
- **Pass band tuning • Scan facility**
- **Notch filter • Two VFO's**

Whether you want to buy outright or part-exchange your existing receiver, phone or call in without delay and be one of the first to enjoy a remarkable new experience in general coverage radio reception.

Ever wanted to decipher all those funny morse code (CW) and radio teletype (RTTY) noises you hear on your communications receiver? Well, now you can – with the new TASCO Morsemaster CWR-600.

Simply connect the input side of the Morsemaster to your receiver or transceiver, and the output either to a domestic TV (UHF) or to a proper VDU which we can also supply. RTTY and CW will be automatically demodulated and displayed on the screen, CW at speeds of up to 250 characters per minute, RTTY between 45.5 and 110 Bauds.

£189

LICENSED CREDIT BROKERS ✻ Ask for written quotation on HP terms. Also interest-free terms with 50% deposit.

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Prices are correct as we go to press, but we reserve the right to vary them if forced to do so by the time this advertisement appears.

YAESU

FT 102	160-10M 9-Band Trans.	NEW	699.00
FT-ONE	Gen. Coverage Trans.	NEW	1295.00
FT 790R	70cm all-mode portable	NEW	295.00
FT 101ZFM	160-10m 9-Band Transceiver		590.00
FT 101ZDFM	160-10m 9-Band Transceiver		P.O.A.
DIGT 101Z	Digital unit		90.00
DCT 101Z	DC Adaptor		42.50
FV 101Z	Remote vfo		112.00
FT 902DM	9-Band AM/FM Transceiver		885.00
FC 902	9-Band atu, swr/pwr etc.		135.00
FTV 901R	Transverter fitted 2m module		285.00
430TV	70cm module for above		185.00
144TV	2m module for Transverter		100.00
70TV	4m module for Transverter		80.00
FV 901DM	Remote vfo for 901		260.00
SP 901	External speaker		31.00
FL 2100Z	9-Band 1200W linear		425.00
FT 107	9-Band 100W solid state		699.00
FT 107DMS	As above with memory		779.00
DMST 107	Memory unit		92.75
FV 107G	Remote VFO for above		98.50
SP 107G	External speaker		29.90
FC 107G	Aerial tuning unit		112.70
FP 107	230V AC power module		101.95
FP 107tG	Cased PSU with speaker		113.00
FT 707	8-Band solid state 100W		545.00
FP 707	230 volts AC power supply		125.00
FC 707	Aerial tuner (unbalanced only)		85.00
MR 7	Metal rack for above		15.70
MMB 2	Mobile mounting bracket		16.00
FRG 7	0.5-30MHz receiver		199.00
FRG 7700	SSB/AM/FM recvr. dig. readout		299.00
MEM 7700	Memory unit for above		90.00

CONVERTERS FOR ABOVE

FRV 7700A	118-150MHz	69.75
FRV 7700B	50-60MHz & 118-150MHz	75.50
FRV 7700C	140-170MHz	65.95
FRV 7700D	70-80MHz & 118-150MHz	72.45
FRT 7700	Receiver aerial tuner	37.85
FF 5	LF filter for above	9.95
FT 480R	2m all-mode transceiver	365.00
FP 80A	230V AC power supply	63.00
FT 780R	70cm all-mode transceiver	449.00
FT 290RM	**SPECIAL** 2m all-mode portable with ARE mods	249.00
NC 11C	AC charger	8.00
CSI-1	Carrying Case	3.45
MMB-11	Mobile mounting bracket	22.25
FT 208R	2m synthesized portable FM	199.00
NC 9C	AC charger	8.00
FT 708R	70cm hand-held	209.00

TRIO-KENWOOD

TS 930	Gen. coverage trans.	NEW	999.00
TS 830S	160-10m transceiver 9 bands		650.00
AT 230	All-band ATU power meter		110.00
YK 88C	500Hz CW filter		29.60
YK 88CN	270 Hz CW filter		32.60
TS 530S	160-10m trans. 200W pep digital		475.00
TS 130S	8-band 200W pep		499.00
TS 130V	8-band 20W pep		445.00
AT 130	100W antenna tuner		79.00
TR 2300	2m FM synthesised portable		166.75
TR 2500	2m FM synthesised handheld		207.00
HC 10	Digital desk World 58.75		
DM 801	Dip meter		60.00
TR 7730	New 25W FM transceiver		247.00
R 600	Gen. Coverage Receiver		199.00

ICOM

IC 740	Multimode H.F. trans.	NEW	P.O.A.
ICR 70	New multimode receiver		P.O.A.
IC 730	HF mobile transceiver 8-band		586.00
IC 720A	HF trans. and gen. cov. receiver		795.00
PS 15	Power suply for 720A		99.00
IC 251E	2m multimode base station		499.00
IC 25E	2m synth. compact 25W mobile		259.00
IC 290E	2m multimode mobile		366.00
IC 24G	2m FM mobile 10W		169.00
IC 2E	2m FM synthesised handheld		159.00
IC 4E	70cm handheld		199.00
IC L1/2/3	Soft cases		3.50
IC HM9	Speaker/microphone		12.00
IC CP1	Car charging lead		3.20
IC BP2	6V Nicad p-ack for IC 2E		22.00
IC BP3	9V Nicad pack for IC 2E		17.70
IC BP4	Empty case for 6 X AA Nicads		5.80
IC BP5	11.5V Nicad pack for IC 2E		30.50
IC DC1	12V adaptor pack for IC 2E		8.40

MICROWAVE MODULES

MMT 144/28	2m Transverter for HF Rig	109.95
MMT 432/28S	70cm Transverter for HF Rig	159.95
MMT 432/144R	70cm Transverter for 2m Rig	184.00
MMT 70/28	4m Transverter for HF Rig	115.00
MMT 1296/144	23cm Transverter for 2m Rig	184.00
MML 144/30LS	2m 30W lin. Amp (3W1/P)	69.95
MML 144/50S	2m 50W lin. Amp (10W1/P)	85.00
MML 144/100S	2m 100W lin. Amp (10W1/P)	139.95
MML 144/100LS	2m 100W linears (1/3W1/P)	159.95
MML 432/20	70cm 20W linear Amp (3W1/P)	85.00
MML 432/50	70cm 50W linear Amp	109.95
MML 432/100	70cm 10/100W linear Amp	228.65
MM 2001	RTTY to TV converter	189.00
MM 4000	RTTY transceiver	269.00
MM 4000KB	Ditto with Keyboard	299.00
MMC 50/28	6m converter to HF Rig	29.90
MMC 70/28	4m converter to HF Rig	29.90
MMC 114/28	2m converter to HF Rig	29.90
MMC 432/28S	7cm converter to HF Rig	37.90
MMC 432/144S	70cm converter to 2m Rig	37.90
MMC 435/600	70cm ATV converter	27.90
MMK 1296/144	23cm converter to 2m Rig	69.95
MMD 050 500	500MHz dig. frequency meter	75.00
MMD 600P	600MHz prescaler	29.90
MMDP 1	Frequency counter probe	14.90
MMA 28	10 meter pre amp	16.95
MMA 144V	2m RF switched pre amp	34.90
MMF 144	2m band pass filter	11.90
MMF 432	70cm band pass filter	11.90
MMS 1	The morse talker	115.00
MMS 2	Bldrs. Adv. morse trainer	169.00

DATONG

PC 1	Gen. Cov. Converter HF on 2m	137.42
VLF	Ver Low Frequency Converter	29.90
FL 1	Frequency Agile Converter	79.35
FL 2	Multi-mode Audio Filter	89.70
FL 3	FL 2 with Auto Notch	129.37
ASP	Auto R.F. Speech Clipper (Trio or Yaesu plug)	82.80-89.70
D 75	Manually controlled R.F. Speech clipper	56.35
RFC/M	R.F. Speech Clipper Module	29.90
D 70	Morse Tutor	56.35
AD 2700	Indoor Active Filter (inc. PSU)	54.05
AD 370	Outdoor Active Filter (inc. PSU)	71.30
MK	Keyboard morse sender	137.42
PS 1	Programmable Tone Sweltch System (2 units)	45.99
RFA	Wideband preamplifier	33.92
MPU	Mains Power Unit	6.90

MORSE EQUIPMENT

MK 704	Squeeze paddle	10.50
HK 707	Up/Down key	10.50
EK 150	Electronic Keyer	74.00

ROTATORS

KR 250	Kenpro Lightweight 1-1½" mast	44.95
9502B	Colorotor (Med. VHF)	55.00
KR 400RC	Kenpro – inc. lower clamps	99.95
KR 600RC	Kenpro – inc. lower clamps	139.95

BENCHER

BY 1	Keyer Paddle (black base)	32.00
BY 2	Keyer Paddle (chrome base)	39.95
BY 3	Keyer Paddle (gold plated)	92.00
ZA 1A	Balun 3.5-30MHz for dipoles	12.65
ZA 2A	Balun 14-30MHz for beam antennas	13.80

TONO

THETA 9000E	RTTY/CW/ASC11	650.00
THETA 7000E	RTTY/CW/ASC11 Receive only	550.00
THETA 350	As above, basic unit	259.00
THETA 550	The latest a Winner!	299.00

AMPLIFIERS

UC 70	430MHz 55W + preamp	149.00
2M-50W	144MHz 30-50W	65.00
2M-100W	144MHz 100W + preamp	115.00
MR 150W	144MHz 130-150W + preamp	159.00
MR 250W	144MHz 250W + preamp	259.00

TASCO

TeleReader CWR 685A RTTY/CW/ASC11	699.00
TeleReader CWR 670E As above RX only	259.00
MorseMaster CWR 600 As above basic unit	189.00

WELZ

SP 200	1.8-160MHz 20W-200W-1KW	59.00
SP 300	1.8-500MHz 20W-200W-1KW	79.00
SP 400	130-500MHz-5W-20W-150W	59.00
SP 15M	1.8-150MHz 0-2.5-20-200W	29.00
SP 380	1.8-500MHz 20-200W	49.00
AC 38M	8-band ATU 400W	59.95
CT-15A	DC-450MHz dummy load	6.95
CT-15N	As above N-type socket	11.75
CH 20A	DC-450MHz coax switch SO239	15.95
CH 20N	As above – N-type sockets	23.95

MOBILE SAFETY MICROPHONES

ADONIS AM 202S	Clip on	20.95
ADONIS AM 202F	S/neck + up/down btns.	30.00
ADONIS AM 202H	H/Band + up/down btns.	30.95

DRAE

FULLY PROTECTED POWER SUPPLIES

4 amp	27.95	6 amp	44.95
12 amp	69.00	24 amp	99.00
VHF Wavemeter	130-450MHz		24.95
Morse Tutor			47.00

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Closed Wednesday at Acton and Monday at St Helens, but use our 24-hour Ansafone service at either shop.

The professional

IC-Rx70, The very latest from Icom! £469.

The New Rx 70 receiver from Icom is designed to provide a really stunning performance at a price not much greater than its inferior competitors.

It covers all modes (when the FM option is included), uses 2 CPU – driven VFO's for split frequency working, has 3 IF frequencies – 70MHz, 9MHz and 455KHz and a dynamic range of 100dB.

Other features are:-
Input switchable through a pre-amplifier, direct or via an attenuator.
Selectable tuning steps of 1KHz, 100Hz or 10Hz.
Adjustable IF bandwidth in 3 steps (455KHz)
Noise limiter. Switchable AGC. Tunable notch filter.
Squelch on all modes. RIT. Tone control.
Tuning LED for FM (discriminator centre indicator)
Recorder output. Dimmer control.
Separate antenna sockets for LW-MW with automatic switching.
Large front mounted loudspeaker - 5.8W output.
Frequency stability 1st hour ± 250Hz, thereafter ± 50Hz, sensitivity -SSB/CW/RTTY better than 0.32 μv for 12 dB $\frac{S+N}{N}$.
Am – 0.5 μv, FM better than 0.32 for 12 dB Sinad.
Built in mains supply – DC optional.
Size 286mm x 110mm x 276mm – weight 7.4Kg.

IC-25E, The Tiny Tiger £239.inc.

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

Remember we also stock Yaesu, Jaybeam, Datong, Welz G-Whip, Western, TAL, Bearcat, RSGB Publications.

Agents (phone first – all evenings and weekends only, except Scotland).
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Midlands – Tony G8AVH (021 32 - 2305)
North West – Gordon G3LEQ (0565 4040 Ansafone available)

Introducing the NEW IC-740. £699.

This latest transceiver contains all the most asked-for features, in the most advanced solidstate HF base station on the amateur market...performing to the delight of the most discerning operator.

Study the front panel controls of the ICOM IC-740. You will see that it has all of the functions to give maximum versatility to tailor the receiver and transmitter performance to each individual operator's requirements.

Features of the IC-740 receiver include a very effective variable width and continuously adjustable noise blanker, continuously adjustable speed AGC, adjustable IF shift and variable passband tuning built in. In addition, an adjustable notch filter for maximum receiver performance, along with switchable receiver preamp, and a selection of SSB and CW filters. Squelch on SSB Receive and all mode capability, including optional FM mode. Split frequency operation with two built-in VFO's for the serious DX'er.

The IC-740 allows maximum transmit flexibility with front panel adjustment of VOX gain and VOX delay along with ICOM's unique synthesized three speed tuning system and rock solid stability with electronic frequency lock. Maximum versatility with 2 VFO's built in as standard, plus 9 memories of frequency selection, one per band, including the new WARC bands.

With 10 independent receiver and 6 transmitter front panel adjustments, the IC-740 operator has full control of his station's operating requirements.

See and operate the versatile and full featured IC-740 at your authorized ICOM dealer.

Options include:
- FM Module
- Marker Module
- Electronic Keyer
- 2 - 9MHz IF Filters for CW
- 3 - 455MHz Filters for CW
- Internal AC Power Supply

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- UP/DWN Microphone
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- Headphones
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The World's most popular portables IC-2E £159. IC4E £199.inc.

and now the marine version IC-M12 £199+VAT.

Nearly everybody has an IC-2E, the most popular amateur transceiver in the world, now there is the 70cm version which is every bit as good and takes the same accessories.

Fully synthesized – Covering 144-145.995 in 400 5KHz steps. (430-439.99 4E). **Power output** – 1.5W. **BNC antenna** output socket. **Send/Battery indicator. Frequency selection** – by thumbwheel switches, indicating the frequency. 5KHz switch-adds 5KHz to the indicated frequency. **Duplex Simplex switch** – gives simplex or plus 600KHz or minus 600KHz transmit (1.6MHz and listen input on 4E). **Hi-Low switch** – 1.5W or 150mW. **External microphone jack. External speaker jack.**

The IC-4E is revolutionising 70cm!

Multimode Mobiles IC-290E £366. IC-490E £445.inc.

290E-144-146 MHz/490E-430-440 MHz. 10 W RF output on SSB, CW and FM. Standard and non-standard repeater shifts. 5 memories and priority channel.

Memory scan and band scan, controlled at front panel or microphone. Two VFO's. LED S-meter. 25KHz and 1KHz on FM – 1KHz and 100KHz tuning steps on SSB. Instant listen for repeaters.

IC-720A Possibly the best choice in HF. £883.inc.

One way of keeping up with rapidly advancing technology is to look at what the IC-720A offers in it's BASIC form. How many of it's competitors have two VFO's as standard, or a memory which can be recalled, even when on a different band to the one in use, and result in instant retuning AND BANDCHANGING of the transceiver? How many include really excellent general coverage receiver covering all the way from 100KHz to 30MHz? How many need no tuning or loading whatsoever? and take care of your PA, should you have a rotten antenna. How many have an automatic RIT which cancels itself when the main tuning dial is moved? How many will run full power out for long periods without overheating? How many have band data output to automatically change bands on a solid state linear AND an automatic antenna tuner unit?

The IC-720A may be just a little more expensive than some, but it's better than most! Make your choice an IC-720A.

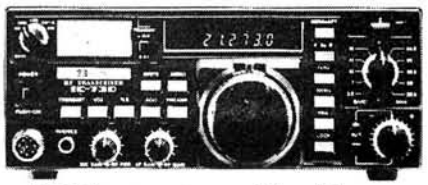
IC-PS15 Mains PSU £99.

Tono RTTY and CW computers 7000E £500. 9000E £650.inc.

The TONO range of communication computers take a lot of beating when it comes to trying to read RTTY and CW in the noise. Others don't always quite make it!

Check the many facilities offered before you buy – especially look at the 9000E which also throws in a Word Processor. Previous ads have told you quite a lot about these products – but why not call us for further information and a brochure?

IC-730 The best for mobile or economy base station-£586.inc.



ICOM's answer to your HF mobile problems – the IC-730. 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 of 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 what's more a memory is provided for one channel per hand. Further convenience circuits are provided such as Noise Blanker, Vox, CW Monitor APC and SWR Detector to name a few. A built in Speech Processor boosts talk power on transmit and a switchable RF Pre-Amp is a boon on today's crowded bands.

Great base stations IC-251 £499. IC-451 £569.inc.

ICOM produce a perfect trio in the UHF base station range, ranging from 6 Meters through 2 Meters to 70 cms. Unfortunately you are not able to benefit from the 6m product in this country, but you CAN own the IC-251E for your 2 Meter station and the 451E for 70 cms. Mains or 12 volt supply. SSB, CW and FM.

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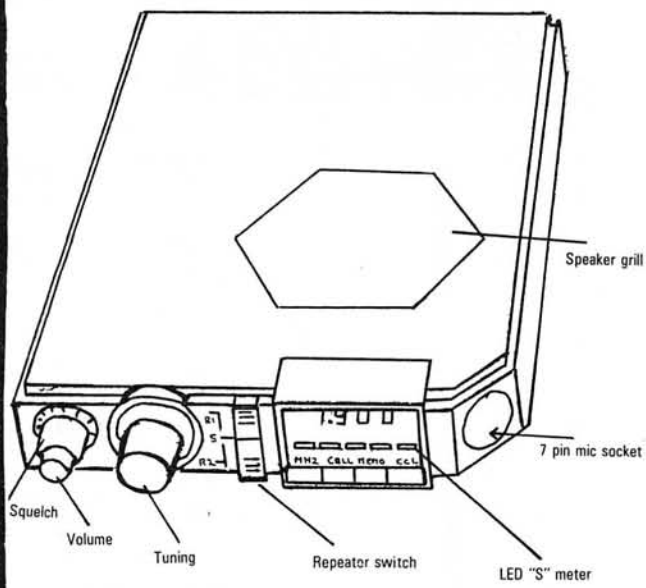

NEW – THE STANDARD C8900

SPECIFICATIONS

GENERAL	
Frequency coverage	144-146MHz
Mode of operation	F3
Voltage	DC 13.8V
Power drain	2.8 Amp TX. 0.4 Amp RX-Standby
Polarity	Negative only
Dimensions (H × W × D)	**31 × 138 × 178 mm**
Weight	**1.1 Kg**
TRANSMITTER	
RF power output	10 watt minimum
Spurious emission	60dB
Maximum deviation	± 5 KHz
Modulation	Reactance modulation
RECEIVER	
Sensitivity	– 10dB (12 dB SINAD)
Bandwidth	± 7.5 KHz (– 6 dB)
Receiver system	Double superheterodyne
Intermediate frequency	1st IF 10.7 MHz 2nd IF 455 KHz
Selectivity	More than 60 dB
Squelch sensitivity	– 16 dB
Audio output	2 W (into 8 ohms with 10% THD)

AVAILABLE SOON – C7900
A 70cm version will be available soon. Its physical size witll be exactly the same but it will have a 1.6 MHz shift fitted. The 2 units will stack together.
Unfortunately we will not have stocks until late December or early January but we do have a Japanese model in the shop now. Come in and see it for yourself.

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TA550	Mobile 1/2 wave 138-180MHz snap-in mount 3dB gain	14.66
TA330	Mobile 70cm co-linear 6dB snap-in mount	9.95
TA3MM	Magnetic mount with 5 mtrs coax PL259 fitted	9.75
TA309/MM	TA309 aerial and TA3MM package	16.95
TA3	Solid gutter mount with 3/8 inch hole for all TA aerials	4.31
TAMSP	Folding Gutter mount, takes SO239 socket	7.50
TA3GC	Gutter clip for all TA aerials 5 mtrs coax and PL259	10.35
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HELICALS		
	4 types available:–	
BNC PL259	Long/short threaded types to suit Icom, Standard Trio etc	4.50
TA285D	6dB base station co-linear 144-148MHz with radials	29.95
TA485D	6dB base station co-linear 430-435MHx with radials	29.95
DPLC22	6.5dB mobile co-linear 144-146MHz	29.95
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UR67/213	50 ohm solid centre – low loss, price per metre	0.65
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CX120A	Direct solder connection	9.75
CM230	DC-500MHz fitted with 3 × BNC sockets	19.95
CX600N	DC-1GHz 3 × 'N' type sockets	24.95
COAX SWITCHES		
CT1	Toggal 2-in, 1-out 3 × SO239	6.84
CT2	Toggal 2-in, 1-out 2 × SO2391 × PL259	6.84
TS120	Coax slide 2-in, 1-out 3 × SO239	6.61
SA450	Diecast box 3.5-500MHz 3 × SO239	9.77
DUMMY LOADS		
DL30	30w DC-150MHz with PL259 connector	6.84
T100	100w DC 500MHz with SO239 connector	20.12
T200	200w DC 500MHz with SO239 connector	31.62

		Excl. VAT	Incl. VAT
BEARCAT SCANNING RECEIVERS			
BC-100	16 channels (handheld)	250.00	287.50
BC-150 FB	10 channels	113.00	129.95
BC-220 FB	20 channels	173.00	198.95
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BC-46	THINSCAN 4 band 6 channel (handheld)	84.00	96.60

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SWR15	Single meter SWR/FS 3.5-150MHz	9.25
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Better Dynamic Range
The extra high-level receiver front end uses 24 VDC for both RF amplifier and mixer circuits, allowing an extremely wide dynamic range for solid copy of the weak signals even in the weekend crowds. For ultra clear quality on strong signals or noisy bands the high voltage JFET RF amplifier can be simply bypassed via a front panel switch, boosting dynamic range beyond 100dB. A PLL system using six narrow band VCOs provides exceptionally clean local signals on all bands for both transmit and receive.

Total IF Flexibility
An extremely versatile IF Shift/Width system, using friction-linked concentric controls and a totally unique circuit design, gives the operator an infinite choice of bandwidths between 2.7kHz and 500Hz, which can then be tuned across the signal to the portion that provides the best copy sans QRM, even in a crowded band. A wide variety of crystal filters for fixed IF bandwidths are also available as options for both parallel and cascaded configurations. But that's not all; the 455kHz third IF also allows an extremely effective IF notch tunable across the selected passband to remove interfering carriers, while an independent audio peak filter can also be activated for single-signal CW reception.

New Noise Blanker
The new noise blanker design in the FT-102 enables front panel control of the blanking pulse width, substantially increasing the number of types of noise interference that can be blanked, and vastly improving the utility of the noise blanker for all types of operation.

Commercial Quality Transmitter
The FT-102 represents significant strides in the advancement of amateur transmitter signal quality, introducing to amateur radio design concepts that have previously been restricted to top-of-the-line commercial transmitters; far above and beyond government standards in both freedom from distortion and purity of emissions.

Transmitter Audio Tailoring
The microphone amplifier circuit incorporates a tunable audio network which can be adjusted by the operator to tailor the transmitter response to his individual voice characteristics before the signal is applied to the superb internal RF speech processor.

IF Transmit Monitor
An extra product detector allows audio monitoring of the transmitter IF signal, which, along with the dual meters on the front panel, enables precise setting of the speech processor and transmit audio so that the operator knows exactly what signal is being put on the air in all modes. A new "peak hold" system is incorporated into the ALC metering circuit to further take the guesswork out of transmitter adjustment.

New Purity Standard
Three 6146B final tubes in a specifically configured circuit provide a freedom from IMD products and an overall purity of emission unattainable in two-tube and transistor designs, while a new DC fan motor gives whisper-quiet cooling as a standard feature. For the amateur who wants a truly professional quality signal, the answer is the Yaesu FT-102.

New VFO Design
Using a new IC module developed especially for Yaesu, the VFO in the FT-102 exhibits exceptional stability under all operating conditions.

ANCILLARY EQUIPMENT

SP-102 EXTERNAL SPEAKER/AUDIO FILTER
The SP-102 features a large high-fidelity speaker with selectable low- and high-cut audio filters allowing twelve possible response curves. Headphones may also be connected to the SP-102 to take advantage of the filtering feature, which allows audio tailoring for each bandwidth and mode of operation to obtain optimum readability under a variety of conditions.

FC-102 1.2 KW ANTENNA COUPLER

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East Anglia – Amateur Electronics UK, East Anglia, Dr. T. Thirst (TIM) G4CTT, Norwich 0603 66189
North East – North East Amateur Radio, Darlington 0325 55969
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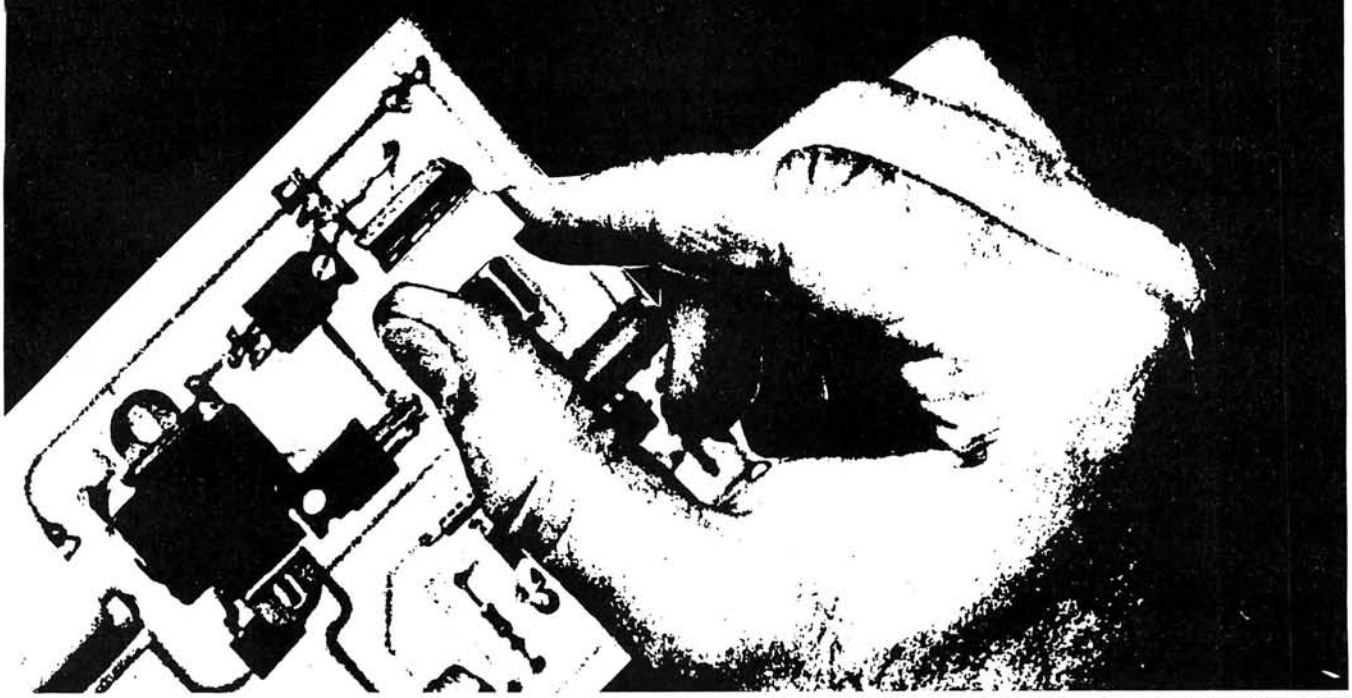

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Sony are well known for the innovations and the new ICF2001 is no exception. This receiver covers the full spectrum from 200kHz to 30mHz plus the FM broadcast band. The clear LCD display gives precise frequency readout to 1kHz and the set has six memories for storing popular frequencies. Its diminutive size and complete portability means you can take it anywhere. Powered from internal dry cells it is just as happy on an executive desk as it is in the radio shack. The telescopic aerial gives very creditable performance together with built in aerial tuner. Plug in the external aerial and the World is at your finger tips. It handles both SSB and AM signals and with excellent FM reception can equally double as a domestic receiver. The dual speed electronic tuning and fine tune vernier control make this set a remarkable package at a price that is quite amazing. As the only officially appointed amateur radio Sony dealer in the UK we can give you the kind of after sales service that has made us second to none.

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A new high sensitivity circuit ensures that even the weakest of signals can be copied and there is an external aerial socket so that it can be used indoors as a base station monitor. Extensive fatigue-free monitoring is possible using the squelch control setting and a built-in earphone socket provides for private listening. Included with the set is a flexible rubber antenna, rechargeable batteries and AC mains charger.

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comment...

W(h)ither Amateur Radio?

TWO WORRYING new developments cause me to wonder whether licensed amateur radio as we know it has a future.

The first is the arrival on the h.f. bands of a new narrow-band "woodpecker", which has been heard intermittently during the day and evening on frequencies ranging from about 14·2 to 21·2MHz, favouring the amateur band segments, but also invading the broadcast bands. Analysis of the signals reveals there are at least four transmitters, radiating pulses at 100ms intervals with identification encoded on the pulse top. Often "echoes" can be detected some 90ms after the transmitted pulse, but sometimes weak "second-trace" echoes return after the following transmitted pulse. What is the function of this interloper?

The second, and far more worrying development, is the reported decision of the UK Ministry of Defence to close the band 430–440MHz to amateurs. According to our sources, different spokesmen at the Home Office have differing ideas on how serious this threat is, one saying that amateurs will be shut out, another saying there is no real problem. The MoD is saying nothing. At WARC '79, equal status in the band was given to amateurs and radiolocation systems in Region 1 (Europe and Africa) with some national variations. The MoD's long-standing annexation of the band and the amateurs' relegation to secondary status was not registered as a UK variation at WARC.

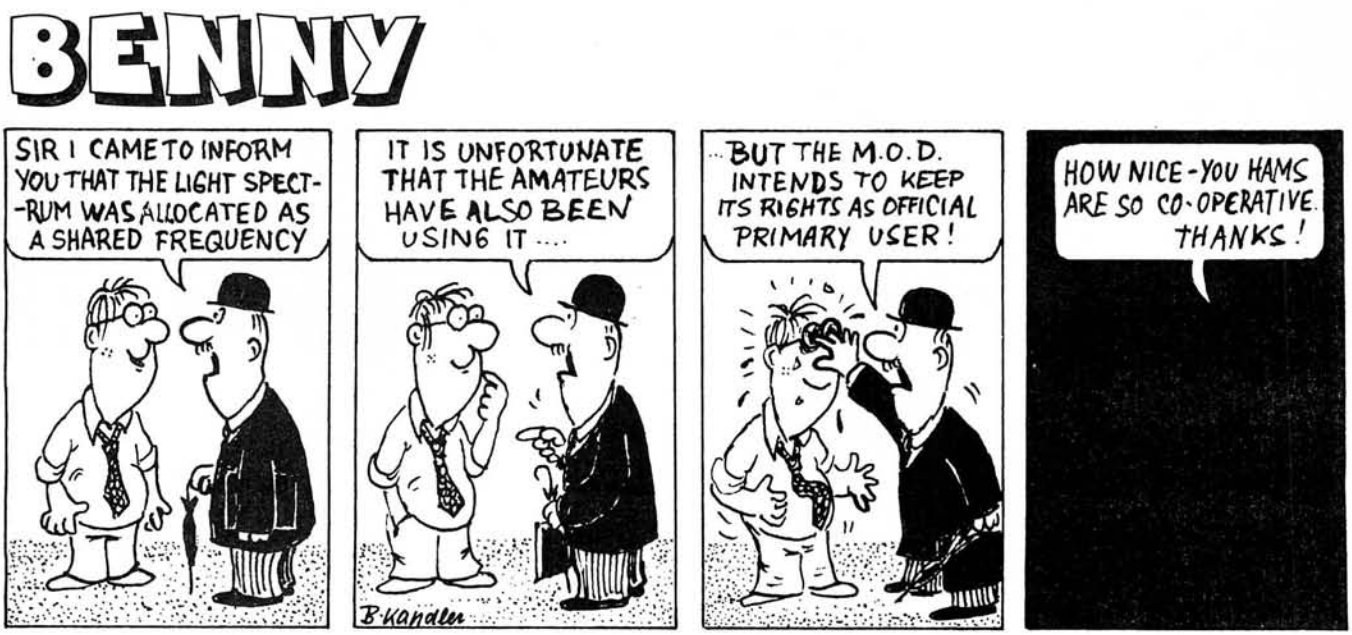
We understand that there has been one official complaint about interference to MoD radio systems from an amateur repeater station, and it is rumoured that the explosion of Amateur Television activity on 434–440MHz is causing them problems too.

The true situation is hard to judge, but there is no doubt whatever that amateurs (including Repeater Groups), importers and manufacturers with a very large investment in equipment for the extremely popular 430MHz band will rightly be in uproar if any attempt is made to turn that equipment into so much scrap metal.

One good piece of news (assuming we still have access to the 430MHz band then) is that the spectrum-hungry Syledis navigation system used by the oil exploration industry around UK shores is to be moved to a new band in twelve to eighteen months' time.

Our contacts also tell us that we should watch the *London Gazette* of October 15 for an announcement of Amateur Licence changes affecting the 18 and 24MHz and 2·3GHz bands, and also the 431–432MHz sub-band (see page 53 of our September issue). Remember, you saw it first in *Practical Wireless!*

Geoff Arnold



DETAILS OF PW READERS' SERVICES ARE OVER THE PAGE THIS MONTH

PRODUCTION LINES

ALAN MARTIN G8ZPW

144MHz Masthead Pre-amp

One of the latest products from Chris Moulding Radio Services is a 144MHz (2m) masthead preamplifier designed particularly for the serious DX operator.

Designated the MPA-2, the unit is capable of switching the full 400W p.e.p. legal limit and utilises a 3SK88 MOSFET and helical filter. Power is supplied by feeding 12V d.c. along the coaxial cable on receive, thus avoiding the compromises of r.f. VOX and separate power supply wiring.

Technical specifications of the MPA-2 are as follows: **Transmit**—maximum power handling, 500W p.e.p. (at up to 1·5:1 s.w.r.); insertion loss, better than 0·5dB. **Receive**—noise factor, better than 1·5dB; gain, 10dB (at 145MHz); —3dB bandwidth, 5MHz (centred on 145MHz); —30dB bandwidth, 20MHz (centred on 145MHz); image rejection (123MHz), —39dB (typical); 1dB compression point (at 145MHz), —7dBm input, and current consumption is 52mA (at 13·8V).

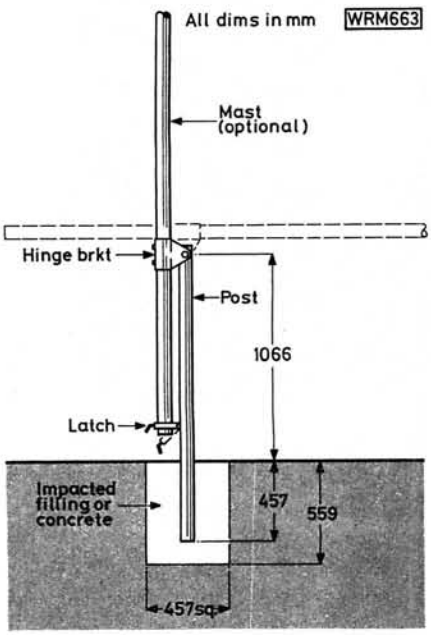
Available in three alternative packages, the MPA-2 is in an ABS case with PL259 sockets and costs

£29.95, the MPA-2B is in an ABS case with "N" type sockets and costs £31.35, and the MPA-2C is in a diecast aluminium case with "N" type sockets and costs £33.35. Carriage for any of the units is 50p. Mast fixing on all types is by two stainless steel bolts inset into the case.

