OCTOBER 1984 90p SOR

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NEW IMPROVED

Radio & Electronics World

For all aspects of practical amateur radio

Simply the Best

COMPUTERS AND AMATEUR RADIO

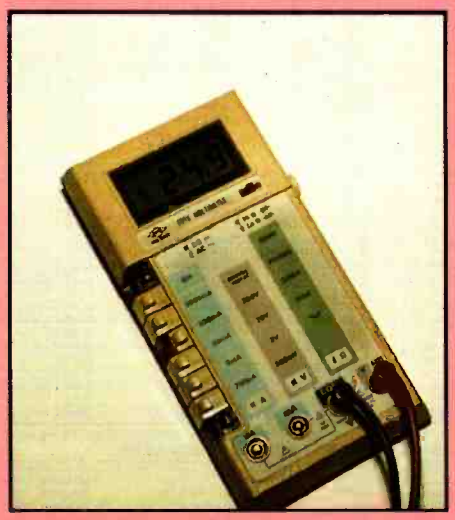
GET THE MOST FROM YOUR TEST EQUIPMENT

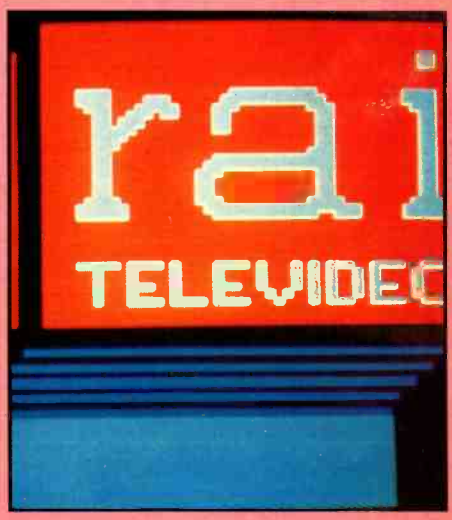
DATA FILE – MORE ALARM CIRCUITS

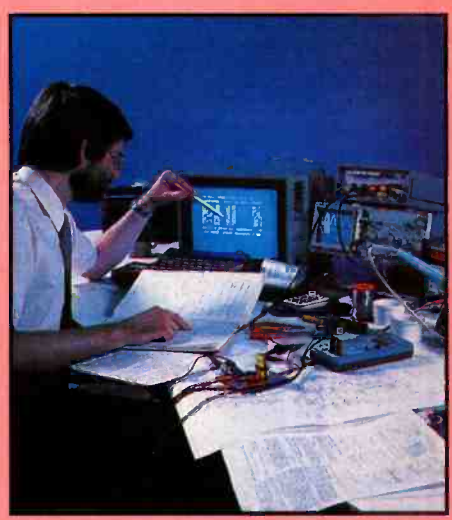
BASE MICROPHONE WITH BUILT IN PROCESSOR

NON – LINEAR ELEMENTS

WOBURN ABBEY
RSGB MOBILE RALLY REVIEW







FREE CLASSIFIED ADS

EAST CORNWALL COMPONENTS

TRANSISTORS DIODES

Type	Price (£)	Type	Price (£)
AC126	0.35	BC108	0.10
AC127	0.30	A B or C	0.12
AC128	0.30	BC113	0.14
AC128K	0.34	BC114	0.12
AC132	0.55	BC115	0.12
AC141	0.26	BC116	0.15
AC141	0.26	BC117	0.22
AC141K	0.40	BC118	0.17
AC142	0.26	BC119	0.30
AC142K	0.48	BC125	0.12
AC151	0.45	BC140	0.28
AC152	0.45	BC141	0.42
AC176	0.28	BC142	0.30
AC176K	0.46	BC143	0.30
AC187	0.26	BC147	0.08
AC187K	0.40	A or B	0.10
AC188	0.28	BC148	0.08
AC188K	0.40	A or B	0.10
ACY40	0.88	BC149	0.09
AD142	1.10	BC157	0.10
AD143	1.10	BC158	0.10
AD149	0.96	BC159	0.10
AD161	0.42	BC160	0.30
AD162	0.42	BC161	0.30
AD161/AD162	0.98	BC168B	0.12
AF106	0.48	BC169C	0.10
AF114	2.10	BC170	0.14
AF115	2.10	BC170B	0.12
AF116	2.10	BC171	0.10
AF117	2.10	BC171	0.10
AF118	0.85	A or B	0.08
AF121	0.62	BC172	0.08
AF124	0.48	A or B	0.12
AF125	0.48	BC177	0.20
AF127	0.48	BC178A	0.22
AF139	0.68	BC182	0.08
AF178	0.68	A B or C	0.09
AF239	0.68	BC182L	0.09
AF279S	0.72	A B or C	0.09
AL100	2.50	BC183	0.09
AL102	1.88	A B or C	0.10
AL113	2.20	BC183L	0.06
ASY80	1.75	A B or C	0.12
AU110	1.40	BC184	0.10
AY102	4.32	A B or C	0.10
BA102	0.34	BC207	0.15
BA110	0.67	BC208	0.16
BA121	0.40	BC212	0.09
BA129	0.38	A B or C	0.10
BA148	0.16	BC212L	0.08
BA154	0.08	A B or C	0.10
BA155	0.10	BC213	0.09
BA156	0.08	A or B	0.10
BA157	0.28	BC213L	0.10
BA164	0.14	A or B	0.10
BB104B	0.52	BC237	0.11
BB105B	0.30	BC236	0.12
BB105G	0.48	BC239	0.14
BB110B	0.42	BC251	0.12
BC107	0.10	A B or C	0.14
A or B	0.12	BC301	0.30
BC302	0.32	BC303	0.32
BC307	0.10	BD410	0.76
BC308A	0.10	BD434	0.68
BC323	0.99	BD436	0.68
BC327	0.14	BD437	0.76
BC328	0.14	BD438	0.75
BC337	0.12	BD439	0.68
BC338	0.12	BD507	0.48
BC350	0.14	BD508	0.53
BC440	0.30	BD509	0.54
BC441	0.32	BD510	0.48
BC461	0.32	BD517	0.56
BC547	0.12	BD520	0.66
BC548	0.12	BD699	1.25
BC549	0.12	BD707	0.88
BC550	0.18	BDX18	2.35
BC550C	0.18	BDX32	2.10
BC557	0.12	BF115	0.32
BC558	0.12	BF117	0.54
BCX34	0.27	BF119	0.82
BCY70	0.15	BF120	0.38
BCY71	0.17	BF123	0.40
BCY72	0.18	BF125	0.42
BCZ10	1.68	BF127	0.38
BCZ11	1.45	BF152	0.16
BD124P	0.80	BF154	0.23
BC130Y	0.68	BF157	0.40
BD131	0.34	BF158	0.22
BD132	0.34	BF159	0.24
BD131/BD132	0.95	BFR160	0.23
BD135	0.32	BF167	0.30
BD136	0.36	BF173	0.25
BD137	0.36	BF177	0.42
BD138	0.38	BF178	0.30
BD139	0.38	BF179	0.32
BD140	0.38	BF180	0.35
BD144	160	BF181	0.35
BD145	1.82	BF182	0.32
BD150A	0.51	BF183	0.32
BD159	0.65	BF184	0.32
BD160	1.65	BF185	0.32
BD165	0.45	BF194	0.08
BD175	0.60	BF195	0.10
BD182	1.00	BF196	0.10
BD183	1.10	BF197	0.10
BD184	1.20	BF198	0.14
BD201	0.72	BF199	0.16
BD202	0.87	BF200	0.48
BD204	0.80	BF222	0.48
BD222	0.80	BF224	0.20
BD225	0.86	BF224J	0.16
BD232	0.45	BF240	0.20
BD233	0.60	BF241	0.26
BD234	0.62	BF244	0.26
BD235	0.63	BF244A	0.28
BD236	0.63	BF244C	0.24
BD237	0.66	BF245A	0.26
BD238	0.56	BF254	0.15
BD241	0.60	BF256	0.40
BD243A	0.80	BF257	0.32
BD244A	0.65	BF258	0.30
BD375	0.32	BF259	0.32
BF262	0.30	BF263	0.30
BF270	0.30	BF271	0.26
BF273	0.18	BF274	0.32
BF323	0.92	BF336	0.26
BF337	0.26	BF338	0.26
BF355	0.42	BF363	0.82
BF367	0.24	BF371	0.27
BF422	0.38	BF450	0.38
BF457	0.33	BF458	0.36
BF459	0.44	BFR39	0.22
BFR40	0.22	BFR41	0.22
BFR51	0.30	BFR61	0.32
BFR62	0.28	BFR88	0.34
BFR90	1.72	BFT41	0.38
BFT43	0.36	BFW10	0.79
BFW44	0.78	BFX80	3.70
BFX29	0.28	BFX30	0.30
BFX80	3.56	BFX84	0.24
BFZ85	0.26	BFX86	0.26
BFX87	0.26	BFX89	0.65
BFY50	0.21	BFY51	0.21
BFY52	0.21	BFY57	0.40
BFY90	0.90	BFY90S	1.34
BR100	0.20	BR101	0.44
BR103	0.58	BRC443	1.76
BRY39	0.38	BRY56	0.42
BRY61	0.86	BSS17	0.56
BSS27	0.92	BSX19	0.34
BSX20	0.34	BSX59	0.62
BSX76	0.29	BT100A/02	0.94
BT101/300	1.15	BT101/500	1.25
BT102/300	1.35	BT102/500	1.65
BT106	1.50	BT108	1.30
BT109	1.18	BT116	1.25
BT119	3.62	BT120	3.50
BT121	3.02	BT138/600	1.30
BT151/560R	0.90	BT151/300R	1.15
BTY79/400R	2.80	BU100A	2.30
BU104	2.00	BU105	1.20
BU105/02	1.56	BU108	1.80
BU124	1.75	BU126	1.25
BU133	1.80	BU204	1.35
BU205	1.30	BU206	1.70
BU208	1.55	BU208A	1.63
BU208/02	2.05	BU326S	1.75
BU407	1.65	BU407D	1.80
BUX80	3.70	BUY20	1.75
BUY69A	2.60	BUY69B	1.98
DBY101	0.48	BY118	1.10
BY122	0.68	BY126	0.12
BY127	0.10	BY133	0.16
BY135	0.25	BY164	44
BY179	0.66	BY182	0.87
BY184	0.40	BY187	0.72
BY189	4.75	BY198	0.44
BY199	0.47	BY206	0.24
BY207	0.24	BY210/400	0.25
BY210/600	0.26	BY210/800	0.30
BY223	1.20	BY227	0.26
BY229	0.30	BY238	0.68
BYX10	0.24	BYX36/150	0.22
BYX36/600	0.28	BYX48/300	0.72
BYX49/300	0.47	BYX55/350	0.29
BYX55/600	0.33	BYX71/600	1.18
BYZ12	0.42	C106D	0.80
E1222	0.40	E5024	0.30
GET872	0.48	ITT44	0.04
ITT2002	0.11	ME0402	0.20
ME0404/2	0.24	MEU21	0.60
MJ400	1.25	MJ2955	0.90
MJ3000	1.98	MJE240	0.60
MJE340	0.54	MJE370	0.88
MJE520	0.48	MJE2955	0.99
MJE3055	0.70	MPSLO1	0.28
OA47	0.10	OA90	0.08
OA91	0.09	OA95	0.18
OA200	0.08	OA202	0.15
OC25	2.10	OC26	1.70
OC28	1.50	OC29	2.47
OC35	1.75	OC36	1.75
OC42	0.72	OC42K	1.40
OC44	0.72	OC45	0.58
OC71	0.50	OC72	0.52
OC81	0.68	OC200	2.45
OC202	2.20	ORP12	0.85
R2008B	1.50	R2010B	1.52
SHG1.5	0.40	TAG1/100	1.40
TAG3/400	1.78	TIC44	0.40
TIC45	0.45	TIC46	0.48
TIC47	0.70	TIC106A	0.70
TIP30A	0.46	TIP31C	0.54
TIP32	0.40	TIP32C	0.60
TIP33A	0.63	TIP34A	0.72
TIP41C	0.46	TIP42A	0.52
TIP47	0.60	TIP110	0.88
TIP2955	0.60	TIP3055	0.60
TIS43	0.32	TIS88	0.40
TIS90	0.25	TIS91	0.28
ZTX108	0.12	ZTX109	0.12
ZTX212	0.28	1N4001	0.05
1N4003	0.05	1N4004	0.06
1N4006	0.07	1N4007	0.07
1N4148	0.05	1N5400	0.12
1N5402	0.15	1N5405	.16
1N5406	0.18	1N5408	0.20
IS920	0.08	2N697	0.55
2N706A	0.33	2N2904	0.28
2N2906	0.24	2N2926G	0.10
2N3053	0.22	2N3054	0.56
2N3055	0.45	2N3702	0.10
2N3704	0.10	2N3708	0.10
2N3772	1.90	2N3773	2.70
2N3904	0.16	2N3906	0.16
2N5294	0.48	2N6107	0.71
2N6126	0.68	2SB337	1.60
2SC1172Y	2.00	2SC1173Y	0.82
2SC1302	1.40	40251	0.95
40361	0.58	40362	0.50
40411	3.72	40530	0.80
40673	0.80	40964	1.54
Quantity available on all listed items.	prices		

VOLTAGE REGULATORS

Type	Price (£)
78L05	0.30
78L08	0.30
78L12	0.30
78L15n	0.30
78M05	0.50
78M08	0.50
78M12	0.50
78M15	0.50
78M24	0.50
7805	0.55
7808	0.55
7812	0.55
7815	0.55
7818	0.55
7824	0.55
7905	0.65
7912	0.65
7915	0.65
7918	0.65
7924	0.65
CA3085	0.95
723C	0.36
LM317K	3.50

CONVERGENCE POTENTIOMETERS

5, 7, 10, 15, 10, 50, 100, 200, 500R

38p each

SPECIAL OFFER

30, 120, 270, 470, all at 20p each

CAPACITORS

Metallised Paper

2n2F 1500V DC	60p
2n2F 600V AC	24p
3n6F 1700V DC	60p
4n7F 1500V DC	60p
10nF 1000V DC	22p
10nF 500V AC	80p
15nF 300V AC	30p
22nF 300V AC	32p
100nF 1000V DC	46p
470nF 1000V DC	85p
82, 100, 120, 150, 180, 200, 220pF	30p
270, 300pF	39p
10kV 1nF	67p

VALVES

Type	Price (£)
DY802	0.88
DY86/87	0.75
ECC81	0.85
ECC82	0.65
ECC83	0.75
ECC84	0.65
ECC85	0.90
ECC88	0.95
ECF80	0.90
ECH81	0.75
ECH84	0.75
ECL82	0.75
ECL86	0.98
EF80	0.65
EF86	1.65
EF183	0.75
EF184	0.75
EH90	0.54
EL34	2.50
EL84	0.69
EL509	5.50
EM87	2.55
EY86/87	0.67
EY500A	1.65
PCC84	0.50
PCC85	0.65
PCC89	0.74
PCC189	0.85
PCF80	0.75
PCF86	1.25
PCF200	1.55
PCF801	1.45
PCF802	0.85
PCF806	1.20
PCL82	0.90
PCL83	2.50
PCL84	0.90
PCL86	0.58
PCL805/85	1.35
PD500	3.75
PFL200	1.35
PL33	1.50
PL36	1.45
PL81	0.85
PL82	0.75
PL83	0.65
PL84	0.75
PL95	2.00
PL504	1.20
PL508	2.40
PL509/519	7.50
PY88	1.80
PY500A	2.40
U26	1.90
UCH81	0.30
UCL82	1.70
6J5GT	1.75
6SJ7	2.20
30FL12	1.60
6JB6A	4.00

NEW 1984 CATALOGUE NOW AVAILABLE — Many prices reduced — range increased — fully illustrated. Price 65p, per copy (free upon request with orders over £5) — includes 30p. Credit Note, special offer sheets, order form and pre-paid envelope. **SEND NOW FOR YOUR COPY.**

ZENER DIODES

400mW Plastic 3V-75V **8p each 10/75p**
1.3W Plastic 3V-200V **15p each 10/£1.40**
1.5W Flange 4.7-47V **£1.26 each**
2.5W Plastic 75-75V **87p each**
20W Stud 75-75v **£1.31 each**

INTEGRATED CIRCUITS (£) EACH

AN240P	3.42	SN76530P	1.40
AN214Q	3.88	SN76533N	1.60
AN715Q	2.90	SN76650N	1.05
CA3065	1.75	SN76660N	0.75
CA4031P	2.88	SN76666N	0.80
CA4102	3.30	STK015	6.50
CA4250	3.50	TA7108P	3.20
CA4400	2.98	TA7120P	2.20
CA4422	3.07	TA7129AP	3.65
LC7120	5.33	TA7130P	1.65
LC7130	5.26	TA7172	1.80
LC7137	5.16	TA7193	5.50
LM380N	0.80	TA7172P	1.80
LM1303N	2.52	TA7176	2.50
HA1151P	3.12	TA7202P	4.18
MC1307P	1.85	TA7204P	1.86
MC1310P	1.85	TA7205AP	1.50
MC1312P	2.25	TA7208P	3.25
MC1327P	1.75	TA7210P	.50
MC1330P	0.83	TA7222P	1.88
MC13449P	1.85	TA7223P	3.68
MC1350P	1.20	TA7227P	5.60
MC1351P	2.50	TA7310P	1.80
MC1352P	1.50	TA7609P	4.28
MC1357P	.88	TA7611AP	2.88
MC1358P	1.30	TAA263	2.46
MC1496L	1.15	TAA310A	2.88
ML231B	2.10	TAA550	0.50
ML232B	2.10	TAA570	1.99
ML237B	2.30	TAA611A12	3.50
NE555	0.25	TAA611B12	2.85
C-mos 555	0.88	TAA630S	3.90
NE556	0.80	TAA661B	1.70
SAA1024	5.35	TAA700	2.80
SAA1025	8.40	TAA840	3.38
SAS560A	2.50	TAD100	2.80
SAS560S	1.85	FM FILTER	1.20
SAS570S	1.85	TBA120A	1.00
SAS580	2.85	AS,S,SA SB	1.30
SAS590	2.82	Q,T,U,UQ	1.32
SC9503P	1.10	TBA120B	1.30
SL432A	4.00	TBA231	1.45
SL901B	5.20	TBA281	2.65
SL917B	6.25	TBA395	1.20
SL1327Q	1.10	TBA480Q	1.50
SN76003N	2.44	TBA400	2.30
SN76013N	1.90	TBA510	2.60
SN76023ND	2.90	TBA510Q	2.60
SN76033N	2.45	TBA520/Q	1.60
SN76110N	1.12	TBA530/Q	1.30
SN76115N	2.00	TBA540/Q	1.40
SN76131N	1.65	TBA550/Q	1.52
SN76226DN	1.80	TBA560C	1.70
SN76227N	1.10	TBA560CQ	1.60
TBA570	1.50	TBA641BX1	4.50
TBA651	2.80	TBA673	2.40
TBA700	2.85	TBA750	2.80
TBA800	1.60	TBA810P	1.10
TBA810S	1.20	TBA820	1.60
TBA890	3.88	TBA920/Q	3.00
TBA950/2A	3.05	TBA970	4.05
TBA990	1.88	TCA160C	3.90
TCA270S	4.00	TCA270SA	4.02
TCA800	3.10	TCA940	1.90
TDA440	3.80	TDA1002	1.90
TDA1003A	5.50	TDA1004A	2.90
TDA1006A	2.40	TDA1035S	4.50
TDA1044	4.30	TDA1170S	3.00
DA1190	3.50	TDA1200	2.98
TDA1270Q	3.70	TDA1327A	1.66
TDA1352A/B	1.56	TDA1412	1.20
TDA2002	2.80	TDA2020	4.60
TDA2030	2.78	TDA2140	5.90
TDA2521	4.10	TDA2523	3.50
TDA2530	2.70	TDA2540	3.80
TDA2541	3.38	TDA2560	3.50
TDA2571A	2.50	TDA2581	3.20
TDA2590	3.20	TDA2591	2.98
TDA2593	2.98	TDA2610	3.20
TDA2611A	1.94	TDA2640	2.90
TDA2680	3.40	TDA2690	3.50
TDA3950/A/B	2.60	UPC554C	1.32
UPC557H	0.90	UPC566H	2.95
UPC575C2	3.20	UPC1018C	1.10
UPC1025H	2.90	UPC1032H	0.90
UPC1156H	4.20	UPC1158H	0.76
UPC1163H	0.98	UPC1181H	1.60
UPC1185H2	3.75	UPC1212C	1.30
UPC1230H	3.90	UPC1350C	4.25
UPC1367C	3.40	UPC1378H	4.40
UPC2002H	2.80		

BRIDGES

1½A 50V	0.27
100V	0.28
200V	0.32
400V	0.40
600V	0.50
800V	0.58
3A 100V	0.52
200V	0.55
400V	0.61
600V	0.67
800V	0.80
6A 100V	0.66
200V	0.68
400V	0.74
600V	0.80
800V	0.86
10A 50V	2.20
100V	2.24
200V	2.35
400V	2.50
600V	3.50
25A 50V	2.05
100V	2.25
200V	2.40
400V	3.20
600V	3.95

SERVICE AIDS

ALL SERVISOL PRODUCTS

Switch Cleaner	0.88
Circuit Freezer	0.96
Foam Cleanser	0.84
Aero Klene	0.78
Silicone Grease (Aerosol)	1.00
Antistat Spray	0.82
Plastic Seal	0.88
Excel Polish	0.76
Fire Extin 640g	2.80
Video Head Cleaner	0.88
Silicone Grease (ICI) 75g tube	1.00
Solda Mop (Std)	0.72
Solda Mop (L/Gauge)	0.72

Additional P&P on above 30p

RESISTORS — CARBON FILM 5%

¼W 1RO to 10M (E12 Range)	2p each. 15p/10. 75p/100
½W 2R2 to 10M (E24 Range)	2p each. 15p/10. 75p/100
1W 10R to 2M2 (E12 Range)	7p each. 65p/10. 6.00/100
2W 10R to 2M2 (E6 Range)	8p each. 70p/10. 6.00/100

RESISTOR KITS — each value individually packed

¼W pack 10 each value E12—10R to 1M 610 pieces	4.80
¼W pack 5 each value E12—10R to 1M 305 pieces	2.75
½W pack 10 each value E12—2R2 to 2M2 730 pieces	5.25
½W pack 5 each value E12—2R2 to 1M 365 pieces	3.00
1W pack 5 each value E12—2R2 to 1M 353 pieces	15.00
2W pack 5 each value E6—10R to 2M2 317 pieces	18.00

RESISTORS — WIREWOUND Generally 5%

2-5W 0-22 to 270R Available in preferred values	0.20
4W 1R0 to 10K. Available in preferred values	0.21
7W 0.47R to 22K. Available in preferred values	0.25
11W 1R0 to 22K. Available in preferred values	0.29
17W 1R0 to 22K. Available in preferred values	0.37

VEROBOARD 0.1in. COPPER CLAD.

