practical WIRELESS

RADIO....ELECTRONICS....INSTRUMENTS....AUDIO....

50p

Australia	95c
New Zealand	95c
South Africa	90c
Malaysia	$2.75

SEPT 1979

Holiday

SPECIAL PULL~OUT FEATURE

radio & tv guide

also:

BURGLAR ALARMS (Part 1)

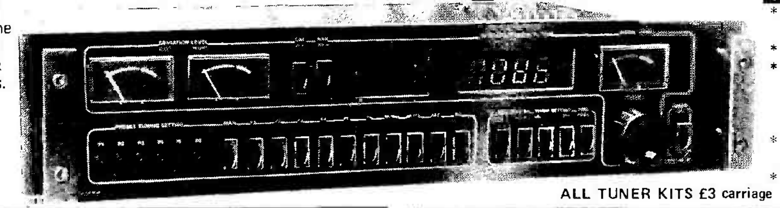
BUILDING DISCO CABINETS

Tecknowledgey for sale.

The Mark III FM Tuner

DIY Hi-Fi will never seem the same again. Ambit's Mark III tuner system is electrically & visually superior to all others. Some options available, but the illustrated version with reference series modules: £149.00 + £18.62 VAT

With Hyperfi Series modules £185.00 + £23.12



ALL TUNER KITS £3 carriage

Features of the system

- Precision construction & design of all parts
- Time/frequency display
- State of the art performance with facilities for updates, using modular plug in systems.
- Deviation level calibrator for recording
- All usual tuner features

Digital Dorchester All Band Broadcast Tuner: LW/MW/SW/SW/SW/FM stereo

A multiband superhet tuner, constructed using a single IC for RF/IF processing - but with all features you would expect of designs of far greater complexity. The FM section uses a three section (air gang) tuned FET tunerhead, with ceramic IF filters and interstation mute; AM employs a double balanced mixer input stage, with mechanical IF filters - plus a BFO and MOSFET product detector for CW/SSB reception. Styled in a matching unit to the Mark III FM only tuner, employing the same degree of care in mechanical design to enable easy construction. MW/LW reception via a ferrite rod antenna.

Electronics only (PCB and all components thereon)	**£33.00 + £4.12 VAT**
Complete with digital frequency readout/clock-timer hardware	**£99.00 + £12.37 VAT**
Complete with MA1023 clock/timer module with dial scale	**£66.00 + £8.25 VAT**

Hardware packages are available separately if you wish to house your own designs in a professional case structure. Please deduct the cost of electronics from complete prices.

LW MW FM LCD Digital Frequency Display - July PW feature

Update your old radio, or build this into a new design. Or use it as a servicing aid - this low power unit with LCD display reads direct frequency in kHz/MHz, or with usual AM/FM IF offsets for received frequency. Low power LCD means no RFI - 15-20mA at 9v even with the divide by 100 prescalar. FM resolution is 100kHz, AM 1kHz. Sensitivities better than 10mV

Complete kit £19.50 +*£1.56 VAT. Built and tested version £24.00 +*£1.92 VAT

Various other DFM systems described in our catalogue part 2 - including a one chip solution to providing digital display of FRG7 kHz dial, combined with clock/timers etc.

PW SANDBANKS PI METAL LOCATOR

Maintaining our professional approach to home constructor kits, we offer the pulse induction 'Sandbanks'. Now with injection molded casing for greatly improved enviromental sealing. £37.00+ *£2.96vat.

VHF MONITOR RX WITH PLESSEY IC

4/9 channel version of the PW design - but using standard 3rd OT crystals, and TOYO 8 pole crystal filter with matching transformers. Coil sets from our standard range to cover bands from 40 to 200MHz. Complete module kit £31.25 +£3.90vat .

ETI - REMCON RADIO CONTROL

A tried and tested RC system with a full set of supporting hardware from a well known manufacturer. Please send for details - and watch our ads for further news of developments in RC products.

Radio and Audio Modules : The biggest range/ best specs:

EF5801/3/4 6 stage varicap tunerheads with LO feed and various levels of sophistication. New 5804 include pin AGC loop 'on board'. 5801:£17.45+£2.18vat - 5803:£19.75+£2.47vat 5804:£24.95 +£3.18vat. *Frequencies in 40-180MHz on appcn.*

EF5402 4 stage varicap with TDA1062, compound FET/Bipolar input stage, low noise, balanced mixer, pin agc, osc output. A worthy successor to the 5400. £10.75+£1.34vat

The 5402 is available centred on a wide range of frequencies from 30MHz to 180MHz. Non standard units £14.75+£1.84 - 3 weeks.

8319 4 stage varicap tunerhead from Larsholt using MOSFET RF and mixer stages. New temperature compensated oscillator for wide ranges of ambient temperature £13.45+£1.68vat

7252 Complete Larsholt FM tuner less stereo decoder. £26.50+£3.31vat

7253 Stereo FM tunerset from Larsholt with FET head. (as 7252)

944378 Hyperfi stereo decoder. The very best. £19.95+£2.49vat

911223 Pilot cancel stereo decoder, priced to make the MC1310 as obsolete as it now deserves to be.£12.50+£1.56vat

Inotec 1-A fully DC tuned and switched LW/MW/FM stereo tuner to interface with synthesiser control etc.A first! Details OA

COMPONENTS for Radio and Audio ICs, HMOS etc.

The list is too long to attempt here, but AMBIT specializes in all types of semiconductor for radio reception, including devices operating from DC to 5GHz. New low cost SBL1 diode ring mixers (equiv case MD108 etc) -first with HMOS fets, now with a PCB for DC amplifier, and offset sense and protection relay for speakers. See catalogue and updates for most info, pse send an SAE for information on anything you cannot find in catalogues.

Radio ICs	cost	+ vat
CA3089E	1.94	24
CA3189E	2.45	30
HA1137W	2.20	27
SN76660	0.75	9
TDA1090	3.35	42
TDA1083	1.95	24
TDA1220	1.40	17
SL6640	2.75	34
MC3357	3.12	39
HA1197W	1.40	17
MC1496	1.25	16
LM373/4	3.75	49

Stereo ICs	cost	+ vat
MC1310P	1.50	19
uA758	2.20	27
CA3090A	2.75	34
HA1196	3.95	49
HA11223	4.35	54
KB4437	4.35	54
KB2224	2.75	34
Preamp ICs/switches		
TDA1028	3.50	44
TDA1029	3.50	44
TDA1074	4.14	52
KB4438	2.22	28

AF power ICs	cost	+ vat
LM380N	1.00	12
TBA810AS	1.09	14
TDA2002	1.95	24
TBA820M	0.75	9

from the general list:
LEDs:all colours and low prices
2SJ48/2SK134 HMOS 9.90 +£0.80 vat(Pair)
Signal fets/transistors and TOKO COILS & FILTERS!

OSTS: Remember all OSTS stocks are obtained from BS9000 approved sources - your assurance that all devices are very best first quality commercial types. Some LPSN TTL is presently in great demand, so please check by phone before ordering .

TTL:Standard AND LP SchottkY

All prices listed in pence *

	'N'	'LSN'		'N'	'LSN'		'N'	'LSN'		'N'	'LSN'
7400	13	20	7455	35	24	74126	57	44	74185	134	
7401	13	20	7460	17		74128	74		74188	275	
7402	14	20	7463		124	74132	73	78	74190	115	92
7403	14	20	7470	28		74133		29	74191		
7404	14	24	7472	28		74136		40	74192	105	180
7405	18	26	7473	32	38	74138		60	74193	105	180
7406	38		7474	27	38	74139		60	74194	105	187
7407	38		7475	38	40	74141	56		74195	95	137
7408	17	24	7476	37	38	74142	265		74196	99	110
7409	17	24	7478		38	74143	312		74197	85	110
7410	15	24	7480	48		74144	312		74198	150	
7411	20	24	7481	86		74145	65	97	74199	160	
7412	17		7482	69		74147	175		74247		90
7413	30		7483A		110	74148	109	191	74248		90
7414	51		7484	97		74150	99		74249		93
7415		24	7485	104	99	74151	64	84	74251		90
7416	30		7486		40	74153	64	54	74253		105
7417	30		7489	205		74154	96		74257		108
7420	16	24	7490	33	90	74155	54	110	74258		153
7421	29	24	7491	76	110	74156	80	110	74259		420
7422	24	24	7492	38	78	74157	67	55	74260		153
7423	27		7493	32	99	74158		60	74261		353
7425	27		7494	78		74159	210		74266		40
7426	36	27	7495A	65	99	74160	82	130	74273		124
7427	27	29	7496	58	120	74161	92	78	74275		312
7428	35	32	7497	185		74162	92	130	74279		52
7430	17	24	74100	119		74163	92	78	74283		120
7432	25	24	74104	63		74164	104	130	74290		90
7433	40	32	74105	62		74165	105		74293		95
7437	40	24	74107	32	38	74166			74295		120
7438	33	24	74109	63	38	74167	20		74298		100
7440	17	24	74110	54	54	74168			74324		157
7441	74		74111	68		74169		200	74325		242
7442	70	99	74112		38	74170	230	200	74326		247
7443	115		74113		38	74172	625		74327		237
7444	112		74114		38	74173	170		74352		100
7445	94		74116	198		74174	87	120	74353		100
7446	94		74118	83		74175	87	110	74362		715
7447	82	89	74119	119		74176	75		74365		49
7448	56	99	74120	115		74177	78		74366		49
7449		99	74121	25		74180	85		74367		43
7450	17		74122	46	57	74181	165	350	74368		49
7451	17	24	74123	48	73	74182	160		74373		77
7453	17		74124		137	74183		210	74374		77
7454	17	24	74125	38	44	74184	135		74375		60

	'LSN'
74377	124
74378	93
74379	130
74368	37
74390	140
74393	140
74395	139
74396	133
74398	180
74399	150
74445	92
74447	90
74490	140
74668	110
74670	249

VOLTAGE /PSU REGULATORS

7800 series	95p
7900 series	£1
78M series (TO220 pack)	90p
78LCP series	35p
78MGT2C	175p
79MGT2C	175p
723C	65p
NE550A	73p
L200	195p

MAINS FILTERS

1Amp IEC	4.83
6Amp IEC	5.83
5A wirein	3.87

All BS approved

Requests for the next issue of the catalogue now being "booked" for despatch immediately it is ready (about November). Please send 50p to reserve a copy. (Part 3)

IMPORTANT: ALL OSTS PRICES EXCLUDE VAT - CURRENTLY 8% - BUT MAY BE CHANGED BY THE TIME YOU READ THIS. PLEASE REMEMBER TO ADD VAT, and 25p POSTAGE !!

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4000	17p
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4012	17p
4013	55p
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4016	52p
4017	80p
4018	80p
4019	60p
4020	93p
4021	82p
4022	90p
4023	17p
4024	76p
4025	17p
4026	180p
4027	55p
4028	72p
4029	100p
4030	58p
4031	250p
4032	100p
4033	145p
4034	200p
4035	120p
4036	250p
4037	100p
4038	105p
4039	250p
4040	83p
4041	90p
4042	85p
4043	85p
4044	80p
4045	160p
4046	130p
4047	99p
4048	60p
4049	55p
4050	55p
4051	65p
4052	65p
4053	65p
4054	120p
4055	135p

4059	563p
4060	115p
4063	109p
4066	53p
4067	400p
4068	25p
4069	20p
4070	20p
4071	20p
4072	20p
4073	20p
4075	20p
4076	90p
4077	20p
4078	20p
4081	20p
4082	20p
4085	82p
4086	82p
4089	150p
4093	50p
4094	190p
4096	105p
4097	372p
4098	110p
4099	122p
4160	90p
4161	90p
4162	90p
4163	90p
4174	104p
4175	95p
4194	95p
4501	23p
4502	91p
4503	69p
4506	51p
4507	55p
4508	248p
4510	99p
4511	149p
4512	98p
4513	206p
4514	260p
4515	300p
4516	125p
4517	382p
4518	103p
4519	57p
4520	109p
4521	236p

4522	149p
4527	157p
4528	102p
4529	141p
4530	90p
4531	141p
4532	125p
4534	614p
4536	380p
4538	150p
4539	110p
4541	141p
4543	174p
4549	399p
4553	440p
4554	153p
4556	77p
4557	386p
4558	117p
4559	388p
4560	218p
4561	65p
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4566	159p
4568	281p
4569	303p
4572	25p
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4582	164p
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4585	100p

Micromarket

6800 series	
6800P	6.50
6820P	£6
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8080 series	
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8228	4.78
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MEMORIES	
2102	£1.70
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2513	£7 54
4027	£5 78

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2708	£
Development	
MEK6800	£220
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AMI, Signetics TI, Intersil, Harris etc OA

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11C90DC /650MHz £14 00
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ICM7208 7 decade counter/display driver £14 95
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ICM7106CPK LCD DVM KIT £24.80
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PLEASE REMEMBER TO ADD 8% VAT TO ITEMS LISTED UNDER OSTS

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CA3130E	84p
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NE531N	105p

OPTO 7 seg displays

0.43" High Efficiency HP:

5082-7650	red CA	233p
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5082 7663	yellow CC	
5082 7670	green CA	
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0.3" Standard HP

5082-7730	red CA	147p
5082 7740	red CC	

0.5" Fairchild

FND500	red CC	150p
FND507	red CA	150p

Current news: Work continues apace on our HMOS PA kit, and by the time this is published - we expect to be about to launch the product in a style that matches the Mark III system. The unit uses separate transformers and power supplies, and includes a DC offset sensing circuit combined with slow switch-on using a relay. We introduce the HyperFi FM IF with this advert - and a separate leaflet is available on request with an SAE. All new pricelist revision also available with an SAE. The Mullard DC controlled tone volume and switch ICs with a 'more than HiFi' specification are in stock at last - together with reams of data (over 50 pages now). Also, RC enthusiasts will be interested to learn that we are supplying parts for various kits now.

Terms: CWO please. Account facilities for commercial customers OA. Postage 25p per order. Minimum credit invoice for account customers £10.00. Please follow instructions on VAT, which is usually shown as a separate amount. Overseas customers welcome - please allow for postage etc according to desired shipping method. Access facilities for credit purchases.

Catalogues: Ambit. Part 1 45p. Part 2 50p 90p pair. TOKO Euro shortform 20p. Micrometals toroid cores 40p. All inc PP etc. Full data service described in pricelist supplements.

Hours/phone: We are open from 9am -7pm for phone calls. Callers from 10am to 7pm. Administrative enquiries 9am to 4.30pm please (not Saturdays). Saturday service 10am to 6pm.

AMBIT catalogues are guaranteed to contain the most up-to-date and best informed comment on modern developments and advances in the field of radio and audio. There is no competetive publication that even approaches the broad range of parts/information on modern techniques.

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practical WIRELESS

SEPTEMBER 1979
VOLUME 55
NUMBER 9
ISSUE 871

BRITAINS LEADING JOURNAL FOR THE RADIO & ELECTRONIC CONSTRUCTOR

Published by IPC Magazines Ltd., Westover House, West Quay Rd., POOLE, Dorset BH15 1JG

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, at the above address, giving a clear description of the problem and enclosing a stamped self-addressed envelope. Only one project per letter please.

Components are usually available from advertisers. A source will be suggested for difficult items.

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Subscriptions are available to both home and overseas addresses at £10·60 per annum, from **"Practical Wireless" Subscription Department, Oakfield House, Perrymount Road, Haywards Heath, West Sussex RH16 3DH.**

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Limited stocks of some recent issues of *PW* are available at 75p each, including post and packing to addresses at home and overseas.

Binders are available (Price £3·75 to UK addresses and overseas, including post and packing) each accommodating one volume of *PW*. Please state year and volume number for which the binder is required.

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☐ NEWS & VIEWS

☐ FOR OUR CONSTRUCTORS

☐ GENERAL INTEREST

☆ SPECIAL PULL-OUT FEATURE

Holiday Radio & TV Guide

Our October issue will be published in early September
(for details see page 41)

We are grateful to Westover Motors Ltd., part of the Patrick Motors Group, for the loan of the car featured on our front cover this month

P.W. JUMBO CLOCK

Kits of parts by the designers of the clock.

Kit A.
Comprising of printed circuit board. **Price £9.52.** V.A.T. and postage included.

Kit B.
Comprising of printed circuit board, case, perspex panel, pillars, transformer and l.e.d.s. **Price £24.30.** V.A.T. and postage included.

Kit C.
Comprising of full kit, excluding mains cable and wire. **Price £31.00.** V.A.T. and postage included.

Two colours of cases are available:– Gloss White & Simulated Black Leather Grain.
Please state colour with order e.g. Kit C/Black.

Full range of R.S. components available (48 hours service)

If you are experiencing difficulty in obtaining certain components for projects please do not hesitate to telephone us.

I.C.'s LM3900 & MC3302

£1.20 per pair Postage and package 20 pence.

V mos transistors. VN66AF

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March 79.	Hythe Receiver	WR038	Price £2.98 & 20 pence p & p.
March 79.	Soudlite Converter	WK001	Price £6.33 & 20 pence p & p.
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	V.MOS Top Band Transmitter	WR056	Price £4.08 & 20 pence p & p.
	Sound Operated Switch	WK005/6	Price £3.74 & 20 pence p & p.
	Inexpensive A/F Voltmeter	WR055	Price £1.15 & 15 pence p & p.

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A1065	1.40	EF80	0.45
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EBF83	0.60	EL821	5.05
EBF89	0.60	EL822	5.05
EC52	0.45	EM31	0.85
ECC81	0.65	EM80	0.70
ECC82	0.60	EM81	0.70
ECC83	0.65	EM84	0.45
ECC84	0.50	EM87	1.15
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ECC86	1.40	EY81	0.55
ECC88	0.70	EY86/87	0.65
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ECH84	1.15	KT66	5.65
ECL80	0.70	KT88	6.45
ECL82	0.65	MH4	1.15
ECL83	1.40	ML6	1.15
ECL85	0.75	N78	10.15
ECL86	0.65	OA2	0.65
EF37A	1.70	OB2	0.70
EF39	3.30	PABC80	0.60
EF40	0.80	PC85	0.60
EF41	0.85	PC86	0.95

PC88	0.85	U25	1.15
PC900	1.40	U26	0.95
PCC84	0.75	U27	1.15
PCC89	0.65	U191	0.85
PCC189	0.75	U281	0.60
PCF80	0.90	U301	0.60
PCF82	0.45	U600	5.10
PCF84	0.75	U801	0.90
PCF86	0.75	UABC80	0.70
PCF200	1.05	UAF42	0.85
PCF201	1.05	UBF80	0.65
PCF801	0.70	UBF89	0.60
PCF802	0.75	UBL1	1.15
PCF805	2.05	UBL21	0.85
PCF806	0.95	UCC84	0.70
PCF808	2.05	UCC85	0.75
PCH200	0.90	UCF80	0.90
PCL81	0.70	UCH81	0.70
PCL82	0.75	UCL82	0.85
PCL84	0.80	UF41	0.90
PCL86	0.80	UF80	0.55
PCL805/85		UF85	0.60
	0.85	UL41	0.85
PD500	3.65	UL84	0.85
PFL200	2.80	UM80	0.70
PL36	0.90	UM84	0.70
PL81	0.85	UY82	0.65
PL82	0.60	UY85	0.60
PL83	0.60	VR105/30	2.05
PL84	0.75	VR150/30	1.40
PL504	1.60	Z66	1.05
PL508	1.50	X61M	1.70
PL509	3.65	Z800U	3.40
PL802	3.15	Z801U	3.90
PLL80	3.40	Z900T	2.50
PY33	0.70	1A3	0.70
PY80	0.70	1L4	0.50
PY81/800	0.65	1R5	0.65
PY82	0.55	1S4	0.45
PY83	0.60	1S5	0.45
PY88	0.75	1T4	0.45
PY500	1.50	1U4	0.80
PY809	6.45	1X2B	1.25
PY801	0.70	2D21	0.65
QQV03-10	2.80	2K25	12.40
QQV03-12	2.80	2X2	0.90
QQV06-40A		3A4	0.70
	15.75	3D6	0.50
QV03-12	2.80	3D21	22.50
SC1/400	4.50	3D29	6.20
SC1/600	4.50	3S4	0.60
SP61	0.95	5B/254M	8.45
TT21	11.80	5B/255M	8.45

V.A.T. INCLUDED

5B/258M	8.45	6K7	0.80	20D1	0.70
5R4GY	1.25	6K7G	0.45	20F2	0.70
5U4G	1.05	6K8GT	0.65	20L1	1.15
5V4G	0.75	6L6M	2.15	20P1	0.45
5Y3GT	0.75	6L6GT	1.05	20P3	0.60
5Z3	1.15	6L7G	0.75	20P4	1.25
5Z4G	0.80	6L18	0.70	20P5	1.15
5Z4GT	0.85	6LD20	0.70	25L6GT	0.90
6AB7	0.70	6Q7G	0.90	25Z4G	0.70
6AC7	0.70	6SA7	0.65	30C15	1.15
6AH6	1.15	6SG7	0.85	30C17	1.25
6AK5	0.65	6SJ7	0.80	30C18	
6AK8	0.60	6SJ7GT	0.60	see PCF805	
6AL5	0.45	6SK7	0.70	30F5	1.15
6AL5W	0.80	6SL7GT	0.85	30F12	1.35
6AM5	1.80	6SN7GT	0.85	30FL12	1.35
6AM6	0.75	6SQ7	0.85	30FL14	2.05
6AN8	0.95	6V6GT	0.90	30L15	1.15
6AQ5	0.95	6X4	0.70	30L17	1.15
6AQ5W	1.45	6X5GT	0.65	30P12	1.15
6AS6	0.90	6Y6G	1.10	30PL1	1.15
6AT6	0.85	6Z4	0.75	30PL13	1.25
6AU6	0.65	6-30L2	1.95	30PL14	1.25
6AV6	0.60	7B7	0.90	35L6GT	1.15
6AX4GT	0.90	7V4	0.90	35W4	0.80
6AX5GT	1.16	9D2	0.70	35Z4GT	0.80
6B7	0.85	9D6	0.85	50C5	1.35
6BA6	0.45	10C2	0.70	50CD6G	1.15
6BE6	0.60	10F18	0.70	75	1.15
6BG6G	1.15	10P13	0.70	75C1	0.90
6BJ6	1.25	11E2	12.40	76	0.90
6BQ7A	0.70	12A6	0.70	78	0.85
6BR7	2.60	12AT6	0.55	80	0.85
6BW6	3.10	12AT7	0.65	85A2	2.70
6BW7	1.15	12AU7	0.60	723A/B	12.40
6C4	0.70	12AV6	0.80	803	6.75
6C6	0.70	12AX7	0.60	805	20.25
6CH6	5.05	12BA6	0.60	807	1.15
6CL6	1.70	12BE6	0.70	813	11.85
6CY5	1.00	12BM7	0.70	829B	7.35
6D6	0.85	12C8	0.65	832A	5.10
6EA8	0.90	12E1	4.80	866A	3.15
6F6GB	0.85	12J5GT	0.45	931A	6.75
6F8G	0.75	12K7GT	0.70	954	0.60
6F12	0.90	12K8GT	0.80	955	0.65
6F14	0.70	12Q7GT	0.60	956	0.60
6F15	1.15	12SC7	0.65	957	1.00
6F17	0.70	12SH7	0.80	1625	1.15
6F24	4.75	12SJ7	0.65	1629	0.80
6F33	4.75	12SQ7	0.65	2051	1.15
6H6	1.95	12Y4	0.45	5763	2.25
6J4WA	2.00	12D6	0.70	5842	7.30
6J4	1.35	14S7	1.15	5933	3.45
6J5GT	0.85	19AQ5	0.85	6057	0.95
6J6	0.60	19G3	11.25	6060	0.95
6J7	0.85	19G6	6.75	6064	0.95
6J7G	0.60	19H5	19.15	6065	1.35

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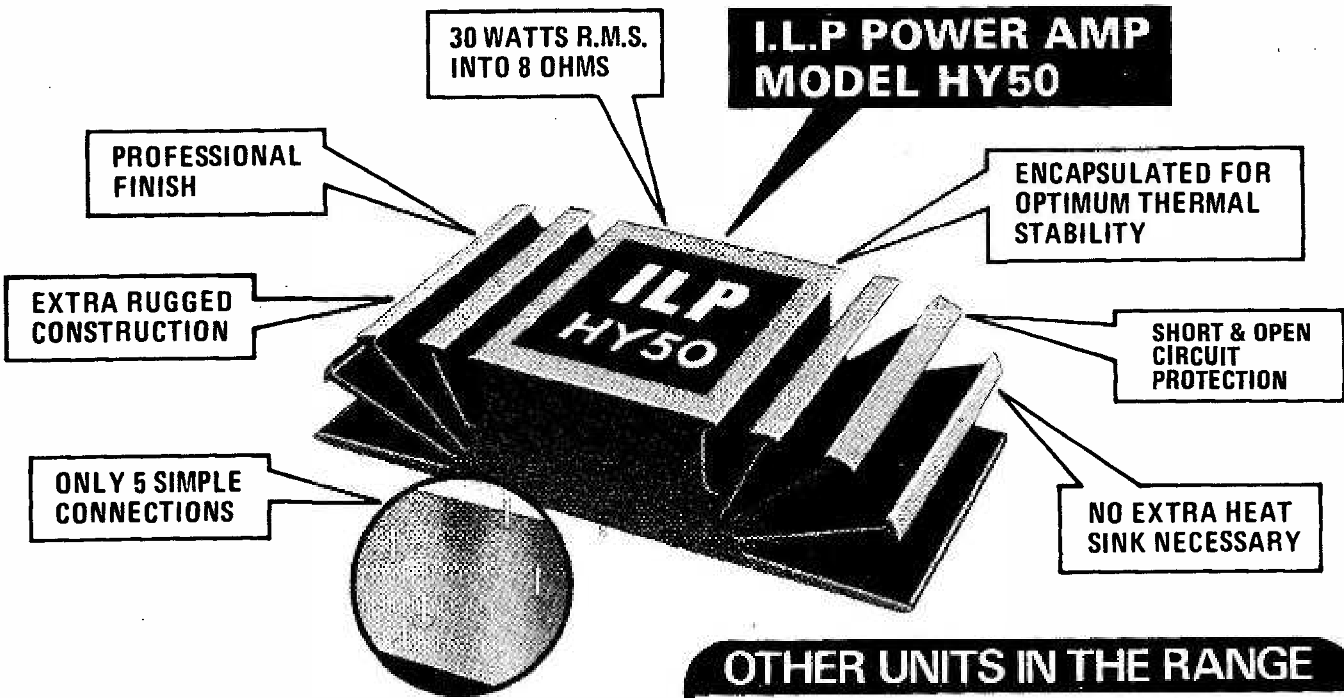

Of all the purpose-built power amplifier modules by I.L.P., the HY50 is understandably the most popular with those wanting to build or up-grade a hi-fi system, run a small high quality P.A. system, amplify a musical instrument (say for practise or small range use) or use it for lab work. Its useful 30 watts RMS output into 8 ohms, its rugged construction and freedom from heatsink worries make HY50 the ideal all-purpose quality power amp – and it is unconditionally guaranteed for five years. Tens of thousands are in use throughout the world.

... and a spec that means just what it says!

Encapsulated power amp with integral full-rated heatsink.
Input –500mV
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Load Impedance – 4 to 16Ω
Distortion – 0.04% from 100mW to 25 watts at 1KHz/8Ω
Supply Voltage – ±25V. Size 105 x 50 x 25mm
Inc. V.A.T. and postage in U.K. **£8.33**

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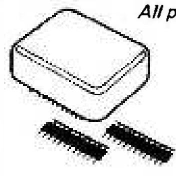
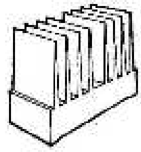


HY5 PRE-AMPLIFIER

Compatible with all I.L.P. power amps. and P.S.U.'s. In a single pack, needs external pots and switches. Multi-function equalization. 5 inputs. High overload margin. Active tone controls. 500 mV out. Distortion at 1 KHz – 0.01%.

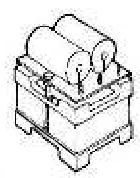
Two connect easily for stereo. **£5.34**



THE POWER AMPS

With heatsinks, full load line and thermal protection. Distortion typically 0.05% at 1 KHz.

HY120	60 Watts RMS/8Ω	114 x 50 x 85mm	£17.48
HY200	120 Watts RMS/8Ω	114 x 50 x 85mm	£21.21
HY400	240 Watts RMS/4Ω	114 x 100 x 85mm	£31.83



THE POWER SUPPLY UNITS

(Split line outputs to suit I.L.P. power amps and HY5)

PSU50	for 1 or 2 x HY50	£9.32
PSU70	for 1 or 2 x HY120	£15.65
PSU90	for one HY200	£15.65
PSU180	for one HY400 or 2 x HY200	£26.47

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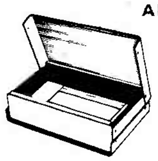
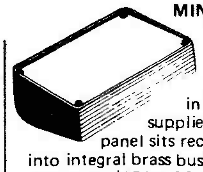


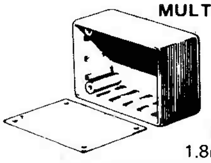
ALL METAL BIMCASES

Red, Grey or Orange 14swg Aluminium removable top and bottom covers. 18 swg black mild steel chassis with fixing support brackets.
BIM 3000
(250x167.5x68.5mm)
£15.52



MINI DESK BIMCONSOLES

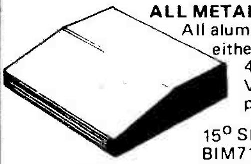
Orange, Blue, Black or Grey ABS body incorporates 1.8mm pcb guides, stand-off bosses in base with 4 BIMFEET supplied. 1mm Grey Aluminium panel sits recessed with fixing screws into integral brass bushes.
BIM 1005 (161 x 96 x 58mm) £2.48
BIM 1006 (215 x 130 x 75mm) £3.48



MULTI PURPOSE BIMBOXES

Orange, Blue, Black or Grey ABS with 1mm Grey Aluminium recessed front cover held by screws into integral brass bushes. 1.8mm pcb guides incorporated and 4 BIMFEET supplied.

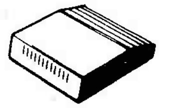
BIM 4003 (85x56x28.5mm) £1.34
BIM 4004 (111x71x41.5mm) £1.84
BIM 4005 (161x96x52.5mm) £2.48



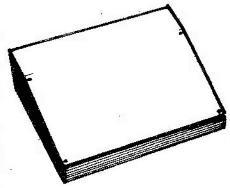
ALL METAL BIMCONSOLES

All aluminium, 2 piece desk consoles with either 15° or 30° sloping fronts, sit on 4 self-adhesive non-slip rubber feet. Ventilation slots in base and rear panel for excellent cooling. See latest catalogue for new styles and sizes

Colour Code	Top Panel	Base
A	Off White	Blue
B	Sand	Green
C	Satin Black	Gold



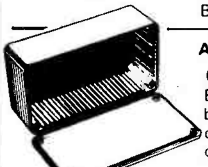
15° Sloping Panel	30° Sloping Panel	
BIM7151 (102x140x51[28]mm)	BIM7301 (102x140x76[28]mm)	£11.36
BIM7152 (165x140x51[28]mm)	BIM7302 (165x140x76[28]mm)	£12.28
BIM7153 (165x216x51[28]mm)	BIM7303 (165x183x102[28]mm)	£13.43
BIM7154 (165x211x76[33]mm)	BIM7304 (254x140x76[28]mm)	£14.83
BIM7155 (254x211x76[33]mm)	BIM7305 (254x183x102[28]mm)	£16.36
BIM7156 (254x287x76[33]mm)	BIM7306 (254x259x102[28]mm)	£17.71
BIM7157 (356x211x76[33]mm)	BIM7307 (356x183x102[28]mm)	£18.83
BIM7158 (356x287x76[33]mm)	BIM7308 (356x259x102[28]mm)	£19.92



LOW PROFILE BIMCONSOLES

Orange, Blue, Black or Grey ABS body has ventilation slots as well as 1.8mm pcb guides and stand-off bosses in base. Double angle recessed front panel with 4 fixing screws into integral brass bushes. 4 BIMFEET supplied.

BIM 6005 (143 x 105 x 55.5 [31.5]mm) £2.76
BIM 6006 (143 x 170 x 55.5 [31.5]mm) £3.58
BIM 6007 (214 x 170 x 82.0 [31.5]mm) £4.83

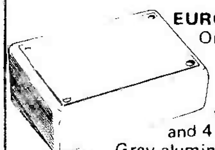


ABS & DIECAST BIMBOXES

6 sizes in ABS or Diecast Aluminium. ABS moulded in Orange, Blue, Black or Grey. Diecast Aluminium in Grey Hammertone or Natural. All boxes incorporate 1.8mm pcb guides, stand-off supports in base and have close fitting flanged lids held by screws into integral brass bushes (ABS) or tapped holes (Diecast).

	ABS		Diecast	Hammertone	Natural
(50x50x25mm)	N/A		BIM5001/11	£1.54	£1.23
(100x50x25mm)	BIM2002/12	£1.09	BIM5002/12	£1.66	£1.32
(112x62x31mm)	BIM2003/13	£1.27	BIM5003/13	£2.24	£1.70
(120x65x40mm)	BIM2004/14	£1.51	BIM5004/14	£2.81	£2.11
(150x80x50mm)	BIM2005/15	£1.72	BIM5005/15	£3.19	£2.72
(190x110x60mm)	BIM2006/16	£2.69	BIM5006/16	£4.94	£3.96

Also available in Grey Polystyrene with no slots and self-tapping screws
BIM 2007/17 (112x61x31mm) £1.06



EUROCARD BIMCONSOLES

Orange, Blue, Black or Grey ABS body accepts full or ½ size Eurocards, with bosses in the base for direct fixing. 1.8mm wide pcb guides incorporated and 4 BIMFEET supplied. 1mm Grey aluminium lid sits flush with body top and held by 4 screws into integral brass bushes.

BIM 8005 (169x127x70[45]mm) £4.71
BIM 8007 (243x187x103[66] mm) £6.70

BIMTOOLS + BIMACCESSORIES

MAINS BIMDRILLS

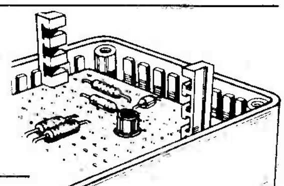
Small, powerful 240V hand drill complete with 2 metres of cable and 2 pin DIN plug. Accepts all tools with 1mm, 2mm or .125" dia. shanks Drills brass, steel, aluminium and pcb's. Under 250g, off load speed 7500 rpm. Orange ABS. high impact, fully insulated body with integral on/off switch £11.21

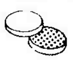
Mains Accessory Kit 1 includes 1mm, 2mm, .125" twist drills, 5 burrs and 2.4mm collet £2.64

Mains Kit 2 includes Mains BIMDRILL as above, 20 assorted drills, mops, burrs, grinding wheels and mounted points, 1mm, 2mm, 2.4mm and .125" collets. Complete in transparent case measuring 230x130x58mm £23.57

BIMDAPTORS

Allows pcb's to be flat mounted sandwich fashion in BIMBOXES, BIMCONSOLES, and all other enclosures having 1.5mm wide vertical guide slots. One plastic BIMDAPTOR on each corner of pcb(s) enables assembly to be simply slid into place. 54mm long, 10 slots on 5mm spacing and can be simply snipped off to length. £1.15 per pack of 25.





BIMFEET

11mm dia. 3mm high, grey rubber self-adhesive enclosure feet.
£0.81 per pack of 24.

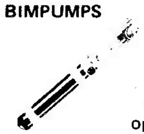
12 VOLT BIMDRILLS

2 small, powerful drills easily hand held or used with lathe/stand adaptor. Integral on/off switch and 1 metre cable.

Mini BIMDRILL with 3 collets up to 2.4mm dia. £ 8.62
Major BIMDRILL with 4 collets up to 3mm dia. £14.49

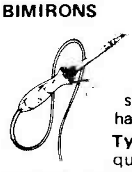
Accessory Kits 1 have appropriate drills and collets as above plus 20 assorted tools. Mini Kit 1 – £16.10, Major Kit 1 – £20.70. Accessory Kits 2 have appropriate drills, collets plus 40 tools and mains-12V dc adaptor. Mini Kit 2 – £36.22, Major Kit 2 – £41.97. Accessory Kits 3 as appropriate Kits 2 plus stand/lathe unit. Mini Kit 3 – £48.30, Major Kit 3 – £54.05.

BIMPUMPS



2 all metal desoldering tools provide high suction power and have easily replaceable screw in Teflon tips. Primed and released by thumb operation with in-built safety guard and anti-recoil system.
BIMPUMP Major (180mm long) £8.51
BIMPUMP Minor (150mm long) £7.24

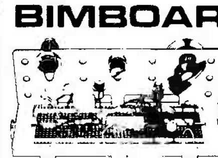
BIMIRONS



Type 30 General Purpose 27 watt iron with long life, rapid change element, screw on tip, stainless steel shaft and clip on hook. Styled handle with neon. £4.37

Type M3 Precision 17 watt iron, quick change tip. long life element, styled handle with clip on hook. £4.71

BIMBOARDS



DIL COMPATIBLE BIMBOARDS

Accept all sizes (4-50 pin) of DIL IC packages as well as resistors, diodes, capacitors and LEDs. Integral Bus Strips up each side for power lines and Component Support Bracket for holding lamps, switches and fuses etc. Available as single or multiple units, the latter mounted on 1.5mm thick black aluminium back plate which stand on non slip rubber feet and have 4 screw terminals for incoming power.

BIMBOARD 1 has 550 sockets, multiple units utilising 2, 3 and 4 BIMBOARDS incorporate 1100, 1650 and 2200 sockets, all on 2.5mm (0.1") matrix.

BIMBOARD 1 £ 9.40
BIMBOARD 2 £22.37
BIMBOARD 3 £31.83
BIMBOARD 4 £41.53

DESIGNER PROTOTYPING SYSTEM

1, 2, or 3 BIMBOARDS mounted on BIM 6007 BIMCONSOLE with Integral Power Supply (±5 to ±15Vdc @ 100mA and fixed +5Vdc @ 1A) All O/P's fully isolated. Short circuit and fast fold back protection. Power rails brought out to cable clamps that accept stripped wire or 4mm plug.

DESIGNER 1 £58.65
DESIGNER 2 £64.97
DESIGNER 3 £71.30

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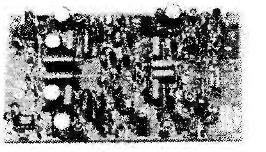
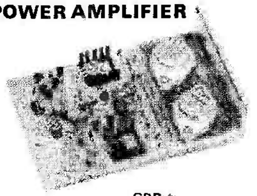


MC 1



CPR 1

CPR 1—THE ADVANCED PRE-AMPLIFIER

The best pre-amplifier in the U.K. The superiority of the CPR 1 is probably in the disc stage. The overload margin is a superb 40dB, this together with the high slewing rate ensures clean top, even with high outout cartridges tracking heavily modulated records. Common-mode distortion is eliminated by an unusual design. R.I.A.A. is accurate to 1dB; signal to noise ratio is 70dB relative to 3·5mV; distortion < ·005% at 30dB overload 20kHz.
Following this stage is the flat gain/balance stage to bring tape, tuner, etc. up to power amp. signal levels. Signal to noise ration 86db; slew-rate 3V/uS; T.H.D. 20Hz—20kHz < ·008% at any level. F.E.T. muting. No controls are fitted. There is no provision for tone controls. CPR 1 size is 138 × 80 × 20mm. Supply to be ±15 volts.

MC 1—PRE-PRE-AMPLIFIER

Suitable for nearly all moving-coil cartridges. Send for details.

X02 : X03 – ACTIVE CROSSOVERS

X02 – two way, X03 – three way. Slope 24dB/octave. Crossover points set to order within 10%.

REG 1—POWER SUPPLY

The regulator module, REG 1 provides 15-0-15v to power the CPR 1 and MC 1. It can be used with any of our power amp supplies or our small transformer TR 6. The power amp kit will accommodate it.

POWER AMPLIFIERS

It would be pointless to list in so small a space the number of recording studios, educational and government establishments, etc. who have been using CRIMSON amps satisfactorily for quite some time. We have a reputation for the highest quality at the lowest prices. The power amp is available in five types, they all have the same specification: T.H.D. typically ·01% any power 1kHz 8 ohms; T.I.D. insignificant; slew rate limit 25V/uS; signal to noise ratio 110dB; frequency response 10Hz-35kHz, —3dB; stability unconditional; protection—drives any load safely; sensitivity 775mV (250mV or 100mV on request); size 120 × 80 × 25mm.

POWER SUPPLIES

We produce suitable power supplies which use our superb TOROIDAL transformers only 50mm high with a 120—240 primary and single bolt fixing (includes capacitors/bridge rectifier).

PRE-AMPLIFIER KIT

This includes all metalwork, pots, knobs etc. to make a complete pre-amp with the CPR 1 (S) module and the MC 1 (S) if required.

ACTIVE CROSSOVERS
X02.........**£15·16** X03.........**£23·58**

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CE 608 60W/8 ohms 35-0-35v **£19·52**
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Ref	Amps	Price	P & P
112	0·5	**2·64**	0·78
79	1·0	**3·57**	0·96
3	2·0	**5·77**	0·96
20	3·0	**6·20**	1·14
21	4·0	**7·99**	1·14
51	5·0	**9·87**	1·32
117	6·0	**11·17**	1·45
88	8·0	**14·95**	1·64
89	10·0	**17·25**	1·64
90	12·0	**19·17**	1·95
91	15·0	**21·96**	2·08
92	2·0	**29·45**	O.A.

50 VOLT RANGE

Pri 220/240V Sec 0-20-25-33-40-50V Voltages available 5, 7, 8, 10, 13, 15, 17, 20, 33, 40 or 20V-0-20V and 25V-0-25V.

Ref	Amps	Price	P & P
102	0·5	**3·41**	0·78
103	1·0	**4·57**	0·96
104	2·0	**7·16**	1·14
105	3·0	**8·56**	1·32
106	4·0	**11·41**	1·50
107	6·0	**15·06**	1·64
118	8·0	**20·26**	2·08
119	10·0	**24·98**	O.A.
109	12·0	**28·90**	O.A.