As a further service the pre-amplifier can be supplied aligned to the customer's specified frequency, in the range 130–180MHz, to special order. The unit is also ideal for p.m.r. and marine applications.

For further details contact: *Chris Moulding Radio Services, 276 Hulton Lane, Bolton BL3 4LE. Tel: (0204) 651348.*

Support Your Antenna



Allweld Engineering, the antenna mast specialists, have recently introduced a number of new products to their range, one that should prove of interest to *PW* readers is the Altron SP1 swing post assembly.

The SP1 is simplicity itself, as the drawing shows, and enables any suitable piece of tubing, between 45 and 50mm diameter and up to 6m (20ft) in length, to be turned into a versatile swing-down antenna mast.

The unit is manufactured of quality steel, galvanised for weather protection and costs £49.50 which includes VAT and UK carriage.

For further details of the Altron range of products, which include a variety of designs for single pole mounts, lattice towers, winding gear, window mounts and an active high *Q* ground plane, send an s.a.e. to: *Allweld Engineering, Factory 6, 232 Selsdon Road, South Croydon, Surrey CR2 6PL. Tel: 01-680 2995, 01-681 6734.*

The Case for Power

As the price of batteries continues to increase, more and more equipment is being designed with facilities to use a mains power supply.

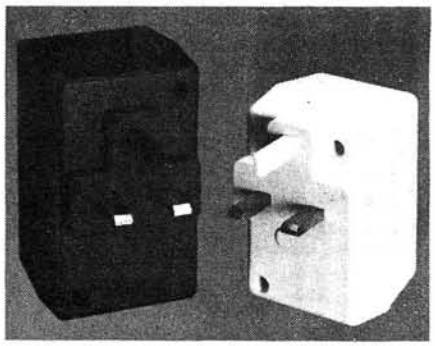
West Hyde Developments Ltd. now produce a specifically designed enclosure to house power supplies for low voltage equipment.

The case is available in two sizes and will accommodate the components of a power supply including the transformer. The case features a plastic earth pin, for opening socket safety gates, and brass live and neutral pins which allow the unit to be plugged directly into a 13 amp socket. Safety is assured with the inclusion of a special internal moulding which, as well as retaining the earth pin, separates the mains input from the low voltage output and transformer laminations.

Moulded in impact-resistant ABS in two screw-together sections, the case is available in either black or white and incorporates a shallow recess intended for a label.

Our photograph shows both models, on the right is 100K measuring 51 × 77 × 58mm and costing £1.20, on the left is the 200K measuring 56 × 92 × 62mm and costing £1.52. Prices quoted include VAT and carriage.

Further information is available from: *West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks. HP20 1ET. Tel: (0296) 20441.*



Solid State Timer

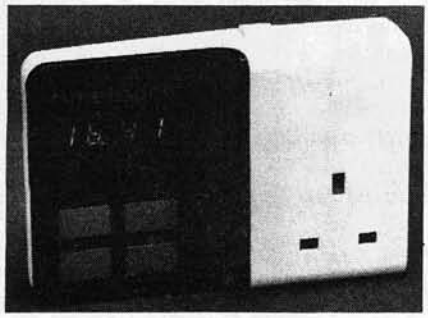
Recently introduced by Tek Marketing is the Timetouch, a new all electronic, plug-in timer that is attractively styled and combines digital accuracy with a current carrying capacity of up to 3kW.

The Timetouch simply plugs into a 13 amp socket, which powers the unit, and the equipment to be controlled then plugs into the socket provided on the face of the unit.

Programming the unit is carried out via large push selector buttons and the l.e.d. display indicates the programme selected, once programmed the unit reverts to a continuous 24 hour clock

display. A useful feature is the manual override function which provides instant power to the socket, without disturbing the pre-set programme.

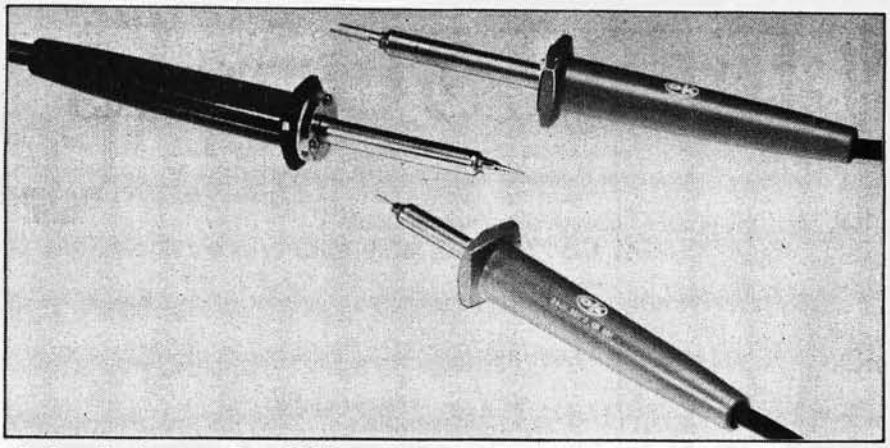
The Timetouch, a digital clock, time switch and interval timer, costs £25.00 which includes VAT and carriage and is available from: *Tek Marketing, Burrel Road, St Ives, Huntingdon, Cambs PE17 4LE. Tel: (0480) 62225.*



Please Note!

September's *Production Lines* (page 38) mentioned a range of linear amplifiers from Solent Electronics (Gosport) Ltd. Unfortunately, the figure quoted for p & p was incorrect, it should have been £3.00 not 70p.

My apologies to readers who have been inconvenienced by this mistake.



Adcola Irons for OK

A new range of soldering irons is being manufactured by Adcola for OK Machine & Tool (UK) Ltd. as a result of a marketing agreement between the two companies.

At the moment there are two thermostatically controlled and thermally balanced instruments plus one temperature controlled iron in the range.

OK-001 operates from 240V and features a short heating element barrel for effective tip control and a handle that remains cool even after hours of operation. It weighs just 43g and has an element barrel length of 51mm. Similar, the OK-002 has its barrel length increased to 88mm for long reach work but weighs only 50g. Temperature ranges are 380°C and 400°C respectively.

The model OK-003 (left in photograph), with proportional control, operates from a 24V 50Hz supply and has a variable temperature range of between 250 and 450°C. This is achieved by the use of a purpose-designed i.c. control unit in the handle. The tool can be totally earthed and has a burn-proof siliconised rubber cable.

For details of price etc. contact: *OK Machine & Tool (UK) Ltd., Dutton Lane, Eastleigh, Hants SO5 4AA. Tel: (0703) 610944.*

PW 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 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 £5.00 to UK addresses, £5.25 overseas, including post and packing) each accommodating one volume of *PW*. Please state the year and volume number for which the binder is required.

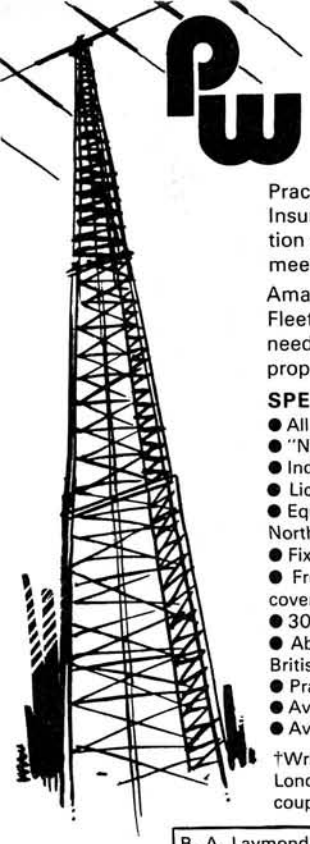
Send your orders to **Post Sales Department, IPC Magazines Ltd., Lavington House, 25 Lavington Street, London SE1 0PF.** All prices include VAT where appropriate.

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

INSURANCE

Turn to the following page for details of the PW Radio Users Insurance Scheme, exclusive to our readers.

PW RADIO USERS INSURANCE SCHEME



Practical Wireless Radio Users Insurance Scheme was devised by Registered Insurance Brokers B. A. LAYMOND & PARTNERS LIMITED following consultation with PRACTICAL WIRELESS to formulate an exclusive scheme designed to meet the needs and requirements of:

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†Write directly to B. A. LAYMOND & PARTNERS LTD, 562 North Circular Road, London NW2 7QZ, for a special application form and full details, enclosing the coupon below.

B. A. Laymond & Partners Limited, Practical Wireless and the Underwriters wish to make it clear that it is an offence to install or use an unlicensed radio transmitter in the United Kingdom and it is not their deliberate intention to encourage or condone the illegal use of any radio communications equipment.

COST OF PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME:

Sum to Insure	£100	£150	£300	£500	£750	£1000	£2000
Annual Premium	£6.00	£6.50	£8.00	£9.00	£10.00	£12.00	£14.00

The premium is charged on sums insured in pre-selected bands. Thus equipment totalling £250 would be in the band up to £300. Quotations for larger sums available on application.

Claims will be settled after deduction of the *Policy* Excess which is: £10 on sums insured up to £500; £25 on sums insured up to £3000.

HOW TO INSURE: Complete the application form below to obtain immediate insurance cover. Photocopies will not be accepted.

APPLICATION FOR PRACTICAL WIRELESS RADIO USERS INSURANCE SCHEME PW11/82

Name in full (State Mr, Mrs, Miss or Title)
Address

Post Code

Occupation Age Phone No. (Home) (Work)

I/We hereby apply to insure the equipment detailed below

COMPLETE IN BLOCK LETTERS

	Manufacturer's Name	Model	Serial No.	Description of equipment to be insured e.g. Base station; Mobile; CB; etc.	VALUE £
1					
2					
3					
4					
5	Antennas (Aerials), s.w.r. meters, etc.				

Please continue list of equipment on a separate sheet if necessary

TOTAL SUM TO INSURE £

DECLARATION: I/We hereby declare that: 1. The sums insured represent the full replacement value of the equipment. 2. I/We have not* had insurance cancelled, declined, restricted, or other terms imposed in any way other than the normal Policy terms. 3. This proposal shall be the basis of the contract and that the contract will be on the Underwriters normal terms and conditions for All Risks and Legal Costs/Expenses cover unless otherwise agreed. 4. I/We have not* sustained any loss or damage to any radio communications equipment or been involved in litigation relating to use of radio equipment during the past three years, whether insured or not. 5. All the above statements made in connection with this proposal are true and no material information has been withheld. 6. I/We understand no liability shall attach until this proposal shall have been accepted by Laymond's and the premium paid in full and a Certificate issued.

* If you have, please give details on a separate sheet.

Date Signed

Rush us details of PW Club Insurance ☐
PW Company Insurance ☐

DELAY IN ARRANGING COVER COULD COST YOU A GREAT DEAL OF MONEY. COMPLETE THIS APPLICATION AND POST WITH YOUR PREMIUM MADE PAYABLE TO "LAYMOND'S" NOW. ADDRESS TO: PRACTICAL WIRELESS (INSURANCE), B. A. LAYMOND & PARTNERS LTD., 562 NORTH CIRCULAR ROAD, LONDON NW2 7QZ. TELEPHONE: 01-452 6611.

SO YOU WANT TO BE A LISTENER?

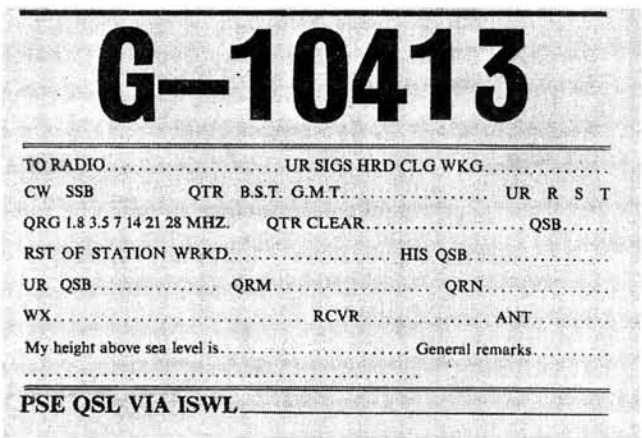
Stephen J. READING G4LZD

The short wave listener can be a valuable member of the amateur radio fraternity, and should be rewarded for his efforts by appropriate acknowledgements of freely given reports provided data given are accurate and cover essential points.

The transmitting amateur who is in receipt of a report which is inaccurate, does not contain sufficient data or appears to be misleading, is under no obligation to acknowledge with his QSL card, although many times I have known a QSL card sent to a listener as a courtesy rather than as a "thank you".

Where to Begin

The listener should, for his own sake, be a member of a society, either the National Society or a recognised organisation (the RSGB or ISWL in this country). They provide education, assistance and a QSL forwarding service which handle the difficult process associated with world-wide amateur distribution of mail. Membership entitles, in most cases, an individual identification which may be used in the operation of the listening station. Each identification is unique and the merits need not be spelt out in detail.



G–10413

TO RADIO..... UR SIGS HRD CLG WKG.....

CW SSB QTR B.S.T. G.M.T..... UR R S T

QRG 1.8 3.5 7 14 21 28 MHZ. QTR CLEAR..... QSB.....

RST OF STATION WRKD..... HIS QSB.....

UR QSB..... QRM..... QRN.....

WX..... RCVR..... ANT.....

My height above sea level is..... General remarks.....

.....

PSE QSL VIA ISWL

Fig. 1: The author's s.w.l. QSL card

The newcomer, now having joined the society of his choice, should decide upon his area of interest within the radio spectrum and how he will subsequently plan and install his station. The equipment will be the subject of many hours of reading, deliberation and planning and subsequently financial factors will outweigh all else. Assuming, however, that the station is operational, there remains to be solved the problem of what the report format will take.

The International Short Wave League, of Lydney, Gloucestershire have available report pads which contain the necessary headings for good reports, or they have QSL cards either general or personalised, and these are reasonable in price. Failing this, the s.w.l. can design his own cards and have them printed locally.

QSL Contents

What should the QSL card content include? Besides the station of origin identification, essential items are:

(i) Your location/address (QTH) (QRA)
(ii) The date of interception
(iii) Time in GMT (QTR)
(iv) Frequency (QRG)
(v) The signal report (RST)
(vi) The mode of transmission A1A, J3E etc.
(vii) The identification of the two stations in contact (QSO)
(viii) The signal report of the second station (if any)
(ix) The general conditions prevailing on the frequency
(x) Fading (QSB)
(xi) Man-made interference (QRM)
(xii) Static (QRN)
(xiii) Finally the review of your operating equipment.

Additional useful information which should be included are weather conditions locally, including barometric pressure, temperature, humidity (don't forget cloud conditions). It is sometimes valuable if you indicate the height above sea level of your antenna.

Not least, emphasis should be made in your report as to the quality of transmissions heard, especially in regard to modulation, carrier stability and drift. An indication of a breakdown in these factors can be invaluable to the distant station. The report should then be rounded off with a few pleasantries together with an indication of where the acknowledgement should be forwarded.

I now refer to a few do's and don'ts in your reporting, although they are only intended as a guide and should really be considered according to local circumstances.

Don't skimp a report in case the distant station doubts your motives—if you want the QSL badly enough, you will have to work for it. Spend a little time monitoring the station, follow him up and down in his QSOs, try to get a broad picture of his operating effectiveness but don't over-exaggerate his signal strength. Yet again, if his carrier is chirpy and warbly, tell him. Better he knows the truth than to get misleading information. I myself have had a few wry comments included about my interpretation of "chirp", but it's water off a duck's back, I know I've told the truth.

Avoid sending signal reports to stations of your own country unless you are located in one of the large countries, i.e. Australia, Canada, America etc. It would be

The FRG-7 receiver, very popular with s.w.l. beginners, often purchased second-hand

pointless for instance to report to an English station heard working the USA. Perhaps the 1·8MHz band (160m) can be treated somewhat differently however; it is a rather unpredictable band and I have monitored it for a considerable time period and have always been told how valuable my report has been, especially c.w. reports.

As for the rest, a good thing to remember is that worldwide communication is possible on the h.f. portions, so, assess the value of your report before sending it. As an example, two PY stations in QSO would find a report valuable, whereas a G station and a LX would not find one useful, especially if it were on the 14, 21 or 28MHz bands unless you were listening from outside Europe.

Do send your reports via the bureau quickly—a very late report is of limited value to the distant station. Do write legibly and avoid words which might prove difficult to understand by a non-English speaking amateur. Do report to stations calling CQ if it appears no-one is responding, but, in such a case, do be very accurate and very concise. Do be accurate with the time in GMT as this will be, together with the frequency in use, the only reference points he will have.

There will be occasions when you notice stations operating, let us say, a KV4 for example, who seems to be active at different times of the day or evening throughout the week. This will provide you with a golden opportunity to compile a lengthy report detailing times, conditions, etc, prevailing during a long period, thus enabling the station concerned to build a picture of how well he is doing. I have done this on many occasions, one notable result, in the Middle East, VS9MB (GAN) I spent three weeks monitoring him on and off and he was so delighted I was invited to fly to his location to visit the station. This of course was possible as we were both serving with the Royal Air Force at the time; but due to operational commitments, I was unable to take him up. It does show, however, how much appreciation can be shown.

It might surprise the potential s.w.l. to discover that from the time of origination of a report to the happy QSL return conclusion, can cover as short a period as a week to five years. I am still getting replies to reports sent in 1974 especially from the USSR. It must be accepted that your reward will take a time; patience is a virtue they say but in the long-run, it is all worth it provided you do not lose heart and expect miracles.

In conclusion, may I say that short wave listening is regarded by most as an interim period between knowing nothing and eventually obtaining a licence to transmit. There is a great deal to learn and I can think of no better way to do so and overall you will be a better operator for it. ●

Recommended Reading

Morse Code for Radio Amateurs—RSGB
Radio Amateur's Examination Manual—RSGB
World at their Fingertips—RSGB

References

The Radio Society of Great Britain, 35 Doughty Street, London, WC1N 2AE.

The International Short Wave League, 1 Grove Road, Lydney, Glos.

kindly note!

PW Morse Show, July 1982

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Reminiscences—2, September 1982

On page 32 the photograph is actually of the author Stan Keeley not Bill Webb as stated in the article. We apologise to both gentlemen for the confusion.

CB Operating Impressions—1, September 1982

On page 42 the basic geometric horizon distance formula was omitted. The formula is

$d_h = 3{\cdot}56\sqrt{h_t}$

and should be inserted above Fig. 1.

Also the square root signs were omitted from the formula

$3{\cdot}56k\,(\sqrt{h_t} + \sqrt{h_r})$.

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IC BP3	9V Nicad pack for IC2E	17.70
IC BP4	Empty case for 6 x AA Nicads	5.80
IC BP5	11.5V Nicad pack for IC2E	30.50
IC DC1	12V adaptor pack for IC2E	8.40

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TS130V	8 band 20W pep	445.00
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PS30	AC power supply TS120/130S	88.50
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TR7850	40W version of above	314.00
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TR2500	2m FM synthesised handheld	207.00
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Boom Length	1.1m	4.5m	6.45m
Weight	1Kg	3Kg	5Kg
Boom		3 sections	4 sections

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Model	Boom Length	Gain Annaboda*)	Claimed
15144 (A)	3.1λ	13.0dBd	14.0dBd
C. C. Boomer	3.2λ	12.8dBd	16.2dBd
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Tonna	3.1λ	12.2dBd	15.7dBd

*) Gain over dipole under matched condition.

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ECC85	0.80	EY81	0.85	PY81/800	0.85	1S5	0.45	6F6G8	1.10	12BH7	1.10	955	0.70
ECC86	1.70	EY86/87	0.80	PY82	0.65	1T4	0.45	6F7	2.80	12C8	0.85	956	0.60
ECC88	0.80	EY88	0.85	PY83	0.80	1U4	0.60	6F8G	0.85	12E1	18.95	957	1.05
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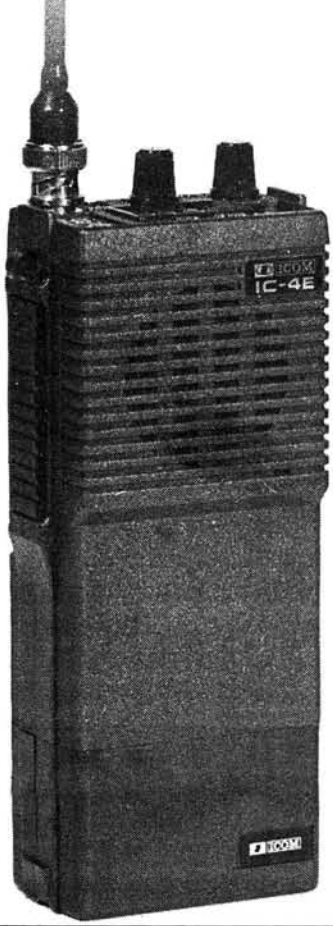
ICOM IC4-E 430MHz Hand-held Transceiver

Back in December 1980 we reviewed the IC-2E with very favourable results. Now Icom have gone one better and produced the IC-4E for the 430–440MHz band.

The overall appearance is identical to the IC-2E and many accessories are interchangeable including, most importantly, the battery pack. For those who have never seen either of the two Icom hand-helds the dimensions are 165·5 × 65 × 35mm including the battery pack and the weight just 470g as supplied.

We found the performance of the IC-2E to be excellent and the IC-4E was not a disappointment. The receiver is sensitive (0·38μV e.m.f. for 12dB SINAD); this proved to be of most use when the IC-4E was used to drive a 10W p.a. The rig comes supplied with a "rubber duck" antenna but its coverage can be greatly improved by using a 430MHz colinear—the antenna socket being a BNC type.



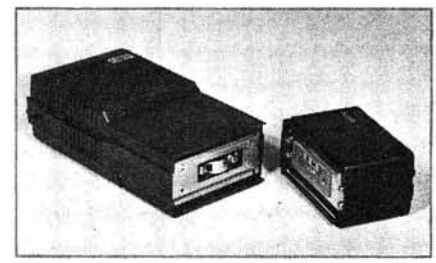
Most of the controls are mounted on the top of the case, and are easy to operate, being the same as the IC-2E. One useful modification that has been made to the back panel is the semi-reverse repeater switch, thus allowing you to check signals on the repeater input quickly and easily.

Three thumbwheel switches provided both frequency selection and the frequency readout. These are easy to operate assuming your fingers aren't too large, or you have finger nails!

The IC-4E is fully synthesised and covers all 10MHz of the 430–440MHz band in 5kHz steps, f.m. only. It has two transmit levels, 150mW and 1·5W using the standard NiCad battery pack. The current drain on high power is approximately 700mA and 300mA on low power.

The instruction manual that comes with the rig is the usual informative one including full maintenance details with circuit diagrams and p.c.b. layouts.

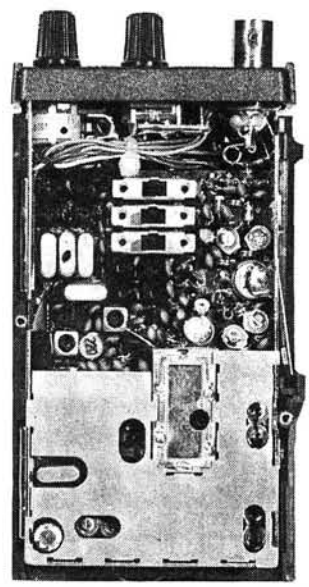
Whilst on test the IC-4E was used as a portable, a base station and mobile. Reports on the quality of the transmissions were always complimentary. All four 430MHz band repeaters in the Dorset area were worked as well as GB3UB in Bath. The 'G' version as supplied for UK use has the correct +1·6MHz shift built in. Other versions have different shifts depending on where they are to be sold. Being both small and light the IC-4E was very convenient for portable work and proved highly useful during a contest in providing talk-back between the different stations.

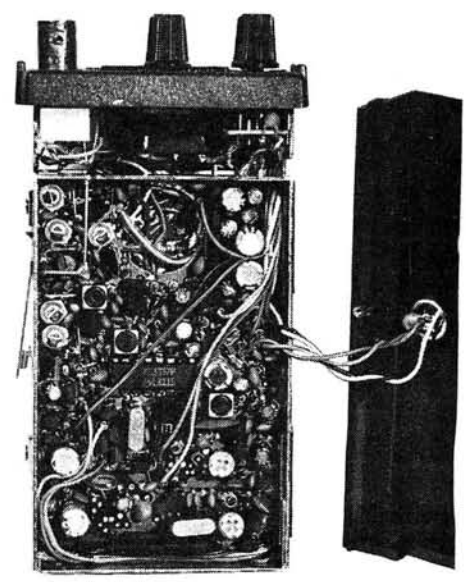


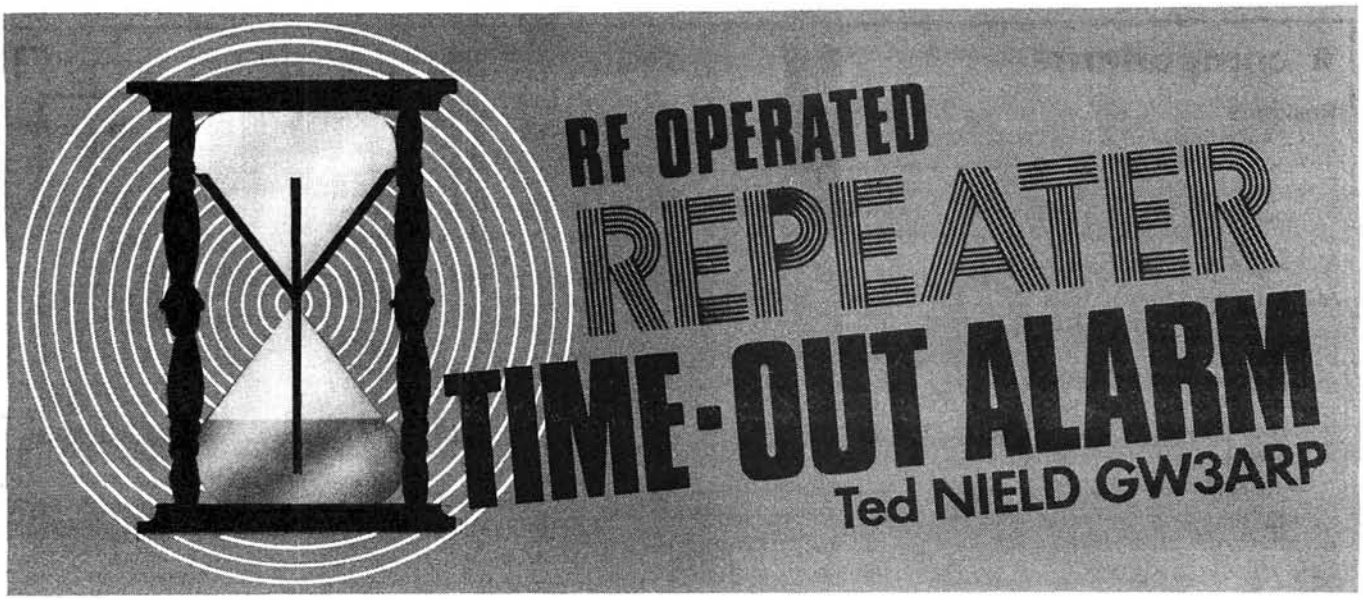
Over the weeks of using the IC-4E I have been pleasantly surprised with the growing amount of activity on the 430-440MHz band.

The IC-4E costs £199 including VAT from **Thanet Electronics Ltd., 143 Reculver Road, Beltinge, Herne Bay, Kent. Tel: 02273 63859,** to whom we offer our thanks for the review unit.

Elaine Howard







The unit described in this article fulfils the well-known function of indicating the impending termination of talk-through, when operating through an amateur repeater. Even if the repeater does not employ a time-out system it is good operating practice to limit the duration of transmissions, allowing maximum utilisation of the repeater.

Many designs for such devices have appeared from time to time but this one, however, possesses certain useful features which may be listed as follows:

1) The device is activated by the r.f. field from the transmitter.
2) No direct connection need be made, as the circuitry is amply sensitive and will function within several metres of the transmitting equipment.
3) The timer is auto-reset; i.e. should the carrier be interrupted and the repeater re-accessed, the alarm will restart its timing cycle from the beginning.
4) The timing period may be varied infinitely from 5 to 150 secs.
5) The construction is simple and the performance reliable.
6) With battery operation from a single 6-F22 (PP3) the device is easily portable and may be taken into the car for mobile use.
7) Current economy measures ensure a long battery life.

Circuit Elements

The block diagram of Fig. 1 illustrates the essential functions of the circuit elements. The r.f. signal from the transmitter is sensed at (1) and a d.c. voltage generated. This voltage is fed to (2)—a timing circuit consisting of a simple variable *CR* time constant. After the variable delay period, unit (3), a pulse generator, is activated, and will continue to function until the carrier is interrupted. The signal is amplified at (4).

Circuit Description

The complete circuit of the alarm is shown in Fig. 3. The r.f. signal, which is picked up on a $\lambda/4$ antenna, is rectified by diodes D1 and D2 and the minute positive voltage obtained is fed to the non-inverting input of the CA3140 MOSFET operational amplifier IC1, which acts as a variable gain d.c. amplifier whose output varies from zero volts (on no signal) to about +6V (with signal input). This output voltage is fed to the time-constant network formed by C5/R5. The c.m.o.s. logic chip CD4011, a quad 2-input NAND gate, is connected to form two separate square-wave oscillators; gates 1 and 2 operate at about 2Hz with a 1: 10 mark/space ratio and gates 3 and 4 operate at about 3kHz. This latter section sets the frequency of each individual alarm "bleep", whilst the former oscillator controls the tone on and off periods. Pins 2 and

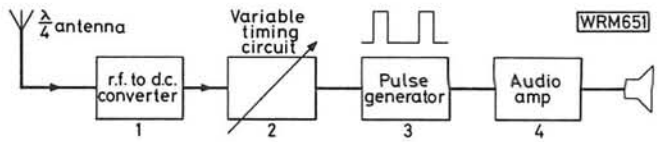


Fig. 1: Block diagram of the time-out alarm

9 of IC2 are the "enabling" inputs of the two oscillators and when at logic *0* (earth) inhibit their action. Thus the 3kHz oscillator is caused to pulse at the frequency of the 2Hz oscillator, which in turn is activated by the output of the op-amp.

CONSTRUCTION RATING Beginner

BUYING GUIDE

All components for this device are readily available from advertisers in the magazine. The prototype was a snug fit in a standard Verobox code 65-2518H

Neosid Small Orders can supply former, slug and wire for inductor L1 (PW 60 kit) at £1.00 including p & p and VAT.

APPROXIMATE COST £7.50

★ components

Resistors

¼W 5% Carbon film

22kΩ	1	R10
470kΩ	1	R3
1MΩ	2	R1, 6
10MΩ	1	R7

Miniature horizontal presets

5kΩ	1	R4
10kΩ	1	R2
100kΩ	1	R8
470kΩ	1	R9

Potentiometer

2MΩ *Log*		R5

Capacitors

Sub-miniature ceramic

2·7pF	1	C1
560pF	1	C2
1nF	2	C8, 9
4·7nF	2	C3, 7

Polycarbonate

47nF	1	C6
200nF	1	C4

Tantalum 16V

47µF	1	C5

Semiconductors

Diodes

OA91	2	D1, 2
1N4148	2	D3, 4
red l.e.d.	1	D5

Transistors

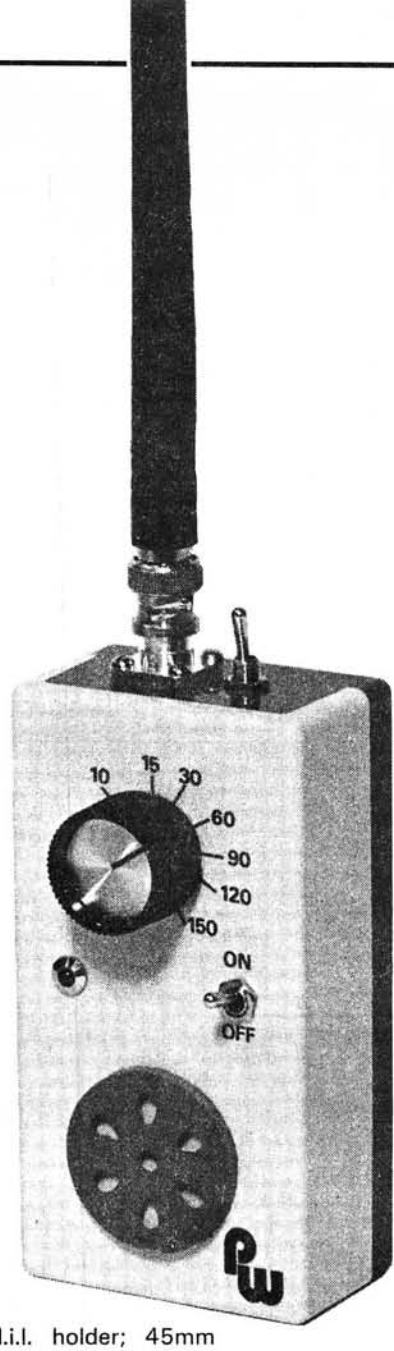
BC108	1	Tr1

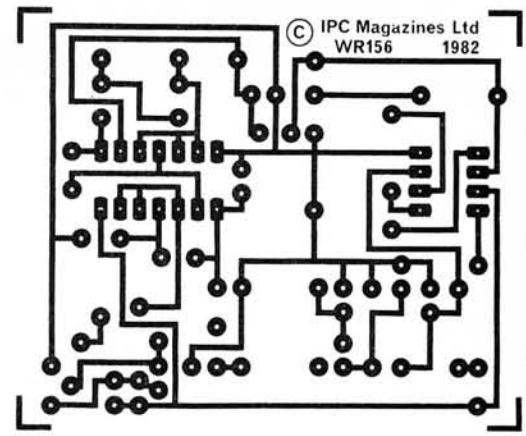
Integrated Circuits

CA3140	1	IC1
CD4011	1	IC2

Miscellaneous

8-pin d.i.l. holder; 14-pin d.i.l. holder; 45mm diameter speaker 50-100Ω (telephone insert); pointer knob; 50Ω BNC socket; 18 s.w.g. enamelled copper wire; 7mm inductor core and slug; Miniature s.p.d.t. toggle switch (2); Plastics case 120 × 65 × 40mm (see buying guide).