2½x3¾	.85
2½x5"	1.00
2½x17"	3.25
3¾x3¾"	1.05
3¾x5"	1.15
3¾x17"	4.10
4¾x17¾"	4.95
Pkt. of 100 Pins	.50
Spot Face Cutter	1.48
Pin Insert. Tool	1.83
Vero Wiring Pen + Spool	3.50

VEROBOARD 0.1in. PLAIN

3¾x5"	.95
3¾x17"	2.70
DIP Board	3.85
VERO Strip	1.25
HAND HELD CONTROL BOXES	.75
72x50x25 Boxes	.52

NI-CAD

Universal Ni-Cad charger, charges PP3, AA, C.D Price **£5.00**

RECHARGEABLE BATTERIES

PP3	4.45	4/	16.00
AA	0.95	10/	8.00
HP11	2.30	4/	8.50
HP2	2.35	4/	8.75

PLUGS & SOCKETS

Metal Co-ax Plug	0.18
Plastic Co-ax Plug	0.14
Single Junction Socket	0.80
Plastic Phono	0.10
F M Plugs	0.20
PL259	0.38
Reducer	0.15
2.5mm Plug Meta	0.15
2.5mm Plug Metal	0.16
2.5mm Chassis Socket	0.10
3.5mm Chassis Socket	0.10
2 pin ¼in Mono Chassis Socket	0.14
4 pin ¼in Mono Chassis Socket	0.20
6 pin ¼in Mono Chassis Socket	0.30
4mm Banana Plug	0.15
4mm Banana Socket	0.15
PP3 Battery Connectors	0.08
PP9 Battery Connectors	0.16

Terminal Blocks

2 amp 12 way	0.19
5 amp 12 way	0.20
15amp 12 way	0.46
32amp 12 way	0.92

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Soldering Section

ANTEX 15W IRON	5.00
ANTEX 18W IRON	5.00
ANTEX 25W IRON	5.20
ANTEX ELEMENTS	2.00
ANTEX BITS	0.95
ANTEX STANDS	1.90
SOLDERSUCKER	4.50
500gm SOLDER	6.80
SOLDA MOP	0.70
ANTEX SOLDERING STATION complete with Iron—30W or 40W	49.95
Spare nozzles for Soldersucker	0.45

FUSES

1¼in Quick Blow 100 150 250mA £1.30 1 1.25 1.5 2.5 3 10 15A **55p**
1¼in Time Delay 100mA **£3.50** 150mA**£2.25** 250 300 500 600 750 850mA **£1.84** 1 1.25 1.5 1.6 2A **£1.84** 2.5A 3 3.15 3.5A **£2.82 20mm Quick Blow** 100 125 160 200 250 315 400 500 600 800mA 1 1.25 1.5 2 2.5 3.5 4 5 6 3A **40p 20mm Time Delay** 100 125 150 200mA **£1.80** 750 300 400 500 600 800mA **£1.00** 1 1 25 1 5 2 2 5 3 3A **85p 1in Mains** 2 3 5 7 10 13A **85p**

Manufacturers please note — we can offer very competitive quantity prices of 20mm Quick Blow & Time Delay range — please apply for quotation

TRANSFORMERS

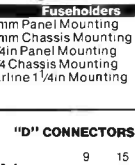
SII 240v Primary 4 5 0-4 5v 400m/A **50p** 6-0-6 100m/A **58p** 6-0-6 500m/A **65p**
Postage and packing **45p** per transformer
Competitive bulk prices on request

EUROPEAN ADAPTORS

These very high quality British made two pin European adaptors are ideal for driving Radios, cassette recorders, TV games, calculators etc. The adaptors fit in the UK shaver socket

REF	DC Voltage	Current	1+	10+	100+
EOB	4.5V	200m/a	50p	45p	32p
EM3	6V	200m/a	£1.00	80p	55p
EO9	6V	400m/a	£1.50	£1.25	85p

(Postage & Packing: 45p per adaptor or £1.60 per 10, £4.50 per 100)



MULTIMETER SPECIAL

Russian type U4324 — (20,000OPV)
DC Volts 0.6, 1, 2, 3, 12, 30, 60, 600, 1200
AC Volts: 3, 6, 15, 60, 150, 300, 600, 900
DC Curr M/A 0.06, 0.6, 6, 60, 600, 3000
AC Curr M/A 0.3 3, 30, 300, 3000
DC Resistance 0.2, 5, 50, 500, 5000K
level dB: — 10 to — 12

Supplied with rechargeable batteries

PRICE £12.00 INC OF P/P & VAT

Fuseholders

20mm Panel Mounting	0.28
20mm Chassis Mounting	0.06
1¼in Panel Mounting	0.35
1¼ Chassis Mounting	0.342
Carline 1¼in Mounting	0.10

"D" CONNECTORS

	9 way	15 way	25 way
Male			
Solder	.75	1.00	1.50
Angle	1.40	2.00	2.40
Female			
Solder	1.00	1.45	1.85
Angle	1.50	2.00	2.40
Covers	.80	80	80

IC SOCKETS Dil to Dil

8	pin	0.08	0.70/10
14	pin	0.10	0.95/10
16	pin	0.11	1.00/10
18	pin	0.14	1.60/10
22	pin	0.21	1.95/10
24	pin	0.25	2.25/10
28	pin	0.30	2.75/10
40	pin	0.34	3.10/10

B.T. Approved. Telephone Plug & 4-core Lead **£3.10**
B.T. Approved. Telephone Secondary Socket **£3.20**

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CONTENTS

SPECIAL FEATURES

REGULAR FEATURES

SERVICES

SAFETY IN THE SHACK

Some of the constructional projects described in ***R&EW*** refer to additions or modifications to equipment. Any alteration or addition to the circuit may invalidate the guarantee.

We prefer that each constructional project contains its own power supply or battery. A constructional project will occasionally describe how the power supplies of any equipment may be used to supply the circuit of that project. Ensure that the power unit in the equipment is adequate to provide the additional load current. In all cases, check that the equipment's mains fuse is correctly rated.

Safety in the shack please, at all times.

A look at Woburn

COVER PHOTOGRAPHS

Top left – Test equipment (p55)
Top right – DX-TV (p70)
Centre left – Base mic (p22)
Centre right – CAD program (p4)
Bottom – RSGB Woburn Rally (p20)

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PRODUCT NEWS

Featured on these pages are details of the latest products in communications, electronics and computers. Manufacturers, distributers and dealers are invited to supply information on new products for inclusion in Product News.
Readers, don't forget to mention ***Radio & Electronics World*** when making enquiries

MICRO-COMPUTER CAD

Number One Systems, the Cambridgeshire based electronics design consultants, have announced the launch of a Sinclair Spectrum version of their ac linear circuit analysis program for microcomputers.

The program was written originally for the BBC Model B and Newbrain computers and has proved to be extremely popular with universities and industrial R & D establishments.

The version for the Spectrum is in response to many requests, particularly from undergraduate students and school science teachers, and brings professional electronics CAD (computer-aided design) facilities within the reach of all.

Circuits of up to 16 nodes and 60 components can be analysed for input impedence, output impedence and gain (magnitude and phase)

at linearly or logarithmically spaced frequencies.

Resistors, capacitors, inductors, transformers, operational amplifiers and bipolar and field effect transistors can be simulated by the program, and the ac performance of circuits containing any combination of these components fully evaluated over a wide frequency range without the need for laborious breadboarding and bench testing.

Once a circuit has been entered into the computer it can be stored on tape for further analysis.

Modifications can be made to the component values and circuit configuration during a simulation, thus enabling the designer to assess quickly the circuit's sensitivity to component tolerances, stray capacitances, temperature effects etc.

The program is ideally suited for frequency response analysis of filter circuits, audio amplifiers, wideband amplifiers, tuned RF amplifiers, linear intergrated circuits etc, and has now been in use for over two years, within the consultancy, for a whole variety of projects over frequency ranges between 0.01Hz and 1.1GHz.

The version for the Sinclair Spectrum is supplied on cassette and is fully documented.

Number One Systems, 9A Crown Street, St Ives, Huntingdon, Cambs PE17 4EB. Tel: (0480) 61778.

SSM 2013 VOLTAGE CONTROLLED AMPLIFIER

The SSM 2013 from Solid State Micro Technology is a low cost monolithic, high performance antilog voltage controlled amplifier with full class A performance. The device has a 97dB signal to noise figure at 0.01% THD. The current inputs and outputs make possible a wide bandwidth of 100KHz and easy signal summing, with minimal external components.

The VCA, which is housed in a 14 pin dual-in-line plastic package, exhibits mute and exponential control inputs, a 40dB gain capability and is specified for commercial temperatures only.

The many applications for the device, which requires ±15 volt supplies, include microprocessor controlled analog signal paths such as audio mixers and compressor/limiter circuits etc.

The SSM 2013 is available ex-stock and the one-off price is £5.18.

Coole Marketing Services Limited, 26 Pamber Heath Road, Pamber Heath, Basingstoke, Hants RG26 6TG. Tel: (0734) 700453.

SIP REED RELAY FOR HIGH-DENSITY PCBs

New from Diamond H is a family of SIP reed relays which have been designed for applications in which available PCB space is extremely limited.

Introduced as the Class 117 SIP reed relay, this new device is available with a maximum contact rating of 10VA, for coil operation voltages of 5, 6, 12, 15 and 24V dc. Each version may be supplied with or without diode suppression.

Probably the most important feature of the Class 117 reed relay is its extremely compact dimensions. Mounted sideways on the host PCB, the relay occupies only 0.75in x 0.2in, or 75% of the space occupied by the conventional dual-in-line reed relay. Accordingly, the series is ideally suited for applications in which board space is at a premium.

Diamond H Controls Ltd, Vulcan Road North, Norwich NR6 6AH. Tel: Norwich (0603) 45291/9.

NEW TERMINATED ASSEMBLIES CATALOGUE

Now available from Reliance Cords & Cables is a 6 page leaflet detailing its range of terminated assemblies for data transmission and computer interface applications.

The range offered utilises BICC cables and is 100% tested to assure the highest quality.

It includes RS 232 C (V24) moulded assemblies, IEEE 488 moulded assemblies, Ethernet assemblies and terminated spiral cords.

Of special note is the wide range of RS 232 assemblies available which covers all permutations of 3, 10 and 30 metre lengths; 6, 9, 15 and 25 lines; and male/male, male/female and female/female configurations.

Also included in the leaflet are useful charts detailing connector contact circuit assignments.

Reliance Cords & Cables Ltd, Staffa Road, Leyton, London. Tel: 01 539 3620.

PRODUCT NEWS

'EINSTEIN' COMPUTER

A new British designed and built micro computer has recently been announced by Tatung.

Called 'Einstein', it is an 8-bit machine with a built-in 500K 3in compact floppy disc drive. It has 16K of ROM, expandable to 30K, with 64K user RAM (plus 16K reserved for the 16 colour high resolution graphics). The sound, from a larger than usual speaker, is very good and the BASIC for the machine is an advanced form especially written for Tatung by Crystal Research.

Thanks to its standard operating system, Einstein can also use languages such as C, FORTH, PASCAL and many others.

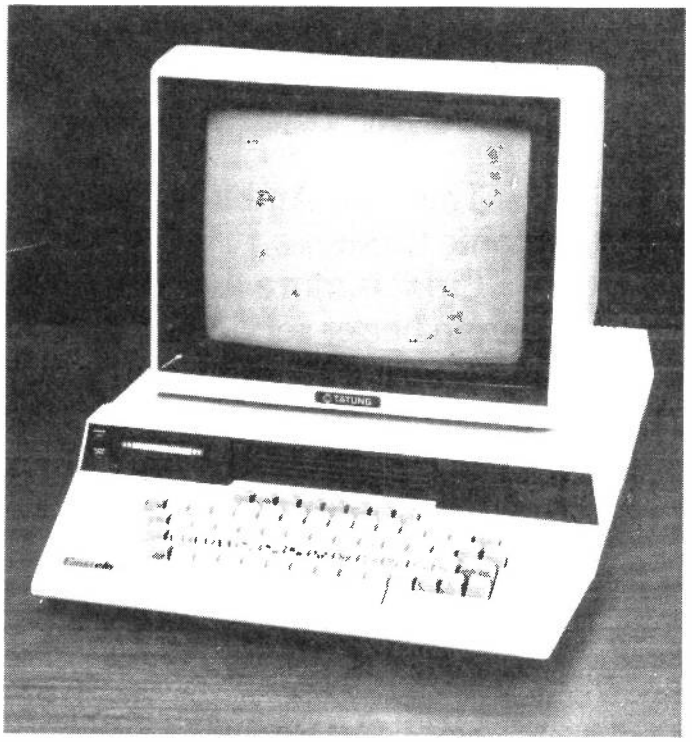
The optional monitor is positioned in a slot on top of the computer, which allows an adjustment of viewing position.

Design policy has been to build in all the connections likely to be necessary for future expansion, with interfaces for parallel printer, RS232, additional disk drive, joysticks, TV and monitor (both YUV and RGB), 8-bit I/O and a unique connection called the 'Tatung Pipe'. This brings all the signals from the Z80A processor to a 60-way port.

A large, behind-the-scenes radio amateur involvement has meant development with consideration for the amateur, with care taken to ensure smooth interfacing for radio use (eg a fully screened/earthed power supply).

Of particular appeal to a great many people will be the price, £499, which includes carriage on mainland UK.

Tatung (UK) Ltd, Bridgnorth, Salop WV15 6BQ.



MOBILE TRANSCEIVER

Com-Tek (Mids) Limited are pleased to announce that UK Type Approval to MPT1301 has been obtained for the company's British built CT210 VHF FM Mobile Transceiver operating in the 66-88MHz band.

The latest addition to the 200 series mobiles has a transmitter power of 20 watts and compliments the existing 165-174MHz mobile.

Amongst the main features of the equipment is its ease of servicing, being of plug-in modular construction, and its compact case size 127mm x 210mm x 52mm.

Com-Tek (Mids) Limited, 506 Alum Rock Road, Birmingham B8 3HX. Tel: 021 326 6343.

SUPERKIT II

Cambridge Learning Limited have announced the publication of their new Superkit II.

Superkit II is the second in the practical digital electronics Superkit series. It consists of a dual instruction manual, written for use with both the Eurobreadboard and the GSC EXP300 breadboard, and a set of components in a plastic wallet. The components and breadboard from the first Superkit are also required to complete all the circuits.

The components in the kit include resistors, capacitors, a 7-segment LED display, integrated circuits, and wire. Superkit II explains how to design and use adders, subtractors, counters (ripple, up/down, synchronous, decade, and Gray code), registers, pattern recognisers, and 7-segment displays.

This practical kit is backed up by Cambridge Learning's theory course, Digital Computer Design.

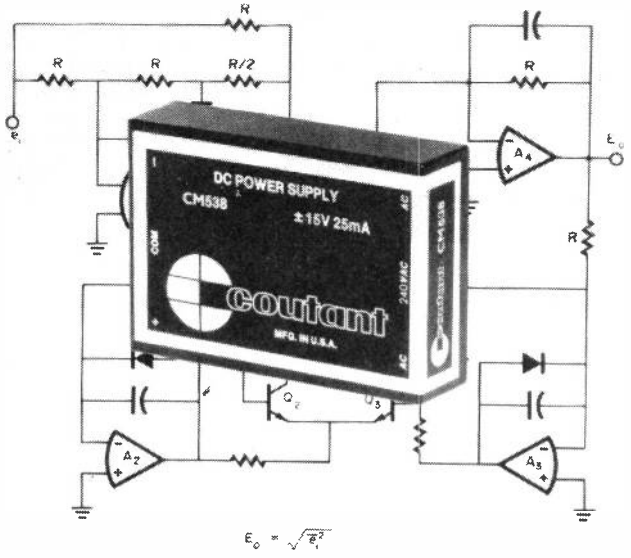
Superkit II costs £16.00 (inc VAT and p&p) and Superkit, £22.00 (inc VAT and p&p). Both kits together cost £35.00 (inc VAT and p&p).

Cambridge Learning Limited, FREEPOST, Unit NR, Rivermill Site, St Ives, Huntingdon, Cambridgeshire PE17 4BR. Telephone orders from credit card holders accepted on (0480) 67446.

LINEAR POWER SUPPLIES

Coutant Electronics Limited have just extended their range of CM Series Encapsulated Linear Power Supplies which now consists of 43 printed circuit board units and 25 chassis mounting models.

All units operate on 240V ac input and the series offers single, twin and triple-output power supplies which have an output voltage accuracy of ±2.0% maximum across the working temperature range of -25°C to 71°C.



Single output units cover a range from 5V to 28V at currents between 40mA and 2A. Twin output units are available from ±12V to ±24V with current ratings of ±25mA to 500mA. The triple output units provide one 5V supply between 300mA and 1A, and either ±12V or ±15V, at currents between ±100 and ±180mA.

The PCB and chassis mount power supplies all have an isolation voltage of 2.5KV (RMS) and an isolation resistance of 50M ohms. Over voltage protection is a standard feature on all 5V rails, and a screw terminal barrier strip is used for the output connections on chassis mount versions. All units in the CM Series are UL recognised.

Coutant Electronics Limited, Kingsley Avenue, Ilfracombe, Devon EX34 8ES. Tel: (0271) 63781

HIGH POWER TRANSFORMERS

Avel-Lindberg have developed a range of specialised toroidal power transformers for use in very high quality audio amplifiers. These toroidal transformers, with power requirements of

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To: Cirkit Holdings PLC, Park Lane, Broxbourne, Hertfordshire.
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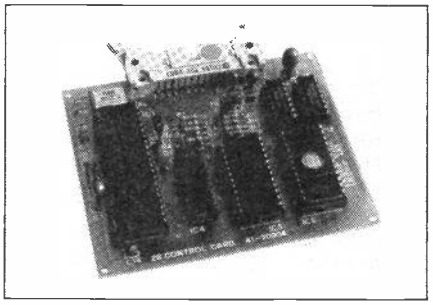


C12 Computer Cassette	21-00012	0.55
BBC to Centronics Printer	03-10019	7.25
BBC to 25 way D Male	03-10021	4.50
25 way D Socket	10-25200	1.90
25 way D Plug	10-25100	1.30
Cover for 25 way D	10-25322	0.93
20 up Eprom Eraser	40-82100	31.25
Z80 A Industrial Controller	40-82000	49.95
6802 Industrial Controller	40-68020	49.95
6502 Industrial Controller	40-65020	49.95
Z8 Basic/Debug Controller	41-00904	50.00

Nicad Batteries & Chargers

Minimum life 600 (300 PP3 size) full charge/discharge cycles. Batteries must be charged from a constant current source only. All batteries are supplied only with a residual charge and should be charged before used.

				1-9	10-49
AA	1.2V	500mAH	01-12004	0.80	0.74
'C'	1.2V	2.2AH	01-12024	2.35	1.99
'D'	1.2V	4.0AH	01-12044	3.05	2.85
PP3	8.4V	110mAH	01-84054	3.70	3.50
CH1/22 PP3 Charger 11mA for 16 hours			01-00159		4.30
CH8/RX Multi-purpose Charger			01-02204		9.40

Will recharge AA, C, D and PP3 size cells with automatic voltage selection. Will recharge following combination: 6×D, 6×AA, 6×C, 2×PP3, 2×D+2×C, 2×D+2×AA, 2×D+1×PP3, 2×C+2×AA, 2×C+1×PP3, 2×AA+1×PP3.

Battery Adaptor	01-12001	0.96

Sold in pairs: one to convert AA size to C size and one to convert C to D size. Both may be used together to convert an AA to D size.

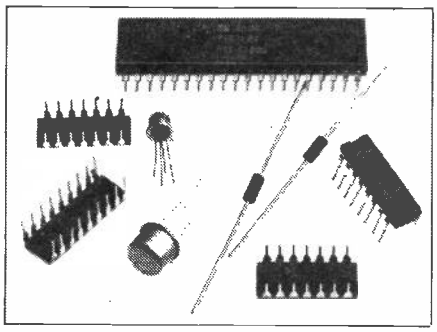
Semiconductors

Linear IC's

LM301AN	DIL version	61-03011	0.44
LM308CN	DIL version	61-03081	0.65
LM311CN	Popular comparator	61-00311	0.46
LM324	Low power quad op amp	61-03240	0.67
LM339N	Low power quad comparator	61-03390	0.68
LM346	Programmable quad op amp	61-00346	3.72
LF347	Quad Bi-FET op amp	61-00347	1.82
LM348	Quad 741 type op amp	61-03480	1.26
LF351	Bi-FET op amp	61-03510	0.49
LF353	Dual version of LF351	61-03530	0.76
LM380N	1W AF power amp	61-00380	1.45
NE555N	Multi-purpose low cost timer	61-05550	0.45

for a better service.