MAINS ISOLATORS (SCREENED)

PM 120/240 Sec 120/240V CT

Ref	VA	Price	P & P
*07	20	**4·40**	0·79
149	60	**6·70**	0·96
150	100	**7·62**	1·14
151	200	**11·16**	1·14
152	250	**13·28**	1·50
153	350	**16·43**	1·84
154	500	**20·47**	2·15
155	750	**29·06**	O.A.
156	1000	**37·20**	O.A.
157	1500	**51·38**	O.A.
158	2000	**61·81**	O.A.
159	3000	**86·66**	O.A.

*Pri 0-220-240V Sec 115 or 240V. State sec. volts required.

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240V cable in 115V USA flat pin outlet

VA	Price	P & P	Ref
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75	**7·73**	1·14	64W
150	**10·01**	1·14	4W
200	**10·92**	1·45	65W
250	**11·59**	1·45	69W
500	**19·17**	1·64	67W
1K	**27·88**	2·30	84W
1·5K	**26·02**	O.A.	93W
2K	**49·97**	O.A.	95W

12 OR 24V OR 12-0-12V

Pri 220-240 volts

Ref	Amps 12V	Amps 24V	Price	P&P
111	0·5	0·25	**2·20**	0·45
213	1·0	0·5	**2·64**	0·78
71	2	1	**3·51**	0·78
18	4	2	**4·03**	0·96
85	0·5	2·5	**5·00**	0·96
70	6	3	**6·35**	0·96
108	8	4	**7·42**	1·14
72	10	5	**8·12**	1·14
116	12	6	**8·99**	1·32
17	16	8	**10·72**	1·32
115	20	10	**13·98**	2·08
187	30	15	**17·93**	2·08
226	60	30	**36·74**	U.C.

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Ref		P+ P
30-Isolator 240V:240V 200VA	**£4·54**	£1·04
62-Isolator 240V:240V 250VA	**£5·62**	£1·04
63-Isolator 240V:240V 500VA	**£11·50**	£2·15
6-250-0-250 @ 100ma 1) Sec 6·3V @ 3·5A 2) Sec 0-5V, 6·3V @ 2/1 amp	**£3·20**	78p
7-350-0-350V @ 100ma 1) Sec 6·3V @ 3·5A 2) Sec 0-5V, 6·3V @ 2/1 amp	**£4·10**	96p
218-250-0-250V @ 150ma 1) Sec 6·3V @ 4A 2) 0-5V, 6·3V @ 2/1 amp	**£3·50**	78p
27-250-0-250 @ 60ma 1) Sec 6·3V @ 2·5A 2) Sec 6·3V @ 1 amp	**£3·00**	78p
220-410-0-410V @ 180ma 1) Sec 6·3V @ 4 amp CT 2) Sec 6·3V @ 2A 5V @ 2 amp	**£5·30**	96p
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M1126 – 0-120 x 2; 9-0-9 1A	**£2·40**	71p
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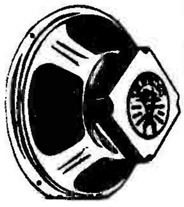

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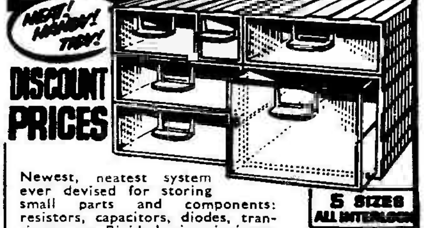

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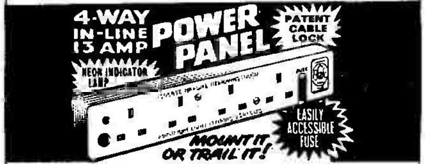

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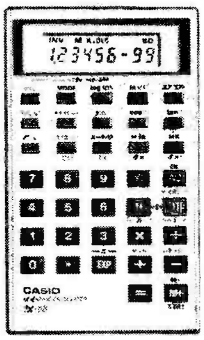

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AC126	£0.21	BC148	£0.08	BC549	£0.12	BU105	£1.84	ZTX108	£0.11
AC127	£0.21	BC149	£0.08	BC550	£0.16	8U105/02	£2.24	ZTX109	£0.11
AC128	£0.18	BC157	£0.12	BC556	£0.16	BU204	£1.61	ZTX300	£0.13
AC128K	£0.30	BC158	£0.12	BC557	£0.15	BU205	£1.61	ZTX500	£0.14
AC132	£0.23	BC159	£0.12	BC558	£0.14	BU208/02	£2.58	2N1613	£0.23
AC134	£0.23	BC167	£0.14	BC559	£0.16	MJE2955	£1.04	2N1711	£0.23
AC137	£0.23	BC168	£0.14	BD115	£0.58	MJE3055	£0.69	2N1889	£0.51
AC141	£0.25	BC169	£0.10	BD116	£0.92	MJE3440	£0.60	2N1890	£0.51
AC141K	£0.35	BC169C	£0.12	BD121	£0.75	MPF102	£0.32	2N1893	£0.35
AC142	£0.23	BC170	£0.10	BD124	£0.81	MPF104	£0.40	2N2147	£0.86
AC176	£0.21	BC171	£0.10	BD131	£0.40	MPF105	£0.40	2N2148	£0.81
AC176K	£0.30	BC172	£0.10	BD132	£0.40	MPSA05	£0.23	2N2160	£1.15
AC178	£0.29	BC173	£0.10	BD133	£0.46	MPSA06	£0.23	2N2192	£0.44
AC179	£0.29	BC177	£0.18	BD135	£0.44	MPSA55	£0.23	2N2193	£0.44
AC180	£0.23	BC178	£0.18	BD136	£0.40	MPSA56	£0.23	2N2194	£0.44
AC180K	£0.32	BC179	£0.18	BD137	£0.40	OC22	£1.73	2N2217	£0.25
AC181	£0.23	BC180	£0.29	BD138	£0.41	OC23	£1.73	2N2218	£0.25
AC181K	£0.32	BC181	£0.10	BD139	£0.41	OC24	£1.55	2N2218A	£0.23
AC187	£0.21	BC182L	£0.10	BD140	£0.41	OC25	£1.15	2N2219	£0.23
AC187K	£0.32	BC183	£0.10	BD155	£0.92	OC26	£1.15	2N2219A	£0.25
AC188	£0.21	BC183L	£0.10	8D175	£0.69	OC28	£0.92	2N2904	£0.23
AC188K	£0.32	BC184	£0.10	BD176	£0.69	OC29	£1.09	2N2904A	£0.24
AD140	£0.69	BC207	£0.13	BD177	£0.78	OC35	£1.03	2N2905	£0.20
AD142	£0.98	BC208	£0.13	BD178	£0.78	OC36	£1.03	2N2905A	£0.23
AD143	£0.86	BC209	£0.14	8D179	£0.86	OC70	£0.27	2N2906	£0.18
AD149	£0.69	BC212	£0.10	BD203	£0.92	OC71	£0.17	2N2906A	£0.21
AD161	£0.40	BC212L	£0.10	BD204	£0.92	TIC44	£0.33	2N2907	£0.23
AD162	£0.40	BC213	£0.10	BDY20	£0.92	TIC45	£0.40	2N2907A	£0.25
AD161/162MP	£0.81	BC213L	£0.10	BF457	£0.43	TIP29A	£0.46	2N2926G	£0.10
AF124	£0.35	BC214	£0.10	BF458	£0.43	TIP29B	£0.48	2N2926Y	£0.09
AF125	£0.35	BC214L	£0.10	8F459	£0.44	TIP29C	£0.51	2N29260	£0.09
AF126	£0.35	BC227	£0.18	BF594	£0.35	TIP30A	£0.46	2N2926R	£0.09
AF127	£0.37	BC238	£0.18	BF596	£0.32	TIP30B	£0.48	2N2926B	£0.09
AF139	£0.40	BC251	£0.17	BFR39	£0.28	TIP30C	£0.50	2N3053	£0.18
AF186	£0.58	BC251A	£0.18	BFR40	£0.29	TIP31A	£0.46	2N3054	£0.46
AF239	£0.47	BC301	£0.32	BFR79	£0.32	TIP31B	£0.48	2N3055	£0.46
AL102	£1.38	BC302	£0.33	BFR80	£0.32	TIP31C	£0.50	2N3614	£1.15
AL103	£1.36	BC303	£0.32	BFX29	£0.25	TIP32A	£0.46	2N3615	£1.21
AU104	£1.61	BC304	£0.44	BFX30	£0.35	TIP32B	£0.48	2N3616	£1.21
AU110	£1.61	BC327	£0.18	BFX84	£0.25	TIP32C	£0.50	2N3646	£0.10
AU113	£1.61	BC328	£0.17	BFX85	£0.28	TIP41A	£0.50	2N3702	£0.09
BC107A	£0.09	BC337	£0.17	BFX86	£0.29	TIP41B	£0.52	2N3703	£0.09
BC107B	£0.10	BC338	£0.17	BFX87	£0.25	TIP41C	£0.55	2N3704	£0.08
BC107C	£0.12	BC440	£0.35	BFX88	£0.25	TIP42A	£0.50	2N3705	£0.08
BC108A	£0.09	BC441	£0.35	BFY50	£0.18	TIP42B	£0.52	2N3706	£0.09
BC108B	£0.11	BC460	£0.44	BFY51	£0.18	TIP42C	£0.55	2N3707	£0.09
BC108C	£0.12	BC461	£0.44	BFY52	£0.18	TIP2955	£0.69	2N3708	£0.08
BC109A	£0.09	BC477	£0.23	BIP19	£0.44	TIS43	£0.25	2N3709	£0.08
BC109B	£0.10	BC478	£0.23	BIP20	£0.44	TIS90	£0.20	2N3710	£0.08
BC109C	£0.12	BC479	£0.23	BIP19/20MP	£0.92	UT46	£0.23	2N3711	£0.08
BC147	£0.08	BC547	£0.12	BRY39	£0.51	ZTX107	£0.11	2N3819	£0.21
		BC548	£0.12					2N3820	£0.40

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7401	£0.12	7428	£0.29	7473	£0.28	74107	£0.27	74164	£0.78
7402	£0.12	7430	£0.12	7474	£0.28	74110	£0.41	74165	£0.78
7403	£0.12	7432	£0.25	7475	£0.33	74111	£0.66	74166	£0.89
7404	£0.12	7433	£0.34	7476	£0.28	74118	£0.92	74174	£0.74
7405	£0.12	7437	£0.25	7480	£0.50	74119	£1.35	74175	£0.71
7406	£0.25	7438	£0.24	7481	£0.97	74121	£0.27	74176	£0.66
7407	£0.25	7440	£0.13	7482	£0.78	74122	£0.44	74177	£0.66
7408	£0.14	7441	£0.57	7483	£0.66	74123	£0.46	74180	£1.72
7409	£0.14	7442	£0.46	7484	£1.01	74136	£0.59	74181	£0.66
7410	£0.12	7443	£0.80	7485	£0.78	74141	£0.63	74182	£0.80
7411	£0.19	7444	£0.80	7486	£0.25	74145	£0.63	74184	£0.80
7412	£0.17	7445	£0.74	7489	£1.95	74150	£0.78	74190	£0.78
7413	£0.27	7446	£0.69	7490	£0.36	74151	£0.55	74191	£0.71
7414	£0.57	7447	£0.55	7491	£0.73	74153	£0.55	74192	£0.69
7416	£0.26	7448	£0.64	7492	£0.40	74154	£0.94	74193	£0.66
7417	£0.26	7450	£0.12	7493	£0.34	74155	£0.57	74194	£0.71
7420	£0.12	7451	£0.12	7494	£0.86	74156	£0.57	74195	£0.69
7421	£0.23	7453	£0.12	7495	£0.57	74157	£0.57	74196	£1.20
7422	£0.18	7454	£0.12	7496	£0.57	74160	£0.66	74197	£1.20
7423	£0.24	7460	£0.12	74100	£0.97	74161	£0.71	74198	£2.12
7425	£0.21	7470	£0.28	74104	£0.44	74162	£0.71	74199	£2.12
7426	£0.26								

CMOS ICs

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
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CD4001	£0.17	CD4016	£0.48	CD4027	£0.57	CD4044	£0.94	CD4071	£0.19
CD4002	£0.18	CD4017	£0.86	CD4028	£0.78	CD4045	£1.61	CD4072	£0.19
CD4006	£1.05	CD4018	£0.97	CD4029	£0.97	CD4046	£1.49	CD4081	£0.19
CD4007	£0.19	CD4019	£0.48	CD4030	£0.55	CD4047	£1.00	CD4082	£0.20
CD4008	£1.05	CD4020	£1.03	CD4031	£2.30	CD4049	£0.48	CD4510	£1.13
CD4009	£0.51	CD4021	£0.94	CD4035	£1.15	CD4050	£0.48	CD4511	£1.09
CD4010	£0.55	CD4022	£0.94	CD4037	£1.09	CD4054	£1.26	CD4516	£1.15
CD4011	£0.17	CD4023	£0.17	CD4040	£1.01	CD4055	£1.15	CD4518	£1.15
CD4012	£0.18	CD4024	£0.74	CD4041	£0.87	CD4056	£1.55	CD4520	£1.15
CD4013	£0.48	CD4025	£0.17	CD4042	£0.82	CD4069	£0.19	CD4014	£0.92

LINEAR ICs

Type	Price	Type	Price	Type	Price	Type	Price	Type	Price
CA3011	£0.92	CA3130	£1.06	MC1350	£1.38	UA710C	£0.46	SN76115	£2.18
CA3014	£1.55	CA3140	£0.80	MC1352	£1.61	72710	£0.34	SN76660	£0.86
CA3018	£0.74	LM301	£0.33	MC1469	£3.39	UA711C	£0.36	SL414A	£2.24
CA3020	£1.95	LM304	£1.84	MC1496	£1.03	72711	£0.36	TAA550B	£0.40
CA3028	£0.92	LM308	£1.15	NE536	£3.05	UA723C	£0.52	TAA621A	£2.30
CA3035	£1.61	LM309	£1.72	NE550	£1.09	72723	£0.52	TAA621B	£2.87
CA3036	£1.15	LM320-5V	£1.72	NE555	£0.27	UA741C	£0.27	TAA661	£1.72
CA3042	£1.72	LM320-12V	£1.72	NE556	£0.69	72741	£0.27	TA0100	£1.49
CA3043	£2.12	LM320-15V	£1.72	NE565	£1.38	741P	£0.23	TBA540	£2.41
CA3046	£0.80	LM320-24V	£1.72	NE566	£1.38	UA7447C	£0.69	TBA810S	£0.86
CA3052	£1.84	LM380	£0.97	NE567	£1.95	72747	£0.69	TBA810	£1.12
CA3054	£1.26	LM381	£1.66	UA702C	£0.52	UA748	£0.40	TBA820	£0.80
CA3075	£1.72	LM3900	£0.66	72702	£0.52	72748	£0.40	TBA9200	£2.87
CA3081	£1.72	MC1303L	£0.97	UA703	£0.28	748P	£0.40	TCA270S	£2.30
CA3089	£2.30	MC1304	£2.18	UA709	£0.28	SN76013N	£2.01	TBA800	£0.92
CA3090	£4.14	MC1310	£1.09	72709	£0.52	SN76023	£2.01		
CA3123	£2.18	MC1312	£2.18	709P	£0.28	SN76110	£1.72		

THYRISTORS

1 amp — TO 5 Case

Volts No:	Price
50 THY1A/500	£0.29
100 THY1A/100	£0.32
200 THY1A/200	£0.36
400 THY1A/400	£0.43
600 THY1A/600	£0.51
800 THY1A/800	£0.66

3 amp — TO 66 Case

Volts No:	Price
50 THY3A/50	£0.32
100 THY3A/100	£0.34
200 THY3A/200	£0.37
400 THY3A/400	£0.48
600 THY3A/600	£0.57
800 THY3A/800	£0.74

5 amp — TO 66 Case

Volts No:	Price
50 THY5A/50	£0.41
100 THY5A/100	£0.51
200 THY5A/200	£0.57
400 THY5A/400	£0.65
600 THY5A/600	£0.79
800 THY5A/800	£0.93

7 amp — TO 48 Case

Volts No:	Price
50 THY7A/50	£0.55
100 THY7A/100	£0.58
200 THY7A/200	£0.65
400 THY7A/400	£0.71
600 THY7A/600	£0.89
800 THY7A/800	£1.05

10 amp — TO 48 Case

Volts No:	Price
50 THY10A/50	£0.58
100 THY10A/100	£0.65
200 THY10A/200	£0.71
400 THY10A/400	£0.80
600 THY10A/600	£1.13
800 THY10A/800	£1.40

16 amp — TO 48 Case

Volts No:	Price
50 THY16A/50	£0.62
100 THY16A/100	£0.66
200 THY16A/200	£0.71
400 THY16A/400	£0.88
600 THY16A/600	£1.03
800 THY16A/800	£1.59

SILICON RECTIFIERS

200mA	
IS920 50V	£0.07
IS921 100V	£0.08
IS922 150V	£0.09
IS923 200V	£0.10
IS924 300V	£0.11
1 Amp	
IN4001 50V	£0.05
IN4002 100V	£0.05
IN4003 200V	£0.07
IN4004 400V	£0.08
IN4005 600V	£0.09
IN4006 800V	£0.10
IN4007 1000V	£0.11
1.5 Amp	
IS015 50V	£0.10
IS020 100V	£0.11
IS021 200V	£0.12
IS023 400V	£0.14
IS025 600V	£0.16
IS027 800V	£0.18
IS029 1000V	£0.23
IS031 1200V	£0.28
3 Amp	
IN5400 50V	£0.16
IN5401 100V	£0.17
IN5402 200V	£0.18
IN5404 400V	£0.19
IN5406 600V	£0.24
IN5407 800V	£0.28
IN5408 1000V	£0.34
10 Amp	
IS10/50 50V	£0.21
IS10/100 100V	£0.24
IS10/200 200V	£0.26
IS10/400 400V	£0.40
IS10/600 600V	£0.48
IS10/800 800V	£0.58
IS10/1000 1000V	£0.69
IS10/1200 1200V	£0.79
30 Amp	
IS30/50 50V	£0.64
IS30/100 100V	£0.79
IS30/200 200V	£1.06
IS30/400 400V	£1.43
IS30/600 600V	£2.02
IS30/800 800V	£2.23
IS30/1000 1000V	£2.65
IS30/1200 1200V	£3.31
60 Amp	
IS70/50 50V	£0.86
IS70/100 100V	£0.96
IS70/200 200V	£1.38
IS70/400 400V	£2.01
IS70/600 600V	£2.58
IS70/800 800V	£2.87
IS70/1000 1000V	£3.45

OPTOELECTRONICS

LED'S (diffused)

O/no.	Type	Price
1501	Size ·125mm RED	£0.11
1502	Size ·125mm GREEN	£0.21
1503	Size ·125mm YELLOW	£0.21
1504	Size ·2mm RED	£0.11
1505	Size ·2mm GREEN	£0.21
1506	Size ·2mm YELLOW	£0.21
1509	Size ·2mm CLEAR	£0.12

SUPER 'Hi-Brite' Type

1521	Size ·3mm (·125) RED	£0.11
1522	Size ·5mm (·2) RED	£0.11
1514	ORP12 Light dependant resistor	£0.63
1520	OC Photo transistor	£0.40

LED CLIPS

1508/·125 pack of 5 ·125 clips	£0.17
1508/·2 pack of 5 ·2 clips	£0.20

DISPLAYS

DL303 7 segment D.P. left (·30" height) common RED anode single digit O/NO: 1523 **£0.80**

DL707 7 segment D.P. left (0·3" height) common RED anode single digit O/NO: 1510 **£0.92**

DL527 RED 7 segment D.P. left (0·50" height) common anode Two-digit reflector O/NO: 1524 **£1.95**

DL727 RED **7 segment D.P. right (·510" height)** common anode Two-digit light pipe O/NO: 1521 **£2.53**

DL747 RED **7 segment D.P. left (·630" height)** common anode Single-digit light pipe O/NO: 1511 **£1.72**

OPTO-ISOLATORS

Isolation Breakdown – Voltage 1500 – continuous fwd current 100mA.

CIL74 Single-channel 6 pin DIP standard type – optically coupled pair with infra-red LED emitter and NPN silicon photo transistor O/NO: 1497 **£0.57**

CILD74 Multi-channel 8 pin DIP two isolated channels O/NO: **£1.15**

CILQ74 Multi-channel 16 pin DIP four isolated channels O/NO: 1499 **£2.53**

2nd GRADE LED PAK
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PW PERSONALITY

The next PW Personality, Ron Ham, VHF Bands contributor, will appear in our October issue

Don't Shoot the Pianist...

COMPONENT availability in the electronics industry seems to go in cycles (no pun intended), and we are now entering what looks like being the worst period of shortage for many years.

The picture is not entirely consistent among all suppliers and stockists, but in general the worst affected component is Low Power Schottky TTL, for which manufacturers are currently quoting delivery times in excess of 52 weeks! Ordinary TTL is no problem, but CMOS is starting to go up in price, and some devices are almost unobtainable. Voltage regulator i.c.s, the 78 and 79 series, are becoming scarce, especially the negative versions, which always suffer from being offered by fewer manufacturers anyway. Some of the more popular linear i.c.s—555s, 741s and CA3140Es, for instance—are getting more expensive and difficult to obtain.

The problem is also extending to passive components, with resistors and capacitors getting scarce. There are reports of some "junk" capacitors, originating in Asia, which are wrongly colour-coded and also have a tendency to fall apart when the leads are formed for insertion into a printed circuit board.

Opinions vary somewhat as to the reason for the periodical "boom and bust" in the semiconductor industry, but the favourite explanation lays the blame fairly and squarely on the big equipment manufacturers. The theory goes that, at times like this, when supplies are short and delivery times long, the equipment manufacturers duplicate their orders with semiconductor manufacturers and distributors, so grossly over-ordering. When all these orders are added up, the semiconductor manufacturer—seeing a large increase in demand—promptly decides to expand to meet the demand. However, it takes about two years to produce fully skilled production staff, and by the time that's happened, the bubble has burst and demand has reverted to normal. The semiconductor manufacturer then lays off staff, who find other jobs, and the whole cycle is ready to start again.

In times of shortage, like now, broken delivery promises are rife. This is making life a misery for some of our advertisers in the mail order business. They get an order which includes items out of stock and give a delivery promise to the customer, based on the promise they have from their suppliers. When the supplier doesn't come across with the goods, he has just one irate customer—the mail order stockist. The mail order firm though, has lots of irate customers, many of whom, naturally enough, start slating him for breaking his promises, and probably write to the magazine complaining as well.

Well, we're not saying that there aren't occasions when mail order firms fall down on their obligations towards their customers, but a little understanding of the problems involved could go a long way towards improving relations. Contrary to opinions expressed in some of the letters we receive, our advertisers are **not** all money-grabbing sharks! But just think of the costs involved if they sent out an amended delivery promise to every customer with an order outstanding, each time one of their suppliers was late. The postal charges alone would be phenomenal.

So if you've got what seems to be a legitimate complaint, and can't get satisfaction from one of our advertisers, then by all means write to us, preferably to the Advertisement Manager. But do try to maintain a sense of proportion, and remember that advertisement copy has to be finalised nearly two months before the magazine appears on sale. Even the most efficient supplier can't offer a "by return" service on an out-of-stock item.

NEWS... NEWS... NEWS...

Teletext into the US

A major effort has been made by Mullard Ltd; collaborating with the BBC, IBA and other manufacturers involved, to illustrate the advantages of the British system of broadcast TV data transmission in the United States. Teletext has a proven three-year record of public trials, and this latest demonstration of the system came hard on the heels of similar efforts made in a number of European countries.

The demonstrations, which were mounted in Chicago on 4/5 June at the Spring consumer electronics conference sponsored by the Broadcast Cable Consumer Electronics Society and the Chicago section of the IEEE, comprised a number of Philips 26in Teletext receivers fed with signals from a professional VTR provided by Pye TVT Ltd. The IBA and BBC both despatched up-to-date information to Chicago especially for the occasion, and a phone link to a Prestel data base in London was used to demonstrate the compatibility of Viewdata (the telephone-based Post Office data transmission system) and Teletext.

The reason for all this effort? North American Philips Corporation and its subsidiaries are currently making recommendations for a data transmission configuration suitable for the NTSC colour TV broadcast system used in the States; they are using the UK's experience as a background. The British team consider that Teletext provides the answer and the initiative to "sell" the idea in the US comes at a time when interest in an information service using the spare TV lines during the vertical retrace interval has been growing there.

Teletext could provide the whole of the United States with a regularly updated information service, with hundreds of pages "selectable" on request and using the existing TV broadcast network. The commercial potential and implications are, of course, enormous.

Club Call

An invitation is extended to visitors from the Fulford (York) Amateur Radio Society, who meet at 7.30pm, every Tuesday at 31 George Street, York. Full details from: *Hon Sec G. W. Kelley G5KC, 10 Deepdale, York YO2 2SA.*

Microprocessor Courses

Courses at the Texas Instruments Supply Division training centre, which are supported by the Department of Industry's Microprocessor Application Project (MAP), are now in full swing and running at the average rate of 5 per month. The range of students attending the courses is widespread and so far in 1979 over 100 students have been trained at the centre, including a chemist, metallurgist and a managing director. Texas instruments hope to see more people from the management, production and mechanical engineering disciplines attending their "Introduction to Microprocessing" training module as this course has been designed with people who are *not* "into electronics" very much in mind.

A UK first for the centre will be the provision of training on MICROTIP, a Pascal Language super set for the 9900 family of microprocessors, commencing in September. There are many who are of the opinion that the introduction of the Pascal Language to microprocessing software development is as significant as the introduction of the microprocessor itself. MICROTIP is a complete development system which runs on the FS9900/4 single user and DS990/10 multi-user software development systems. It includes interactive editing and de-bugging facilities with a compiler specifically designed for the 9900 family of microprocessors. The compiler retains all the powerful data and program control structuring of Pascal and provides many additional features to aid complex real time programming.

For full information write to: *Microprocessor Training Centre, Texas Instruments Ltd., Supply Division, Manton Lane, Bedford MK 7PA. Tel: (0234) 674666.*

For the Amateur

Neosid, well known in Professional electronics has recently established a new outlet to cater for the amateur market. A selection of the parent company's range of ferrites, coil assemblies and trimming tools are listed in a catalogue available from: *Neosid Small Orders, PO Box 86, Welwyn Garden City, Herts.* Please send a foolscap s.a.e.

MI at Testmex

Marconi Instruments presented a major tour de force at the June Testmex Exhibition in the Wembley Conference Centre with a comprehensive display of counters, signal generators, a spectrum analyser and all manner of other radio and communications test equipment.

The highlight of the stand was undoubtedly the new range of universal counter timers and frequency meters. Our picture shows the new-look 10Hz–2GHz digital frequency meter, Model 2435. Controls are colour-coded for ease of operation.

Further information available from: *Marconi Instruments Ltd., Longacres, St Albans, Herts AL4 0JN. Tel: (0727) 59292.*

CB —an unbiased review

J. D. PEARSON G3KOC

Few people would dispute a government's right—duty even—to organise the allocation of space in the radio frequency spectrum, in a manner which permits maximum utilisation and minimum interference to all classes of users. Nor with its making international agreements with other governments to the same purpose.

Many however would dispute the right of a democratic government to refuse an allocation to a legitimate class of user. As far as the writer is aware, no democratic government has ever done so.

How then will would-be users acquire legitimacy—in other words, be enabled by law to stake a claim in the spectrum? Should they be required to make out a case in support of their claim—as other users periodically need to do if they wish to retain their existing allocations—or should the informal granting of radio communication facilities be an inherent right of the taxpayer?

It would certainly be unfair to expect other users to continue providing evidence of their need for retention or expansion of their existing exclusive allocations, if CB radio were absolved from this obligation. The CBers would no doubt soon regret not having provided evidence sufficient to obtain an exclusive allocation, when their channels were usurped by high-powered commercials who claimed a similar "freedom of the air".

The Demand for CB

If one accepts that CB radio needs to make its case, the question arises: Has it done so? Is there in fact an army of citizens clamouring for two-way radio? And if there is, what sort of arguments are they advancing?

Despite the ill-disguised "secondary" advertising in TV commercials, questions in the Commons, and a pretty good airing in the popular (and not so popular) radio and electronics periodicals, and even occasionally in the national and provincial daily press, the majority of the British public have never heard of CB radio. All attempts to arouse some enthusiasm for the subject appear to have had little effect.

Anyone can try the writer's experiment for himself. Select a hundred people at random, the only qualification being that they must not be engaged in radio or electronics in a professional or amateur capacity, and mention CB radio. In the writer's case, ninety-one had never heard of it, and the remaining nine said something like—"Oh! radio hams you mean? Tony Hancock and all that stuff. Yes, my neighbour plays with it. Friends all over the world—none in this country—but friends all over . . ." etc. Or, "Ah, yes! Saw Brian Rix on the telly the other night. Interesting hobby, what!"

For various reasons most radio amateurs would prefer not to be confused with existing or would-be CB operators, although a very small minority of radio amateurs are actively pushing CB, for reasons best known to themselves. And in fact the pressure for CB would appear to be emanating almost entirely from within the radio-electronics industry itself, and only to a much lesser degree from would-be users.

There is no doubt that a potential market of say twenty million sets—"every home should have one!" the American TV commercials advise—is a legitimate aspiration of the people who will make, market (and hopefully maintain) these equipments. And the trade and hobby press are not oblivious of the potential advertising of course. It is debatable however whether this in isolation is sufficient grounds for creating a CB licence.

Controlling CB

A claim worthy of more serious consideration perhaps is that commercial and business users do not need to pass any form of test. The equipment used however, is subject to stringent government specifications regarding design and maintenance embodied in Type Approval certification. Could this not be applied to CB equipment? And if so, would there be any practicably enforceable limitation on the use of non-approved or even home-made equipment?

Radio amateurs of course are allowed to use this type of gear. But they have demonstrated competency to do so by City & Guilds examination—a requirement which the CBers absolutely refuse to consider—and since there are only some 24 000 amateurs in the UK, their activities are—marginally—within the existing government monitoring and supervisory capability. It would be irresponsible perhaps of any government to grant facilities to twenty million potential users without the commensurate regulatory machinery, a problem which the American government has abandoned as economically insoluble. Even the collection of a CB licence fee, which until recently was four dollars, has been discontinued.

Despite the lessons obvious in the American experience—the range limitation of 150 miles, for instance, in the 27MHz band where, for six years or so out of every eleven, inter-continental distances are easily possible during the winter months—many European governments have eventually succumbed to commercial pressures and granted CB facilities—on 27MHz!

An allocation in the u.h.f. part of the spectrum would have ensured compliance with any range limitation whilst at the same time satisfying the CBers demand for short-range communications. There is however no provision in internationally agreed allocations for u.h.f. CB radio. Presumably the pressures applied to those governments who have relented were so great as to render postponement until WARC79, this year's international frequency allocation conference, inconceivable. And additionally of course, due to over-production in the Far East, there is a world glut of 27MHz CB gear.

In both Europe and America, in the absence of a massive supervisory machinery, the CBers themselves have not demonstrated any inclination to adhere even approximately to the terms of their licences. The American Federal Communications Commission, for instance, has recently had to ban the manufacture or importation of 28MHz amateur power amplifiers because CBers were modifying kilowatt linears in order to flout their 5 watt power limitation on 27MHz!

Opponents of CB like to quote lurid accounts of instances where CB has been used in the futherance of crime, and even worse. These would seem to be far outweighed however by cases where it has been of assistance at road accidents, natural disasters and other emergency situations.

A number of radio amateurs have objected purely on the grounds that if CBers want a licence they should have to earn it, as they themselves have to do by taking the Radio Amateurs' Examination. The CBers' reply is that since they are not asking for the wide-ranging facilities granted to the amateur there should be no examination requirement. Both viewpoints merit careful analysis.

Interference

Whilst a small percentage of the amateur objection is certainly purely a question of sour grapes, many amateurs are genuinely afraid that they would be blamed, by both neighbours and the authorities, for a massive interference problem which may arise, and be ordered to close down until such time as a grossly understaffed Post Office interference department might get around to eliminating their equipment as the source.

The CBers, if they consider the question at all, appear to have a naïve conviction that, providing their gear is factory-built and crystal controlled, it is fool-proof. Harmonic radiation and out-of-band spurii are peculiar technical problems which happen only to those people who take out an amateur licence. Confrontation with these terms has decided many a would-be amateur to join the CB campaign!

Some thirty per cent of the marks awarded in the RAE are on the subject of interference, and a failure in this part of the examination entails failure in the whole. This is indicative of the cruciality of this aspect alone, so far as the licensing authority is concerned, when considering the wider implications of a CB licence. Certainly, one needs little technical knowledge of radio theory in order to push a button and speak into a microphone—as the CBers are fond of asking: "How many taxi-drivers are radio technicians?"—but an appreciation of the effectiveness of even a few milliwatts of power into an efficient aerial in wiping out TV screens over a wide area, is perhaps not an unreasonable requirement. Unfortunately, so far as the CBers are concerned, this requires some theoretical capability.

The professional communications companies take care of this problem for the commercial users. Who will do it for the CBers, if they refuse to prove by examination that they can do it for themselves?

If, by government decree—or lack of it, as in many other countries—a CB equipment were to be sold by anyone who cared to do so, it is doubtful for instance if the kitchen-table mail order dealers would have either the inclination or ability to offer the pre-sales type approval and in-service maintenance applicable to the licensing of commercial gear. The onus would therefore be on the users to assume this responsibility, and it would not be unreasonable for a government, with fifty million TV viewers to consider, to expect some proof of capability.

Never-the-less, many would-be CBers can see no reason why (if other governments have opted for the chaotic American situation, together with unrestricted importation of Far Eastern 27MHz gear) the UK cannot do likewise. One cannot deny a government the right, however, if it chooses not to become embroiled on these terms.

Financial Implications

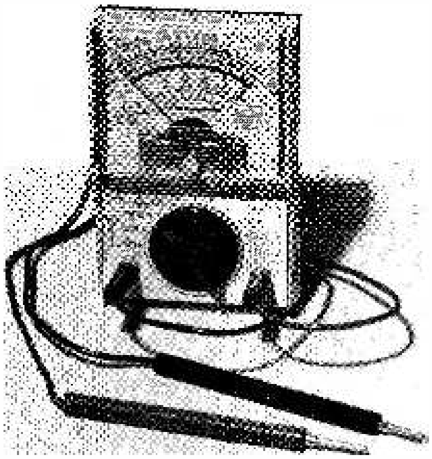
In the preface to an American publication called *All About CB Two-way Radio,* published by the Tandy Corporation in 1976, there is a sentence which is worth quoting here: "Surprisingly, it took most retailers and the financial press about 15 years to recognise CB for what it really is—a telephone system for whose use you don't have to pay Ma Bell a nickel a call to use." With a free-enterprise telephone system of course, the American government never had to consider the loss of telephone revenue when it instituted the CB licence in 1947. In the UK the loss would eventually become substantial. Are the CBers prepared to pay a licence fee equivalent to their phone bills?

It is also perhaps worth noting here that the American CB licence permits usage for business purposes. Even if any future UK CB licence were to expressly exclude such usage, would this exclusion be practicably enforceable without the massive expansion of regulatory machinery already mentioned as a prerequisite? It may well turn out to have been short-sighted policy on the part of the odd one or two of the larger British manufacturers who have lent their name, even if indirectly, to the CB movement. Those who are backing it directly would seem to be making an unwarranted assumption regarding just who will secure the lion's share of the market.

Before attempting to draw some conclusions from the foregoing, perhaps the writer should state his credentials. Engaged in radio professionally as an area field engineer with the largest telecommunications organisation in the UK, the introduction of a CB licence would ensure, one way or the other, that his grandson, let alone himself, need never fear the prospect of redundancy. As a professional therefore, he is biased slightly in favour of CB. And having held an amateur radio licence since 1955, would admit, as an amateur radio operator, to being slightly

▶▶▶continued on page 40

PRODUCTION LINES alan martin



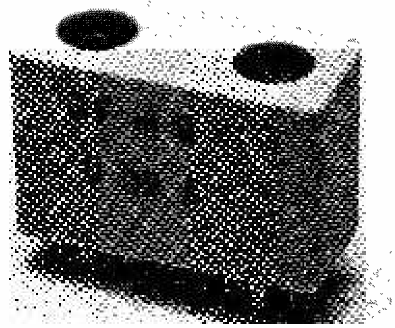
IF filters

TOKO has recently introduced a series of miniature mechanical i.f. filters for frequencies in the range 450 to 480kHz.

The basic mechanical element is available either individually—the CFM2 series—or with integral input, and input/output matching i.f. transformers—known as CFMA and CFMQ types respectively.

The main advantages of these filters over conventional ceramic and crystal filters is the low cost and size required to achieve equivalent shape factor responses. The CFMA and CFMQ series also maintain an excellent skirt response by taking advantage of the i.f.t. matching to keep the stopband below −70dB.

Priced at less than £1 for all types,



TOKO CFM filters are available with a wide range of matching transformers, in bandwidths ranging from 4kHz to 10kHz, with stock centre frequencies of 455kHz.

Further information from: *Ambit International, 2 Gresham Road, Brentwood, Essex. Tel: (0277) 227050.*

Mini-meter

A very neat and inexpensive multimeter is being offered by Armon Products Ltd. The NH-55 has 11 ranges: 10, 50, 250 and 1000V d.c.; 10, 50, 250 and 500V a.c., all at 2kΩ/V; 100mA d.c.; 10kΩ and 1MΩ, using a 1·5V cell. Measuring 90 × 60 × 30mm, it is ideal for the beginner, or to carry around for emergencies in the car. Complete with test leads, prods and instruction manual, the NH-55 costs £5.30 including post, packing and VAT, from: *Armon Products Ltd., Cottrell House, 53-63 Wembley Hill Road, Wembley, Middlesex HA9 8BH.*

Capacitance meter

An attractive and simple-to-use instrument is the latest component test equipment now available in the UK from Alcon Instruments. Known as the Varicaptester, it is a pocket-sized multirange capacitance meter with abilities extending from pF to thousands of µF.

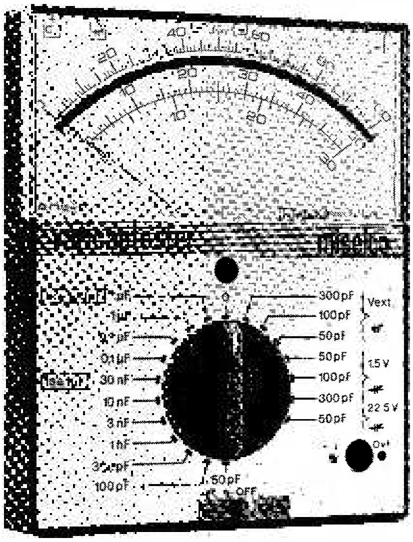
Constructed in tough ABS plastic with simple range selection and a full-view cover, the instrument can cope with all types of capacitors, including plain and polarised devices, Varicap and Varactor diodes.

A high quality movement complete with bright red pointer, antiparallax scale mirror and clear markings, help to guarantee the ease of reading, accuracy and repeatability. Component values up to 3µF are read in conjunction with a green illuminated indicator (overflow) which clearly shows when the value of the component under test is too high and it requires a higher range.

For values above 3µF a system of timing the interval between flashes of an l.e.d. provide direct indication of capacitance value. On two selected ranges, capacitance can be indicated as 1µF per second or 100µF per second, thus extending the range to several thousand µF.

Maximum sensitivity is 1pF × division, accuracy is 2·5%.

Power for all normal uses, including the application of 1·5V or 22·5V to the Varactor or Varicap diodes, is supplied using internal batteries. The user may, should he wish, apply a selected external voltage via terminals provided for this latter purpose.



The Varicaptester comes complete with instructions, leads, case and batteries. Optional extras include component test-rigs for production testing.

Price is £87.50, which includes both VAT and P&P.

Further information from: *Alcon Instruments Ltd., 19 Mulberry Walk, London SW3 6DZ. Tel: 01-352 1897.*

Economy cutter

OK's CAS-130 "Clip and Strip" tool for 0·25mm wire, including wire wrapping wire, cuts and strips without nicking—often a problem with fine wires.

Priced at £1.52 (excluding carriage and VAT) it has been produced for the hobby market but could prove equally useful for the field service engineer and prototype wiremen. Its one-piece cutting mechanism and precision blade produces a consistent 25mm strip-off length and will handle Kynar and all PVC type insulations.

For further details contact: *O.K. Machine & Tool (UK) Ltd., 48a The Avenue, Southampton, Hants SO1 2SY. Tel: (0703) 38966/7.*

PRODUCTION LINES

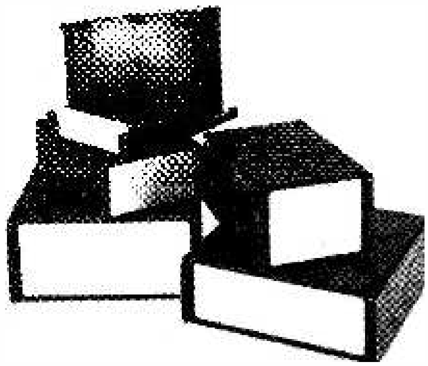
alan martin

Bocon Major

The latest extension to the BOCON range provides 10 models of two part cases with loose front and back panels. The front panel is supplied in satin anodised aluminium and the rear panel in aluminium or plastic. All sizes have similar top and base mouldings except that the assembly screws go through the base.

The panels are recessed and by the use of four separate slots, more than one panel can be used at the same time. Printed circuit boards can be mounted on the bosses, the three middle sizes taking one and the three largest sizes taking two standard Eurocards on both the top and base. Further pillars are also provided as intermediate mounts as are also extra chassis supports.

An important feature of this range is that the four smallest sizes are available with battery compartments at one end. The batteries, which may be either 1·5 volt pencells or the flat 9 volt type,



are changed by unclipping the separate moulded panel. The case parts are firmly clipped together in addition to the locking screws. The smallest case in the range is a miniature version of those illustrated above and is ideal for small hand-held battery operated instruments.