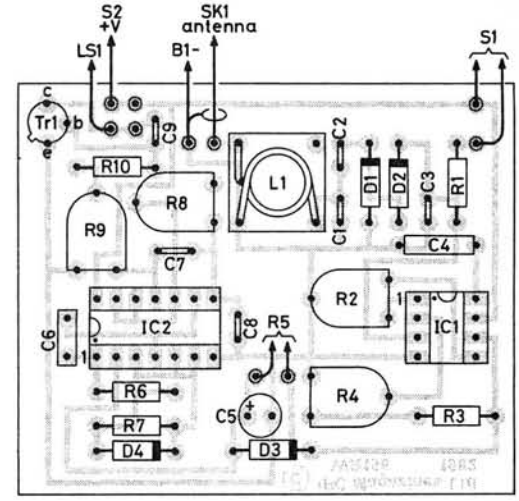
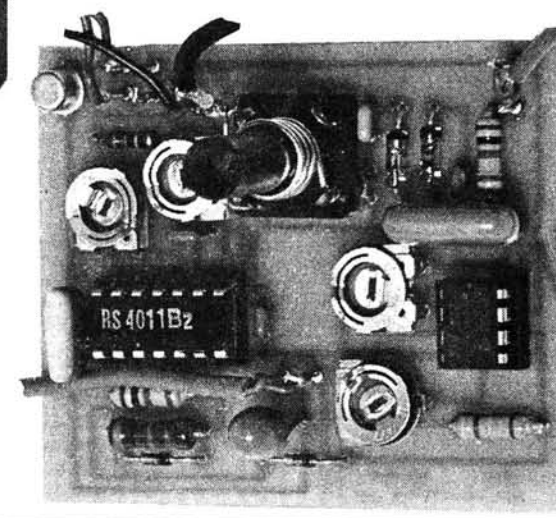


Fig. 2: Track pattern and component layout for the p.c.b. shown full size



When the voltage on pin 2 rises via the C5/R5 network to the transfer potential, the gate is enabled and the circuit begins to produce its pulse output. This is then amplified by the transistor stage Tr1 which drives the speaker.

The waveform at the base of Tr1 takes the form of short positive pulses, between which Tr1 is cut off. The use of an unequal mark/space ratio, with the short pulses corresponding to the "turn on" phase, minimises the total current consumption of the device. These pulses also illuminate the l.e.d. D5 giving in addition a visible indication of the end of the repeater's "talk-through" period.

A current of approximately 10mA during the pulses is all that is needed to produce the necessary volume and illuminate the l.e.d. With a 1:10 mark-space ratio this represents a continuous current of only 1mA, plus about 1·5mA to IC1, thus giving an extended battery life.

Switch S1 provides a convenient means of testing that the unit is working and is also used in the initial adjustment procedure. When closed, a slight positive potential is applied to pin 3 of the CA 3140, causing the output to rise to maximum, and starting the pulse train.

The silicon diode D3 enables the tantalum electrolytic capacitor C5 to discharge via the low impedance output circuit of the CA 3140 when the transmission period ends and the output voltage at pin 6 falls to near zero. This

arrangement is essential to ensure that the next charging cycle starts from zero and that the full timing period is provided. Components R6, R7 and D4 provide the 1:10 ratio in the waveform.

Adjustment Procedure

In order to obtain maximum gain from IC1 and to allow for variation between samples, the preset potentiometer R2, "null" adjustment control, has been fitted. Initially set preset R4 to maximum, i.e. slider to earth. Now attach a 0-10V voltmeter between pin 6 of IC1 and earth and adjust the slider of R2 until the indicated voltage just falls to zero. Close S1. The voltage will rise to maximum, but should fall to zero once again when S1 is opened. Adjust R2 until this happens.

Next set R4 to minimum, with the slider at the pin 6 end of the control. Place the alarm unit within the field of the transmitter that it is to be used with. During the alignment the transmitter should be terminated into a suitable dummy load or run at low power. Tune the slug of L1 so that the voltage at pin 6 passes through a maximum, avoiding too strong an input. The maximum is a broad one and is not critical. Finally reset R4 to maximum.

The pitch of the "bleep" is at about 3kHz but has been made variable by means of R8. The reason for this is as follows. All speakers have peaks of resonance where the sound volume increases considerably. By adjusting R8 to one of these peaks, a lower setting of the audio gain may be used, resulting in a reduction of current drawn from the battery. Capacitor C4 inhibits IC1 from responding to impulse type signals such as are encountered in the car from the ignition system.

If it is desired to operate the alarm in the silent watches, an additional switch, shown in dotted lines on the circuit diagram, may be included. This switch merely shorts the speaker terminals, muting the audio output and at the same time allowing the l.e.d. to obligingly put forth extra brilliance! ●

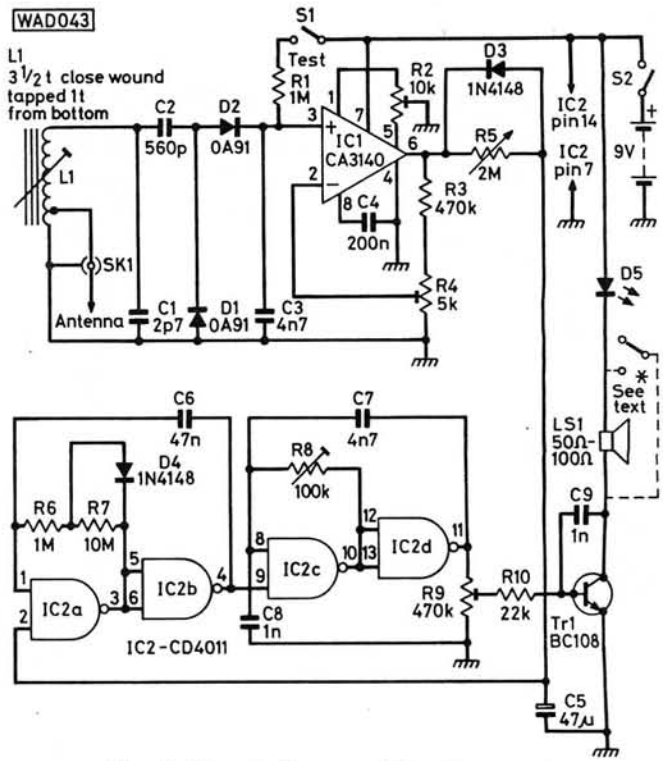


Fig. 3: Circuit diagram of the time-out alarm

Follow-up to PW 'STOUR' TOP-BAND TRANSCEIVER

A.K.DENYER G4MLG

The *PW* Stour Top Band transceiver, featured in the May to November 1981 issues has proved to be a popular project. This short follow-up article has been written to complement the original design details and provides further useful information.

Component Substitutions

The list of components shown in Table 1 represent substitutions made by the author following difficulties experienced in obtaining the original specified components.

If the alternative BB105 Varicap diode is used in the r.i.t. circuit, resistors 10R14/15 should be changed to 1kΩ. The BB105 produces less frequency shift than the original component, even with the modified resistor values, but the 1kHz available has been found to be adequate.

Microphone Gain Control

The original microphone amplifier board (7) contained a 1MΩ potentiometer 7R1 to pre-set the microphone gain. This arrangement works perfectly satisfactorily for s.s.b., however the author wished to use a.m., or more correctly described, inserted carrier. This had been accomplished by replacing the pre-set with a front panel mounted control. Setting-up for a.m. operation then involves reducing the microphone gain, whilst the KEY line is grounded via a suitable shorting link. Adjust the microphone gain until the needle on the p.a. meter is just moving about 1mm on speech peaks.

Table 1

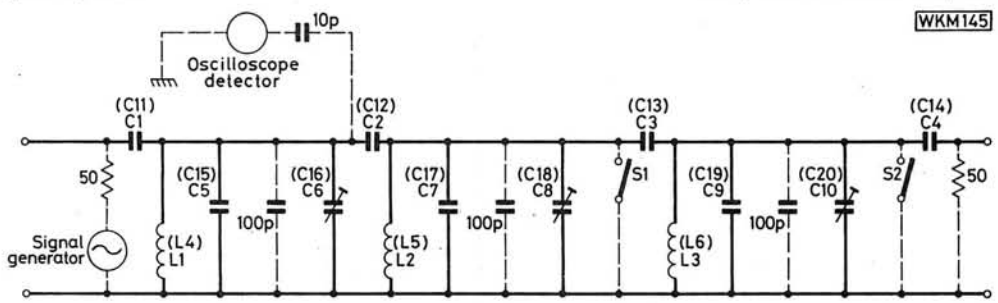
Original Specification	Substitute
HP2800	1N4148
HP3080	BY206
BB121	BB105
2N4427 / 2N3866	BFY50, BFY51, 2N3053
2N2222	BC107, BC108, BC109 metal can versions

Filter Alignment

An alternative method of aligning the filter boards was adopted, based on the technique described in the *Solid State Design Handbook* and requires the use of a signal generator and oscilloscope.

The first step is to fit the additional components shown in Fig. 1, switches S1 and S2 consisting of pieces of wire soldered to the p.c.b. and initially closed.

Decide which part of the band you require to peak on; at the lower end for c.w., upper for phone or 1·9MHz for both. The signal generator is first tuned across the range and the oscilloscope detector observed for a peak indication, which should be quite distinct.



Note:- Additional components shown dotted

Fig. 1: Test set-up for alignment of Filter boards F1 and F2. All additional components, with the exception of the three 100pF and single 10pF capacitors, are removed after alignment

Filter Boards

Unfortunately an error crept into the component list specification for the inductive elements of the two bandpass filters F1 and F2.

The original toroid reference (Neosid 28-522-31) should have been 17-101-13. Constructors who purchased these items from Neosid Small Orders can receive f.o.c. replacements, providing the original invoice number and date is quoted. Winding details comprise 40 turns of 22 s.w.g. enamelled copper wire tightly wound and an extra 100pF silvered mica capacitor should be added to each resonant section of the filter network as shown in Fig. 1.

Next set the signal generator to the required operating frequency and adjust trimmer capacitor C6 (16) to bring the section to resonance, peaking at this frequency.

Open switch S1, maintaining the signal generator and oscilloscope in their previous positions and frequency and then adjust C8 (18) to produce a dip on the oscilloscope.

Finally open S2 and adjust C10 (20) for peak output, once again with the positions and frequency of the signal generator and oscilloscope maintained.

Having completed the alignment remove all the additional components used for setting-up, with the exception of the 10pF capacitor that fed the oscilloscope detector. This should be soldered to ground on the p.c.b. ●

NEWS NEWS NEWS

Rallies and Events

The Leeds and District Amateur Radio Society confirm the details of their 1982 Christmas Rally.

The Rally will be held on Sunday 12 December at the same venue as last year's highly successful event, which is the Pudsey Civic Centre, situated on the Leeds Ring-road midway between Leeds and Bradford.

Further information from: *Alex A. Alexander G6CJI, 22 Lichfield Road, Dewsbury, W. Yorks. WF12 7NA. Tel: (0924) 455516.*

Leeds Castle Trust have invited the Medway Amateur Receiving and Transmitting Society to spend the last open event of their Diamond Jubilee year at the Fairfax Hall, Leeds Castle on Sunday 17 October, using the special event callsigns GB2MDJ and GB8MDJ.

1000 QSL cards depicting Leeds Castle have also been provided by the Leeds Castle Trust and a full range of amateur radio equipment will be provided by Thanet Electronics and K.W. Electronics of Chatham, for use by society members on the day.

Disabled visitors (both radio amateurs and the general public) will be admitted free, and the Leeds Castle Trust has provided many amenities for them.

Further details from: *Ruby Sivyer G6DJV, 22 Boxley Road, Waderslade, Chatham, Kent. Tel: daytime (0634) 46284 and after 6pm (0634) 61927.*

Solent Audio '82

Hamilton Electronics Ltd of Southampton will be the host exhibitor at Solent Audio '82, which is being held in Southampton on October 23 and 24 at the Post House Hotel, Southampton.

In its 6th 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. Representatives of the manufacturers will be in attendance throughout the show.

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

New Components Shop

Tom Powell, the component and kit supplier, has opened a new shop at the site of the old "Comp Shop" in Edgware Road.

The shop will be stocking an enormous selection of components and will be specialising in kits for magazine articles including most *Practical Wireless* projects.

The new premises are at: 311 Edgware Road, London W2.

OBITUARY

It is with great sadness that we have to report the death on Tuesday, August 24, after a brief illness, of Peter Metalli, Art Editor of *Practical Wireless*. From art school, Peter began his career in a newspaper agency in Fleet Street. From 1943 to 1947 he served in the RAF as a Flight Engineer. In 1955 Peter joined George Newnes, now part of IPC, where he worked in the art studio servicing the "Practical Group" magazines, and from there graduated to the position of Art Editor of *Practical Wireless*.

We shall remember Peter as a most loyal and diligent workman, but even more as a friend to all, and one of life's real gentlemen. He was very much the home-loving family man, and leaves a widow, a son and a daughter, to whom we extend our deepest sympathy.

Repeater News

70cm: On 21 August 1982, GB3HZ on RB4 at Haslemere came on air. Reports would be welcomed by the repeater group, via G4CYR, QTHR.

In recent weeks I have heard from several sources that all is not well with the licensing of u.h.f. Phase 6, which has been with the HO for many months.

It is currently rumoured that the issue of all further u.h.f. repeater licences has been suspended, possibly because of the problems encountered by the first recently commissioned elements of a nationwide system of MoD u.h.f. repeater links. These devices, code named "MOULD", have apparently been allocated input frequencies that interleave with the established amateur repeater network and are offset by 12·5kHz. As the UK 432MHz amateur allocation is on a secondary user basis things are looking somewhat grim. It would be incredible if the HO/MoD were unaware of the occupancy of this small segment of this particular amateur band with its many thousands of regular licensed users/listeners. However, the only HO reaction we are aware of, is the suggestion that the operating frequency of GB3HR should be changed to RB1.

2m: GB3SB on R0 at Dunns in Berwickshire, became operational on 1 August 1982, also GB3BT on R2 at Berwick followed on 21 August. Both devices were built and installed by the Borders area group, and reports would be welcomed by Bruce McCartney GM4BDJ, QTHR.

The operation of these two installations marks the completion of all licensed 144MHz repeaters in the UK. Although some are currently off the air for various reasons, all have been operational at some time.

PW Exe

Following the phenomenal success of the *PW Exe* project, for which we made available parabolic dishes, we unfortunately have to announce that our stocks have been completely sold out.

We do not, at present, plan to order new stock, but this may be reconsidered in the light of future demand.

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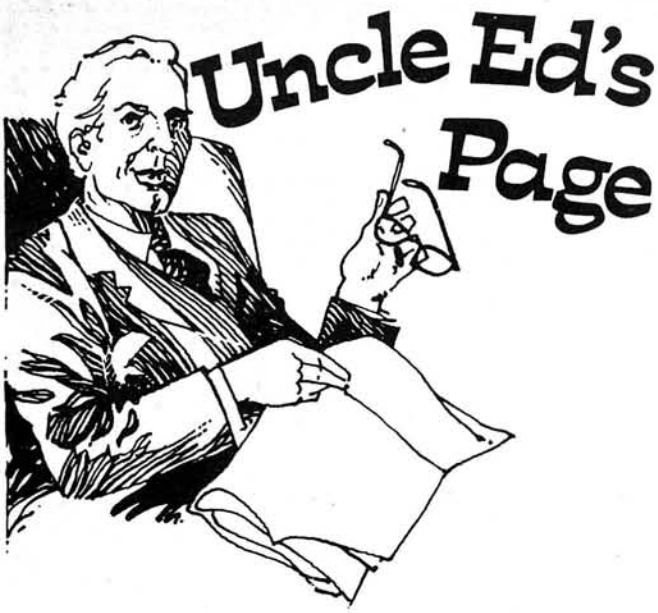


A monthly look at some aspect of the radio/electronics hobby that seems to bug the beginner, or occasionally a more advanced topic seen from an unusual angle.

TRANSMITTER POWER—3

To round off this series on transmitter power ratings, I will look briefly at how the various ratings relate to each other for different types of modulation, and what limits the power output of a transmitter.

The UK Amateur Licence, before it was revised early in 1982, allowed 150 watts d.c. input power, or 400 watts peak envelope power for s.s.b. operation, in the h.f. bands from 3·5 to 29·7MHz. Since the revision, that has become 100 watts (20dBW) carrier power to the antenna, or 400 watts (26dBW) p.e.p. for s.s.b. I've already explained that for normal d.s.b. a.m. telephony, p.e.p. is four times carrier power for 100 per cent modulation, so that the p.e.p. allowed is similar for a.m. with or without carrier. Compared to the "d.c. input" days, 100 watts carrier output for 150 watts d.c. input to the final stage works out at an efficiency of 66·6 per cent, or two thirds. That's a fair ball-park figure for a transmitter final stage, so the new licence schedule hasn't changed the power you can run on the h.f. bands.

When we come to c.w. (Morse code) or f.m., then carrier power, mean power and p.e.p. are all exactly the same, because the r.f. output of the transmitter is at a constant level in each case (ignoring the fact that the carrier is keyed on and off).

Sometimes, people ask why they can't run 400 watts p.e.p. on c.w. or f.m. as they can on s.s.b. Well, I think they'd have a lot more problems with TVI and BCI with the higher carrier power, and I wonder whether it's necessary (on c.w. particularly) when you look at what can be achieved with QRP (low power) transmitters. In any case, most commercial transmitters or transceivers are not designed to run at such high power levels continuously.

A transmitter's power capability depends on many factors.

1. How "beefy" is the power supply? An s.s.b. transmitter draws heavy peaks of current from the supply but a very low average current during normal speech, because the carrier is suppressed by at least 40 dB (that is, to only one hundredth of the peak power). An a.m. d.s.b. transmitter draws similar heavy peaks, plus a higher average current because of the steady carrier-frequency output. A c.w. transmitter draws a constant heavy current whilst the key is down, but very little current when the key is up, so the average current is fairly low. An f.m. transmitter, or an f.s.k. (frequency shift keying) transmitter used for RTTY, draws a constant heavy current throughout a transmission.

An s.s.b. transmitter therefore needs a much lighter-duty power supply than any of the others, which require bigger transformers, bigger smoothing capacitors, and bigger heat-sinks for the voltage regulators. Some transmitters, like the Drake TR-7, have fans fitted to the transmitter and power supply if you want to run continuous full-power RTTY.

2. How much heat can the transmitter final stage valves or transistors dissipate safely? As in the power supply, the average power is much higher for d.s.b. a.m., c.w., f.m. or RTTY operation, than it is for s.s.b. Valve and transistor ratings and the efficiency of the cooling arrangements must be taken into account.

3. What r.f. voltage can the components in the output circuits stand? As I showed last month, applying 100 per cent modulation to an a.m. transmitter doubles the r.f. voltage at the peaks. The insulation of fixed capacitors and the spacing between the vanes of variable capacitors must be rated to withstand these peaks.

Let's look at the power output specifications of a typical modern h.f. transceiver: On s.s.b. and c.w.; 100 watts p.e.p., but with a time limit of 30 seconds for c.w. full-power key down, after which the p.a. transistors need time to cool. On d.s.b. a.m.; 25 watts (notice it's one quarter of the s.s.b. p.e.p. rating). On f.m. and f.s.k.; 50 watts, but again with a 30 second limit on full-power continuous operation. This transceiver has a built-in cooling fan for the final stage and power supply, without which the c.w. rating might have to be lower. Other transceivers may have different ratings for the various modulation modes, it depends upon how the designers have chosen the components used.

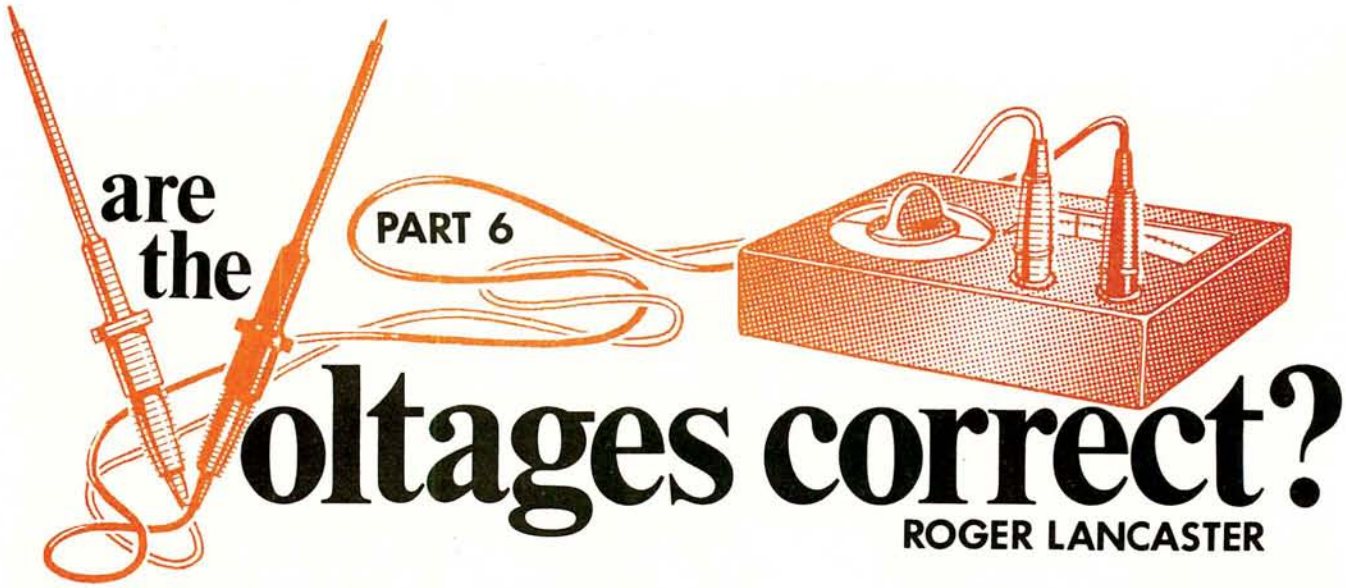
Remember that most transmitter power output meters, though they may be calibrated in watts, cannot give a true indication of output on speech. They will have been calibrated using a sinewave test signal, which has a steady level, whereas speech is anything but steady. When you are "talking up" an s.s.b. transmitter to full power, the final stage current meter or power output meter will probably have a deflection around one third to one half of that for a constant tone at full power.

Finally, a word on those **dBWs**! All that's meant is **decibels relative to one watt,** in whatever impedance you're talking about, which for transmitters is most often 50 ohms nowadays. A power of 1W is 0dBW, and 2W would be 3dBW. 10W is 10dBW, 100W is 20dBW and a kilowatt would be 30dBW. All these dBW figures are positive, but the "+" sign is omitted. For the QRP brigade, 500mW (half a watt) would be −3dBW, and 100mW would be −10dBW. The only advantage to using dBW so far as I can see, is that a very large range of powers can be covered without need for "micro", "milli", "kilo" or "mega" prefixes. The range from a microwatt to a megawatt, for example, can be expressed by figures between −60dBW and +60dBW. Dropping "milli" and "mega" avoids the confusion between their abbreviations "m" and "M" — I never did believe that advert for a pocket transistor radio with an audio output of 500MW (500 megawatts?)!

Conversions from dBW to watts for the figures quoted in the UK Amateur Licence are approximately as follows:

9dBW = 8W	16dBW = 40W	22dBW = 160W
15dBW = 32W	20dBW = 100W	26dBW = 400W

Next month, I'll be having a look at power transformer descriptions and ratings. Cheerio until then.



are the voltages correct?

PART 6

ROGER LANCASTER

Solutions to last month's problem: The circuit is reproduced here in Fig. 6.1.

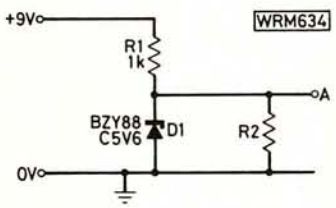


Fig. 6.1

You were asked to calculate the potential at "A": (i) when R2 = 2·2kΩ and (ii) when R2 = 680Ω.

(i) The open circuit voltage of D1 would be:

$$\frac{2\cdot2}{(1+2\cdot2)} \times 9 = \frac{2\cdot2}{3\cdot2} \times 9$$
$$= 6\cdot19V$$

Since this is greater than the Zener voltage of D1, D1 will "Zener" at 5·6V and the potential at "A" will be +5·6V.

(ii) D1 open circuit voltage in this case would be:

$$\frac{680}{1680} \times 9 = 3\cdot64V$$

This is insufficient to cause the Zener to conduct, D1 will behave as an open circuit, leaving the 3·64V across it and R2, thus the potential at "A" will be **+3·64V.**

Now let us return to the audio amplifier circuit we were looking at last month. The circuit is reproduced here in Fig. 6.2. By neglecting base current, we estimated the electric potentials to be: e = +1·93V, b = +2·53V, c = +6·16V.

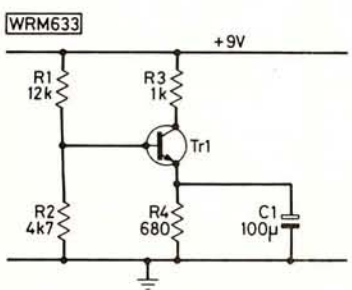


Fig. 6.2

Base current **will** flow, however, and perhaps we should examine its effect upon the above results. See Fig. 6.3, which shows all the currents flowing in the circuit. Remember that

$I_e = I_b + I_c$

Suppose $I_b = 100\mu A$.

We cannot use the potential divider formula

$$V_{R1} = \frac{R1}{R1 + R2} \times 9V$$

because this formula is based on the fact that the **same** current flows through both R1 and R2, and from the diagram this is clearly no longer true.

Instead, we can use Kirchhoff's Second Law. Resistors R1 and R2 form a series circuit, so the sum of the p.d.s across R1 and R2 must equal the e.m.f. applied, namely 9V. Also, by Ohm's Law, the voltage across each resistor is equal to the product of the current through it and its resistance (V = IR).

$V_{R1} + V_{R2} = 9V$

$V_{R1} = (I_{R2} + I_b)\,R1$ and $V_{R2} = I_{R2} \times R2$

Therefore, $(I_{R2} + I_b)\,R1 + (I_{R2} \times R2) = 9$

$$12000\,(I_{R2} + \frac{100}{10^6}) + 4700 \times I_{R2} = 9$$

$12000I_{R2} + 1\cdot2 + 4700I_{R2} = 9$

$16700I_{R2} = 9 - 1\cdot2$

$16700I_{R2} = 7\cdot8$

$$I_{R2} = \frac{7\cdot8}{16700} = 467\mu A$$

Therefore, $V_{R2} = I_{R2}R2 = \frac{467}{10^6} \times 4700 = 2\cdot2V$

Thus the base potential is **+2·2V**

As a check:

$$V_{R1} = (I_{R2} + I_b)\,R1 = \frac{(467 + 100)}{10^6} \times 12000$$
$$= \frac{567}{10^6} \times 12000 = 6\cdot8V$$

Thus, the base potential is +9 − 6·8 = **+2·2V.**

The emitter potential is therefore +2·2 − 0·6 = **+1·6V**

Therefore,

$$I_e = \frac{1\cdot6}{680} = 2\cdot35mA \text{ and}$$

$I_c = I_e - I_b = 2\cdot35 - 0\cdot1 = 2\cdot25mA$

Therefore,

$$V_{R3} = \frac{2\cdot25}{1000} \times 1000 = 2\cdot25V$$

Thus, the collector potential is +9−2·25 = **+6·75V.**

So the potentials calculated taking base current into account are slightly different from those estimated ignoring base current.

Where is all this getting us? Should we take base current into account or ignore it?

Base current will not normally be known and it is difficult to measure. In view of this, it is best to treat the effects of base current in a similar way to our treatment of meter resistance. Ignore base current in voltage estimations initially. Then, if the voltage measured is different to that estimated, ask yourself the question: "Could this difference be caused by a reasonable value of base current flowing?" If the answer to this question is "yes", accept the voltage as being correct.

There are limits to collector potential, however. Firstly, there is the upper limit of the supply voltage, in this case +9V, which will be the collector potential if the transistor is cut off, i.e. no collector current through R3 so no voltage dropped across R3. This would occur, for example, if we were to short base and emitter together. Secondly, there is a lower limit, when the transistor is conducting a heavy collector current through a collector resistor.

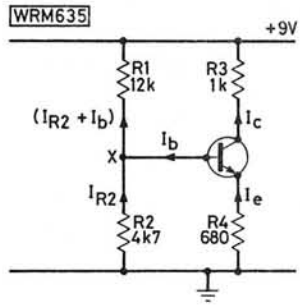


Fig. 6.3

Suppose, in the circuit of Fig. 6.3, R4 was 180Ω instead of 680Ω. Neglecting base current, we would calculate base potential +2·53V and emitter potential +1·93V as before. However, under these conditions, emitter current (and hence collector current) would be:

$$I_e = \frac{1{\cdot}93}{180} = 10{\cdot}7\text{mA}$$

If this were to flow through R3 there would be

$$\frac{10{\cdot}7}{1000} \times 1000 = 10{\cdot}7\text{V dropped across R3.}$$

This would be impossible. It is more than the supply voltage? Kirchhoff's Second Law tells us that in any series path between the +9V and earth the sum of the p.d.s must equal 9V. A series path is: +9V, R3, c–e, R4, earth. We already have 1·93V across R4, so even if c–e was a short-circuit, the maximum voltage possible across R3 would be 7·07V. In fact, even when a transistor is conducting as heavily as it possibly can, there is always a **minimum** voltage which can be developed across its c–e, although this could be as low as 0·1V. If this were the case here, 6·97V would be left across R3, leaving the collector potential at +2·03V. Such a state of affairs could never be permitted in an audio amplifying stage, as a transistor conducting as heavily as this would cause excessive distortion.

When a transistor becomes faulty, the usual reasons are that one or more of its junctions has become short-circuit, open-circuit or resistive. Other types of internal disorder are rare, and an ohmmeter test is sufficient in the vast majority of cases to determine whether the transistor is good or bad. A sensible testing method, in which it is not even necessary to know whether the transistor is *npn* or *pnp*, is as follows:

Switch the ohmmeter to the "direct ohms" range (not the "ohms × 100" or the "ohms ÷ 100"). Connect one prod to the base and touch the other prod onto the emitter and collector in turn. Both these readings should be **the same as each other**—EITHER both high resistance (meter needle barely moving off the back stop) OR both low resistance (500 to 2000Ω). Then repeat the test with the prods reversed. The two readings should again be **the same as each other** but this time **opposite** to those in the first test. Finally, check emitter to collector resistance: this should be **high** whichever way around the prods are connected (check both ways), i.e. virtually open-circuit. Note Germanium transistors will register proportionally lower resistance.

Do not assume, however, that just because its electrode potentials are incorrect in circuit that it must be the transistor itself which is faulty. It could be one of the associated components. A careful analysis of the potentials will usually indicate the most likely cause and this can save unnecessary unsoldering, with consequent possible harm to the printed wiring as well as wasted time.

Let us look at some examples of incorrect voltages and decide which component is the most likely one to be the cause of the trouble:

No. 1: e = 0V, b = 0V, c = +9V: The transistor is not conducting, since its collector voltage is at supply potential, meaning there is no collector current through R3. This should not be surprising, however, as there is no forward bias between base and emitter. If the base-emitter junction was open-circuit, there should still be a potential on its base of about +2·5V. If the junction was short-circuit, the equivalent circuit in the base-emitter region would be as shown in Fig. 6.4. Resistor R2 in parallel with R4 would reduce to

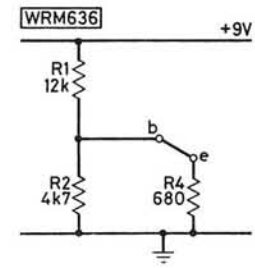


Fig. 6.4

$$\frac{4{\cdot}7 \times 0{\cdot}68}{5{\cdot}38} = 0{\cdot}594\text{k}\Omega = 594\Omega$$

So the potentials at base and emitter should both be

$$\frac{594}{12594} \times 9 = 0{\cdot}42\text{V}$$

So even though the transistor potentials are incorrect a faulty transistor does not seem to be the cause. Either R1 open-circuit or R2 short-circuit would provide these results, the former being by far the most likely. Either would mean no forward bias, no emitter or collector currents through R4 and R3 and thus no voltage dropped across either resistor.

No. 2: e = +0·42V, b = +0·42V, c = +9V: We have already seen in No. 1 that these base and emitter readings would be caused by a base-emitter short-circuit. There is no forward bias, so there will be no collector current, leaving the collector at +9V as in No. 1.

No. 3: e = 0V, b = +2·53V, c = +9V: Again the transistor is non-conducting, but this time it has 2·53V worth of forward bias. This is not possible for a good transistor. The **upper limit** of base-emitter forward bias is about 1V, anything much more than this signifying an open-circuit base-emitter junction.

No. 4: e = +2·7V, b = +4V, c = +4V: The fact that the base and collector potentials are equal looks highly suspicious and indeed a base-collector short-circuit would cause results like these. The equivalent circuit is shown in Fig. 6.5, with R1 in parallel with R3 and R4 almost (but not quite, because of the good base-emitter junction) in parallel with R2.

No. 5: e = +2V, b = +2·5V, c = +9V: This is more tricky. The transistor is not conducting, yet the base voltage is correct and the emitter voltage is only marginally high, so our first assumption may be that the

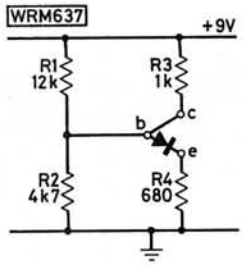


Fig. 6.5

base-collector is open-circuit. To verify this we could unsolder the transistor and test it, but we would probably find it checked out all right and we would have to think again.

At this point, it is perhaps best not to replace the transistor yet, but to take some voltages with it out of circuit. With the transistor absent, the equivalent circuit (see Fig. 6.6) is quite a simple one. Potentials on the points to

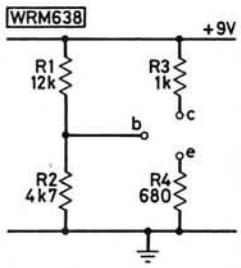


Fig. 6.6

which the transistor was originally connected should be e = 0V, b = +2·53V, c = +9V. Suppose these are precisely the readings we measure. We seem to be near our wits' end. The equipment is not working, the transistor voltages are incorrect yet we can find nothing faulty! In desperation (or perhaps with a cunning born out of experience), let us measure the voltages **with respect to the +9V line** instead of with respect to earth, with the transistor still out of circuit. These should be e = −9V, b = −6·47V, c = 0V. Instead of these readings we measure e = 0V, b = −6·47V, c = 0V. Ha! The culprit is R4, which has gone open-circuit, leaving point e (and therefore one lead of our meter) unconnected to **any** part of the circuit.

But, wait a minute! If R4 is open-circuit, why did we measure 2V across it initially, apparently indicating a current through it? The answer lies with that old arch-deceiver we often forget—meter resistance. When the circuit stands alone, with the transistor in circuit, the potentials are e = 0V, b = +2·5V, c = +9V, the emitter connection being isolated from the rest of the circuit. But as soon as we connect our meter between emitter and earth the meter takes the place of R4 and provides us with a near-correct reading.

Perhaps we could have found the fault by measuring the voltages with respect to the +9V line **before** removing the transistor. If we had done this we would have been looking for potentials of e = −9 + 1·93 = −7·07V, b = −9 + 2·53 = −6·47V, c = −9 + 6·16 = −2·84V. Now we know that the fault is R4 open-circuit, it may be anticipated that we would have actually obtained results of e = 0V, b = −9 + 2·5 = −6·5V, c = −9 + 9 = 0V. However, the readings we actually measure may well be something like e = −0·5V, b = −6·5V, c = 0V.

The reason for this cruel discrepancy in emitter potentials is that when a transistor base-emitter junction is sufficiently reverse biased it can often behave like a 6V Zener diode! The equivalent circuit would then be that of Fig. 6.7. The base is at −6·5V with respect to the +9V line, so that when the meter is connected the Zener circuit is completed, with 6V across the Zener and the remaining 0·5V across the meter.