NE556N	Dual version of the 555	61-05560	0.50
uA741CN	DIL low cost op amp	61-07411	0.22
uA747CN	Dual 741 op amp	61-07470	0.70
uA748CN	741 with external frequency comp	61-04780	0.40
HA1388	18W PA from 14V	61-01388	2.75
TDA2002	8W into 2 ohms power amp	61-02002	1.25
ULN2283	1W max. 3-12V power amp	61-02283	1.00
MC3357	Low power NBFM IF system and detector	61-03357	2.85
ULN3859	Low current dual conversion NBFM IF and detector	61-03859	2.95
LM3900	Quad norton amp	61-39000	0.60
LM3909N	8-pin DIL LED flasher	61-39090	0.68
KB4445	Radio control 4 channel encoder and RF	61-04445	1.29
KB4446	Radio control 4 channel receiver and decoder	61-04446	2.75
ICM7555	Low power CMOS version of timer	61-75550	0.98
ICL8038CC	Versatile AF signal generator with sine/square/triangle OPs	61-08038	9.50
TK10170	5 channel version of KB4445	61-10170	1.87
HA12002	Protection monitor system for amps, PSUx, TXs etc	61-12002	1.22
HA12017	83dB S/N phono preamp 0.001% THD	61-12017	0.80
MC14412	300 baud MODEM controller (Eduro/US specs)	61-14412	6.85



Microprocessor & Memories

Z80A	Popular and powerful 8-bit CPU	26-18400	3.40
Z80AP10	2 port parallel input/output	26-18420	2.95
Z80A CTC	4 channel counter/timer	26-18430	2.90
Z8671	Z8 Micro comp. and Basic	26-08671	17.50
6116-3	16K (2kx8) CMOS RAM 200nS	26-36116	6.68
Z6132-6	32K (4kx8) quasi RAM 350nS	26-06132	15.00
4116-2	16K (16kx1) 150nS	26-24116	1.59
2764	64K (8kx8) 450nS	26-02764	9.50
2732	32K (4kx8) 450nS	26-02732	5.70

Voltage Regulators

7805	5V 1A positive	27-78052	0.40
7812	12V 1A positive	27-78122	0.40
7815	15V 1A positive	27-78152	0.40
7905	5V 1A negative	27-79052	0.49
7912	12V 1A negative	27-79122	0.49
7915	15V 1A negative	27-79152	0.49

Transitors

BC182	General purpose	58-00182	0.10
BC212	General purpose	58-00212	0.10
BC237	Plastic BC107	58-00237	0.08
BC238	Plastic BC108	58-00238	0.08
BC239	Plastic BC109	58-00239	0.08
BC307	Complement to BC237	58-00307	0.08
BC308	Complement to BC238	58-00308	0.08
BC309	Complement to BC239	58-00309	0.08
BC327	Driver/power stage	58-00327	0.13
BC337	Driver/power stage	58-00337	0.13
MPSA13	NPN Darlington	58-04013	0.30
MPSA63	PNP Complement to MPSA13	58-04063	0.30
J310	JFET for HF-VHF	59-02310	0.69
J176	JFET analogue switch	59-02176	0.65
3SK51	Dual gate MOSFET-VHF amp	60-04051	0.60
3SK88	Dual gate MOSFET-Ultra lo noise	60-04088	0.99
TIP31A	Output stage	58-15031	0.35
TIP32A	Complement to TIP31A	58-15032	0.35
VN66AF	VMOS Power FET	60-02066	0.95
IN4001	Rectifier diode	12-40016	0.06
IN4002	Rectifier diode	12-40026	0.07
IN4148	General purpose silicon	12-41486	0.05

Silicon Controlled Rectifiers

BRY55-100	100V .8A	52-55100	0.50
C106DI	400V 4.0A	52-00106	0.70
C122DI	400V 8.0A	52-00122	1.45

3mm Diameter LEDs

V178P	Red	15-01780	0.15
V179P	Green	15-01790	0.16
V180P	Yellow	15-01800	0.18

5mm Diameter LEDs

CQY40L	Red	15-10400	0.12
CQY72L	Green	15-10720	0.15
CQY74L	Yellow	15-10740	0.15

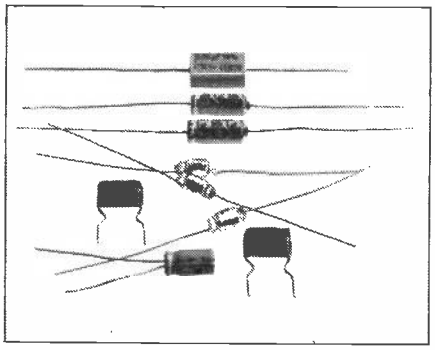
Infra-Red LEDs

CQY99	Emitter	15-10990	0.56
BPW41	Detector	15-30410	1.51

Tri Colour LED

V518	Orange-Green-Yellow	15-05180	0.60

Capacitors



Aluminium Electrolytics Radial PCB Mounting

			Pack of 4
10u	16V	05-10606	0.24
47u	16V	05-47606	0.28
47u	25V	05-47607	0.28
470u	6.3V	05-47705	0.36
470u	16V	05-47706	0.48

Tantalum Beads

			Each
1uf	35V	05-10501	0.18
10uf	16V	05-10601	0.28
47uf	6.3V	05-47601	0.45
47uf	16V	05-47602	0.92

Monolithic Capacitors

		Pack of 3
1n	04-10204	0.39
10n	04-10304	0.42
100n	04-10404	0.45

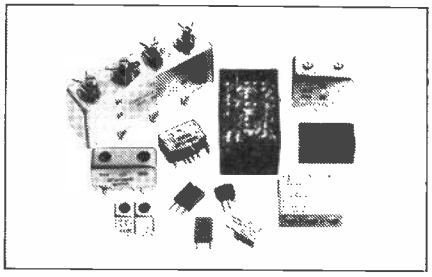
Low Voltage Disc Cermaic

		Pack of 5
1n	04-10203	0.20
10n	04-10303	0.20

Polyester (C280)

		Pack of 3
10n	04-10305	0.18
47n	04-47305	0.24
100n	04-10405	0.24
470n	04-47405	0.51
1uF	04-10505	0.66

R F Components



Filters

CFU/LFB CFW/LFH SERIES

Miniature 455kHz filters. I/P and O/P impedance 2K.

		-6dBW	-40dBW		
LFB6/CFU455H		6kHz	18kHz	16-45512	1.95
LFB12/CFU455F		12kHz	26kHz	16-45515	1.95
LFH6S/ CFW455HT		6kHz	14kHz	16-45525	2.45
LFG12S/ CFW455FT		12kHz	22kHz	16-45528	2.45
CFM2455A Mechanical IF Filters for 455kHz				19-45530	0.77

Crystal Filters 2 Pole Types

10M15A	10.7 Centre Freq.	20-10152	2.10
10MO8AA	10.695 Centre Freq.	20-11152	3.49

Inductors

We offer the complete Toko range of fixed and variable inductors. Over 500 coils from audio to V.H.F. See catalogue for details.

Soldering Irons (Antex)

CS240	Iron 240VAC 17 Watts	54-22300	5.20
XS-240	Iron 25W 240V High heat capacity	54-22500	5.40
SK6	Presentation pack of one XS-240 with ST4 stand	54-22510	7.20
MLXS	Handy 12V 15W soldering iron complete with crocodile clips and solder	54-20004	5.60

Please add 15% VAT to all advertised prices and 60p post and packing. Minimum order value £2 please. We reserve the right to vary prices in accordance with market fluctuation.

between 500VA and 2KVA and dual outputs of 60 to 70V RMS, can be tailored to suit both the electrical and mechanical constraints imposed by designers – including the lowest possible radiated noise figure.

Although it is claimed that the best results are achieved with a separate transformer feeding each channel on a stereo amplifier, Avel will also supply toroids capable of feeding both channels.

The aim of the designer is to ensure that the musical performance is totally neutral and that the amplifier will not add any colouration to the integrity of the input source. The separate transformers help in achieving the greatest separation and lowest interaction of one channel with another and nothing is shared electrically with the adjacent channel.

Toroidal core and winding technology are at their most cost-effective in the 500VA to 2KVA range, and toroids can be produced in the relatively short runs required by very high quality systems at a competitive price compared with the more normal laminated types.

The radiated magnetic field (which is the cause of most unwanted hum in audio amplifiers) is maintained at a very low figure of less than seven gauss (7×10^{-4} Tesla) measured at a distance of only 5cm (2in) approximately from any surface of the transformer.

A flash proof test of 4.5KV peak is applied to each transformer, and primary to secondary insulation can be provided in accordance with BS415 Class 2; IEC 65 Class 2; and VDE 0550 Class 2, or better, as required by the customer.

Toroidal construction is highly efficient and as the weight and volume are smaller than conventionally constructed transformers, a larger and cooler running toroid can be fitted.

Avel-Lindberg Limited, South Ockendon, Essex RM15 5TD. Tel: 0708 853444.

NEW 15MHz OSCILLOSCOPE

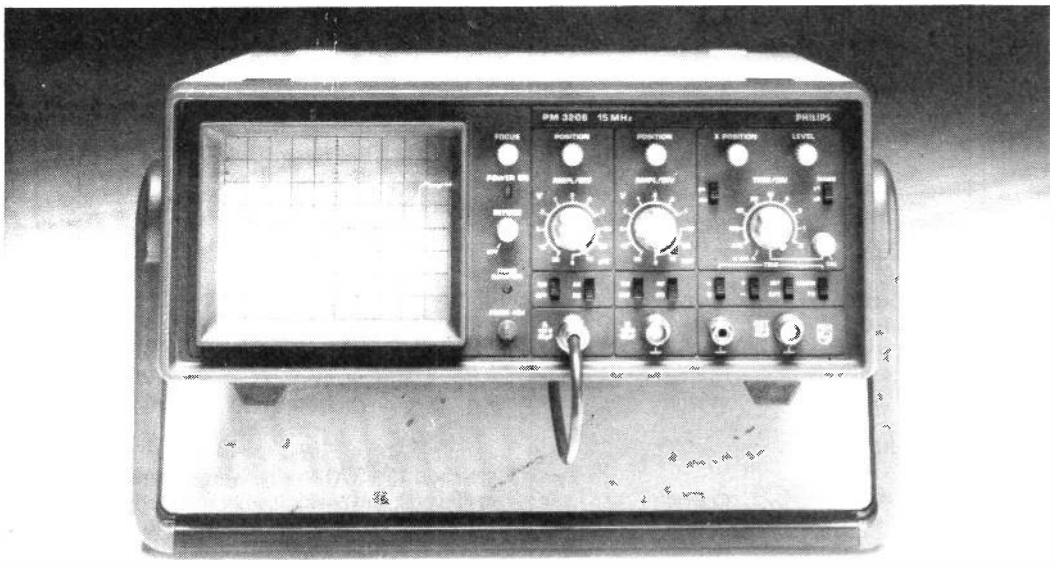
A new dual-trace oscilloscope has been introduced by Philips Test and Measuring Instruments. The 15MHz PM 3206 oscilloscope costs only £275, but the instrument has a high standard of construction and a performance not normally associated with instruments within this price range.

The PM 3206 offers all the facilities expected of a general-purpose instrument for education, laboratory and field use, including a wide sensitivity range of 5mV to 20V. It has a bright CRT with excellent display quality. The 'scope provides simple and reliable triggering, including TV, selectable from either channel. X-Y presentation, via the input amplifiers, is included as well as the facility to Z modulate the display.

The new instrument is modern and lightweight, yet of a robust construction enabling it to withstand the rigours of today's testing environments. It has a clear, well designed and ergonomic front panel layout.

The low cost of the PM 3206 has been achieved by employing modern design concepts for simpler, faster production. Careful selection has also enabled component costs to be kept to a minimum.

Pye Unicam Limited, York Street, Cambridge, CB1 2PX.



DC/DC CONVERTERS

Triple outputs of +5V at 3.2amps together with ±15V at 0.32amps are now available in what are the smallest 25W dc/dc converters available in volume production on the market (76 x 76 x 17.3mm).

These new RIFA Power Product units are available with either +24V or -48V inputs.

They are designated PKA 2232 (input 19V to 35V) and PKA 4232 (input -39V to -64V).

The size is achieved because of 300KHz switching frequency.

They are available in either printed circuit board or chassis mounting versions. In either configuration they require no extra cooling, need no extra components, have an MTBF in excess of 200 years at T_{amb} 45°C and have no derating of output power over the temperature range -45 to +85°C.

These units add to the existing PKA range which already offers 5V at 5amps, 12V at 2½amps, and triple output versions giving 5V at 4amps with ±12V at 0.25amps.

Campbell Collins Limited, 162 High Street, Stevenage, Herts. Tel: Stevenage (0438) 69466.

PRODUCT NEWS

SSTV SOFTWARE

Scarab Systems have just announced a new development for the radio amateur using the Sinclair Spectrum 48K computer.

They are now marketing an SSTV program for the Spectrum that will require no additional hardware.

Once loaded, it will allow the inputting of audio SSTV tones from a radio receiver into the Spectrum's EAR socket, and the computer will then display the decoded picture on the screen.

The features include up/down scrolling, user adjustable grey scale and sync, save picture to tape, input analysis routine, recall last picture from memory, etc.

The price is £15.00 including VAT and p&p, and includes a demonstration tape containing 'off air' SSTV pictures.

Scarab Systems, 39 Stafford Street, Gillingham, Kent. Tel: Medway (0634) 570441.

NEW OSCILLOSCOPES

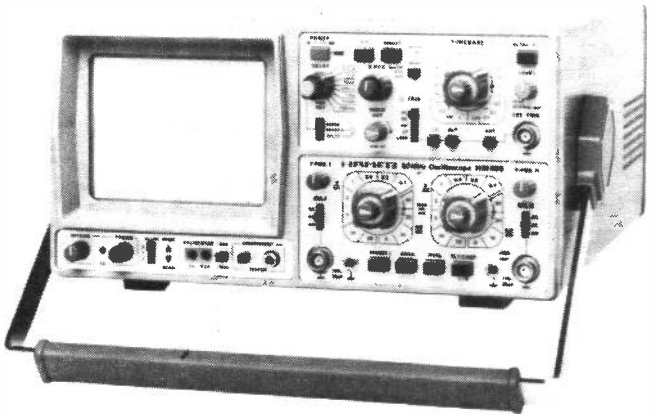
Levell Electronics have released details of two new dual channel oscilloscopes that they can supply. The HM204-2 is dc to 20MHz (-3dB) and the HM605 is dc to 60MHz (-3dB).

These multi-function oscilloscopes have sensitivities of 1mV/cm to 50V/cm with a signal delay line built in so that the trigger edge of a waveform can be viewed. A variable sweep delay from 100nS to 1S enables detailed signal analysis by expanding any section of a waveform. The sweep range is variable from 10nS/cm (including x10 magnification) to 1.25S/cm for the HM204-2 and from 5nS/cm to 2.5S/cm for the HM605.

Both oscilloscopes have a built in component tester for checking electronic components individually or in circuit, and a 1kHz/1MHz square wave calibrator for probe compensation and system checks. A Z modulation input is also provided.

Levell offer free delivery in the UK and discounts based on mixed total order value.

Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD. Tel: 01-449 5028, 01-440 8686.



muTek TRANSVERTER

muTek now have available their new TVHF 230c 9 band HF transverter.

Designed to operate with a 144MHz SSB/CW or multimode transceiver, the TVHF 230c will give high performance receive and transmit facilities on all nine current HF amateur allocations with 10W PEP output.

In order to cope with the problems of more numerous signals on HF than VHF, and of generally greater signal levels, the TVHF 230c has extensive filtering and employs the technique of 'noise equalisation', in which the sensitivity of the transverter is tailored to be consistent with external noise. This is possibly the first time this technique has been used in amateur radio.

The unit will accept input drive of between 1W and 5W PEP without need for adjustment, and up to 20W PEP with the optional VFAT 206 power attenuator.

It requires 12.5 to 14.5V at 4A (ripple voltage less than 0.5V p-p), and so with a suitable power supply is ideal for portable and mobile operation in addition to fixed use.

The TVHF 230c retails at £334.90 including VAT (plus £5.00 carriage).

muTek Limited, Bradworthy, Holsworthy, Devon EX22 7TU. Tel:-0409-24543.

TEA, TOAST AND TELEVISION

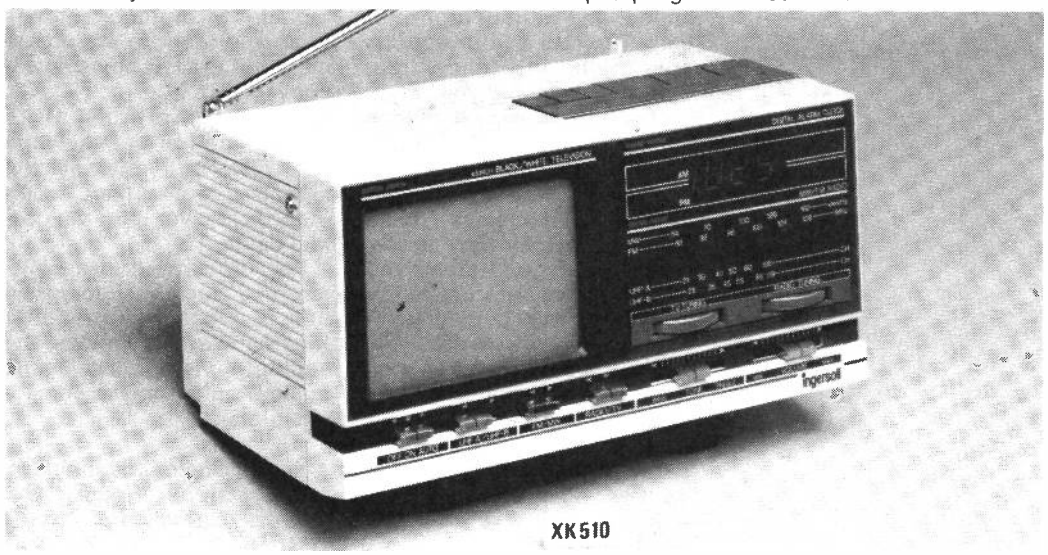
The Ingersoll XK510 television and radio alarm clock solves the problem of waking up in the morning. What could be more comforting than waking up to your favourite breakfast television programme and then staying in bed a few minutes extra to watch the news?

The XK510 can be programmed to wake you with either television or radio. It features a 4½in black and white television, a MW and FM waveband radio, a digital clock with 12 hour red LED display and indoor aerial. The XK510 is lightweight, compact and can be easily transferred from one room to another. This would also be ideal for the kitchen, playroom or even a caravan.

The XK510 also has a snooze and sleep facility. If you like watching late night films in bed but normally fall asleep half way through, the sleep button will switch the television off at a pre-programmed time.

The Ingersoll XK510 is now available from major department stores and mail order houses, priced at approximately £132. 95.

Heron Electronics Limited, Heron House, 19 Marylebone Road, London NW1 5JL. Tel: 01-486 4477.



XK510

LOW COST FUNCTION GENERATOR

The new Jupiter 500 Function Generator is a rugged mains operated instrument offering features unique in its price range, such as full programmability of both amplitude and frequency by external voltage and exceptionally high output voltage of up to 30V peak-to-peak.

The frequency range of the Jupiter 500 is 0.1Hz to 500KHz in 7 switched decade ranges with fine frequency control.

Sine, square, triangle and TTL (30 loads) waveforms are selectable and an adjustable dc offset up to 15V can be applied to the output.

The Jupiter 500 sells in the UK at £110.00 (+ VAT) with a comprehensive manual.

Black Star Limited, 9A Crown Street, St Ives, Huntingdon, Cambs PE17 4EB. Tel: (0480) 62440.

PRODUCT NEWS

PACKET SWITCHING TERMINAL NODE CONTROLLERS

ICS are introducing the first packet switching TNCs to be commercially available on the UK amateur radio market.

The PKT-1 is a fully assembled, tested and cased unit which sells at £499 inc VAT plus £2.50 p&p.

Also available is the Tucson Amateur Packet Radio Group terminal unit in kit form at £295 inc VAT plus £2.50 p&p.

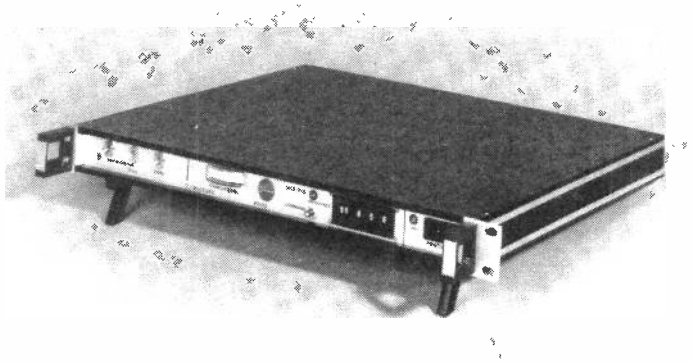
Both units implement the TAPR AX25 protocol, include a modem, and are designed to be driven by a dumb terminal unit or a personal computer equipped with terminal emulation. They interface directly to a standard VHF FM transceiver.

These units are suitable for high speed terrestrial or satellite error correcting data communication and multiple QSOs are permitted on one frequency. Each TNC can act as a digital repeater with the ability to 'digipeat' via up to eight TNCs.

This means that VHF contacts will ultimately be possible from one end of England to the other under flat band conditions – given suitably equipped and attended stations.

Packet radio represents the leading edge of developing amateur radio technology in the United States.

ICS Electronics Ltd, PO Box 2, Arundel, West Sussex BN18 0NX. Tel: (024 365) 590.



NEW 20mm 6-CHIP LED

The new Taiwan Liton LTJ 811 series of large LED lamps is now available in the UK from Selectronic.

Available in a choice of four colours, these new PCB mounting lamps are 20mm (0.8 inch) diameter, low power dome-shaped lamps incorporating 6 chips per unit for high reliability and large area illumination. They are mounted on 15mm (0.6 inch) pitch DIP bases with separate anodes and cathodes for each chip. The four colour options are: high efficiency red, orange, green and yellow.

Absolute maximum ratings are 500 milliwatts power dissipation; 30 milliamps average forward current per LED; 200 milliamps pulse peak current per LED and 5V reverse voltage. Storage and operating temperature range is -40°C to +85°C, and luminous intensity – with all six LEDs lit – varies from 20 mcd for the yellow version to 35 mcd for the green.

Selectronic Ltd, The Old Stables, 46 Market Square, Witney, Oxon OX8 6AL. Tel: (0993) 73888.

NEW SATELLITE TELEVISION RECEIVER

A new, compact satellite television receiver which is only 44.5mm thick has been announced by Marconi Communication Systems Ltd of Chelmsford.

Designated the P3400, it has been designed for high quality, cost effective reception of the new European satellite television transmissions beamed from satellites such as the ECS and Intelsat series.

The main users are likely to be cable system operators and telecommmunication organisations who require high quality vision and sound signals for distribution within their terrestrial networks.

However, the receiver is also intended for other professional users such as broadcasting organisations, hotels and conference centres, language teaching institutes, military bases and offshore installations.

A complete satellite TV receive-only (TVRO) also includes the outdoor antenna (dish and feed) on which are mounted the low noise down-converters.

These convert the 11 or 12GHz satellite signals to the 900-1700MHz range, so the signals can be taken to the indoor receiver units via coaxial cable.

For encrypted transmissions a further decryption unit or decoder is used after the receiver, to recover the separate vision and sound components from the composite signal.

Marconi Communication Systems, Marconi House, New Street, Chelmsford, Essex CM1 1PL.

NEW!

The TVHF 230c HF Transverter
– all 9 hf bands from a 2m multimode!

★ As reviewed by Angus McKenzie in September's 'Amateur Radio Magazine'

£334.90 inc VAT (£5.00 carriage)

from muTek limited

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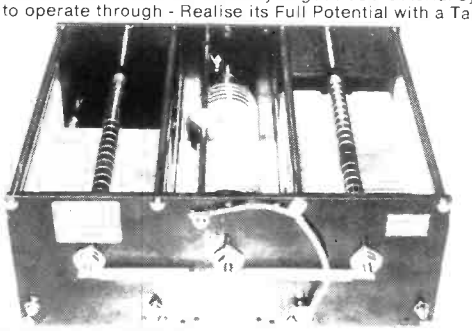

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NEWS DESK

Marconi wins £3.3M naval telegraphy order

The Ministry of Defence has placed a £3.3M contract with Marconi Secure Radio Systems Limited of Portsmouth, Hants, for the development and production of an advanced ship-to-shore automatic HF telegraphy system.