Prices start at £2.73 each and further details are available from: *West Hyde Developments Ltd., Unit 9, Park Street Industrial Estate, Aylesbury, Bucks HP20 1ET. Tel: (0296) 20441.*

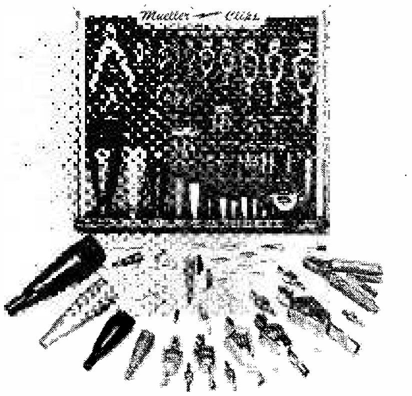
Clips Galore

The complete range of Mueller test clips and insulators, for use in all applications where temporary electrical connections have to be made, has recently been introduced into the UK market by Speedograph Ltd.

The clips are available in a variety of sizes and specifications, from the microgator clips just 28mm long, with pin head tip for connecting test equipment to printed circuit boards, tiny components etc., to the "Big Brute" clip capable of handling 300 amps, and used for grounding welding sets, and other heavy industrial applications.

All clips are available in cadmium plated steel, or solid copper, and insulating sleeves are available in a range of distinguishing colours to suit all clips.

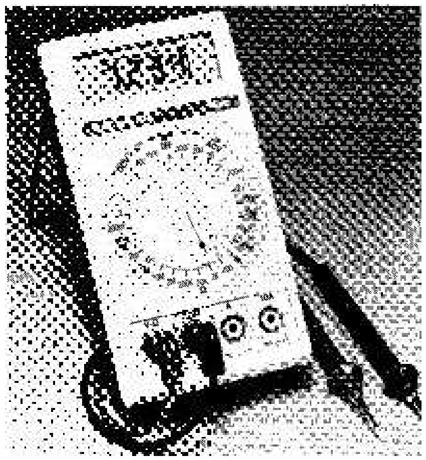
Further information from: *Speedograph Limited, Darlton Drive, Arnold, Nottingham. Tel: (0602) 264235.*



Versatile DMM

A portable, high precision $3\frac{1}{2}$ digit multimeter has been introduced by Beckman Instruments. The 3020 has features not usually found on most multimeters, such as the Insta-Ohms TM instant continuity test indicator and the 2000 hour battery life.

Measurements can be made across five d.c. voltage ranges from 200mV to



150V; five a.c. voltage ranges from 200mV to 1000V; five a.c. and d.c. current ranges 200µA to 2A (a separate input extends the range to 10A); and six resistance ranges from 200Ω to 2MΩ.

The low power resistance ranges permit in-circuit measurements to be made without turning on semiconductors, which would affect the measurements. For applications that require testing of diodes and semiconductors, a separate semiconductor test function provides 5mA of test current—enough to verify the operation of most semiconductor junctions—even circuits with as low as 200Ω of equivalent parallel resistance.

The Insta-Ohms TM continuity test indicator allows continuity to be checked simply and speedily. When an in-range resistance is measured an ohms symbol appears on the display in less than one millisecond. Input impedance is 22MΩ and signals with frequencies of up to 10kHz can be measured. Accuracy is within 0·1% +1 digit on all d.c. voltage ranges. Both a.c. voltage and current are average r.m.s. measurements.

All ranges are protected against overload conditions that may arise from measuring unknown signals or from operator error. A single 9V transistor battery provides up to 2000 hours of continuous operation. Battery run-down, during the last 200 hours is indicated by a decimal point flashing and re-calibration, requires the simple adjustment of an internal trimmer.

Accessories include two carrying cases, a r.f. probe for voltage measurements up to frequencies of 200MHz, a current clamp for measurements up to 200A, and a de-luxe test-lead kit with test leads and ten screw-in probe tips.

The instrument is guaranteed for a year, against any fault, other than abuse, and is available direct from Beckman or through distributors, the price is £115 plus VAT and P&P.

Beckman Instruments Ltd, Queensway, Glenrothes, Fife KY7 5PU. Tel: (0592) 753811.

BURGLAR ALARMS PART 1

P. J. WALES

The whole question of how to adequately safeguard premises against illegal entry is a vastly complicated one—a labyrinth of devices, alarms, beams, dogs, combination locks and interlocks. If you have ever seen one of those films where the baddies don't quite get away with it after a sweaty weekend in the Louvres, you will have some small appreciation of the immensity of the subject in hand.

This article is not, of course, even going to begin to attempt an explanation of how the home constructor might go about protecting a world-famous art gallery! But we do aim to show much more comprehensively than is normal in a magazine article, how you might instal a system capable of deterring the average small-time thief. This means the majority of those intent on infringing your personal right to property and privacy.

However, it must be pointed out straight away that if you instal a system based on the advice contained in this article, your house will not, repeat, *not* be burglar-proof (you might just achieve that state of bliss if you spent out as many dollars as the US Government does on Fort Knox). And, you will be saddened to learn, it will not lead to a reduction in your insurance premiums either—even though the system design and construction that we are to describe, can be made to meet the relevant British Standard. A typical reaction from an insurance company: "If we specify that an intruder alarm is to be fitted, it must be fitted by an approved installer. Then, if we have specified an alarm we will offer insurance. If no alarm is fitted, then the scope of the insurance may be reduced accordingly." Therefore, in very general terms, there is no such thing as a reduced premium—there is only insurance to a greater or lesser extent where there is a larger than average domestic risk.

But despite this, you will obviously have increased the protection of your property beyond that offered by the structure alone and that, of course, must be the main motive for carrying out the design and installation.

We shall also be describing simpler systems than those which meet BS3545; the installation of the "loop" (the principal sensing circuit which connects the various devices together) and its peripherals will equally apply to other, less comprehensive designs. We shall also be describing how you can include a measure of basic fire protection as well.

Sensing Devices

Before you can design a loop, obviously you must have a good idea of the types of available sensing devices which can be incorporated into it and, importantly, their limitations. They all have limitations, naturally, which is why in a full-blown system a variety of devices are employed in an attempt to provide a reasonably fool-proof security umbrella.

The simplest sensor is the reed-switch. These are manufactured in many forms, the most basic of which consists of a cast magnet actuator with the reed-switch encapsulated in a plastic case. This enables the sensor to be inconspicuously fitted into a door or window frame, for example. The door is opened, the magnetic field moves with it and the reed-switch contacts open, sounding the alarm.

Pressure mats are another popular form of device consisting, basically, of two contacts separated by a perforated insulator. They are placed under carpets, generally adjacent to windows or doors, and when the intruder treads on the mat the circuit is completed. Once again, the alarm sounds. Pressure mats have the particular advantage that they are easy to instal, and the disadvantage that they can be actuated by your dog, cat or overweight budgerigar. Pets, therefore, need to be restricted in their movements in order to prevent this.

Windows are, of course, the thief's traditional way in. Window-foil, glued around the edge of each pane of glass six inches from the window frame, will guard against simple breakage: if the window is broken, the foil ruptures, breaking the alarm circuit. It is, however, very difficult to apply neatly, requiring the glass to be scrupulously clean and a coat of varnish before and after application. A second and more tricky device for preventing entry through windows is the vibration sensor comprising basically a

Fig. 1. A typical domestic "security door". The normal door has been modified and now has a security lock, area isolation switch and reed-switch incorporated into it. Connection into the rest of the system is made via the tamper-proof boxes. The hidden reed-switch (A) is operated by the magnet actuator (D), neatly recessed into the edge of the door; notice how the wire exit channel is concealed by removing and then replacing a 4in. section of the door-stop (C). Hole B is drilled at an angle so that it intercepts the sensor mounting-hole and the lead wires are then hooked through it. This installation, and that of the area isolation switch and security lock will be fully described in Part 2. The inset photographs show various commonly available devices: three different types of magnet-operated reed-switch (bottom-left), a pressure-mat (bottom-right), a personal attack button (with key) and a vibration sensor (top left). All items were kindly provided by Basco (Security) Ltd.

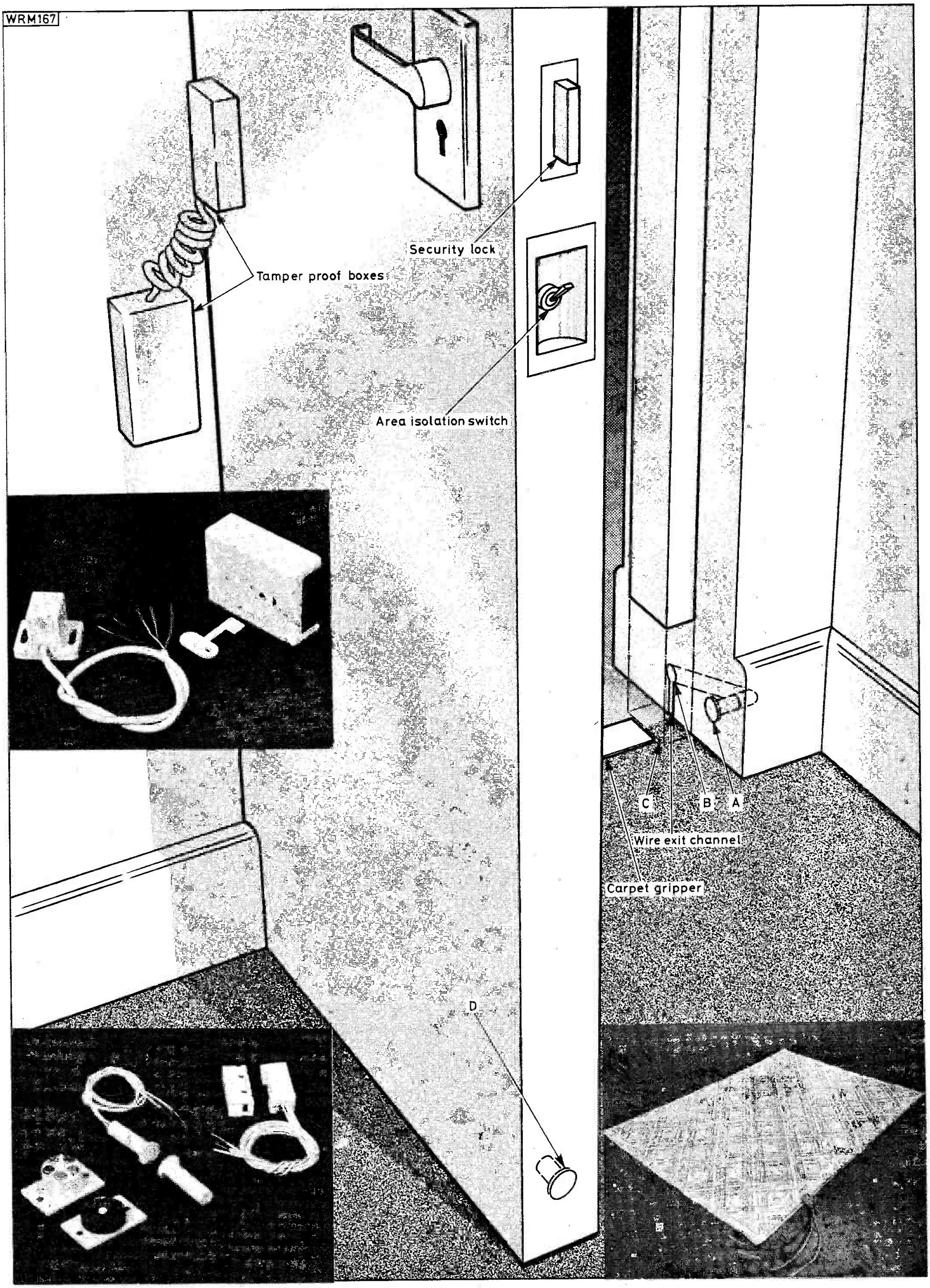
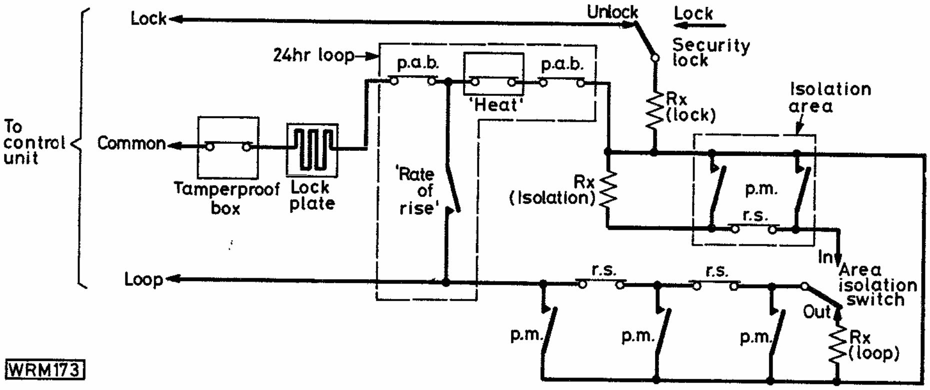

WRM167
Security lock
Tamper proof boxes
Area isolation switch
C
B
A
Wire exit channel
Carpet gripper
D

Fig. 2. A 4-wire circuit incorporating personal attack buttons, fire sensors and tamper-proofing into a "24 hour" loop, and including an area isolation facility. Devices used in the lock-activated loop are pressure mats (p.m.) and reed-switches (r.s.). The value of Rx will be discussed in conjunction with the control-unit circuit, in Part 2



ball-bearing resting on three spikes; the ball completes a circuit between two of the spikes and breaks the circuit when it is bounced off them by a disturbance. The disadvantage here is that traffic vibration, sonic booms, etc., can cause just such a disturbance and careful siting is necessary if they are to be of more than purely nuisance value!

All of the devices mentioned so far are "trap protection" sensors—they set a trap which, you hope, "Fingers" will fail to avoid as he slinks quietly around the house, assessing the value of your property. They provide a degree of security that is fairly low, but then the cost is fairly low also; as with most things you get that for which you have paid!

More sophisticated, more expensive, but also more effective are "space protection" sensors. These differ from the "trap protection" variety in that they do not require the intruder to physically trip a pre-set alarm device, but merely to violate any space which is subject to their surveillance, hence their title. They are usually, therefore, active electronic devices requiring a power supply arrangement of some sort and very careful setting up. Examples include infra-red ray beams and motion detectors which use ultrasonics or microwaves as a medium. They are normally connected into the same type of loop circuit to which we referred earlier—it is worth remembering that they are quite capable of working through walls and that their area of surveillance is not therefore limited by the size of rooms.

The security loop described must, of course, be made "live" by closing a switch of some sort. At times when the house is occupied and people are coming and going, it is switched off and therefore provides no protection and, in addition, is itself vulnerable. If a villain enters your premises during the day posing as a meter-reader or conducting one of those "surveys", and snips through the loop, you will have no idea of what has happened until it is too late.

A way of avoiding this problem is to include a second

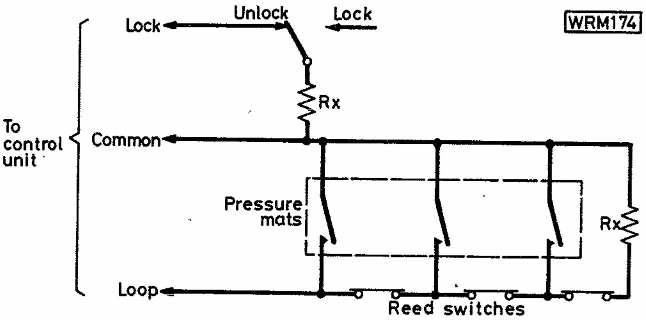


Fig. 3. A very basic 2-wire security circuit. Devices are shown in the "non-alarm" condition

loop—the 24 hour loop—which stays permanently "live" and which must remain continuous if the alarm is not to sound. Now if a baddie cuts the wires, the siren will make you well aware of the fact. The 24 hour loop can also be used to "tamper-proof" termination boxes, locks, etc., by interlocking their covers—remove the lid or attempt to drill through the lock and all hell breaks loose!

This is called "24 hour monitoring"—if you decide to use it then you will need to instal four-wire devices, as opposed to two-wire, the extra pair simply forming an inward extension of the 24 hour loop in order to provide security for the device itself.

Personal Attack

An entirely different category of protection can be provided by the use of "personal attack" buttons—push-switches which latch mechanically when operated and which can be reset only by means of the appropriate key. These, remember, are to protect your person as much as your property so please do not regard them merely as an embellishment!

When in an emergency situation a button is pressed, the alarm sounds; the neighbours, hopefully, are roused, the intruders caught unawares and the local constabulary very shortly on the scene.

This is just the type of protection that should be available around the clock, irrespective of whether the main anti-intrusion devices are "live"; thus it makes sense to incorporate the "personal attack" buttons into the 24 hour loop. Imagine the situation: it is a hot summer's day, the alarm system is switched-off except for the 24 hour loop (*after all, you are at home*) and, all of a sudden, you come upon an intruder who, having entered via the french window, is inspecting your silver cutlery . . .

Personal attack buttons are best placed adjacent to the main entrance and exit doors and by the beds; we have all seen films where the heroine awakes in a cold sweat to find a cat-burglar quietly sifting through her jewellery-case. Well, the p.a.b. could provide her with a noisy and effective solution to the problem!

Fire!

If one has a loop running around the premises, basic fire protection can be added by including either a heat detector, pure and simple, or a "rate-of-rise" detector. The former is essentially a pellet of conductive material which melts at a known temperature thus opening the circuit; when things have cooled off the pellet reforms, closing the circuit again.

The "rate-of-rise" detector is more complicated, having two bi-metallic strips inside it, one of thicker cross-section than the other. If the rate-of-rise is below the maximum

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both strips bend, the thin one slightly more quickly than the thick one, but with no contact being made. If the rate-of-rise is excessive however, the thin strip deflects much more quickly than the thick one and contact *is* made, sounding the alarm.

The most effective fire alarm is, without doubt, the smoke-detector but, unfortunately, there appears to be none available at the present time which is compatible with the system that we shall describe. You could, of course, instal a self-contained battery-powered one to complement the "heat" and "rate-of-rise" types described above but these would naturally be separate entities altogether and would not, therefore, be included in the main security loops.

The main point to remember with fire detectors of any sort is to *site them carefully*. Not over the cooker, for example, or directly over the chair in which the man of the house enjoys a pipe with his after-dinner coffee. They should be away from draughts and walls and yet in moving air—for this reason, wiring to them neatly generally means coming down through the ceiling.

Area Isolation

A comprehensive security system must obviously incorporate some means of being able to disable parts of it in order to permit normal movement around certain areas of the house—at night, for instance. It would be ridiculous to have a system where half of the street is woken up if a bedroom door is opened in the middle of the night by a sleep-walking child!

The technique of avoiding this problem is called "area isolation"—by means of a switch, usually set into the edge of a door (Fig. 1) where it cannot be reached when the system is "live", a number of devices can be switched in and out of the alarm loop. The switch, for example, may isolate the bedroom and bathroom doors and possibly the kitchen door as well, if you have a habit of making tea at 2 am. It is for you to decide.

Your System

That is a cardinal point, of course. Only *you* can decide the type and level of security that you wish to provide for your premises and property, because only *you* know how much value you attach to your bits and pieces. Maybe you wouldn't give tuppence for next door's porcelain cat —but to them, it may be priceless. And your hi-fi they may consider to be just so much junk.

The aim in this first instalment has been simply to provide you with some idea of the devices and techniques (within reach of the average pocket) that you could use. Knowing just this much, you can now sit down and consider just what kind of system you need.

Think about the weak points in your house: how would you go about silently breaking and entering at the dead of night, or making an inconspicuous entrance in the middle of a suburban afternoon? Which door will be your security door—generally, it will be the one that the family habitually uses, but maybe you have other ideas (perhaps you want all of your external doors to be security doors). Do you want your isolation switch to be on the security door or upstairs on the main-bedroom door perhaps? Maybe you will decide to go for a simple two-wire loop without such sophistications. Think about where the wiring would run, etc.

In the next instalment, we shall be considering the control-unit and other electronics, discussing the alarm generators that can be used and where they should be sited. Additionally, we shall consider many other points concerning the installation of an effective system.

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When used to check the frequency of a transmitter a small aerial is screwed into a socket fitted in one end of the case. Provided that there is enough field strength the meter will display the frequency of the transmitted signal. The radio control enthusiast will find this instrument of use in checking the frequency of his, and fellow modellers' transmitters.

Used in this form the Mini Max has to be held quite close to the transmitter aerial, so that it would be no use expecting to be able to use it as a monitor for checking interference on your channel.

The test model proved to be easy to use, reliable and very useful, both in the workshop as a bench instrument and in the field. Although it is powered normally by one 9V battery the Mini Max can be used with an external mains adaptor to extend battery life when used in the workshop. Battery life is given as 2 hours continuous or 8 hours intermittent.

A 500MHz prescaler is also available for use with this instrument and this extends the coverage of the Mini Max to 500MHz. The prescaler can be powered from the same mains adaptor as the main instrument.

The display can be a little confusing at first with its two decimal points and fairly small red l.e.d. display, but this was soon overcome and the instrument was easy to use and read. No controls are fitted other than the power on-off switch and the unit is fully operational in use. A screened input lead with two croc. clips is provided for use with conventional equipment.

The input circuits are protected against overvoltage and input impedance is greater than 1MΩ. Input sensitivity is quoted as less than 30 millivolts over the frequency range 100Hz to 30MHz, but to obtain a meaningful reading the signal to noise ratio should be better than 40dB.

★ specification

Frequency range:	100Hz–50MHz
Gate time:	0·1 second
Resolution:	100Hz over full range
Input impedance:	1MΩ min. a.c. coupled
Sensitivity:	30mV r.m.s. to 30MHz, 100mV 30–50MHz
Input:	100V pk. 100Hz–1kHz
	75V pk. 1kHz–10MHz
	50V pk. over 10MHz
Timebase	
Frequency:	3·58MHz crystal controlled
Accuracy:	±3 p.p.m. at 25°C
Stability:	Better than 0·2 p.p.m./°C
Display	
Type:	8 digit l.e.d. 0·2 inch magnified
Update:	6 per second
Power supply:	9V PP3 battery or mains power adaptor
Size:	76 × 152 × 38mm, weight 227gm
Prices	
Mini Max 50 counter:	£63.82 inc. postage and VAT
PS500 Prescaler:	£41.98 inc. postage and VAT

The instruction booklet is comprehensive, telling the user how the instrument works and how to use it to the best advantage. The prescaler also has its own instruction booklet with details showing how to check it out and how to use it with the frequency counters in the CSC range. Power can be supplied from any d.c. source of 7 to 10 volts which need not be regulated since the unit has an internal regulator. The power source must be capable of supplying 100mA and should be filtered.

The counter represents good value for money and should fill the need for a simple and reliable instrument for amateur use.

Dick Ganderton

letters

The Editor,
PRACTICAL WIRELESS,
Westover House,
West Quay Road, Poole,
Dorset BH15 1JG

In Emergency . . .

Sir: Like amateur radio types all over the world, American devotees, too, are justly proud of their achievements in providing desperately-needed and, strictly speaking, illegal, communications in times of great disaster.

As a tribute, I thought that your readers might be interested to read of the particular activities and achievement of one US amateur who recently provided the only possible link between the Washington State Department and the beleaguered US Embassy in Teheran. It is a measure of the importance of his role that the information which he was able to obtain was immediately relayed to the Secretary of State, and to President Carter himself.

For four hours Mr Charles Watters, 54, president of the Sinco Engineering Co. of Orlando, Florida was successful in maintaining a multi-hop path to two amateurs operating from the battle-torn Iranian capital. The Embassy had been attacked, its radio destroyed, all international communications had been severed and Mr Watters, who two weeks previously had established links with the two amateurs in an attempt to obtain news of members of his family, was contacted by a very anxious Pentagon. They were fortunately aware of his earlier success.

Mr Watters naturally declines to identify his contacts for fear of reprisals against them, but says that the Pentagon was concerned for the safety of the Ambassador, Mr Walter Sullivan, and his staff after around 100 armed men had broken into the Embassy.

He modestly stated later: "I just happened to be in the right place, at the right time and on the right frequency. While I was talking to the operators in Teheran, an amateur station in Moscow broke in with a 'Good Morning'. They were listening to all this too! Nothing really classified was said. The people in Washington were more concerned over the welfare of their people. But it was a frightening affair, seeing history being made in that way."

Charles admits, tongue in cheek, that his transmissions were a certain violation of the FCC rules. Rules, it is often said, are made to be broken but Charles Watters, like many of his counterparts world-wide, would break those rules again simply to be of help at times when the price of their strict observance may very well be paid in human life.

A. Faulkner
London W8

Pen-Pal

Sir: I am 14 years and would like to correspond (by letter or cassette) with other amateur radio enthusiasts of roughly my own age. I promise to reply to any letters I receive.

Graham Monro
7 Anderson's Way
Woodbridge
Suffolk IP12 4EB

CW licence for novice amateurs

Sir: The recently formed European CW Association is examining the possibility of Western European nations introducing a CW-only Novice Amateur Radio Licence. This licence would be a stepping-stone for beginners who wish to eventually qualify for a full amateur licence. Suggested licence conditions would be:

1. A simple examination covering regulations and radio theory.
2. A 5 w.p.m. Morse test (administered by any amateur who has held a full licence for at least 3 years).
3. Crystal control only, in defined segments of the amateur bands (h.f. and v.h.f.).
4. Maximum power input of 10 watts.
5. Holders of a RAE pass certificate need only pass the Morse test.
6. A Novice Licence could only be held for 2 years in any 5 year period.

As an attempt to establish the volume of support for such a proposal, I would be obliged if those in favour of the idea—whether licensed amateurs or not—would send their name and address to me on a postcard. In the case of local radio clubs, correspondence could be saved by the secretary informing me of the number of his members who are in favour of the idea. Considerable support is essential if the proposal is to succeed, and even then negotiations may take many months.

The European CW Association currently consists of the Scandinavian CW Activity Group (Denmark, Finland, Norway and Sweden), The West German CW Activity Group, The TOPS CW Club (UK), and the G QRP Club (UK). It represents over 1500 licensed radio amateurs and a number of s.w. listeners.

A. D. Taylor G8PG
Executive Committee Member
European CW Association
37 Pickerill Road
Greasby
Merseyside L49 2ND

Any offers

Sir: I have a complete set of *"Practical Wireless"*, from 1955 to 1960. I wonder if any current reader would be interested in owning this set.

The magazines are in very good condition as they have been kept in five separate binders.

I would be prepared to split the set into five separate years. Offers please to:

R. G. Bayly
95a Ingelow Road
Battersea
London SW8 3PE

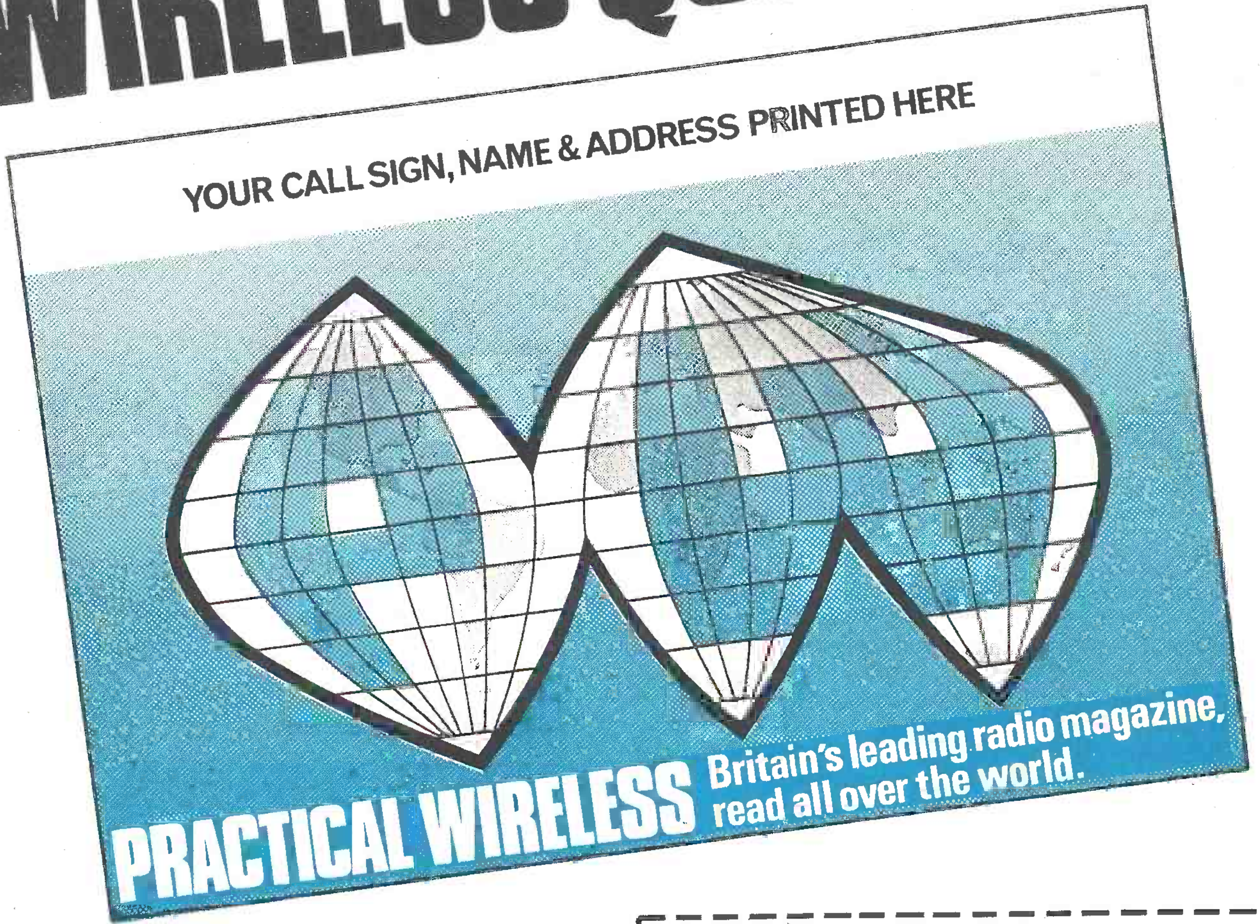
Information Please

Sir: I have recently acquired a quality reel-to-reel tape recorder from the early sixties. It is a Reflectograph "A" semi-professional machine with three heads, two amplifiers and three motors, made by Multimusic Ltd, Hemel Hempstead, later marketed by Pamphonic Reproducers.

Unfortunately, this machine is in need of a thorough overhaul, and I would appreciate if any reader having a service manual available could contact me.

F. W. Pentland
14 Hillview Road
Balmullo
St Andrews
KY16 0DE

practical WIRELESS QSL CARDS



For the radio amateur or short wave listener, an attractive card incorporating a world map and the initials of your favourite radio magazine, printed in blue and green.

Your callsign, name and address will be overprinted in black, at the top of the card. The reverse of the card will have the usual form for reception report, etc., and address space.

The cards measure 102 × 152mm (4 × 6in) and are available in the following quantities:

250 off— £6.25
500 off— £10.00
1000 off— £16.00

These prices include VAT and packing and postage to any United Kingdom address. Please send your order with a cheque or postal order for the appropriate amount to: Practical Wireless, Westover House, West Quay Road, Poole, Dorset BH15 1JG, giving full details on the coupon provided, or on plain paper if you do not want to cut your copy of Practical Wireless. Please make your remittance payable to IPC Magazines Ltd.

Please supply:
250/500/1000* PRACTICAL WIRELESS QSL CARDS
Information to be printed on card (please print):

Callsign: ....

NAME ....

ADDRESS ....

....

....

....

Post Code ....

I enclose remittance for £ made payable to **IPC MAGAZINES LTD.**
* Please circle number required.

Cut round dotted line

Automatic Intercom

PART 2

Keith CUMMINS

If you are interested in providing extra security for your home and family, or want simply to be rid of nuisance callers without having to answer the front door, then PW's auto-intercom is for you! The system, briefly, is designed to provide two-way conversation between the interior and exterior of a house completely automatically. All that happens is that the caller announces his arrival by pressing a button—thereafter, the speech is switched to and fro by the unit itself determining who is speaking and arranging the speech-path accordingly.

Part 1 of the article, in our August issue, described the operation of the audio, power supply and door unit circuitry; in this second instalment we pass on to a consideration of the logic components (or, if you prefer, the digital side of things) and all the mechanical construction details.

Logic Operation

The digital control system is illustrated in Fig. 2. In order to appreciate the functions of the logic gates, it is necessary to understand the outputs produced by NAND and NOR gates for different inputs. The "truth tables" for both types are shown in Fig. 1. *'Hi'* and *'lo'* refer to logic levels corresponding, in this circuit, to +12V and 0V respectively. Perhaps curiously, teaching experience has confirmed these terms as being more readily comprehensible than "1" and "0".

First let us consider the purposes that the logic must serve:

(i) it must provide as outputs an "audio enable" command, call-pips when the control-line is earthed by the door-unit call-button and an "a.g.c. disable" command while these are being generated;

(ii) it must provide visual "call", "speak" and "listen" l.e.d. indications to both householder and visitor;

(iii) it must recognise whether "H" (householder's) speech is present and condition RLA accordingly;

(iv) it must respond to the householder pressing the "manual" button (S1) either by opening the system so that events at the door can be monitored, or by cancelling the flashing "call" indicator (LED1).

Undoubtedly the best method of understanding the way in which the logic functions is to examine what it actually does during the normal sequence of events: a visitor arrives on the door-step and presses the call-button, the householder replies, and a normal conversation ensues.

Let us first, however, examine some of the quiescent conditions which are established in the logic when the intercom is first switched on and which are subsequently changed by the caller operating S2 (the call-button).

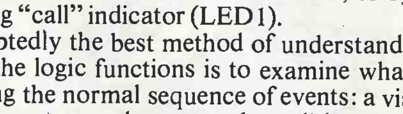
(i) The control-line is held at +6V by the voltage divider network R29–32.

(ii) Tr5 is switched off since the output of gate 5d is *'hi'*.

(iii) Tr3 is switched off so that its collector and the cathodes of D8 and D9 are *'hi'*. As D8 cathode is *'hi'*. pin 2 of gate 5a and pin 13 of gate 5d (via R28) are also *'hi'*.

(iv) The current flowing through R29–R32 turns on Tr6 and thus its collector is *'lo'*. Therefore pin 1 of gate 5a is also *'lo'*.

Now the visitor arrives and presses S2, pulling the control line down to earth potential. At the door unit, LED5 ("listen") illuminates, while in the main unit Tr6 turns off, its collector going *'hi'* and, with it, pin 1 of gate



NAND

HI	HI	LO
HI	LO	HI
LO	HI	HI
LO	LO	HI

NOR

HI	HI	LO
HI	LO	LO
LO	HI	LO
LO	LO	HI

Fig. 1: Truth table

5a. Now that both inputs of 5a are *'hi'*, its output goes *'lo'* and pin 13 of 3d and pin 1 of 3b also. The bistable latch 3a/3b now changes state, pin 3 going *'hi'* and pin 4 going *'lo'* (the reverse of the previous quiescent condition). The *'hi'* at pin 3 is taken two ways—to gate 4a pin 1 and 2a pin 11. Considering that latter first, 2a is a NOR gate if either input goes *'hi'*, its output will go *'lo'*. The *'lo'* thus produced is converted into a *'hi'* by inverter 2c and emerges as the "audio enable" command (circuit reference G). drastically reducing the attenuation introduced by IC9 and, in effect, turning on the audio amplifier. The same *'hi'* is routed to gate 1a pin 1 via R5 and 1c pin 5 to enable both gates to respond to changes on their other inputs (1a pin 2 and 1c pin 6); we will consider the reasons for this later.

The *'hi'* output from 3b pin 3 to 4a pin 1 enables gates 4a and 4b to function as a RC oscillator with an approximate frequency of 10Hz. The quiescent conditions before latch 3a/3b is "set" by the output of 5a going *'lo'* are as follows: the pin 1 input to 4a is *'lo'*, therefore the output of 4a is *'hi'*. This *'hi'* is fed to the pin input of 4a via resistors R12 and R11, to 4b pin 6 and to C8. The pin 5 input of 4b is held permanently *'hi'* from the +12V rail, via R17 and R18. The output of 4b is therefore *'lo'*; this *'lo'* if fed to the base of Tr7 keeping both it and LED1 switched off.

Now let us consider what occurs when the caller presses S2 and 3b pin 3 and 4a pin 1 go *'hi'*. Now there are two *'hi'* inputs to 4a, its output goes *'lo'* causing 4b's output to go *'hi'*. Transistor Tr7 switches on which, in turn,

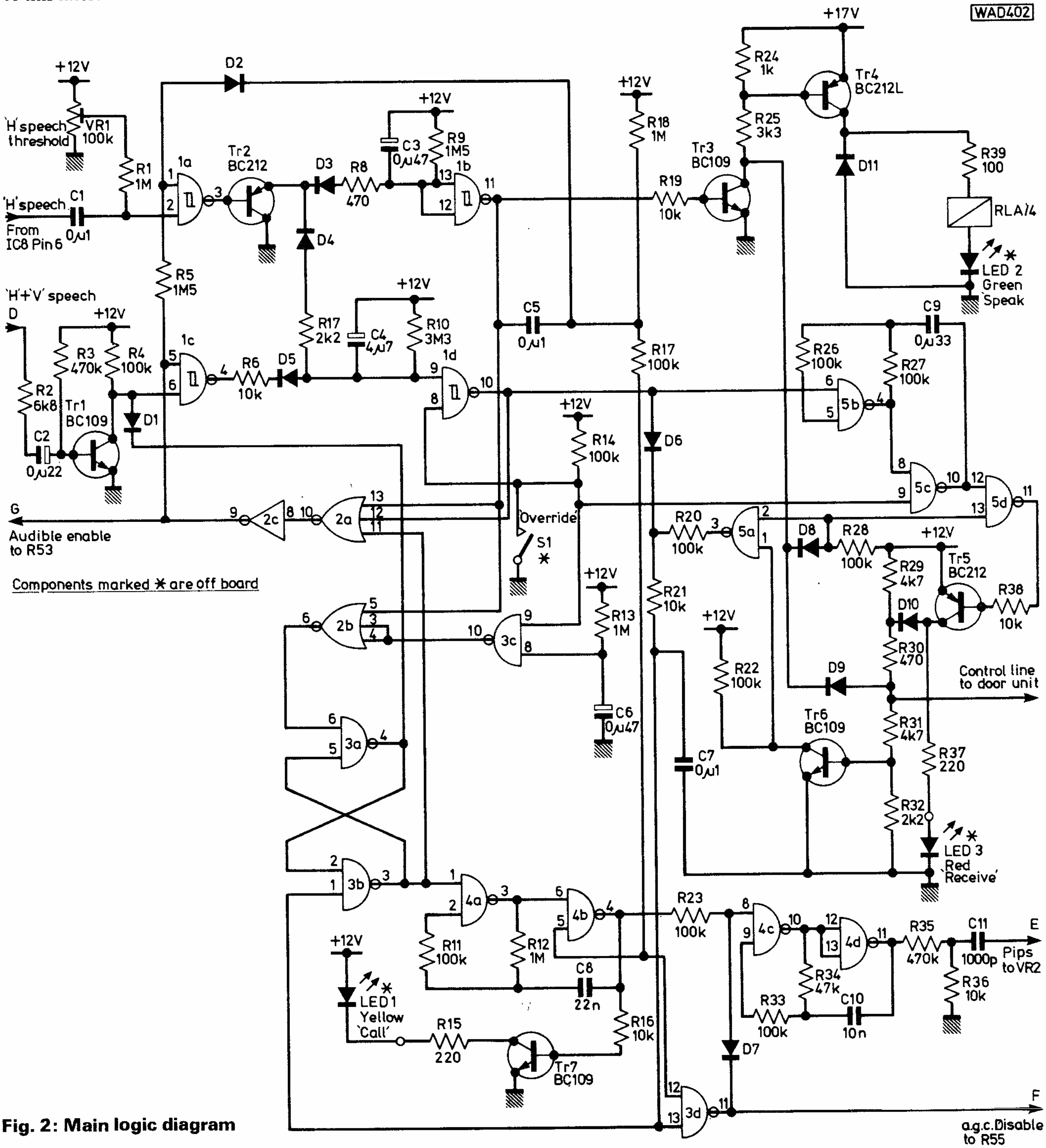


Fig. 2: Main logic diagram

causes LED1 to illuminate. The potential across C8 is now reversed and it charges to the point where 4b pin 6 goes *'hi'* again. The output of 4b reverts to *'lo'* and Tr7 and LED1 switch off again. Capacitor C8 discharges until 4b pin 6 is *'lo'* again, taking the output of 4b *'hi'* and switching Tr7 and LED1 on again. The cycle will repeat for as long as the visitor continues to press S2—LED1 flashes and alternate *'hi'* and *'lo'* inputs are applied to pin 8 of gate 4c.

The *'lo'* from the output of gate 5a, you may remember, is also taken to the pin 13 input of gate 3d; this causes the output of 3d to be *'hi'*. This *'hi'* is fed to R55 and constitutes the "a.g.c. disable" command— this prevents C19 from becoming over-charged and the householder's speech from being over-attenuated, should he answer immediately. The output from 3d also holds the cathode of D7 *'hi'*—it is because D7 is thus reverse-biased that the oscillating output from 4b reaches pin 8 of 4c. When pin 8 of 4c is *'hi'*, gates 4c and 4d function as an oscillator in much the same way as 4a and 4b, except that the frequency is approximately 400Hz. Thus this 400Hz tone is switched on and off by the output of 4b, producing "pips" at the output of 4d which, after attenuation by R35 and R36, are taken via C11 (high-pass filter) to the "pip volume" control, VR2. Naturally, as soon as the visitor releases S2, the output of 3d goes *'lo'* and D7 conducts. This forces a *'lo'* onto 4c pin 8 which stops the pips. Thus it is only when S2 is operated that the pips are produced.

After so much concentrated description of the detailed operation of the logic, it might now be of benefit to recap on the events so far! The visitor has pressed S2 and released it again—as a result, latch 3a/3b has been "set" and stays that way. The yellow "call" l.e.d. (LED1) remains flashing, the "audio enable" line is *'hi'* and the system is therefore open. When the caller pressed S2, he pulled the control line down to earth which caused the "listen" l.e.d. to light; now he has released the button, however, no indications are visible at the door but the householder can hear what is going on there.