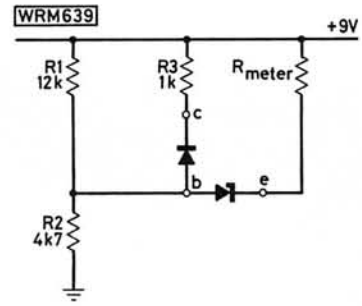


Fig. 6.7

So while it is a good idea to take readings with respect to some point other than 0V in order to glean more information if needed, one must still bear in mind the possibility of initially unexpected results due to meter resistance and/or the behaviour of transistor junctions under these different conditions. It is obviously much more straightforward after the transistor has been removed but one is naturally loth to do this unless the transistor itself is suspected of being faulty or in the event of our inability to interpret the readings with it in circuit.

Incidentally, it is sufficient to unsolder just two of the transistor leads in order to isolate it from the circuit.

You should now be in a position to appreciate the two problems posed in the opening paragraphs of this series in the June issue. (Assume use of a 1kΩ/V meter on its 10V range for Fig. 1 and a 20kΩ/V meter on its 30V range for Fig. 2.)

Here are some others for you to try (full solutions will be given in next month's issue):

No. 1: With reference to the circuit of Fig. 6.2, deduce the most likely component fault, given the following sets of readings taken with respect to earth. In each case, testing the transistor out of circuit shows it to be satisfactory.

(a) e = 0V, b = +0·8V, c = +0·1V (with the transistor out of circuit e = 0V, b = +2·53V, c = +9V).

(b) e = +0·3V, b = +1·1V, c = +0·5V (with the transistor out of circuit e = 0V, b = +2·53V, c = 0V).

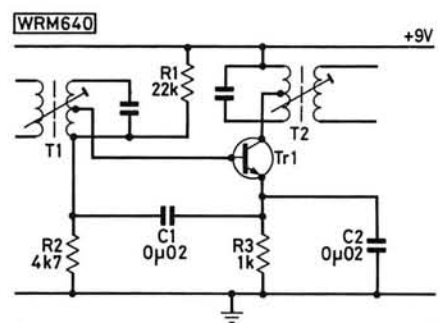


Fig. 6.8

No. 2: Estimate the correct e, b and c potentials of the transistor in the i.f. amplifier circuit of Fig. 6.8.

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. 17

I am receiving an increasing number of requests for mods to extend the range of 144MHz equipment for use with transverters to operate over the whole of the 430–440MHz band.

IC-25E

A surprising number of 144MHz band rigs can be modified to cover 10MHz (140–150MHz). The easiest is probably the Icom IC-25E. This is a tiny 25 watt mobile set that has three rectangular silver buttons on the right-hand side of the front panel. If the right-hand pair of buttons are depressed simultaneously, the set will then cover 10MHz. The buttons are marked SIMPLEX and NORMAL/REVERSE. The out of band frequencies can be entered into the memories in the normal way and they will stay there even when the pushbuttons are released. It is also possible to hardwire the IC-25E for 140–150MHz coverage but as the external mod is so easy, I don't think that it is worthwhile delving inside.

TR-9000

In our February 1982 issue I passed on a mod that gave extended frequency coverage on the Trio TR-9000. This involved fitting a small toggle switch to the back of the set. It is this switch that determines the band edges when power is first applied to a modified set. In position A the band edges will be 143·900–148·995MHz and the channel spacing will be 5/10kHz. If power is applied with the switch in position B, the coverage will be 144–146MHz with 12·5/25kHz channel spacing. Flicking the switch from one position to the other while power is still being applied to the set will not change the band edges but it will alter the channel spacing. This makes it possible to have 12·5/25kHz channels within the 143·900–148·995MHz band and 5/10kHz channels in the 144–146MHz band. David G4HAZ, telephoned me because he has discovered a very easy way to make this set cover 10MHz with the aid of the toggle switch and the previously mentioned mod. He found that by applying power with the switch in position A and tuning down to 143·900MHz, he could flick the switch over to position B and carry on tuning down. The set will tune down to 140MHz and then carry on down to 149, 148MHz etc. Providing you stay out of the 143·900–148·995MHz band, you can tune up and down. If you should inadvertantly slip back into the amateur band you will have to carry out the same procedure as before to get out of it. When in the out of band section, it is possible to use the toggle switch to choose whichever channel spacing you want. I have tried this out on my set and I found that it worked perfectly as far as the display goes but unfortunately when I tried to measure the output, I discovered that there wasn't any in the top and bottom megahertz bands. The set will transmit full power only between 141MHz and 149MHz. Similarly, the receiver will not work properly at the top and bottom edges of the 10MHz band. Incidentally, an easy way to find out if the p.l.l. is locked or not is to turn the squelch threshold back to zero and listen for the background noise that is always present on f.m. If the p.l.l. is not locked, there will be no noise. Alan, the engineer at Waters and Stanton, showed me that and when we tried it on my TR-9000, the lack of noise showed that the oscillator was not locked at the extreme edges of the 10MHz band.

PCS 3000

The Azden PCS 3000 is quite easy to modify for 10MHz coverage. The first step is to remove the top cover of the control head. Then find the screen printed markings on the printed circuit board that show where diodes D113 and D114 should go. They should be next to pins 8 to 11 on the MP4432 microprocessor. If you now fit a diode (any 1N914 type) into the space marked D113, the set will be able to receive between 144 and 148MHz. If however, you fit the diode in the D114 position, the set will cover 142 to 150MHz, nearly 10MHz. To make it transmit in these bands you will have to remove the top cover of the body unit and unplug the small upside-down green printed circuit board. Under this board you will find diodes D401 and D402. These should be cut. If you now reassemble the set, you will find that it transmits and receives in the new band. As this modification is primarily designed for 70cm transverter driving, it would be a good idea to adjust the low power output with VR407. The Microwave Modules transverter requires an input of $\frac{1}{2}$W and this seems to be a standard figure for most transverters.

Many of our readers are obviously scanner users because I am still being inundated with requests for mods to the SX-200N. I have had long conversations with Peter Longhurst of Garex Ltd, the main service agents for this set, and he is not too optimistic. He has had his hopes raised once or twice by people who have managed to trick the set into running from 0 to 999MHz but whenever he has checked up, it has proved to be the display that is indicating a frequency that the set is not receiving. All avenues are currently being explored and should there be any news I will certainly let everyone know as soon as possible.

I had hoped to be able to bring you lots of mods for the Yaesu FT-290 this month but events have prevented me from doing so. Just in case any of you have rushed out and bought this month's issue just for those promised mods, here is a very simple one that has been sent in by Harry G3LLL, of Holding's Photo Audio Centre. It sounds a bit brutal when you read it but I have been assured that it works well. First remove the lid from the set. Then, with the p.l.l. facing away from you and the p.a. nearest to you, look in the bottom left-hand corner and find C110. This is part of a de-emphasis network comprising C110, C109, R82 and R89 (Fig. 1). Now obtain a sturdy pair of long nosed pliers and reach in and grip C110, which inciden-

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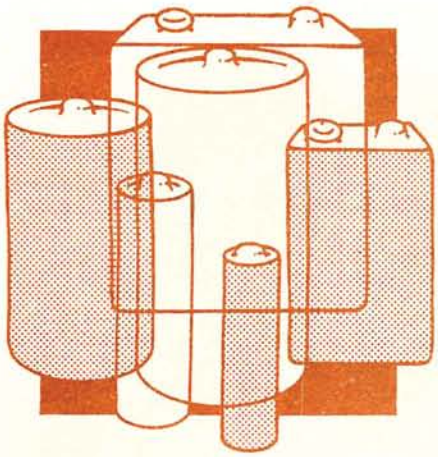

RECHARGEABLE BATTERIES IN RADIOS

B.P. CASTLE G4DYF

By the addition of a single resistor it is possible to adapt a portable transistor radio to run on Nickel Cadmium rechargeable cells and provide for their charging in situ. With the current price of ordinary dry cells it has become economic for this application to consider purchasing rechargeable cells, even though they cost several times as much initially.

The modification proposed entails the connection of a resistor to bridge the internal battery cut-off switch, which normally disconnects the internal battery pack when the mains lead is plugged in. The internal mains power unit will then supply the radio circuitry as usual, but will also provide, via the resistor, a small charging current to a suitably rated NiCad battery pack.

A charging current will flow because the voltage of NiCad cells is lower, by about 0·25V per cell, than non-rechargeable secondary types. Because of this the existing power supply voltage will always be higher than the replacement battery voltage. The additional resistor is selected to limit the charging current, which will increase when the radio is switched off.

I adopted this rather unorthodox method of NiCad charging after fitting rechargeable cells into my mother-in-law's new radio. Before this modification the periodic removal of the cells to a charger, and subsequent replacement in the radio, offered too much scope for reversal of the cells and their consequent destruction.

After modifying the radio I suggested to her that she should plug it into the mains every night and at times when it could conveniently be used on the mains. At all other times the set is used on the NiCad batteries which become partially discharged, though complete discharge is unlikely. With this pattern of use the simple modification is likely to be satisfactory for most domestic demands.

It must be noted that this modification will invalidate the maker's guarantee and morally one cannot argue with this. Damage could undoubtedly be caused, especially by the wrong choice of charging resistor value. It would therefore be wise to defer the modification until after the expiry of the guarantee.

TABLE 1

Size		Non-rechargeable types	Rechargeable Equivalents	
IEC	NBS		Nominal Capacity at C/5 Rate	Normal Charging Rate
R6	AA	SP7, HP7	0·5 Ah	56mA for 14 hours
R14	C	U11, SP11, HP11	2·0 Ah	215mA for 14 hours
R20	D	U2, SP2, HP2	4·0 Ah	430mA for 14 hours

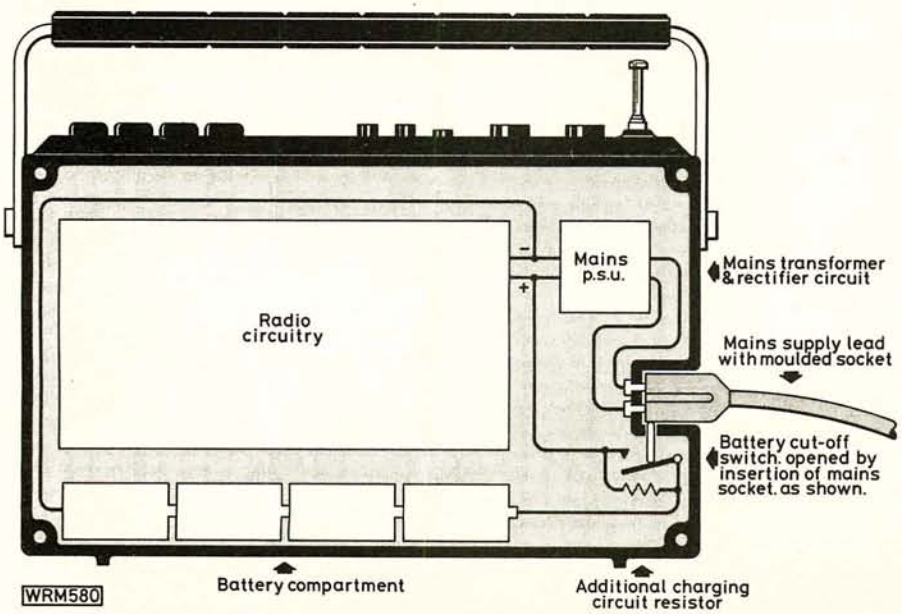

Fig. 1: Schematic layout of an average mains/battery portable radio showing the modification required to provide charging current when using a NiCad battery pack.

References: ***Engineering Data on Nickel Cadmium Cells.*** **British Ever Ready.**

NiCad Facts

It is not possible to specify a resistor value which will be correct in every radio. Certain tests must be carried out to make sure that both the battery and the apparatus it is used with will not be damaged. The following facts are useful background knowledge to have before one starts.

1) The end-of-charge voltage per cell at 20°C, after a charge at 1/8 of the NiCad cell's Ah capacity (C/8), is 1·48V.
2) The end-of-charge voltage per cell at 20°C, after a charge at 1/20 of the NiCad cell's Ah capacity (C/20), is 1·45V.
3) The average voltage during discharge, at 1/5 or less of the NiCad cell's Ah capacity (C/5), is more than 1·25V. This voltage is maintained until about 80 per cent of the cell's capacity has been used up.
4) To avoid permanent damage to the cells they should not be allowed to discharge to below 1 volt.
5) The charging rate should normally be between 1/8 and 1/20 of the cell's rated capacity (C/8 to C/20) and the battery should be charged to 150 per cent of its capacity; i.e. C/8 for 12 hours or C/20 for 30 hours, if starting from the fully discharged state.
6) Provided that the charge rate is no higher than C/8 the charge can continue indefinitely.
7) Charging at a rate lower than C/20 may progressively reduce the cell's capacity.

Choosing The Resistor

A set of four non-rechargeable cells has a voltage, when new, of just over 6V, while four NiCads will have an average voltage during their useful discharge period of about 5V. A radio will work happily at this reduced voltage.

The mains power supply of the portable radio will have a nominal open-circuit voltage of over 6V. The value of the charging current will depend upon the state of the charge of the cells, the internal resistance of the mains power unit and the value of the additional resistor.

The resistor must be chosen to limit the current when the battery is fully discharged to a value which is unlikely to damage the power supply components of the radio, especially the transformer. If the transformer does not get unpleasantly hot it will probably survive. One must accept that it is a gamble, or shall we say a calculated risk, unless the specification of the component is known.

Select a resistor value which gives a charging rate of approximately 70 per cent of the recommended rate when the cells are fully charged; e.g. 40mA for R6 (AA) cells. Check when the cells are discharged to the point where their voltage is at about 1 volt per cell, that the charging current is no more than 100mA. Also check with this current flowing for an hour and with the radio in its case, that the transformer is not too hot. If necessary, increase the resistor value.

If there are four or more cells in series, a flat battery can be simulated by removing one cell temporarily and bridging the gap with a piece of wire. Do not continue this with a fully charged battery as venting of the cells will occur.

I found that a resistor of 5Ω was about right in a Sanyo RP7160 which takes four R6 (AA) size cells. The power rating of the resistor must be at least equal to twice I^2R watts, and then doubled again to be on the safe side.

Once the new charging resistor has been fitted the NiCads must on no account be replaced by ordinary cells.

Crude though it may seem, this method does work and it is, to date, mother-in-law proof. Nothing could be simpler. ●

NEW BOOKS

SERVICING RADIO HI-FI AND TV EQUIPMENT
by G. J. King
Published by Butterworths
205 pages, 215 × 137mm. Price £6.95

The text of this book is aimed at the service technician, the student starting in electronics and the enthusiastic amateur. It does not assume all readers are electronics engineers. The aim in the book is fault diagnosis, with each "fault-finding" chapter concluding with a Fault Diagnosis Summary Chart. The chart gives probable fault conditions, and items to aid diagnosis.

RADIO HANDBOOK (22nd Edition)
by William I. Orr W6SAI
Published by Howard W. Sams & Co. Inc.
(UK Distributors, Prentice Hall International)
1200 pages, 240 × 170mm. Price £24.45

Amateur radio encompasses a vast area of communications and electronics, both of which are undergoing continuous expansion. Naturally then subject reference material must follow suit and in this respect the latest, 22nd edition of the Radio Handbook continues to catalogue both the established and latest developments within the field. Apart from in depth theory many of the pages of the 35 chapters provide practical details, allowing the reader to produce many useful items of radio equipment, latest amongst which are designs for a range of GaAs f.e.t. low noise pre-amplifiers.

JMF

ELECTRONIC TEST EQUIPMENT
Operation and Applications
Edited by A. M. Rudkin
Published by Granada Publishing Ltd
316 pages, 235 × 153mm. Price £20.00

Many engineers, scientists and technicians use electronic test equipment in their everyday work. Few need detailed knowledge of the circuit techniques employed within the instruments, but most would benefit from some appreciation of their design principles, and how to operate them most effectively, realising their limitations and sources of errors.

The twelve chapters are written by specialist contributors, and cover: LF oscillators; Signal generators; Sweep generators; Voltmeters; Power meters, a.f. and r.f.; Distortion meters; Frequency meters and counter-timers; Modulation meters; Oscilloscopes; Spectrum analysers; Component bridges; Microprocessors and programmable instruments, including a description of the various data bus standards used by instrument manufacturers.

It is a fascinating and useful book, including many of the "tips and wrinkles" which would be passed on to newcomers by the old hands in an electronics lab. It would interest many hobbyists too, if the price could be brought down to a more reasonable level by producing a paperback edition, instead of the hardback original.

GCA

SPACE SHUTTLE COMMUNICATIONS

Part 2

Brian DANCE

Having outlined the communications parameters of the shuttle vehicle, this article concludes with details of the supporting network

TDRSS Satellites

The Tracking and Data Relay Satellites being constructed by TRW Inc. form an important part of the Space Shuttle communications system. They will operate in conjunction with a single, highly complex, earth station under construction at White Sands, New Mexico. Western Union Space Communications Inc. will own and operate the entire TDRSS system, leasing tracking and data relay services to NASA.

This system of geosynchronous satellites will provide data relay services for up to 32 user spacecraft in orbits of up to about 5000km altitude. An earth station can provide an average of only about 15 per cent coverage of the orbital time, but the TDRSS satellite system will be able to provide cover equal to that of many earth stations—some 85 to 100 per cent of each spacecraft's orbit. The cover provided by the two 130° separated satellites to be used by NASA is illustrated in Fig. 3[2].

The TDRSS satellites are large structures weighing over 1000kg and have large solar cell arrays generating over 1·7kW. These three-axis stabilised craft are over 17m in length and almost 13m in width. They employ 4·9m diameter deployable antennas (two per satellite) and other smaller antennas. Further information about these satellites is given in Table 2.

No signal processing is carried out by the satellites, which operate as repeaters for the relaying of signals between the earth station and the user spacecraft. As few operations as possible are carried out on-board, since reliability can be improved by performing most operations at the earth station. Two-for-one redundancy is used in almost all active circuits (even greater redundancy in some parts) so as to almost eliminate the chance of single point failures. All four satellites will be identical and interchangeable in orbit for greater system redundancy. They are expected to provide cost-effective, ultra-reliable telecommunications services which will meet NASA requirements over the ten year period ending in 1990.

Two of the four satellites will be used by NASA, whilst another is intended for the use of Western Union for their Advanced Westar commercial service. The fourth will be an on-orbit spare shared by both NASA and Western Union. The system performance is shown in Table 3.

All signals relayed by the TDRSS satellites will be processed at the White Sands Earth Station by demodulation equipment which has been specially designed for high data rate reception. Automatic data processing equipment helps to make user satellite tracking measurements; this equipment also controls all communications equipment in the earth station and collects TDRSS status data for transmission, together with user spacecraft data.

All data to and from NASA will be given to NASA at the White Sands station and NASA will route the data to such locations as the Johnson Space Center in Houston for Space Shuttle flights. The station will also accept command data from NASA for transmission to user spacecraft via the TDRSS satellites.

The beam of the multiple-access phased array will be formed and controlled by the earth station, as will the control and tracking functions of the satellite single access antennas. Such functions have been generally carried out in the space section of a system, but it is felt that maximum reliability can be obtained by performing them in the earth station.

Ground Support

The Ground Space Tracking and Data Network used with the Shuttle initially consists of a world-wide system of about 12 S-band stations which provide primary support until the TDRSS system is available and operationally verified. The TDRSS will then provide primary support, whilst the ground stations will be mainly used to support launches, landings and deep-space operations.

When the TDRSS satellite system is operating, data from the TDRSS ground station will be carried over two diversely routed duplex 1544Mbps lines, as shown in Fig. 4[2]. One line will be routed to the Mission Control Center (MCC) via the Goddard

(NASA)

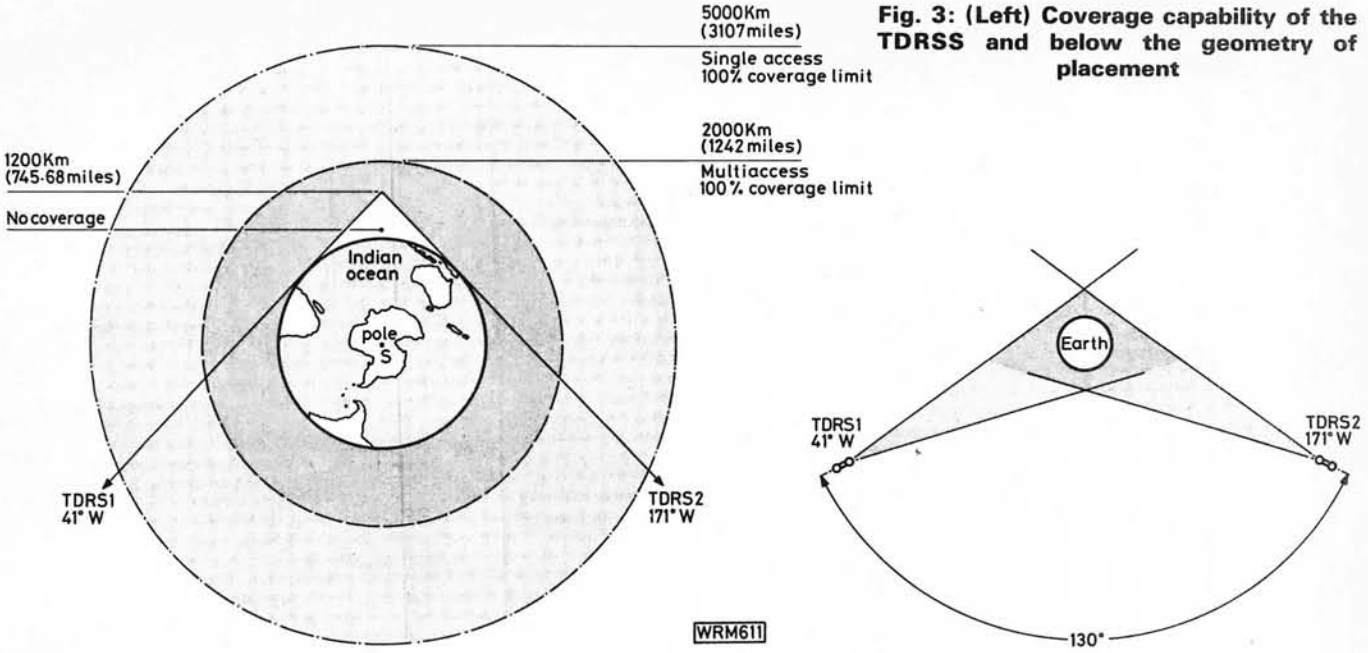

Fig. 3: (Left) Coverage capability of the TDRSS and below the geometry of placement

Space Flight Center (GSFC) and the other to the GSFC via the MCC. A single duplex 244kbps line between the GSFC and the MCC will be provided for back-up communication. The ground station will provide short duration recording capability as a protection against circuit failures.

The Mission Control Center at the NASA Lyndon B. Johnson Space Center (JSC) in Houston will provide facilities for flight control and data systems personnel to monitor and control Space Shuttle flights. In addition, the JSC will provide for the monitoring and control of certain specific payloads.

TABLE 2

TRDSS Technical Data

Dimensions:	17·4 x 13m
Weight:	1088·63kg (in orbit)
Electrical power:	1700W (at end of life)
Communication channels:	2 in the S-band, duplex, 2 in K-band, duplex and multi-purpose S-band channel
Antennas:	6 (3 directional with 0·2° tolerance)
Orbit:	Geostationary (36 000km), positioning to 0·1°
Applications:	Telecommunication and tracking of up to 32 user satellites simultaneously
Transponders:	K- and S-band communications to user spacecraft and K-band to earth stations
Output power:	26W and 1W from travelling wave tubes for S- and K-bands respectively
Total bandwidth:	650MHz (down links) 625MHz (up links)
Antenna for down links:	2m diameter parabolic mirror
Main S- and K-band antennas:	Two foldable parabolic mirrors 4·9m diameter
Phased array antenna:	30 element spiral antenna
Effective beam power:	34dBW (multiple access): 46·4dBW (S-band single access): 49·4dBW (K-band single access)

Gradually the work of the MCC will change from monitoring the basic systems to monitoring the payloads, managing the missions and providing support to multiple flight missions.

There are three major systems within the MCC for accepting, routing, processing, controlling and displaying the received data. They are:

(1) *The communications interface system.* This provides voice and data communications within the MCC and voice, data and video interfaces between the MCC and external sources.

(2) *Space Shuttle Data-Processing Complex.* The SDPC will contain three computer systems which will usually be arranged to provide: (a) On line mission support; (b) A dynamic standby system and (c) An off-line system which can be switched to the mission support role of a dynamic standby. The SDPC will perform the operations of validation, calibration and special computations on telemetry data together with data retention, tracking and management functions. It will generate, transmit and record the commands to be initiated by mission control personnel and will also perform certain other functions.

(3) *The display and control system.* This will provide personnel with the facility of requesting and monitoring computer-generated data displays.

TABLE 3

System Performance

	Multiple Access		S-band Single Access		K-band Single Access	
	Forward	Return	Forward	Return	Forward	Return
Number of channels	1	30	2	2	2	2
Effective Radiated Power (dBW)	34	—	46·4	—	49·4	—
G T (dBK)	—	14·7	—	8·9	—	24·4
Maximum Data Rates (Mb/s)	0·01	0·05	0·3	12	25	300
Channel Bandwidth (MHz)	10	5	20	10	50	225
Bit Error Rate	—	10^{-5}	—	10^{-5}	—	10^{-5}

Shuttle and Space Abbreviations

AA	Accelerometer assembly
A/A	Air to air
ACCU	Audio center control unit
ACIP	Aerodyamic coefficients identification package
ACN	Ascension Island (STDN site)
ADI	Attitude directional indicator
AGO	Santiago, Chile (STDN site)
ANT	Antenna
AOA	Abort once around
AOS	Acquisition of signal
APU	Auxiliary power unit
ATO	Abort to orbit
AUD	Audio
AUTO	Automatic
BDA	Bermuda Island (STDN site)
BOT	Botswana (STDN site)
BUC	Buckhorn, California (STDN site)
CAL	Calibration
CAMR	Camera
CCU	Crewman communications umbilical
CDR	Commander
CNSL	Console
CNTLR	Controller
C/O	Checkout
COAS	Crewman optical alignment sight
CTR	Center
C/W	Caution and warning
DAP	Digital autopilot
DB	Deadband
DKR	Dakar, Senegal (STDN site)
DTO	Detailed test objective
ECLS	Environmental control life support
EDW	Edwards Air Force Base, California (de-orbiting optional site)
EES	Emergency ejection suits
EET	Elapsed entry time
EI	Entry interface
ET	External tank
FCS	Flight control system
FDF	Flight data file
FRD	Flight requirements document
FSO	Functional supplementary objective
FTO	Functional test objective
GDS	Goldstone, California (STDN site, 1st antenna)
GDX	Goldstone, California (STDN site, 2nd antenna)
GLRSHLD	Glareshields
GNC	Guidance, navigation and control
GPC	General purpose computer
GSFC	Goddard Space Flight Center
GWM	Guam Island, USA (STDN site)
H2	Hawaii (Kauai, STDN site)
HIC	Hickam Air Force Base (de-orbiting optional site)
IECM	Induced environmental contamination monitor
IMU	Inertial measurement unit
INCO	Integrated communications officer
IOS	Indian Ocean (STDN site)
IRCS	Integrated radar and communications sub-system
ITS	Interim teleprinter system
JPL	Jet Propulsion Laboratory, California
JSC	Lyndon B. Johnson Space Center
KAD	Kadena AB, Ryuku (de-orbiting optional site)
KSC	Kennedy Space Center, Florida (de-orbiting optional site)
LH2	Liquid hydrogen
LON	Longitude
LOS	Loss of signal
LOX	Liquid oxygen
LTG	Lighting
LVLH	Local vertical local horizontal
MAD	Madrid (STDN site, 1st antenna)
MAX	Madrid (STDN site, 2nd antenna)
MCC	Mission control center
MECO	Main engine cut off
MET	Mission elapsed time
MIL	Merritt Island, Florida (STDN site, 1st antenna)
MLX	Merritt Island, Florida (STDN site, 2nd antenna)
MNVR	Manoeuvre
MOCR	Mission operations control room
NASCOM	NASA communications network
NOR	Northrup FLT strip, New Mexico (de-orbiting optional site)
OFI	Operational flight instrumentation
OI	Operational instrumentation
OMS	Orbital manoeuvring system
ORB	Orbiter
ORR	Orroral Valley, Australia (STDN site)
PCM	Pulse code modulation (p.c.m.)
PL	Payload
PLBD	Payload bay doors
PLT	Pilot
POCC	Payload operations control center
PRO	Proceed
PTC	Passive thermal control
QUI	Quito, Ecuador (STDN site)
RCDR	Recorder
RCS	Reaction control system
REFSMMAT	Reference stable member matrix
RELMAT	Relative matrix
RGA	Rate gyro assembly
ROS	Regulated oxygen stream
ROT	Rita, Spain (de-orbiting optional site)
RT	Rotation, discrete rate
SSA	South Atlantic anomaly
SEP	Separation
SGLS	Space ground link system
STDN	Space flight tracking and data network
SV	State vector
TB	Talkback
TDRSS	Tracking and data relay satellite system
TK	Tank
T/L	Timeline
TRKR	Tracker
TUL	Tula Peak, New Mexico (STDN site)
VLV	Valve
VTR	Video tape recorder
WCS	Waste collection system
WIN	Irwin, Australia (STDN site)
WMC	Waste management compartment
XFER	Transfer
X-POP	X Body axis perpendicular to orbit plane
Y-POP	Y Body axis perpendicular to orbit plane
-ZLV	-Z Local vertical (-Z body axis towards earth)

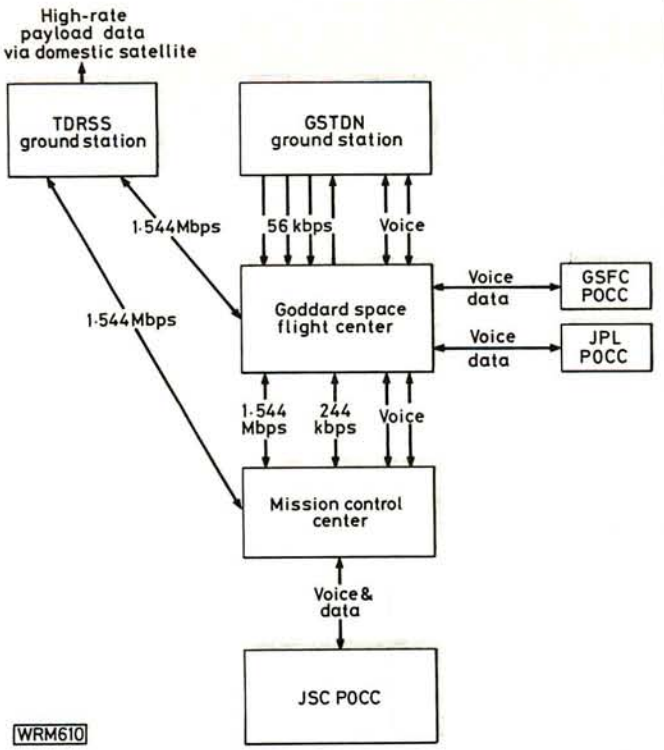

Fig. 4: Flow diagram of ground communications

POCCs

Three payload operations control centres (POCCs) have been named to interface with the Mission Control Center during the Shuttle programme. These are located at the Goddard Space Center, the Jet Propulsion Laboratory and the Johnson Space Flight Center. The POCC at the GSFC will have the responsibility of controlling earth-orbiting free-flying payloads, that at the JPL of controlling deep-space payloads and that at the JSC of controlling Shuttle attached payloads.

Some payloads will transmit direct to a ground station or to a TDRSS satellite via the Orbiter bent-pipe mode. Such data streams will be directly routed to the appropriate POCC. Other payloads will send data interleaved in the Orbiter operational telemetry downlink and such data will be routed to the MCC before being passed to the appropriate POCC, along with any appropriate Orbiter data.

Command signals from POCCs to a payload attached to an Orbiter, or operating through the Orbiter interrogator link whilst detached from the Orbiter, will be routed via the MCC and put into the Orbiter's command format for transmission. After completion of a Shuttle mission, deep-space and free-flying earth-orbiting payloads will be controlled by the appropriate POCC directly and not through the MCC.

Acknowledgements

The author is indebted to the NASA Lyndon B. Johnson and John F. Kennedy Space Centers; the Hughes Aircraft Company, California; TRW Inc., and to Ms. Kit Weinrichter (formerly of NASA's Ames Research Center) for providing detailed information and photographs for use in this article. ●

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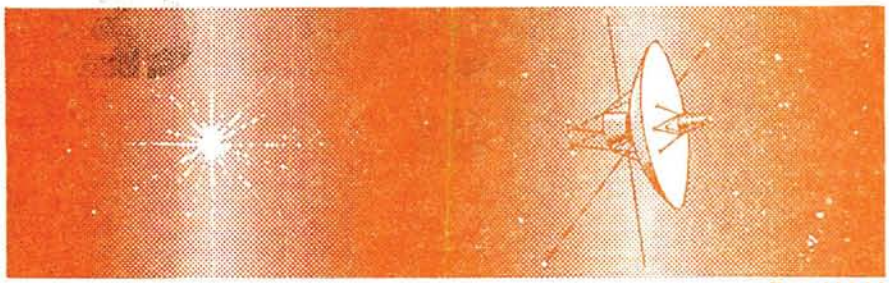
from spark to space



Ron HAM

Among the historic items I received recently were some of the log books of the late Bill Corsham G2UV and a BBC information pamphlet, published during WWII. Its text, repeated in nine languages, ends with the words, "Throughout Europe, men and women are risking imprisonment and even death, to hear The News from London because they know it tells the truth. SO LISTEN . . . TO THE VOICE OF BRITAIN—AND FREEDOM!"

We know that scores of key people in occupied countries listened to the BBC on such clandestine sets as the B2 suitcase transmitter/receiver and the miniature communications receiver MCR 1, both of which are now much sought-after collectors' items.

Help the Nation

Hundreds of wireless enthusiasts, like Bill Corsham, served in the signals sections of the armed forces during the 1914–18 War and tribute was paid to them in 1932 by the RSGB President, H. Bevan-Swift who, in a leading article in the *T and R Bulletin* said, "During the Great War many of the early members of the Society were able to materially help the nation in its need for expert technicians and operators and the Society has always been able to look back with pride upon this one period where it has been able to perform a national service".

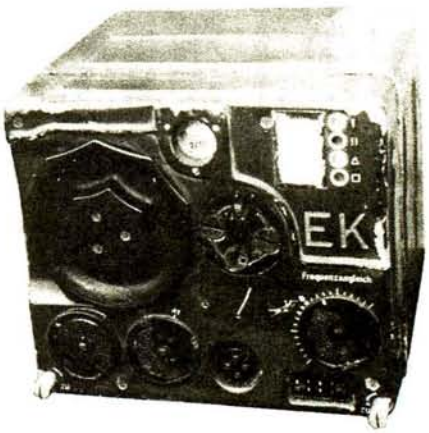
In December, 1921 Bill (first licensed in 1920) took joint third place in the second series of "Transatlantic Tests" and throughout the following sixty years, played an active role in amateur radio and was credited with the first ever QSL card. One of the amusing entries I found in his log dated January 28 1926 was "Accumulator QRT" and all old timers will know the significance of that.