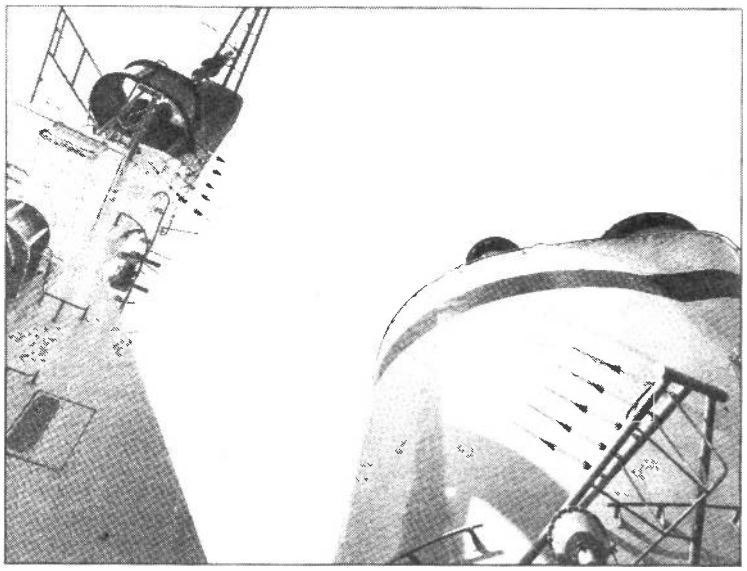
The equipment is required to satisfy a Royal Navy Staff Requirement and will consist of both ship-borne and shore-based elements. Development and production of the former will be undertaken by MSRSL at Portsmouth, and of the latter, by the principal sub-contractor Marconi Communication Systems Limited at Chelmsford. The contract follows a project definition study undertaken for ASWE by Marconi and other interested companies in 1980 and has been awarded to Marconi despite keen competition. The company has high hopes for follow-on contracts in due course.

Under the terms of the contract, two complete shore facilities will be provided. Each will consist of a receiving station with co-located interference monitoring equipment, a remote sounding transmitting station, and a control station. Ships of the Royal Navy that use Marconi ICS3 high frequency radio communications equipment, together with some submarines, will be fitted with on-board equipment developed under the contract. Deliveries are expected to begin in late 1987.

When the equipment enters service, it will provide an improved, fully-automatic method of determining and selecting noise-free channels in the HF maritime mobile bands.

It will largely do away with the laborious and time-consuming method currently employed, which relies on the ship's Communications Officer consulting HF prediction charts and manually switching to channels that are, hopefully, noise-free.

Through the use of the channel evaluation and monitoring facility being provided under this contract, there will be a ship-to-shore frequency instantly available for use at most times in each of the maritime mobile bands.



Zinc coating process beats an old headache

A new process to combat electrical interference created by radio waves is attracting widespread interest in the electronics industry.

A London-based company, Deccospray, has perfected a method of spraying a molten pure zinc metal coating onto a range of plastic components and enclosures without deforming or weakening the base materials.

The successful adoption of the Deccospray technique has led to a surge of orders for the Charlton firm, which has extended its premises to meet demand.

One leading British micro manufacturer is referring users to Deccospray to cure interference problems in environments where transmitters and receivers are working in close proximity.

By applying the molten pure zinc coating to components' internal surfaces, the electromagnetic energy is absorbed, and external radio frequency interference – a factor which can seriously disrupt a computer's operation – is reflected.

Says John Stirling, chairman of Deccospray: 'Equipment that we have successfully processed includes visual display unit housings, electronic mail equipment, radio and radar dish reflectors, computer consoles, voice synthesizers, and a wide range of defence equipment'.

The process is to international UL and DIN standards for European and US markets. Other applications include protection against interference from vehicle ignition systems, fluorescent lights and domestic appliances.

Mr T I Lundegard, President of the British Radio Teleprinter Group and a council member of the Radio Society of Great Britain, who channels enquiries to Deccospray, said: 'There is enormous potential for this company's process, which is a superb way of countering the increasing problem of electro-magnetic interference.

'It has a lot to recommend it not only as a curative method, but as a process that could be introduced by manufacturers at the design and build stage. I will be watching its progress with great interest'.

Further information from: *Deccospray Ltd, Eastmoor Street, Woolwich Road, Charlton, SE7 8NA. Tel: 01 858 5128*

New amateur radio licence schedule

A new schedule to the amateur radio licence is being introduced on 10 September 1984. This is the result of joint discussions between the Department of Trade and Industry and the Radio Society of Great Britain.

The new single-format schedule (the technical supplement to the licence which lists the frequencies amateurs may use, etc) covers amateur radio operations of both Class A and Class B licensees.

It has been designed with the needs of the user in mind and also clears up areas of misunderstanding.

Operators will in future be able to see at a glance the frequencies they may use and their status (ie, primary/secondary), the maximum power and the type of transmission permitted.

Two minor changes to the amateur licence are also being made. The first is to reflect the transfer of functions of the Radio Interference Service from British Telecom to the Department of Trade and Industry.

The second change removes the clause referring to Radio Teleprinter (RTTY) transmissions since this is now superseded by the new schedule.

The changes to the licence are as follows (the numbering relates to the licence as amended):

Clause 1 (1) (a) (iii): Reference to the 'General Manager of the British Telecom Telephone Area' is deleted and replaced by 'Manager of the Radio Investigation Service District'.

Clause 1 (2) (e): This clause, relating to a prohibition of offensive or indecent messages, (Clause 1 (2) (f) in the old licence) replaces the old Clause 1 (2) (e) (referring to RTTY transmissions) which is now deleted.

Two forms of amateur radio licence are available. Those who have passed the Radio Amateur Examination (RAE) which tests technical and operational knowledge, may apply for the Class B; this gives access only to frequencies above 144MHz. The Class A licence which gives access to all amateur bands is available to those who have pas-

sed both the RAE and a Morse test.

There are currently about 55,000 amateur licences in force.

BARTG Autumn RTTY Contest

Duration; 1800 GMT Saturday 13th October until 1100 GMT Sunday 14th October 1984. A rest period of at least 4 hours must be taken during the contest period and be declared on the summary sheet.

Band; 144 MHz only. Contacts via a repeater or satellite will not be valid.

Operators; Licensed amateur radio stations within zones 14 and 15 who are permitted to use RTTY as a mode of operation. Portable operation is allowed but must be from one location or within one Km for the whole of the contest. Entries from SWLs will also be very welcome and will be scored separately.

Contacts; Stations may not be contacted more than once during the period of the contest.

Messages; Messages shall consist of the following:

a) Time of start of contact in GMT, to consist of a full figure group. This information must be passed in both directions and logged. The use of 'Same' or "Same as yours' are not permitted.

b) RST report, normal three figure group.

c) Message number. This will consist of a three figure group starting from 001 for the first contact made and numbers will continue in sequence throughout the duration of the contest.

d) QRA locator; normal five symbol locator is preferred, or QTH given either as a town or as a bearing and distance in Km from a town (max 25 Km). The town must be identifiable on a 1:500,000 Tourist or Road Plan map.

Logs; Logs shall be entered on A4 size log sheets and be accompanied by a cover sheet similar to the RSGB form 427, giving address for correspondence, site and equipment details, comments and signature(s) of responsible person etc.

The log entry shall contain: date/time of start of contact – RST report sent – message number – time received – call sign of station worked – his RST and message number (these may be combined,eg 599001) – QRA and/or QTH received – estimated distance and points claimed.

It will be helpful to include your own QRA locator at the top of every log sheet.

Scoring; All two-way RTTY contacts will score in accordance with the distance chart as shown. Proof of contact may be requested in certain cases where the station worked does not appear in any other contest log received.

Awards; Certificates will be awarded to the top scorers and runners up in each section;

1. Single operator stations UK and Europe.
2. Multiple operator stations UK and Europe.
3. Short wave listeners UK and Europe.

(See additional note.)

In addition, the Ealing Challenge Cups will be awarded to the winners of the Single and Multi Operator Sections (UK).

The judges' decision will be final and no correspondence can be entered into in respect of entries or logs received after the closing date for entries.

All logs must be postmarked no later than Saturday 17th October 1984 to qualify.

Send your logs to: BARTG Contest *Manager, 464 Whippendell Road, Watford, Herts, WD1 7PT. England.*

Additional note: Single operator stations may be fixed or portable but must be set up and operated by one operator only, otherwise entry must be made under the Multi Operator section.

Exemption from licensing of low power radio devices

The Rt Hon Kenneth Baker MP, Minister for Information Technology, recently announced proposals for the exemption from licensing of four categories of low power radio devices.

The categories for exemption are:

Telemetry and telecontrol for general purposes – it is proposed to exempt: induction telemetry and telecontrol equipment in the bands 0-185 KHz and 240-315 KHz; free radiating telemetry and telecontrol devices in the band 173.200-173.350 MHz which use up to 1mW; equipment in the band 458.5-458.8 MHz using up to 500 mW and devices in the band 26.96-27.28 MHz.

This category includes items such as garage door openers, alarms, sensing systems and animal identification tags.

Low power speech communications – it is proposed to exempt, in addition to the induction telemetry and telecontrol equipment mentioned above, wide band radio microphones using up to 2 mW, narrow band radio microphones using up to 5 mW and radio aids for the deaf using up to 2 mW on specified frequencies.

This category covers such devices as radio microphones for lecture and entertainment, translation facilities and radio aids for the deaf.

Low power doppler and field disturbance devices – as well as induction systems it is proposed to exempt devices using spot frequencies between 3 MHz and 33.4 GHz. This category includes production line controls, traffic light controls and anti-shoplifting tags.

Low power emergency alarms for the elderly and infirm – it is proposed to exempt alarms operating at 27.45 MHz with a power up to 0.5 mW.

Until an exemption order is made and comes into effect use of the devices concerned continues to require a licence from the Radio Regulatory Division of the Department of Trade and Industry. Installing or using one without a licence is an offence (maximum penalty £2,000).

Model control equipment and metal detectors were exempted from licensing in January 1981 and cordless telephones in January 1983.

DTI takes over RIS

The Department of Trade and Industry formally took over direct control of the Radio Interference Service (RIS) from British Telecom (BT), on 7 August 1984. This change, a consequence of the imminent privatisation of BT, was first announced on 13 April by the Rt Hon Kenneth Baker MP, Minister for Information Technology.

It has also been agreed that the service will be renamed the Radio Investigation Service to reflect its activities more accurately.

The RIS has at present about 260 staff in the field. It investigates interference to authorised radio and television broadcasts, land mobile radio and emergency services, and where possible takes action to stop it.

The service traces illicit transmissions and prosecutes offenders, for example operators of pirate radio transmitters and illegal citizens' band users.

It also inspects licensed stations to ensure compliance with licence conditions, and tests controlled equipment.

This change brings the field staff under direct control of the responsible Department, whereas previously the service was run by BT on an agency basis.

The Government and BT have agreed that the RIS work would not be compatible with BT's commercial interests after privatisation.

The RIS will from now on be part of the DTI's Radio Regulatory Division.

BT staff who wish to stay with the RIS will be assimilated into DTI as civil servants.

The new RIS will operate in due course from 37 offices in 20 districts (made up of groups of counties), although meanwhile staff will continue to work from BT regional offices.

Distance/Scoring Chart

0 – 50 Km scores 1 point	250 – 300 Km scores 11 points
50 – 100 Km scores 3 points	300 – 350 Km scores 13 points
100 – 150 Km scores 5 points	350 – 400 Km scores 15 points
150 – 200 Km scores 7 points	400 – 450 Km scores 17 points
200 – 250 Km scores 9 points	450 – 500 Km scores 19 points

and pro rata on 50 Km increments.

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MODEMS

A link between radio and computers

by RJ Redding

In an article in *Radio and Electonics World*, June 1984, I discussed the possiblities of using high speed data, and in particular the use of telephone type modems on radio.

We now have enough experience to say that whilst both 300 baud and 1200 baud signals work well on VHF, the higher speed gives error free copy for long files, whereas the occasional error at 300 baud seems the norm.

The reason for this rather surprising result appears to be that the frequency shift for 1200 baud is large, ie from 1300 to 2100 Hz. It may be that this wide shift suits the commercial modems we have tried. We are of course only using one-way transmission, so it could be because the 300 baud specification was intended for duplex transmission on telephone lines and so two sets of tones suitably spaced are specified with a narrow shift of only 200 Hz.

There seems no reason why even faster speeds should not be used. However, commercially available equipment is not so easy to come by, and uses special modulation techniques more complex than the frequency shift keying which seems ideal for FM amateur transmitters.

As has been found in RTTY practice, FSK can be used directly into side band transmitters, resulting in efficient usage of the available power because only one pure signal tone is transmitted at a constant volume (although the actual frequency changes very rapidly), so unless carefully adjusted, it could overload a sideband transmitter designed for speech.

Connecting a telephone modem to a transceiver

To use a modem designed for the telephone on a radio channel requires an understanding of modem and telephone practice in order to avoid pitfalls.

Figure 1 gives an outline of a modem, which comprises a receiving path which takes the tones and restores them into digits, and a transmit path which does the inverse.

In order that they should both work onto one line there is a unit known as a 'duplexer' which combines them. This is usually connected to the telephone line itself via a bridge rectifier whose ac input is the telephone line. The public telephone line has a voltage of 50V dc across it and the main purpose of this 'rectifier' is to ensure that the unit will work whichever way round it is connected.

If we try to use the modem to drive a radio receiver, the output of the modem is likely to be zero because the rectifier acts as a backstop to any signals within

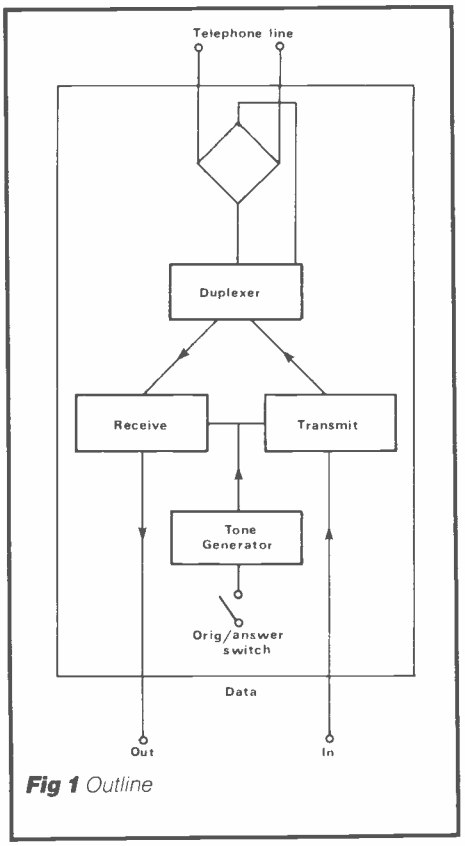

Fig 1 *Outline*

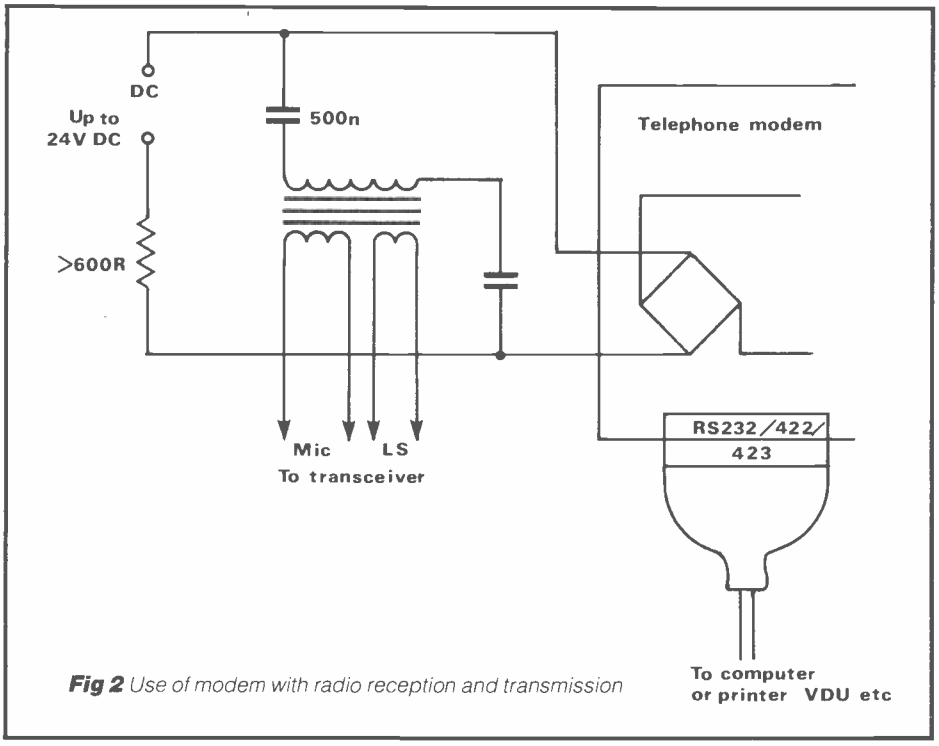

Fig 2 *Use of modem with radio reception and transmission*

the modem. We need to apply a dc voltage across the rectifier in order to open its 'gates'.

Circuit

A suitable circuit is shown in *Figure 2* where a dc votage and a series resistance are applied to the line terminals. A transformer across the line terminals will then provide the tone signals, and if this has two secondaries, they can be separately used for the transmit and receive functions in a way that is readily adjusted to suit the transceiver system.

A capacitor, say 0.5 microfarad, in series with the primary stops the dc current from saturating the core, and a high resistance in series with the battery avoids the need for switching, particularly if the modem is connected by a plug-in jack.

A current of 2mA is usually quite adequate except if the modem is of the line powered type, in which case the telephone line needs to be simulated with perhaps a 20V supply at 15mA.

A signal of approximately 200 millivolt ac is available from a modem, and since most transceivers require less than this the ratio of the transformer is not critical and virtually any small transformer will suffice. The Tandy 2731380 8 plus 8 to 1K ohm has been used in a number of units with success; in fact a resistor network could be used instead.

One useful trick is to put a small jack across the microphone of the transceiver so that when the lead from the modem is plugged in, the signal appears across the microphone giving an aural check of the transmission, the microphone acting as a small reproducer.

Similarly if the modem input is connected via a suitable resistor across the loudspeaker of the transceiver, the modem can be left in position and operated by just switching it 'on line' when required. This enables one to be sure that the listening station is ready before switching over to data, and allows announcements of call signs in speech, as required by the licence regulations.

There are two more steps to the complete system. One is the connection of the computer to the modem, and this brings in the mysteries of the 'RS232'; the other is a programme for driving a computer as a terminal.

A number of the latter exist and several can be downloaded from a bulletin board. Some machines such as the Model 100 Tandy have a TELECOM programme already built in, and most word processor programmes can be modified to work as a terminal by extending the input and output facilities to cover 'data in' and 'data out'.

Mystery

To the uninitiated the 'RS232 interface' is most confusing and frustrating. After hours attempting to assimulate the whys and wherefores, I think the subject as far as a modem is concerned boils down to a few simple connections and procedures.

The purpose of these notes is to help other people to avoid the waste of time, energy and money which seems to result from obsolescence and commercial sacred cows.

Telescoping history, the RS232 was developed in the 1960s for inter-connecting electro-mechanical units of the Telex machine type. These worked on signals of 50 or 80 volts and currents of 20 mA or so. The printers needed a considerable number of monitor signals to see that motors were running, paper inserted, and so on.

Control

Before sending, we needed similar control signals to make sure that one was not talking into thin air.

With the passage of time we now have everything on 5 volts at a few milliamps and if we leave out the motors and paper by going onto screens or straight into memory, these problems hardly arise. The trouble is the magic words 'Industry Standards' have been taken to mean a 25 pin 'D' type connector, and apparatus is no good unless this is fitted!

This in turn means that the cost of the cable with connectors is often commensurate with the apparatus which it connects, and in fact a unit which does little more than cross over the two transmit and receive wires, called a 'null modem', costs £17, even from Tandy.

The number of pins which are in use these days is rarely more than 8 as listed in *Table 1*. These are the ones provided on the majority of equipment, eg the Tandy Model 100 and printers, or a typewriter with an 'RS232'.

Theoretically the signals should be plus and minus 12V but many will work down to ± 5V. However, this dual polaty is inconvenient in a micro with a single 5V supply, and the later standards RS422/RS423 which use a single polarity with a minimum of 3V and maximum of 5V (as used on the BBC micro) are much to be preferred.

Table 1 *Details of (RS232-C) connector interface*

Terminal number	Signal name	Code	EP ⟷ connected device	Function summary	Note
2	Send Data	SD	→	Data line sent from this printer to connected terminal	
3	Receive Data	RD	←	Data line sent from connected terminal to this printer	
4	Request to Send	RS	→	Controls transmission carrier ON carrier output OFF carrier stop	Normally ON in the terminal mode
5	Clear to Send	CS	←	Controls data transmission ON data transmission possible OFF data transmission not possible	
6	Data set Ready	DR	←	Indicates condition of connected device ON transmission/reception possible at connected device OFF transmission/reception not possible at connected device	ON when cable is not connected
7	Signal Ground	SG	—	Provides basic ground potential	
8	Carrier Detect	CD	←	Detects carrier ON receiving access signal OFF not receiving access signal	ON when cable is not connected
20	External Ready	ER	→	Indicates condition of this printer ON printer preparation completed OFF printer preparation not completed	Enables on/off setting selection ON unless otherwise specified

Table 2 *Facilities of EP44 printer interface*

Baud rate (transmission speed)	75, 110, 300, 600, 1200 (Baud)
Synchronous system	Asynchronous
Communication control process	Full duplex, no procedure
Bit length	7 bit + parity, or 8 bit no parity
Parity	N ..... NONE parity (parity is normally 1) O ..... ODD parity E ..... EVEN parity Z ..... ZERO parity (parity is normally 0)
Data style	10 bits/character SPACE (0) MARK (1) | ST | b_1 | b_2 | b_3 | b_4 | b_5 | b_6 | b_7 | b_8 | SP | Start of character is the first shift (Start Bit) from MARK to SPACE. If without Line data, it is MARK mode. ST. ..... start bit $b_1 - b_7$ ..... data bit (LSB is b1) b_8 ..... parity bit (MSB during 8 bit data) SP ..... stop bit
New line (carrier return)	**CR - LF** ..... carrier return according to **LF** code **CR** ..... automatic carrier return according to **CR** code
Code	7 bit. ..... 7-bit data code (see page 38-43) Applicable with 7-bit codes used in personal computers T/W ..... Typewriter code (see page 38-43) 8 bit ..... 8-bit data code (see page 43) (8-bit expansion code)
Shake hand protocol	Enables selection of X_{ON} **(DC1)**, X_{OFF} **(DC3)** signals or **ER** signal line

There are thus two problems to be faced in connecting a micro to a serial interface. One is handshaking, and the other is voltage levels.

A wealth of commercial equipment is available to get over these problems by means of indicator boards showing what connections to make, and even empty boxes in which to build your own circuitry; but one rarely solves the problem by adding something, since that usually creates other problems.

The clue is to consider the matter from the point of view of the electronic circuit, be it a micro, modem or a serialiser. Basically it will have three connections, one for data in, one for data out and a common wire. If the voltage on these wires isn't adequate, then increasing the voltage is not terribly difficult.

The trouble is what to do with all the other connections, for although the circuit might work initially, sooner or later one of the redundant circuits will make its presence felt. The trick seems to be to connect the RS232 pins together within the plug so that each gets the signal it is looking for.

Referring to *Table 1*, Pin 5 wants a 'Clear to Send' from the remote end in order to start, and such signal is available from the adjacent Pin 4. Thus we connect the two together so that it kicks its own backside.