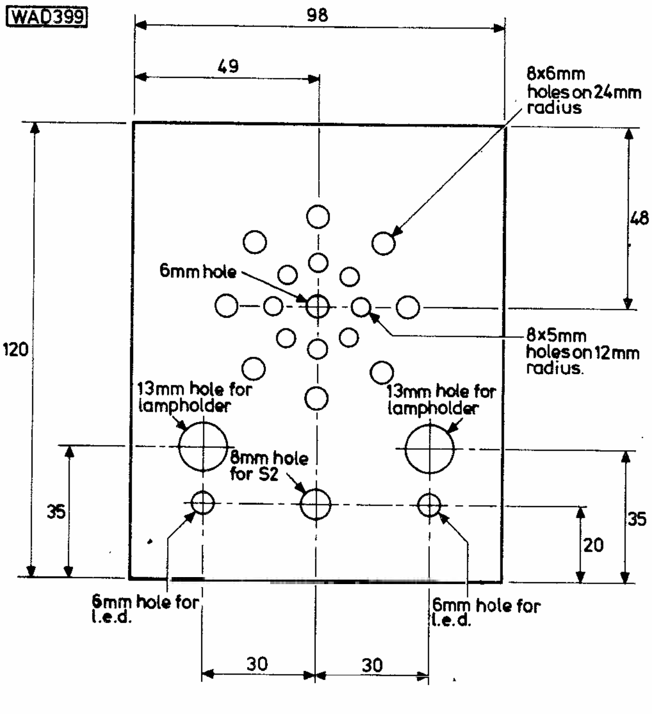


Fig. 3: Drilling information for the front door unit

The interior of the front door unit

The next natural event, of course, will be the householder's reply; he speaks into the microphone asking the name of the caller. His speech ("H" speech), amplified by a total of 63dB by IC7 and IC8, is applied via C1 to the pin 2 input of gate 1a. IC1 is a quadruple 2-input NAND Schmitt trigger; it is the Schmitt trigger action which causes the output to rapidly change state once the threshold is passed. The speech threshold level at which 1a responds is set by VR1—once this has been exceeded, the audio signal drives the gate input so that it quickly changes state. Obviously this can occur only when 1a pin 1 is *'hi'*—this is the "audio enable" command to which we referred earlier. With two *'hi'* inputs, the output of 1a now goes *'lo'*, turning on Tr2 and causing its collector to fall to near earth potential. The following sequence then follows: diodes D3 and D4 become forward-biased; C3 rapidly charges via R8 and both inputs to gate 1b go *'lo'*; the output of 1b therefore goes *'hi'*, turning on Tr3 which turns on Tr4. Transistor Tr4 energises RLA which connects the output of IC7 (the microphone pre-amp) to the rest of the audio system and which switches the output of IC10 from the main-unit speaker through to the door-unit. Naturally, this circuit is arranged to have a very fast response time so that no perceptible loss of the householder's speech occurs while the switching sequence is taking place. Transistor Tr2 is used as a buffer to protect gate 1a from being overloaded by the high charging current drawn by C3.

The *'lo'* at the collector of Tr3 which turns on Tr4 is also applied to the cathodes of D8 and D9, forward-biasing them. D8 feeds a *'lo'* onto pin 13 gate 5d and pin 2 of 5a; D9 pulls down the control line causing LED5 ("Listen") to illuminate. Transistor Tr6 turns off and its collector and the pin 1 input to 5a go *'hi'*—however, because the input from the householder's microphone has caused the pin 2 input to have been pulled *'lo'* via D8, its output remains *'hi'*. It is by this means that the logic is able to distinguish between a "call" pull-down and a speech-initiated pull-down on the control line.

The *'hi'* at the output of 1b is also routed to the pin 5 and pin 13 inputs of 2a and 2b, which are NOR gates. These *'hi'* inputs to both gates will result in a *'lo'* appearing at the outputs of both—that emerging at pin 10 of 2a is inverted by 2c and appears as a *'hi'* on pin 9. This *'hi'*

★ components

200Ω microphone	1	
64Ω loudspeaker, 66mm dia.	1	LS3
Case, 120 × 98 × 45mm	1	
Resistor, 470Ω, ¼W, 5%	1	R69
Switch, push-to-make	1	S4

4-core screened cable, sleeving, foam, grommet, adhesives, screws, etc., as required.

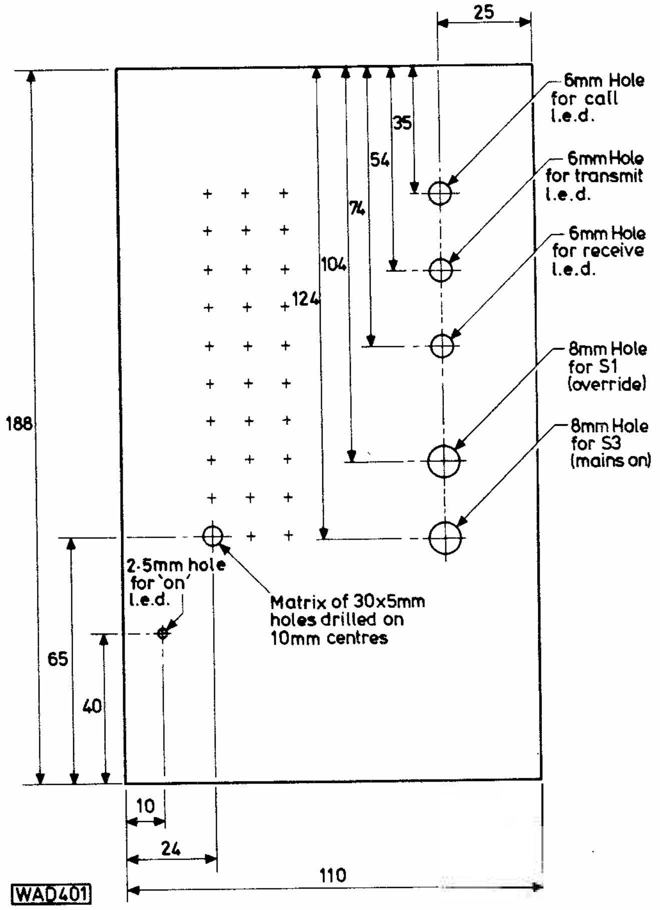
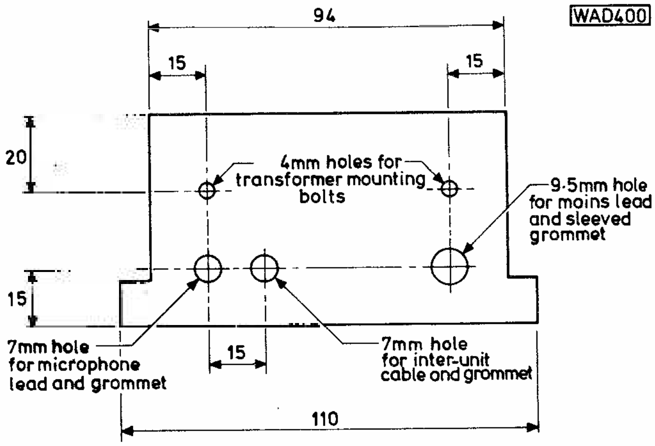


Fig. 4: (above) Drilling information for the front of the master unit. Fig. 5: (below) the details of the end of the master unit



serves the purpose of simultaneously maintaining the "audio enable" command to R53 when the latch 3a/3b is "reset" by the other *'lo'* output from gate 2b.

When the latch "resets", the previous conditions established when it was "set" as a result of the visitor pressing S2, are naturally reversed. Gate 3b pin 3 reverts to *'lo'* and switches off RC oscillator 4a/4b, stopping the pips, and 3a pin 4 goes *'hi'* again, reverse biasing D1. With the latch in the "set" condition (i.e. when the call-pips are being produced), the effect of forward biasing D1 is to impose a standing *'lo'* on pin 6 of 1c; this prevents it from responding to varying voltage levels appearing on Tr1 collector during the call-pip period. This prevents the logic from providing spurious visual indications and from unnecessarily opening the audio system.

First, however, let us consider the "H + V" speech input circuitry to the logic—Tr1 and its associated components. The varying voltage levels applied to Tr1 base will, of course, cause the transistor to turn on and off—its collector will apply an alternating *'hi–lo'* signal to pin 6 of gate 1c. Because the other input to 1c, pin 5, is held *'hi'* by the "audio enable" command being maintained at the output of 2c, this will result in a *'lo'* at 1c's output. This *'lo'* provides a low-resistance charging path for C4—being of relatively high capacitance with a high resistance discharge path via R10, pin 9 to gate 1d will go *'lo'*. As the other input on pin 8 is held *'hi'* via R14, this causes the output of 1d to go *'hi'*.

To recap slightly, this complete chain of events (from the input to 1a through to the "resetting" of the latch and the *'hi'* output from 1d) was initiated by the householder speaking in response to the call-pips. Now he stops speaking and the output from 1b goes *'lo'*—this would remove the "audio enable" command from the output of gate 2c were it not for the *'hi'* output from 1d fed to the pin 12 input of 2a, which serves to keep the audio system open in readiness for the caller's answer. But, before he can reply, RLA must de-energise and with the cessation of the "H" speech input to C1 it does so, after a delay of between 250 and 500mS as C3 discharges via R9. The rapid collapse of output from 1b is fed via C5 as a "one shot" signal in three directions: via D2 to gate 1a pin 1; to the pin 5 input of 4b; to 3d pin 12. The purposes of the three outputs are, respectively: to disable the "H" speech detector so that it cannot re-trigger on feedback; to produce a *'hi'* on 3d's output which acts as a "reset" disable command to the a.g.c. to produce a *'hi'* at the output of 4b which, when fed to oscillator 4c/4d, produces a single pip serving as an "end of sentence" indication.

Now let us consider the other two functions served by the *'hi'* appearing at the output of 1d. The first of these is to turn on 5b and 5c, another oscillator, and the second is to forward-bias D6 which forces a *'hi'* onto 3b pin 1, holding the latch in the "reset" (pips off) condition. The latter measure is necessary in order to prevent a malfunction if a caller should happen to operate S2 in the middle of the conversation. Incidentally, R30 is included in the divider chain to prevent damage to Tr5 and D10 if this should occur.

The oscillation from 5c output (approximate frequency 2Hz) is fed to 5d pin 12 and emerges from 5d pin 11 reversed in phase. This occurs, of course, only if the pin 13 input to 5d is *'hi'* (RLA de-energised, householder not speaking), for 5d's output turns Tr5 on and off, pulsing the control line via D10 between half and full rail voltage. Thus LED4 ("speak") is made to flash telling the visitor that it is his turn to speak. The main unit "listen" indicator, LED33, mimics LED4; it is fed directly from Tr5 via R37.

When the caller has finished speaking and the householder replies, the pin 13 input to 5d is taken *'lo'* by Tr3 switching on and stops the oscillating output; gate 5d pin 11 reverts to *'hi'*, switching Tr5 off. The "listen" and "speak" indications to householder and caller are reversed—the control line is pulled down re-establishing the "listen" indication at the door unit and LED2 gives the "speak" indication at the main unit, fed by the current through the coil of RLA.

Having studied what the logic is actually doing during a normal question-and-answer conversation, we can now consider what occurs when the chat is finally over. Capacitor C4 is now no longer having its charge replenished by the *'lo'* output from gate 1c and it slowly discharges through R10 until the input to 1d pin 9 goes *'hi'*, and the output of 1d goes *'lo'*. This takes approximately 15 seconds and, on completion, all the inputs to 2a are *'lo'* resulting in a *'lo'* on the "audio enable" line. The system therefore closes down and the indicator l.e.d.'s are all turned off.

The only point which we have not covered is the operation of S1 ("override") and gate 3c. When the householder presses S1, a *'lo'* is applied to the pin 9 input of 3c, pin 8 of 1d, and pin 9 of 5c. The *'lo'* applied to 3c results in a *'hi'* at the output of the gate which is inverted by 2b; the resulting *'lo'* "resets" the latch 3a/3b and thus removes any flashing "call" indication left by a visitor when no-one was at home.

The *'lo'* applied by S1 to 1d pin 8 causes the output of 1d to go *'hi'*—this results in an "audible enable" command from 2c and opens the system. The householder can now hear what is happening at the door and is able to use the microphone if necessary. The other *'lo'* imposed by S1 to pin 9 of 5c inhibits the flashing indications given by LED3 and LED4 fed by the pulsing output from Tr5, and makes them constant "on" indications instead. This is to differentiate between the "override" and "automatic" modes of operation.

This, then is how the logic works. Before we leave it, though, a few miscellaneous points. When the unit is first switched on, it is useful if the latch 3a/3b sets up correctly in the "reset" condition (pin 3 *'lo'*, pin 4 *'hi'*). This is achieved by the time constant of R13 and C6 which ensures that a *'lo'* is applied to gate 3c pin 8 until C6 is charged—the *'hi'* output from 3c is inverted by 2b and is fed as a *'lo'* "reset" command to pin 6 of 3a.

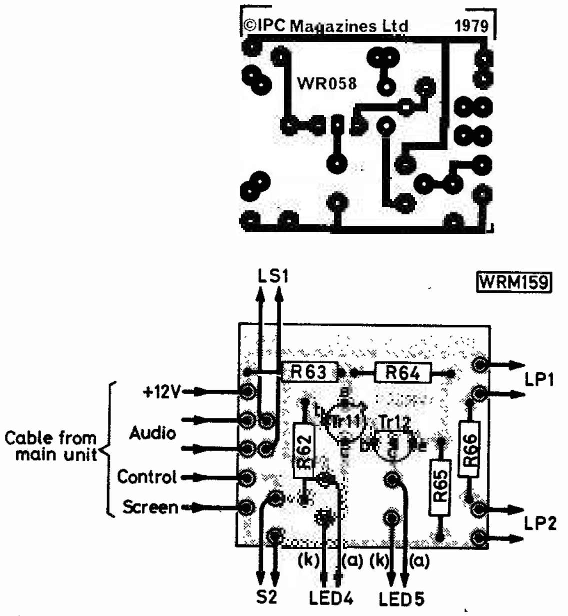


Fig. 6: Component placement and (top) the copper track pattern of the p.c.b. for the door unit shown full size

The relay, you will notice, is fed directly from the +17V supply; obviously, there is no particular need for a relay supply to be regulated and this approach reduces the load on the regulator. Diode D11 quenches any back e.m.f. emanating from the relay coil when it de-energises.

Regarding individual components—R20, R21 and C7 form an "anti-glitch" integrator which prevents transients from triggering the latch. Resistors R11, R26 and R33 prevent excessive input drive to their respective gates when in use as oscillators, and R17 performs a similar function for 4b and 3d after the end-of-sentence "one-shot" signal from C5, referred to earlier.

Construction

Both units are housed in the readily obtainable plastic cases specified in the main components list (see Part 1 in our August issue); Figs. 3, 4 and 5 show the drilling details for both. When drilling the main unit base, take care that you drill the correct end—the p.c.b. mounting holes are differing distances apart and the board will therefore fit in only one way! The transformer is mounted directly above IC1 and IC2, which is why we have specified low-profile mounting sockets for these items, and the cover fits so that the l.e.d.s are above the relay. Fuse FS1 can be glued quite conveniently on to the flat surface of the transformer frame.

Obviously, if the door unit is to be mounted in a particularly storm-swept position you might have to give some thought to using a more weatherproof type of container. A diecast aluminium box with integral sealing grommet (RS Components 509-305 for example) comes to mind, but this will cost a good deal more and, under normal conditions, the specified plastic case should prove quite adequate. Do take care, though, to insert a polythene membrane between the speaker and the front panel—the unit will not give of its best if the speaker cone is soggy! Applying patent black sealer around the joint between base and cover and around the cable-entry grommet will provide extra protection; seal over the screw-heads with the same material to make quite sure of a reasonably waterproof job.

With regard to securing the speakers in the cases, impact adhesive or double-sided fixing pads were found to be simplest and best for the main unit. The corner of the speaker flange must be sawn off in order for it to be correctly located in the main unit cover (see photo—resist the temptation to use tin-snips as this method may well distort the flange and damage the bond between it and the cone). Also, to avoid the possibility of the l.e.d. lead wires short-circuiting we found it best to discard the wire securing-clip supplied with the relay p.c.b. mounting socket. Use, instead, a piece of foam stuck to the inside of the cover (see photo)—this should brace the relay into the socket quite adequately.

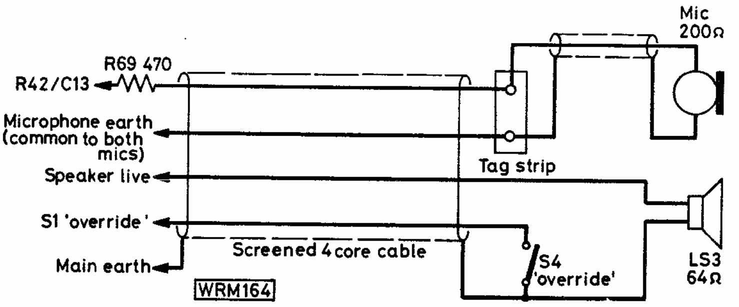


Fig. 7: Front door unit wiring diagram

In the case of the door unit, the polythene membrane (ungluable!) means that a different method of mounting the speaker must be employed. In constructing the prototype, we manufactured supports from a polystyrene sheet and then glued them to the front panel (see photo) using polystyrene solvent; rapid-setting epoxy adhesive was used to finally fix the speaker securely in position. You might, alternatively, consider using a wire strap across the speaker's diameter, fixed to the back of the front panel at each end with epoxy adhesive and a cable-clip and braced against the speaker magnet with a piece of foam. Also, a good idea before finally sealing and screwing down the cover (i.e. after final testing and setting-up is complete), is to fill the interior with a foam to prevent resonances—the unit will then sound much less "boxy" in tone.

The photograph of our prototype door unit shows the components mounted on Veroboard and adhering to the front panel—obviously the purpose-made p.c.b. (Fig. 6) is smaller and neater but, whichever you choose, it would be more tidily placed at the back of the unit. Double-sided tape or similar would provide an adequate fixing but be sure to leave the wires to the l.e.d.s, S2 and the lamps long enough to permit easy opening of the unit should repair work be necessary!

With regard to the inter-unit cable, this should be "hard-wired" into the door unit (i.e. no plug and socket). At the main unit end also, the cable can be directly soldered to the p.c.b. Alternatively, you might like to terminate it with a 185° 5-pin DIN plug; you will then need to modify the drilling details shown for the base of the main unit so as to accommodate the appropriate socket. As the intercom is intended for permanent installation, however, the use of these items is barely justified—it is for you to decide!

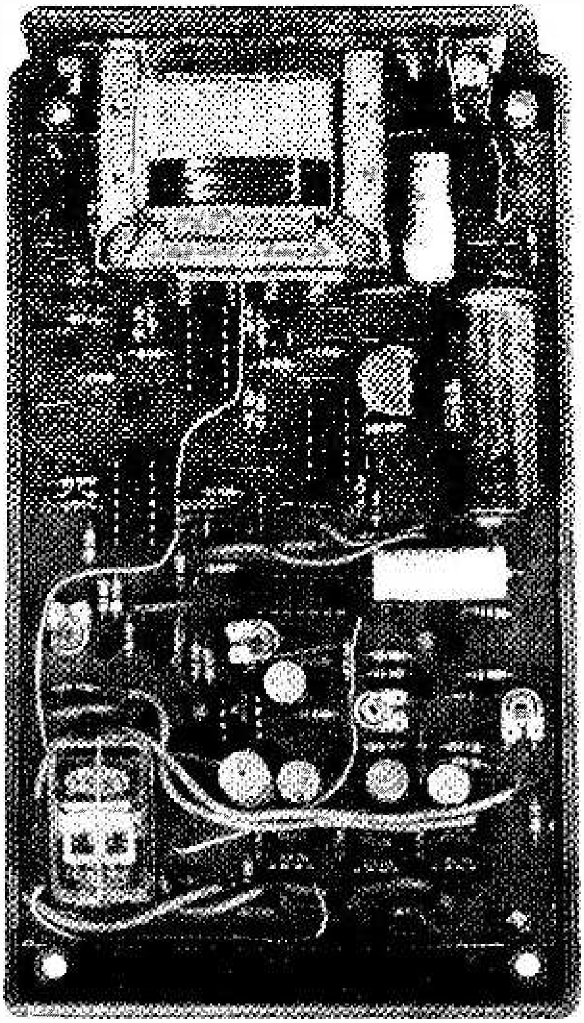
You will note that a miniature "on" l.e.d. is provided (LED6). This is a push-fit into its hole in the main unit cover and is secured with a blob of epoxy glue: it is fed from the +17V line via R68. A mains on-off switch (S3) is fitted so that the system may easily be switched off at night, during holiday periods or in the faces of particularly objectionable callers.

Next, a word on sleeving. Obviously, all points where bare wire meets bare wire (l.e.d.s are the prime example) should be properly sleeved—it makes for a neater job and will prevent all manner of short-circuit troubles! Take particular care to sleeve the mains input connections to the on-off switch and transformer, of course. Naturally, only one l.e.d. requires an earth connection to the p.c.b.—the others can then share that earth via a common wire. Once again, remember to leave all wires long enough to permit the unit to be conveniently opened for fault-finding etc.

Finally, do take the standard precautions when handling the CMOS chips: keep them in conductive foam until required; avoid touching the pins with your fingers, particularly if you are wearing synthetic clothing; have the sockets ready-soldered into the p.c.b. and then insert the chips directly into them.

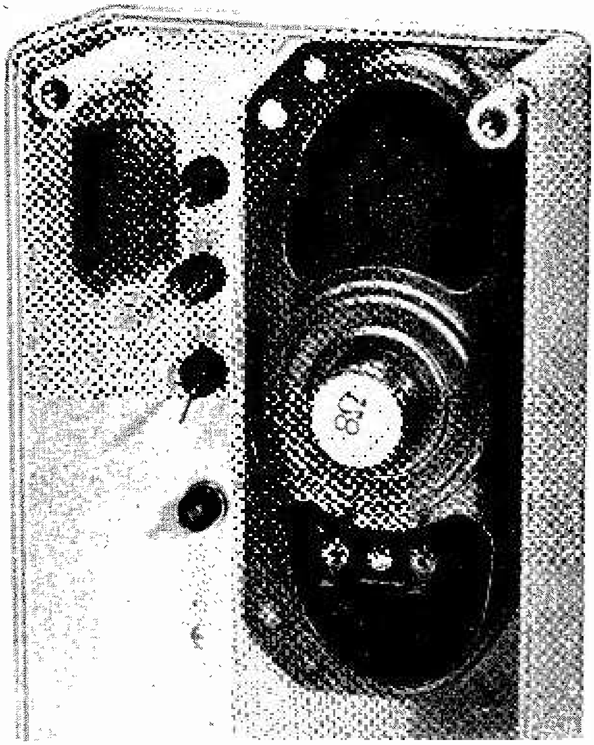
Setting Up

Do not switch on, or connect the mains supply until you have given your completed unit a careful visual inspection. When you are satisfied that all is well, set the "audio gain" (VR3) and "set a.g.c." (VR4) to a minimum and switch on; check that the +17V and +12V supplies are present. Press S1 ("override"), check that LED3 and LED4 illuminate (door unit "speak" and main unit "listen"), speak into the microphone and adjust "H speech threshold" (VR1) until RLA operates as soon as you start



Above: Internal view of the prototype main unit

Below: Main unit cover showing speaker mounting position



CB—AN UNBIASED REVIEW

▶▶▶continued from page 23

biased against CB. Incidentally, the writer is also, in a very small way, a "kitchen-table mail order dealer"!

To Sum Up

Hopefully therefore, the issues raised and conclusions attempted are presented impartially. They are as follows:

1. The majority of UK citizens are not demanding two-way radio facilities—most of them have never heard of CB.

2. The increasingly vociferous minority, most of whom have a vested interest, have not made out a case for the granting of facilities additional to those already available to people whose sole requirement is simply to communicate. There may well be many people, as suggested in the June '79 editorial page of *PW,* who, like one of their correspondents, seem unable to pass the RAE. Many people regularly fail their driving test also.

Schoolboys, housewives and sixty-year-old grandfathers continue to pass the RAE with flying colours. The new, recently introduced RAE format barely requires the ability to write. But the CBers continue to support their case for an examination-free licence almost entirely on the fact that an examination is required, rather than producing evidence as to why it should not be so.

3. It would not be too difficult to provide an allocation in the u.h.f. part of the spectrum for CB operation. Low-power equipment would ensure range limitation, providing frequencies adequately removed from existing amateur bands were designated, in order to prevent illegal modification of high-power amateur gear.

4. Unless there were a complete ban on the importation, sale and licensing of foreign equipment, the UK market would be saturated almost overnight with sets produced in the Far East, whatever frequencies were designated. In the domestic market for instance most British manufacturers have already opted out—or been forced out—and now have their equipment made overseas. Without a firm political commitment there would be no market for British firms.

5. There would need to be a massive increase in those government departments dealing with licensing and interference investigation, etc., since there would be no point in formulating legislation which was not practicably enforceable.

Perhaps the final words should be: Do we need CB? And if the answer is Yes! Then a more difficult question is Why? ●

to speak. Next, increase the audio gain (VR3) until the required sensitivity is achieved.

Having released the "override" button, check the call from the door unit and adjust "pip level" (VR2) as required. Now adjust "set a.g.c." (VR4) until the speech is "compressed" to the required level, remembering that excessive audio gain may cause extraneous noises to keep the system open, even though conversation has ceased.

If all is not as it should be, check the logic levels at the gate outputs using a fairly high impedance meter (10kΩ/volt or greater). Fault-finding is not difficult if you adopt a logical approach—making pencilled notes on your circuit diagram is a good way of getting to the bottom of the more ticklish problems.

Extension Unit

What if I am in bed, I hear you cry! Well, it's quite simple—you need to build in the extension unit, and you will be pleased to learn that it is quite straightforward and inexpensive to do so.

The extension unit does not include the indicator l.e.d.s but the householder should still hear the "end-of-sentence" pips, of course. Use the same four-core screened cable to provide the connection with the main unit as you used to connect the door unit; the circuit diagram is shown in Fig. 7.

The second microphone is connected via R69 to the input of IC7; either maybe used when replying to a caller, and there is no interaction between them. The op. amp ensures that neither "sees" the other, in fact.

The plastic box and speaker are of the same type as those used in the door unit. The drilling of the box lid is also identical—simply omit the holes for the l.e.d.s and lamps. The speaker impedance of 64Ω allows it to be connected directly in parallel; with the main unit's 8Ω speaker—this gives a 9dB difference in power output, but in practice this does not seem to be very obvious. Both speakers emit the "call pips" when a visitor presses the button, so this could prove to be an advantage in a large house.

The "override" switch (S4) on the extension unit is also directly in parallel with its main unit counterpart, therefore the system can be opened by pressing either.

If you used a DIN plug and socket to provide the connection between main and door units, you may like to connect the extension unit in the same fashion. If you do, you will probably find it nigh-on essential to bring the extension unit cable into the top of the main unit rather than into the bottom. Also, it would be a good idea to use a 270° DIN plug for the extension cable entry. Any possibility of confusion between that and the door unit cable is then removed.

Once again, fill the interior of the unit with foam to avoid resonance.

Final Hints

Take care to install the microphones at least 12in. away from either main or extension units to avoid the unpleasant effects of feedback.

Finally, make sure that the whole family understands the system and how to use it; try it out with different members on the doorstep. When inside, remember that you will hear a pip when you stop speaking and if you don't hear the pip, it means that the message has not been received—try again, but speak a little louder the second time! ●

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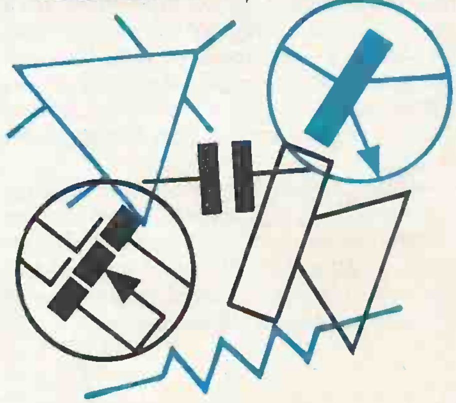

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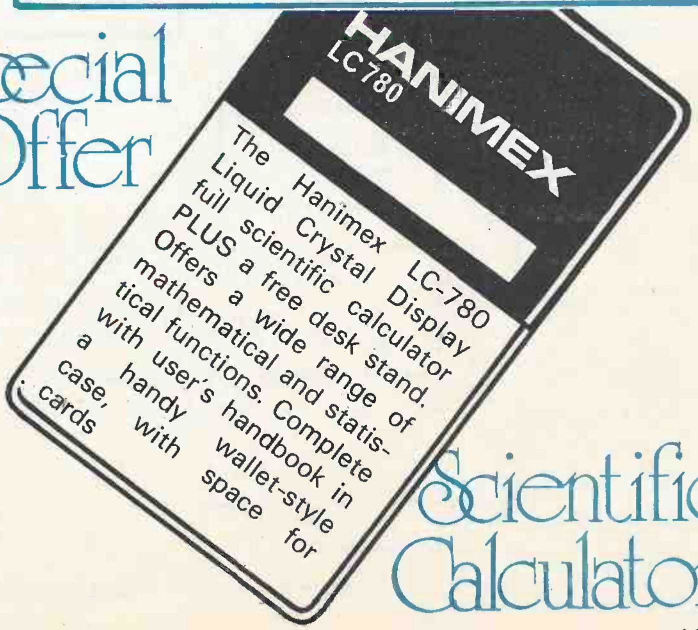


FM NOISE BLANKER

R.A.PENFOLD

Many readers will be familiar with the clipper type of noise limiter which clips the signal at about the peak level it will normally achieve, leaving the main signal largely unaffected. However, any high amplitude noise spikes which would otherwise be well in excess of the normal peak audio amplitude will be severely clipped and reduced in level, and their nuisance value will be significantly diminished.

While this type of noise limiting device is extremely simple, often consisting of little more than a couple of diodes, it obviously only provides a marginal improvement in the signal. It also tends to introduce significant levels of distortion and is therefore only really suitable for use in communications receivers, and similar applications where intelligibility rather than fidelity is of prime importance.

A less well-known form of noise reduction device is the noise blanker, which provides a much greater improvement than a limiter, although it is admittedly considerably more complex. A good noise blanker will produce little loss of fidelity, and is perfectly suited to high quality applications as well as to communications systems.

In essence the action of a blanker is extremely simple. For the period of the noise pulse it simply switches off the signal so that the pulse is replaced by a period of no signal whatever. The length of the blanking period may, in some circumstances, be made so short that it is almost totally inaudible. Sometimes it is necessary to use a comparatively long blanking period and a more evident audible effect will be produced, but the gap in the signal will still be too short to be heard as such. In either case the gap in the signal is far less troublesome than the noise spike, and a very considerable improvement in the signal is obtained.

The blanker described in this article is for use in f.m. radios and is intended to combat car ignition interference.

Operation

The f.m. noise blanker is based on the KB4423 i.c., designed specifically for this task. The circuit is connected between the output from the detector and either the audio amplifier or stereo decoder input, as appropriate. In the case of a mono radio it is essential that the de-emphasis

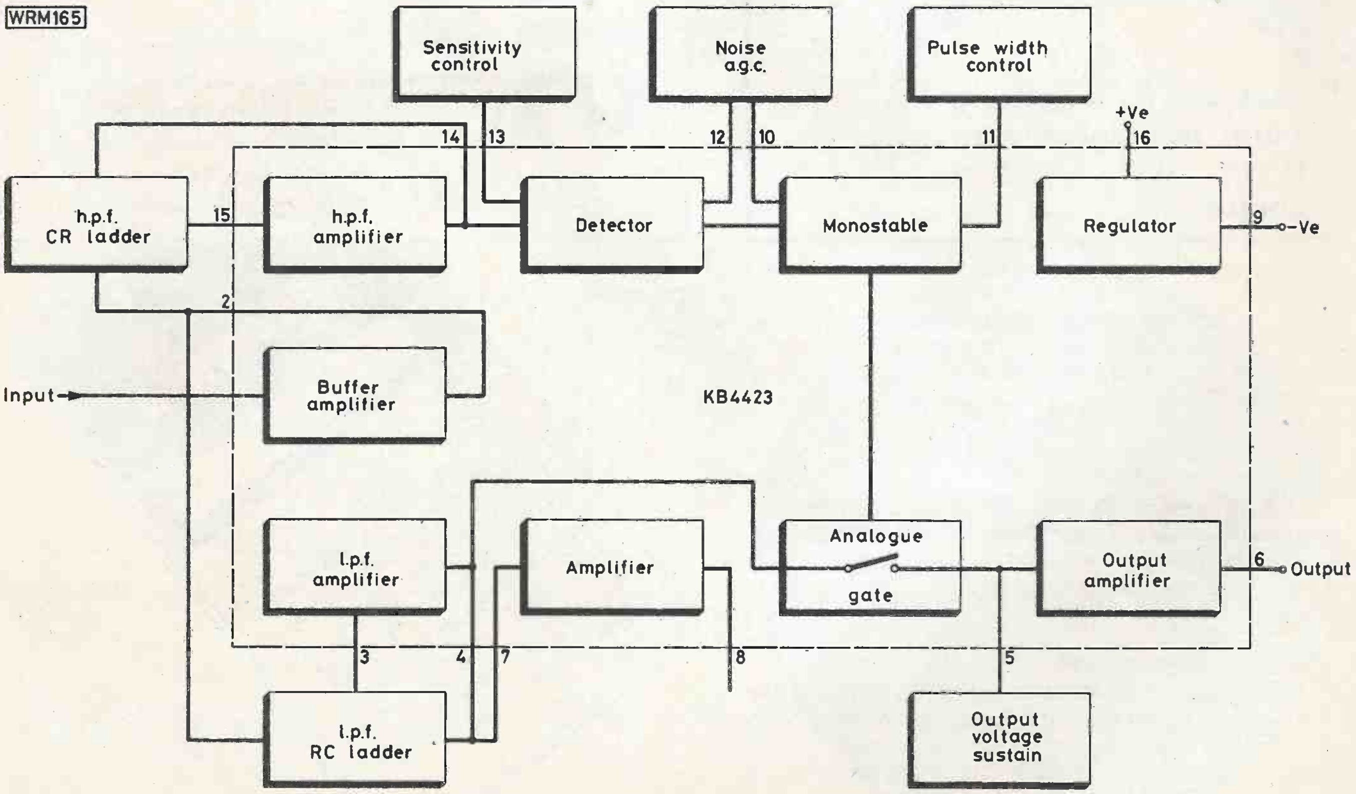


Fig. 1: General arrangement of the f.m. noise blanker based on the KB4423 i.c.

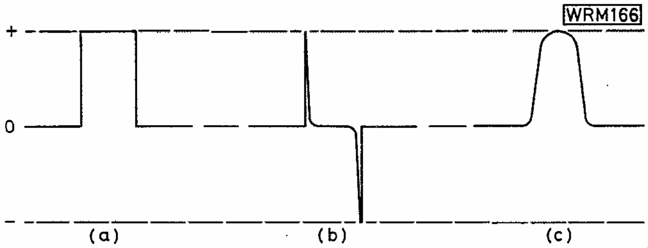


Fig. 2: The output of the high pass filter (b) and low pass filter (c) for a rectangular pulse input (a)

capacitor is removed from the detector circuit and that the de-emphasis is applied at some point in the system after the noise blanker. In a stereo radio this will be achieved without the need for any modifications. It is recommended that inexperienced constructors should not undertake this project unless they are quite sure they have the necessary knowledge to enable them to successfully incorporate the finished unit into a receiver.

Fig. 1 shows in block diagram form the general arrangement of the circuit. The area within the broken line represents the KB4423 device, and the blocks outside this line represent discrete circuitry.

The input signal is taken to a buffer amplifier and the output from this is split into two sections. One part is taken to a low pass filter and the other part is fed to a high pass filter. The low pass filter output contains the audio signal, and in the case of a stereo signal (which will still be multiplexed) it also contains the necessary high frequency components, as the filter cut off frequency is approximately 75kHz. The output from the high pass filter will consist only of noise as this has a cut off frequency of about 100kHz. Most of the filter components are external to the i.c., the latter merely providing the amplifiers for the filters which are both of the active type and have fast roll off rates.

An analogue gate is fed with the output from the low pass filter, and this gate normally enables the signal to flow straight through to the output via a buffer amplifier. The output from the other filter is connected to a detector circuit which produces a suitable trigger pulse for the subsequent stage, a monostable multivibrator, in the presence of a noise spike at the input.

The output pulse from the monostable is used to control the gate and the gate blocks the signal in the presence of a control pulse. The monostable pulse length is chosen so that it is just long enough to blank car ignition impulses, which are extremely brief (only a fraction of a millisecond). Many other types of impulse noise are considerably longer in duration incidentally, and so will not be fully blanked by this device.

An output voltage sustain circuit is connected at the output of the gate circuit, and this maintains the output voltage at whatever value it happened to be when the signal was initially blanked, until the blanking is complete. If this was not done it is quite possible that the circuit would suppress the input pulse, but would generate an output pulse as the output assumed its natural quiescent level for the blanking period. This would only produce a modest improvement in the signal.

A noise a.g.c. circuit is incorporated in the detector and monostable circuitry, and this prevents spurious operation of the device in the presence of a high continuous background noise level. A buffer amplifier is connected between pins 7 and 8 of the KB4423, and this can be used to obtain an ungated 19kHz pilot tone signal when the unit is used in a stereo system. However, this facility is not normally required. A supply regulator circuit is contained within the KB4423 circuitry.

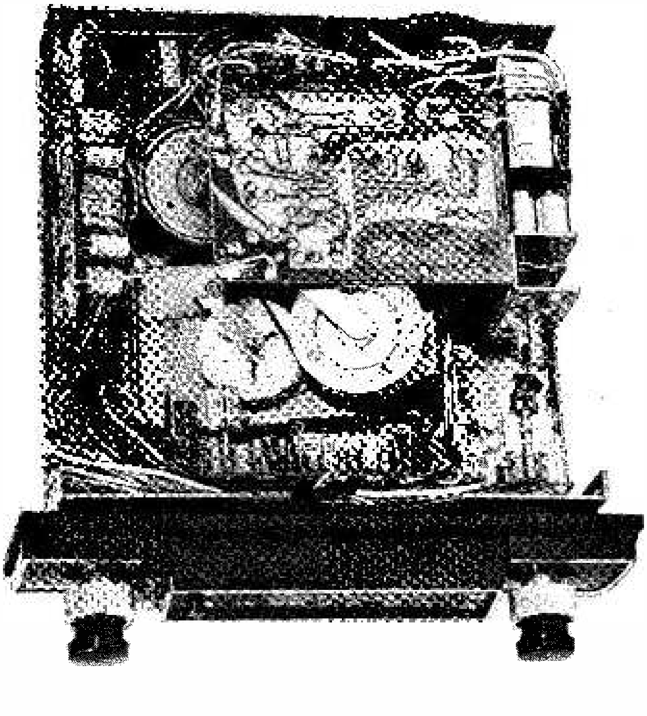
The KB4423 requires a nominal supply potential of 12 volts, but will operate at voltages as low as 8 volts, with the absolute maximum permissible supply voltage being 18 volts. The gain of the circuit is unity (plus or minus 1dB) and the maximum distortion with an output level of 500mV. r.m.s. is only 0·1%. At least 1·5V r.m.s. is needed at the output before the distortion level reaches 1%. The current consumption of the circuit is no more than 25mA. The device has the wide operating temperature range needed for car radio applications, the actual range being −20 to +70°C.

Filtering

The purpose of the high and low pass filtering is to ensure that the main signal is blanked before the input pulse has reached a significant amplitude on this signal. This works in the following manner.

If the input is a rectangular pulse as in Fig. 2(a), it will contain a multitude of frequencies ranging from audio to radio frequencies. It is the high frequency content that gives the waveform its very fast rise and fall times. The output from the high pass filter therefore has a rapid rise time, as shown in Fig. 2(b), and this gives virtually instantaneous operation of the monostable and gate circuits. On the other hand, the lack of high frequencies at the output of the low pass filter will give the signal here a relatively slow rise time, as shown in Fig. 2(c). This means that the signal here will have only just started to rise by the time the gate circuit has been operated, and so the blanking action almost totally eliminates the pulse.

Of course, actual noise pulses will not be straightforward rectangular signals of the type shown in Fig. 2(a), but for more complicated pulse signals the basic method of operation is precisely the same.