The advert for part-time radio operators in our May, 1982 issue reminded me that the achievements of enthusiasts like G2UV caused the technical prestige of amateur radio to rapidly grow. Early in 1932, council members of the RSGB met representatives of the Admiralty to discuss the formation of the "Royal Naval Wireless Auxiliary Reserve". When negotiations were complete, Bevan-Swift wrote, "the Society can feel proud of the honour which has thus been paid to it and the recognition of its capabilities by the Government".

The formation of RNWAR (later changed to RNV(W)R) was considered so important that Capt. A. J. L. Murray RN, Director of Signals, was invited to speak at the RSGB convention on August 27 1932. He made it clear to all present that the Royal Navy were looking to the RSGB, as sponsors of organised amateur radio in this country, to provide a reserve of trained men for use in time of war. Between 1932 and the outbreak of WWII in 1939, several hundred radio amateurs trained with the RNV(W)R. In the official document called "National Service" published by HMSO in 1939, it referred to the RNV(W)R as, "formed for the purpose of training and providing telegraphists for service in the Royal Navy in emergency" and to qualify . . . "Candidates should be amateur operators or should be interested in wireless transmission work in the Morse code". In 1938, the Royal Air Force Civilian Wireless Reserve was formed for similar reasons and during WWII several thousand radio amateurs were involved in armed forces communications.

Airborne Radio

Forty years ago, war planes of the Luftwaffe were active in many theatres of war. Naturally, the RAF and Government scientists were interested in the radio equipment used in these machines just as much as the German authorities were keen to learn more about the variety of sets used by the RAF. In November, 1940, an article entitled "Wireless Equipment of the Luftwaffe" was published in *Wireless World* by special permission of the Ministry of Aircraft Production. They gave the journal an opportunity to "examine at first hand the wireless equipment in a number of crashed or captured aircraft". Then in April, May and July, 1946, *Practical Wireless* published comprehensive articles about German Airborne Radio. It was from these articles, invaluable to collectors, that I identified the set EK (Fig. 1) as a short-wave receiver, 3 to 6MHz, used in the Messerschmitt 110 and the E26 (Fig. 2) as a long-wave receiver, 150–600kHz, used in a Junkers 88.



Figs. 1 & 2: German aircraft receivers, both these sets are on display in the Chalk Pits Museum

On Active Service

Referring to the 1914–18 war, the RSGB history book *World at Their Finger Tips* says: "As the war progressed the need for telegraphists, signallers and operators became increasingly urgent. Society members filled many important posts in the wireless sections of all three services and it was to them the Royal Navy, the Army and the Royal Flying Corps looked for instructors and technicians." Between the wars a large number of amateurs trained with the armed forces

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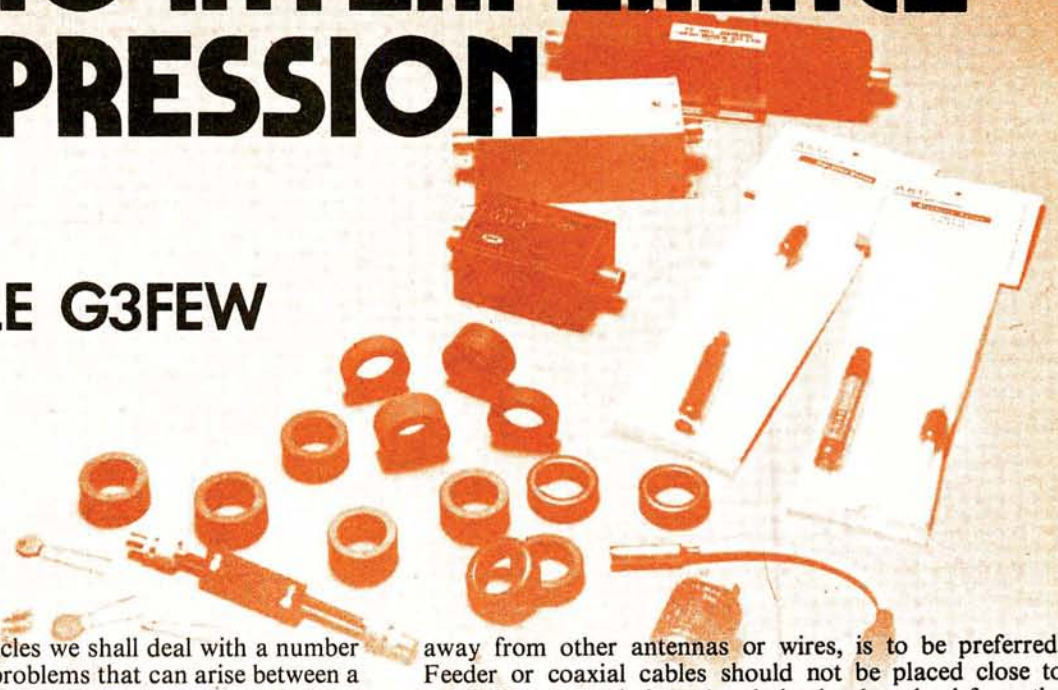
RADIO INTERFERENCE SUPPRESSION

PART 1

E.A.RULE G3FEW



In this short series of articles we shall deal with a number of the radio interference problems that can arise between a transmitter and nearby electronic equipment. There is no one magic cure, and each case can only be examined for its own individual cure which can sometimes only be found after many hours of frustrating investigation. Complaints of radio frequency interference (r.f.i.) should be dealt with in a polite manner and the ideal method is to have a third party to act as a go-between. The self-interest of each of the affected parties can thereby be avoided and each particular case examined on the facts alone. Don't start off by telling your neighbour that it is his equipment that's at fault (even if you know it is) before you have made an investigation. He may well retort that his equipment is perfect until you start transmitting!

Once a complaint is received it is suggested that you close down until you can start the investigations. This will show concern about the problem. At all times show a willingness to help and, most important, be polite. Your neighbour may have spent far more money on equipment than you have on yours, and will be equally entitled to expect it to be faultless. Don't do anything that could sour the relationship between yourself and your neighbour, you need his co-operation if the outcome is to enable you to transmit whenever you want to, regardless of peak viewing times, etc.

First, ensure that any electronic equipment that you own can be operated while you are transmitting and that it is free from r.f.i. A demonstration that you can transmit without problems to your own equipment is very disarming as it implies (without saying so) that the fault must be with the neighbour's equipment and not yours! Make sure that your transmitter is correctly installed according to the manufacturer's instructions, and also that the antenna system is correctly matched. Read the operating instructions carefully; the writer is still surprised by the number of people who do not read the instructions supplied with equipment, sometimes not even doing so when they have some problems. Never assume that you know it all, you might just be wrong for once.

Antennas used for transmitting should not be placed near other equipment, and an outside location in the clear, away from other antennas or wires, is to be preferred. Feeder or coaxial cables should not be placed close to other feeders, and sharp bends in the downlead from the antenna to the transmitter should be avoided. A low-pass filter (one which passes signals below a certain frequency but blocks those above that frequency) should always be used between the transmitter and its antenna system even though the transmitter may already contain harmonic filters. The complete design of a high-quality, low-pass filter will be given later, along with designs and details of other types. A low-pass filter should be installed into the antenna system as shown in Fig. 1. Note the position of the s.w.r. meter. Such meters contain semiconductor diodes to provide the current for the meter, and these diodes can generate considerable levels of harmonics. For this reason, after the standing wave ratio has been checked with the meter in Position 1, it should be moved to Position 2. It will still serve as an output indicator but cannot measure actual s.w.r. in this position, however the harmonics generated by its diodes are suppressed.

Low-pass filters are designed to be used with an antenna system of a particular impedance (usually 50 ohms), and will not work correctly if any odd length of wire is used instead of a matched antenna. Good quality coaxial cable should be used and more important, coaxial cable from the **same batch** should be used throughout the antenna system. The impedance of coaxial cable is a nominal one and can vary from batch to batch. Joining up odd lengths of the cable may cause standing waves and therefore radiation of power from the feeder, which in turn will greatly increase the risk of r.f.i. A well-installed antenna system is well worth the extra expense and could

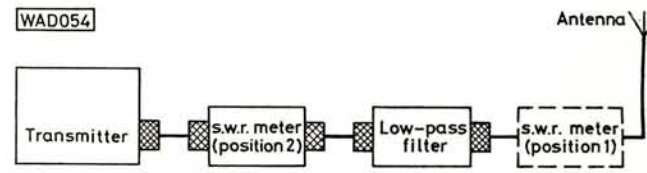


Fig. 1: General layout of equipment for transmitting

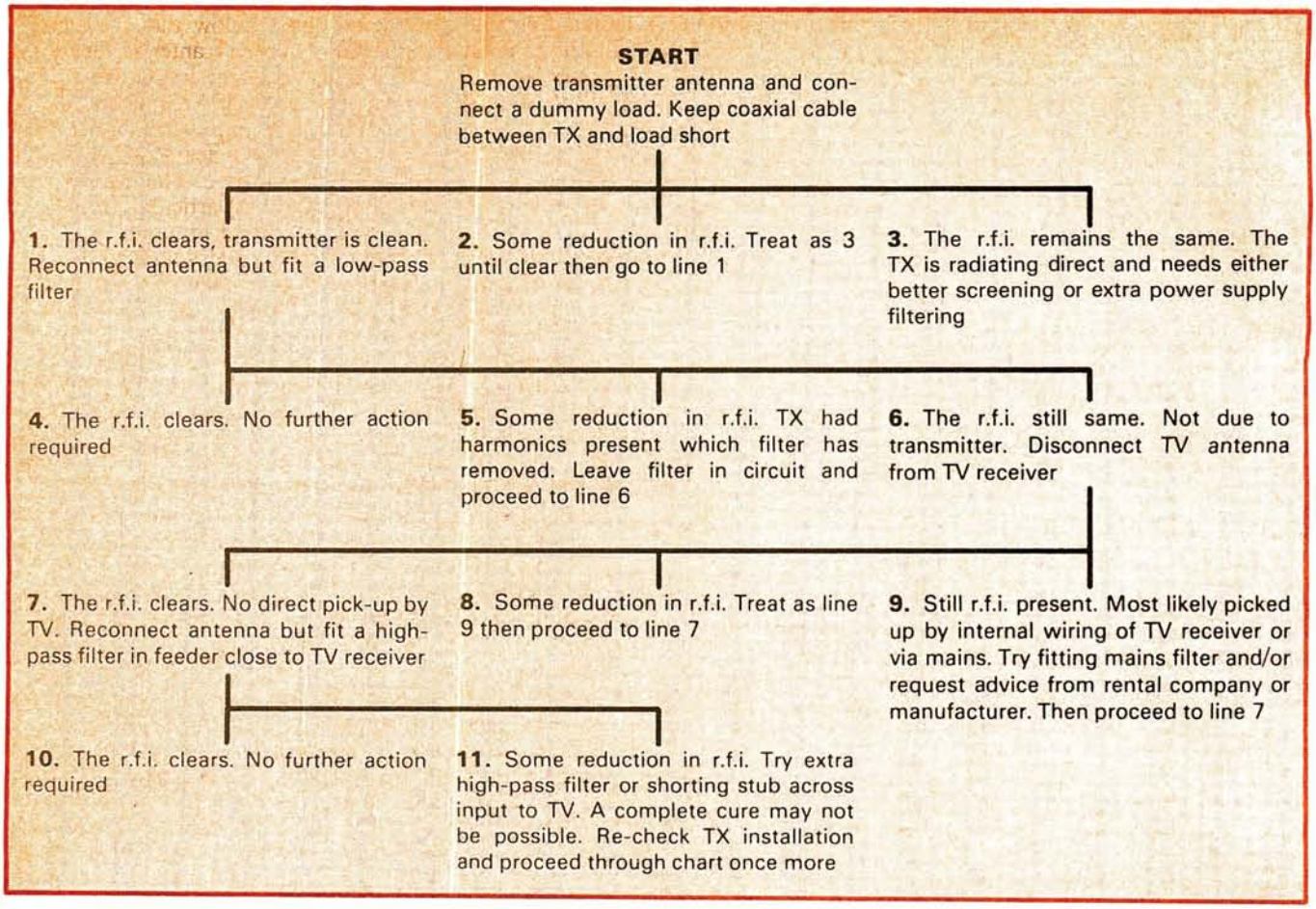


Fig. 2: Interference Tracing Chart. This chart is intended as a general guide in tracing the cause of r.f.i. In many cases more than one cause could be present and it is possible that a number of different filters may be needed before the r.f.i. is removed. Proceed in an orderly manner down the chart and the causes of the r.f.i. should become known. The use of a third party to make the checks will be found most helpful, he can check results while you operate the transmitter, and also act as a go-between. Any filters fitted to your neighbour's equipment should be neat and "professional"; a bundle of odd components left "hanging" on the back of the receiver will not instil confidence in your abilities

save the cost of expensive filters later. As the radiated signal falls according to the square of the distance, keeping the initial distance between the transmitting antenna and other systems as great as possible is important. Each doubling of this distance will reduce the signal strength by a factor of four times and greatly reduce the chances of r.f.i.

Most commercial transmitters are built to a very high standard as far as the spurious and/or harmonic content of their output is concerned. But the level of these spurious signals will be relative to other factors. For example, if we have a 10 watt transmitter having a harmonic content say 40dB down (10 000 times) there will be 1 milliwatt of power contained in its harmonics. This is more than enough to cause severe interference to (say) a nearby TV receiver if one of the harmonics happens to fall on the same frequency as the wanted signal. Even much lower levels of harmonics can cause problems in areas of fringe reception, bearing in mind that the transmitter and its antenna will be closer to the receiver than the TV transmitting station. A typical transmitter would have its harmonics suppressed by around 60dB and this can be improved to around 120 to 140dB by adding a low-pass filter. These figures refer to harmonics in the UK TV u.h.f. band. Regretfully, even with this amount of suppression it is still possible to have enough harmonic power present to cause r.f.i., especially if a high-power transmitter or linear amplifier is in use. By way of interest, 10 watts across 50 ohms equals 22·36 volts. 120dB equals a voltage ratio of 1 000 000. So the harmonic level is

$$\frac{22{\cdot}36}{1\,000\,000} = 0{\cdot}000022 \text{ volts}$$

or 22 microvolts, more than enough to cause interference! It's all a matter of relative signal strengths.

Referring back to Fig. 1, the low-pass filter should be placed as close to the transmitter as possible and its metal case should not be allowed to touch the transmitter chassis. The only electrical connections should be via its input and output sockets, with the coaxial connection between the transmitter and filter as short as possible. All interconnections must be properly terminated with 50 ohm plugs/sockets for optimum results. A good filter costs money and you only get what you pay for. Many of the low-pass filters at present offered on the CB market are quite useless and care is needed when deciding which type to purchase. The price and external appearance are no clue to how good a filter is. Pick one from a reputable manufacturer or one that has been recommended in a review. Even a good filter will not ensure 100 per cent success for the reasons outlined above regarding signal strengths. But even if the low-pass filter doesn't cure the problem, leave it in circuit while trying other approaches as the r.f.i. may be coming from two or more sources.

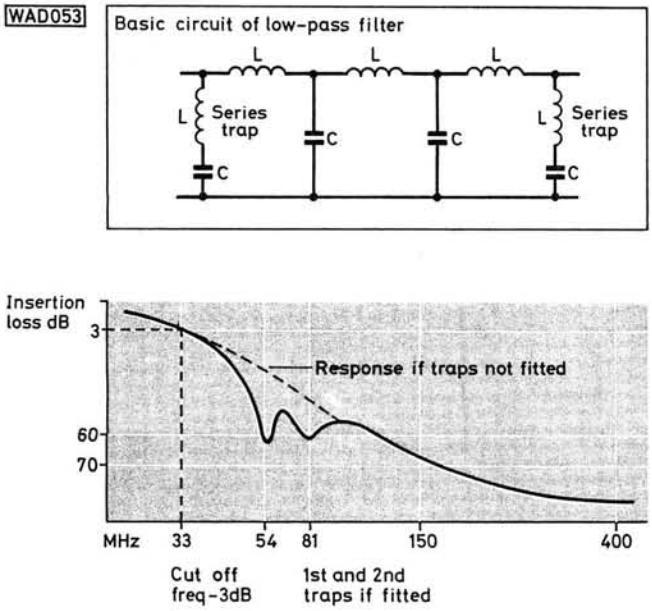


Fig. 3(a): Typical frequency response of low-pass filter (not to scale). The series tuned traps (if fitted) will normally be tuned to the second and/or third harmonics of the 27 to 30MHz band. The basic circuit is as shown

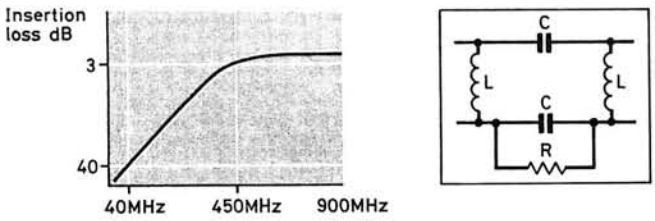


Fig. 3(b): Typical circuit and frequency response of a high-pass filter suitable for use with the UK u.h.f. TV service

Proceed by adding filters, etc., until the r.f.i. is removed. Once this has been done you can remove filters one by one to see which ones are needed. Just trying one filter at a time and, if it doesn't work, trying another will not get you anywhere if the cause is due to more than one source. You **must** proceed in an orderly manner as outlined later if success is to be achieved.

An interference tracing chart is shown in Fig. 2. Start at the top and proceed down the columns as indicated in an orderly manner, taking one step at a time. In general, if the problem is due to harmonics of the transmitted signal, this will be recognised by the fact that a small shift in transmitter frequency will cause a change in the effect the harmonic is having on the receiver, or the interference may only show up on certain channels either on receive or transmit. On the other hand, if the problem is due to "blanking" of the receiver due to the amount of r.f. present, changing frequency by a small amount will not have much effect. In other words, r.f.i. from harmonics tends to occur at particular points in the frequency spectrum whereas blanking due to strong r.f. fields tends to be general over a broad band. These comments of course only apply when dealing with receivers of one type or another. Hi-Fi and other electronic equipment normally only suffers from the blanking effect of strong r.f. fields at the transmitter fundamental frequency. This type of r.f.i. will be dealt with in detail later in the series.

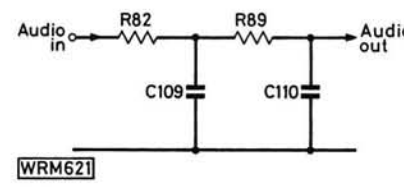
Mention is made in the chart of high-pass filters. These are filters which will pass all frequencies above a certain design frequency but reject those below that frequency. This type of filter is used in a receiver antenna feeder to prevent (say) h.f. band signals getting into a u.h.f. TV receiver. Typical frequency response curves of both low-pass and high-pass types are shown in Fig. 3. These two types of filter are the most common ones used and combinations of these can be very effective. There are other types which are "tuned" to reject one particular frequency and although these can be very useful in certain difficult cases, they tend to be tricky in setting up. However, details of some of these other types will be given later. One special type is called a "braid-breaker"; this is used mainly in TV antenna leads to prevent signals passing down the outside braiding of the coaxial cable into the receiver. For example, the average TV antenna feeder is of a suitable length to act as a quarter-wave vertical antenna at 27/30MHz, and this results in signals from the CB band or 28MHz amateur band being injected at considerable strength directly into the front end of the receiver. By using a braid-breaker filter this vertical antenna is "disconnected" from the receiver, but the wanted higher frequencies are allowed to pass. This type of filter is also very effective in reducing TV timebase radiation via the TV antenna into nearby communications receivers, so can be a double blessing in practice. It not only prevents your signal getting into your neighbour's TV but also prevents his timebase signals getting into your receiver as well (worth fitting for that alone even if your neighbour is not getting r.f.i.!).

Next month in Part 2, we shall be giving full constructional details of both low-pass and high-pass filters suitable for use with h.f. band transmitters and u.h.f. TV receivers. Details will also be given of braid-breaker filters and quarter-wave shorting stubs, etc.

Mods — 17

▶▶▶*continued from page 37*

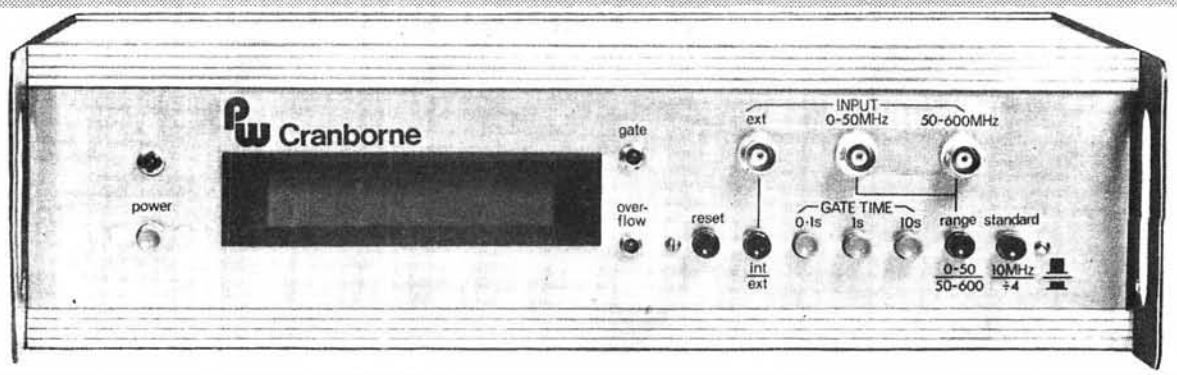
tally is a small green ceramic capacitor. It's as well to make sure that you have the right one as Harry now suggests that you crunch it with the pliers. I gather that not only is the sound of the capacitor breaking very satisfying, but when it has gone, the audio from the set is greatly improved. Harry calls it an added brightness. One reason that I have been given for the effectiveness of this unlikely mod is that the set was originally designed to suit Japanese voices, which tend to be slightly higher than European ones, and that's why the audio tailoring circuit needs to be modified. I don't know whether this is true or not but everyone who has carried out this mod has said how much their audio has improved.



Hopefully next month will be FT 290 month but until then, please continue to send in your mods and your requests. The address is, as always, R.S. Hall, Room 301 Hatfield House, Stamford Street, London SE1 9LS.

73
Sam.

PW Cranborne



600MHz FREQUENCY METER

Part 3

Stephen IBBS G4LBW

Oven Controlled Oscillator

There are many occasions when an accurate oscillator is needed for test purposes and this design aims not only to cater for these needs, but also to supply the necessary frequencies for the *PW* Cranborne frequency meter.

It uses an oscillator oven which, when it has reached its operating point, holds the crystal at a designated temperature, thus limiting any frequency drift due to changes in ambient temperature levels. Using this in conjunction with a special close-tolerance crystal and a well-tried and tested oscillator and buffer circuit produces a useful piece of equipment.

How it Works

No claims for originality are made for the oscillator circuit, which is described in the author's reference books as either a "Clapp" or a "Series-tuned Colpitts", depending on which book is looked at! The crystal is trimmed to exactly 10MHz by C1 and C2, with C3 providing the feedback network. Resistors R1 and R2 bias the transistor base to half supply voltage, and C10 decouples the collector, whilst C4 couples the oscillator to the buffer circuit arranged around Tr2, a simple switching transistor. This provides enough voltage swing across the collector resistor R6 to clock the TTL gates.

Further buffering is provided by IC1d and IC1c and the 10MHz signal is output via S1. IC1a and IC1b are used as logic gates which inhibit the incoming signal if one of the input pins is LOW (held LOW by R7 or R8). However, the gate is enabled when this pin goes HIGH, by either S2 or S3. The 10MHz signal then either clocks a divide-by-ten i.c. (74LS196) to provide 1MHz, or a divide-by-four i.c. (74LS74), to provide 2·5MHz.

For readers building the unit for the *PW* Cranborne, the frequencies (10MHz or 2·5MHz) are fed into the external oscillator input pin 33, and the external oscillator enabled by connecting pin 1 to pin 8 via a diode, as detailed in the first two parts of the *PW* Cranborne.

Components

When collecting the components for the oven, silver mica capacitors were assumed to be the best for the task. However, the *Amateur Radio Handbook, (ARRL),* recommends polystyrene capacitors for frequencies up to 10MHz because of temperature stability, with silver mica capacitors second choice as they can have some unusual drift characteristics—very good news if the prices of each are compared.

To improve stability, the oscillator is fed from its own regulated voltage supply, using a three-terminal regulator, with its associated capacitors C6 and C7, whilst the TTL uses +5V supplied by another regulator. It will be noticed

CONSTRUCTION RATING Intermediate

BUYING GUIDE

Apart from the crystal and crystal oven all components are obtainable from many of our regular advertisers. The crystal and crystal oven are available from Cathodeon Crystals Ltd., Linton, Cambridge CB1 6JU. Tel: 0223 891501.

APPROXIMATE COST £55

★ components

Resistors

¼W 5%

150Ω	1	R3
680Ω	1	R9
1kΩ	2	R4, 6
10kΩ	2	R7, 8
22kΩ	1	R5
47kΩ	2	R1, 2

Capacitors

Electrolytic p.c.b. mounting

22µF 16V	2	C7, 9
2200µF 16V	1	C5

Polystyrene

47pF	1	C4
100pF	2	C2, 3

Polyester

47nF	1	C10
0·22µF	2	C6, 8

Trimmer

5–65pF	1	C1

Semiconductors

Diodes

50V 1A bridge	1	D1
Red l.e.d.	1	D2
1N4001	1	D3

Transistors

2N2222	2	Tr1, 2

Integrated Circuits

7805	1	IC5
7812	1	IC4
74LS00	1	IC1
74LS74	1	IC3
74LS196	1	IC2

Miscellaneous

Crystal oven, Cathodeon MCO-2M 75°C; Crystal, Cathodeon RA-A16403; BNC Sockets (3); 2-pole push-push switches (3), 5-way bracket 15mm, 5-way latchbar 15mm, Knobs (3) Ambit SUE range; 250mA fuse and holder; Diecast box (see text); Printed circuit board; Mains transformer 0–12V, 12VA; Heat sinks, plastic package type (2).

that 1A regulators were used. This is because the performance parameters are better, and perhaps more important, they can be cheaper than the 100mA devices.

The oven uses raw a.c. from the secondary winding of the transformer rather than d.c., to avoid possible sparking at the contacts. When the temperature inside the oven reaches its specified point, the bimetallic element snaps from a convex to a concave shape disconnecting the supply, and thus acting as a thermostat. At the same time the l.e.d., its current limited by R9, has one of its terminals effectively disconnected, indicating that the oven is off. As the oven takes 450mA the transformer is rated at 12VA.

Construction

Mount the components, including the transformer, onto the p.c.b., a design for which is given in Fig. 15. Tr1 has a heatsink, again to help temperature stability. The prototype was mounted in a diecast box but builders of the *PW* Cranborne could mount the p.c.b. inside the main unit and re-arrange the power supplies to use a single transformer.

The oven was secured to the p.c.b. by a wire clip, and connections made to the crystal using small lengths of wire. Twisted leads connect the oven to the secondary

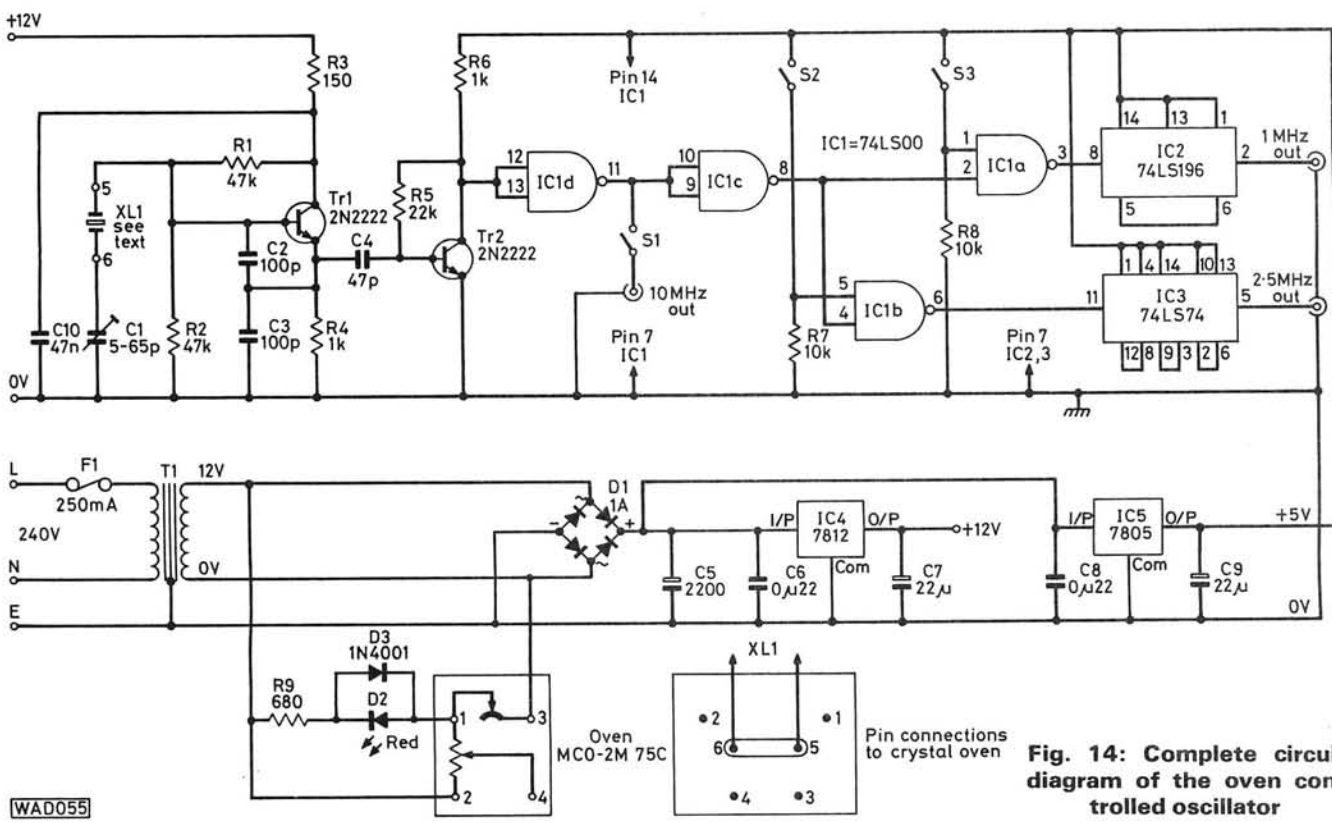
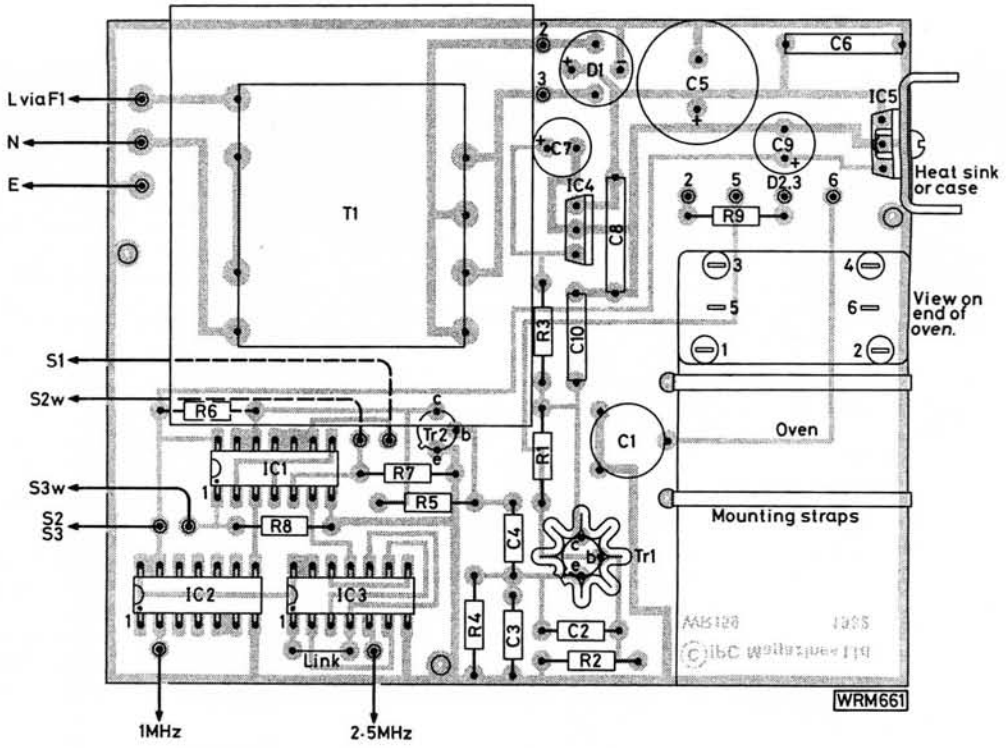


Fig. 14: Complete circuit diagram of the oven controlled oscillator

Fig. 15: (Right) the component overlay for the p.c.b. The copper track pattern is shown full size below the overlay. The photograph at the foot of this column shows the author's prototype. The final design uses a much smaller p.c.b. making the unit more compact

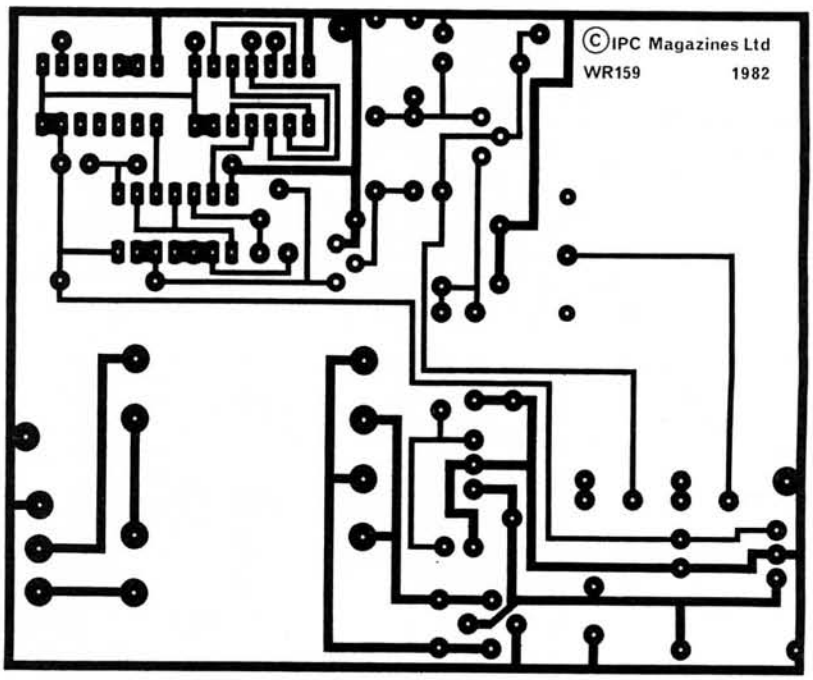


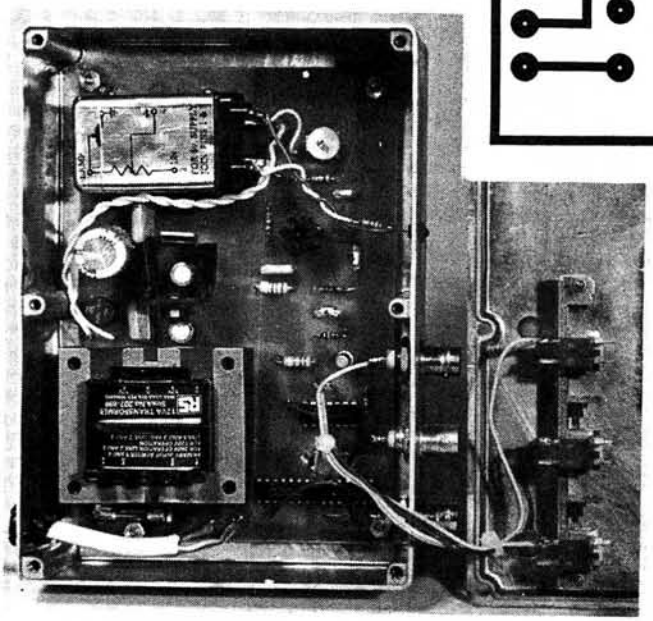
ERRATA

In Part 2 the alternative l.e.d. display should have been a common cathode type to suit the driver chip IC7

winding of the transformer, and two more leads connect the l.e.d. to the board. The 7805 should be fitted with a heatsink, or bolted to the case.