Similarly, Pin 6 looks for a signal to say that the remote equipment is ready and, in the case of a modem, to say at Pin 8 that the carrier has been detected, and we may not have this facility.

Luckily at Pin 20 it is the convention to provide a signal which says 'External Ready' whose main purpose seems to be to tell others to 'forget it and get on with the job' so that if we connect together 6, 8 and 20 we should be in business for 'data in' and 'data out' as shown in *Figure 4*.

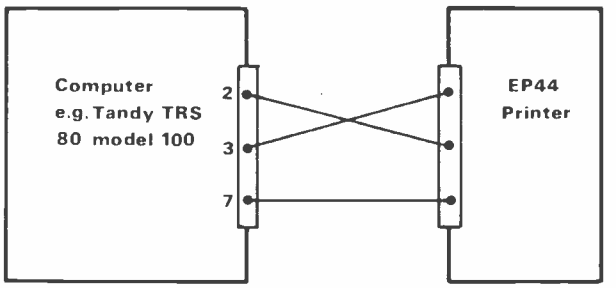

Fig 3 *Null modem cable*

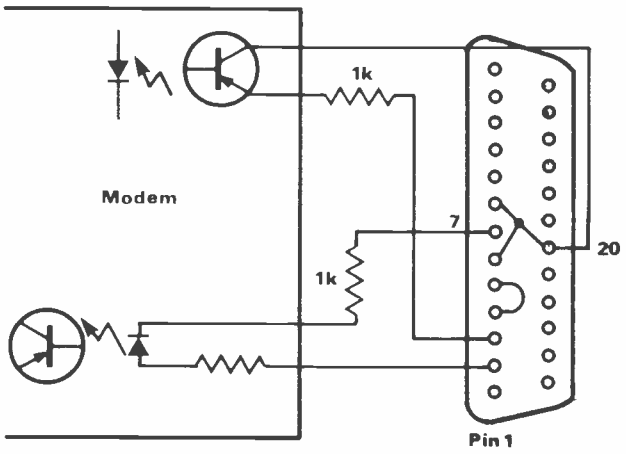

Fig 4 *Modem to RS232*

Memory

There could be a problem in that our machine may not be able to receive the data because, say, the memory is full, or the speed is too fast for it to cope with. However, there is a software convention known as 'x on'/ 'x off' which is implemented in many software programs and seems to adequately cope with the situation in two-way exchanges.

Having worked out the above with an old modem, I acquired an EP44 electronic battery operated typewriter with an RS232 interface and instructions.

The basic specification details of the RS232 are given in *Table 2* and in fact *Table 1* is taken from that instruction book as the best description I have found.

I had tended to think that 'parity' is more nuisance than it is worth only to discover that there are yet further variations, 'none', 'odd', 'even', and 'zero'. The wrong one produces quaint results if your micro has several character sets.

There comes with the EP44 a book of RS232 application circuits which shows the connection between the EP44 and the Model 100 as just three wires 2, 3 and 7, with 2 and 3 crossed to provide the null-modem effect (*Figure 3*) because 'data out' of one is 'data in' to the other.

The EP44 works as a terminal and has a buffer of 4K which can be prepared and edited in advance and down loaded, which is adequate for a news bulletin.

However, on reception of data, this buffer is not available and so the printer gives the 'x off' signal once the small memory is full, which of course is useless on a one-way radio contact. No doubt Brother will improve this in due course but declined to provide details so that we could try to overcome the limitation.

Now that the feasibility of high speed data is demonstrated we need to think about new and fresh things we can do with the added facilities. My previous article discussed the advantages of a news bulletin in the form of searchable data, and there has been much interest in packet radio.

Local news on radio as a service

Traffic bulletins and news flashes on Radio 2 are not the only services of assistance to the road user. In addition to the folklore of CB radio, quite a lot of useful information is passed between mobiles and radio amateurs who have long used the facility of 'talk-in' to congregate at rallies and events.

The advent of repeaters on 144 MHz gave a boost to mobile operation, and to be able to ask for local directions in a strange area can justify the fitting of a mobile radio in a car. Some years ago a retired taxi driver could be heard regularly guiding people through London streets via GB3LO, and few people knew that he was incapacitated by blindness.

Speech, however, has its disadvantages. One can lose the vital word or be distracted at the wrong time, as anyone who regularly listens to the RSGB news bulletins for amateurs will know. We can, of course, record the bulletin on tape but it still means listening to the whole of it in case there is something that we ought to know.

Speech is also pretty wasteful in terms of time if one must repeat addresses, etc, and then spell out critical nmonics in phonetic terms.

For an experiment, I took an RSGB news bulletin which took 15 minutes to read, and reduced the essentials to one A4 page of text which takes less than one minute to send over the air as 1200 baud data.

The point I would make is that this one minute of data would go into about 8Kilobytes of computer memory from which it can be retrieved, displayed, printed, colated, etc, at will at any time. Better still, most small computers which could handle this duty have a search feature which means that instead of reading it all we can input 'FIND.....?' and know whether we are missing

anything!

The extension of this leads to an automatic receiver of continually updated news information for inspection when required, but before we go for a black box in the car that can answer our queries, let us look at this grass roots – new departure – situation and make sure that our procedures and conventions or vested interests do not stop it happening.

It would be all too easy to get into arguments about added value services, licence regulations, third party traffic and so on. Already Packet Radio is causing worries about apparent conflict with some amateur licensing regulations.

Instead, let us look at how we can extend current practice amongst enthusiasts on amateur radio, making the experiments which allow people without transmitting licences to take part, and make use of the storage capacity of a home computer rather than being limited by the mechanical performance of a printer.

The interest in this aspect is shown by the fact that the British Amateur Radio Teleprinter Group, BARTG, of the RSGB has doubled its membership in the last year since declaring that they were including computers as well as Telex type equipment.

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THE 1984 RSGB NATIONAL MOBILE RALLY

Sunday 5 August saw the RSGB National Mobile Rally in the grounds of Woburn Abbey, a mere stone's throw from the world-famous wildlife park.

If we expected good weather that day, considering the time of year, the early morning found us rather apprehensive at the prospect of ten-tenths cloud and a chilling drizzle.

However, by the time of our arrival at Woburn we had not been rained on for a few hours, and spirits rose. From then on things got even better; the beer tent opened, the sun broke through for a good while in the afternoon, and by the end of the day some 7000 people had visited the rally.

Fun for all the family

Traders

The two large marquees housed around 100 exhibitors. There were a few new products, notably two new units from Microwave Modules and Mutek's TVHF transverter, but the overall impression was one of an Aladdin's cave of highly desirable 'junk'.

With the large amount of secondhand equipment and the many components on sale there were certainly many bargains to be had. It paid to shop around, though, with prices varying greatly for particular items from one end of a marquee to the other.

The pack-rats amongst us had a field day. It was the ideal place to find those rarities which normally take hours of searching the shops for; it also provided a great opportunity to pick the brains of all the experts behind the stands, absolutely free of charge!

The RSGB had a large stand, of course, this being their show. It was located near the main entrance, and its staff were kept busy selling books and maps, and enrolling new members.

BARTG also had a stand, and they, too, did quite a trade in their books, kits and PCBs and just chatting about data communication.

RAIBC

It was nice to see that the Radio Amateur Invalid and Blind Club had a stand, and the interest shown in this organisation by some amateurs was heartening.

Some of the editorial staff of *Radio & Electronics World* and our sister publication, *Amateur Radio*, were present, and we spent an interesting day at our stand talking to those who came to catch up on back issues, or to buy the Amateurs Handbook. Unfortunately, too many of you already have the complete set, so we didn't get to do as much nattering as we might have liked! Certainly, it was very nice to meet all of you.

Apart from the trade stands, the back-up was good, with good service at the refreshment tent – OK, so they did run out of bitter late in the day, but if you lot will drink so much . . .

The location was ideal for such a rally. Quite apart from the choice of a well-drained spot, so that it was dry underfoot despite rain the day before, the attractions of the impressive park and wildlife enclosure were enough to keep wives and children happy for the day.

Too few rally organisers allow for this factor, yet it must rate as fairly important for many family men. The RSGB definitely deserve a pat on the back here.

The one gripe I have about the event concerns the arrangement of stands. On several occasions the marquees seemed terribly overcrowded, with the only people free to move being those behind the stands.

The problem, I think, was not the number of people, but rather the unfortunate layout which caused bottlenecks, thus inhibiting free circulation. Possibly a minor point, and it certainly didn't detract too much from a very pleasant day.

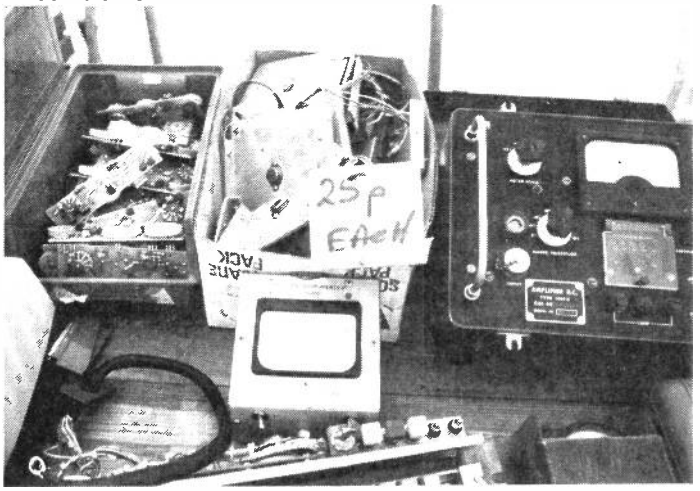
Delighted

Everyone seemed pleased, from the 7000 happy radio amateurs to the organisers. Even the traders, who apparently didn't break any records in turnover, looked tired but delighted at the end of the day.

The most striking factor with rallies such as these is the wide range of topics embraced by the hobby, all of which were more than adequately covered at Woburn.

If next year's rally is half as pleasant as this one, I would not want to miss it – so I will see you all next August!

Aladdin's cave!



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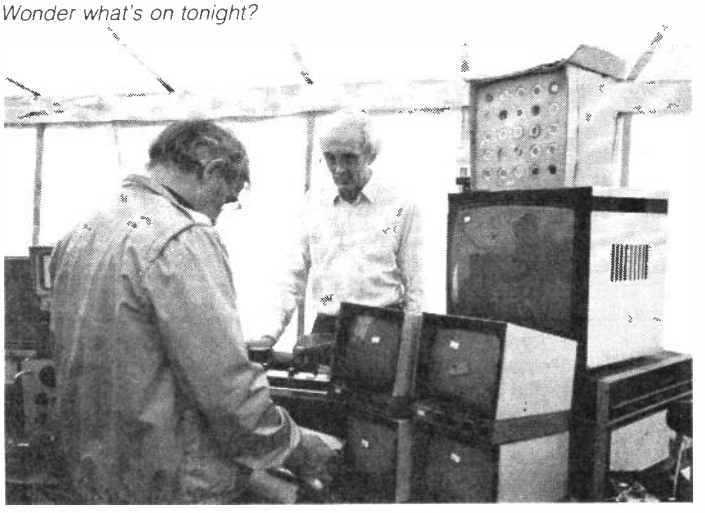

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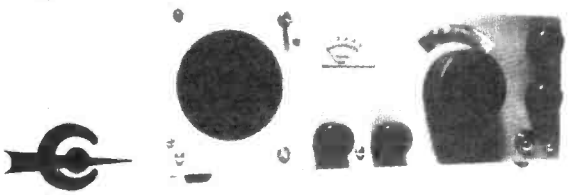

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LF356	100p
LF357	110p
LM301A	35p
LM307	50p
LM308A	95p
LM311	75p
LM324	45p
LM339	50p
LM348	75p
LM358	70p
LM380	120p
LM381	170p
LM386	95p
LM393	100p
LM3909	85p
MC1310P	210p
MC1455	75p
MC1456	135p
MC1458	45p
MC1496	75p
MC3242A	630p
MC3302	95p
MC3340	160p
MC3401	65p
MC3403	70p
MC3456	107p
MC3480	580p
MC34001	58p
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NE556	70p
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Base Mic — Processor Controlled

by Peter Rouse

A novel means of constructing a modern style piece of equipment without the need for specialised parts or tools.

Simple electronics, based around a one-chip speech processor, make this unit easily adaptable to most amateur, CB and commercial equipment.

The idea of constructing a good quality base station microphone is attractive when one considers the price of commercially made units. However, most hobbyists have probably been put off the idea because of the problems of making the microphone head and stem without access to special materials and equipment such as a lathe.

The project presented here, however, consists of nothing more than two TV coaxial plugs, a short length of heating pipe, a low cost capacitor microphone insert, a case and electronics.

The electret insert used in two prototypes were sold under the Archer brand name and are available from Tandy stores at only £1.29. Similar devices are available from numerous suppliers and they do provide remarkable performance for their low cost.

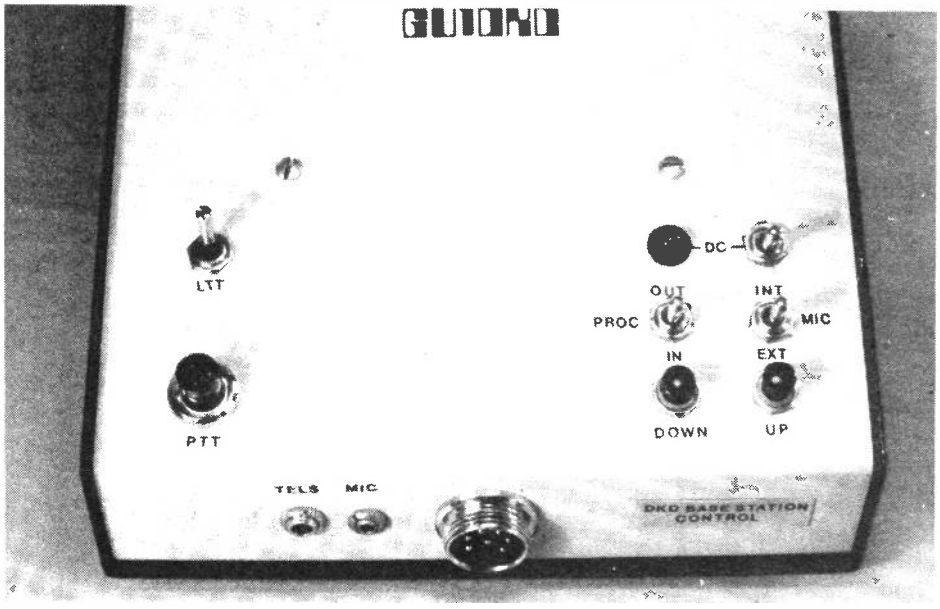
Having realised that the mechanics of the project would be fairly easy, the next task was to consider an amplifier with some form of AGC to keep audio to the transmitter constant even when the operator is moving in relation to the position of the microphone.

Many processor circuits have been published over the years and amateurs usually have their particular favourite. There is no reason why they should not incorporate them here but for anyone starting from scratch a suitable circuit based around the Hitachi KB4417 is presented.

To make the unit as flexible as possible it was decided that sockets should be included to allow the processor circuit to be used with a standard hand-mic or a headset with boom microphone. A further feature of my own unit was to incorporate up/down scan switching which is normally available on the hand-mic for the FT290 2metre transceiver and similar rigs.

A further refinement would be to use the relay to activate hard-wire switching of RF pre-amps and linears, and so provide more reliable operation than that available from RF sense switching which can be erratic with SSB operation.

Panel layout as used with the FT290



Circuit options

The circuit has been designed to offer as many options as possible and the PCB designed to hold components required for most variations.

A look at the circuit diagram shows that there are four main functions catered for on the circuit board: processing, headphone amplification, relay switching and voltage control.

In its simplest form, the circuit need only consist of the processor, a push switch (push-to-make or SPCO depending on the transceiver), and an LED indicator. This latter item is essential, as in the receive state it activates the mute control.

When used in this configuration there is no reason why the unit should not be operated by a 9V battery. Something that can be added is a lock-to-talk toggle switch.

Another option is the headphone foldback amplifier, which is useful for operators who like to be able to hear their own transmitted speech when using a headset (a facility often found on professional systems such as aircraft radio).

When this circuit is used it will be necessary to route the output via the relay so that foldback or receiver audio is automatically selected; attempts to mix both signals into the headphones will almost certainly lead to distortion.

A bonus for owners of FT290s who use this configuration, is that the annoying undemodulated SSB audio that appears at low level on the external speaker socket is switched out of the headphones.

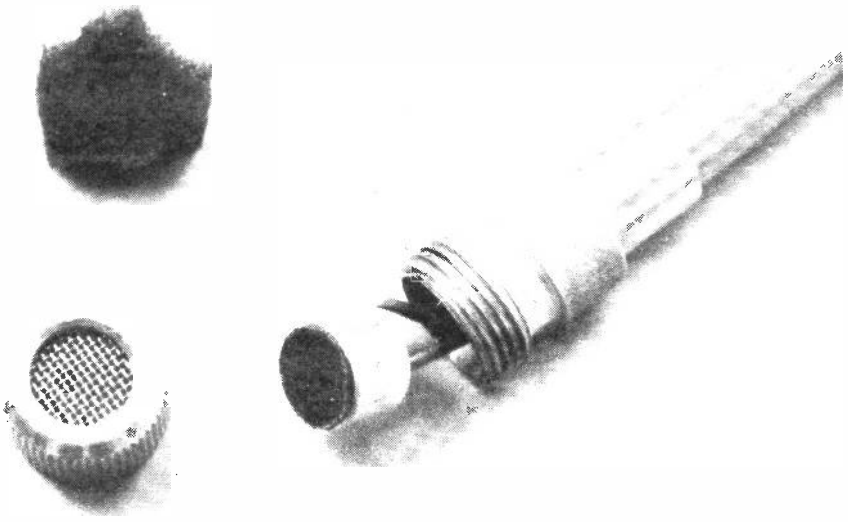
If foldback is not included then the relay may be used for equipment that requires SPCO Rx/Tx switching.

Processor requirements

For optimum transmission of speech, there are several requirements that need to be met. The human voice during normal speech produces sounds that cover a wide range of levels and frequencies and over noisy radio channels many softer sounds may be completely lost.

The way to overcome this is to level-off the voice's dynamic range, firstly by some form of AGC or compression and then by removing unnecessary peaks by clipping. Unfortunately Hitachi supply no details of the AGC range of the KB4417 but it appears to be over 50dB, which is adequate for our application.

The final refinement consists of limiting the frequency response to the range 300Hz to 3KHz as this is where most speech intelligibility is. The circuit around the KB4417 covers all these requirements, and although clipping and bandwidth limiting are not absolutely necessary on a base station microphone it is worth including them so as to increase the versatility of the unit.



Electret and headshell assembly

The working circuit

The IC consists of five main blocks; a balanced input pre-amp, an AGC detector, two amplifiers, and a limiting amplifier incorporating a mute switch and overmodulation protector.

The pre-amp is connected for single-ended input at pin 1 and the second input is de-coupled through C6. The output is further amplified between pins 14 and 13 and the resulting audio is fed to the AGC detector and the limiting amplifier through VR1, which sets the clipping level.

AGC time constants are determined by C11/R14 and the control voltage is internally applied to the input pre-amp. The limiting amplifier has a mute facility when not in transmit mode and this is activated by taking pin 5 high through a 150K resistor.

In order to keep Tx/Rx switching simple, the resistor, R5, is in fact connected to an LED transmit indicator; enough current flows through the LED (or the relay when fitted) to activate the mute, but when the transmit switch is pressed, the LED and resistor are grounded so disabling the mute.

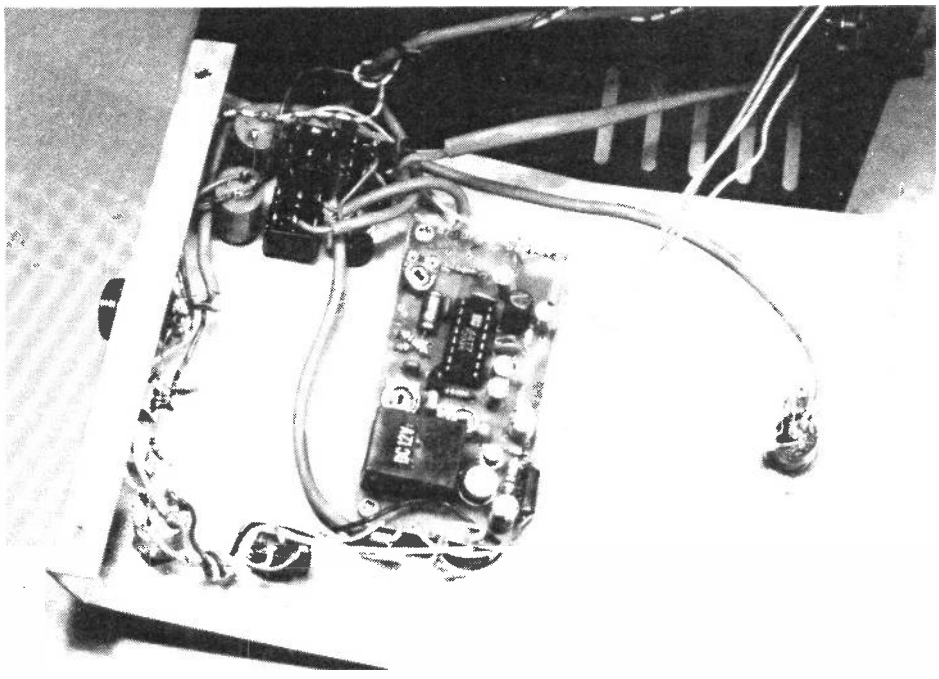
The mute is necessary as many amateur and CB rigs use audio stages that are shared for both receive and transmit, and unless the mic is out of circuit during reception audio feedback between mic and speaker can occur. The mute also means that SPCO Tx/Rx switching on many rigs is no longer necessary and can be replaced by a simple push switch.

The remaining amplifier between pins 7 & 9 is used both as a low pass filter and output stage. The filter components comprise R7/R8/C14/C15 and they restrict the upper limit to around 3KHz. They also remove any harmonics that may have been generated by clipping as these could cause RF splatter if fed to the transmitter. The lower frequency response is determined by the value of coupling capacitors throughout the circuit.

The optional headphone amplifier is made up of the Darlington pair Tr1/Tr2, and this simple circuit provides more than enough output to drive a headset.

The value of the resistor RX will depend on whether or not the amplifier is included...52 ohms if it is, 120 ohms if it is not. For battery use replace it with a wire link and omit the Zener and C13. R2 feeds current to the electret mic.

Internal layout



Circuit construction

Layouts are not critical and the circuit can be built on either a PCB or stripboard. However, great care should be taken over de-coupling; a metal case is a must and all audio connections, no matter how short, must be made with coaxial cable, or watch out for RF feedback.