The author's prototype installed in a car cassette/ radio. The final version is much smaller (see Fig. 4)

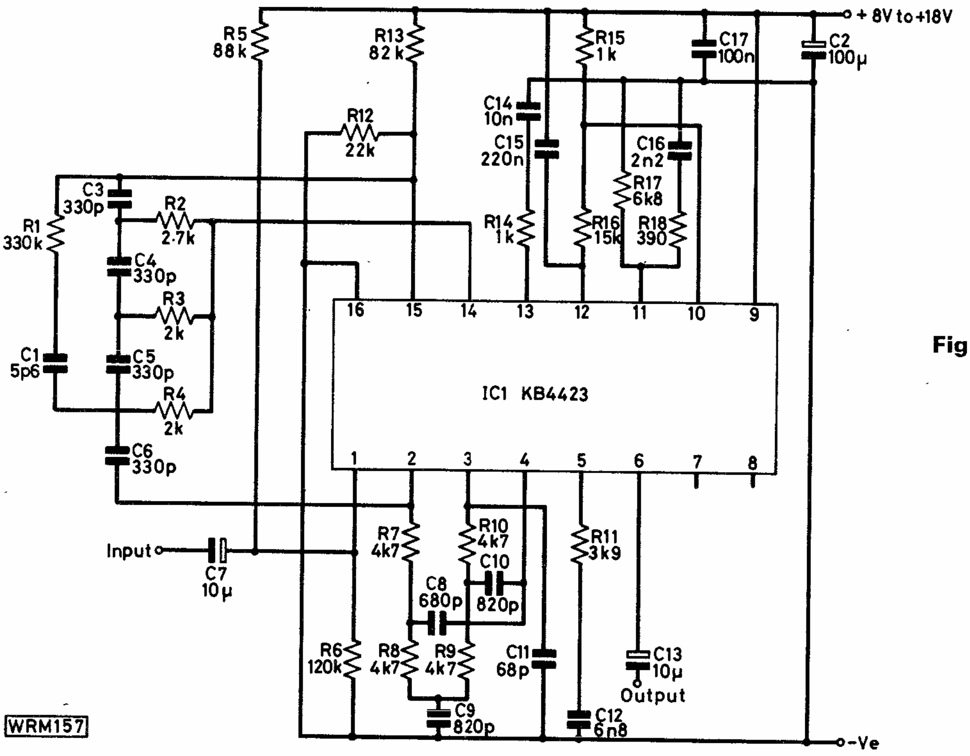


Fig. 3: Complete circuit diagram

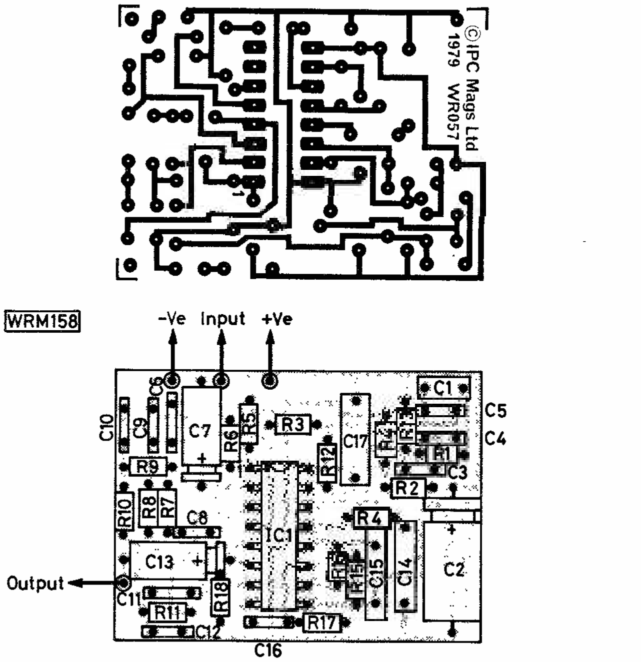


Fig. 4: Component layout and copper pattern of the p.c.b. (shown full size).

The Circuit

The complete circuit diagram of the f.m. Noise Blanker appears in Fig. 3. R5 and R6 bias the input buffer amplifier and C7 provides d.c. blocking at the input.

R7 to R10 are the resistive elements in the low pass filter R-C network, and they also bias the low pass filter amplifier from the output of the input buffer amplifier. C8 to C11 are the capacitive filter elements. The operation of this filter is quite straightforward, and is a two section filter of the type used in scratch filters and similar applications. R7 plus R8 in series form a simple passive top cut filter in conjunction with C9. A second filter of the same type is formed by R9, R10 and C11. The filter amplifier has unity gain, and so at frequencies within the passband of the filter C8 and C10 have no effect on the circuit. This must be so, as any change in the input voltage is matched by an identical change in the output voltage. Any voltage change at the left-hand terminal of C8 or C10 is thus matched by an identical change at the right-hand terminal. This technique is known as bootstrapping and gives these two components an apparent infinite impedance at filter pass frequencies.

At frequencies where the passive top cut filters provide a degree of roll off, the circuit will provide less than unity gain overall, and both C8 and C10 will have a finite impedance. C8 then forms a low pass filter in conjunction with R7, as does C10 in conjunction with R9. The two bootstrapping capacitors thus greatly increase the roll off rate of the filter.

R12 and R13 bias the high pass filter amplifier, and the capacitive elements of this filter are formed by C3 to C6. The resistive elements are formed by R2 to R4 and the input impedance of the filter amplifier. This filter works in the same basic manner as the low pass one, but the resistive and capacitive elements are transposed so that a high pass action is produced.

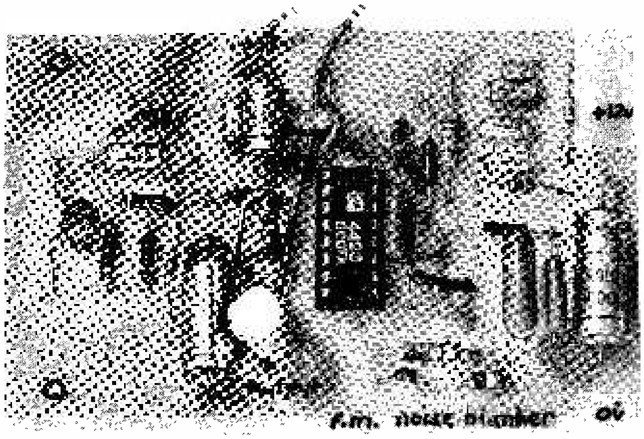
R11 and C12 are the voltage sustain components with the charge on C12 being used to sustain the output voltage for the period of the blanking. R11 prevents C12 from providing an significant high frequency roll off. R14 controls the sensitivity of the pulse detector circuit and C14 merely provides d.c. blocking. R15, R16 and C15 are the discrete part of the noise a.g.c. circuit. R17, R18 and C16 are used to control the monostable pulse width. C2 and C17 are supply decoupling capacitors and the output is obtained via d.c. blocking capacitor C13.

Construction

The circuit can be accommodated on a small printed circuit board using the component layout and copper pattern reproduced actual size in Fig. 4.

★ components

Resistors		
$\frac{1}{8}$W 5%		
390Ω	1	R18
1kΩ	2	R14, 15
2kΩ	2	R3, 4
2·7kΩ	1	R2
3·9kΩ	1	R11
4·7kΩ	4	R7, 8, 9, 10
6·8kΩ	1	R17
15kΩ	1	R16
22kΩ	1	R12
68kΩ	1	R5
82kΩ	1	R13
120kΩ	1	R6
330kΩ	1	R1
Capacitors		
Ceramic plate		
5·6pF	1	C1
68pF	1	C11
220pF	4	C3, 4, 5, 6
680pF	1	C8
820pF	2	C9, 10
2·2nF	1	C16
6·8nF	1	C12
10nF	1	C14
100nF	1	C17
220nF	1	C15
Electrolytic, axial leads		
10µF 25V	2	C7, 13
100µF 25V	1	C2
Semiconductors		
KB4423	1	IC1
Miscellaneous		
Printed circuit board.		



View of the author's prototype board

The most obvious use for the circuit is in car radios, but car ignition interference can also cause problems in fixed f.m. equipment, and one prototype was incorporated in a home constructed tuner amplifier. This has a quadrature detector using a SN76660N i.c. and a stereo decoder using a MC1310P i.c., and the blanker seems to be perfectly compatible with this unit. It should also work well with any other system provided the audio signal level is not too low (more than about 100mV) and the high frequencies needed to trigger the unit are present. ●

RADIO SPECIAL PRODUCT REPORT

SWAN ELECTRONICS

100 MX SSB TRANSCEIVER Part 1

Modern Amateur equipment is gradually turning away from valves, even in p.a. stages, while at the same time, receivers are appearing that are, at last, as good as valved receivers. However, the equipments are fairly costly—not, it is true, as relatively costly as, say, KW2000 was ten years ago—but still sufficiently so as to make a full examination of the specifications and the closeness or otherwise of the approach to them worthwhile. In addition, the technically minded may well wish to know more about the performance than they can measure with equipment available to them, and a better comparison with other makes is more easily performed—especially since many of the more vital parameters are ignored in the specifications!

The Swan 100MX is the latest in a long line of Swan transceivers going back some years. It is all solid state, and was designed very much with mobile installation in mind, although a matching a.c. power unit and an a.t.u. are available. These make the system very attractive—for example, the rig could be used mobile, or with a piece of wire thrown out of the window, in say a hotel or caravan. The transceiver is quite small, and handles easily—so much so that the author was able to put it on the air without the handbook! Perhaps the main criticisms of the handling are that the main tuning knob is rather on the small side for fixed station use, while the i.r.t. range is greater than required, and thus rather critical to set. The mic. gain control sets the drive on c.w. and is also extremely critical to set. However, these are really minor points, while some very clever points were found. Especially appealing to the author were the use of the mic. socket for the Morse key on c.w. and the provision for switching the dial lights off—very useful for avoiding awkward reflections at night. The power cable has provision for feeding 12 volts to the a.t.u. to illuminate the meters, but this cable is fairly short, and the facility cannot be used in all installations.

The a.t.u. is of a novel design for the Amateur market. For many years now, the only a.t.u.'s available have been of the "Z Match" variety, which use a minimum of variable controls and allow the operating of the matching circuit to vary wildly. This variation is the cause of some impedances making the a.t.u. catch fire, even at low power levels. The ST3, however, uses three variables in a T configuration, with a tapped inductor and two variable capacitors. A balun is fitted for feeding balanced feeders.

★ specification

Frequency coverage:	80m, 40m, 20m, 15m, 10m bands
Modes:	u.s.b., l.s.b., c.w.
Power output (r.f.):	100W p.e.p. and c.w.
Audio power:	4W
Loudspeaker:	Built-in, sockets for external speaker at rear
Power supplies:	11 to 15V d.c.
Other features:	Noise blanker, VOX, 25kHz calibrator, c.w. sidetone, semi-break in c.w., 9MHz 8 pole crystal into i.f. filter.

General Description

The Swan 100MX is a single conversion transceiver, using an i.f. of 9·0165MHz, with injection to the mixer derived from a pre-mixer system, in which a crystal oscillator output is mixed with a 5·0—5·5MHz signal derived from the v.f.o. This pre-mixed signal is suitably filtered to reduce the chances of spurious responses.

A noise blanker is fitted, as is a c.w. sidetone oscillator, VOX, and a 100/25Hz crystal calibrator. A separate mains p.s.u. is available in a matching cabinet, which also incorporates a larger loudspeaker than that fitted in the transceiver. The ST3 aerial matching unit is also in a matching

cabinet, and provides a very flexible matching system to allow use with a multiplicity of aerials. The incorporation of a balun in the a.t.u. makes it suitable for aerials with balanced feeders, and forward and reverse power indication is provided to allow easy tune up.

Figure 1, reproduced from the handbook, shows the block diagram for the equipment when in the receive mode, while Fig. 2 (next month) shows the transmit mode. In the receive mode, signals are amplified in the preselector section by a MOSFET amplifier with diode switched tuned input and output circuits, and a.g.c. control. The signal is routed via a diode switch to the main circuit board in the transceiver, where it is applied to the input of the first mixer. Injection for the first mixer is now amplified in a single transistor amplifier, passed via an f.e.t. gate for the noise blanker to another single transistor amplifier which drives the crystal filter. The output of the crystal filter feeds a 757 integrated circuit amplifier, which in turn feeds the MC1496 balanced demodulator. Another f.e.t. gate follows this stage, and is used to mute the audio feed to the rest of the receiver when in transmit. A single transistor provides audio pre-amplification, after which a TBA810S acts as the a.f. output stage. A transistor detector and part of an LM358 dual op. amp. provides e.g.c. to a gain control line which is common to both transmit and receive, and which is applied to the 7575 amplifier and to a p.i.n. diode attenuator immediately preceding it.

On transmit, the a.f. from the microphone is amplified in part of the LM358, and applied to the first mixer, which now acts as a balanced modulator. The resulting double sideband signal follows the same path as described for the receiver, until the product detector i.c. is reached, where the signal is heterodyned to the operating frequency. Thus the injection frequencies to the two mixers are reversed between receive and transmit, and the switching is done using an MC1496 double balanced mixer i.c. as an analogue switch to route the signals as required. A 555 timer i.c. acts as a c.w. sidetone oscillator, while the c.w. function is performed by unbalancing the balanced modulator and allowing the carrier to provide drive. To prevent a jump between transmit and receive frequencies, the v.f.o. is shifted by 800Hz when on c.w. transmit.

The output from the MC1496, which is at final frequency, is routed to the pre-selector board, and via an extra amplifier stage, which is only in use on transmit to the p.a. stages. The power amplifier board consists of five stages—an emitter follower driving a 2N3866 Class A amplifier, a 2N3553 Class A stage, a pair of MRF433's and a pair of MRF458's as the p.a. stage. The p.a. and driver transistors are Motorola devices, and rather surprisingly, the MRF458 does not appear in the latest Motorola catalogue—suggesting either a misprint in the handbook, or that the device has been changed by Motorola. No attempt was made to disassemble the transceiver to find out what was fitted, but the r.f. power transistor market is very competitive.

The p.a. circuit uses a large amount of negative feedback to stabilise gain and flatten the frequency response, and the bias is stabilised against temperature variations in a manner very similar to that used on the *PW* Trent amplifier.

The output of the wideband p.a. stage is routed via a set of low pass filters, switched selected for band and a built-in reflectometer. This is arranged to provide a.g.c. from the forward power component of the signal, while, in the event of a mismatched feeder, the reverse power is also detected and used to reduce the drive, thus protecting the p.a. transistors.

The crystal calibrator uses a 10MHz crystal, and 74C series TTL compatible CMOS Logic to divide down to 25Hz. VOX is obtained from a 1458 dual op. amp., and a 555 timer i.c. arranged to give the required VOX delay. Anti-vox is provided, and the whole circuit board has been well designed—it is a much less "bitty" circuit than some of the others used in the equipment.

The equipment is contained in a black crackle painted cabinet 95 x 248 x 295mm, and weighs 6kg. As mentioned earlier, the a.c. p.s.u. and a.t.u. are contained in matching cabinets. The a.c. and p.s.u. operates from either 115 or

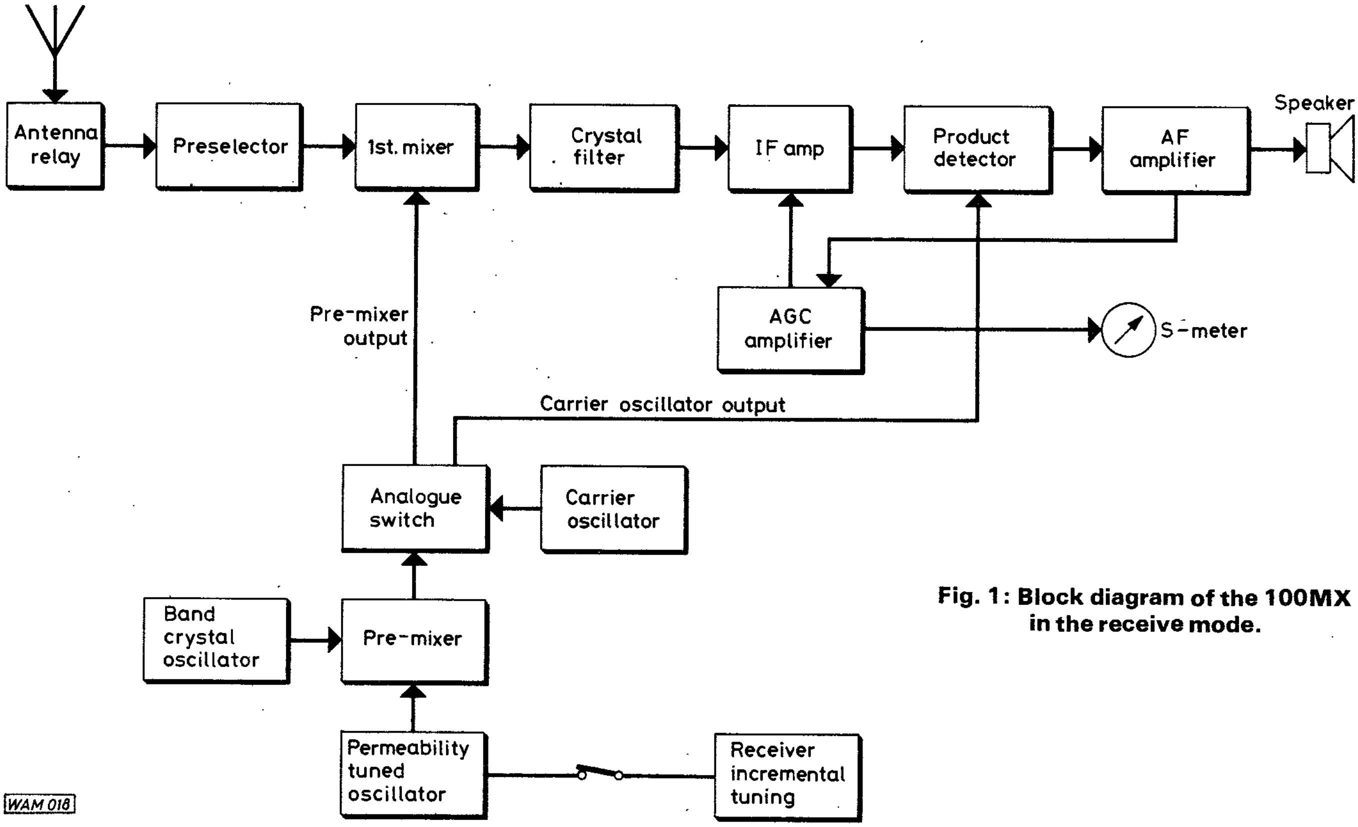


Fig. 1: Block diagram of the 100MX in the receive mode.

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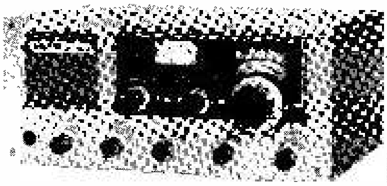

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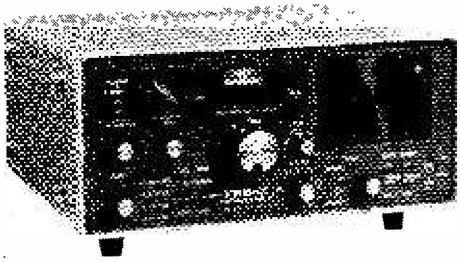

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230 volt a.c. supplies, and although not rated for continuous operation, is quite satisfactory for normal s.s.b. and c.w. use. The front panels are well laid out, but the small size of the equipment is rather reflected in the size of the control knobs, which are rather on the small side. The microphone plugs into the front panel, and the same socket is used for the key. An external speaker may be plugged into the rear of the equipment, where there are also facilities provided for controlling a linear amplifier.

Controls are: tuning, RIT (pull for on), r.f. and a.f. gain controls (concentric), bandswitch, pre-selector, mode switch, VOX/PTT, noise blanker and calibrator/dial lamp switch.

Measurement Techniques

The measurements were made with a view to producing the maximum amount of information with the least number of actual measurements.

Receiver measurements were made on the following parameters: sensitivity, including signal-to-noise improvement, a.g.c., S meter, a.f. output power, intermodulation, cross-modulation, blocking, internal spurious (whistles), external spurious responses, reciprocal mixing, dial calibration and drift.

The receiver sensitivity was measured in terms of the SINAD ratio (signal plus noise, plus distortion to noise, plus distortion ratio), and the SINAD ratio was measured at various levels of input. This gives a very good test of the gain control distribution of the receiver, as quite obviously, a larger signal should give a better signal-to-noise ratio. Hopefully, an increase of 20dB in input signal will give an increase in signal-to-noise ratio of 20dB, but this can happen to a greater or lesser extent. By measuring the distortion as well, a very good check is obtained on the total capability of the receiver. The change in audio output for a large change in input signal was also measured, and also the S meter calibration.

The claimed sensitivity by the manufacturer is that a 0·25μV signal will give a 10dB signal-plus-noise to noise ratio. This should give a 22dB signal-to-noise ratio at 1μV, and it is noticeable that in two equipments tested, the best SINAD ratio, which is very close to the same thing, only measured 19dB at best. However, the sensitivity is certainly adequate for most amateur operation, and although it has been claimed that the smaller signals available in mobile operation necessitate a higher sensitivity, the greater noise levels tend to negate this.

Traditionally, a.g.c. has been considered to be better if the output shows no change with a large change in input signal. This, however, is not really what is required. The less the change in output level, the greater the noise output when not tuned to a signal, and in practice, a variation of 6 to 10dB is quite acceptable. The Swan shows a smaller variation than this, but the a.g.c. has very good characteristics in terms of distortion of strong signals, and the noise ouput is not excessive. The a.g.c. is used to feed the S meter circuitry, and it was found that the S meter readings changed little from band to band. The usual calibration of 6dB per S unit is not followed, varying from 1dB at the low end to 10dB from S5 to S6, and then gradually reducing to around 6dB per S point before increasing again. However, most S meters are fairly similar in their characteristics, and in any case, the meter reading is rarely any more use than a report based on listening.

The a.f. output is greater than is usual in transceivers, but is necessary for mobile use where the ambient noise level can be very high.

Intermodulation is a very important feature of a receiver, and is unfortunately rarely quoted except by professional manufacturers. A top class receiver can be expected to produce a signal equivalent to 1μV input from two signals each at 15mV, or 84dB above 1μV. The 100MX is some 13dB or so worse than this on third order intermodulation, and although there are better amateur receivers, this represents an input intercept point of around 0dBm, which is a very satisfactory result in a mobile receiver, and better than many fixed station receivers. The second order intermodulation distortion is somewhat better, and again represents a very adequate result.

Cross-modulation is a term commonly misused in amateur radio, and it is interesting to find that no cross-modulation could be satisfactorily measured in this rig. Similarly, blocking was not occuring at levels of interfering signal of 50mV, but performance was limited by reciprocal mixing. Reciprocal mixing is an effect whereby a strong interfering signal causes the noise sidebands of the local oscillator to be heterodyned into the i.f. passband.

So if the local oscillator is very noisy, as in many synthesised systems, and all those using Wadley Loops, then a strong signal a few hertzs away, causes the signal-to-noise ratio of a weak signal to be degraded. Pre-mixed injection as used in the Swan and in the Drake transceivers suffers from this also, but not to such an extent. Older receivers, such as the HRO and AR88, with fairly high power oscillators are very good in this respect, while very good professional synthesised receivers are about as good as the 100MX at their best, and about 20dB worse as a typical figure.

Dial calibration is an obvious fault when it is far out, but provided the dial is zeroed at the nearest 100Hz point, the accuracy is more than adequate. Even without zeroing the dial, the error does not reach 3Hz.

Spurious responses are not only annoying, but can lead to unjustified complaints of interference. Testing involves tuning a signal through the range and measuring the level of each whistle for external spurious, and tuning the receiver throughout its range and measuring the whistles for internal spurious. The makers claim that internal spurious whistles do not exceed 1μV input, but it was found that this was not the case. The usual problem with a 5·0—5·5MHz v.f.o. occurs on 21·2MHz, where the 4th harmonic of the v.f.o. falls on the receive frequency, and the suppression should be rather better than the 10μV measured. External spurious responses include image and i.f. rejection, and it can be seen that in general, a spurious response is produced by signals greater than 1mV. This is not a particularly good figure, but in mobile use, the extra selectivity of the resonant whip will help enormously. In fixed station use the a.t.u. will give some rejection, but because of the larger signals and relatively low Q of the a.f.u., these may cause a problem.

The RIT range was considered to be excessive, making the RIT control very "touchy" to get right.

Drift is a very difficult thing to measure—should it be measured from cold, over a given temperature range, on a receive/transmit cycle, or what? In the end, it was decided to measure drift from cold on receive only, and the results obtained were quite reasonable.

Prices

Costing £459 plus VAT, the Swan Electronics, 100MX SSB Transceiver reviewed was kindly loaned by Amateur Electronics UK, 508–514 Alum Rock Road, Birmingham 8. Tel: 021-327 1497, and we would like to thank them for their invaluable assistance in this respect.

Next month the transmitter section of the 100MX is examined.

BUILDING DISCO CABINETS

T. P. HOPKINS

When we saw the prototype of the *PW* "Soundlite", sound-to-light converter, published in our March 1979 issue, we were so impressed with the quality of the case that we thought it must have been professionally made. When we learned that the author had built it himself, we asked him to put pen to paper to describe his methods for the benefit of our readers, and here he reveals all.

In recent years, much interest has been shown in mobile equipment for music reproduction, either "live" or for Discos. Many designs for mixers, amplifiers and lighting control units have been published, but little attention has been paid to the rugged enclosures demanded in these applications. Cabinets may be bought commercially, but they are generally expensive and, in the writer's experience, often leave something to be desired in construction or finish. After some nasty experiences with poor-quality commercial cabinets some years ago, the writer has constructed all his own with some success. The techniques used are straightforward, require few specialist tools and can be applied by anyone with a little spare time and space.

Cabinet Design

An essential part of cabinet design is to plan carefully the final form of the equipment. Although some projects have been radically altered during construction, this cannot be recommended as a general technique! Useful decisions to make at this stage are proposed use, shape, size and overall layout, materials and final finish.

A good, general-purpose material is chipboard (either 12mm or 19mm thick). This has good acoustical properties and is strong enough for most applications. A tougher material is 12mm plywood which, although more expensive and too flexible for sealed loudspeaker enclosures, has good strength/weight properties making it ideal for mixers and consoles. Many cabinets require internal battens to provide rigidity and/or to allow the fixing of removable panels. Softwood of 25 × 25mm or 38 × 38mm cross-section will be adequate for all but the largest cabinets.

For amplifiers etc., the electronics should be mounted on a rigid chassis which may be slid in and out of the cabinet for ease of servicing. The method of fixing the chassis into the cabinet and the provision of ventilation grilles (if required) should be considered. For loudspeaker cabinets and light-boxes, the fitting of translucent panels, baffle-boards and decorative trim should be worked out, as well as the placement of handles, feet and castors.

An example chosen to illustrate the method is the construction of a "combo" amplifier/loudspeaker (see Fig. 1). This consists of a 50W amplifier measuring 432 × 89 × 240mm in a cabinet with two 305mm (12in) speaker units fitted from the rear. The material is 19mm chipboard covered with black Vynide cloth, and the cabinet will have a sealed back for general instrumental use. If preferred this could be left with the back open.

Woodwork

Having completed the design, the sizes of the various pieces of timber should be determined (see Table 1). Those with limited facilities or unsteady hands (like the writer!) are advised to get the boards cut-to-size; most retail timber merchants offer this service. Remember that if the panels are initially accurately cut, this will save much unnecessary work. For the combo-amplifier, it is better if both baffle-board and back are removable; the former so that the fretcloth is easily fitted, and the rear panel to allow access to the speakers. These panels should be at least 3mm smaller than the corresponding hole to allow room for covering materials. Battens will be required around both front and rear edges of the cabinet. Other speaker mounting arrangements may not require removable panels, especially if the drive units are front-mounted.

The construction of the combo-amp should proceed as follows: first assemble the outer panels and partition using plenty of glue (there are several excellent types available) and 3 or 4 pins or screws per joint. Excess glue is easily removed while wet with a damp rag or convenient finger. Remember that it is the glue that gives the strength to the joint; the pins are merely to hold the joint in place while the glue is setting. Each joint must dry **thoroughly** before any strain is put on it. Note that some woodglues will not set correctly in a cold, damp environment. All nails and screws should be sunk well into the wood, so that the remaining holes can be filled to a smooth finish. It is essential to ensure during construction that all joints are accurately made. A corner-clamp, if available, is extremely useful in producing a perfectly "square" cabinet. Wood battens are added after the panels using glue and nails, making sure that they are correctly cut and placed. When completely assembled, check that the front and rear panels fit reasonably well.

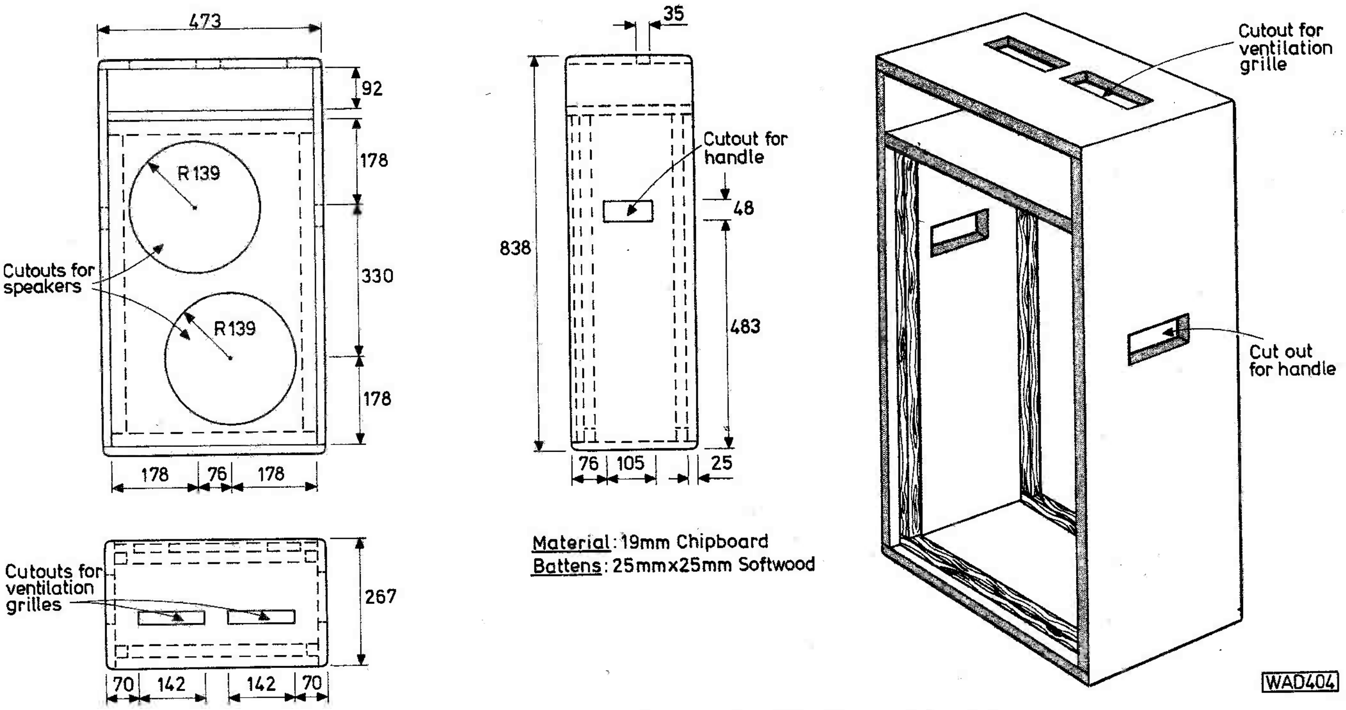
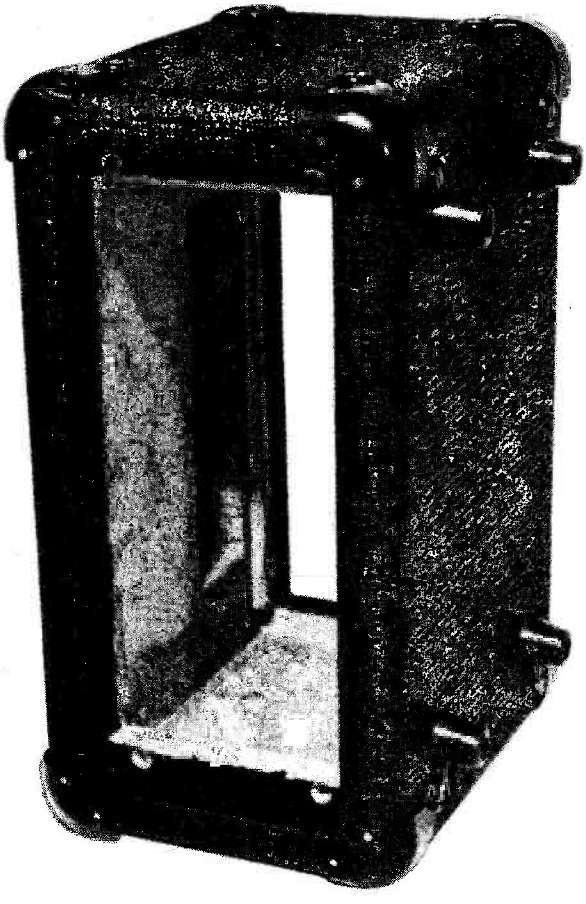


Fig. 1: Dimensions and assembly details of a combination amplifier/loudspeaker cabinet

Table 1: Materials For The Combo-Amplifier Cabinet

19mm Chipboard:	
Sides (2)	800 × 267mm
Top, Bottom	473 × 267mm
Partition	435 × 267mm
Front, Back	432 × 686mm
25 × 25mm Softwood battens:	
Verticals (4)	629mm
Horizontals (4)	435mm
Woodglue	
Filler or Plastic Wood	
Impact Adhesive	
Fabric Adhesive (optional)	
Aerosol Furniture Polish	
Paint (optional)	
Shoe Polish (if required)	
Corner Protectors (8)	
Handles (insert-type) (2)	
25mm Castors (4)	
Ventilation Grilles (2)	
3m Covering Material (1·27m wide)	
1m Fretcloth (0·57m wide)	
38mm (1½in) pins (50)	
32mm (1¼in) No. 8 Woodscrews—Zinc plated (20)	
No. 8 Cup Washers (10)	
16mm (⅝in) No. 6 csk Woodscrews—Zinc plated (16)	
25mm (1in) pins (16)—for plastics corners only	
2BA Speaker Studs, with nuts and washers (8)	



Internal view of the *PW* "Soundlite" cabinet, showing internal battens and plastics feet on base

While the main cabinet is drying, the holes for the loudspeaker units may be cut in the baffle board. Mark the positions of the centres of the drive units, and of the fixing holes, and draw circles with a pair of compasses. The ideal tool for cutting the holes is a hand or power jigsaw, although a coping-saw or even a hacksaw blade could be used. Drill several starter holes around the edge and saw carefully along the marked line. The holes may be finished with a wood rasp or Surform tool and coarse sandpaper. Large holes in the main cabinet can be cut in a similar manner. Smaller holes for fixing screws, speaker studs, sockets, etc., should be carefully marked and drilled with a hand drill or brace-and-bit.

Having allowed the glue to dry thoroughly, the next stage is to round off the edges of the cabinets. Unless the edges are to be protected in some other way, this renders them much less susceptible to accidental damage. A 12mm radius will suit most common types of corner protector. The best tool for this job is a small plane, but other suitable tools are Surform or similar, spokeshave, wood rasp, or even coarse sandpaper. With a little practice, this job is easily done by eye, but for the inexperienced the following method is recommended (see Fig. 2). For each edge to be rounded, mark two parallel lines (on both sides) at 6mm and 12mm. Next, plane away the section between the two inner lines and finally round off up to the remaining two lines. If necessary, a cardboard template (Fig. 2 (c)) can be made to check the accuracy of the curve.

Having rounded the edges, any visible holes and cracks should be filled, using one of the many proprietary fillers available. When this is dry, the exterior of the cabinet should be sanded smooth.

Covering The Cabinet

Cabinet covering requires time and patience for good results, but is otherwise not unduly difficult. For large cabinets, it is best carried out on a newspaper-covered floor. The use of a good quality adhesive is highly advisable; either that specifically recommended for the purpose or a general-purpose impact adhesive. A wide variety of types and colours of material are available and here again good quality is essential—remember that it is the covering material that receives most of the knocks. The fabrics are usually supplied by the yard or metre and have a standard width, approximately 1·27–1·3m. Essential tools for this job are a large pair of scissors and a very sharp knife, while a steel rule is also useful.

Cut the material slightly oversize, remembering to leave enough to fold around the edges. For rectangular cabinets, it is generally best to cut enough to go all the way around

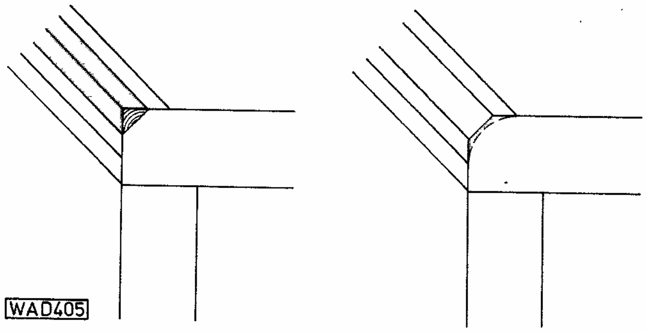


Fig. 2: (a) (left) marking for rounding edges; (b) (right) Initial planing of edge completed

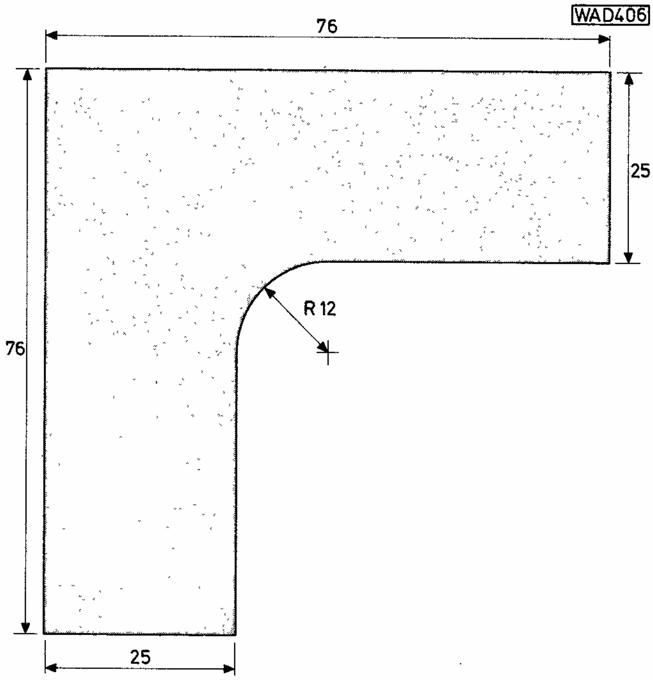
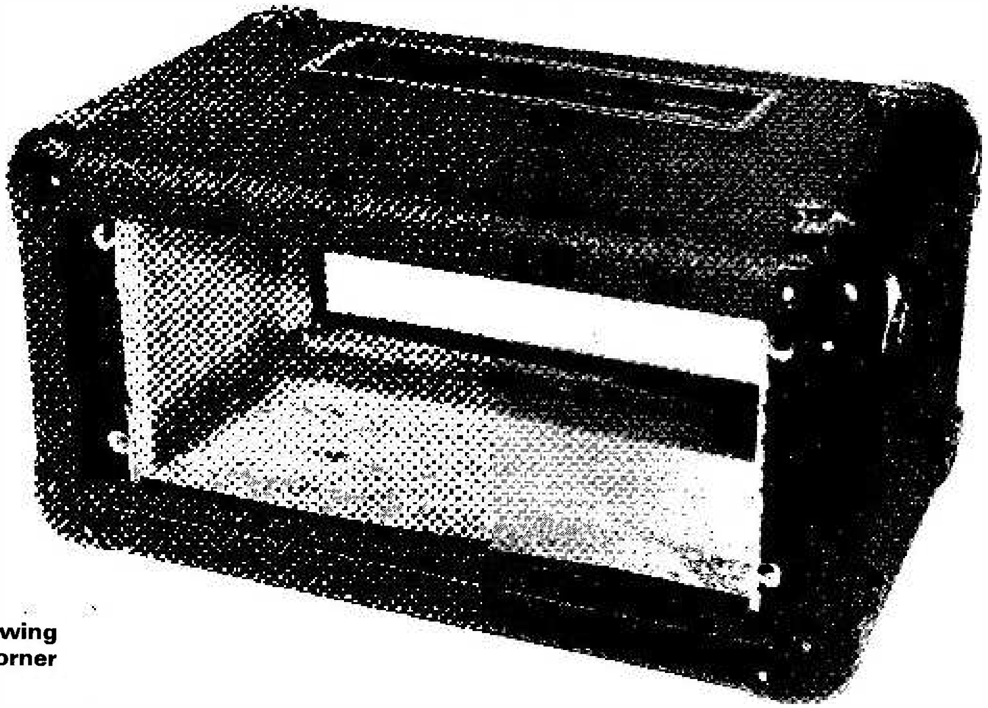


Fig. 2 (c): Full-size pattern for template



The "Soundlite" cabinet, showing ventilation grille and plastics corner protectors

in one piece and position the join at the centre of the cabinet base, **not** at an edge where it will easily fray (Fig. 3). Fasten one long side first, following the instructions for the adhesive used. Make sure that the grain of the material runs parallel to the edges of the cabinet. Smooth out the material with a rag held in the hand, taking care to remove all bubbles and creases but avoiding overtautening. Wait for the glue to dry sufficiently to prevent the material from moving when working on the next section. Repeat the procedure for the other sides leaving the joined side until last. This remaining side should be butt-jointed (i.e. without overlap). Glue down one side as above and, using a knife and ruler, cut the edge straight. Trim the other piece slightly oversize and apply glue, but before sticking down permanently, cut straight using the previously cut edge as a guide. Any small discrepancy can be made good by using the elastic nature of the material.

The edges of the cabinet should now be covered. The material should be butt-jointed at 45° at the corners as described above and, if corner pieces are to be fitted, the fabric should be cut away from the vertex. The fabric should be just sufficient to cover all visible areas, with a small overlap; excess material is not desirable and should be removed. Rear panels, etc. may be covered in a similar manner, or may simply be painted. Any holes for handles, etc. should be covered over initially and the material cut away after the glue has dried.

Having ensured that the baffle-board is sanded smooth and the speaker bolts or studs are in position, the fretcloth may be fitted. The simplest method is to paint the baffle-board a similar colour to the fretcloth chosen, and then glue the fret directly to the board, tightening the material as required. An alternative method is first to glue plastics foam to the baffle-board, cut out the holes over the speaker apertures and darken the foam with an appropriate aerosol paint. Then stretch the fretcloth over the foam, securing **at the edges only** with glue and temporarily with drawing pins. This method gives a pleasant, "spongy" finish. Yet another technique is to glue the fretcloth to a wood frame or hardboard sheet, so that the fret is removable. This may be held in place with Velcro or Hedgehog clips. Whichever method is used, the fret may be tautened after fitting by warming it in front of an electric bar fire until a small movement is seen. Then, remove from the fire and allow to cool. This technique is also useful for tensioning frets that have slackened with age.

Finishing

Finishing is the final stage of construction and one which is so often badly done commercially. The key to a good finish is care and patience; rushing the job will only lead to an inferior product. Any glue on the covering material should be removed with white spirit, and joints may have black shoe polish rubbed into them to disguise them (assuming black material of course!). Next, the surface is cleaned with aerosol furniture polish; this reduces the chance of damage from dust, water and other fluids and can be used regularly to keep cabinets in good condition.