The switch-bank is from the Ambit SUE series, similar to those in the *PW* Cranborne, because they were cheaper than miniature toggles, and look professional. They are interlocking, i.e. pushing one switch releases the others, but if, for some reason, constructors were to want two or three frequencies at the same time, simply push two or all three together. The bank was mounted in the lid, and





connections made with ribbon cable. The three sockets and l.e.d. were mounted in the side of the box, and on the opposite side a hole was drilled for the mains lead strain relief bush. Diode D3 is soldered directly to the l.e.d. D2 and is fitted as the l.e.d. is switched across an a.c. supply.

When all connections are made and checked, the unit can be switched on. The l.e.d. should come on and stay on until the operating temperature is reached. After about 10 minutes (with the lid on), the unit is ready for calibration. Try to remove the lid as infrequently as possible so that the temperature inside remains stable, and calibrate either by reference to an accurate meter, or by zero beating to WWV. Check that the switches provide the correct signals, and if all is well the unit can be bolted down.

My thanks to Russell G8BHH and Doug G3ONP for their help with the oscillator design. ●

swap spot

Have a Griffin double-beam oscilloscope. Would exchange for a 2m multi-mode or w.h.y. S. M. Walker, 25 St. Aidans Place, Norfolk Park Estate, Sheffield S2 2NE. *P288*

Have Ferguson studio 20D audio centre with new f.m. antenna. *Would* exchange for FRG–7 communications receiver or similar. G. W. West, 37 Welford Gardens, Abingdon, Oxon OX14 2BN. Tel: Abingdon 26635. *P289*

Have (any item or mixture) TV DX antenna for Band III; Datong AD370 active antenna; 10A battery charger 6/12V; "Titan" CB/Ham p.s.u. 5/7 amp; Trio speaker model SP–100; various books on CB. Would exchange for Global a.t.u. AT1000 or audio filter, or any useful item for the TV DXer or s.w.l. Tel: Mike Evans 01-242 3732. *P290*

Have camera—AE1, Hoya zoom lens, black and white and colour 35mm enlarger. Would exchange for a Trio R–1000 in good condition. Tel: Burton-on-Trent 221870. *P292*

Have Eddystone 840C general coverage set 1·1–30MHz. Very good condition 5 wave-bands b.f.o. unmodified and unmarked. Would exchange for w.h.y. (value about £75). Armstrong. Tel: Ruislip 74349 or 11 Woodville Gardens, Ruislip, Middlesex. *P309*

Have Marconi TF995A signal generator a.m./f.m./c.w. with manual, working (value up to £100) Swap for good pair walkie-talkies, bench power supply, frequency counter w.h.y. Tel: 0385 712784. *P322*

Have complete Adana printing equipment including two machines 8 x 5 and 5 x 3, 12in guillotine, auto ink duct, lead cutter, 14 founts of type in case, inks, etc., in fact everything needed to start printing. Would exchange for a h.f. s.s.b. transceiver. Tel: Romford 67627. *P328*

Have Heath of London ships grid compass, fluid filled, with rotating bezel. Gimbal mounted, 152mm across bezel as new (value £150). Would exchange for FRG-7 with fine tune or similar modern 0·5–30MHz receiver. Brian Stacey, 31 Westfield Road, Garlinge, Margate, Kent. *P339*

Have Microwave Modules 144/28LO converter. Would exchange for the four metre version. M. Woollin G4ADE, QTHR. Tel: 04012 4365. *P348*

Have Unica UR-1A General Coverage receiver 550kHz–30MHz, 12V d.c. and mains, bandspread, b.f.o., r.f. gain, noise limiter, "S" meter. Would exchange for a CB transceiver. David Hedging, Bridgwater. Tel: 0278 662413. *P358*

Have Eddystone 770R receiver 19–165MHz, c.w., a.m., n.b.f.m., f.m. in immaculate condition. Would exchange for general coverage receiver or w.h.y. Davis. Tel: Worthing (0903) 41109. *P363*

Have 3cm Klystrons, 25mW (okay) and 75mW (boxed, new)—much more output than a Gunn! Would exchange for recent Sinclair ZX81 and p.s.u. and 16K RAM . M. Mann, 45 Old School Lane, Milton, Cambridge. *P386*

Have VIC 20, matched cassette and ROM Star Battle, all 3 months old, under warranty. Would exchange for Daiwa s.w.r./power/automatic a.t.u., or c.w. or RTTY equipment, or FT-707 accessories. Tel: 01-733 9961. *P387*

Have *PW* Special Offer Counter Kit, p.s.u. p.c.b., undrilled H.L. Smith custom eyebrow case with dimensions. Would exchange for two each of GNP7-AH Nixie tubes, 74LS90 and 74LS141, RS decade counter boards. G4LEG, 0329 46984 after 6 pm. *P388*

Have 1967 Triumph Bonneville T120, Maroon/Grey. Ideal for rebuild, have some new parts, engine very good, lost interest! Would exchange for FT-101ZD or 70cm transceiver and linear or w.h.y. Storrington (090-66) 2979. *P401*

Have Telequipment D83, D1016 'scopes, Fluke 8020A, Avo DA116 d.m.m., Bontempi electric chord organ. Would exchange for anything interesting, or computer. Write with s.a.e. to: B. Jain, 17 Taylors Lane, London NW10. *P402*

Have complete set Scuba, 72 cubic ft. cylinder Typhoon/Avon a.b.l.j. would suit 5ft 8in or 6ft. Would exchange for 70cm or w.h.y. Tel: 061-320 8752 evenings. *P410*

Have Realistic PR2001 f.m. scanning RX, 68 to 88, 144 to 174, 430 to 512MHz, also v.h.f./u.h.f. 12in portable TV. Would exchange for a 70cm transceiver and a legal f.m. CB transceiver. Also 1956 Ekco TV free to anyone who can collect it. M. Hahn G4JRB, 21 Stanley Road South, Rainham, Essex RM13 8AJ. *P415*

Have Philips N1500 video recorder with one tape. Would exchange for r.f. generator. Tel: Ferndown 872439. *P426*

Have little used 10ft Tomboy dinghy with tubular aluminium reinforcement. This rigid boat would easily convert to a sailing dinghy. Would exchange for IC-2E or w.h.y. Tony Briggs G8YHX. Tel: Buxton 6800. *P427*

Have two army type 38 sets. Would exchange for amateur v.h.f./u.h.f. gear, test equipment or w.h.y. Also have expanded Nascom computer. Would exchange for solid state RTTY or ATV gear. G6CUL. Tel: Andover 65368. *P441*

Have Grundig Satellit 2100 in mint condition. Would exchange for a small portable colour TV. A.F. Roberts, 16 Regis Avenue, Aldwick Bay, Bognor Regis, West Sussex PO21 4HQ. Tel: Pagham 3304. *P442*

Have Fidelity 2000 f.m. CB rig with s.w.r. meter, power supply, low loss cable, mint condition, 4 months old. Would exchange for FRG-7 communications receiver in good condition with manual if possible. P. Fincaer, 29 Princes Road, Brighton BN2 3RH. Tel: 0273 609684. *P443*

Have Imp engine dismantled, rebored, new rings, bearings, valves, etc., many Imp spares. Would exchange for hand-held CB or good 2m base antenna. Ian Halson, 164 Balfour Road, Queen's Park, Northampton. Tel: 0604 710941. *P451*

PW "SWAP SPOT"

Got a camera, want a receiver? Got a v.h.f. rig, want some h.f. gear to go with your new G4? In fact, have you got anything to trade radio-wise?

If so, why not advertise it FREE in our new feature SWAP SPOT. Send details, including what equipment you're looking for, to "SWAP SPOT", *Practical Wireless*, Westover House, West Quay Road, Poole, Dorset BH15 1JG, for inclusion in the first available issue of the magazine.

A FEW SIMPLE RULES: Your ad. should follow the format of those appearing above; it must be typed or written in block letters; it must be not more than 40 words long including name and address/telephone number. Swaps only—no items for sale.

IC of the month

Brian DANCE M Sc

Plessey Semiconductors SL6691

The SL6691 is an integrated circuit device designed for use as a complete low power consumption i.f. system. Included within the i.c. is a limiter amplifier and the circuitry needed for use, in conjunction with an external quadrature tuned circuit, for demodulation.

Plessey Semiconductors have designed this device mainly for paging receivers, although it is also very useful as the i.f. system of f.m. broadcast portable receivers. One of the main requirements of a device for applications in equipment which may have to be very small and light in weight is that the current consumption and power supply voltage requirement should be very low, allowing the use of small and reasonably long life batteries.

A regulator circuit is incorporated into the SL6691 which allows it to operate from supplies of between 2·5V and 6V. The typical quiescent current is only 1mA (maximum value for any device 1·4mA), so the power consumption is little more than 2mW. However, in paging applications the SL6691 may be used with a strobed power supply, in which case the power consumption can be reduced by a factor of about ten. Using such techniques a paging receiver can be made which consumes only 100μW from two small cells.

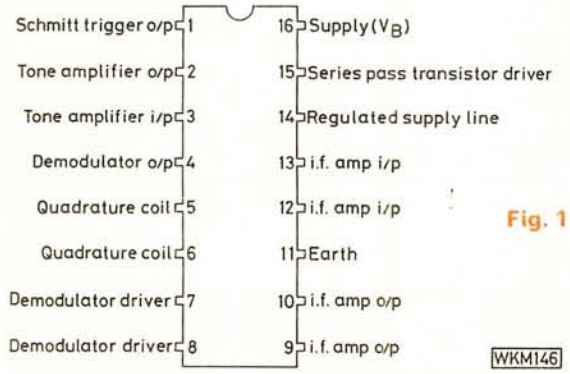


Fig. 1

The SL6691 is encapsulated in a 16-pin dual-in-line package with the connections shown in Fig. 1.

The internal circuitry of the i.c. is shown in block form in Fig. 2. Input signals from the front-end circuit of the receiver are fed at the intermediate frequency into the limiting i.f. amplifier of the SL6691. This amplifier has a bandwidth of 1·5MHz and is very suitable for use at the common 455kHz i.f., for paging or other applications. The input impedance of this amplifier is 20kΩ in parallel with 2pF, so loading of the front-end stage is small.

Output impedance of the limiting i.f. amplifier is approximately 2kΩ and this output feeds a conventional double-balanced demodulator circuit, employing "transistor-tree" techniques. A quadrature tuned circuit must be connected between pins 5 and 6. External capacitors are used to drive the quadrature circuit; this enables the demodulator to be used at frequencies which are very low. If these capacitors had been integrated onto the chip, their value would have had to be relatively small and thus very low frequency operation would have been impossible. The maximum i.f. is at about 1·5MHz, this being limited by the amplifier bandwidth.

The low frequency tone amplifier of Fig. 2 has a gain of 54dB. It is an inverting amplifier whose gain and frequency response are controlled by negative feedback. This amplifier stage feeds a Schmitt trigger circuit whose output is the free collector of a transistor, which may be connected to either the positive supply at pin 14 (the regulated supply) or to the unregulated positive supply line through a suitable load resistor. When switched to the ON state by an input signal, the output of the Schmitt trigger at pin 1 will sink (accept) a current of up to 150μA.

A 20μV r.m.s. signal input is sufficient to cause the output stage of the Schmitt trigger circuit to saturate. This occurs when the input at pin 2 to the Schmitt trigger is high. When no such input signal is present, the Schmitt trigger output at pin 1 is turned off and rises to the value of the positive supply line.

Practical Circuit

A practical circuit for the use of the SL6691 as an i.f. system is shown in Fig. 3. It should be noted that an external series-pass *pnp* transistor is required in the voltage regulator circuit to enable the supply to be anywhere in the range of +2·5V to +6V. It is also interesting to note that this external transistor could not satisfactorily have been fabricated onto the chip, since monolithic *pnp* transistors have quite low values of current gain at low collector currents.

Positive supply from the battery is connected to pin 16 and a regulated supply for the operation of the circuit is available at pin 14. If the value of the battery supply is over 2·2V, the regulated voltage at pin 14 is within the range 1·9V to 2·1V. In tests a 40dB rejection of 500Hz, 200mV peak-to-peak, square waves injected into the supply line to pin 16 was measured in the regulated output from pin 14.

The i.f. input, which will normally be at 455kHz, is fed to pin 13 of the device. The 100kΩ resistors from pin 10 to

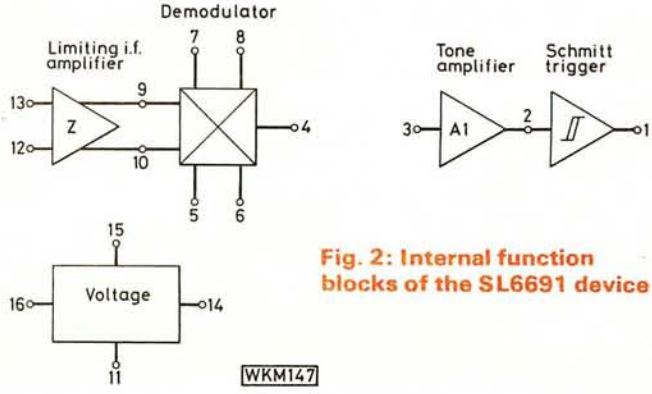


Fig. 2: Internal function blocks of the SL6691 device

pin 12 (R3) and from pin 9 through the 2kΩ/33nF filter network to pin 13 (R2) are essential, since they provide the feedback necessary to maintain the correct operating point of the limiting i.f. amplifier. Pin 12 is decoupled to ground, so that the feedback is effecive only at zero frequency, i.e. for d.c. currents. Similarly capacitor C2 decouples the junction of resistors R1 and R2 to ground.

The signal source must not short circuit the steady potential at pin 13 to ground; if the signal source has a low impedance to d.c., it should be coupled to pin 13 through a small capacitor. The value of the resistor R1 should be chosen so that the signal source has the correct value of impedance connected across its output, the value being normally determined by the characteristics of the filter circuit through which the signal is fed to pin 13.

Typical dynamic range and gain figures of the i.f. amplifier are 100dB and 90dB respectively. Sensitivity is quoted as 16μV r.m.s. typical (minimum sensitivity 20μV r.m.s.), for a signal to noise ratio of 20dB, using a 455kHz i.f. modulated at 500Hz. The device can provide an output voltage swing of 600mV peak-to-peak and a typical a.m. rejection of 40dB.

It is important that no connections are made to pin 3, through which a direct current can flow, except the bias connection to pin 2; all other inputs should be connected by means of coupling capacitors. It may be necessary to connect a 120pF capacitor in series with a 2·2kΩ resistor from pin 2 to ground to prevent high frequency instability.

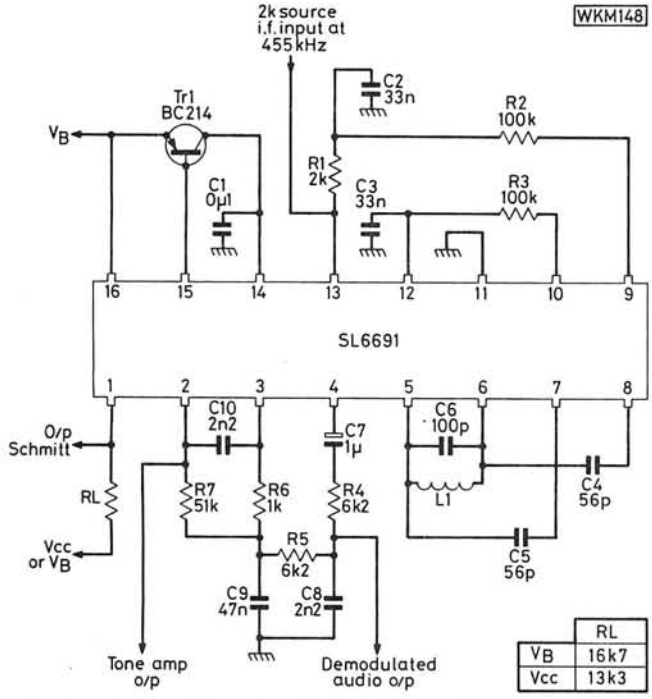


Fig. 3: A SL6691 circuit for demodulating an f.m. signal and providing a paging output if required

Demodulator

The quadrature circuit connected between pins 5 and 6 may be a parallel tuned *LC* circuit, as shown in Fig. 3, or alternatively a ceramic resonator may be employed. In consequence the quadrature circuit may or may not present a path to direct currents between these two pins, where there is an impedance of about 50kΩ shunted by 2pF, owing to the internal circuit configuration.

Using a ceramic element between these pins eliminates the need for any tuning adjustment and offers the advantage of occupying less space, an important consideration in portable equipment. However the use of ceramic elements usually results in greater distortion than when using an *LC* tuned circuit. The quadrature circuit is driven from pins 7 and 8 through the series capacitors C4 and C5; the optimum value of these capacitors depends on the frequency of operation and on the type of quadrature circuit employed. Audio output is taken from pin 4 and is filtered by the *CR* network R4/C8, to attenuate the i.f. signal.

It is important to note that the absolute maximum supply voltage of the SL6691 device is 6V; higher voltages, even if applied only for a very short time, may cause permanent damage. The device is specified over the operating temperature range of −30°C to +85°C.

The maximum value for total harmonic distortion is guaranteed to be better than three per cent and a typical audio output of 15mV r.m.s. (minimum 8mV) can be obtained, when a quadrature tuned circuit with a *Q* factor of 30 is employed, using a tuned circuit. The demodulator output impedance is typically 3kΩ.

It should be noted that the SL6691 supersedes the pin compatible SL6690 device. The only difference relates to the tighter production tolerance of the SL6691 in respect of total harmonic distortion. ●

ELECTROLUBE CM 100 CIRCUIT MAKER PCB KIT

Over the years there have been several attempts at producing an easy-to-use home printed circuit board kit. The latest to appear on the market is the CM100 Circuit Maker from Electrolube Ltd.

Apart from the fact that this kit really is complete, the most notable feature is the film supplied which allows positive films to be made from opaque magazine pages. This offers great advantages to the amateur who perhaps wants to make two or three projects a year from magazines such as *PW*.

This film proved simple to use and produced good positive films from p.c.b. patterns printed in a variety of magazines. By the way if you do decide to produce film from such magazine pages remember that under the laws of copyright you may do so only for yourself. In other words do not be tempted to go into production of p.c.b.s for your friends—it's against the law.

Another use of the film is to produce prototype p.c.b.s. Instead of having to make a transparent positive version of the track pattern, using acetate sheet and adhesive pads and tape, it is now possible to draw the track pattern on a piece of white card or even paper using a pen or felt-tip and then use the CM100 Circuit Maker film in the same manner as if copying from a magazine.

The simple exposure frame supplied in the kit was easy to use and worked well—even the lint-free cloth for cleaning the glass comes with the kit. The photoflood bulb provided to expose the film proved to be a bit of a problem as it had to be held at about 600mm from the exposure frame for up to 4 minutes. I used an Anglepoise lamp but this could prove to be a bit dangerous as it is well over the maximum allowable wattage for such a lamp. A better system would be to make up a special lead with a bayonet fitting at one end and a suitably fused 13A plug at the other, arranging to hang this by some suitable means over the frame. The instruction booklet gives no ideas on this although the lamp does get very hot in use.

The chemicals needed to develop and fix the film are all supplied as are the developing trays, thermometer and measuring utensils. The safety aspects of using these chemicals are noted in the instructions and rubber gloves are also provided to prevent the chemicals coming into contact with the user's hands.

The instruction booklet covers each process thoroughly with a troubleshooting chart at the end of each section. This certainly assists with finding out just where you have gone wrong and how you should put it right.

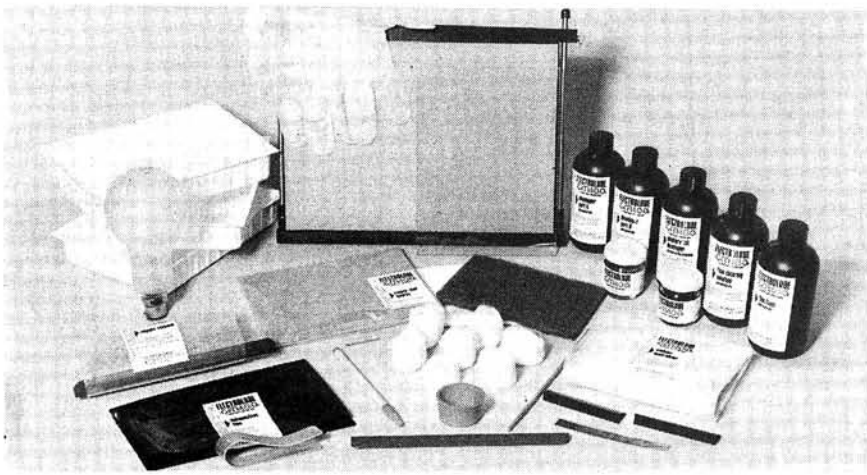
The main criticism I can find is the photoresist. A bottle of positive working photoresist is supplied with the kit and this has to be applied evenly and thinly onto a perfectly clean copper-clad board. The problems arise when you actually try to do this. The instructions describe how to cut a piece of foam strip to fit the applicator jaws and position the foam with the chamfered edge clearing the lower edge by $\frac{1}{8}$ inch. The foam supplied was not chamfered and the only way of deciding what the applicator looked like was by a process of elimination. The next problem is that of ensuring that the board is properly cleaned and stays clean. A scouring pad is supplied for this purpose but after the board has dried you have to ensure that it remains clean and dust-free, not at all easy. The resist has to be applied evenly—in subdued light—until the coating is a medium blue colour. How you are supposed to tell its colour in near darkness goodness only knows! I suppose it can be done but I am still trying to achieve results with this part of the operation.

It would have been much better if pre-coated board had been supplied. It is much easier to handle and cut to size and at least it is evenly coated and dust-free.

Although a photoflood lamp is supplied for exposing the film no u.v. lamp is provided for exposing the resist-coated board. The suggested method of exposure to daylight is a bit of a non-starter in this country. Trying to find sunlight in the middle of winter is going to prove a problem—it did during our tests in the summer. Add to this the problems of trying to determine the exposure time required and the need for a u.v. exposure box becomes evident.

The copper-clad board supplied is of good quality glass-fibre and is double-sided. This is no problem as for single-sided boards you just coat one side with resist and allow the other side to etch completely away. It reduces the life of the etching solution dramatically but at least you can make double-sided boards if needed, and a lot of radio projects use boards with a complete ground plane on the non-component side.

The etching bath is the now familiar transparent plastic bag with special clamps to seal sections of the bag during etching and washing. These work well and are safe and easy to use. When the etchant is "worn out" a neutraliser, supplied, is added to the spent etchant which solidifies and can



then be safely disposed of with the household rubbish. It must not under any circumstances be poured down the sink or toilet.

Having successfully produced your own board, not forgetting to drill the holes for the component leads with the selection of small drills provided in the kit, and disposed of or stored the chemicals as instructed, the exposure frame can be used as an assembly fixture, the foam pad being used to prevent the components from falling out of their holes before soldering.

This kit is probably the most comprehensive attempt yet to satisfy the needs of the radio and electronics enthusiast and represents good value at about £65.00 inc. VAT. The owner of one of these kits is in a position to produce p.c.b.s as and when he needs them without having to wait for someone else to make them for him. Replacement chemicals and copper-clad board can be bought from Electrolube and the kit can be used with the commonly available ready-coated boards.

The CM100 Circuit Maker kit is produced by **Electrolube Ltd., Blakes Road, Wargrave, Berkshire, RG10 8AW. Tel: 073-522 3014** to whom we extend our thanks for the loan of the review kit.

Dick Ganderton

from spark to space

▶▶▶*continued from page 44*

reserves and in 1939 hundreds of them joined up and, along with the RSGB, played a vital part in the war effort. John Tye G4BYV, reminded me about the Society's "Prisoners of War" fund organised by members to send parcels of books and cigarettes to prisoners in Germany and Italy. In December 1941 the fund stood around £70, by the end of 1942 it was £446 and by 1944 it was over £1300. Parcels were sent to many known members and the RSGB journal, *The T and R Bulletin,* had a page called *Khaki and Blue* to help amateurs seek out friends for an "eyeball" and for the families to keep in touch. There was also an *Active Service* list and sadly, *Silent Keys* for those who died in action.

Always a DXer.

"As an ex-RAF wireless operator, I was brought up on HRO's, Skyriders and the good old RAF 1084 set . . . and in the wartime RAF we worked point-to-point up to 25 w.p.m. and more. We used the solid up and down keys so much that one's "fist" on the key became as recognisable as one's own handwriting", writes Colin Dawson of Portsmouth. In pre-war days he used a two-valve receiver, built on a breadboard with bakelite panel, two Mullard valves, PM1 HL detector and PM2A output and Eddystone plug in coils covering from 15 to 90 metres.

Fig. 3: DX Certificate

As a member of the British Long Distance Listeners' Club, Colin received a certificate (Fig. 3) in May, 1940 confirming that he had received verified wireless transmissions from all continents. Among his collection of 1930 ephemera, Colin has commercial QSL cards from General Broadcasting Co., Cuba, dated 1934; Iceland State Broadcasting Service, 12 July, 1936; General Electric Co., New York, 25 July, 1936; Atlantic Broadcasting Corporation, November, 1936; International Wireless Telephone Company of Japan Limited, January, 1937 and Amalgamated Wireless, Australia.

More Volume

Colin also remembers dangling the Ericcson headphones of his two-valver in a basin to increase the sound for the Joe Louis-Tommy Farr fight which came direct from the USA. One WWII armoured-car driver told me that, in the desert campaign, he often put the headphones of their WS-19 in a petrol tin and the loud-speaker like response enabled all the crew to hear the station they were tuned to.

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.

With the constant influx of new enthusiasts into the world of amateur radio there is a corresponding constant demand for information and advice on the best types of receiver to buy. This new blood will have arrived as a result of reading of amateur activities in *PW*, or having got fed up with the constant barrage of propaganda on the s.w. broadcast bands, or perhaps from having seen amateur radio in action at a public fête or suchlike activity.

The latest and very prolific source of new amateurs is CB radio which many find very boring after only a short time on the air, realising that there must be more to communicating by radio than just talking into a microphone. Unfortunately, perhaps, the CB regulations prohibit any form of experimentation, even with antennas, so that there is no incentive to improve equipment and thereby gain useful knowledge in the process.

I always welcome enquiries from readers who are thinking of buying a receiver for the amateur bands, far more preferable than buying a set, often useless for the job, and *then* seeking my approbation! There are several factors to be considered before rushing off to make what may turn out to be a bad decision in the long term.

In days gone by the amateur radio listener might spend a matter of years on the bands before getting around to applying for a transmitting licence, so that by the time he got on the air he was well briefed in what goes on there. Today, however, it is more often a matter of "how soon can I get on the air", frequently with next to no practical knowledge of the subject. So, first of all, do you intend to spend some time listening on the amateur bands with a vague possibility of thinking about a transmitting ticket some time in the future? If so then you should think about buying the best receiver that the pocket book or, more likely, the credit card, will run to, together with an antenna tuning unit.

If you feel that you are likely to want to go for an amateur licence within a year or so then a good second-hand receiver should be appropriate because, come the great day when you receive your still-wet callsign from the Home Office, nothing less than a transceiver will be acceptable, and the old set will be relegated to receiving the weather forecasts from Radio 4.

By far the best approach, if you have the patience, is to visit, and possibly join, your local radio club or society and to meet the members who will be only too happy to give you the benefit of their advice and experience of receivers. You will almost certainly find someone who is moving up the amateur radio ladder, a couple of steps ahead of you, who has a receiver to dispose of, usually necessary in order to buy the next bit of equipment!

Above all, don't buy one of those all-singing, all-dancing receivers reputed to be able to pick up anything anywhere, at any time of the day or night. These are generally nothing more than a domestic type set with lots of frills and necessarily a compromise in every department.

Should you pick out a particular receiver from an ad then make every effort to go along and have it demonstrated and then sit down and play with it yourself. Try any others that are available and if you are tempted to buy something that costs a bit more than you originally intended to spend, then BUY it! The old saw of "getting what you pay for" still applies and you'll only regret it if you don't! If you want something at the budget end of the market then you'll get basic facilities and only average performance.

I have been referring so far to the amateur bands from 1·8 to 29·7MHz but even if your interest lies with v.h.f. the best receiving set-up is still an h.f. receiver, with a v.h.f. converter in front. As amateur v.h.f. f.m. signals are narrowband it is still possible to copy them on a set intended for a.m. The s.s.b. and c.w. v.h.f. signals are no problem as the h.f. bands receiver is already equipped to deal with such signal modes.

It is probably correct to say that the vast majority of amateurs start off listening to the h.f. bands, yet when they do get a ticket it is a "B" one for v.h.f. and u.h.f. only, instead of making that extra effort to learn the Morse code and get an "A" licence enabling them to return to their first love, the h.f. bands.

On the Bands

In Llanmorlais, Swansea, **Philip Morris** has added an h.f. pre-amplifier to his CR100 which has boosted performance quite a bit especially at the higher frequencies, as one would expect. Having stripped some copper wire off an old transformer he put up a "V" beam with legs about 40m long and 10m up but I suspect the angle of around 30 degrees between the legs is a bit too acute for optimum performance over several bands. However the DX logged looks pretty good, like CT2DG, TR8DX, K5KG/OH0 and OJ0, and PT7NA all on 3·5MHz (80m), with 14MHz (20m) providing FG7BM, ZF1AE, 5Z4RL, VS5DD and PJ8UQ. 21MHz (15m) wasn't too bad either with 5H3TM, 9J2BO, ZS3TL, VQ9WB, 9V1TL, 9M2BB, VS5GA and V2AZE.

Up in Earl Shilton, Leics, **Dennis Shepherd** got very worried with nearby thunderstorms and shocks from his antennas although they appeared to be earthed. However his FTDX402 and inverted "V" antenna for 3·5 to 30MHz still brought in TU2HJ, TYA11 and 6W8AR on 28MHz s.s.b.; VU2ASD, YB0AV and 9X5SL on 21MHz plus CE6DDN, CX3TU, ZL1AJF and ZL2AIQ on 7MHz in the very early morning. Best on 3·5MHz were FM7WS, FR0FLO, ON6BC/ST4 and PY4YQP. Dennis is thinking of going over to a VDU on his RTTY set-up to avoid disturbing the neighbours! Hence no RTTY reports this time. The Sony ICF2001 and 30m wire of **Tony Pinnell** BRS50886 seems to have been going well enough in Reigate, Surrey, with ZP5PX, 6Y5MJ (QSL K8ZBY), 8P6JA, 5B4JE on 3·5MHz and then on 7MHz it was CM1AG (Box 253, Pinar del Rio, Cuba), HH2JR (Box 658, Port au Prince, Haiti), 6Y5EE. Of note on 14MHz were VR6TC (QSL W6HS) and 3C1AB, with CR9AN, ON6BC/ST4 and ZD7HH on 21MHz.

From Berkhamsted, Herts, **Jon Kempster** BRS45205 writes to say he has put up a new antenna around 40m long in the form of a horizontal triangle fed at one corner with coaxial cable. Sounds horribly mis-matched to me but with his main receiver, an FRDX400S, he has copied N1XZ/CT2 on 3·5MHz, then 9N1MM, SV5OX, HT2CGB (Nicaragua), 9X5SL, VU2GI, YC4YBU, 9M2BB, 9V1TL, VQ9CI (QSL KA4UMB) and C31ZE (QSL DF9SP) on 21MHz. Think what he'll do when it's all nicely matched! The next-door neighbour to **Paul Williams** in Whitehaven, Cumbria, is a CB fan it seems, breaking through Paul's DX100L on all bands. Short of punching him on the nose OM I suggest you get the appropriate QRM form from the local PO and send it off. It might help if you let him know you have done this. He may not even be licensed! Report QRM on any BBC service, in particular, or no-one will be interested. In between times Paul did log CP3CN, HI8BFP on 21MHz plus HH2VP (QSL N4XR), PZ9AB and 6Y5SG on 14MHz on a 15m-long wire.

From Birmingham, **Dennis Court** used his Collins R390A receiver and 30m wire plus a.t.u. to copy 3B8CF, FC9UC, VU2AVG on 14MHz and HB9CJX/OY and KA6JAW/CT2 on 7MHz. In Knutsford, Cheshire, **Dave Coggins** has acquired an old pen recorder from the local junk shop and is trying to use it to measure solar noise levels. Other DX

noise included ZD7BW and 5H3DM on 28MHz and then JY9RC, TYA11 (QSL W2TK), HK1BAU on c.w., OE1EHB on the Golan Heights, VK9NS on Norfolk Island and 5B4JE/A, all on 7MHz, having turned down the r.f. gain on his FRG-7700 with end-fed antenna for the l.f. bands and a 2-element job on 28MHz, plus FRT-7700 a.t.u.

Vic Doidge in Callington, Cornwall, tells of the VU9 prefix being bandied about just now, being issued for the 9th Asian Games at the end of November and expected to be valid until mid-December. Typical at the moment are VU9RX and VU9XYL. Work 15 such VU9s and get a certificate from VU2RX QTHR. Vic also reported that the now famous funny call TYA11 packed up on August 12. Otherwise on his FRG-7700, long wire and a.t.u. it was just Z2EI on 28MHz, then EP2TY, HS1ZE, PZ5LAA, TN8HA, J73PP, KP2A, S79MC, 6Y5MJ and 7Q7LW on 21MHz. Filling in on 14MHz were PJ9EE, TU2JL, FG7XL, V2AO, 4S7EA and 8R1RBF.

From Sheffield, **Brian Patchett,** hoping to get BRS status, wonders why the RSGB can't even acknowledge his application although the cheque was banked quick enough! Shades of the HO! Brian's Grundig 1400 caught CE2AWH, C53EK, ZS4GM, 5H3DM and 9Y4VU on 21MHz plus C53AB, FY7YE, XT2AW and 9Y4VU, again, on 14MHz.

Another letter from **Andy Durrant** of Colchester with news from war-torn Lebanon with a certain Mike Mattouk operating as 91TOD5 on 21MHz. Not much of interest on 14MHz except C31MK in Andorra and J6LB on St Lucia. Well, good news from **Jim Dunnett** (Prestatyn) passing his RAE but with a wait until October before he'll be able to get to Liverpool for the code test which will not be any problem for Jim. He would remind new licensees that the change from G6 to G4 can cost £8 extra so it is often worth waiting for the code test instead of rushing on the air with a G6. On c.w. Jim has copied C30SH, CX1DZ, EK9F, ON6BC/ST4, R6L, SV0BE/9, VQ9XX, 3B8CF, 5H3TM and 8J5SUN thought to be a special Japanese call rather than Antarctica, all on 21MHz. On the same band s.s.b. included SU1BD, TU2JL, TYA11, YB8VN and 5Z4TX. All of note on 14MHz c.w. was 9V1TL with YB0AV on s.s.b. VP2MIX turned up on 10MHz c.w. and the same mode on 3·5MHz raised TF3JO, VE1ZZ and a goodie in TR8DX. All this on the ready and waiting FT-101 and G5RV.