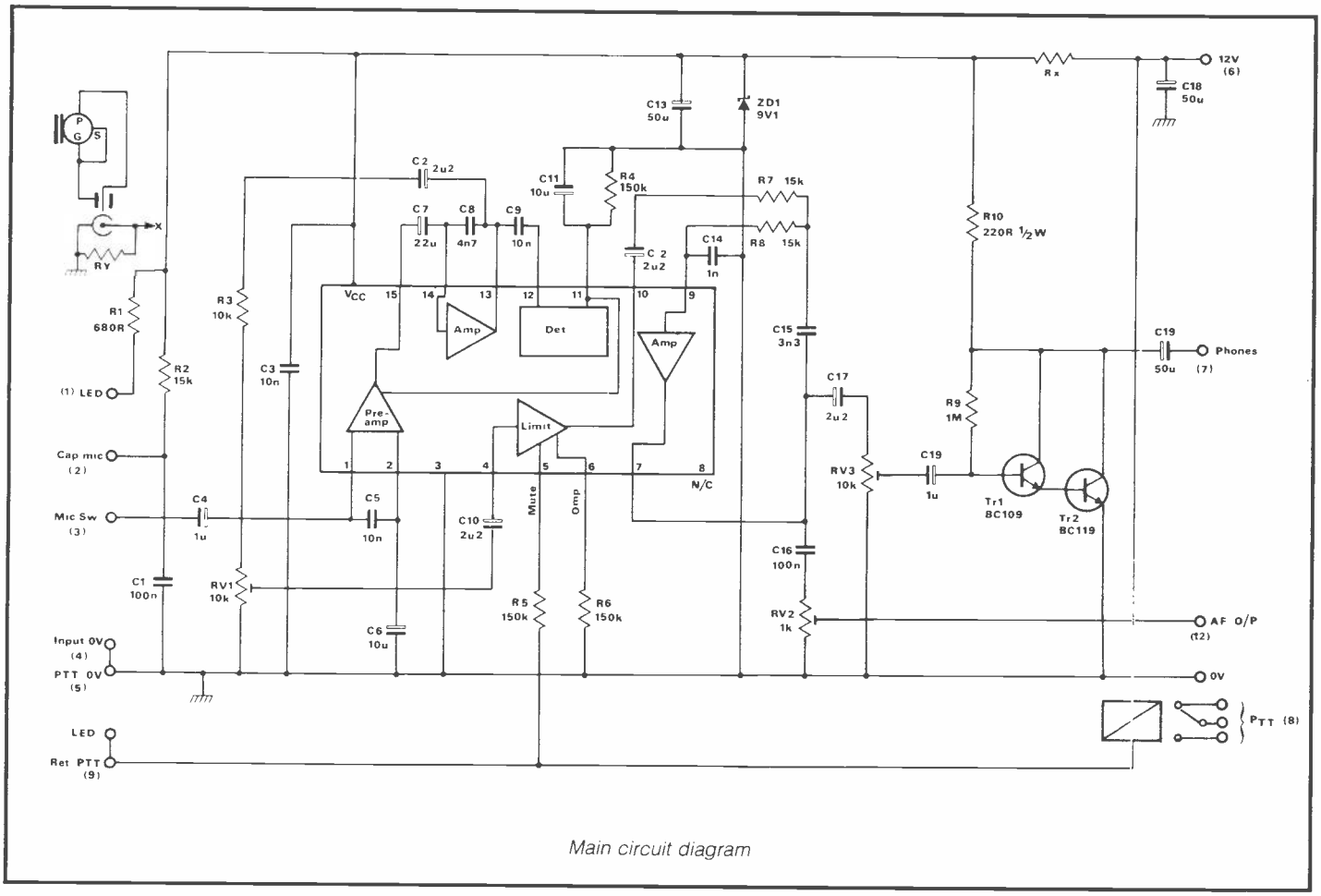
The problem is worse when transmitting AM and SSB, but be warned that even FM is not immune.

In addition to the capacitors shown on the main circuit diagram, additional 10nF capacitors will be needed to de-couple power lines as they come into the unit and all non-AF PTT and special function lines as they both enter and leave the unit.

Microphone input points and sockets should have a 100pF capacitor connected between live and chassis. It is impossible to be overcautious and effective de-coupling with short lead capacitors must take precedence over neatness or symmetry of layout.

The sloping fronted case used on my own version is of unknown origin but similar cabinets are widely available, and if you are contemplating a simple battery operated version there is no reason why you should not use a cheap die-cast case, painted and used lid-down with stick-on rubber feet. If external microphones are to be used then it will be necessary to fit appropriate sockets.

Many CB and amateur rigs now use the round locking types and these should be



Main circuit diagram

available from equipment dealers. In case of difficulty a full range is stocked by Cirkit (formerly Ambit).

Microphone assembly

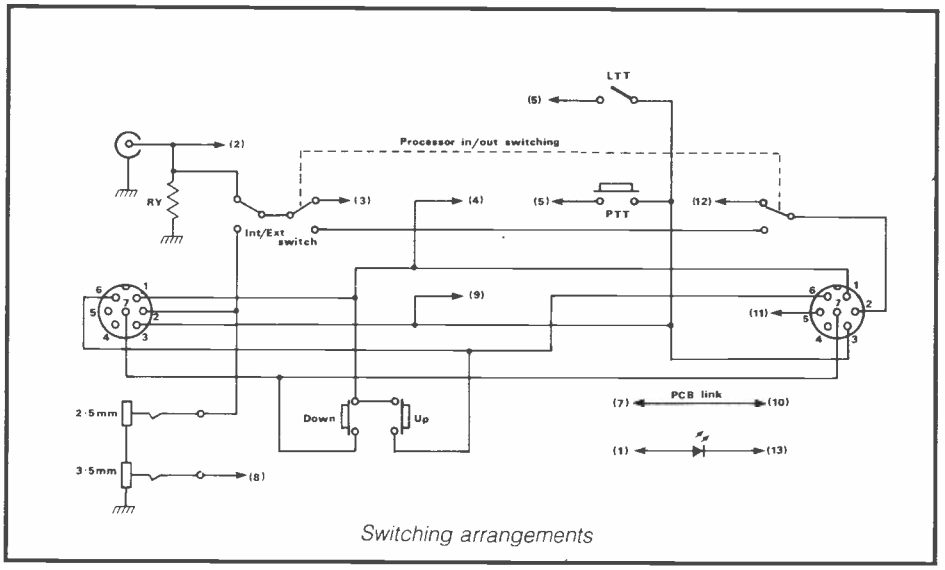
And now the bit that will save you money. All you need are two television aerial plugs, one matching recessed socket, an electret mic insert and a small section of 8mm bore copper piping.

The version shown in the photograph used only 8 inches of the pipe, which is generally available from suppliers of central heating equipment. You will also need a piece of scrap foam rubber and a small section of wire mesh or similar material – the grill off an old radio or speaker is ideal.

Construction will be obvious from the diagrams and photographs. Note the unusual method of connecting both audio output and ground together and wiring them to the copper tube for ground. This allows a two-wire connection with audio-power being fed along a single wire to the centre pin of the plug fitted to the case end.

Do not try and bend the pipe too tightly or it will crimp. One way of reducing this risk is to thread a piece of thick, wet coaxial cable down the pipe, bend it and then pull the co-ax out.

Paint the tube or plate it in PCB tinning solution and fit the plugs. A dab of glue will hold the mic end and the normal cable clamp the case end.



Switching arrangements

Resistor RY is chosen to balance the output of the electret mic against any external mics. It is wired directly across the back of the input socket and in the case of the Archer insert should be about 4K7.

Setting up will be made a lot easier if a second transceiver or receiver is available feeding into headphones. Failing this, the only option is to get another operator to monitor the quality of the transmitted audio.

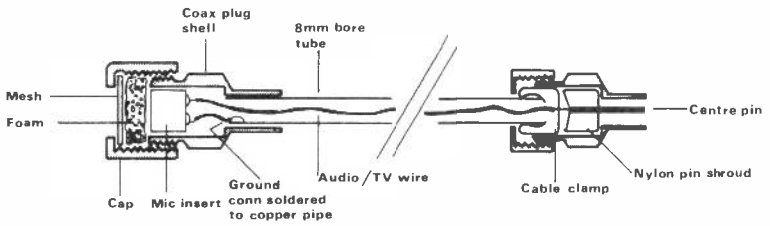
Start by setting VR2 to about 50 percent of its track and then speak at normal level about two inches away from the stem microphone. Adjust VR1 to the point just before noticeable distortion sets in. Then increase VR2 in the same way.

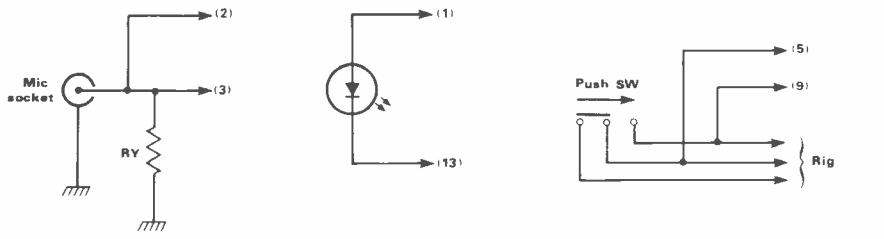
The system should now be optimised and capable of providing a fairly constant output when speaking between an inch or two feet away from the microphone, although obviously the 'presence' will alter depending on the distance.

Finally, check that external mics do not cause any distortion.

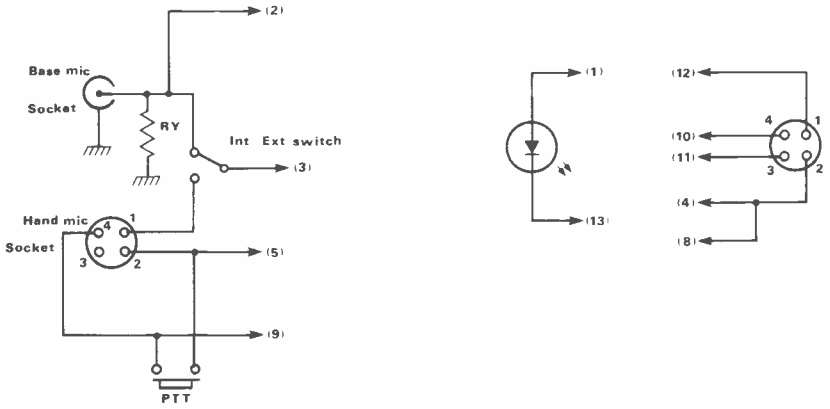
BASE MIC

Headshell construction





Alternative wiring details



PARTS LIST

Resistors

R1	680R	
R2	15K	
R3	10K	
R4	150K	
R5	150K	
R6	150K	
R7	15K	
R8	15K	
R9	R9 1M	
R10	220 R	½W
RX	120R without amp 52R with amp	½W
RY	4K7 or see text	
VR1	10K	
VR2	1K	
VR3	10K	

All resistors ¼W unless otherwise stated.

Capacitors

C1	0n1 F Ceramic plate
C2	2μ2F Eelctrolytic
C3	10nF Ceramic disc
C4	1μF Electrolytic
C5	10nF Ceramic disc
C6	10μF Electrolytic
C7	22μF Electrolytic
C8	4n7F Ceramic disc
C9	10nF Ceramic disc
C10	2μ2F Electrolytic
C11	10μF Electrolytic
C12	2μ2F Electrolytic
C13	50μ Electroytic
C14	0n1F Ceramic plate
C15	3n3F Ceramic disc
C16	100nF mini Ceramic disc
C17	2μ2F Electrolytic
C18	50μF/30V Electrolytic
C19	50μF Electrolytic

In addition, 10nF Disc Ceramic and 1nF Ceramic plate for de-coupling – see text. All electrolytics 16V unless otherwise stated

Semiconductors

IC1	KB4417 (Cirkit, formerly Ambit)
TR1	BC109
TR2	BC119
ZD1	9V1/400mW

Miscellaneous

Electret mic insert, 8mm bore copper tube, metal case, 2x TV coax plugs 1x TV coax socket (flush mount). Relay – KAM LING KUIT-A (Cirkit). Sockets, switches, etc.

The settings as such are something of a compromise as far as the stem mic is concerned.

Normally a base mic is used for local contact rather than serious DX work and as such heavy compression and clipping can sound a little tedious and harsh on the receiving end, particularly during long overs.

If the unit is to be used only as a base mic then it may be an idea to back-off VR1 and compensate by increasing VR2 accordingly. VR3 is set for a comfortable level in the headphones.

Set properly, the unit provides a clear well-rounded sound with the stem mic and a punchy audio that will cut through a lot of QRM on closer mics. Set badly it will distort horribly.

One word of caution concerns the distance between the operator and the stem mic.

Although the AGC will compensate for speech well over two feet away, the greater the distance the more the background noise will be amplified, as well as any resonance within the room; the result can be a rather dull, hollow sound mixed with the roar of passing traffic, screaming children, nagging XYLs etc.

Finally, we must point out that constructors must work out their connecting details from the information and examples given.

Under no circumstances can we enter into correspondence on how to wire the unit for any particular rig *(see diagrams above).*

Can I talk to you from the satellite, Bernie?

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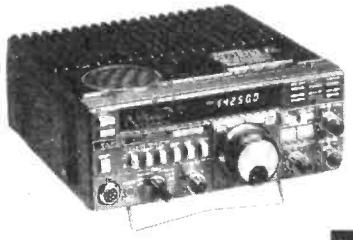

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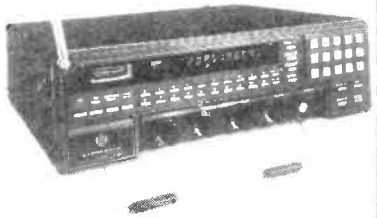

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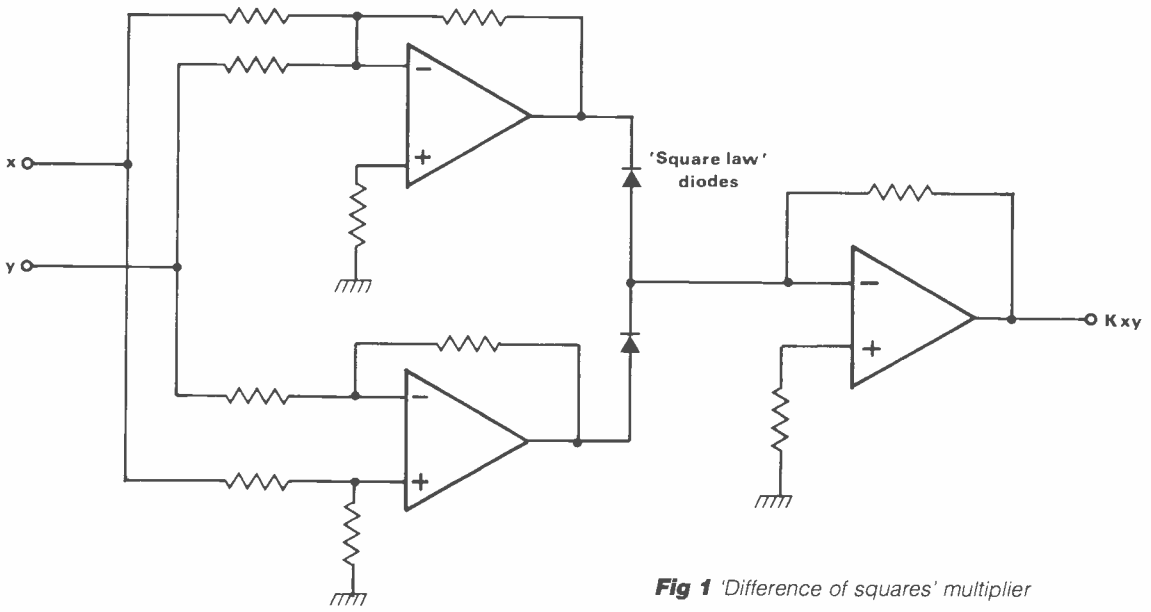


Fig 1 *'Difference of squares' multiplier*

The majority of computers nowadays are digital, and so there is not much call for analogue multipliers in computers as such.

However, there are many areas of signal processing where the analogue multiplier is an invaluable circuit element. Also, from a purely electronic point of view, the multiplier in its various forms is an interesting device – from the 'difference of squares' method (rarely employed now) right through to the 'transconductance' cell (much refined over the years).

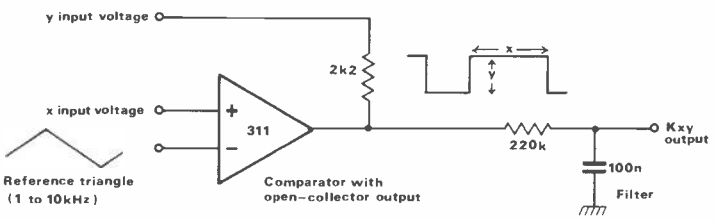


Fig 2 *'Pulse modulation' multiplier*

Origins

Starting with the fact that diodes follow a 'non-linear' law (as exploited in 'cat's whisker' AM detectors), an early technique of obtaining the desired product of x and y was to apply the signals x+y and x-y to 'squaring' diodes and then subtract the results, making use of the algebraic expression $(x+y)^2 - (x-y)^2 = 4xy$, as illustrated in *Figure 1.* Rather cumbersome, but it worked – and played a vital role in analogue computers twenty years ago.

A method offering better accuracy, though limited frequency response, is to control the mark-space ratio and amplitude of a rectangular waveform, and filter the result (see *Figure 2).* However, virtually all serious multiplier designs today stem from the 'transconductance' cell, or rather its 'linearised' form as originally devised by Gilbert[1] ,and outlined in *Figure 3.*

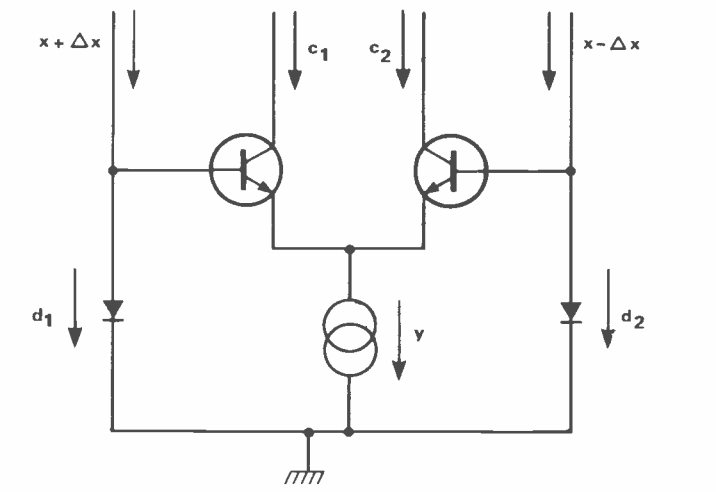


Fig 3 *Linearized variable transductance cell (two-quadrant)*

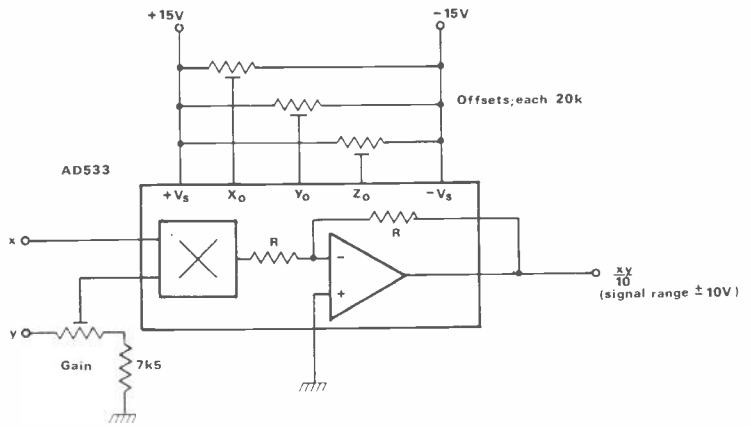


Fig 4 *Trimming multiplier for offsets and gain*

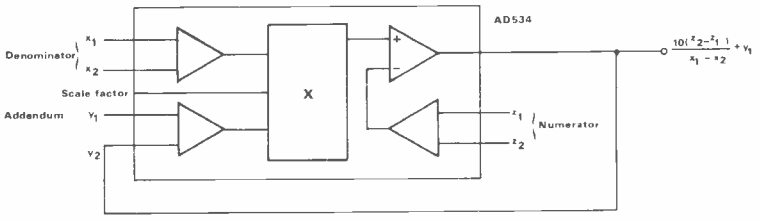


Fig 5 *Multiplier connected as a divider*

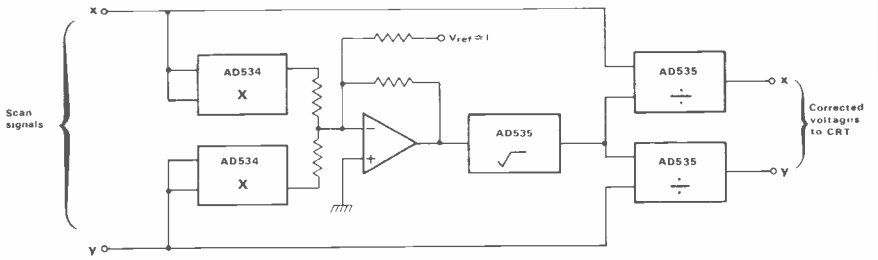


Fig 6 *Multiplier connected as RMS converter*

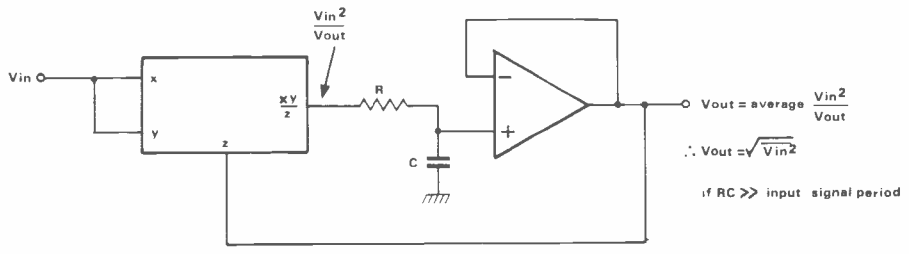


Fig 7 *'Pin-cushion' connection for CRT*

Practical multipliers

In fact, the 'Gilbert Multiplier' has passed into the language of electronics the same way as has the 'Schmitt trigger' and the 'Darlington transistor'.

It is generally known that the gain, g_m, of a transistor is proportional to its collector current, and this is exploited in the cell, where the 'tail' current of a pair of NPN transistors is made dependent on y. The extra diodes on the bases ensure that the x signal has a linear, rather than exponential, effect, and we can see already that the cell is basically a differential element, as is an op-amp. This is exploited in some circuit hook-ups, and in any case is important for trimming out various offsets.

For full four-quadrant operation, the multiplier cell is somewhat more complex: its operation is described in detail in the interesting book edited by Sheingold[2].

Although much ingenuity has gone into the design of these multipliers over the years, in precision applications it is necessary to trim out the so-called feed-through terms and adjust the scale factor, as shown in *Figure 4*.