Corner pieces (if used) should now be fitted. Metal corner protectors are easier to fit, while the plastics types are cheaper but still withstand considerable ill-use. The metal types are simply fitted with two or three screws, but the plastics ones require two pins and two screws. Fitting the latter types is somewhat tricky, but the best procedure appears to be as follows: mark and pre-drill holes for the screws, partially insert the pins then put in the screws and finally drive home the pins.

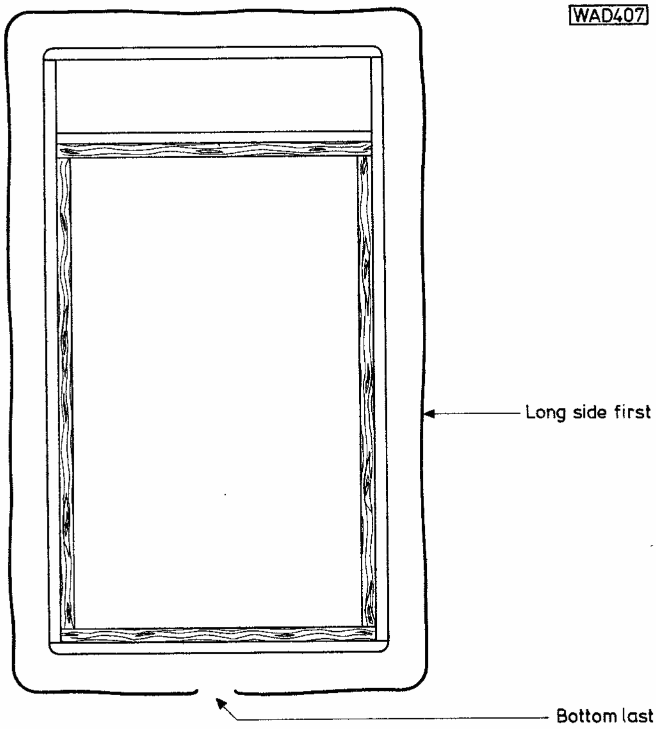


Fig. 3: Applying covering material to the cabinet

Table 2: Tools Required

Small Plane, or "Surform" tool
Light Hammer
Small Tenon or Dovetail Saw
Keyhole Saw, or alternative
Hand Drill and Drill Bits
300mm (12in) Ruler—preferably steel
Sharp Knife (e.g. Stanley Knife)
Screwdrivers
Try-square
Pencil
Pair of Compasses
Scissors
Glue Spreader
Sandpaper (various grades)
Optional
Corner Clamp
Sanding Block
Wood Rasp
Brace and Bits
Electric Hand Drill
Electric Jigsaw
Electric Orbital Sander

The next step is to attach the remaining fittings. Strap and "briefcase" style handles are simply fixed with screws or bolts, remembering to pre-drill holes as necessary. Moulded plastics "insert" handles and ventilation grilles require rectangular cutouts and are fixed with woodscrews and glue. Plastics and rubber feet are screwed on in the desired position. Castors are best fixed with the bolts

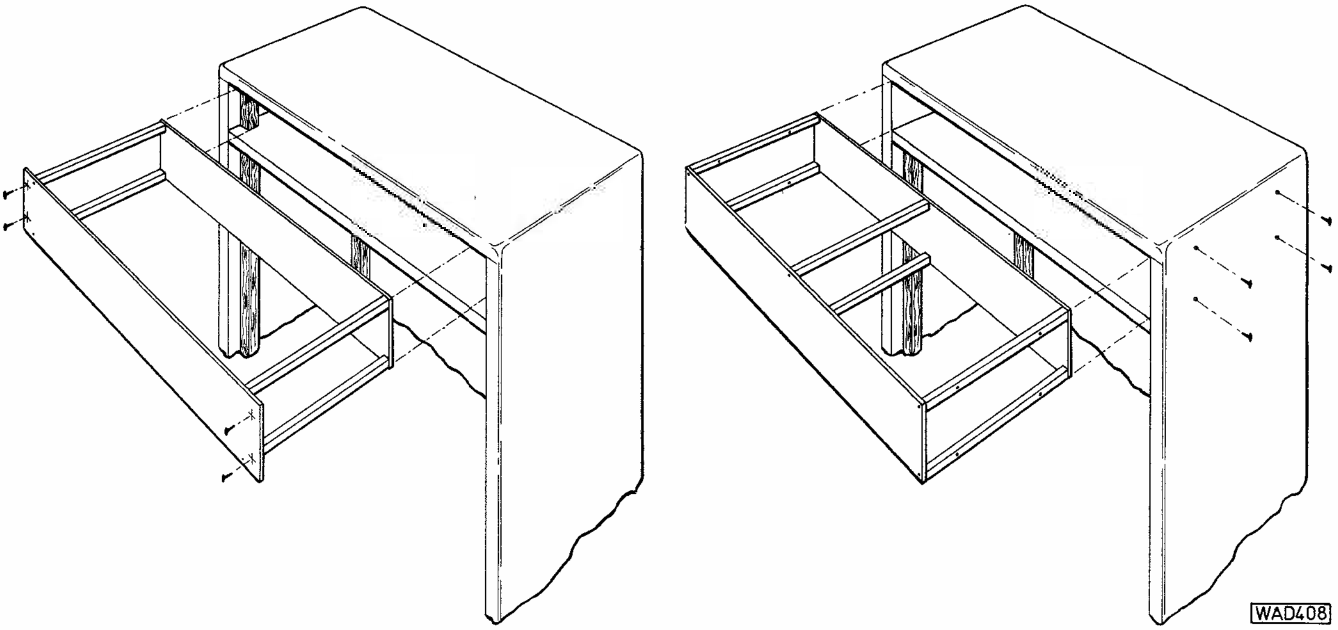
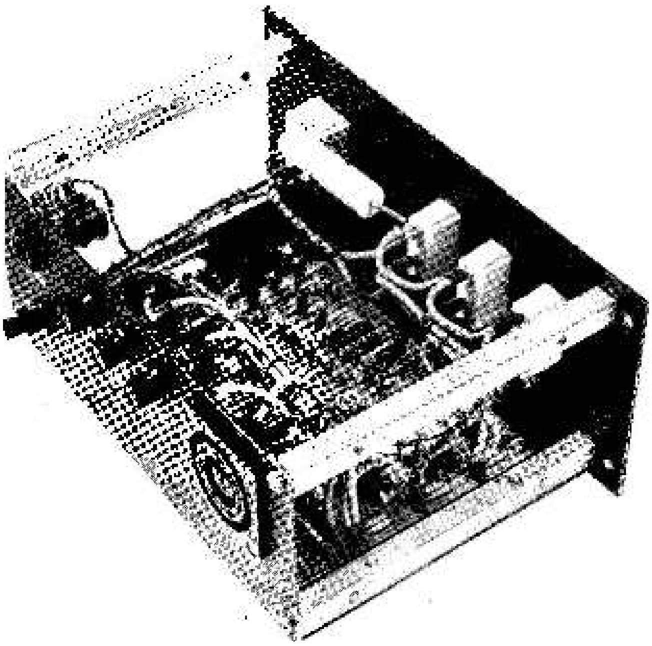


Fig. 4: Two methods of fixing the amplifier chassis into the cabinet: (a) (left) through front-panel "ears"; (b) (right) through cabinet sides into chassis rails



Chassis construction used in the *PW* "Soundlite"

Table 3: Materials Suppliers

Maplin Electronic Supplies Ltd.
P.O. Box 3,
Rayleigh,
Essex SS6 8LR

Adam Hall (Supplies)
Unit 3, Carlton Court,
Grainger Road,
Southend-on-Sea,
Essex SS2 5DA

Hamiltons of Teesside Ltd.
26 Newport Road,
Middlesbrough,
Teesside

supplied with them. Hinges and catches are again screwed on, but care should be taken to align the various parts before fixing.

The remaining stage is to assemble the various parts to form the complete system. This stage is highly dependent on the nature or the equipment but, for the combo-amplifier example, this will mean the assembly of the cabinet, baffle-board, rear panel, speaker units and the amplifier chassis. The baffle-board is best secured with 38mm ($1\frac{1}{2}$in) woodscrews through holes in the front battens. If desired, "Tadpole" piping may be glued or stapled around the edge before the baffle is mounted. The speaker units should be attached with nuts and washers on to the captive bolts already fitted. Tighten the nuts evenly, but do not overtighten, and seal the nuts with a dab of glue to prevent them from vibrating loose. The amplifier chassis may be fixed either by screws through the front panel into battens or brackets in the cabinet, or by bolts through the side of the cabinet into tapped holes or captive nuts on the chassis (see Fig. 4). The amplifier and loudspeakers should be wired up, and the speaker enclosure lagged, if desired. Finally, the back is fitted with woodscrews and cup washers. The cabinet is now finished and ready for testing.

Parts And Materials

Little trouble should be experienced in obtaining the necessary materials. Chipboard, plywood, glue, fillers, etc. should be easily obtainable from a local timber merchant, while paint, polish, screws, nails, etc. should also be readily available locally. Covering materials, fretcloth and fittings can be bought from a number of mail-order outlets; Maplin Electronic Supplies Ltd. stock a small range, while two specialist suppliers with larger ranges are Adam Hall (Supplies) and Hamiltons of Teesside Ltd. Speaker bolts and other esoteric hardware is available from the latter two firms. Also, many suppliers of commercial cabinets stock some materials and fittings, although their prices are sometimes higher. ●

NEWS... NEWS... NEWS...

Exhibition

Following the success of the 1978 Harrogate Festival of Sound, the organisers are happy to report that the 1979 Festival will be bigger and better than ever.

To be held at the Harrogate Exhibition Centre which consists of three interlinked purpose built halls, of equal size and stature and equipped with all modern facilities. Once again the ground floor space of the Cairn, Crown, Majestic and Old Swan Hotels will be used for demonstration purposes.

The exhibition will be open to the public on Saturday, 18 and Sunday, 19 August 1979, between 11.00am and 8.00pm, admission free. Trade days will be Monday, 20 August and Tuesday, 21 August 1979, between 10.00am and 6.00pm, admission by ticket only, available from the organisers: *Exhibition and Conference Services Ltd., Claremont House, Victoria Avenue, Harrogate, North Yorkshire. Tel: (0423) 62677.*

RAE Courses

The following colleges will be offering the City & Guilds RAE Course No. 765 this autumn:—

College of Technology, Belfast, GI2BX. On Tuesdays between 5.30 and 8.30pm, and Thursdays between 6.00 and 8.00pm (Morse code). Commencing Tuesday, 18 September 1979, enrolment early September. Lecturer, J. E. Wilson. Further details from: *College of Technology, College Square East, Belfast BT1 6DJ. Tel: (0232) 27244.*

Mid-Warwickshire College of Further Education. On Thursday evenings, commencing Thursday, 20 September 1979, enrolment 6 and 7 September. Further details from: *Mid-Warwickshire College of Further Education, Department of Engineering, Warwick New Road, Leamington Spa CV32 5JE. Tel: (0926) 311711.*

North Wirral College of Technology. On Thursday evenings, commencing Thursday, 13 September 1979, enrolment 3 to 5 September. Further details from the course tutor: *D. E. Owen G4GGB, or North Wirral College of Technology, Electrical Engineering Department, Borough Road, Birkenhead.*

North and West Farnborough Further Education Centre. On Thursday evenings at 7.30pm, commencing Thursday, 20 September 1979. There will also be a Morse Proficiency Course starting on Monday, 17 September, at 7.30pm. Further details from: *The Principal, J. Brett, North and West Farnborough Further Education Centre, Cove School, St John's Road, Farnborough, Hants. Tel: (0252) 42397.*

Mobile Rallies

The Telford Amateur Radio Rally Group hold their mobile rally at the Telford Town Centre Malls, Telford, Salop, on Sunday, 9 September 1979. Attractions include trade stands, exhibitions, "flea market" for private sales, club stands plus excellent catering and on-site pub. There will also be a free coach service running to the Ironbridge Gorge Open Air Museum, which is celebrating the bi-centenary of the original Ironbridge.

Further details from: *Ken Walker, G8DIR on Shrewsbury 64273 or Martyn Vincent G3UKV on Telford 55416.*

Peterborough Radio and Electronic Society hold their mobile rally at Walton School, Mountsteven Avenue, Peterborough, on Sunday, 16 September 1979. There will be trade stands, bring and buy stall, raffles, buffet and talk-in on 2m, callsign G3DQW, possibly also Peterborough repeater GB3PB on RB10, operational callsigns to be arranged.

Further details from: *G3EEL QTHR, Tel: Peterborough 65423/62881.*

Can I Help You!

Are you the secretary, organiser or general dog's body of your local radio club or any other group whose functions may interest readers of *PW*. If so, let me know and I will endeavour to publicise your rally, get-together whatever, through this column. Remember though, we compile the magazine some time ahead of publication day (e.g. this note was written in mid-June), so, the earlier I can have details, the better.

Alan Martin

IEE Call for Papers

The Institution of Electrical Engineers is seeking papers for a Conference on "Radio Transmitters and Modulation Techniques", to be held at Savoy Place on 24-25 March 1980. Those wishing to have papers considered should submit a 50-word synopsis to the IEE Conference Department by 3 September 1979.

Subjects to be covered at the Conference include the following: transmitters for communication (fixed and mobile), broadcasting, television, and navigational aid; improvements in transmitting valves; impact of power semiconductors on transmitter designs; new methods of modulation; exploitation of Doherty and pulse width modulation and other methods for the purpose of higher efficiency; transmitter control/tuning, protection and safety; common antenna working (filters and other means); linearity control; frequency and signal generation; automatic monitoring and correction; and spurious frequencies and noise radiation.

The Conference is being organised in association with the Institution of Electronic and Radio Engineers and the Radio Society of Great Britain.

For further information please contact: *Annemarie Cunningham-Swendell, Assistant Secretary, Public Affairs, IEE, Savoy Place, London WC2R 0BL. Tel: 01-240 1871 Ext. 280.*

HF Convention

The RSGB HF Convention, organised by the RSGB HF Committee, is to be held at the Pavilion Suite Complex, Warwickshire County Cricket Ground, Edgbaston, Birmingham on Saturday, 15 September 1979.

The Convention to be held in comfortable surroundings, with ample free car parking on site, will include an interesting programme of films and lectures.

Entrance is by ticket only, as the number of places is limited, and will cost: Convention only, £1.50; Convention and dinner, £5.50 (single); £10 (double). Cheques should be made payable to "RSGB HF Convention" and sent with an s.a.e. to: *S. H. Jesson G4CNY, 181 Kings Acre Road, Hereford HR4 0SP.*

ON THE AIR

AMATEUR BANDS

by Eric Dowdeswell G4AR

Over the years I have stressed in this column, and to correspondents, that regardless of one's apparently poor location, from the radio reception point of view, it is always possible to sling up some kind of wire, which, with an a.t.u. will give reasonable results.

It was with some delight therefore, that I received recently a copy of *Indoor And Invisible Aerials for SWL's* by Dick Holman G2DYM, consisting of 34 pages of A4 format very amply illustrated with line diagrams. Dick is now a telecommunications consultant and "has been in aerials all his life" including the BBC where he was running 300kW transmitters and associated aerial systems.

His new publication is full of good advice for the flat-dweller and others similarly afflicted. He has included many diagrams of the dozens of alternatives possible with wires in roof spaces, attics, and the like, not to mention the outsides of buildings where very thin wire is virtually invisible, but very effective. *Indoor And Invisible Aerials for SWL's* costs £3.24 by first class post, including VAT*. The price also includes a seven-page write-up of the G2DYM multi-band dipole designed to combat the menace of QRM from TV sets, probably the bane of more listeners than anything else.

I have taken a special interest in listeners' logs this month as I have been able to get on the air on 20m s.s.b. recently, having acquired a Heathkit HW32A transceiver. My 160m dipole with tuned feeders, built to my own spec. by G2DYM, was pressed into service on 20m by folding each of the 132ft arms into a right angle, thus making a square rhombic with one-wavelength sides. Unfortunately this "lazy rhombic" is 55ft at one end sloping down to 20ft at the other but it obviously works very well judging by the several 59 reports from VK land. An early catch, beating the massive pile-up, was VP2MX on Montserrat with a 59 report also.

Other users of the HW32A may like to know that mine has been modified to cover all the 20m band, instead of only the telephony segment, so I shall be using it on c.w. also. The lower sideband crystal has been taken out and a second crystal fitted in the conversion oscillator to give two switchable ranges.

Exams and the Like

It may be high summer, at long last, but it is not too early to think of evening classes later in the year with a view to sitting the RAE. In the Birkenhead area an RAE course starts at the North Wirral College of Technology, Borough Road, Birkenhead on Thursday Sept 13 and you can enrol between Sept 3 and 5. Write to: **Dave Owen** G4GGB, course tutor, at the College.

How about the Slough area of Berkshire? Classes in code and theory at the Langley College of Further Education, Station Road, Langley, on Mondays and Thursdays respectively, with full laboratory facilities. You lucky people! Enrolment on Sept 11/12 between 1230 and 2000 each day or details from: **E. C. Palmer** G3FVC who is a senior lecturer at the College. It could hardly be made any easier!

Visitors are very welcome at the **Edgware & District RS** on the second and fourth Thursday of the month at the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, at 8pm sharp. This issue should be out in time for me to tell you that the Society will not be having a meeting on Aug 9! But the 23rd sees a briefing for the assault on the SSB Field Day event on Sept 1/2. Club station G3ASR puts out slow Morse every Monday between 2030 and 2145 on 1·875MHz and 144·175MHz and on the first and third Thursdays between 1930 and 2045 on the same frequencies.

Brian Bennett G3EAM writes on behalf of the **Lincoln SW Club** appealing for members: "Youngsters are welcome, we can do much for them," he says, so write to Brian at 142 West Parade, Lincoln, if you want to take advantage of this fine offer. That excellent body, the RAIBC, has changed its name to the Radio Amateur Invalid & Blind Club thus keeping the initials the same, a change I personally welcome as, in my mind, I always read "Bedfast" as "breakfast" in the old name! Interested in joining or supporting the club? Then write to: **Francis Woolley** G3LWY, 9 Rannoch Court, Adelaide Road, Surbiton, Surrey. Incidentally, the club now sports the call G4IBC.

Garth G3IER has had to "retire" from the job of editing *CARA*, the news letter of the **Cheltenham ARS,** after performing a thankless job for the last 13 years. The club meets regularly at the Old Bakery, Chester Walk, Cheltenham, so write to the Hon Sec G8MZV for details (QTHR). The **Cray Valley RS** meets on the first and third Thursdays at the Christchurch Centre, High Street, Eltham, London SE9 with talks and lectures. Sept 6 sees a Surplus Sale Extravaganza with all welcome provided they bring their wallet! Write to: **D. Haines** G8OXT, 259 Rangefield Road, Bromley, Kent.

**G2DYM Aerials, "Cobhamden Castle", Uplowman, Near Tiverton, Devon EX16 7PH.*

The revolutionary Swan 100 MX: 100% new, 100% solid state, 100% portable from home station to mobile! — 235 Watts PEP!

Swan's new "get up and go" transceiver, superbly designed for 100% mobility and control, as only new Swan space-age technology could do it!

100% solid state 100 MX: the compact HF unit you can take seriously – anywhere you choose to operate.

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Your most-wanted extras, 100% built-in: like noise blanker and VOX. Like a preselector to optimize signals. Like a real RF GAIN control, and CW sidetone.

Swan includes the RIT control (±1.5 kHz) you'd like too. Plus, for stability, a permability tuned oscillator with 1Kc readout.

A powerful package, with a full 235 watts PEP and CW on all bands, 10-80 meters.

Setting a 100% new state of art: 100 MX and our matched-station units. Ready for check out today at your Swan dealer, the first major breakthrough in Swan's new programme dedicated to changing the face – and performance – of ham equipment 100% . . . inside and out!

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G3FIK

Finally, the **Bury RS** will run a Brains Trust on radio and electronics on Aug 14 while Sept 11 sees the club's annual nosh-up which happens to be the club's 40th anniversary as well. Current projects for the practically-minded include an h.f. bands linear amplifier, a 6800 MPU and the possible purchase of a v.h.f. transceiver. More from **Mike Bainbridge** G4GSY, 7 Rothbury Close, Bury, Lancs.

DX-wise

Usual very interesting letters during the month from **Bill Rendell** in Truro, Cornwall, who shares my bird-watching interests. He thought he could pull a fast one on me by logging STORK in Wau in the S. Sudan. "A rare immigrant," he said! Happens to be genuine so QSL via DL7FT, says Bill. If you hear VP2MDG on Montserrat, send your card to W6FDG, while 5W1AB, heard by Bill on 15m s.s.b., can be contacted via DJ9ZB. Bill uses a Heathkit AR3 with pre-selector, a.t.u., 115ft wire plus dipoles for 15 and 20m.

Dennis Sheppard of Sheerness, Kent, types his letters out on his teleprinter, being an RTTY fan, followed by yards of print-out of the QSOs he's copied! He is now using his KW202 receiver in preference to the Trio JR310 and had copy from FR7BE, HI8JSM, VR3AH (Christmas Is) and the like on 20m, with lots of JA's and VQ9MR on 15m.

From Marple, near Stockport, **John and Steve Goodier** have been busy on their FRG-7 with 30ft wire and a.t.u. finding J3AG on Grenada, VK2AGT/LH on Lord Howe Is and old friend VR6TC on Pitcairn on 20m, not to mention OK3TAB/D2A in Angola and 5N2NAS, a rare prefix these days, on 15m. I'm glad to say that **C. P. Palfreyman** of Loscoe, Derbys, stuck to his guns, or rather his key, by copying some good stuff on c.w. on all bands from 10 to 80m using only his home brew 0-V-1 with indoor dipoles on 10 and 15m feeders, strapped together for the other bands.

Help!

Anyone got a manual for the CR100? **John Allan** of 40 Park Road, Stanford-le-Hope, Essex, has been dabbling in amateur radio for years but only now has decided to tackle it seriously so we ought to help him on his way if we can. **Dick Robbins,** 2 Ross Cottages, The Rise, Brockenhurst, Hants, has a trusty old BC348 but like so many other users is wishing it would cover the 15 and 10m bands now that activity is concentrated up there with the increasing sunspot activity. Has anyone a particular practical design to recommend to Dick? Details or even a 'stat copy would be most welcome and expenses refunded of course.

Now the proud owner of a new DX160 receiver **Cyril Pratt** of Steventon, Oxon, sent in a couple of extra copies of the circuit diagram in case anyone else needs one. What a nice thought! He has a 100ft wire and a.t.u. and is busy making up a 144MHz converter. Wonder if he is going to defect to Ron Ham? The DX160 looks a good buy for **Arthur Bottrill** (Stoke Golding, Nuneaton) who is now a regular subscriber to *PW*, being a paraplegic who was looking for a suitable hobby after discarding several others as being unsuitable. I am quite sure OM that you have chosen wisely and trust that you will get that set soon and then start swotting for your RAE, when you will be able to talk to the world.

John Sparks, MBE, living in Darlington, Co Durham, has long cherished the idea of having his own ticket and as he approaches retiring age is determined to fulfill his ambition. For the moment, he is using a Lafayette HE30 for which he'd like a manual if anyone can oblige. John lives at 10 St Gregory Close, Staindrop, Darlington D12 3LG. If you don't mind me saying so, John, you can't fail with a name like Sparks!

A late letter from **Dave Coggins** seems to have gone all round the country since it left Knutsford in Cheshire. He has just returned to radio after a "null" of around 10 years and he too uses a DX160 with a single loop "quad" on 10m which works well too on 15m, plus 100ft long wire. Suggest you look at one of the aerial books and make up a loop with suitable loading that will be resonant on 10, 15 and 20m. I used one once on the air and it worked very well indeed fed with co-ax.

I know this is a busy time for us all with so many chores, and exams to think about, but do write and get it to me by the 15th of the month. Happy Holidays!

Log Extracts

D. Coggins:—80m FM7WS WA4VCV **40m** CX4DI VK3XI **20m** FO8DT VP8SB **15m** HR3JJR JR6REP(Okinawa) VK9KK(Chagos) XT2AV 5W1AB 6W8MW **10m** FG7AR/FS7 FR7BU YB0ADW VQ8KK.

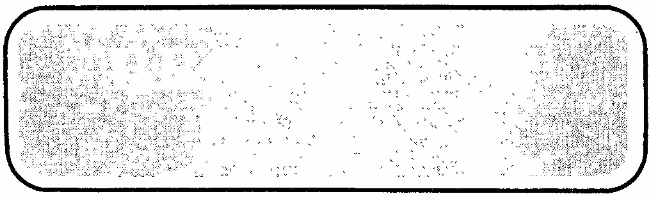
C. Palfreyman:—All c.w. 80m EA8NU LU5AMT UH8EBB **40m** EA9FC HK3YH **15m** JF1EZH VP9JQ **10m** HZ1HZ 6W8EX

J. & S. Goodier:—20m J3AG VK2AGT/LH VK0PK(Macquarie Is) VQ9TC VR1AF VR6TC 5W1BU **15m** OK3TAB/D2A VP2MDG

D. Sheppard:—All RTTY 20m AC3U FR7BE HI8JSM LU3ABI OD5AO OX3CO PJ3EC PZ1AP VK2ADZ VR3AH XE1OE YV2BE ZS1CL 5W1BV 9J2KD **15m** JA1QWF VQ9MR 5Z4RT 9H1FF

W. Rendell:—20m C5AAP CT3AB D4CBC M1C VP2KC VP8SB VR6TC YB1CS **15m** D4CBS HK7ELG HS1WR STORK VP2MDG VP2SV XT2AV ZB2BL 5W1AB

All are s.s.b. unless stated otherwise.



MEDIUM WAVE DX

by Charles Molloy G8BUS

The medium waves extend from 531 kHz to 1602kHz with 9kHz spacing between stations in those parts of the world covered by the Geneva Plan, while in other areas (particularly North America) the band is from 540 to 1600 with 10kHz spacing. Communications receivers and domestic sets in countries outside the UK are marked in kHz or kHz divided by 10 (i.e. 54 to 160) but many receivers produced for use in the UK still have their scales marked in metres, a practice which creates problems for the DXer. Table 1 should help those who have to convert from one system to the other.

Table 1

kHz	Metres	kHz	Metres
531	565	1100	273
550	545	1150	261
600	500	1200	250
650	462	1250	240
700	429	1300	231
750	400	1350	222
800	375	1400	214
850	353	1450	207
900	333	1500	200
950	316	1550	193·5
1000	300	1600	187·5
1050	286	1602	187·3

Intermediate values can be worked out with a pocket calculator using:

$$\text{Frequency in kHz} = \frac{300\,000}{\text{Wavelength in metres}}$$

or

$$\text{Metres} = \frac{300\,000}{\text{kHz}}$$

Wavelength or Frequency

At first sight it would seem that one system is as good as the other. In the early days of wireless there was a preference for waves and wavelengths, but the disadvantage of using metres soon became apparent when station separation had to be taken into account. Selectivity is the ability of a receiver to separate adjacent signals, and selectivity is a function of frequency not wavelength. For example, look at the two lowest and the two highest channels in the Geneva Plan. These are: 531kHz (565m); 540kHz (556m); 1593kHz (188·3m); 1602kHz (187·3m). The frequency difference between the stations of each pair is the same, 9kHz, but at the l.f. end of the band the difference is 9 metres while at the h.f. end it is only 1 metre.

If you use a receiver with scale marking in metres you will really have little idea how far "apart" stations are from each other. When listening to North American DX, the separation from European QRM can be anything from 1kHz to 8kHz! From the near impossible to the reasonable. So when choosing a receiver for m.w. DXing be sure to get one with the scale marked in kHz. It will make life a lot easier.

Varicap Loop Tuning

"Have you tried varicap loop tuning?" asks **P. W. Simmonds** (Isle of Wight), who goes on to describe a tuning device he constructed using a MVAM115 varicap (available from Ambit International), two 10nF capacitors, one 100kΩ resistor and a 100kΩ potentiometer which, he claims, cost less than a variable capacitor. The diagram (Fig. 1) shows the set-up. The negative side of the power supply used was earthed, but this is not essential.

It never occurred to me to try varicap tuning, as a stabilised power supply is required. However, Mr Simmonds says that he was able to mount the 100kΩ pot, which is the tuning control, close to the receiver, which also supplied the 12 volts. This arrangement was a lot more convenient to use than operating a tuning capacitor fixed to the loop.

Personally I prefer to keep things simple and there isn't much that can go wrong with a variable capacitor, but varicap tuning is essential if you want to try a remotely controlled loop; say in the loft, which could be large and either fixed or attached to a rotator. If you attempt to tune a loop remotely using a variable capacitor at the receiver end, then the capacitance of the lead, which may be considerable, will be in parallel with the tuning capacitor and will interfere with the tuning range of the loop. This of course will not occur with a varicap.

Readers' Letters

My remarks in the June issue about heterodynes and DXing prompted **Harold Emblem** to write from Mirfield to say that he tracked down the "het" on 585kHz to Riyadh in Saudi Arabia, and one on 900 to Guriat which is a new one in the same country. The latter was picked up after Milan had signed off. Also heard was Cukurova in Turkey which is a lot easier now it is on 630kHz. The receiver is an Eddystone 740 used with a m.w. loop.

Harold refers to Conakry in Guinea on 1404kHz which together with Dakar on 765 are good pointers to reception conditions on the West African path. Two others to look for, which will verify a report in French, are Ougadougou in Upper Volta on 747 and Libreville in Gabon on 1557. **N. W. Hucker** (Taunton) used his BRT400 to pull in EAJ50 in Las Palmas in the Canary Islands on its new frequency of 1008kHz. This channel is reasonably clear of QRM once Lopik in Holland has signed off for the night.

A National Panasonic DR28 and 60ft loft aerial are in use at Carshalton by **Vic Dye** who would like to hear the 50kW Radio Paradise in St Kitts. Try on 1265kHz between 0200 and 0300 GMT, but you do have to be persistent to pick up DX on the medium waves as conditions vary a lot. If you don't hear it first time then try again a few days later and stay on the frequency for a few minutes as slow deep fading is normal on this band.

Foreign Language Recognition Course

After writing about language identification last month I sent off for the cassette version of this course, which originated with Radio Canada, but is now distributed by the Handicapped Aid Programme.

The course must really be unique. It is designed to give the DXer a basic grounding in the ability to recognise the many different foreign languages that are to be heard over the air. Languages are grouped into ten families starting with the Romance Languages and ending with the Sino-Tibetan group, with a final section on Odds and Ends, the latter covering Eskimo and Cree Indian from R. Canada's Northern Service.

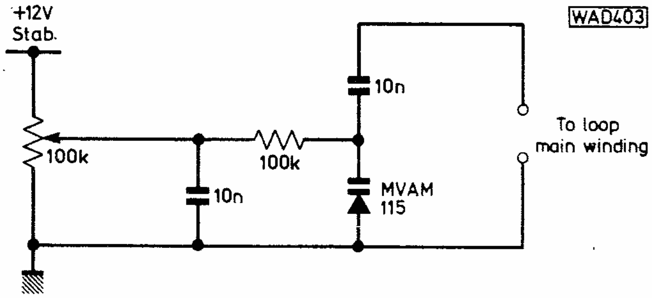


Fig. 1: A medium-wave loop tuning circuit using a varicap diode

Playing time is 83 minutes, covering 55 languages, but one should remember that it is a course of several lessons. I tried to play it through at one sitting but had to give up half-way through.

The tape costs £1.98 post paid, either as reel-to-reel or cassette, and delivery is about six weeks as it comes from Canada. I ordered mine through the North England Radio Club (66 Chesnut Grove, Birkenhead, Merseyside L42 OM2), but non-members can get it from the HAP, 56 Rose Grove, Wombwell, Barnsley, S. Yorkshire.

SHORT-WAVE BROADCASTS

by Charles Molloy G8BUS

While browsing through the pages of the 1979 edition of the *World Radio and TV Handbook* recently, a smallish advert caught the eye which offered a C90 cassette "crammed full of current s.w. interval signals and announcements". It suddenly occurred to me that interval signals have not been touched upon so far in this column, so here goes.

Interval Signals

Interval signals are very much taken for granted by the DXer. If you tune around the main short-wave bands just a few minutes before the hour or the half hour, which is the time programmes change, you are certain to come across several interval signals. They are really signature "tunes" consisting of a short piece of music, bells, chimes, bird calls, drums, etc., which only last a moment or two and are repeated over and over again. They enable the regular listener (SWL) to home-in on the station of his choice in time for the start of the programme, often on a receiver marked out in metre bands only. Examples of interval signals are Radio RSA's bird call plus guitar, Yankee Doodle from the Voice of America, the few bars of piano music from Radio Warsaw, Waltzing Matilda and Jacko the Kookaburra Bird from Radio Australia.

Interval signals are often attractive, my favourites being the flute and cowbells from the Voice of Greece, the short piece of music from Radio Denmark and the orchestral music from Radio Bucharest. These signals are of value to the DXer as well as to the SWL. They assist him in identifying less common stations as well as helping him to avoid some of the more powerful occupants of the bands. The *WRTVH* gives details of interval signals from many countries and where appropriate, a few bars of music appear in the text.

Recordings

Recordings of interval signals are not new of course. Side two of Mitch Murray's album *Long Live Short-Wave* presents original recordings of 31 of them. The C90 cassette seemed more specialised though, so a cheque for £3.50 was sent off which brought the cassette and a four-page list of the 131 recordings. The interval signals are grouped according to type such as bells, chimes, electronic organs, strings, xylophone, drums, etc., which should help the DXer to track down the unidentified.

These recordings were obviously made from live broadcasts and the quality of a few are not too good. There were a few rarities and also some surprising omissions. Those that interested me most were of the Asiatic Republics of the USSR which I have always found difficult to identify. The cassette is offered by Intervals Signals, 31 Lyons Crescent, Tonbridge, Kent TN9 1EY, and the advert can be found on page 20 of the *WRTVH*.

Harmonics

Reference to broadcasting around 29MHz in the 10m amateur band is made by G2BSU, who is Hon. Sec. of the Bristol Amateur Radio Club. He picked up the Radio Moscow World Service at 1400 on 29 162kHz and an unidentified transmission (probably a commercial station) on 29 086kHz at 1410.

Any broadcasting on or around 10 metres is almost certain to be a harmonic. Divide 29 162 by 3 and you get 9720 which is in the 31m band. The use of high-power transmitters and directional aerials must mean that megawatts are being radiated on the fundamental in the chosen direction. A few watts of harmonics is almost inevitable, and these may travel a long way now that the higher frequencies have opened up. Harmonics of broadcasting stations should be fairly common above 21MHz at the moment.

I read in a DX club magazine recently of a report from the BBC Monitoring Service that IBA Jerusalem were broadcasting in the 10m band. To whom? Few s.w. receivers tune above 21MHz and broadcasting authorities are reluctant even to use the 11m broadcast band (25 600–26 100) because of the shortage of listeners. A harmonic is a more likely explanation of IBA's appearance amongst the amateurs.

Short-Wave Receivers

"The short-wave bug has bitten me again rather late in life, and you have acquired another regular reader," writes **A. D. Browning** of Ramsgate. His previous experience of the hobby was with a one-valve set just after the last war. Welcome back OM. You will find quite a change with your Pye 6000 which is a much more powerful receiver. The function of the S meter, a.g.c. and a.f.c. are puzzling our "old recruit" and others may be in the same boat.

S Meter

An S meter or Signal Strength meter, shows the strength of the incoming signal. A strong station will give a large

Reports on the various bands are welcome and should be sent direct, by the 15th of the month, to:

AMATEUR BANDS Eric Dowdeswell G4AR, Silver Firs, Leatherhead Road, Ashtead, Surrey KT21 2TW. Logs by bands, each in alphabetical order.

MEDIUM and SW BANDS Charles Molloy G8BUS, 132 Segars Lane, Southport PR8 3JG. Reports for both bands **must** be kept seperate.

VHF BANDS Ron Ham BRS15744, Faraday, Greyfriars, Storrington, Sussex RH20 4HE.

reading and a weak signal a small reading. Watch the needle as you tune in and when it reaches a peak you will be spot-on the station. Fading and fluctuations caused by interference will show up as swings on the needle.

The scale markings are meant to indicate relative values only. S8 on one receiver may not be the same as S8 on another or even S8 on another band on the same receiver. The meter on my BRT400 is marked from 0 to 100 and this is quite adequate.

Automatic Gain Control (A.G.C.)

This used to be called Automatic Volume Control (a.v.c.) and it is fitted to nearly all receivers these days. It helps to maintain a constant volume at the loudspeaker by automatically adjusting the receiver gain to compensate for fading. It is usual when using a.g.c. to set the r.f. gain control to maximum and to control the receiver with the a.f. gain (volume) control.

Automatic Frequency Control

This facility is used on v.h.f. to keep the receiver in tune. If frequency drift (detuning) occurs, due perhaps to changes in supply voltage or to the effect of heat, the a.f.c. will, within limits, bring the receiver back on tune.

Readers' Letters

"After reading your article I decided to build a s.w. receiver," writes **Richard Benbough,** 16 Raven Crescent, Billericay CM12 0JF, who now has a two-transistor set. When used with a 30ft long wire it pulled in Baghdad at 2130 and All India Radio at 1825 both on 31m, HCJB The Voice of the Andes at 0715, Peking at 2003 and Vietnam at 2100. Richard would like to know if there are any other t.r.f. DXers around who would like to compare notes with him and also if there is a DX club in his locality. Richard has bought a copy of the 1979 *WRTVH* (which must have cost as much as the receiver) and this has helped him a lot with QSL addresses, etc.

"Can you give me details of the stations and the addresses for QSLs of the four stations operating above the 49m bands?" asks **Richard Goodwin** of Crawley. 'Fraid not, pirates are illegal and cannot be covered here. **Ted Allison** purchased an R1155 receiver in 1954 and now that he has retired he is returning to DX after a lapse of several years. He would like to contact other R1155 users, replies to 138 George St., Mablethorpe, Lincolnshire.

Tropical Bands

"I am now in contact with five other Vega 206 users, thanks to the piece you wrote a couple of months ago," writes **Bill Stevenson** (Swinton). When connected to both ends of the TV co-ax cable, the receiver pulled in R. Super in Colombia on 4825kHz at 0703 SIO333; R. Reloj Costa Rica 0700 on 4832 SIO433; R. Mozambique 0515 on 4865 SIO233; China at 2150 on 4865 SIO232; Benin 2200 on 4870 SIO343; Yakutsk 2230 on 4920 SIO232; R. Colosal 0515 on 4945 SIO333; R. Rumbos Venezuela at 0700 on 4970. Bill praises the Tropical Bands Survey, published by the Danish SW Clubs International, which he thought was a bargain at five IRCs. He says it is of immense value in identifying Tropical Band stations. This survey is up-dated every summer and further details can be obtained from the DSWCI, Greve Strandvej 14, DK-2670 Greve Strand, Denmark.

"I am still digging around the Tropical Bands," says **Bob Bell** (Blyth) who goes on to say: "it is surprising what you find under all the telegraph QRM—I am surprised there are not more logs for you of the Tropical Bands." Bob uses an FRG-7 and he heard the Cape Verde Islands on 3930kHz at 2355, Gansu in China on 4865 at 2200, Benin on 4870 at 2020 and China on 5030 at 2100, plus an unidentified station in Arabic and French on 5455kHz.

VHF BANDS

by Ron Ham BRS15744

With strange happenings on the 10m band, plenty of sporadic-E, two tropospheric openings and an intensive solar storm, there was a great deal to interest my readers between May 23 and June 20.

Solar activity

Isolated bursts of solar noise during a quiet period are not unusual because they often herald the start of a noise storm, as happened on May 26 and 29, when a few individual bursts preceded the storm which both **Cmdr Henry Hatfield,** Sevenoaks, and myself, recorded at 136 and 146MHz between June 1 and 3. On the 2nd, **Alan Baker** G4GNX, Newhaven, heard the solar noise with his 2m gear and Henry saw two large sunspots through his spectrohelioscope. Apart from a strong, 2 minute duration burst at 1310 on the 7th, the sun was quiet until the 9th when another and more intense noise storm began and lasted through to the 14th. Frequently during this event readers heard bursts of solar noise at 28, 50 and 70 MHz, but none were as massive as those which occurred on the 17th, sending the recording pens of my radio telescope banging against the stops.

The 10 Metre Band

Apart from the Sussex beacon, GB3SX, 28·215MHz, which is almost on my doorstep and despite frequent checks, the 10m band was very quiet from May 23 through to the 30th, however, at 0705 on the 31st a 589 signal from the Cyprus beacon, 5B4CY, 28·220MHz, broke the silence and during the following 13 days, signals averaging 539 were received from the beacons in Bahrain, A9XC, 28·245MHz and Germany, DL0IGI, 28·205MHz.

On the days when sporadic-E was present the signal from the German beacon was a good 599. **Harold Brodribb,** St Leonards-on-Sea, also noted the quiet 10m band but, at 1018 on June 8, he heard a QSO between a G station in Farnborough and a very strong VK8NPS, and later, he received signals from A9XC. DL0IGI and 5B4CY. **Alistair Duprés,** Rhiwbina, Cardiff, recently purchased a Yaesu FRG-7 and with a long wire aerial he heard a QSO between and OZ and PY on June 10 and amateur stations in France, Germany and Spain. Alistair has applied for membership of the RSGB and is keen on 10m listening like **Nigel Golds** BRS36910, who is now serving with the RAF at Locking, and, as a member of the RAF ARS, he often uses one of the receivers at the station on G3RAF. During the sporadic-E disturbance on June 1 and 2, both **Gordon Goodyer,** Petworth, Sussex and **David Rennison,** Horsham, told me that short skip European stations were very strong. The band was quiet again on the 14th, 16th and 18th.

Satellites

"I have never previously heard such a severe disturbance on OSCAR 8J as we got on May 27," writes **John Branegan,** Saline, Fife. "The satellite could not be accessed at all from the south in the evening and I received reports confirming this from Germany and Sweden." Early in June, GM8PSM worked UA6LLD and W7AVD via OSCAR, and one cannot get much farther east than near Volvograd and west than Geyner, Montana. On June 4, John had c.w. contacts, via OSCAR 8J, with EA8CS and on the 5th, via OSCAR 8A, with VE2LI. Another satellite enthusiast is **Mr P. Moore,** Cardiff, who heard a QSO between stations in Holland and Germany, via OSCAR 7, at 1724 on June 3.