Odd Notes

A period in the London Hospital should be over now for Andy Durrant who normally writes from Colchester where he has been able to get a couple of 10m-long wires from his window out to his tiny 6 × 3·6m garden, with an a.t.u. under construction, to feed the AR88.

At long last **Rick Barker** (G8UUK) of Sunninghill, Berks, can boast of having a full licence, namely G4OFB, so now he can get cracking with his Ten Tec Argosy 525 and HF5 multiband. Rick is very unhappy at failing his medical for the Army. In spite of his hobbies of hiking along the Pennine Way, and running, an early op on one foot was enough for the doc to say nay.

Among several favourable comments on my idea for a modern micro-valve in the front end of receivers, **John Munning** in Pershore, Worcs, pointed out how much the present generation of radio enthusiasts is missing by not playing around with valves, and their welcome warmth when DXing in the shack in the winter! Valved equipment, he says, was easier to design, much more tolerant of errors, and easier to service.

As readers may know by now, the City and Guilds will be running a third RAE, every March, in addition to those in May and December. In view of the scandalous delays so far this year in issuing licences already paid for months previously, it is to be hoped that computers will be ready for the task when the floods of licence applications are received.

Another news item that may not be so new by the time it appears here in print is that the VKs will be allowed to handle third-party traffic with the USA and US-licensed amateurs. This will provide good ammunition for those who are trying to get third-party facilities for us in the UK.

Back to the RAE and a bit more detailed info. The December exam this year is on Monday December 6 and the extra one on Monday March 21, which will be known as the Spring Series. The regular one in May next year is to be held on May 16.

Club Round-up

Abergavenny & Nevill Hall ARC Sec: Dave Jones GW3SSY, 2 Dalwyn Houses, Llanover Road, Blaenavon, Gwent (0495) 791617. I was taken to task for getting Dave's call and telephone number wrong in the September issue but in fact my copy was correct so guess someone further along the line was to blame! *(Sorry about that. Ed.)* Club nights every Thursday at 7.30 at Pen-y-Fal Hospital, Abergavenny (above Male Ward 2) with club net on S17, 8pm Sundays. RAE courses have already started but no harm in enquiring if you are still interested.

Aylesbury Vale RS M. J. Marsden G8BQH, Hunters Moon, Buckingham Road, Hardwick, Aylesbury, Bucks. You could get *PW* in time to get along to the October 5 meeting when G6AGE talks on British Telecom. On November 2 David Evans G3OUF, GM of the RSGB, talks about the Society and will answer questions. Brave fellow! Venue is Stone Village Hall, Stone, two miles west of A'bury on the A418 at 8pm. Sec's phone is (0296) 641783.

Mid-Warwickshire ARS Mrs Mary Palmer G8RZR, 12 Edmondes Close, Woodloes Park, Warwick. First and third Tuesdays, 8pm, 61 Emscote Road, Warwick. Other Tuesdays are devoted to a net on 145·350MHz.

Wimbledon & District RS Ken Bailey G3EPU, 32 Strathern Road, Wimbledon Park, London SW19, or 01-946 1390. Temp sec says second and last Fridays, St John Ambulance HQ, 124 Kingston Road, Wimbledon at 8pm where tea and biscuits will be served. Net time is 9pm on 144·875MHz every Monday.

British Railways ARS G. Sims G4GNQ, 85 Surrey Street, Glossop, Derbys. Reminder of the special event station GB2ICR active during the International Congress October 4 to 8. In the meantime efforts are being made to reactivate the local Glossop & District ARC.

Chichester & District ARC T. M. Allen G4ETU, 2 Hillside, West Stoke, Chichester, Sussex or W. Ashling 463. Club net Wednesdays 7pm on S11. First Tuesday and third Thursday, 7.30, Fernleigh Centre, North Street, Chichester with a car park conveniently alongside. In the Green Room on Oct 21 will be a sale of members' surplus equipment and, not to be missed at any price, satellite broadcasting is the subject by IBA's Jim Slater on November 2.

Sutton & Cheam RS Meets either at the Sutton College of Liberal Arts or at the Banstead Institute, High Street, Banstead, says sec. G. Brind G4CMU, 26 Grange Meadow, Banstead, Surrey, who will tell you what and when if you contact him.

Surrey Police RS Richard Hook G8LVB, Ops Room, Surrey Police HQ, Mount Browne, Sandy Lane, Guildford, Surrey, which is where this newly-formed club holds its meetings. Membership is open only to serving members of the Force, any retired police officer, or civilian employed by the Surrey Constabulary. Try Richard on (0483) 71212.

University of Manchester ARS G3VUM/G8FUM C. K. Chan G5MUR, Flat 20, Agnes Court, Wilmslow Road, Fallowfield, M'chester. Club station is open for informal gatherings on Wednesday afternoons in the shack on the first floor on the north side of the Students' Union building. Local students' natter frequency is S23.

Dartford Heath DF Club Alan Birchmore G4BWV QTHR. Meetings at the Malt Shovel, Eynsford, Kent, the next being on Wednesday October 13 at 8.45 with a DF hunt fixed for the 17th.

Echelford ARS John Osborne G4GSC, 3 Temple Gardens, Chertsey Lane, Staines, Middx or Staines 51898 is Social Sec and anxious to socialise with new and prospective members. Every second Monday and last Thursday at 7.30pm, The Hall, St Martins Court, Kingston Crescent, Ashford, Middx. Club net Sundays 10am on 1930kHz or thereabouts, or on 144·575MHz at 8pm on Wednesdays. The excellent club newsletter is full of club chitter-chatter

and articles. One project is a Bottle Bank, in this case collecting old valves for the benefit of any member wanting that odd elusive bottle. Computerised slow Morse is put out by G4NNS on 144·625MHz on Wednesdays at 1900. Monday Oct 11 is bring-and-buy time while on Thursday Oct 28 it's Peter Hale G2HS holding forth on a.t.u.s.

Torbay ARS New sec is Arthur Cooper, 41 Kingsway Avenue, Paignton, or (0803) 843350. Meetings at Bath Lane, rear of 94 Belgrave Road, Torquay, with an organised programme of events now running until April next year.

Wirral ARS Gordon Lee G3UJX, 30 Manor Drive, Upton, Wirral, Merseyside or 051-677 1518. Club call is G3NWR and meetings first and third Wednesdays at 7.45 at Minto House School, Birkenhead Road, Hoylake, Wirral, with October 6 devoted to a sale of surplus gear and, not to be missed, the AGM on the 20th. Must advise of the tape talk by G3TKN/VK2EAO on the amateur radio scene in VK-land, on November 13.

Edgware & District RS G3ASR Howard Drury G4HMD, 11 Batchworth Lane, Northwood, Middx (Northwood 22776). Second and fourth Thursdays at 8pm, 145 Orange Hill Road, Burnt Oak, Edgware, Middx plus club net, 10pm, Mondays on 1875kHz plus extensive slow Morse sessions from club call G3ASR. Big item in October is the demonstration station at the SSAFA Fayre at Stanmore Park on Saturday October 23.

Acton, Brentford & Chiswick ARC G3IIU W. G. Dyer G3GEH, 188 Gunnersbury Avenue, Acton, London W3. Meeting at the Chiswick Town Hall, High Road, Chiswick, London W4 will be devoted to members' holiday activities complete with slides, etc., to prove it. That is at 7.30pm. Sad news is the death of Reg G6RC for long a stalwart supporter of the club and amateur radio and well known to me personally.

Aston University ARS G3UOA/G8PGM Tim Wander G6GUX, 48 Baldocks Lane, Melton Mowbray, Leics. Station active on all bands during the academic term, with RAE guidance available, and any students, or others, interested in amateur radio very welcome at the club. Another contact is club chairman Mike Beech G8ZEZ at St Peters College, College Road, Birmingham B8 3TE.

Thames Valley ARTS Julian Axe G4EHN, 65 Ridgway Place, Wimbledon, London SW19 or 01-946 5669. Club venue is the Thames Ditton Library, Watts Road, Giggshill, Thames Ditton at 8pm on first Tuesday of the month. That in October will be a film night.

Bury RS G3BRS D. Hensby G8TKD c/o Mosses Youth and Community Centre, Cecil Street, Bury. Second Tuesdays at this QTH with October 12 concentrating on finding a winner in the club's construction competition while test equipment is the subject for November 9.

Wakefield & District RS G3WRS Rick Sterry G4BLT on Wakefield 255515 says meetings take place at the Holmfield House, Denby Dale Road, W'field, at 8pm on "alternate Tuesdays" so the club project evening on October 5 will give you a clue. The 19th is on-the-air time for the club station G3WRS and if I don't tell you now of the pie-and-pea supper at the Rose & Crown, Methley, on November 2 you will miss it, which would be a pity.

Worthing & District RC G3WOR/G8GCP Joyce Lilleywhite, 41 Brendon Road, Worthing, Sussex. Every Tuesday at the Amenity Centre, Pond Lane, Durrington at 7.30. In October it's the AGM on the 5th and the autumn sale of surplus equipment (all right, a junk sale!) on the 12th among other attractions. You can find Joyce on Worthing 63062 for further details.

Fareham RC Brian Davey G4ITG, c/o 31 Somervell Drive, Fareham, Hants, or F'ham 234904. Every Wednesday Room 12, Portchester Community Centre, at 7.30, with G8GNB describing receiver measurements on October 6, G6NZ on historic radios on the 13th and G4ITF tackling synthesisers on the 27th. So you can see it does not pay to miss a meeting of the Fareham group.

Cheshunt & District RC G4ECT/G6CRC Bob Gray G6CNV, 2 Sacombe Green Road, Sacombe, Ware, Herts (Dane End 254). Principal attractions in October are John G3YPZ discoursing on f.m. operation on the 28MHz band, on the 6th, and a junk sale night on the 20th. Which makes it every Wednesday at 8pm in the Church Room, Church Lane, Wormley, near Cheshunt, Herts.

Sutton Coldfield RS Les McCullough G6DCI, 63 Hill Hook Road, Four Oaks, Sutton Coldfield, W. Mids is PRO. Second and fourth Mondays at 7.30 at the Central Library, SC. Main feature in October is Tom Douglas G3BA addressing the multitude on the 25th. A reminder that the AGM will be held on November 22.

Stevenage & District ARS G3SAD/G8SAD Terry Bailey G6CRF, 187 Archer Road, Stevenage, Herts is the secretary. It's first and third Thursdays in the Site B Staff Canteen, British Aerospace Dynamics, Argyle Way, Stevenage with the entrance in Gunnels Wood Lane. Around 8pm will do but get there by 7.15 if you want to participate in the Morse code classes. DF hunts are a feature of the fourth Thursdays rendezvous-ing at 7.30pm at Fairlands Valley Lakes car park, said to be off Six Hills Way. Just for a change the talk by G3YJE on October 21 will be on the subject of printing. During the autumn months RAE classes are held regularly.

Nene Valley RC Lionel Parker, 128 Northampton Road, Wellingborough, Northants can also be found on W'boro 79539. Just a few months old, the club gathers on Wednesday evenings at 8pm at the Royal in Knox Road, W'boro but be on duty at 7.30 if you want to join in the code sessions. October 13 concentrates on h.f. bands operation with the 20th devoted to v.h.f.

Hastings Electronics and Radio Club G6HH Sec is George North G2LL, 7 Fontwell Avenue, Little Common, Bexhill-on-Sea. A lovely cartoon in the club's magazine *Vital Spark* shows a member in despair as the cardboard box from his wife's Ariel detergent, on the end of a wire, doesn't seem to be getting much DX! Meetings at 479 Bexhill Road or at the West Hill Community Centre, depending upon one's interests, computers and the like or amateur radio. However October 20 is surplus gear sales evening but George will give you more detailed information.

Vale of White Horse ARS Ian White G3SEK, 52 Abingdon Road, Drayton, Abingdon, Berks (0235) 89559. Formal meetings on the first Tuesday at the White Hart Inn, Harwell Village with third Tuesdays more of a noggin-and-natter occasion. Morse lessons are held beforehand. Just as well, perhaps! Discussions have taken place on the possibilities of assisting local CBers to attain amateur status.

Biggin Hill ARC Ian Mitchell G4NSD, 37b The Grove, Biggin Hill, Westerham, Kent, also (09594) 75785. October gathering at 8pm in the Biggin Hill Memorial Library on October 26 to welcome RSGB Regional rep Pat Walker G8HMG. No normal meeting in November but something much better! A planned visit to the TV site at Crystal Palace on November 16 with a restriction on the numbers who can attend, so get in there early. That's a Tuesday.

Wirral & District ARC G4MGR/G8WDC Neil McLaren G4OAR, 596 Woodchurch Road, Oxton, Birkenhead, or 051-608 1377. Second and fourth Wednesdays at 8pm at the Irby Cricket Club, just off Irby Mill Hill Road. Much-to-be-praised club magazine *Airwave 325* has excellent map for the guidance of visitors and new members. This new venue continues to prove very popular indeed. Well, I suppose I'd better tell you of the meeting on October 13 which is on advanced driving techniques (of cars, not of rigs) by no less than the president of the Wirral Advanced Motorists. Might help on DF hunts! October 27 is more down-to-earth with G8UZZ helping the understanding of receiver parameters, with notice of the November 10 activity evening when everyone is invited to take along their computers, rigs, printers and terminal units or whatever. What fun joining them all together! Pleasant interludes for members are drinking-and-waffling evenings (D & W for short) at local hostelries, like October 6 at the Hotel Victoria at Heswall and October 20 at the Red Cat at Greasby.

Spen Valley ARS G3SVC Ian Jones G4MLW, 54 Milton Road, Liversedge, Heckmondwike, W. Yorks. Second and fourth Thursdays at the Old Bank WMC, Mirfield at 8pm but if you are more of a noggin-and-natter person then the intermediate Thursdays are for you. Or both. Right! October 14 is project night with October 28 an open night for members of

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all local clubs. What a good idea. Free beer? More seriously, the club's president J. Sykes G3YPC will hold forth on November 11, so no excuses.

Radio Club of Thanet G2IC Ian Gane G4NEF, 17 Penshurst Road, Ramsgate, Kent. (0843) 54154. AGM on October 6 is a change of date but the junk sale remains on October 22. Meetings at the Birchington Village Centre, while club nets operate on 28·4MHz on Sundays at 9.30am and on S23 Thursdays at 8pm.

Chesham & District RS J. Alldridge, 15 Whichcote Gardens, Chesham, Bucks, or Chesham 786935. Important news of new meeting venue at the Stable Loft, Bury Farm, Pednor Road, Chesham, on the second Wednesday. Contact J. A. for more up-to-date details of the meetings.

Farnborough & District RS Ivor Ireland G4BJQ, 118 Mytchett Road, near Camberley, Surrey or F'boro 43036. It's film show night on October 13, courtesy G4MBZ, concentrating on HF NFD and the like, with the 27th being more of a natter-nite. Where? The Railway Enthusiasts Club, Access Road, off Hawley Lane, F'boro, near the M3 bridge in fact, on second and fourth Weds.

10-UK N. J. J. O'Brien G3ZEV, 88 The Maples, Harlow, Essex or (0279) 418204. A widespread "club" dedicated to saving the 28MHz (10m) band for the amateurs by promoting activity when the band may seem to be dead, also as an alternative to local rag-chewing on 144MHz, not to mention combating the CB pirates on certain channels in our band. Annual sub is only £3.50 and there is a useful, well-produced monthly newsletter of some 16 pages.

Radio Society of Harrow Chris Friel G4AUF, 17 Clitheroe Avenue, Harrow, Middx which is also 01-868 5002. It's the Roxeth Room at the Harrow Arts Centre, High Road, Harrow Weald at 8pm with talk-in on RB14, plus light refreshments. Code classes at the club are augmented by slow Morse transmissions locally on the 1·8 and 144MHz bands. Meetings every Friday with further details of coming events from Chris.

Wolverhampton ARS G8TA John Cook G8EDG, 75 Windmill Lane, Castlecroft, W'hampton. Every Monday at the W'hampton Chamber of Commerce, 93 Tettenhall Road, W'hampton. You might get this in time for the AGM on October 4. The club is also looking forward to the Midlands Convention on Saturday October 9 at the W'hampton Poly about five minutes' walk from the station. Trade show, lectures, full catering and special interest meetings. More on this from Peter Burden G3UBX, 28 Coalway Road, W'hampton.

Maidstone ARS G3YSC/G3TRF/G8TRF J. King G4EMC, YMCA Sportscentre, Melrose Close, Cripple Street, Maidstone. Every Friday with big October highlight on the 8th, **Louis Varney G5RV** talking on h.f. antenna equipment, and who better? RAE instruction on the 15th, with Bob Warner demonstrating vintage equipment on the 22nd. For the 29th Ken Crouch visits the club and he's the RSGB's regional rep. Club programme is complete to the end of the year so for more gen why not contact sec. J. King.

Mid-Sussex ARS G3ZMS Bob Hodge G4MMI, Corner House, Manor Gardens, Hurstpierpoint, Hassocks, or H'point 833559 is programme sec and waiting to tell you of the latest goings-on at the Marle Place Adult Education Centre, Leylands Road, Burgess Hill, W.Sx at 7.30 and it looks like every other Thursday which happens to be the 7th and 21st in October.

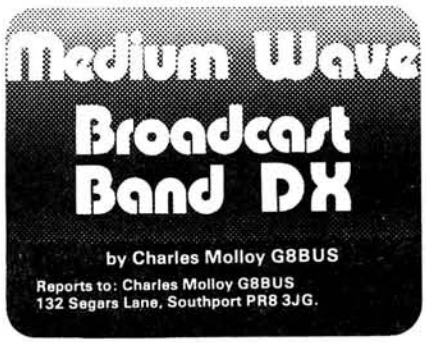
West Kent ARS It's 8pm at the Adult Education Centre, Monson Road, Tunbridge Wells. In October it's the 15th for a "Celebrity Lecture" when Ted Allbenry will tell why he is inspired by radio. G4BOO divulges the secrets of receiver measurements on the 29th when you may take your own set along for evaluation. Further info from Brian Castle G4DYF, 6 Pinewood Avenue, Sevenoaks, Kent otherwise (0732) 456708.

Cunningham & District ARC GM3USL Roger Bryce GM3JOB, 3 West Bowhouse Way, Girdle Toll, Irvine. Welcome to this club, newly-formed and gathering at 7.30 every Thursday at the Community House, 1 Bonnyton Row, Girdle Toll, Irvine, with guest speakers organised and an RAE course likely to start at any moment, but this will be held on Tuesdays at the same QTH and run by GM3DJS. Needless to say new members and visitors more than welcome, so drop a line to Roger or, easier still, ring him on Irvine 215728.

Milton Keynes & District ARS D. White G3ZPA, Rose Cottage, Shenley Brook End, M.K. also to be reached on (0908) 501310. Second Mondays at 8 in the evening, Lovat Hall, Silver Street, Newport Pagnell AND fourth Mondays, 8pm, at the Globe, Long Street, Hanslope.

An appeal, yet again, for contributors to the Club column to ensure full info on club sec, PRO or whoever is included EACH month, together with full details of place and time of meetings, in correspondence to me. Some otherwise excellent club newsletters contain no ref whatsoever to club officials. Editors please note.

To those who send impeccable copy every month, many thanks, it does make life that much easier.



Last month I mentioned my newly acquired second-hand DX160 communications receiver and referred to the problems many users have had with the version of this set, which is the one I have, that has an internal ferrite rod antenna for the medium and long waves. You cannot use a loop antenna with a receiver that has an internal antenna of its own, a fact that has reduced the usefulness of the DX160 for medium wave DXing. A great pity, for otherwise it is an excellent set. I suggested that it might be possible to screen the DX160 so that the ferrite rod would no longer act as an antenna but would still perform as a tuning inductor. Surprisingly, I have found it is quite easy to do this.

Screening the DX160

The DX160 is built on a metal chassis with detachable metal base plate and has a metal front panel which holds the controls and tuning assembly. There is a metal plate behind the glass tuning scale. The "cabinet" is a U-shaped piece of metal which fits onto the chassis to form the sides and top of the receiver. The gap at the rear between the chassis and top of the receiver is occupied by a back panel made of a material similar to hardboard, which is held in position by screws. The ferrite rod is mounted on top of the chassis immediately behind the back panel and it seemed clear that the radio waves were travelling through this back panel to reach the ferrite rod.

The back panel was removed and a strip of aluminium kitchen foil wound right round it. The self-tapping screws were pushed through the foil so that the panel plus foil could be screwed in firmly when it was replaced.

The Results

The difference was striking. Without connecting an external antenna, all that could be heard were a few strong locals and even those were much weakened. Then I tried a loop. It was connected to antenna terminals A1 and A2. The strap between A2 and E, which is normally in place when using a long wire, was removed, but the earth connection to terminal E (earth) was left in place.

The loop functioned normally, giving a good null with most signals and a useful reduction in signal strength on those few locals that were still being picked up by the ferrite rod. I was now using a loop with the DX160 without interfering with the inside of the set or using a converter. This was only possible because of the

metal cabinet and metal backplate to the tuning scale plus the coupling winding on the ferrite rod which is joined to terminals A1 and A2.

How do the results compare with the other version of the DX160 that has normal antenna tuning inductors? Without doing comparative tests it is not possible to say, but I did have the impression that signal strength when using the loop was a little less than one would have expected, using the receiver's performance with a long wire as a yardstick.

Clearly, a more permanent job is called for. A metal back plate should be used instead of the foil-covered hardboard one. There are also the 22 holes in the back plate, each 1cm in diameter, to take into account. They do seem excessive for the ventilation needs of a receiver that only takes 6 watts from the mains, but it would be unwise to ignore them entirely. Perhaps a couple at either end of the back panel, well away from the ferrite rod, will do.

Screening other Receivers

I have gone into some detail about my "mod" and the construction of the DX-160, hoping that it may be of value to anyone who has a similar set. The latest communications receivers such as the FRG-7, FRG-7000, FRG-7700, DX302, SRX30D, R-300, R-1000 do not have an internal antenna but there are others that do. The DX300 for example. So far as portables are concerned, such sets are usually in a plastics or wooden case and not all of them have provision for an external antenna. You would have to place the entire set in a screened metal box in order to eliminate pick-up and obviously this is impracticable. Useful results might be obtained by placing the set face upwards inside a metal box without a lid. An avenue for the experimenter to explore.

Breakthrough

Rod Short G3AFF writes from Portchester. "I had a problem with a car radio which received our local coast station (Niton Radio) and certain vessels when a particular working frequency was employed. This form of interference was entirely removed by producing the circuits you illustrated (September and February issues), from a then readily available component—a discarded i.f. transformer—for 455kHz or thereabouts, the appropriate connectors being fitted to the can. The idea is not original but it certainly works."

The unmodified i.f. transformer is shown in Fig. 1, and Fig. 2 shows it rewired to form rejector and acceptor wavetraps in the same can. All one has to do is to adjust the two trimmers until the QRM disappears. Rod concludes by saying. "It is most important to stress that screened cable is used from the i.f. can to the receiver's antenna socket or the signal will be picked up on that connecting lead and the elaborate precautions will be invalidated." Many thanks for the tip Rod. Surprising how simple all the best ideas are—after someone else has thought them up!

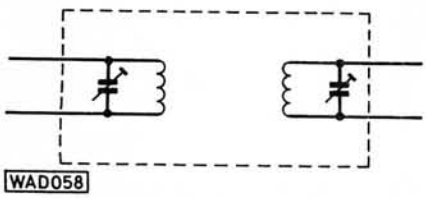


Fig. 1: Original i.f. transformer

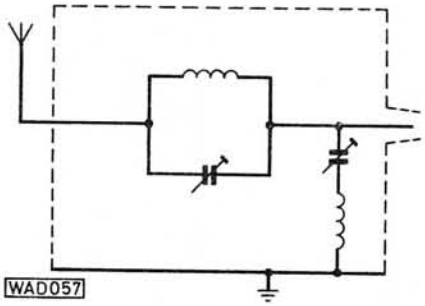
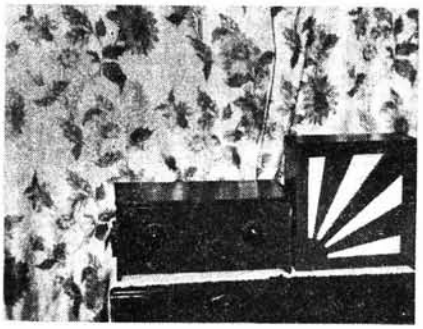


Fig. 2: Modified version of the transformer

Cossor Melody Maker

Old timers will be interested to learn that at least one Melody Maker is still in use, pulling in stations on the medium waves. Reader **Charles Scotney** has sent me a photograph of his 1929-1930 Cossor Empire Melody Maker alongside the original Ormond moving iron loudspeaker used with it. The set has been reconditioned with new valves and the cabinet reconstructed "because after 52 years the thin wood was unable to hold together". Charles says the set works very well. With a piece of wire round the picture rail and using headphones this vintage receiver gave daylight reception of the BBC World Service on 648kHz, Radio Eireann on 567kHz and 612kHz and Manx Radio on 1368kHz.



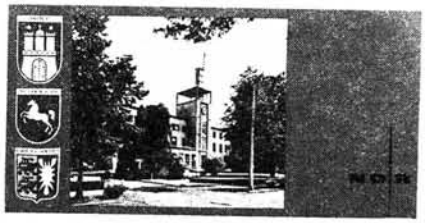
Charles Scotney's Melody Maker

BBC Information Sheet Radio Medway

Our reader would be willing to exchange the receiver with loudspeaker and home-made power supply for a "second-hand short wave receiver that can bring in some of the amateurs". Anyone interested should write direct to Charles H. Scotney, 101 Stocks Lane, Penketh, Warrington, Cheshire WA5 2RW.

DX and QSLs

An FRG-7 is in use in Belfast by reader **Paul McKee** who writes: "I've just built a 1 metre loop and it has proved very successful with many British local stations, and I've also received a few Spanish stations which were inaudible with a long wire. Now I've got more used to using the loop I'm going to try for the smaller Spanish stations." Those heard include Radio San Sebastian at 2340 on 1260kHz, Radio Sevilla at 0017 on 792, Radio Espana de Madrid 0057 on 954 and Radio Popular Madrid 2353 on 1224kHz.



QSL card from Norddeutscher Rundfunk

"If anyone is interested in colourful QSL cards they won't do better than writing to the German stations" concludes Paul who is referring to the Norddeutscher Rundfunk on 942kHz, Westdeutscher Rundfunk 1593, Hessicher Rundfunk 594, Radio Bremen 963, Deutschlandfunk 1269 and Saarlandischer Rundfunk 1422kHz.

"The illustration of the Radio Jersey frequency guide in the July issue is the reverse side of the BBC Engineering Information Sheet for this station" writes **Martin C. Smith** who goes on to say this sheet is an exception to the norm. "Most of the others have reams of technical information" and Martin sent me the one for Radio Medway as an example which even has a coverage map. These sheets are available from the BBC Engineering Information Department, BBC, Broadcasting House, London W1A 1AA.

Martin uses a 5 valve superhet model BD5857 along with a 20 metre long-wire. He is at present constructing an a.t.u. and the notch filter from the July issue of *PW*. He is anxious to obtain a circuit diagram of his receiver, as he wishes to add a few gadgets that require connection to the i.f. stages and the a.g.c. line. If anyone can help will they please contact Martin at 45 Stanhope Gardens, Cranbrook, Ilford, Essex IG1 3LQ.

Short Wave Broadcast Bands

by Charles Molloy G8BUS

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

We have certainly had our share of fadeouts and unsettled conditions during recent months. I have probably noticed it more than some listeners because of my habit, during the summer, of listening a lot on the 6MHz band. The effects of a Sudden Ionospheric Disturbance, which occurs during the day, are more noticeable on the lower frequencies and it is during the day that 6MHz gives good reception at my QTH of the BBC World Service as well as Radio Netherlands, Austria, Switzerland and other Europeans. A s.i.d. unfortunately is not the end of the matter. It is invariably followed a day or two later by an ionospheric storm which affects all bands, though the emphasis this time is on the higher frequencies, and both the day and night halves of the earth are affected.

Causes of Poor Reception

The s.i.d. and the ionospheric storm are caused by solar flares which occur on the face of the sun near to some sunspots. It has been interesting to listen to the different explanations offered to account for recent happenings. One expert suggested that there might be two maxima to the current sunspot cycle. One in December 1980 and a second in late 1982. If this really happens it will be unique so far as our knowledge of the sun is concerned. It is well known that a period of disturbed ionospheric conditions occurs a year or two after a sunspot maximum. At the start of a cycle, which is the minimum, the sunspots are mainly in high solar latitudes. As the cycle progresses they appear nearer and nearer to the solar equator and it is shortly after the sunspot maximum that they are facing the earth and we receive the full blast of the radiation, etc., that is emitted from the flare.

Future Outlook

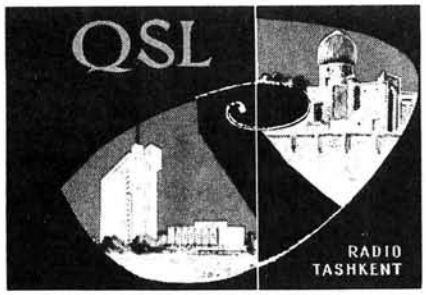
If this is the explanation for the current disturbed conditions then we can look forward to an improvement in reception before long, and a steady decline in solar activity until we reach the next minimum. DXers who are interested in the tropical bands or the medium waves will be pleased as reception on these bands gets better, but the situation on the international s.w. bands is not so rosy. Reception at the h.f. end of the spectrum will suffer. The bands at the h.f. end will be used less and consequently the bands in the centre and the l.f. end will be used more. Increased congestion will be the result. The extension of some of the existing bands together with the introduction of a new one — 13·6MHz to 13·8MHz — should help and one hopes that WARC 1984 (World Administrative Radio Conference) will sort this out.

Short Wave Converter

In the September issue I mentioned a short wave converter that is inserted between a car radio and its antenna. It selects any one of the short wave bands and converts it into a range of frequencies on the medium waves which can now be tuned in by the car radio. The converter I was thinking of is available in the United States and as I was unable to track down a source of supply in the UK I asked if any reader could help.

A very helpful and interesting reply comes from reader **D. C. Evans** of Barnehurst in Kent. He bought his son a CB/AM converter for use with a car radio. "It is possible with the unit as standard to pick up Radio South Africa on around 26MHz whilst mobile — the unit has a 25·995MHz crystal so I should imagine the frequency is subtracted to produce an output between 1000kHz and 1440kHz for the car radio. It would be interesting to substitute a lower frequency crystal to see what could be achieved with some adjustment to the tuning slug."

Ideally the input circuit to the converter should have a tuned circuit that resonates in the centre of the short wave band it is converting. In the case of the CB converter, this would be around 27MHz. If it could be made to resonate at 21·6MHz, even by shunting additional capacitance across it, then a crystal of approx 22·6MHz would convert the 21MHz (13m) broadcast band into a range of frequencies centred on 1MHz which is the mid-point of the medium waves. An interesting line to follow and many thanks to our reader for suggesting it.



Recent QSL card from Tashkent

Programmes for the DXer

"You missed RSA's *DX Corner* from your list of DX programmes" writes **S. Higgins** from Hounslow, who goes on to say that he picked up this broadcast on a Saturday at 1535 on 25·79MHz (11m band). "Interesting but could be considered provincial — only deals with about half of Africa" concludes our reader. It might be a good source of up-to-date information though for DXers who are interested in that area.

There are still a few programmes on the air that are specifically directed to DXers, which is rather surprising when one considers they are probably only a tiny part of the total audience. Not all of these programmes are on the air at a time convenient to DXers in the UK, e.g. Budapest at 1515 on a Wednesday. Some, like Tashkent, are not too easy to pick up. Radio Tashkent DX Club is broadcast at 1200 on the second Saturday and the third Sunday of the month and can be heard at my QTH on 11·785MHz. A few DX programmes are concerned mainly with amateur radio while others are really the mailbag programme under a different name. Has anyone anything to add to the list? (see April and May issues). Something you have heard yourself and is related to broadcast DXing.

From my own listening there are four that could be of interest. The first, *Waveguide,* is broadcast by the BBC World Service at 2155 on a Friday. Although it only last five minutes and deals with listeners' problems in receiving the W.S., there are often items of general interest as well. *Waveguide* comes in well at my QTH on either 648kHz medium waves or 5·975MHz in the 6MHz (49m) band.

DX Party Line from HCJB in Ecuador on a Monday and Saturday, lasts half an hour and is well worth listening to. Unfortunately it comes on the air at 2130 on 15·295, 17·79 and 21·48MHz which is not the best time of day for reception on these frequencies in Europe. The station is aware of this but their position seems to be that the peak listening period should be used for programmes of more general interest. The matter is under review though, and may be changed in the winter schedule. The address of the station is HCJB, PO Box 691, Quito, Ecuador.

Radio Berlin International has its *DX Club Meeting* on alternate Mondays. Although much of it is orientated toward amateur radio there are often items for the broadcast bands DXer as well. The station schedule is complicated and changes with the seasons but an up-to-date version is available from RBI, 1160 Berlin, GDR. Last winter the programme could be heard at 1915 on 1359kHz medium waves and on 6·08MHz and 6·115MHz.

Sweden Calling DXers has been on the air for years. It consists of listeners' tips and consequently keeps the DXer in touch with the ever-changing scene on the bands. Listen on a Tuesday at 1115 on 9·63MHz at 1615 on 6·065MHz and 9·63MHz, at 1845 on 1179kHz and 6·065MHz and at 2315 on 1179kHz.

Readers' Letters

"I am relatively new to DXing," writes **Martin Holden** from Harlow who uses an Amstrad 6010 receiver. "The Amstrad is good for the bands it covers but has no antenna sockets — also it seems to be full of images of stations — any ideas how to rectify these gripes?"

Extend the whip antenna. Wind several turns of insulated wire round it and join one end only to the antenna leaving the other end floating. One reader has joined the antenna lead to the top of the extended whip but this method may encourage receiver overloading. It is worth remembering that the designer of the set did not intend it to be used with an additional antenna otherwise he would have provided the appropriate socket, so you are taking a chance if you try to get round this limitation.

Images are caused by lack of selectivity before the mixer stage. The block diagram of a conventional superhet receiver with a tuned r.f. stage is shown in Fig. 1. If you omit the r.f. stage, as occurs in simpler sets, then images are more likely. The remedy is to fit an additional r.f. stage and this is done easily by fitting a device called a preselector between the antenna and the receiver antenna socket. The Lowe UL-1000 reviewed in the April *PW* is an example of a preselector. It has a tuning control which peaks the station you are listening to but not the image. Of course you have to use screened cable from the preselector to the antenna socket of the receiver otherwise this lead would act as an antenna and pick up the image you are trying to suppress. Portables, by and large, are self-contained sets and do not easily match-in with accessories, so it is best at the outset to get one that will satisfy your needs.