An alternative is to use a premium grade of laser-trimmed multiplier, such as Analog Devices' AD534L. A rival range of devices is made by Burr-Brown.

Squares can obviously be obtained by connecting the x and y inputs together. Division is possible using a multiplier and an op-amp in an 'inverse' connection, as shown in *Figure 5*. The square root can be extracted by connecting x_1 to y_2 and including a series diode from the output. For accuracy and convenience, it is probably better to use a dedicated divider such as AD535.

Some examples of the use of a multiplier as a modulator, or as a demodulator, or as a frequency-doubler for sinewaves have been published by Renschler and Weiss[3], employing the Motorola MC1595. Similar circuits can be found in Exar application notes.

Other applications

A good way of computing the RMS value of a signal is to use the 'implicit' method shown in *Figure 6*, since this way the signal levels presented to the multiplier are kept within its working range; hence signals with higher crest factors can be handled. Remember that for a signal with a dynamic range of 10:1, its square has a dynamic range of 100:1.

A more recent alternative is to use a dedicated RMS to dc converter such as the AD536 or 636: these additionally give a 'dB' output, a most useful feature.

An interesting application of multipliers is in the correction of distortion in CRTs. For instance, with a flat-screened tube, the image on the face-plate would normally suffer from 'pin-cushion' distortion, but this can be corrected by dividing the scanning signals by vector sums, as illustrated in *Figure 7*.

Scanning yokes can introduce extra errors of their own, complicating things further. Various complete modules, giv-

ing raster and focus correction, are manufactured by Intech.

For those with an interest in video and TV, a relatively new addition to the multiplier stable is the AD539, which is a dual-channel device with at least 25MHz bandwidth, depending on the output op-amps. It can be used in many handy circuits, such as remote fading and automatic gain control[4].

Conclusion

It is enlightening to see just what can be done, and with a respectable degree of accuracy, using modern non-linear analogue techniques. Analogue designers do exist, despite the current fashion for an all-digital approach!

References

1 Gilbert, B : A precise four-quadrant multiplier with sub-nanosecond response, IEEE Journal of Solid-State Circuits, December 1968.

2 Sheingold, D H : Non-linear Circuits Handbook, published by Analog Devices, Norwood, Massachusetts 02062, USA, 1974.

3 Renschler, E and Weiss, D : The monolithic multiplier as a versatile ac design tool, Design Electronics, March 1971, 41-50.

4 Catto, C J D : Video AGC reacts at TV field rate, Electronic Engineering, February 1984, 32.

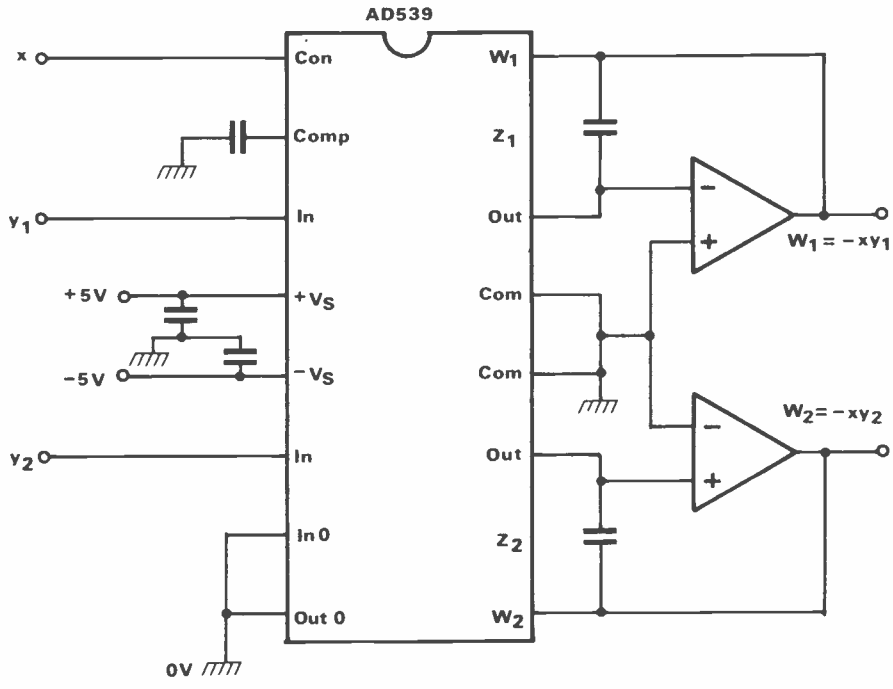


Fig 8 *Wideband dual-channel multiplier*

C. M. HOWES Communications

FUN TO BUILD KITS BY MAIL ORDER

Enjoy the satisfaction of building your own quality equipment with one of our kits. All kits come with a ready drilled and tinned PCB that has the component locations screen printed on it for easy assembly. All board mounted components, and a full, clear set of instructions are included.
Building is straightforward and fun, so choose a worthwhile project from our expanding range. How about the new frequency marker?

NEW!
XM1 mk2

We are pleased to announce the new mark 2 version of the popular XM1 Crystal Frequency Marker. The new XM1 retains all the facilities of the old model, but has an additional four marker frequencies. We now use a 10MHz quartyz crystal and an extra digital frequency divider. The on-board voltage regulator and the pulsed ident facility are retained. The XM1 can now produce a total of EIGHT marker frequencies, making this one of the most versatile and comprehensive pieces of frequency checking equipment available.

- ★ Marker outputs: 10,2.5 & 1 MHz, 250, 100, 25, 10 & 2.5 kHz. These are useable from LF up to UHF.
- ★ Semiconductors: A total of 8 integrated circuits (chips) are used.
- ★ Power required: Any voltage between 8 and 24 Volts DC @ approx 40mA.
- ★ Module size: 4.6 by 2.5 by 0.7 inches, 117 by 64 by 17 mm.

The XM1 mark 2 is available in kit form or as a ready built PCB module. It comes with a good clear set of instructions, detailed parts list and circuit diagram.
The XM1 is a very useful piece of test equipment to have in the "shack" – apart from simply helping you to meet amateur licence conditions! You will find the accurate, stable signals generated by the unit, which are available throughout the normally used part of the radio spectrum, most useful when building, checking or aligning your station equipment. A reliable signal source is a must for any shack.
The XM1 is a very simple kit to build, but if you suffer with poor eye-sight or simply lack of time, we have them available as ready assembled items too. All you need to do is install the module in a suitable case and connect up a few wires to whatever switches and sockets you choose to add. We like to design our equipment to be as versatile as possible so that you can construct a piece of equipment to suit your own taste. This is why we leave you to add your own case and external parts, so that you can add your own individual touch. It is nice to be able to show your friends something with your own "stamp" on it on the operating bench. If you find obtaining cases, switches etc. difficult, we can supply a suitable set of "Hardware" for the XM1, and for that matter most of our products, send an SAE for prices – you still have to drill your own holes though! We refuse to take *all* the challenge and fun out of home construction!
Prices XM1 mk2 kit: £16.80. Assembled PCB module: £21.30.

139 HIGHVIEW, VIGO, MEOPHAM KENT, DA13 0UT FAIRSEAT (0732) 823129

DcRx DIRECT CONVERSION COMMUNICATIONS RECEIVER
The DcRx is an easy to build communications receiver. It uses the direct conversion principal, which avoids the use of expensive IF filters, but still enables good performance to be achieved. You will be amazed how well a simple receiver can work. The DcRx may be small and simple, but it is capable of world wide reception. This kit was reviewed in the May issue of "Shortwave Magazine" by G3RJV. The article says a lot more than we can in this space. Suffice to say these are very popular with both beginners and experienced operators.

- ★ Single band versions for 3.5, 10 and 14MHz
- ★ 12 Volt operation
- ★ 1 Watt output into an 8 ohm 'speaker or 'phones.
- ★ Only one adjustment to make to align the module.
- ★ All coils ready wound for repeatable results.
- ★ Balanced FET mixer, stable FET VFO.

The unit only requires a couple of tuning capacitors by way of external components to function. We have suitable air-spaced devices of a little under 50pF at £1.50 each while stocks last. **DxRx Kit £14.80. Assembled PCB module (aligned) £19.90.** PLEASE STATE WHICH BAND YOU REQUIRE.

AP3 AUTOMATIC SPEECH PROCESSOR
Add more "punch" to your signal with this excellent processor. The AP3 really can make the difference between failing to get through and making the contact. If you every try your skill at "pile-ups" on the HF bands, you are really working with "one hand tied behind your back" if you do not have a good speech processor. The AP3 offers a good way of getting out better without the expense of a linear amplifier. The AP3 was described by getting out better without the expense of a linear amplifier. The AP3 was described by Dave, G4KQH in the September 1983 issue of "Ham Radio Today". Since then we have sold over 1000 units and they are in use all over the world. The AP3 could make the improvement you are looking for in your stations' signals.

- ★ Automatically adjusts to the level of your voice to give precise clipping levels.
- ★ Four selectable clip levels in approx. 6dB steps.
- ★ 9 to 14 Volt DC operation, onboard voltage regulator.
- ★ Suitable for low or high impedance mics (will even work with the ICOM rigs with the amplified microphone – if you carry out a simple change to the AP3, we can give you details)
- ★ Simple to build, with only one adjustment for output level to make.
- ★ Five pages of instructions, parts list, circuit diagram etc.

AP3 Kit £15.90. Assembled PCB module £21.40.

ST2 CW SIDE-TONE UNIT or PRACTICE OSCILLATOR
The ST2 produces a nice sounding sinewave note, either from your key, or from the output of your rig by RF sensing. This unit is audibly superior to the great majority of CW practice devices available on the market. The note from the ST2 sounds like a good signal received on a quality receiver. The unit will work with positive or negative keying, up to 15 volts, and by direct connection to the antenna feeder of an HF or 2M rig up to 25W. There is also provision for connection of a pick-up antenna for detection of your transmitted signal. With inline connection the unit will work with QRP rigs of as little as ½W output on the HF bands. **ST2 Kit £7.30. Assembled PCB module £10.80.**
PA2/15 10dB gain 15W 2M linear amplifier. **Kit: £18.90. Assembled £23.90.**
PA2/30 8dB gain 30W 2M linear amplifier **Kit: £22.90. Assembled £27.90.**
CO1 RF or PTT operated switching unit for the above. **Kit: £9.80. Built £13.80.**
If you would like further information on any product, simply drop us a line, enclosing an SAE, we have an information sheet on each item. We aim to keep everything in stock and delivery within 7 days. **Please add 60p P&P to your total order value.**
73, Dave, G4KQH Technical Manager

Ken Williams asks: Do you really use your micro?

And describes the development of a simple program

Some time ago, a friend presented me with a box containing upwards of a couple of dozen crystals, some of which he believed were suitable for two metres.

I thanked him and later that evening, as the sexploits in 'Dallas' were reaching new depths of inanity, I reached for the box and my pocket calculator to check out the possibilities of the contents.

I switched on the calculator. The display glowed dimly for a few seconds and faded. After a moments reflection, it occured to me that it was about time my expensive number-cruncher, the microcomputer, started earning its keep. I dusted it off, brushing aside games cassettes, and keyed in:

```
10 REM – CRYSTAL FREQUENCY CHECK PROGRAM
```

That's a start! Now for the calculation. First input the crystal frequency, so:

```
20 PRINT 'INPUT CRYSTAL FREQUENCY'
30 INPUT F
```

Now for two metres you can use X3, X8, X9, X12, X18 or X24, so the next few lines must read:

```
40 PRINT '3F= ',3*F
50 PRINT '8F= ',9*F
60 PRINT '9F= ',9*F
70 PRINT '12F= ',12*F
80 PRINT '18F= ',18*F
90 PRINT '24F= ',24*F
```

These lines take care of the transmitter frequencies; however, suppose the crystal is for a receiver? Luckily, all my equipment uses a 10.7MHz IF, so the next part of the program must read:

```
100 PRINT '3F+10.7= ',(3*F)+10.7
                etc.
```

Having taken care of the mathematics, it now only remained to make the computer set itself up to calculate the possibilities of the next crystal. This required:

```
160 PRINT 'INPUT NEXT CRYSTAL FREQUENCY'
170 GOTO 30
```

and we are back to the beginning of the program again.

I took a deep breath and typed 'RUN'. To my surprise, on the screen appeared the words:

INPUT CRYSTAL FREQUENCY

'Better make it a simple one to start with', I thought.

I pressed the '8' key.

On the screen appeared:

```
3F=          24
8F=          64
9F=          72
12F=         96
18F=        144
24F=        192
3F+10.7=   34.7
8F+10.7=   74.7
9F+10.7=   82.7
12F+10.7= 106.7
18F+10.7= 154.7
24F+10.7= 202.7
```

INPUT NEXT CRYSTAL FREQUENCY

Success!! I grabbed my box of crystals, enabled the printer, and fed in the first crystal frequency.

Inside five minutes I had a printout of every possibility for each crystal. Even allowing for the time spent writing the program, the task had still taken less time than if I had used the calculator.

Later I realised that, with a few additions, this could become a very useful little program. The first point was that not all receivers use a 10.7MHz IF. To allow for this we need a line:

```
PRINT 'WHAT IS THE INTERMEDIATE FREQUENCY OF YOUR RECEIVER?'
```

followed by:

```
INPUT I
```

The later lines must then be modified to:

```
PRINT '3F+IF= ',(3*F)+I
    etc.
```

Flushed with success, it then occurred to me that another program working in the opposite direction would also be useful.

I saved the previous program on tape and started from scratch:

```
PRINT 'WHAT IS THE INTERMEDIATE FREQUENCY OF YOUR RECEIVER?'
INPUT A
PRINT 'WHAT IS THE REQUIRED FREQUENCY?'
INPUT F
PRINT 'TRANSMIT CRYSTAL'
PRINT 'X3= ',F/3
    etc.
PRINT 'RECEIVER CRYSTAL'
PRINT 'X3= ',(F-A)/3
    etc.
```

This program proved just as successful as the first, and I realised that if the two could be combined it could prove to be a very useful piece of software. However, I will not describe the combining of the programs as the method varies from computer to computer, and consequently it will be necessary to look up 'merging programs' in your instruction book.

Having completed the merging, you will be left with a program in which only the first half will run, for having completed the first calculation, the program returns to the beginning! It is therefore necessary to commence with a 'menu' in order to allow the appropriate section of the program to be selected.

As anything inserted at the beginning of the program will overwrite that already written, the lines of the existing program must be renumbered, say from 500 upwards, to leave some working space.

We can then write the menu:

```
PRINT 'THIS PROGRAM CALCULATES'
PRINT '1. FREQUENCIES AVAILABLE FROM GIVEN CRYSTALS'
PRINT '2. CRYSTALS REQUIRED FOR GIVEN FREQUENCIES'
PRINT '   INPUT 1 OR 2'
```

This must be followed by an instruction to the computer to accept a 1 or a 2 but reject any other number, thus:

```
INPUT N
IF N=1 GOTO (start of the first section)
IF N=2 GOTO (start of second section)
       GOTO (back to the beginning)
```

Finally, we must provide a means by which it is possible to return to the menu after each calculation if we so wish. For this it is only necessary to put five lines at the end of each section:

```
PRINT 'PRESS 0 FOR MENU OR 1 TO CONTINUE '
INPUT M
IF M=0 GOTO (beginning of menu)
IF M=1 GOTO ('INPUT NEXT CRYSTAL FREQUENCY')
       GOTO ('PRESS 0 FOR MENU
etc.)
```

'Cleaning up' the program

Although this program will run perfectly well, when presented on the screen or printer it will look rather messy. For example, when the menu is

```
 10 PRINT
 20 PRINT
 30 CLS
 40 PRINT
 50 PRINT"THIS PROGRAM CALCULATES:"
 60 PRINT
 70 PRINT
 80 PRINT"1.  FREQUENCIES AVAILABLE FROM GIVEN CRYSTALS"
 90 PRINT
100 PRINT"2.  CRYSTALS REQUIRED FOR GIVEN FREQUENCIES"
110 PRINT
120 PRINT"     INPUT 1 OR 2"
130 INPUT N
140 IF N=1 GOTO180
150 IF N=2 GOTO 500
160        GOTO 10
170 REM CRYSTAL FREQUENCY CHECK PROGRAM
180 PRINT"WHAT IS THE INTERMEDIATE FREQUENCY OF YOUR RECEIVER?"
190 INPUTI
200 CLS
210 PRINT''
220 PRINT"INPUT CRYSTAL FREQUENCY"
230 INPUT F
240 PRINT " "
250 PRINT"3F=",3*F
260 PRINT"8F=",8*F
270 PRINT"9F=",9*F
280 PRINT"12F=",12*F
290 PRINT"18F=",18*F
300 PRINT"24F=",24*F
310 PRINT"36F=",36*F
320 PRINT"3F+IF=",(3*F)+I
330 PRINT"8F+IF=",(8*F)+I
340 PRINT"9F+IF=",(9*F)+I
350 PRINT"12F+IF=",(12*F)+I
360 PRINT"18F+IF=",(18*F)+I
370 PRINT"24F+IF=",(24*F)+I
380 PRINT"36F+IF=",(36*F)+I
390 PRINT '
400 PRINT"PRESS 0 TO RETURN TO MENU OR 1 TO        CONTINUE"
410 INPUT M
420 IF M=0 GOTO 20
430 IF M=1 GOTO 450
440        GOTO400
450 CLS
460 PRINT '
470 PRINT"INPUT NEXT CRYSTAL FREQUENCY"
480 GOTO 230
490 REM CRYSTAL REQUIREMENT CHECK PROGRAM
500 PRINT"WHAT IS THE INTERMEDIATE FREQUENCY OF YOUR RECEIVER?"
510 INPUT A
520 CLS
530 PRINT ''
540 INPUT "WHAT IS THE REQUIRED FREQUENCY " F
550 PRINT
560 PRINT"TRANSMIT CRYSTAL"
570 PRINT"X3=",F/3
580 PRINT"X6=",F/6
590 PRINT"X8=",F/8
600 PRINT"X9=",F/9
610 PRINT"X12=",F/12
620 PRINT"X18=",F/18
630 PRINT"X24=",F/24
640 PRINT"X36=",F/36
650 PRINT ' "RECEIVER CRYSTAL"
660 PRINT"X3=",(F-A)/3
670 PRINT"X6=",(F-A)/6
680 PRINT"X8=",(F-A)/8
690 PRINT"X9=",(F-A)/9
700 PRINT"X12=",(F-A)/12
710 PRINT"X18=",(F-A)/18
720 PRINT"X24=",(F-A)/24
730 PRINT"X36=",(F-A)/36
740 PRINT
750 INPUT"PRESS 0 FOR MENU OR 1 TO CONTINUE " M
760 IF M=0 GOTO20
770 IF M=1 GOTO790
780        GOTO750
790 CLS
800 PRINT ''
810 INPUT "WHAT FREQUENCY IS REQUIRED NEXT " F
820 GOTO 550
```

displayed it will appear on consecutive lines in the upper part of the screen and, furthermore, some of the words may appear with part on one line and the remainder on the next.

'Opening up' the statements is quite simple; merely by inserting an extra line saying PRINT without giving any statement to print will cause the computer to leave a blank line. Thus, if two PRINT statements are made before the first line and then two more between each of the next two lines, the printing will be spaced neatly down the screen. This can be repeated throughout the program wherever the printing needs spacing out or bringing to a convenient place on the screen.

The method of dealing with split words is equally simple. Count the number of letters of the divided word remaining on the top line and then rewrite the line with that many spaces after the previous word.

The display of each calculation takes most of the available screen space, so if anything from the previous calculation remains it will look untidy. To remove this residue from the screen only requires a CLS (clear screen) command at suitable points in the program, the most convenient being after selecting whether to return to the menu or continue.

Finally, on some computers the statement:

INPUT 'INPUT 1 OR 2'A

means exactly the same as:

PRINT 'INPUT 1 OR 2'
INPUT A

If this is available on your computer, the number of lines on the program can be reduced. In my final listing both methods have been used. Should you have any difficulties with this statement, change it to the alternative version.

If you wish to add this program to your library, there is no need to go through the process which I have described, just key in the final listing.

I do not claim that the program which I have described is difficult or in any way special.

However, the fact remains that a recent survey showed that over 80% of microcomputer owners never write programs, relying instead on purchased cassettes, discs and program listings published in the amateur radio and computer press. Yet, as I have shown, the writing of simple programs is not difficult, is frequently enjoyable and can often save hours of subsequent work.

So the next time you need to do a long or repetitive calculation, don't reach for a calculator or a piece of paper, sit at the keyboard and 'let the micro take the aggro'. After all, that is what it was designed for!

Note: The computer used in the development of this program was a BBC B which uses Microsoft BASIC. Consequently the program should run on almost all home computers, except possibly the Sinclair ZX81 or Spectrum for which minor alterations may be necessary.

AMATEUR RADIO WORLD

Compiled by Arthur C Gee G2UK

Talking books: can you help?

Radio amateurs, by and large, are reasonably responsible members of society, and as such are often to be found engaging in activities of value to the community. Of such activities, providing hospital audio broadcast services and help for the blind through the Talking Book Service are popular with them.

The Talking Book Service has recently appealed to radio amateurs and others with electronic exerience for help in servicing and installing their equipment. There are now over three thousand technical helpers looking after 'Talking Books' throughout Britain, but there are over fifty thousand blind 'readers' needing help – 4,300 of them are over ninety years of age and there are as many as 150 who are over 100 years old!

The technical helpers come from a wide range of electrical or electronic engineers and each one looks after up to ten or so blind people, visiting them when required and assisting in repairing minor defects to their equipment, installing equipment and so on.

In a letter to your scribe, the Hon Organiser of this service, which is run by the Royal Institute for the Blind, Dr Finlay-Maxwell, says: 'Incidentally, the whole movement originally started from a note I read in the RSGB Bulletin over thirty years ago when I was resident in Scotland, and originally my area included Glasgow, Dundee, Edinburgh and the Borders! The situation was so desperate that we set up a base at our company HQ in Galashiels and this was the first organisation for recruiting and looking after helpers – following on this some 3,200 have joined, but there are still a fair number of areas where we are desperately short'.

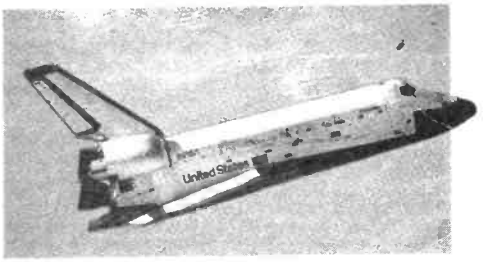
Those readers who might like to help in this service should write to Dr Finlay-Maxwell, PhD, FTI, Hon Organiser Voluntary Helpers, c/o John Gladstone & Co Ltd, Wellington Mills, Huddersfield HD3 3HJ.

Future amateur radio astronauts

It looks as though there will be no shortage of radio amateur applicants for future Shuttle flights. Huber Occolls from the Netherlands may become the first European radio amateur to fly in space.