Microwaves

During April and May, **Ern Downer** G8GKV/P, Worthing and **Ern Hoare** G3RZD/P, Southwick, were out on Chanctonbury Ring, a high spot on the Sussex Downs, for 10GHz contacts with **Don Hayter** G3JHM/P, near Biggin Hill, Kent, and G2DSP/P and G4ETU/P, at Bognor Regis, Ford and the Trundle near Chichester. "The first leg of the 1979 Cumulative contest was literally a washout," writes Ern Downer whose gear gave trouble when swamped with rain. However, things were different on May 27 when the two Erns carried one lot of 3cm gear up Ide Hill, Kent, and despite an obstructed propagation path, had a 58 QSO, both ways with G3JHM/P situated on Butser Hill, in Hampshire and later they drove to Cross-in-Hand, near Heathfield, Sussex and worked him again.

The two Erns were back on Chanctonbury Ring for the second leg of the 10GHz cumulative contest and worked F3LP/P, 137km, F6DLA/P, 155km, G3JVL, Hayling Island, Hants, and G2DSP/P and G4ETU/P on the Trundle.

Tropospheric

On May 25, **John Cleaton** G4GHA, Wareham, Dorset, worked F1CVE/A, F6DGT/M and GU3KFT on 2m and between 1407 and 2200 on May 31, **Alan Baker** contacted two Belgian, one French and three German stations on 2m s.s.b., received strong signals through the Continental repeaters on R3, 4, 5, 7 and 9 and heard ON5UI say that he was watching u.h.f. TV from London. On June 2, I listened to a station in Leicester and another in Derby have a QSO via the Bristol Channel repeater, GB3BC, R6, and, during the evening while u.h.f. TV was disturbed some south coast stations worked into Germany on 2m. Incidentally, G4GNX had a 2m c.w. QSO with OS7EJ which is a special event station in Belgium, like our GB. At 2013 on June 5, F6FLB had a chat with RSGB Council Member **Robin Bellerby,** G3ZYE/M in Rottingdean, via the Brighton repeater, GB3SR, R3. During the good conditions on June 2, **George Grzebieniak** RS45173, London, heard G4FZL, Leicester, on 70cm and for the 144MHz portable contest on May 26/27 George and a school friend camped on a hill and had Frenchmen in the log among the stations heard. George has purchased an aerial rotator and is currently building Yagis for both 70 and 23cm. Members of the Brighton and District Radio Society made 44 contacts on 2m fm from the v.h.f. section of their demonstration station at Peacehaven Carnival on May 28 using the callsign, GB2PHC. Band V television was periodically disturbed on June 3 and 4 and while signals through the UK v.h.f. repeater network were very strong, I was receiving pictures from Lichfield on Ch. 8, 189MHz, with a dipole feeding my 405-line receiver. With the high atmospheric pressure, v.h.f. conditions were generally good between June 9 and 19; for example, on the 9th G4GNX worked 13 ONs and 2 PAs on 2m s.s.b. On the 11th, 18th and 19th I heard signals through GB3BC. At 2310 on the 18th, **Graham Knight** GM8FFX, RSGB v.h.f. Columnist, had a QSO with Alan Baker in Sussex on 2m s.s.b. and while all repeater channels were active, EI9Q worked a station in southern England. Around 0900 on the 19th, I received ATV's "Good Morning" caption from Lichfield on Ch. 8 and during the evening, G4GNX had a 30 minute QSO with ON4CJ, using 0·5 watt, a contact with G3SCH, Torquay, via the French repeater, FZ3VHB, R7, and joined the many stations waiting their turn to work EA1CR who was putting a strong signal into southern England.

Mobile Rally

About 100 people attended the mobile rally, organised by **Barry Ainsworth** G4GPW, for the Worthing and District Radio Club at Whiteways, Nr Arundel on May 19. The club station, G3WOR, operated by **Alan Floyd** G4GVB, had 19 contacts on 2m f.m. with GU4EON as their best DX. Among those present were members of the Brighton, Chichester, Horsham and Mid-Sussex radio clubs, and the prize, a bottle of sherry for the visitors who travelled the longest distance for the event went to **Don Butterworth** G3IKO and **Ted Creasy** G4FBI, from Redhill, Surrey.

Sporadic-E

Major sporadic-E disturbances occurred during the early evening of May 29, for most of the day on the 31, and June 1, 2, 3, around 1600 on the 4th, the afternoon of the 6th, the early evening of the 8th and during the mornings of the 11th, 17th and 19th. Between 1528 and 1615 on the 29th, **Des Sayer** G8RCF, Chard, Somerset, had 59 plus contacts with eight Italian stations as the first big event of the 1979 season spread into the 2m band. Des uses a FT225R, running 25 watts into a Tonna 9-element beam at 40ft a.g.l. and is currently working for his G4 call. John Cleaton, using a TS700, with 14 watts to a 6-element quad, worked 10 Italian stations and **Roy Bannister** G4GPX, Lancing, Sussex, worked six. While Mr P. Moore, Cardiff, using an AR88 receiver, Microwave Modules Converter and a 4-element quad aerial, heard GW4CQT work IC8IGJ and GW3CAD work I6WJB. **Peter Turner** G8RCJ, Brighton, contacted one Italian station and an IT9 and during the event, **Guy Stanbury** and **Bob Dewick,** had a good haul of Italian broadcast stations in Band II. **Igor Hajék,** University of Lancaster, heard many east-European f.m. stations between 65 and 73MHz during the sporadic-E events and writes: "before anyone starts wondering about doppler shifts, etc., there is up to one minute time difference between Polish transmitters when they broadcast the same stereo programmes."

Filters

Igor also has an idea for improving sporadic-E reception and says: "few people realise that under OIRT standard,

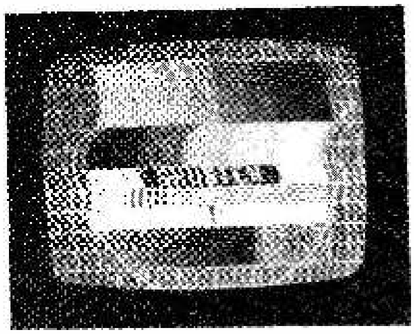
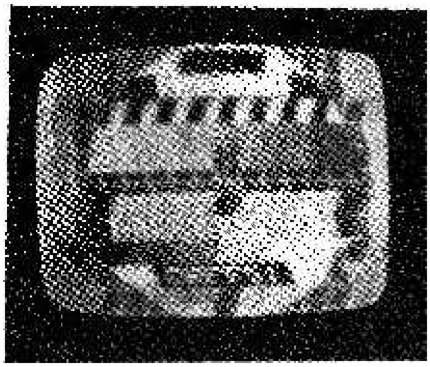
 

Fig. 2: (left) and Fig. 3 (right): Test cards from Grünten, Germany, and Austria, received by John Branegan in Fife on June 6

maximum deviation used by the east European f.m. transmitters is only 50kHz, rather than the 75kHz used by the west European CCIR systems. This of course means that the bandwidth of most current i.f. sections is unnecessarily large when receiving OIRT standard f.m. broadcasts. I would therefore advise anyone who uses for this purpose an i.f. section with ceramic filters such as CFSE10.7, or similar, to replace it with mono ceramic filters CFSB10.7 (available from Ambit International). Slight realignment of the i.f. section coils may be required if the new filters are of a different centre value". On several days between May 31 and June 20, I counted more than 30 strong f.m. broadcast signals from eastern Europe between 65 and 73MHz along with a variety of continental radiotelephone traffic in Band I.

DX TV

During the afternoon of May 29, Guy Stanbury and myself received strong television signals on Channel R1, 49·75MHz, from a variety of countries and, as in previous years, we noticed that programmes and test cards from different countries would replace each other on the channel according to the sporadic behaviour of the 'E' region, as it scattered the signals in many directions. Although it was difficult to identify stations under these circumstances, pictures from Czechoslovakia and Poland were predominant with me. At 0830 on the 31st there was a film about animals on R1, and at midday a Russian test card. One of the longest sporadic-E disturbances for many years occurred from June 1 through to the 3rd and, as usual my readers were right to the fore. **Graham Lay,** West Chiltington, Sussex, using a JVC 3040 and a dipole saw Mr Ian Smith in a newsreel from Yugoslavia, and then adverts for sweets from another station, while I received the MTV clock from Hungary and test cards from Austria, Poland and Russia, changing places on the screen, and both **Peter Penfold,** West Chiltington, and myself, noted the strong test card marked PRAHA.

From early morning on June 2 pictures from Scandinavia were pounding in and as the day went on a wide variety of television signals were seen between 48 and 68MHz, and **Sid Talbot** G8FCX, using a JVC 3050 and a dipole, saw ballet dancing from RTVE, Spain, as late as 2300. **Ian Rennison,** Horsham, saw test cards from Norge, Bremanger, Gamlemsveten, Gulen, Kongsberg, Hemnes and Melhus in addition to pictures from East Germany, Italy, Spain, Sweden and Russia. Ian, Peter and myself saw parts of the Pope's visit to Poland live from their TV service, but up in Fife, John Branegan said "By noon on June 3 the DXTV was rolling in with Poland, Norway and West Germany prominent. Unfortunately it was rolling from one station to another with five seconds of the Pope's visit to Poland, five seconds of football, five seconds of the Pope, hour after hour. By 1800, Norway Hadsel and Steigen were dominant and both giving quality signals till I went to bed at 2200." While **Adrian Boyd,** Horsham, and myself saw the test card from Iceland, Guy Stanbury watched pictures from Portugal.

"At around 0630, on June 3, Ch. R1 began to lock and I was able to watch news programmes and a WWII documentary for about an hour or so," writes **Sam Faulkner** of Burton-on-Trent, Staffs. "As R1 began to fade, tuning to E2 produced the PM5544 test card, Sverige, which was soon replaced by Norway on both E2, 48·25MHz, and E3, 55·25MHz, with transmitters Bagn, Gamlen, Hemnes, Melhus and Steigen." Both John Branegan and myself saw these early pictures and later, John saw a test card from Sweden, and at 1500, added Hadsel and Trondheim to the Norwegian list.

Around 1130 on the 6th, Sam Faulkner saw RTVE, Spain, on E2, and during the early afternoon John Branegan and myself received a strong test card from the German station, Grünten, Fig. 2, and Denmark, and later John had pictures from Austria, Fig. 3, and Poland, while Sam, using a Skantic 1746 receiver and a 4-element beam said: "some of the strongest signals so far came from Sweden with many transmitters fighting for predominance." Pictures from Norway were again seen at 1219 on the 11th, Spain at 1700 on the 18th, Poland at 0810 on the 19th and Switzerland at 1214 on the 20th.

70 Centimetres

I had a 539 signal from the Emley Moor beacon, GB3EM, on 432·91MHz, during an extensive tropospheric opening around 0800 on the 20th, with only a dipole feeding the 70cm converter in my Yaesu FR101.

Dave Cox G8OPR, Andover, Hants, is now active on 432MHz and made his first contact with GU3KFT and his first into France with F5NS/P, 30km n.w. Caen. Dave's equipment can run f.m., s.s.b. or amateur television into an 18-element parabeam.

Teaching Radio to the Blind

B. WATSON

Radio is a very popular hobby with many people suffering from various forms of physical disability. The reprint of our series: *So You Want to Pass the Radio Amateurs' Examination?* is currently being transcribed into Braille for the use of blind students.

This article, written by a blind pupil at Worcester College for the Blind, gives an insight into some of the problems to be overcome in pursuing the practical side of the hobby.

You may think that the only work which a blind person is capable of doing is weaving baskets. Well, in the case of Worcester College for the Blind, this is not true. Here, some of the pupils have the opportunity to take a course in radio construction, organised each year by the science teacher.

You may wonder: "How does a blind person know what to look for on a resistor to denote its value? He can't see the colours." Well, a blind person doesn't need to see colours to know the value of a resistor, he just needs to be able to read Braille. Every blind person at Worcester can do this anyway, as it is the main form of communication outside speech. Braille symbols consist of a series of raised dots, shaped like a six on a die, each with some dots missing from it, depending on the letter or series of letters it denotes.

Each resistor is capped with a label bearing a series of three of these symbols, one for each coloured band. The resistors are, in fact, ordinary components taken from a radio or electronics kit, with the addition of the Braille label. None of the other components—capacitors, transistors, coils or transformers—is specially labelled, except that the connecting wires on coils are identified by a number of raised bands round the wire, according to the colour. Most of the circuits are joined together by means of metal strips, fitted over a transparent Perspex circuit board.

Circuits

The course begins by building a simple one-diode set, and progresses through one transistor plus one diode, two transistors, and so on right up to the end of the course when students can, if they wish, build a six-transistor superhet, with a push-pull amplifier. This is a very slow build-up, as it is difficult for a blind person to work quickly.

The classes are limited to a maximum of five or six, partly because of the lack of equipment, but mainly because it takes so long to teach blind people due to the impossibility of using a blackboard or printed diagram. If a diagram is needed, it has to be drawn in raised lines on a substance called Melinex. Alternatively, it can be drawn in Braille and then printed onto plastics pages; this is called Thermaforming. Both these processes, however, take time. In practice, those pupils with a small amount of sight, sufficient to make out the detail on an ordinary diagram, will use that, and the rest generally don't use a diagram at all.

Progress

Some of the radio sets constructed get quite complicated, and it takes two or more classes to complete one set. Each student works at his own pace, which must make the teacher's job far from easy, as everyone is at a different stage of construction. However, people learn far more that way.

After each set is completed, it is tested using headphones, or an external amplifier and loudspeaker. The more advanced circuits include their own audio amplifier, and can be tested directly on a loudspeaker.

After the radio course, some of the boys go on to construct simple electronic apparatus, under the guidance of the same science teacher. Such things as oscillators, very low power transmitters and some other equipment can be made, taken from the same course as the radio building, but more advanced.

Theory

Another activity at Worcester, also involving radio, needs outside assistance, and each week a man comes down from Birmingham to teach some pupils more of the theory of radio and electronics. This involves some maths and a little knowledge of physics. At the end of the course, it is intended that pupils will be able to take the Radio Amateurs' Examination.

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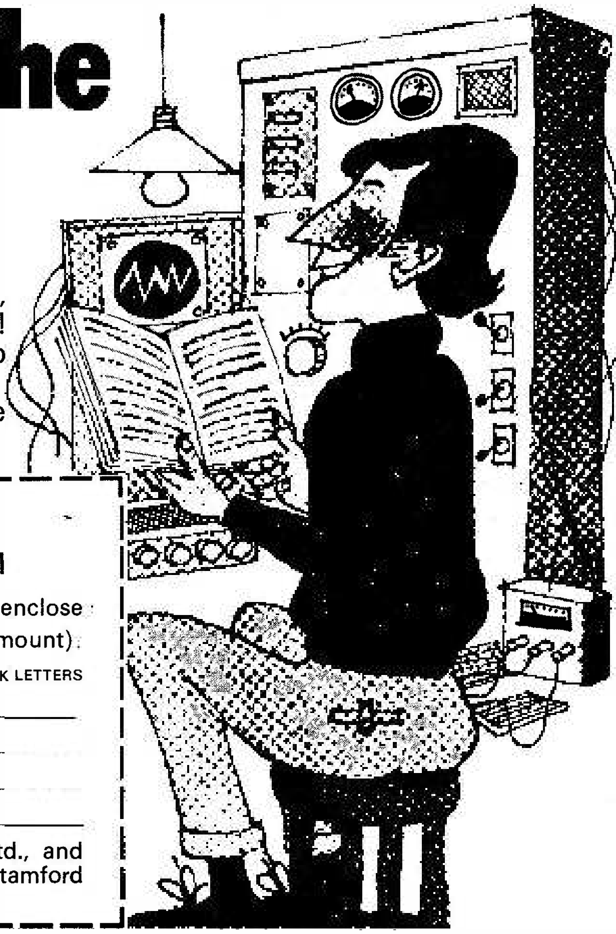

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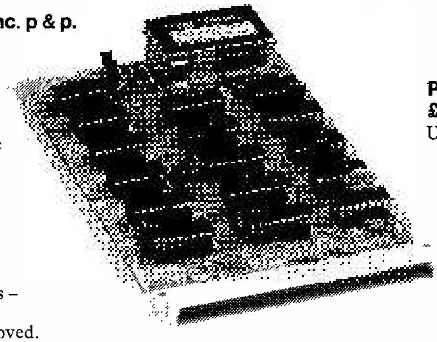

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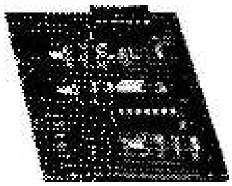

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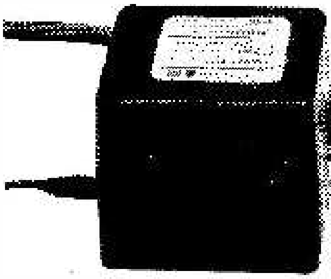

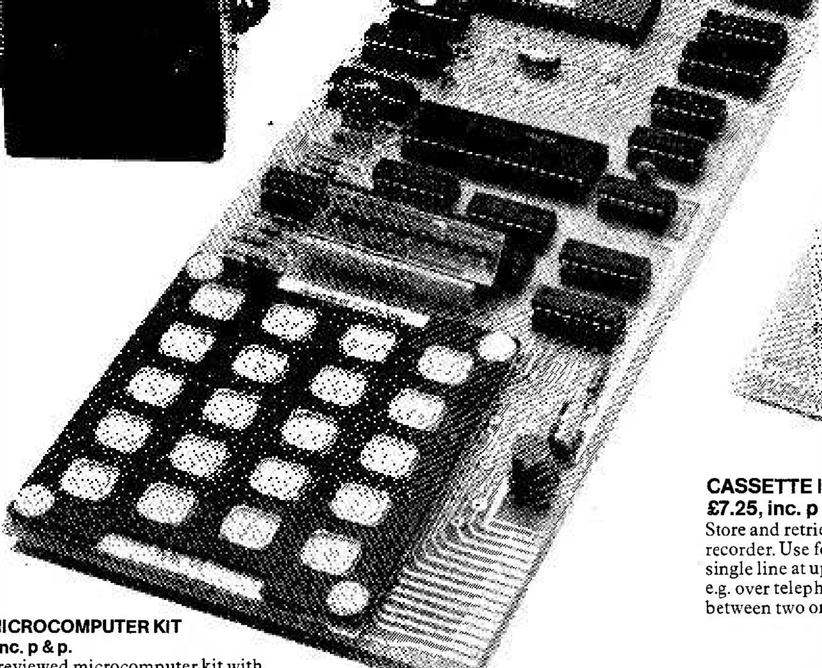

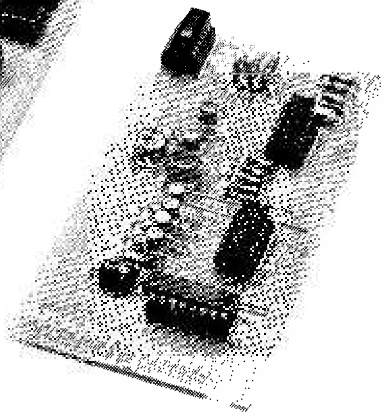

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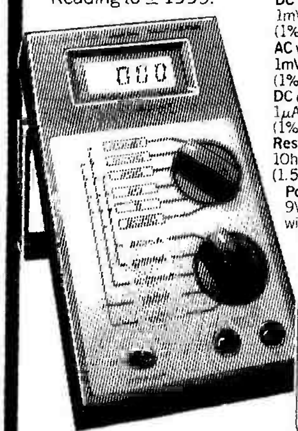

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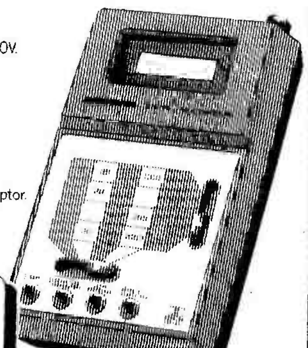

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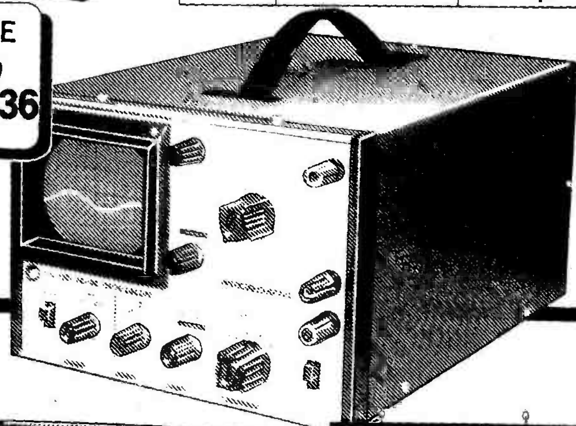

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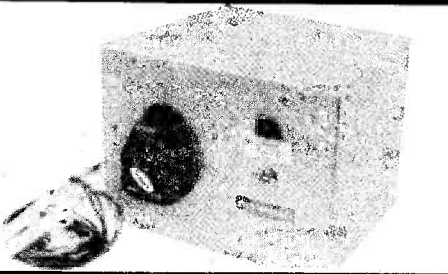

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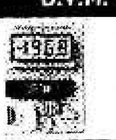

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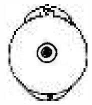

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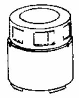

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8·08333MHz	323p
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10MHz	323p
10·7MHz	323p
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CA3046	71	NE555	22
CA3048	210	NE556DB	60
CA3075	175	NE560	325
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CA3130	85	NE567V	170
CA3140	70	NE570	395
ICL7106	795	NE571	420
ICL7107	975	RC4136D	120
ICL8038CC	340	SAD1024	1350
ICM7205	1150	SAS560	195
ICM7215	1025	SAS570	195
ICM7217A	790	SG3402	295
ICM7555	89	SN76003N	170
LD130	452	SN76013N	140
LF365	98	SN76013ND	120
LM301A	30	SN76018	148
LM308T	110	SN76023N	140
LM311H	120	SN76023ND	120
LM318H	205	SN76033N	175
LM324A	68	SN76115N	215
LM339	70	SN76131	110
		SN76227N	115
		SN76477	225

TRANSFORMERS* (mains Prim. 220-240V)
6-0-6V 100mA; 9-0-9V 75mA; 12-0-12V 75mA **95p**.
8VA type: 6V-·5A 6V-·5A; 9V-·4A 9V-·4A; 12V-·3A 12V-·3A; 15V-·25A 15V-·25A **195p**.
12VA: 4·5-1·3A 4·5V-1·3A; 6V-1·2A 6V-1·2A 12V-·5A 12V-·5A **220p** (20p p&p)
24VA: 6V-1·5A 6V-1·5A; 9V-1·2A 9V-1·2A; 12V-1A 12V-1A; 15-·8A 15-·8A; 20V-·6A 20V-·6A **290p** (45p p&p)
50VA: 6V-4A 6V-4A; 9V-2·5A 9V-2·5A; 12V-2A 12V-2A; 15V-1·5A 15V-1·5A; 20V-1·2A 20V-1·2A; 25V-1A 25V-1A; 30V-·8A 30V-·8A **350p** (50p p&p)
100VA: 12V-4A 12V-4A; 15V-3A 15V-3A; 20V-2·5A 20V-2·5A; 30V-1·5A 30V-1·5A; 40V-1·25A 40V-1·25A; 50V-1A 50V-1A **650p** (N.B. P&P charge to be added (60p p&p) above our normal postal charge.)

DENCO COILS

Dual Purpose 'DP' VALVE TYPE		B9A Valve Base	25p
		RDT2	92p
		RFC 5 chokes	91p
Ranges: 1-5 Bl. Yl.		RFC 7(19mH)	96p
Rd. Wht.	86p	1FT 13/14/15/16	
6-7 B, Y, R	76p	17	85p
1-5 Green	92p	1FT 18/1·6	92p
'T'-type (Transistor Tuning).		1FT 18/465	104p
		TOC1	86p
Ranges: 1-5 Bl. Yl.		MW 5FR	82p
Rd. Wht.	93p	MW/LW 5FR	103p

TRANSISTORS

	p
AC125	20
AC126	20
AC127	20
AC128	20
AC141	24
AC142	24
AC176	24
ACY17	40
ACY18	40
ACY19	40
ACY20	40
ACY21	40
ACY22	40
ACY28	40
ACY39	78
AD149	70
AD161	42
AD162	42
AF114	50
AF115	50
AF116	50
AF117	50
AF118	65
AF139	35
AF178	70
AF239	42
BC107	9
BC107B	10
BC108	9
BC108B	10
BC10BC	12
BC109	9
BC109B	12
BC109C	12
BC117	20
BC119	28
BC140	35
BC142	30
BC143	30
BC147	8
BC147B	10
BC148	8
BC148B	10
BC148C	10
BC149	8
BC149C	10
BC153	27
BC154	27
BC157	10
BC158	11
BC159	11
BC160	42
BC167A	11
BC168C	12
BC169C	14
BC170	18
BC172	11
BC173	12
BC177	18
BC178	16
BC179	18
BC181	20
BC182	9
BC183	9
BC184	9
BC182L	11
BC183L	10
BC184L	11
BC187	28
BC212	10
BC212L	11
BC213	10
BC213L	12
BC214	10
BC214L	13
BC307B	20
BC308B	20
BC327	15
BC328	15
BC338	12
BC441	36

	p
BC461	36
BC477	25
BC547	12
BC548	12
BC549C	13
BC557	15
BC558	20
BC559	20
BCY70	18
BCY71	20
BCY72	20
BD131	45
BD132	45
BD133	43
BD135	38
BD136	36
BD137	36
BD138	50
BD139	40
BD140	36
BD144	198
BD145	198
BD205	110
BD378	65
BD434	42
BD517	65
BD695A	65
BD696A	65
BDY56	156
BF115	34
BF167	30
BF194	12
BF195	12
BF196	12
BF197	14
BF198	18
BF199	18
BF200	32
BF244	29
BF244B	30
BF256	60
BF257	30
BF258	30
BF259	30
BF274	18
BF336	35
BF594	40
BF595	38
BFR39	25
BFR40	25
BFR41	28
BFR79	28
BFR80	28
BFR81	28
BFR98	105
BFX29	28
BFX84	26
BFX85	28
BFX86	28
BFX87	28
BFX88	28
BFY50	20
BFY51	20
BFY52	20
BFY56	45
BFY64	40
BFY71	20
BFY81	90
BSX20	18
BSY95A	18
BSZ26	75
BU105	140
BU205	190
BU208	225
MD8001	158
MJ491	160
MJ2955	105
MJE340	54
MJE370	58
MJE371	60
MJE2955	105
MJE3055	70
MPF102	66

	p
MPF103	36
MPF104	36
MPF105	36
MPF106	40
MPSA05	25
MPSA06	25
MPSA12	42
MPSA55	25
MPSA56	25
MPSU06	56
MPSU56	60
OC26	170
OC28	150
OC35	130
OC36	130
OC41	48
OC42	48
OC43	55
OC44	31
OC45	28
OC70	28
OC71	28
OC72	45
OC74	55
OC76	36
OC77	76
OC81	50
OC82	50
OC83	48
OC84	44
OC140	110
OC170	85
OC171	75
OC200	85
TIP29	43
TIP29B	56
TIP29C	60
TIP30	47
TIP30B	64
TIP30C	65
TIP31A	52
TIP31C	65
TIP32A	58
TIP32C	75
TIP33A	85
TIP33C	105
TIP34A	85
TIP34C	110
TIP35A	185
TIP35C	220
TIP36A	220
TIP36C	255
TIP41A	66
TIP41B	73
TIP42A	72
TIP42B	82
TIP2955	65
TIP3055	65
TIS43	34
TIS44	45
TIS45	45
TIS88A	00
TIS90	20
TIS91	24
ZTX107	12
ZTX108	12
ZTX109	14
ZTX300	13
ZTX301	15
ZTX302	20
ZTX303	25
ZTX304	24
ZTX314	24
ZTX326	40
ZTX341	20
ZTX500	15
ZTX501	15
ZTX502	19
ZTX503	15
ZTX504	25

	p
ZTX531	25
ZTX550	25
40311	60
40313	125
40315	55
40316	85
40362	48
40408	70
40594	90
40595	98
40603	65
40411	295
40412	65
40467	95
40594	90
40595	98
40603	65
40673	68
2N697	25
2N698	44
2N699	54
2N706A	18
2N708	19
2N918	40
2N1131	22
2N1132	22
2N1303	50
2N1304	50
2N1305	28
2N1613	23
2N1670	150
2N1671B	215
2N2160	350
2N2217	43
2N2218A	34
2N2219A	22
2N2220A	26
2N2221A	23
2N2222A	20
2N2303	45
2N2368	21
2N2369A	15
2N2483	28
2N2484	25
2N2646	48
2N27B4	55
2N2846	140
2N2894	35
2N2904	22
2N2905A	22
2N2906	22
2N2907	22
2N2907A	22
2N2926G	10
2N3011	24
2N3053	20
2N3054	55
2N3055	48
2N3108	32
2N3442	146
2N3663	26
2N3702	11
2N3703	11
2N3704	11
2N3705	11
2N3706	11
2N3707	11
2N3708	11
2N3709	11
2N3710	16
2N3711	12
2N3771	233
2N3772	195
2N3773	288
2N3819	22
2N3820	45
2N3822	130

	p
2N3823	95
2N3866	90
2N3903	20
2N3904	18
2N3905	18
2N3906	17
2N4037	52
2N4058	17
2N4061	17
2N4062	17
2N4427	75
2N5172	25
2N5179	60
2N5191	70
2N5305	40
2N5457	32
2N5458	32
2N5459	32
2N5485	35
2N5642	750
2N5777	45
2N6027	40
3N128	112
3N140	112

Matched Pair 20p extra

CMOS

4000	13	4174	82
4001	13	4175	78
4002	15	4194	90
4006	82	4408	670
4007	14	4409	670
4008	55	4410	670
4009	38	4411	795
4010	38	4412F	1250
4011	16	4412V	1050
4012	14	4415F	520
4013	34	4415V	390
4014	55	4419	226
4015	63	4422	426
4016	27	4424	426
4017	60	4425	550
4018	61	4426	276
4019	32	4429	480
4020	70	4430	199
4021	52	4433	780
4022	52	4435	540
4023	14	4440	1275
4024	42	4447	370
4025	14	4450	260
4026	120	4451	220
4027	35	4452	
4028	50	4460	690
4029	54	4461	280
4030	50	4462	82
4031	205	4469	890
4032	100	4490F	310
4033	145	4490V	240
4034	116	4493	240
4035	80	4494	240
4036	335	4495	240
4037	100	4496	580
4038	90	4500	650
4039	320	4501	16
4040	54	4502	57
4041	80	4503	42
4042	54	4535	75
4043	46	4506	46
4044	46	4507	30
4045	145	4508	160
4046	66	4510	55
4047	87	4511	80
4048	58	4512	70
4049	24	4513	206
4050	30	4514	140
4051	45	4515	140
4052	45	4516	52
4053	45	4517	382
4054	110	4518	52
4055	99	4519	32
4056	135	4520	52
4057	1650	4521	228
4059	480	4522	149
4060	115	4526	58
4061	1425	4527	152
4062	995	4528	70
4063	110	4529	145
4066	34	4530	85
4067	380	4531	135
4068	14	4532	67
4069	14	4534	575
4070	14	4536	365
4071	14	4538	142
4072	14	4539	105
4073	14	4541	135
4075	14	4543	155
4076	57	4549	375
4077	14	4550	398
4078	14	4554	150
4081	14	4555	46
4082	14	4556	44
4085	74	4557	451
4086	73	4558	105
4089	150	4559	375
4093	35	4560	210
4094	190	4561	65
4095	105	4562	533
4096	105	4566	155
4097	372	4568	268
4098	99	4569	280
4099	145	4572	26
4160	78	4580	594
4161	78	4581	297
4162	78	4582	130
4163	78	4583	75
		4584	63
		4585	105

SN76660	90	74S188	185
SP8629	450	74S262	895
TAA621AX1	250	74S287	325
TAA661A	155	74S470	325
TAA700	353	74S475	825
TAA960	320	81LS95	125
TAD100	159	81LS96	125
TBA120S	70	81LS97	137
TBA540	220	AY-5-2376	920
TBA550Q	330	CP1610	920
TBA990Q	270	MC1488	85
TBA641-A12/		MC1489	90
BX1 or BX11	250	MK4027 4K	325
TBA651	180	MK4118	2099
TBA800	90	Z80 CPU2·5	990
TBA810S	95	Z80 4MHz	1099
TBA820	70	Z80 P10	660
TBA920Q	260	Z80 CTC	595
TCA270Q	235		
TCA965	210		
TDA1008	310		
TDA1022	575		
TDA1024	105		
TDA2020	320		
TL061C	76		
TL062CP	125		
TL064CN	199		
TL072CP	125		
TL074CN	199		
TL081CP	48		
TL082CP	96		
TL083CP	105		
TL084CP	130		
UAA170	198		
UAA180	198		
ZN414	90		
ZN424E	130		
ZN425E	415		
ZN1034	200		

VDU IC'S

AY-3-1015	550
AY-5-1013	450
SFF96364E	1050
SFC71301	820
SFS80102	205
SN74LS163	118
SN74S262	895
SN75450	120
SN75451	70
SN75452	70
SN75454	225
TMS6011	355

COMPUTER IC'S

2102-2	225
2111	195
2112-2N	250
2114	550
2513	650
2708	775
27L08	995
2716	1950
4116 16K	1050
4027	325
4047	750

TTL 74* (TEXAS)

7400	11	7420	14	74107	29	74185	135
7401	11	7421	29	74109	54	74188	275
7402	11	7422	19	74110	54	74190	95
7403	12	7423	23	74111	60	74191	95
7404	12	7425	16	74112	125	74192	70
7405	13	7426	25	74116	150	74193	70
7406	23	7427	18	74118	62	74194	70
7407	30	7428	30	74119	110	74195	98
7408	13	7430	12	74120	79	74196	65
7409	16	7432	15	74121	25	74197	80
741D	12	7433	30	74122	31	74198	150
7411	14	7437	17	74123	35	74199	150
7412	18	7438	17	74125	35	74221	132
7413	21	7440	13	74126	51	74246	204
7414	35	7441	65	74128	60	74247	204
7416	26	7442	35	74132	42	74248	204
7417	30	7443	85	74136	55	74249	204
		7444	85	74141	45	74251	125
		7445	75	74142	165	74265	63
		7446	79	74143	250	74273	320
		7447	47	74144	250	74278	240
		7448	56	74145	52	74279	119
		7450	16	74147	99	74283	173
		7451	16	74148	93	74284	385
		7453	16	74150	70	74285	395
		7454	16	74151	39	74290	125
		7460	16	74153	45	74293	125
		7470	23	74154	75	74297	236
		7472	23	74155	45	74283	173
		7473	19	74156	45	74284	383
		7474	19	74157	45	74285	395
		7475	25	74159	150	74290	125
		7476	22	74160	54	74293	125
		7480	45	74161	59	74297	236
		7481	70	74162	60	74298	185
		7482	69	74163	92	74365	128
		7483	51	74164	65	74366	118
		7484	80	74165	105	74367	124
		7485	65	74166	80	74368	124
		7486	16	74167	150	74390	184
		7489	120	74170	120	74393	184
		7490	30	74172	350	74490	198
		7491	70	74173	90	75150	175
		7492	37	74174	60	75491	92
		7493	30	74175	87	75492	92
		7494	50	74176	75		
		7495	46	74177	78		
		7496	44	74178	153		
		7497	150	74180	85		
		74100	119	74181	165		
		74104	62	74182	88		
		74105	62	74184	135		

INDEX TO ADVERTISERS

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Tecknowledgey for sale.

The Mark III FM Tuner

DIY Hi-Fi will never seem the same again. Ambit's Mark III tuner system is electrically & visually superior to all others. Some options available, but the illustrated version with reference series modules: £149.00 + £18.62 VAT

With Hyperfi Series modules £185.00 + £23.12

Features of the system

* Precision construction & design of all parts
* Time/frequency display
* State of the art performance with facilities for updates, using modular plug in systems.
* Deviation level calibrator for recording
* All usual tuner features

ALL TUNER KITS £3 carriage

Digital Dorchester All Band Broadcast Tuner: LW/MW/SW/SW/SW/FM stereo

A multiband superhet tuner, constructed using a single IC for RF/IF processing - but with all features you would expect of designs of far greater complexity. The FM section uses a three section (air gang) tuned FET tunerhead, with ceramic IF filters and interstation mute; AM employs a double balanced mixer input stage, with mechanical IF filters - plus a BFO and MOSFET product detector for CW/SSB reception. Styled in a matching unit to the Mark III FM only tuner, employing the same degree of care in mechanical design to enable easy construction. MW/LW reception via a ferrite rod antenna.

Electronics only (PCB and all components thereon) £33.00 + £4.12 VAT
Complete with digital frequency readout/clock-timer hardware £99.00 + £12.37 VAT
Complete with MA1023 clock/timer module with dial scale £66.00 + £8.25 VAT

Hardware packages are available separately if you wish to house your own designs in a professional case structure. Please deduct the cost of electronics from complete prices.

LW MW FM LCD Digital Frequency Display - July PW feature

Update your old radio, or build this into a new design. Or use it as a servicing aid - this low power unit with LCD display reads direct frequency in kHz/MHz, or with usual AM/FM IF offsets for received frequency. Low power LCD means no RFI - 15-20mA at 9v even with the divide by 100 prescalar. FM resolution is 100kHz, AM 1kHz. Sensitivities better than 10mV

Complete kit £19.50 +*£1.56 VAT. Built and tested version £24.00 +*£1.92 VAT

Various other DFM systems described in our catalogue part 2 - including a one chip solution to providing digital display of FRG7 kHz dial, combined with clock/timers etc.

PW SANDBANKS PI METAL LOCATOR

Maintaining our professional approach to home constructor kits, we offer the pulse induction 'Sandbanks'. Now with injection molded casing for greatly improved enviromental sealing. £37.00+ *£2.96vat.

VHF MONITOR RX WITH PLESSEY IC

4/9 channel version of the PW design - but using standard 3rd OT crystals, and TOYO 8 pole crystal filter with matching transformers. Coil sets from our standard range to cover bands from 40 to 200MHz. Complete module kit £31.25 +£3.90vat .

ETI - REMCON RADIO CONTROL

A tried and testec RC system with a full set of supporting hardware from a well known manufacturer. Please send for details - and watch our ads for further news of developments in RC products.

Radio and Audio Modules : The biggest range/ best specs:

EF5801/3/4 6 stage varicap tunerheads with LO feed and various levels of sophistication. New 5804 include pin AGC loop 'on board'. 5801:£17.45+£2.18vat - 5803:£19.75+£2.47vat 5804:£24.95 +£3.18vat. *Frequencies in 40-180MHz on appcn.*

EF5402 4 stage varicap with TDA1062, compound FET/Bipolar input stage, low noise, balanced mixer, pin agc, osc output. A worthy successor to the 5400. £10.75+£1.34vat

The 5402 is available centred on a wide range of frequencies from 30MHz to 180MHz. Non standard units £14.75+£1.84 - 3 weeks.

8319 4 stage varicap tunerhead from Larsholt using MOSFET RF and mixer stages. New temperature compensated oscillator for wide ranges of ambient temperature £13.45+£1.68vat

7252 Complete Larsholt FM tuner less stereo decoder. £26.50+£3.31vat

7253 Stereo FM tunerset from Larsholt with FET head. (as 7252)

944378 Hyperfi stereo decoder. The very best. £19.95+£2.49vat

911223 Pilot cancel stereo decoder, priced to make the MC1310 as obsolete as it now deserves to be.£12.50+£1.56vat

Inotec 1-A fully DC tuned and switched LW/MW/FM stereo tuner to interface with synthesiser control etc.A first! Details OA

COMPONENTS for Radio and Audio ICs, HMOS etc.

The list is too long to attempt here, but AMBIT specializes in all types of semiconductor for radio reception, including devices operating from DC to 5GHz. New low cost SBL1 diode ring mixers (equiv case MD108 etc) -first with HMOS fets, now with a PCB for DC amplifier, and offset sense and protection relay for speakers. See catalogue and updates for most info, pse send an SAE for information on anything you cannot find in catalogues.

Radio ICs	cost	+ vat	Stereo ICs	cost	+ vat	AF power ICs	cost	+ vat
CA3089E	1.94	24	MC1310P	1.50	19	LM380N	1.00	12
CA3189E	2.45	30	uA758	2.20	27	TBA810AS	1.09	14
HA1137W	2.20	27	CA3090A	2.75	34	TDA2002	1.95	24
SN76660	0.75	9	HA1196	3.95	49	TBA820M	0.75	9
TDA1090	3.35	42	HA11223	4.35	54			
TDA1083	1.95	24	KB4437	4.35	54			
TDA1220	1.40	17	KB2224	2.75	34			
SL6640	2.75	34	Preamp ICs/switches					
MC3357	3.12	39	TDA1028	3.50	44			
HA1197W	1.40	17	TDA1029	3.50	44			
MC1496	1.25	16	TDA1074	4.14	52			
LM373/4	3.75	49	KB4438	2.22	28			

from the general list: LEDs:all colours and low prices
2SJ48/2SK134 HMOS 9.90 +£0.80 vat(Pair)
Signal fets/transistors and TOKO COILS & FILTERS!

OSTS: Remember all OSTS stocks are obtained from BS9000 approved sources - your assurance that all devices are very best first quality commercial types. Some LPSN TTL is presently in great demand, so please check by phone before ordering .

IMPORTANT: ALL OSTS PRICES EXCLUDE VAT - CURRENTLY 8% - BUT MAY BE CHANGED BY THE TIME YOU READ THIS. PLEASE REMEMBER TO ADD VAT, and 25p POSTAGE !!