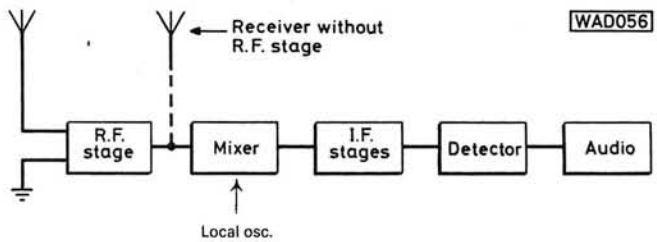


Fig. 1: Block diagram of a superhet receiver

VHF Bands

by Ron Ham BRS15744

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

Judging from the enthusiastic remarks contained in your letters, I feel that the best way to summarise the many atmospheric events which brought the DX between July 19 and August 18, is to simply say, "this was a something-for-everyone month".

Solar

Down in Bristol, **Ted Waring,** projecting the sun's image through his telescope counted 93 sunspots on July 19, 4 on the 25th, 20 on August 4 and 50 on the 11th, and **Cmdr Henry Hatfield,** Sevenoaks, using his spectrohelioscope observed 7 sunspot groups on the 8th, one with a long and quite active chain, and 6 groups with nothing very active on the 14th. It is most likely that a major event from within that long chain was responsible for the aurora borealis which manifested on the 7th. **David Coggins,** Knutsford, checks for solar radio noise with his 144MHz and 50MHz converters feeding a Yaesu FRG-7700M communications receiver and reports hearing solar noises on 50MHz on July 19 and 20 and on 28MHz on August 1. Apart from one small burst of radio noise at midday on July 19 and another on August 6, my solar log for 143MHz for the period July 19 to August 18 is blank.

Aurora

"The aurora on August 7 had two phases, the first lasting from 0030 *until* 1642 while the second started about 2100 and was very weak, fading out gradually around 2300," writes **Jim Penny** GM4JLY, Aberdeen. Between 0107 and 1555 he made auroral c.w. contacts with 144MHz stations in Czechoslovakia, Denmark, Faroe Is., East and West Germany, Holland, Latvia, Lithuania, Sweden and White Russia, and with EI6AIB at 1518 on s.s.b. Peaks of this

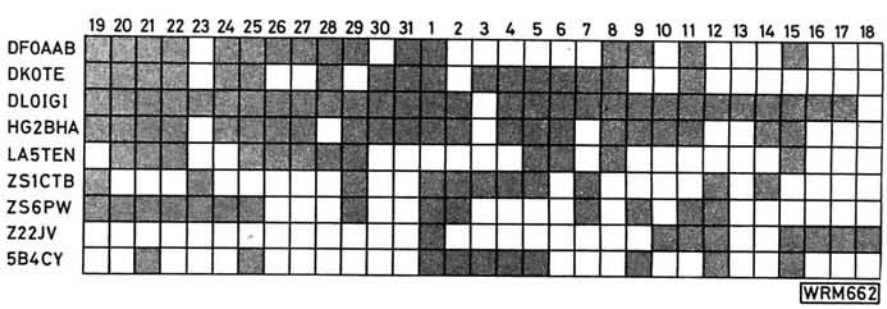


Fig. 1: Distribution of 28MHz beacon signals

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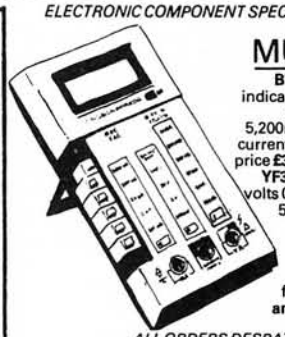

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event came around 0115, 0600 and a long one from 1330 to 1600. At 0600, **John Cooper** G8NGO, Cowfold, Sussex, was ready for a meteor scatter sked on 144MHz with I4MKN, but when he switched on the aurora was in full swing and he heard stations in DL, F, GD, GI and GM. At 0703 he worked GM8OEC on s.s.b., and at 1500 added GW, OZ and YO to the list of stations heard, and at 1518 worked GM3WML. During another auroral event at 1738 on August 11, John had s.s.b. QSOs with GM3WML and GM8MBP.

The 28MHz Band

Although the 28MHz band seemed very quiet between July 19 and August 18, there were a few openings due to sporadic-E, Henry Hatfield heard the Bermuda beacon VP9BA on July 22 and 23 and for the satellite buffs there is OSCAR-8 which has a downlink between 29·4 and 29·5MHz and a beacon on 29·402MHz. "I occasionally come across OSCAR-8 and orbital data from RS7 on 29·431MHz," writes **John Coulter,** Winchester, a regular 28MHz listener who keeps a special ear open in the beacon and satellite sections of the band.

Readers with a particular interest in 28MHz wishing to join "10-UK", who have a s.s.b. net on Wednesday evenings 28·305MHz, a c.w. net Thursdays 28·105MHz and f.m. on Mondays 29·600MHz, should write to **N. J. O'Brien** G3ZEV, 88 The Maples, Harlow, Essex. The annual subscription is £3.50 and membership, currently around 130, is open to licensed and non-licensed people and their slogan is "USE 10 METRES".

28MHz Beacons

Further to my recent report about the strange callsigns heard on the "wrong" side of some beacon signals, **Ted Ross** GM3LWS, Glenrothes, writes, "Similarly, on 28·224MHz, "VELEETVVE" will produce HG2BHA on the right limit." Thanks Ted. I believe that several readers are looking for these strangers now. **David Newman** G4GLT, Leicester, noted on August 1 that the beacon Z22JV, previously on 29·265MHz had moved to 28·250MHz and was a good 599 with Dave at 1649. On August 11, **Bert Glass** BRS 32693, Plymouth, using a KW202 receiver heard the Gough Island beacon ZD9GI and writes, "I am a bit of an old timer, ex-VS1 and ZB2B now reaching the age of 75 but still quite interested in having a listen around the bands." Bert, who is also RNARS member of No 621 used a Spark and Poulsen Arc transmitter when he first joined the Royal Navy in the early 1920s. **Susan Beech,** Dollar, Scotland, uses an ex-RN B40 receiver and long wire antenna for the h.f. bands and is currently studying for the December RAE and practising Morse with a local group. Good luck Sue, you will soon be sporting that GM call. David Coggins has been DXing for about 4 years and keeps a daily watch on the 28MHz, 50MHz and 144MHz beacons. **Geoff Arnold,** Susan Beech, John Coulter, Bert Glass, Henry Hatfield, Ted Waring, David Coggins and I, contributed to the beacon report in Fig. 1.

The 50MHz (6m) Band

David Coggins received signals from the beacons in Gibraltar ZB2VHF on July 19, 20, 22 and 29 and August 1, 2 and 3 and the UK GB3SIX every day from July 18 to August 7. **Chester Beck** K6DFP, writes from Downey, California, to say that there is 50MHz activity in the Los Angeles area and that he uses an Icom 502 for 50MHz s.s.b. and listens out for the beacons listed in the American magazine *QST*. Chester also intends to build a 5W beacon using a Vanguard, valved r.f. unit to operate just inside the band or on a spot around 50·4MHz. Thanks for the gen Chester, we are always pleased to hear from readers on the other side of the Atlantic.

Sporadic-E

During the sporadic-E disturbances on July 20, 21 and 29 and August 1, 6, 7, and at 0910 on the 15th an average of 20 very strong signals from east-European broadcast stations were received between 66 and 73MHz and during major disturbances at 1230 on the 30th, 1915 on the 8th and 1910 on the 15th, I counted 50, 45 and 44 of these stations respectively. **Harold Brodribb,** St Leonards-on-Sea, also listens between 66 and 73MHz when sporadic-E is about and on one occasion when he heard 26 stations he noted that 15 were below 70MHz and 11 above and, like me, has heard the 70MHz amateur band swamped by broadcast stations during several events.

RTTY

Peter Baylis, Peterborough, uses a Drake receiver, Yaesu FRT-7700 a.t.u. and a Microwave Modules MM2000 fed by two long wire antennas, 46m N/S and 15m E/W, for the reception of RTTY signals. Peter, Fig. 2, has passed the RAE and hopes to be active soon with a G6 call. During the period July 19 to August 18, I copied RTTY signals from stations on 14·090MHz in the 20m band, in 15 countries, DK, EA, F, GI, HA, HB9, I, LA, LX, ON, OK, SM, UT, VK and YV and one of the strongest signals was at 0820 on the 14th when I copied VK2NN working into G. **Norman Jennings** BRS48675, Rye, East Sussex, using an FRG-7700 receiver and a.t.u. and a Telereader CWR670 logged over 50 countries on RTTY between mid-July and mid-August. Although the majority of these were on 14MHz, he did copy a JA on 21MHz and a W on 28MHz. Norman was a s.w.l. in the late 1930s using a

Fig. 2: Peter Baylis in his shack

Hallicrafters Sky Buddy for the h.f. bands and a home-brew receiver for the 60MHz (5m) band and now, at the age of 73, Norman is active again and I will be looking forward to more of his RTTY reports.

Meteor Scatter

During the late evening of August 12, John Cooper G8NGO, completed meteor scatter contacts on 144MHz s.s.b. with OE5KE and OK3KCM, but his real prize came when he confirmed a 2-way QSO with HG6KVB in only 2·75 mins which suggests that there were some big meteor bursts around at the time. John, a seasoned m.s. operator with a previous best of 17 mins to complete a QSO, was delighted with the HG contact and his achievement was witnessed by **Mitch Tribe** G8PMT, Worthing and **Andrew Vare** G6BBS, Porchester. Congratulations John, I bet you are looking forward to the Leonids in November.

Tropospheric

The atmospheric pressure, measured at my QTH, was steady around 30·2in (1022mb) from July 19 to midday on the 29th when it fell to just below 30·0 (1015). It remained there until noon on August 7 when it began to rise, reaching 30·15 (1020) on the 8th, and hovered around 30·2 until 1600 on the 11th when it fell sharply to 30·0 and stayed there for the rest of the period.

During the small hours of July 22, John Cooper worked several Y2 stations in East Germany, DK7LS on the Baltic coast, OZ1FTW, and gave OZ1EYE, a YL operator, her first contact with ZK square on 144MHz s.s.b. Later he had a 3-way QSO with DF1OH and DF5AI at 1000km near Bremen and at 0313 he gave Y25FG, who was a very strong signal with John, his first contact in ZK square. On July 24 John heard stations in Scandinavia and on the 28th worked into LA and OZ. Towards the end of July **Ian Wassell** G4KDR, Horsham, was on holiday in the Shetlands and worked into LA on 144MHz via one of the Norwegian

repeaters using just 2 watts to a "rubber duck" antenna. At home Ian uses an FT-200 and modified G5RV antenna for the h.f. bands and an FT-480 for mobile operation on 144MHz, his favourite band. While camping at Ferndown, Dorset, at the end of July, **Harold Goble** G4FDQ worked **Leon Ward** GW5NF via the Wells 144MHz repeater GB3WR on R0, and when he arrived home in Lan-

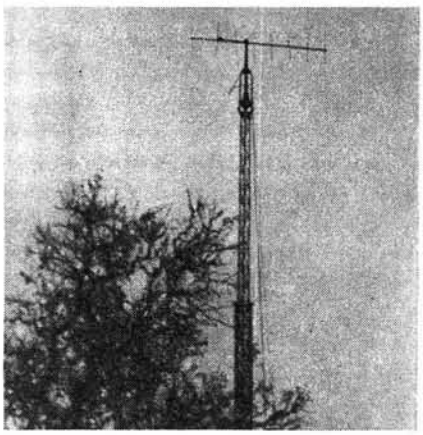

Fig. 3: The main mast used by Maurice and Prim Fagg

cing, Harold heard several French stations calling on the 144MHz simplex channel. On July 29, David Coggins heard OZ1HNE and GM8HLZ on 144MHz and LA5XAA and the Angus 144MHz beacon GB3ANG on the 30th. During another lift on August 11, John Cooper heard several OEs on 144MHz and worked EA2AA. On the 12th he had a QSO at 1300km with HG1KYY. Well done John, follow that! When conditions are good on 144MHz Jim Penny listens for the Danish 430MHz beacon, OZ2UHF 432·865MHz, to come up and often, when it has peaked around 599, he cannot find any s.s.b. or ATV stations active in Denmark.

Susan Beech, using a Wolfesen 1200 and an 8-element vertically polarised Yagi, heard stations on July 30 through the 144MHz repeaters in Belfast GB3NI R5 and Cumbria GB3AS R1 and a 59 signal from GI4MVE on a simplex channel.

Band II

At 0750 on July 19, **Alan Beech,** Dollar, Scotland, using a Lloytron 952 Stereo and a loft dipole, received signals from Radio Cumbria, RET 2, Downtown Radio in stereo and a local station in Eire, Sunshine Radio. On July 21, 28 and 29, David Hackwell, Warrington, received strong signals from Radio Newcastle and RTE 2, and at 0930 on the 29th Harold Brodribb logged 8 French stations between 88 and 100MHz and up to 12 at 1545 on the 30th. During the late afternoon and early evening on the 27th, I was mobile in East Sussex and using the v.h.f. radio section of my Plustron TVR 5D and its own telescopic antenna, I heard strong signals from several French stations between 96 and 100MHz and a station playing French pop music at 104MHz. "Band II was absolutely congested with sporadic-E stations on August 7," writes **Simon Hamer,** Presteigne, who heard many stations from France, Italy, Spain, Sweden and Yugoslavia between 1845 and 2000. Around 0900 on the 9th, **Fraser Lees,** Ringmer, Sussex, logged several Italian and Spanish stations during another sporadic-E disturbance. Between 1300 and 1700 on August 11, **Ian Kelly,** Reading, heard good tropo signals from French stations in Amiens, Caen, Bologne, Le Mans, Lille, Paris and Rouen and from Belgium's BRT in Egem and RTBF in Anderlues. "There were also a few unidentified French and Belgian private stations between 100 and 104MHz," writes Ian.

News About Stations

Congratulations to G8RZO and G8KUC and G6ECM and G8JAY/P who were the leading stations in the high and low power sections of the 144MHz FM Contest held in April and organised by the Stevenage and District Amateur Radio Society. "A fair amount of DX was worked including many continentals," said society secretary, **Trevor Tugwell** G8KMV.

Stephen Rooker, Ashford, works as a civilian in the workshops of REME and apart from his special interest in test gear he hopes to take the RAE in the not too distant future.

Maurice and **Prim Fagg** G4DDY and G4CCY are active members of the Surrey Radio Contact Club and operate with the club on both v.h.f. and h.f. national field days. Maurice is currently the vice-chairman and Prim was one of the club's c.w. instructors. At their home in Wallington, Surrey (Fig. 3), Mr and Mrs Fagg have their operating shack in the corner of their dining room and are equipped for the h.f. bands with a FT-101B and a linear, and for 144MHz with a FT-221R and they have a Microwave Modules transverter for 430MHz. On August 8, Maurice and Prim visited the Chalk Pits Museum and Maurice, using the museum's station under his own call G4DDY/A, worked GB4GM, the Four Points of Scotland DXpedition station in the Mull of Galloway and heard VE0MBA/MM, the station aboard the new ice-breaker, *Sir John Franklin.* Their home station is also equipped for RTTY with a ST1 terminal unit and a Creed 444 printer.

Jon Kempster BRS 45205, Berkhamsted, attended the RSGB Rally at Woburn on August 1 and added to his enjoyment by listening to the traffic on S20 with his Sound Air 008 hand-held receiver while walking among the displays.

71-year-old **John *Dickson*** *G2HV,* Hove, operates mainly on 144MHz with a TR-9000 and a ground plane antenna. John joined the Royal Navy Wireless Auxiliary Reserve in 1932, obtained his amateur licence in 1936, served as a Warrant Telegraphist in the RNVWR during WW-II and stayed in the RNR until 1961, ending up as a Lt/Cmdr in the electrical branch. John is now active in the South-Sussex Raynet Group and was among the 9 Raynet members who recently passed their First-Aid exam.

I met **Rene Van-Trigt** PE1ICT while he was on holiday in the UK on August 11. Rene, a member of VERON and VRZA (Vereniging Radio Zendamateurs) was keeping up with the h.f. DX with an FRG-7 in his car, and at home he is building a transmitter for 144MHz and practising Morse for a future examination.

Roy Bickley G4MZQ, Market Drayton, uses a Trio-7500 in his car for 144MHz and at home has a 700G fed by a 6-element vertical quad or an 8-element horizontal Yagi. Roy is also keen on the h.f. bands and uses a Heathkit SB101 transmitter and one of the famous ex-government AR88LF communications receivers.

Congratulations to 15-year-old **Jeremy Bulbrook,** Wimblington, Cambs, on passing the RAE and having a picture of himself with CR100 and FRG-7 communications receivers and a good write-up in his local paper, the *Fenland Advertiser.* Jeremy studied for the RAE at evening classes and is now, with the help of Richard Thurlow G3WW, polishing up his Morse.

Having built crystal sets and Cossor and Scott-Taggart kit sets in the early 1930s, 70-year-old **Arthur Bagnall** G8OYC, Peacehaven, took to amateur radio after WW-II with a Geloso shortwave converter into an ex-RAF R1155 communications receiver. Arthur, a member of the Brighton and District Amateur Radio Club and RAIBC, uses an FRG-7 for general listening and a Yaesu FT-221R and 8-element Yagi for QSOs on 144MHz.

14-year-old **Alan Beech,** a keen v.h.f. and TV DXer from Dollar in Scotland hopes to join his sister, Susan, and take the RAE in December. Good luck Alan, might as well have two GMs in the house.

Before moving a G4MH Mini-beam from one QTH to another, on August 12, Geoff Arnold G3GSR, our Editor, and **Dick Ganderton** G8VFH, our Assistant Editor, checked the installation with a Shimizu SS-105S and received a good signal from the new 28MHz beacon Z22JV. We would all like some more information about it. Any ideas?

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TV

by Ron Ham BRS15744

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

It soon became obvious when I read your letters that you all enjoyed the sometimes exceptional sporadic-E disturbances which occurred between July 19 and August 18 and piled up the often super DX at the input sockets of your television receivers.

Amateur Television

Jim Penny GM4JLY, Aberdeen, is concentrating his efforts on fast scan television on 430MHz (70cm) because he is after the British Amateur Television Club's "Diamond Award". He has so far passed the half way mark toward the 100 000 points required for the certificate. "On July 19 conditions were very good for 430MHz ATV into Yorkshire and even further south" writes Jim, who exchanged pictures with G3ACK, G3UMF, G3YQC, G4EKD, G6BIA and G8RWV between 1910 and 2143. At 2239 he worked G3NOX in Saffron Walden, Essex with 59 plus 40dB signals both ways. On August 3 Jim noticed that the signal from the PI3HKH repeater on 430MHz was well over S9 and using his 48-element Multibeam worked PA3BAY and PE0MAR through the repeater and then alerted other ATV stations to the good conditions. Later he received a perfect colour picture from PE1EWV complete with sound on the 5·5MHz CCIR system. "The overall effect was very impressive and we were able to operate duplex over the 700km path receiving sound and vision on 430MHz and transmitting sound back on 144·75MHz" said Jim who also exchanged pictures with PE1AIG and PE1GVS.

Fig. 1: UHF signals received by Nicholas Wythe on July 8

Fig. 2: Received by Nicholas Wythe

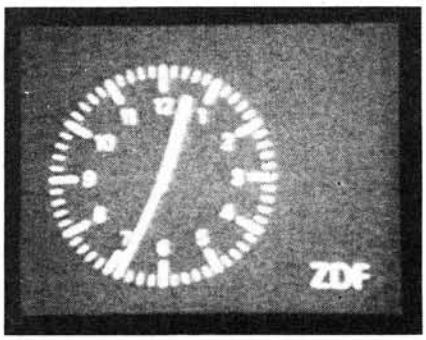

Fig. 3: ZDF Clock received on Ch. 34 by Peter Baylis

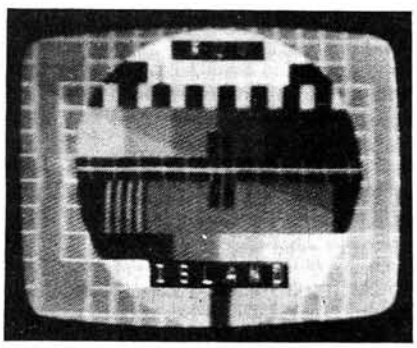

Fig. 4: Test card from Iceland received by Tim Anderson

Fig. 5: Spanish regional caption received by Sam Faulkner

Fig. 6: Spanish teletext received by Dave Cawser

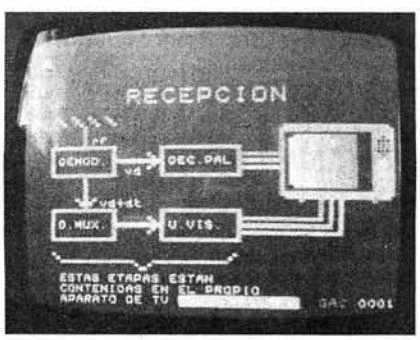

Fig. 7: Received by Dave Cawser

Fig. 8: Picture from ARD received by Tim Anderson

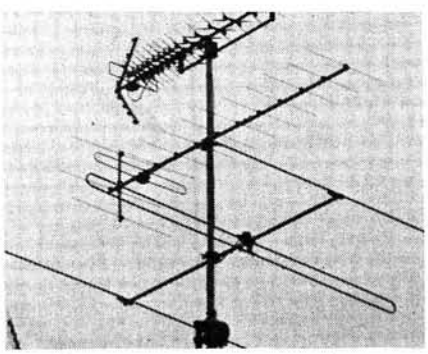

Fig. 9: Tim Anderson's DXTV array

Congratulations to TVDXer **Dave Cawser,** Burton-on-Trent, on passing the RAE and now Dave intends to join G4LIR, G8OZP and G8VBA and become active in the field of ATV.

SSTV

Between July 15 and August 11, **Richard Thurlow** G3WW, March, Cambs, had 2-way SSTV QSOs on 144MHz (2m) with G4FBA, DK7LZ, G8CDK, G4CNJ and G4DHI, and although conditions on the 14MHz (20m) band were often poor, Richard exchanged colour pictures with DL7MT, G3NOX, KB8LU who writes a regular SSTV column in the American magazine *World Radio News,* and ZS6BT, plus black and white pictures with stations in Austria, Germany, Portugal and Spain.

Tropospheric

"The 19th was excellent" writes **David Hackwell** from Warrington, who received Anglia TV, the Good Evening caption from Ulster and captions from the BBC and IBA stations in Scotland around Chs. 40 and 43. At 1454 on July 20, **Peter Baylis,** Peterborough watched the Tour-de-France from BRT Belgium on Ch. 46 and again at 1441 on the 21st. Around 0805 on the 19th, **Alan Beech,** Dollar, Scotland, received pictures from Ulster Television on Ch. 23 and BBC1 Northern Ireland on Ch. 31. On the 28th, 29th and 30th David Hackwell logged strong pictures from Border TV and **Nicholas Wythe,** Folkestone sent two photographs, Figs. 1 and 2, of u.h.f. DX that he received earlier in the month.

"On the 29th, signals really came booming in", writes Peter Baylis, who saw test cards from Sweden's TV1 and TV2 on Chs. 22, 26 and 33 and news in text form from Nederlands 1 and 2 on Chs. 39 and 52. He also watched an episode of *Secret Army* with Swedish subtitles at 1710 on Ch. 33, a weather forecast from BRT-1, a weather map from Beyerischer Rundfunk on Ch. 32 and a programme called "Heute" from ZDF (Fig. 3) on Ch. 34.

Sporadic-E

"Conditions in Band I have been really tremendous" writes **Sam Faulkner,** Burton-on-Trent, who like **Tim Anderson,** Stroud, **Harold Brodribb,** Peter Baylis, David and **Pam Cawser,** David Hackwell, **Brian Renforth** and **Alan Taylor** sent long and detailed logs. From their logs I found that between them they had received test cards and/or programmes from Austria ORF, Czechoslovakia CST and RS-KH, Denmark DR, Finland YLE, Germany ARD and NDR, Hungary Budapest, Ireland RTE, Italy RAI, Iceland RUV (Fig. 4), Norway Bagn, Hemnes, Kvel, Kongsberg, Melhus, NRK, Steignen and Televerket, Poland TVP, TP1 and "dt", Portugal RTP, Spain TVE, RTVE and Teletexto (Figs. 5 and 6), Sweden TV1, USSR "HOBOCTON", "BPEMR" and "CCCP TB", Yugoslavia JRT ZGRB and BGRD and Zimbabwe ZTV.

On July 20, I saw a caption, sometimes in colour, which read "Emission Experimental Teletexto RTVE" followed by animated block diagrams, also seen by Dave Cawser (Fig. 7), of how the system works. During most of the sporadic-E disturbances between July 19 and August 18, signals from Spain were very strong and among the regional pictures seen by Sam Faulkner were Andalucia Fig. 5, Canary Islands, TVE Murcia and the caption, Programa Regional Simultaneo over a colour-bar background. At 0740GMT on August 1, I saw the RTVE digital clock superimposed on the colour bars showing 0940, followed at 0746 by the TVE test card strong enough to resolve the colour, with TVE 1 at the bottom and a digital clock showing 0946, and later a news programme from Spain with the presenter using sign language for the deaf. "There have been long hours of RAI, RTP and RTVE reception during the period" writes Sam who, on July 28, saw news and a cookery programme from Nigeria NTV on Ch. E3 and watched two African YLs in national dress preparing ingredients while the third YL attended to the cooking.

My thanks to **John Coulter,** David Hackwell, **Bruce Luff,** Lincoln and my wife Joan, for checking their Russian dictionaries and telling me that a caption we often see under news items "TACC COO6WAET" means "Tass Report".

Fig. 10: Belgian teletext received by Nicholas Wythe

After reading your fascinating letters I realised that between you the following items were seen: Athletics, a factory ship unloading, big dipper at a fair, cartoons, children's sports and special programmes, church services, circus, *CUBA 82, Dallas,* Fats Domino singing and people dancing, football, film from RAI with Chinese sub-titles, golf, German Grand Prix, ice hockey, Portugal's Omega clock, RAI clock, *Tarzan* dubbed into Italian, Scandinavian Women's Peace Movement, Italian Amphitheatre and war films.

DX on Chs. E2 and R1 ebbed and flowed for most of the day on August 15. Broadcast listener **Adrian Butcher,** Washington, Sussex, was delighted to see cartoons, dancing and the Control Central RTVE colour bars from Spain, a test card from Norway and football from the USSR, all fighting for predominance on the screen of my Plustron TVR5D, coupled to the h.f. quad antenna at the Chalk Pits Museum, where he was a visitor.

As well as being intense, some of these events went on a long time. For instance on July 27, Tim Anderson received pictures from RUV Iceland at 2350 and on August 9 saw the Canary Is colour bars with the caption "Izara 1". Tim also sent in a photograph of the picture he received from ARD (Fig. 8), on August 1 and a picture of his TVDX antenna system (Fig. 9), with his home-brew Band I beam at the bottom.

Station Reports

Peter Baylis BRS 50556, Peterborough, uses a JVC CX610GB colour set and a Philips Video Recorder for DXTV fed by a 4-element Antiference antenna for Band I, a home-brew 8-element Yagi for Band III and a Fuba XC391 for u.h.f. The whole array is rotatable and mounted on a 10m mast with a head pre-amplifier switchable by a coaxial relay.

Alan Taylor, Coventry is a new TVDXer, using a Plustron TVR5D receiver fed by a 4-element beam, and is delighted with the signals from 12 countries which he has logged in such a short time.

Christopher Cawser kept the home station active during the school summer holidays and was able to tell Dad what he had missed while he was at work.

Fraser Lees G6JIO, Ringmer, Sussex, is a keen TVDXer with an impressive set of Fuba antennas on his house. He uses two CLOU 45s for u.h.f., 8-element Yagis for Band III and 144MHz and a 4-element beam for Band I. For DXTV Fraser has a modified JVC 3040, and for 144MHz a 290R.

David Appleyard, Uppsala, Sweden, has moved QTH and although he occupies the top floor of a three-storey house, he just can't get away from the QRM generated by an ancient extractor fan in the roof. Bad luck David, let's hope that someone fits a new one soon and you can get back to your DXing.

Nicholas Wythe kindly sent a photograph of the Belgian teletext signal that he received on May 12 (Fig. 10) and writes, "As you can see, the teletext signal has been decoded perfectly".

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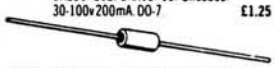

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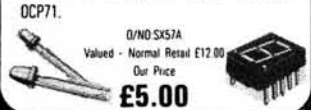

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You have the facility to support separate data files.

You have a choice of storage capacities (governed by the amount of RAM). 16K of RAM (which you can uprate later to 48K of RAM) or a massive 48K of RAM.

Yet the price of the Spectrum 16K is an amazing £125! Even the popular 48K version costs only £175!

You may decide to begin with the 16K version. If so, you can still return it later for an upgrade. The cost? Around £60.

Ready to use today, easy to expand tomorrow

Your ZX Spectrum comes with a mains adaptor and all the necessary leads to connect to most cassette recorders and TVs (colour or black and white).

Employing Sinclair BASIC (now used in over 500,000 computers worldwide) the ZX Spectrum comes complete with two manuals which together represent a detailed course in BASIC programming. Whether you're a beginner or a competent programmer, you'll find them both of immense help. Depending on your computer experience, you'll quickly be moving into the colourful world of ZX Spectrum professional-level computing.

There's no need to stop there. The ZX Printer – available now – is fully compatible with the ZX Spectrum. And later this year there will be Microdrives for massive amounts of extra on-line storage, plus an RS232 / network interface board.

Key features of the Sinclair ZX Spectrum

- Full colour – 8 colours each for foreground, background and border, plus flashing and brightness-intensity control.
- Sound – BEEP command with variable pitch and duration.
- Massive RAM – 16K or 48K.
- Full-size moving-key keyboard – all keys at normal typewriter pitch, with repeat facility on each key.
- High-resolution – 256 dots horizontally x 192 vertically, each individually addressable for true high-resolution graphics.
- ASCII character set – with upper- and lower-case characters.
- Teletext-compatible – user software can generate 40 characters per line or other settings.
- High speed LOAD & SAVE – 16K in 100 seconds via cassette, with VERIFY & MERGE for programs and separate data files.
- Sinclair 16K extended BASIC – incorporating unique 'one-touch' keyword entry, syntax check, and report codes.

um

RS232/network interface board

This interface, available later this year, will enable you to connect your ZX Spectrum to a whole host of printers, terminals and other computers.

The potential is enormous. And the astonishingly low price of only £20 is possible only because the operating systems are already designed into the ROM.

The ZX Printer – available now

Designed exclusively for use with the Sinclair ZX range of computers, the printer offers ZX Spectrum owners the full ASCII character set – including lower-case characters and high-resolution graphics.

A special feature is COPY which prints out exactly what is on the whole TV screen without the need for further instructions. Printing speed is 50 characters per second, with 32 characters per line and 9 lines per vertical inch.

The ZX Printer connects to the rear of your ZX Spectrum. A roll of paper (65ft long and 4in wide) is supplied, along with full instructions. Further supplies of paper are available in packs of five rolls.

The ZX Microdrive – coming soon

The new Microdrives, designed especially for the ZX Spectrum, are set to change the face of personal computing.

Each Microdrive is capable of holding up to 100K bytes using a single interchangeable microfloppy.

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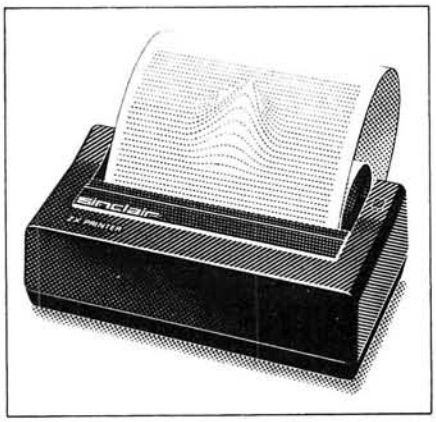
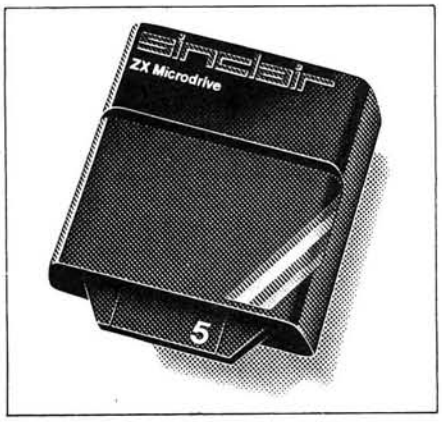
All the BASIC commands required for the Microdrives are included on the Spectrum.

A remarkable breakthrough at a remarkable price. The Microdrives are available later this year, for around £50.





How to order your ZX Spectrum

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	Sinclair ZX Spectrum – 48K RAM version	101	175.00	
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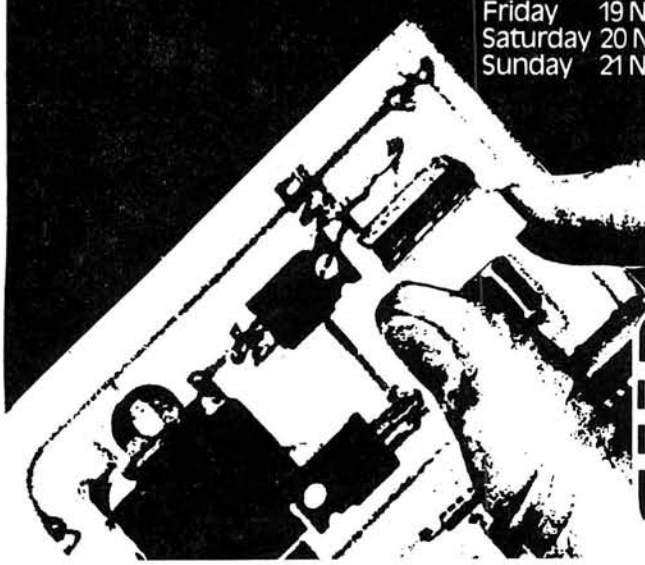

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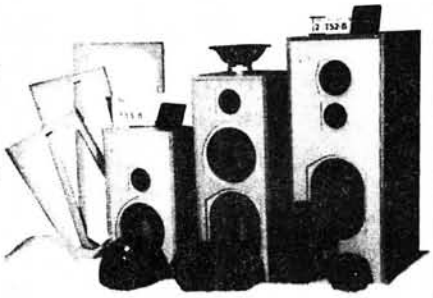

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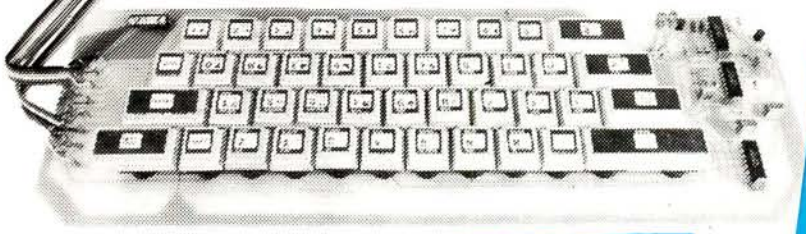

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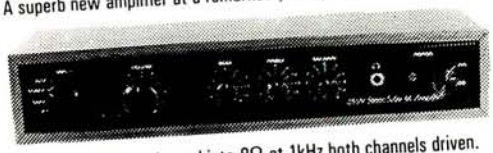

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