TTL:Standard AND LP SchottkY

All prices listed in pence *

	'N'	'LSN'		'N'	'LSN'		'N'	'LSN'		'N'	'LSN'		'LSN'
7400	13	20	7455	35	24	74126	57	44	74185	134		74377	124
7401	13	20	7460	17		74128	74		74188	275		74378	93
7402	14	20	7463		124	74132	73	78	74190	115	92	74379	130
7403	14	20	7470	28		74133		29	74191			74368	37
7404	14	24	7472	28		74136		40	74192	105	180	74390	140
7405	18	26	7473	32	38	74138		60	74193	105	180	74393	140
7406	38		7474	27	38	74139		60	74194	105	187	74395	139
7407	38		7475	38	40	74141	56		74195	95	137	74396	133
7408	17	24	7476	37	38	74142	265		74196	99	110	74398	180
7409	17	24	7478		38	74143	312		74197	85	110	74399	150
7410	15	24	7480	48		74144	312		74198	150		74445	92
7411	20	24	7481	86		74145	65	97	74199	160		74447	90
7412	17		7482	69		74147	175		74247		90	74490	140
7413	30		7483A		110	74148	109	191	74248		90	74668	110
7414	51		7484	97		74150	99		74249		93	74670	249
7415		24	7485	104	99	74151	64	84	74251		90		
7416	30		7486		40	74153	64	54	74253		105		
7417	30		7489	205		74154	96		74257		108		
7420	16	24	7490	33	90	74155	54	110	74258		153		
7421	29	24	7491	76	110	74156	80	110	74259		420		
7422	24	24	7492	38	78	74157	67	55	74260		153		
7423	27		7493	32	99	74158		60	74261		353		
7425	27		7494	78		74159	210		74266		40		
7426	36	27	7495A	65	99	74160	82	130	74273		124		
7427	27	29	7496	58	120	74161	92	78	74275		312		
7428	35	32	7497	185		74162	92	130	74279		52		
7430	17	24	74100	119		74163	92	78	74283		120		
7432	25	24	74104	63		74164	104	130	74290		90		
7433	40	32	74105	62		74165	105		74293		95		
7437	40	24	74107	32	38	74166			74295		120		
7438	33	24	74109	63	38	74167	20		74298		400		
7440	17	24	74110	54	54	74168			74324		157		
7441	74		74111	68		74169		200	74325		242		
7442	70	99	74112		38	74170	230	200	74326		247		
7443	115		74113		38	74172	625		74327		237		
7444	112		74114		38	74173	170		74352		100		
7445	94		74116	198		74174	87	120	74353		100		
7446	94		74118	83		74175	87	110	74362		715		
7447	82	89	74119	119		74176	75		74365		49		
7448	56	99	74120	115		74177	78		74366		49		
7449		99	74121	25		74180	85		74367		43		
7450	17		74122	46	57	74181	165	350	74368		49		
7451	17	24	74123	48	73	74182	160		74373		77		
7453	17		74124		137	74183		210	74374		77		
7454	17	24	74125	38	44	74184	135		74375		60		

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4010	58p	4070	20p	4534	614p
4011	17p	4071	20p	4536	380p
4012	17p	4072	20p	4538	150p
4013	55p	4073	20p	4539	110p
4014	95p	4075	20p	4541	141p
4016	52p	4076	90p	4543	174p
4017	80p	4077	20p	4549	399p
4018	80p	4078	20p	4553	440p
4019	60p	4081	20p	4554	153p
4020	93p	4082	20p	4556	77p
4021	82p	4085	82p	4557	386p
4022	90p	4086	82p	4558	117p
4023	17p	4089	150p	4559	388p
4024	76p	4093	50p	4560	218p
4025	17p	4094	190p	4561	65p
4026	180p	4096	105p	4562	530p
4027	55p	4097	372p	4566	159p
4028	72p	4098	110p	4568	281p
4029	100p	4099	122p	4569	303p
4030	58p	4160	90p	4572	25p
4031	250p	4161	90p	4580	600p
4032	100p	4162	90p	4581	319p
4033	145p	4163	90p	4582	164p
4034	200p	4174	104p	4583	84p
4035	120p	4175	95p	4584	63p
4036	250p	4194	95p	4585	100p
4037	100p	4501	23p		
4038	105p	4502	91p		
4039	250p	4503	69p		
4040	83p	4506	51p		
4041	90p	4507	55p		
4042	85p	4508	248p		
4043	85p	4510	99p		
4044	80p	4511	149p		
4045	150p	4512	98p		
4046	130p	4513	206p		
4047	99p	4514	260p		
4048	60p	4515	300p		
4049	55p	4516	125p		
4050	55p	4517	382p		
4051	65p	4518	103p		
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		NE531N	105p

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5082 7663	yellow CC	
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5082- 7673	green CC	

0.3" Standard HP

5082- 7730	red CA	147p
5082 7740	red CC	

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Current news: Work continues apace on our HMOS PA kit, and by the time this is published - we expect to be about to launch the product in a style that matches the Mark III system. The unit uses separate transformers and power supplies, and includes a DC offset sensing circuit combined with slow switch-on using a relay. We introduce the HyperFi FM IF with this advert - and a separate leaflet is available on request with an SAE. All new pricelist revision also available with an SAE. The Mullard DC controlled tone volume and switch ICs with a 'more than HiFi' specification are in stock at last - together with reams of data (over 50 pages now). Also, RC enthusiasts will be interested to learn that we are supplying parts for various kits now.

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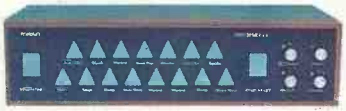
MAPLIN

This superb organ – build the first working section for just over £100. Full specification in our catalogue.



Touch operated rhythm generator, the 'Drumsette'. Construction details 25p. (Leaflet MES49). Specification in our catalogue.

Multimeters, analogue and digital, frequency counter, oscilloscopes, and lots, lots more at excellent prices. See cat. pages 106 and 183 to 188 for details.

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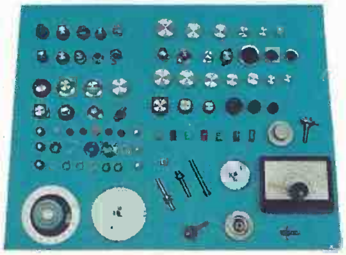
Our bi-monthly newsletter contains guaranteed prices, special offers and all the latest news from Maplin.



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PW 979

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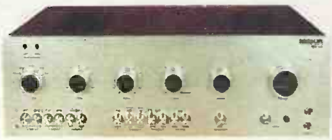

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Television Transmitters

	ITV	BBC1	BBC2
101 (T)	23	26	33
102 (A)	43	46	40
103 (Ga)	59	55	62
104 (Y)	47	44	51
105 (Sc)	43	40	46
105.10 (Sc)	25	22	28
106 (H)	41	44	51
107 (U)	24	31	27
108 (S)	27	31	24
109 (TT)	61	58	64
110 (H)	61	58	64
111 (A)	61	58	64
112 (Gn)	25	22	28
113 (S)	66	50	56
114 (Aa)	59	62	55
115 (Aa)	41	51	44
116 (TT)	29	33	26
117 (A)	60	57	63
118 (H)	60	57	63
119 (H)	60	57	63
120 (Y)	25	22	28
121 (A)	23	26	33
123 (Gn)	60	57	63
124 (Aa)	24	31	27
125 (S)	58	61	55
126 (S)	42	39	45
129 (H)	43	46	40
130 (U)	59	55	62
131 (W)	25	22	28

	ITV	BBC1	BBC2
132 (W)	23	33	26
134 (Gn)	43	40	46
135 (H)	24	31	27
136 (W)	60	57	63
137 (B)	28	30	34
138 (W)	59	55	62
139 (S)	64	49	52
141 (W)	41	51	44
145 (H)	49	52	45
147 (Sc)	24	31	27
148 (Gn)	24	31	27
149 (A)	25	22	28
151 (U)	25	22	28
152 (Sc)	23	33	26
153 (Gn)	23	33	26
154 (Gn)	23	33	26
155 (TT)	49	39	45
156 (Gn)	49	39	45
158 (T)	43	40	46
161 (B)	59	55	62

Programme Areas:

Border (B)	Grampian (Gn)
Scottish (Sc)	Ulster (U)
Anglia (Aa)	Southern (S)
Granada (Ga)	Westward (W)
Thames (T)	HTV (H)
ATV (A)	Yorkshire (Y)
Tyne Tees (TT)	

National v.h.f. stations

	Radio 2/1 MHz	Radio 3 MHz	Radio 4 MHz
Oxford	89·5	91·7	93·9
Swingate	90·0	92·4	94·4
Wrotham	89·1	91·3	93·5
Sutton Coldfield	88·3	90·5	92·7
Peterborough	90·1	92·3	94·5
Tacolneston	89·7	91·9	94·1
Rowridge	88·5	90·7	92·9
N. Hessary Tor	88·1	90·3	92·5
Redruth	89·7	91·9	94·1
Belmont	88·8	90·9	93·1
Holme Moss	89·3	91·5	93·7
Douglas (I.of M.)	88·4	90·6	92·8
Morecambe Bay	90·0	92·2	94·4
Pontop Pike	88·5	90·7	92·9
Sandale	88·1	90·3	94·7
Kirk O'Shotts	89·9	92·1	94·3
Ashkirk	89·1	91·3	93·5

	Radio 2/1 MHz	Radio 3 MHz	Radio 4 MHz
Forfar	88·3	90·5	92·7
Orkney	89·3	91·5	93·7
Rosemarkie	89·6	91·8	94·0
Fort William	89·3	91·5	93·7
Melvaig	89·1	91·3	93·5
Meldrum	88·7	90·9	93·1
Oban	88·9	91·1	93·3
Skriaig	88·5	90·7	92·9
Blaenplwyf	88·7	90·9	93·1
Haverford W.	89·3	91·5	93·7
Llanddona	89·6	91·8	94·0
Llangollen	88·85	91·05	93·25
Wenvoe	89·95	96·8	94·3
Llandrindod Wells	89·1	91·3	93·5
Divis	90·1	92·3	94·5
Brougher Mountain	88·9	91·1	93·3
Londonderry	88·3	90·55	92·7

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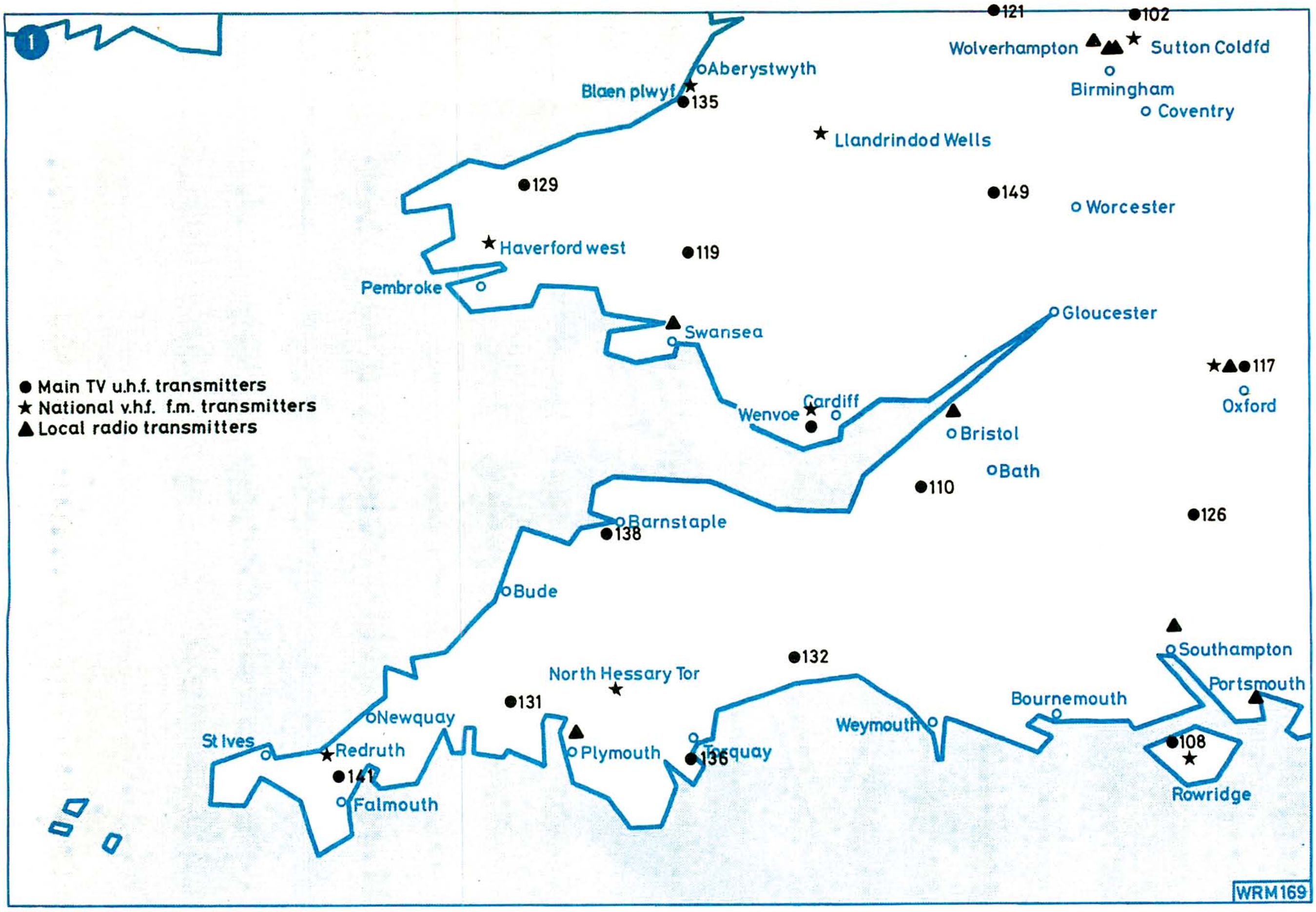
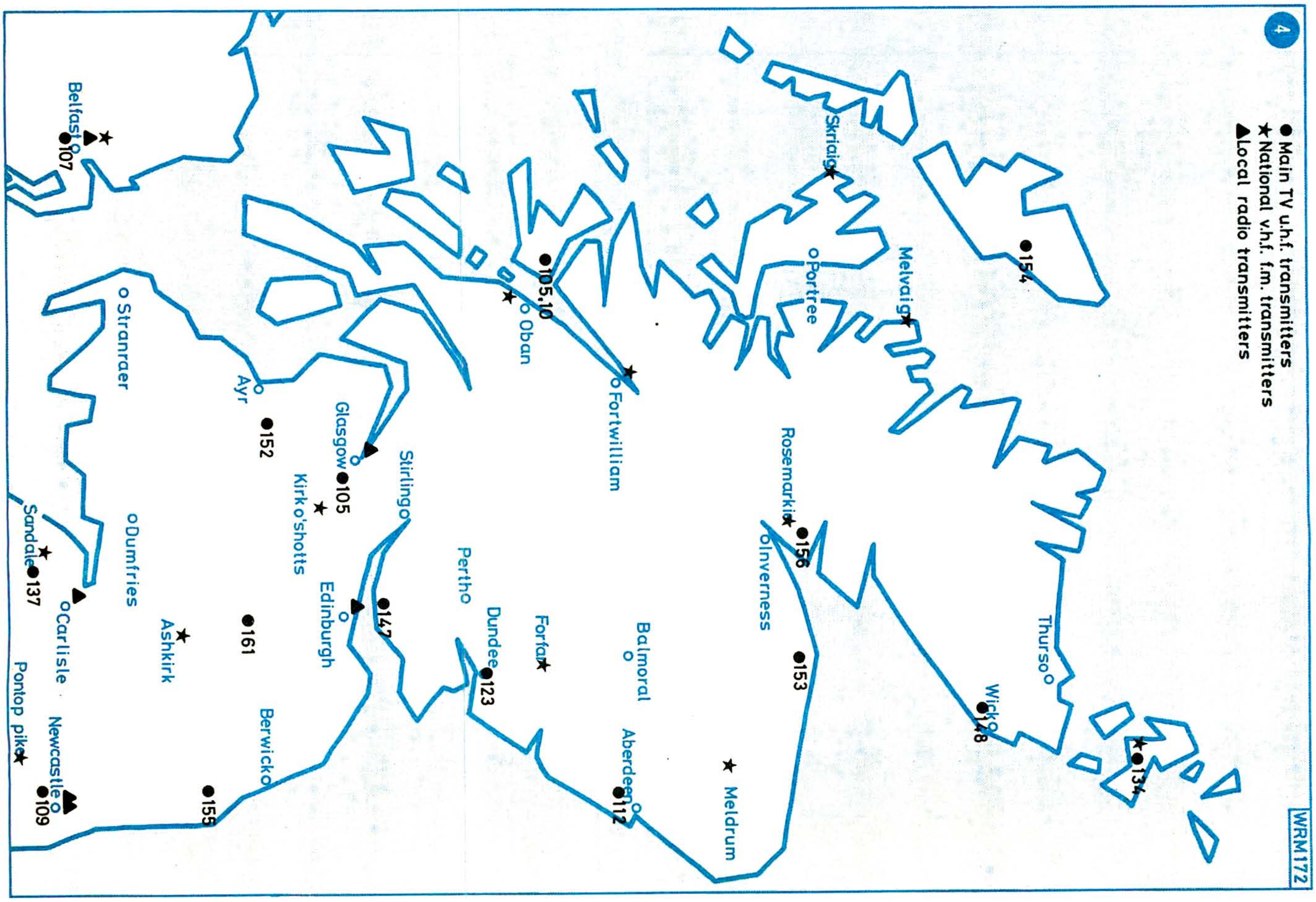
radio & tv guide

Contents


1
● Main TV u.h.f. transmitters
★ National v.h.f. f.m. transmitters
▲ Local radio transmitters
121
102
Wolverhampton
Sutton Coldfd
Birmingham
Coventry
Aberystwyth
Blaen plwyf
135
Llandrindod Wells
129
149
Worcester
Haverford west
119
Pembroke
Swansea
Gloucester
117
Oxford
Wenvoe
Cardiff
Bristol
Bath
110
126
Barnstaple
138
Bude
Southampton
132
North Hessary Tor
Portsmouth
131
Bournemouth
Newquay
Weymouth
St Ives
Redruth
Plymouth
Torquay
136
108
141
Falmouth
Rowridge
WRM169


4
● Main TV u.h.f. transmitters
★ National v.h.f. f.m. transmitters
▲ Local radio transmitters
Belfast
107
Skriaig
154
105,10
Portree
Melvaig
Oban
Stranraer
Fortwilliam
Ayr
152
Glasgow
105
Stirling
Rosemarkie
Kirk o'shotts
156
Inverness
Sandale
137
Dumfries
Perth
Carlisle
161
Edinburgh
147
Ashkirk
Dundee
123
Forfar
Balmoral
153
Thurso
Wick
148
Pontop pike
Newcastle
109
155
Berwick
Aberdeen
112
Meldrum
134
WRM172

SCOTLAND & BORDERS MAP 4

RADIO CARLISLE

Programme Information: Carlisle 31661
Frequencies:
397m/757kHz, 206m/1459kHz;
95·6MHz v.h.f.
News: 0700, 0730, 0800, 0830, 0900, 1000, 1100, 1200, 1245, 1500, 1600, 1700, 1757
Traffic: With News and 0655, 0725, 0755, 0825, 1745
Weather: With News and 1900

RADIO CLYDE (Glasgow)

Programme Information: 041-204 2555
Frequencies: 261m/1151kHz;
95·1MHz Stereo v.h.f.
National News: On-the-hour 0400 to 0200 (23hrs)

RADIO FORTH (Edinburgh)

Programme Information: 031-556 9255
Frequencies: 194m/1546kHz;
96·8MHz Stereo v.h.f.
National News: On-the-hour and 0630, 0730, 0830, 1230, 1730
Local News: 1730

DOWNTOWN RADIO (Belfast)

Programme Information: Newtownards 815555
Frequencies: 293m/1025kHz;
96MHz Stereo v.h.f.
National News: On-the-hour
Local News: 0600—0900
Traffic: 1705
Weather: After Morning News, Lunch and Teatime

RADIO NEWCASTLE

Programme Information: Newcastle 814243
Frequencies: 206m/1457kHz;
97·4MHz v.h.f.
News: 0600—0900, 1245, 1745
Traffic: 0600—0900 and as received
Weather: 0600—0900

METRO RADIO (Newcastle)

Programme Information: Newcastle 884121
Frequencies: 261m/1151kHz;
97MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: As necessary
Weather: With News

SOUTH & WEST MAP 1

BEACON RADIO (Wolverhampton)

Programme Information: Wolverhampton 757211
Frequencies: 303m/989kHz;
97·2MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 20 minutes past the hour
Weather: After News

BRMB RADIO (Birmingham)

Programme Information: 021-359 4481
Frequencies: 261m/1151kHz;
94·8MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 0720, 0750, 0820, 0850, 1650, 1720, 1750
Weather: 0600—0930

RADIO BIRMINGHAM

Programme Information: 021-472 5141
Frequencies: 206m/1458kHz;
95·6MHz v.h.f.
News: On-the-hour
Traffic: 0700, 0800 and as received
Weather: 0700, 0800

RADIO BRISTOL

Programme Information: Bristol 311111
Frequencies: 194m/1549kHz;
95·5MHz v.h.f.
National News: As Radio 2
Local News: 0600—2030
Traffic: 0745—0900, 1630—1800

RADIO OXFORD

Programme Information: Oxford 53411
Frequencies: 202m/1484kHz;
95·5MHz v.h.f.
News: 0900, 1100, 1230, 1400, 1500, 1600, 1730
Traffic: With News and 0600—0900, 1600—1900
Weather: 0600—0900, 1240, 1650

SWANSEA SOUND

Programme Information: Gorseinon 893751
Frequencies: 257m/1170kHz;
95·1MHz Stereo v.h.f.
National News: On-the-hour
Local News: 1200
Traffic: 0645 and 1600
Weather: 0820, 0920

SOUTH & WEST cont.

RADIO SOLENT (Southampton)

Programme Information: Southampton 31311
Frequencies:
300m/1002kHz, 221m/1360kHz;
96MHz v.h.f.
News: 0600–0900, 1000, 1100, 1200, 1255, 1400, 1500, 1600, 1700, 1750, 1900 then as Radio 2
Traffic: 0635, 0735, 0835, 1600, 1700
Weather: 0600–0900, 1000, 1100, 1200, 1259, 1400, 1500, 1600, 1700, 1730, 1900

PLYMOUTH SOUND

Programme Information: Plymouth 27272
Frequencies: 261m/1151kHz;
96MHz v.h.f.
News: 0600–2400 (On-the-hour)
Traffic: 0745, 1245, 1645, 1745

RADIO VICTORY (Portsmouth)

Programme Information: Portsmouth 27799
Frequencies: 257m/1169kHz;
95MHz v.h.f.
News: On-the-hour
Traffic: 0600–0900
Weather: 0600–0900 and with the News

SOUTH & EAST MAP 2

RADIO BRIGHTON

Programme Information: Brighton 680231
Frequencies: 202m/1484kHz;
95·3MHz v.h.f.
National News: 0630, 0655, 0730, 0755, 0830, 0900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1745, 1855, 2300
Local News: 0630–0900, 1300, 1745
Traffic: 0730, 0830, 1630, 1730
Weather: After News

RADIO SOLENT (Southampton) see above

RADIO 210 THAMES VALLEY (Reading)

Programme Information: Reading 413131
Frequencies: 210m/1430kHz;
97MHz v.h.f.
National News: 0600–0100 (Hourly)
Local News: 0630, 0730, 0830, 0930, 1630, 1730
Traffic: 0630–0930, 1630–1900

PICCADILLY RADIO (Manchester)

Programme Information: 061-236 9913
Frequencies: 261m/1152kHz;
97MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: With News
Weather: With News

PENNINE RADIO (Bradford)

Programme Information: Bradford 31521
Frequencies: 235m/1277kHz;
96MHz Stereo v.h.f.
News: 0600–0900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1630, 1700, 1730, 1800
Traffic: With News
Weather: With News

RADIO STOKE

Programme Information: Stoke 24827
Frequencies: 200m/1503kHz;
96·1MHz v.h.f.
News: On-the-hour (24hrs)
Traffic: 0730, 0830, 1650
Weather: With News and 0730, 0830, 0930, 1630

RADIO TRENT

Programme Information: Nottingham 581731
Frequencies: 301m/998kHz;
96·2MHz Stereo v.h.f.
News: 0530–0900 (On-the-hour)
Traffic: 0530–0900, 1900
Weather: 0530–0900

RADIO SHEFFIELD

Programme Information: Sheffield 686185
Frequencies: 290m/1037kHz;
88·6MHz, 97·4MHz v.h.f.
National News: 0600–0900, 1100, 1700 as Radio 2 from 2000
Local News: 0600–0900, 1250

RADIO TEES

Programme Information: Stockton 615111
Frequencies: 257m/1170kHz;
95MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: As necessary
Weather: As necessary

METRO RADIO (Newcastle)

Programme Information: Newcastle 884121
Frequencies: 261m/1151kHz;
97MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: As necessary
Weather: With News

BEACON RADIO (Wolverhampton)

Programme Information: Wolverhampton 757211
Frequencies: 303m/989kHz;
97·2MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 20 minutes past the hour
Weather: After News

RADIO LEEDS

Programme Information: Leeds 42131
Frequencies: 388m/774kHz;
92·4MHz v.h.f.
News: 0635, 0700, 0800, 0900, 1300, 1730 after 2000 as Radio 2
Weather: 0655, 0755, 0855, 1255

RADIO MERSEYSIDE (Liverpool)

Programme Information: 051-236 3355
Frequencies: 203m/1484kHz;
95·2MHz v.h.f.
News: On-the-hour
Traffic: 0600—0833 and with News
Weather: 0600—0833 and with News

RADIO MANCHESTER

Programme Information: 061-228 3434
Frequencies: 206m/1459kHz;
95·1MHz v.h.f.
News: 0630—0900, 1000, 1100, 1200, 1300, 1400, 1500, 1600, 1700, 1800, 2200, 2300, 2345
Traffic: 0640, 0720, 0740, 0750, 0820, 0845, 1645

RADIO NEWCASTLE

Programme Information: Newcastle 814243
Frequencies: 206m/1457kHz;
97·4MHz v.h.f.
News: 0600—0900, 1245, 1745
Traffic: 0600—0900 and as received
Weather: 0600—0900

RADIO DERBY

Programme Information: Derby 361111
Frequencies:
269m/1117kHz;
94·2MHz and 96·5MHz v.h.f.
News: On-the-hour
Traffic: 0630—0900, 1640—1720
Weather: With News and Early Morning Programmes

RADIO BLACKBURN

Programme Information: Blackburn 62411
Frequencies: 351m/855kHz;
96·4MHz v.h.f.
National News: 0630—0900, 1100, 1500, 1600, 1700, 1843, 1845 then as Radio 2
Local News: 0630—0900, 1240
Traffic: 0630—0900, 1605
Weather: 0630—0900, 1605

RADIO CARLISLE

Programme Information: Carlisle 31661
Frequencies:
397m/757kHz, 206m/1459kHz;
95·6MHz v.h.f.
News: 0700, 0730, 0800, 0830, 0900, 1000, 1100, 1200, 1245, 1500, 1600, 1700, 1757
Traffic: With News and 0655, 0725, 0755, 0825, 1745
Weather: With News and 1900

RADIO HALLAM (Sheffield)

Programme Information: Sheffield 71188
Frequencies: 194m/1546kHz;
95·9MHz v.h.f.

BRMB RADIO (Birmingham)

Programme Information: 021-359 4481
Frequencies: 261m/1151kHz;
94·8MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 0720, 0750, 0820, 0850, 1650, 1720, 1750
Weather: 0600—0930

RADIO BIRMINGHAM

Programme Information: 021-472 5141
Frequencies: 206m/1458kHz;
95·6MHz v.h.f.
News: On-the-hour
Traffic: 0700, 0800 and as received
Weather: 0700, 0800

BEACON RADIO (Wolverhampton)

Programme Information: Wolverhampton 757211
Frequencies: 303m/989kHz;
97·2MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 20 minutes past the hour
Weather: After News

CAPITAL RADIO (London)

Programme Information: 01-388 1288
Frequencies: 194m/1548kHz;
95·8MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 0600—0900, 1500—1900
Weather: After News

RADIO BRISTOL

Programme Information: Bristol 311111
Frequencies: 194m/1549kHz;
95·5MHz v.h.f.
National News: As Radio 2
Local News: 0600—2030
Traffic: 0745—0900, 1630—1800

RADIO DERBY

Programme Information: Derby 361111
Frequencies:
269m/1117kHz;
94·2MHz and 96·5MHz v.h.f.
News: On-the-hour
Traffic: 0630—0900, 1640—1720
Weather: With News and Early Morning Programmes

RADIO MEDWAY (Chatham)

Programme Information: Medway 46284
Frequencies: 290m/1034kHz;
96·7MHz v.h.f.
National News: 0500, 0700, 0800, 1000, 1100, 1200, 1800, 2400
Local News: 0700, 0800, 1000, 1500, 1600, 1730, 1915
Traffic: 0630—0930, 0930—1100, 1630, 1700
Weather: 0500

RADIO TRENT

Programme Information: Nottingham 581731
Frequencies: 301m/998kHz;
96·2MHz Stereo v.h.f.
News: 0530—0900 (On-the-hour)
Traffic: 0530—0900, 1900
Weather: 0530—0900

LBC (London)

Programme Information: 01-353 1010
Frequencies: 261m/1151kHz;
97·3MHz Stereo v.h.f.
News: Every 30 minutes
Traffic: Every hour
Weather: With News

RADIO LONDON

Programme Information: 01-486 7611
Frequencies: 206m/1457kHz;
94·9MHz v.h.f.
News: Every 30 minutes 0630–1800, 2200, 2300, 2400
Traffic: 0745, 0845, 0900–1130 then after the News
Weather: 0700, 0800 then after the News

RADIO LEICESTER

Programme Information: Leicester 27113
Frequencies: 189m/1590kHz;
95·1MHz v.h.f.
News: 0630, 0645, 0745, 0900, 1000, 1100, 1230, 1500, 1600, 1700, 1730, 1830
Traffic: As received
Weather: Follows News

RADIO OXFORD

Programme Information: Oxford 53411
Frequencies: 202m/1484kHz;
95·5MHz v.h.f.
News: 0900, 1100, 1230, 1400, 1500, 1600, 1730
Traffic: With News and 0600–0900, 1600–1900
Weather: 0600–0900, 1240, 1650

RADIO ORWELL (Ipswich)

Programme Information: Ipswich 216971
Frequencies: 257m/1169kHz;
97·1MHz Stereo v.h.f.
National News: 0600 to 2400 (On-the-hour)
Local News: 0700 to 1800 weekdays; 0900, 1200, 1500, 1800 weekends
Traffic: 0720, 0750, 0820, 0850, 0930, 1615, 1645, 1715
Weather: 2400

RADIO VICTORY (Portsmouth)

Programme Information: Portsmouth 27799
Frequencies: 257m/1169kHz;
95MHz v.h.f.
News: On-the-hour
Traffic: 0600–0900
Weather: 0600–0900 and with the News

Using this Guide

The aim of this guide is to help you to enjoy radio and TV programmes while you are on holiday. To find details of local radio in your holiday area locate where you are staying on the map of the UK and then turn to the appropriate area map to find details of local radio, v.h.f. and TV transmitters. Remember that programmes will be different from your home area and you should obtain the appropriate regional edition of Radio Times and TV Times from the nearest newsagent in your holiday area. Some holiday resorts have local v.h.f. and TV repeater stations to give better reception. The local TV dealer should be able to give you details of channels and aerial directions.

NORTH & ULSTER MAP 3

BRMB RADIO (Birmingham)

Programme Information: 021-359 4481
Frequencies: 261m/1151kHz;
94·8MHz Stereo v.h.f.
News: On-the-hour (24hrs)
Traffic: 0720, 0750, 0820, 0850, 1650, 1720, 1750
Weather: 0600–0930

RADIO BIRMINGHAM

Programme Information: 021-472 5141
Frequencies: 206m/1458kHz;
95·6MHz v.h.f.
News: On-the-hour
Traffic: 0700, 0800 and as received
Weather: 0700, 0800

DOWNTOWN RADIO (Belfast)

Programme Information: Newtownards 815555
Frequencies: 293m/1025kHz;
96MHz Stereo v.h.f.
National News: On-the-hour
Local News: 0600–0900
Traffic: 1705
Weather: After Morning News, Lunch and Teatime

RADIO CLEVELAND

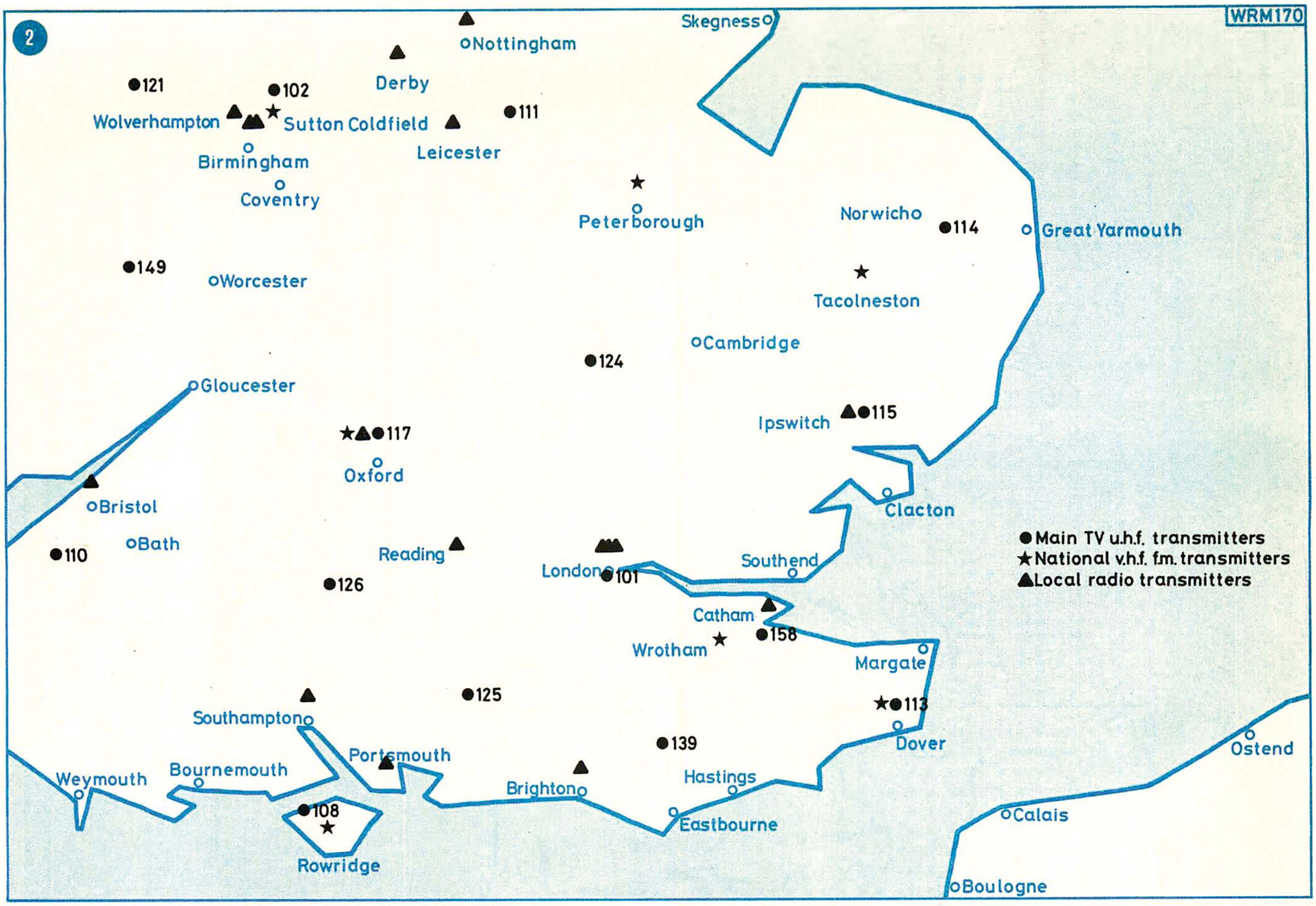
Programme Information: Middlesbrough 248491
Frequencies: 194m/1546kHz;
96·6MHz v.h.f.
News: 0600–1800 (On-the-hour)
Traffic: With News and at 0830 and 1615, 1715
Weather: With News

RADIO HUMBERSIDE

Programme Information: Kingston upon Hull 23232
Frequencies: 203m/1484kHz;
96·9MHz v.h.f.
News: 0750, 0850, 1250, 1650, 1750
Traffic: 0632, 0732, 0832, 1530, 1630, 1730
Weather: With News and 0635, 0710, 0735, 0810

RADIO LEICESTER

Programme Information: Leicester 27113
Frequencies: 189m/1590kHz;
95·1MHz v.h.f.
News: 0630, 0645, 0745, 0900, 1000, 1100, 1230, 1500, 1600, 1700, 1730, 1830
Traffic: As received
Weather: Follows News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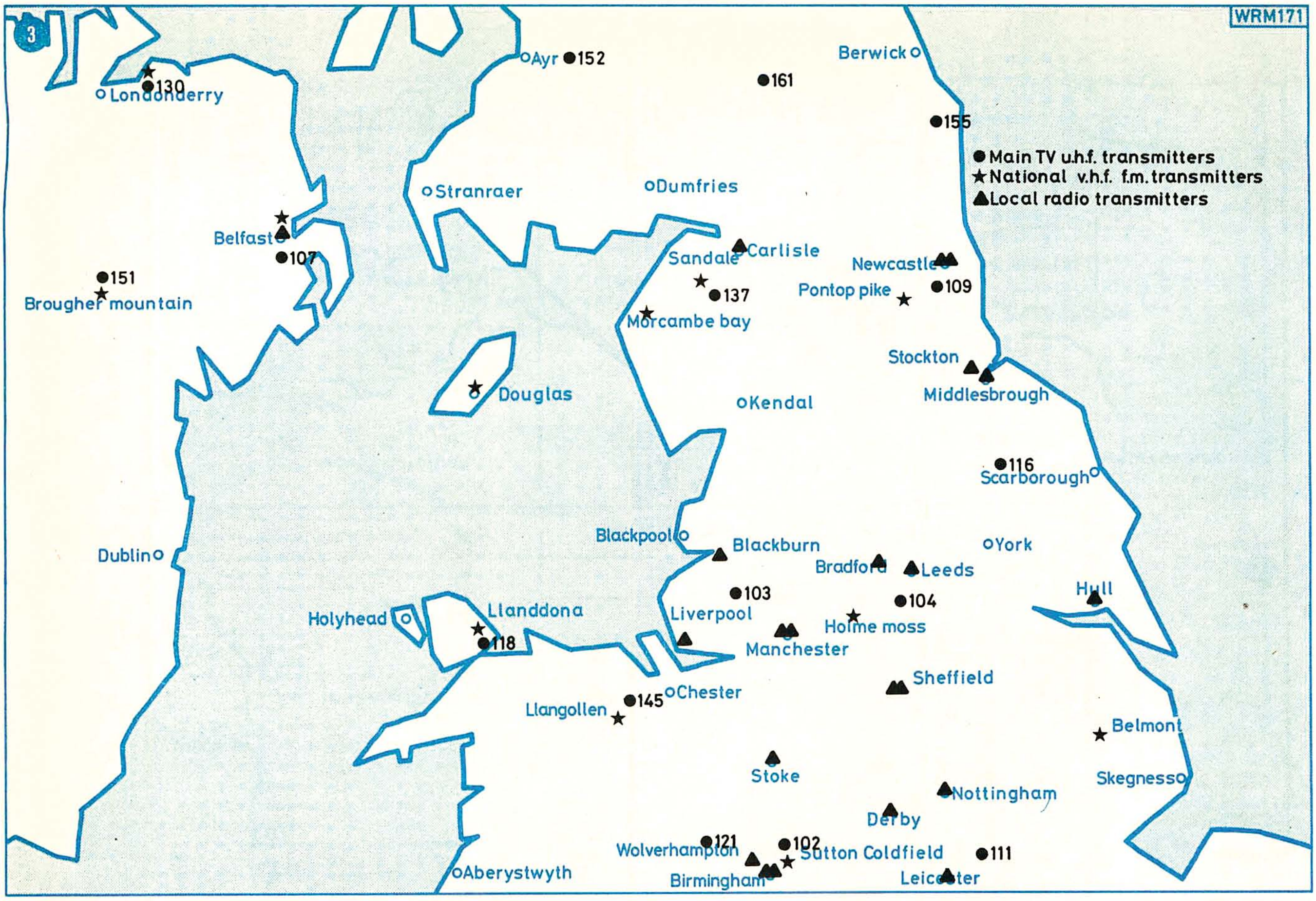
WRM170
Skegness
Nottingham
Derby
121
102
111
Wolverhampton
Sutton Coldfield
Leicester
Birmingham
Coventry
Peterborough
Norwich
114
Great Yarmouth
149
Worcester
Tacolneston
Cambridge
124
Gloucester
Ipswitch
115
117
Oxford
Clacton
Bristol
Bath
110
Reading
London
101
Southend
126
Main TV u.h.f. transmitters
National v.h.f. f.m. transmitters
Local radio transmitters
Catham
Wrotham
158
Margate
125
Southampton
113
139
Dover
Ostend
Portsmouth
Weymouth
Bournemouth
Brighton
Hastings
108
Eastbourne
Calais
Rowridge
Boulogne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WRM171
Ayr
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Berwick
Londonderry
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Main TV u.h.f. transmitters
National v.h.f. f.m. transmitters
Local radio transmitters
Stranraer
Dumfries
Belfast
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Sandale
Carlisle
Newcastle
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Brougher mountain
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Pontop pike
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Morcambe bay
Stockton
Middlesbrough
Douglas
Kendal
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Scarborough
Blackpool
Blackburn
York
Dublin
Bradford
Leeds
103
104
Hull
Holyhead
Llanddona
Liverpool
Holme moss
118
Manchester
Sheffield
Llangollen
145
Chester
Belmont
Stoke
Skegness
Nottingham
Derby
Wolverhampton
121
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Sutton Coldfield
111
Birmingham
Leicester
Aberystwyth

★ National Radio Stations

	Radio 1	2	3	4
(a) Burghead	285m	433m	247m	1500m
(b) Westerglen	275m	330m	247m	370m
(c) Stagshaw	285m	433m	—	—
(d) Lisnagarvey	275m	330m	247m	224m 417m
(e) Moorside Edge	275m	330m	247m	—
(f) Droitwich	285m	433m	247m	1500m
(g) Brookmans Park	275m	330m	247m	—
(h) Washford	275m	—	247m	340m
(j) Start Point	285m	—	—	—