He is a European Space Agency astronaut, and whilst he does not yet have his radio amateur's licence he intends getting it before his flight, which is scheduled for a Shuttle mission in 1985. The Dutch National Society, VERON, is to make an official request to NASA for him to use equipment similar to that used by Dr Owen Garrett, W5LFL.

The next radio amateur in space, due to



fly in March 1985 on the 51F Shuttle mission, will be Tony England, W0ORE, a NASA astronaut. At the moment it is suggested he may use both 144MHz and 28MHz during his flight.

He may well visit England in the near future and it is hoped he may attend the Welsh Amateur Radio Convention in September. Astronaut Owen Garrett is due to fly again in November 1985 on the 51H mission.

FAST

The professional producers of microcomputer software reckon they are losing millions of pounds from the copying of programs by the non-professionals. In the USA, the copyright laws have been amended to cover software, but so far no such action has been taken in European countries.

Some concern has recently been

shown by one commercial company over the transmission over the air by radio amateurs of their software programs, and they threatened to take legal action against those concerned.

A new organisation, FAST – 'Federation Against Software Theft' – has recently been formed to try and get protection against this copying of professionally produced software. There is, of course, no illegality in the transmission over the air of programs written by individuals for their own use.

Further news

The British Amateur Radio Teleprinter Group reports a dramatic increase in membership recently. They have had a 54% increase in the last five months.

This is thought to be due to the widening of their interests to cover computer originated RTTY, AMTOR and Packet Radio. Readers interested in joining BARTG should contact John Beedie, G6MOK, 161 Tudor Rd, Hayes, Middlesex UB3 2QG.

Italy has now joined those countries permitting use of the 'new frequencies'. The assignments are as follows:

The band 18068 to 18168KHz on a secondary basis, until reallocation of the present services occupying the band, when it will become a primary amateur radio allocation. 24890 to 24990KHz also on the same terms.

Allocation of the 10MHz band is still under consideration.

It is likely that only 10KHz will be allocated in the 10100 to 10150KHz band, and the Italian Radio Society is to investigate which 10KHz would be best, bearing in mind the likely continuance of powerful SW broadcasting stations in this band.

The frequency band 1830 to 1850KHz has been allocated with a maximum output power of one hundred watts. On 433.5 to 433.6MHz they can use 300 watts PEP, all modes.

1267 to 1270MHz is reserved for the Amateur Satellite Service and will be assigned on a personal basis only on request. 1296 to 1298MHz can be used on all modes with 50 watts PEP.

If one's experiences of the amount of activity generated by Italian stations on other modes on the air – RTTY for instance – is anything to go by, the authorisation of the Italians to use the new frequency bands should produce a welcome increase in activity on these bands.

Raynet operating changes

The Secretary of State for Trade and Industry made changes to the terms of the Amateur Radio Licence in June last, which enabled Raynet to extend its activities in a very satisfactory manner.

These changes enabled any Raynet exercises relating to 'disaster relief operations' conducted by one of the 'user services', viz, the British Red Cross, the St John Ambulance Brigade, the County Emergency Planning Officer or any Police Force in the United Kingdom, to be conducted 'without limit' – as they put it.

Other operations conducted by a 'User Service', were, however, restricted to a maximum of four exercises in any one calendar month, with an overriding limit of twelve in any calendar year. Furthermore, changes were made so that the amateur radio station can now be directly operated, in such circumstances as outlined above, by a representative of the 'user service', provided that the station is under the supervision of the station licensee.

What all this means is that Raynet can exercise disaster relief procedures as often as they like, but other types of activity such as participating in marathons, charity walks, county shows and so on, are restricted to the number of occasions indicated.

The permission for non-licenced persons to operate the station will enable such persons as doctors, first aid workers, police, etc, to use the equipment directly, not through the intermediary of the station licensee. This should help considerably in ensuring the correct transmission of messages.

TRANSISTORS

BC107/8/9	– 12p	BC184L	– 10p	BFY50,51,52	– 20p
BC147/8/9	– 10p	BC212,212L	– 10p	BFX88	– 15p
BC157/8/9	– 10p	BC327,337,337L	– 12p	BSX19	– 12p
BC547/8/9	– 8p	BD135,136	– 25p	BSX20	– 15p
BC557/8/9	– 8p	BD137,138,139	– 25p	2N2926	– 7p
BC182L	– 10p	BF195,7	– 12p	2N3055	– 50p
BC183	– 10p	BCY70	– 15p	TIP31A,32A	– 25p

SUBMINIATURE TANTALUM ELECTROLYTICS. (MFDS/VOLTS)
0.1/35,0.22/35,0.47/35,1.0/35,3.3/16,4.7/16 ..... 14p
2.2/35,4.7/25,10/6 – 15P.4.7/35,6.8/16 ..... 16p
10/16,10/25,22/6 – 20P,15/25,22/16,33/10 ..... 30p

ELECTROLYTIC CAPACITORS. (Mfds/Volts)
1/25, 1/50, 2.2/25, 2.2/50, 4.7/25, 4.7/50, 10/16, 10/25, 10/50 ..... 5p
22/16, 22/25, 22/50, 47/16, 47/25, 47/50, 33/10 — 6p. 100/16, 100/25 ..... 7p
100/50 — 12p. 100/100 — 14p. 220/16 — 8p. 220/25, 220/50 ..... 10p
470/16, 470/25 — 11p. 470/35 — 12p. 470/40 — 15p. 1000/16 ..... 15p
1000/35 — 22p. 1000/40 — 35p. 2200/10 — 8p. 2200/25 ..... 35p
Carbon Film resistors ¼W 5% E24 series 0.51R to 10MO 1p
100 off per value — 75p, even hundreds per value totalling 1000 ..... £7.00
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Mixed metal/carbon film resistors ½W E12 series 1RO to 10MO 1½p

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2% 1.8 pf to 47 pf — 3p. 2% 56 pf to 330 pf — 4p. 10% 390p — 4700p 4p

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10 pf to 820 pf — 3p. 1000 pf to 10,000 pf — 4p. 12,000 pf 5p

DIODES (p.i.v./amps)
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100/1A 1N4002 4p. 1000/1A 1N4007 7p. 60/1.5A S1M1 5p. 100/1A bridge 25p
400/1A 1N4004 5p. 1250/1A BY127 10p. 30/45mA OA90 6p. 30/15A OA47 ..... 8p
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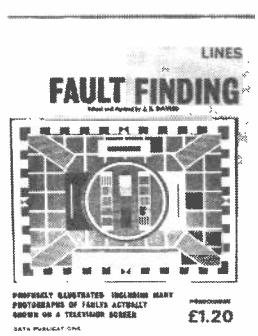

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AC128	0.30	A B or C	0.12	BC303	0.32	BD375	0.32	BF259	0.32	BT101/500	1.25	BYX36/600	0.28	TIP32C	0.60
AC128K	0.34	BC113	0.14	BC307	0.10	BD410	0.78	BF262	0.30	BT102/300	1.35	BYX48/300	0.72	TIP33A	0.63
AC132	0.55	BC114	0.12	BC308A	0.10	BD434	0.68	BF263	0.30	BT102/500	1.65	BYX49/300	0.47	TIP34A	0.72
AC141	0.26	BC115	0.12	BC323	0.99	BD436	0.68	BF270	0.30	BT106	1.50	BYX55/350	0.29	TIP41C	0.46
AC141K	0.40	BC116	0.15	BC327	0.14	BD437	0.76	BF271	0.26	BT108	1.30	BYX55/600	0.33	TIP42A	0.52
AC142	0.26	BC117	0.22	BC328	0.14	BD438	0.75	BF273	0.18	BT109	1.18	BYX71/600	1.18	TIP47	0.60
AC142K	0.48	BC118	0.17	BC337	0.12	BD439	0.68	BF274	0.32	BT116	1.25	BYZ12	0.43	TIP110	0.88
AC151	0.45	BC119	0.30	BC338	0.12	BD507	0.48	BF323	0.92	BT119	3.62	C106D	0.80	TIP2955	0.60
AC152	0.45	BC125	0.12	BC350	0.14	BD508	0.53	BF336	0.26	BT120	3.60	E1222	0.40	TIP3055	0.60
AC176	0.28	BC140	0.28	BC440	0.30	BD509	0.54	BF337	0.26	BT121	3.02	E5024	0.30	TIS43	0.32
AC176K	0.48	BC141	0.42	BC441	0.32	BD510	0.48	BF338	0.26	BT138/600	1.30	GET872	0.48	TIS88	0.40
AC187	0.28	BC142	0.30	BC461	0.32	BD517	0.56	BF355	0.42	BT151/560R	0.90	ICT44	0.04	TIS90	0.25
AC187K	0.40	BC143	0.30	BC547	0.12	BD520	0.66	BF363	0.82	BT151/300R	1.15	ITT2002	0.11	TIS91	0.28
AC188	0.28	BC147	0.08	BC548	0.12	BD699	1.25	BF367	0.24	BTY79/400R	2.80	ME0402	0.20	ZTX108	0.12
AC188K	0.40	A or B	0.10	BC549	0.12	BD707	0.68	BF371	0.27	BU100A	2.30	ME0404/2	0.24	ZTX109	0.12
ACY40	0.88	BC148	0.08	BC550	0.18	BDX18	2.35	BF422	0.38	BU104	2.00	MEU21	0.60	ZTX212	0.28
AD142	1.10	A or B	0.10	BC550C	0.18	BDX32	2.10	BF450	0.38	BU105	1.20	MJ400	1.25	IN4001	0.05
AD143	1.10	BC149	0.09	BC557	0.12	BF115	0.32	BF457	0.33	BU105/02	1.56	MJ2955	0.90	IN4003	0.05
AD140	0.90	BC157	0.10	BC558	0.12	BF117	0.54	BF458	0.36	BU108	1.50	MJ3000	1.98	IN4004	0.06
AD161	0.42	BC158	0.10	BCX34	0.27	BF119	0.82	BF459	0.44	BU124	1.75	MJE240	0.60	IN4006	0.07
AD162	0.42	BC159	0.10	BCY70	0.15	BF120	0.38	BFR39	0.22	BU126	1.25	MJE340	0.54	IN4007	0.07
AD161/162	0.98	BC160	0.30	BCY71	0.17	BF123	0.40	BFR40	0.22	BU133	1.80	MJE370	0.88	IN4148	0.05
AF106	0.48	BC161	0.30	BCY72	0.18	BF125	0.42	BFR41	0.22	BU204	1.35	MJE520	0.48	IN5400	0.12
AF114	2.10	BC168B	0.12	BCZ10	1.68	BF127	0.38	BFR51	0.30	BU205	1.30	MJE2955	0.99	IN5402	0.15
AF115	2.10	BC169C	0.10	BCZ11	1.45	BF152	0.16	BFR61	0.32	BU206	1.70	MJE3055	0.70	IN5405	0.16
AF116	2.10	BC170	0.14	BD124P	0.80	BF154	0.23	BFR62	0.28	BU208	1.55	MPSLO1	0.28	IN5406	0.18
AF117	2.10	BC170B	0.12	BC130Y	0.68	BF157	0.40	BFR88	0.34	BU208A	1.63	OA47	0.10	IN5408	0.20
AF118	0.85	BC171	0.10	BD131	0.34	BF158	0.22	BFR90	1.72	BU208/02	2.05	OA90	0.08	IS920	0.08
AF121	0.62	BC171	0.10	BD132	0.34	BF159	0.24	BFT41	0.38	BU326S	1.75	OA91	0.09	2N697	0.55
AF124	0.48	A or B	0.08	BD131/132	0.95	BF160	0.23	BFT43	0.38	BU407	1.65	OA95	0.18	2N706A	0.33
AF125	0.48	BC172	0.08	BD135	0.32	BF167	0.30	BFW10	0.79	BU407D	1.80	OA200	0.06	2N2904	0.28
AF126	0.48	A or B	0.12	BD136	0.36	BF173	0.25	BFW44	0.76	BUX80	3.70	OA202	0.15	2N2906	0.24
AF127	0.48	BC177	0.20	BD137	0.38	BF177	0.42	BFX29	0.28	BUY20	1.75	OC25	2.10	2N2926G	0.10
AF139	0.68	BC178A	0.22	BD138	0.38	BF178	0.30	BFX30	0.30	BUY69A	2.60	OC26	1.70	2N3053	0.22
AF178	0.68	BC182	0.09	BD139	0.38	BF179	0.32	BFX80	3.56	BUY69B	1.98	OC28	1.50	2N3054	0.56
AF239	0.68	A B or C	0.09	BD140	0.38	BF180	0.35	BFX84	0.24	BUY101	0.48	OC29	2.47	2N3055	0.45
AF279S	0.75	BC182L	0.09	BD144	1.60	BF181	0.35	BFX85	0.26	BY118	1.10	OC35	1.75	2N3702	0.10
AL100	2.50	A B or C	0.09	BD145	1.82	BF182	0.32	BFX86	0.26	BY122	0.68	OC36	1.75	2N3704	0.10
AL102	1.88	BC183	0.09	BD150A	0.51	BF183	0.32	BFX87	0.26	BY126	0.12	OC42	0.72	2N3708	0.10
AL113	2.20	A B or C	0.10	BD159	0.65	BF184	0.32	BFX89	0.65	BY127	0.10	OC42K	1.40	2N3772	1.90
ASY80	1.75	BC183L	0.08	BD160	1.65	BF185	0.32	BFY50	0.21	BY133	0.16	OC44	0.72	2N3773	2.70
AU110	1.40	A B or C	0.12	BD165	0.45	BF194	0.08	BFY51	0.21	BY135	0.25	OC45	0.58	2N3904	0.16
AY102	4.32	BC184L	0.10	BD175	0.60	BF195	0.10	BFY52	0.21	BY164	0.44	OC71	0.50	2N3906	0.16
BA102	0.34	A B or C	0.10	BD182	1.00	BF196	0.10	BFY57	0.40	BY179	0.66	OC72	0.52	2N5294	0.48
BA110	0.67	BC207	0.15	BD183	1.10	BF197	0.10	BFY90	0.90	BY182	0.87	OC81	0.68	2N6107	0.71
BA121	0.40	BC208	0.16	BD184	1.20	BF198	0.14	BFY90S	1.34	BY184	0.40	OC200	2.46	2N6126	0.68
BA129	0.38	BC212	0.09	BD201	0.72	BF199	0.16	BR100	0.20	BY187	0.72	OC202	2.20	2SB337	1.60
BA148	0.16	A B or C	0.10	BD202	0.87	BF200	0.26	BR101	0.44	BY189	4.75	ORP12	0.85	2SC1172Y	2.90
BA154	0.08	BC212L	0.08	BD204	0.80	BF222	0.48	BR103	0.58	BY198	0.44	R2008B	1.50	2SC1173Y	0.82
BA155	0.10	A B or C	0.10	BD222	0.80	BF224	0.20	BRC4443	1.76	BY199	0.47	R2010B	1.52	2SC1302	1.40
BA156	0.08	BC213	0.09	BD225	0.86	BF224J	0.16	BRY39	0.38	BY206	0.24	SHG1.5	0.40	2SC1226	0.84
BA157	0.28	A or B	0.10	BD232	0.45	BF240	0.20	BRY56	0.42	BY207	0.24	TAG1/100	1.40	2SC1279	0.50
BA184	0.14	BC213L	0.10	BD233	0.60	BF241	0.20	BRY61	0.86	BY210/400	0.25	TAG3/400	1.78	2SC1306	0.92
BB104B	0.52	A or B	0.10	BD234	0.62	BF244	0.26	BSS17	0.58	BY210/600	0.26	TIC44	0.40	2SC1307	1.40
BB105B	0.30	BC237	0.11	BD235	0.63	BF244A	0.28	BSS27	0.92	BY212/800	0.30	TIC45	0.45	2SC1413A	2.70
BB105G	0.48	BC238	0.12	BD236	0.63	BF244C	0.24	BSX19	0.34	BY233	1.20	TIC46	0.48	2SC1444	1.45
BB110B	0.42	BC239C	0.14	BD237	0.65	BF245A	0.28	BSX20	0.34	BY227	0.26	TIC47	0.70	2AC1449	0.63
BC107	0.10	BC251	0.12	BD238	0.56	BF254	0.15	BSX59	0.82	BY229	0.30	TIC106A	0.70	2SC1507	0.63
A or B	0.12	A B or C	0.14	BD241	0.60	BF256	0.40	BSX76	0.29	BY238	0.68	TIP30A	0.46	2SC1678	1.06
		BC301	0.30	BD243A	0.80	BF257	0.32	BT100A/02	0.94	BYX10	0.24	TIP31C	0.54	2SC1758	0.68

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2SC1953	0.74	ECC82	0.65	PCL86,	0.98
2SC1957	0.76	ECC83	0.75	PCL805/85	1.35
2SC1969	2.88	ECC84	0.65	PD500	3.75
2SC2028	0.73	ECC85	0.90	PFL200	1.35
2SC2029	1.00	ECC88	0.95	PL33	1.50
2SC2078	1.05	ECF80	0.95	PL36	1.45
2SC2091	0.73	ECH81	0.75	PL81	0.85
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2SC2122A	3.20	ECL82	0.75	PL83	0.65
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2SC2335	1.50	EF86	1.60	PL504	1.20
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2SC2752	0.30	EF184	0.75	PL509/519	5.95
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2SK135	1.90	EM87	2.55	UCL82	1.70
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3N211	2.52	EY500A	1.65	GSJ7	2.20
3SK45	0.76	PCC84	0.50	30FL12	1.60
		PCC85	0.65		
		PCC89	0.74		
		PCC189	0.85		
		PCF80	0.75		
		PCF86	1.25		
		PCF200	1.95		
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DATA FILE . . .

Ray Marston continues his survey of home-security system principles and practice by looking at alarm-call generator circuits, and at various types of 'fault-indicator' alarm system.

In last month's edition of Data File we looked at the basic operating theory and installation principles of modern home-security systems, and showed a number of practical security-alarm circuits that can be used to give a high degree of protection against fire, thuggery, and burglary in the home. All of these circuits are provided with a relay output which can activate an external 'alarm-call generator' via one pair of relay contacts.

In practice, the above 'alarm-call generator' can take the form of either an electro-mechanical bell or siren, or it can take the form of an electronic siren or sound-generator.

In the first half of the present edition of the file we describe ways of interconnecting alarms and alarm-call generators, and go on to describe some practical 'electronic siren' circuits.

In the second half of the article we describe various types of 'fault-indicator' home-security alarm system.

Alarm-generator connections

An alarm-call generator may use the same battery supply as the actual burglar alarm with which it is used, or it may have to be separately powered from its own supply battery, depending on the specific details of the individual alarm system and alarm-call generator.

If the burglar alarm and the alarm-call generator operate from similar supply voltages, and the burglar alarm is of the type that self-latches via a set of relay contacts, the two units can safely be powered from the same supply battery as shown in *Figure 1*.

If on the other hand, the burglar alarm and the alarm-call generator operate from different supply voltages, or if the burglar alarm is *not* self-latching via a pair of relay contacts, it is vital to use separate supplies for the two units, as shown in *Figure 2;* an operating alarm-call generator impresses a great deal of 'noise' on its battery supply, and this noise may cause malfunctioning of a non relay-latching burglar alarm if the two units are powered from the same supply.

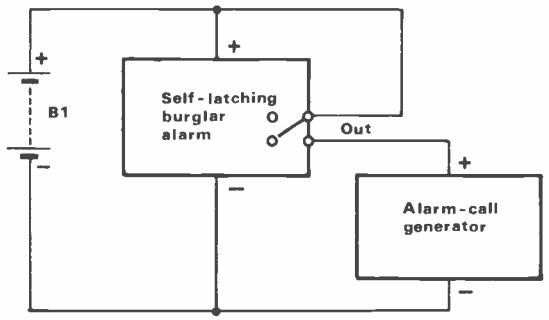

Fig 1 *Method of connecting an alarm-call generator to a relay-output burglar alarm, using a single supply battery*

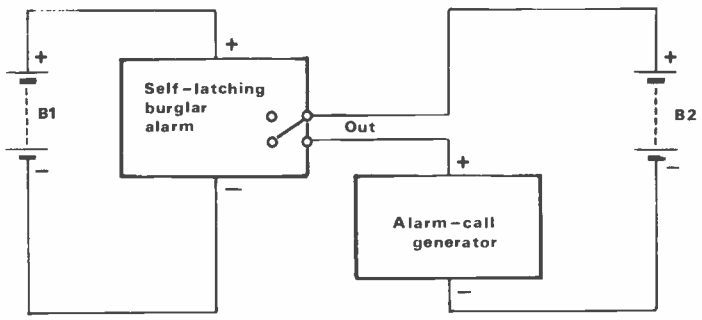

Fig 2 *Method of connecting an alarm-call generator to a burglar alarm, using individual supply batteries*

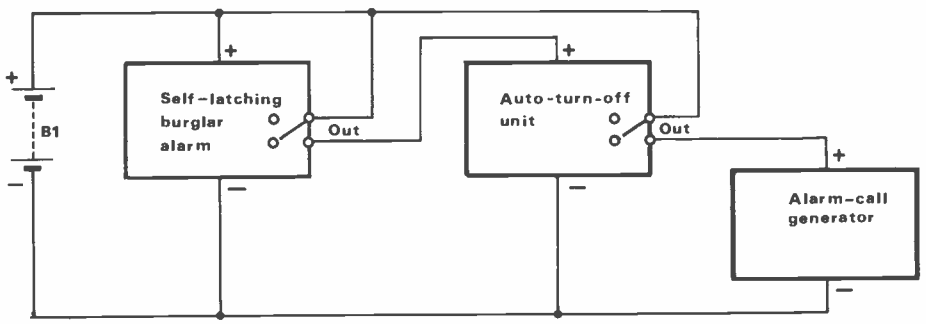

Fig 3 *Method of connecting an alarm-call generator to a burglar alarm via an auto turn off unit, using a single supply battery*

Auto-turn-off alarm action

Once a self-latching alarm has been activated, it automatically sounds the alarm-call generator until the system is either reset manually, or until the generator's supply battery runs flat.

The main purpose of a burglar alarm sound generator is that of scaring off the intruder (attracting the attention of the owner and/or neighbours is merely a secondary function), and if this result has not been achieved within a few minutes of generator activation, there is clearly no value in allowing the alarm generator to continue to sound. Thus, the above-described simple self-latching type of alarm action is rather inefficient.

A far more efficient type of alarm-generator action can be obtained by interposing an automatic-turn-off 'timer' circuit between the burglar alarm and the alarm-call generator, as shown in *Figures 3* and *4*.

This unit incorporates a relay that closes and completes the generator circuit as soon as the burglar alarm activates, but then automatically turns off and disables the generator after some pre-set period (typically 5 to 15 minutes maximum) if the system has not already been manually reset. *Figure 3* shows how to interconnect the three units when a single supply battery is used, and *Figure 4* shows the connections to use with dual supply batteries.

Figure 5 shows the practical circuit of an auto-turn-off unit that gives a basic timing period of about 8 minutes: the

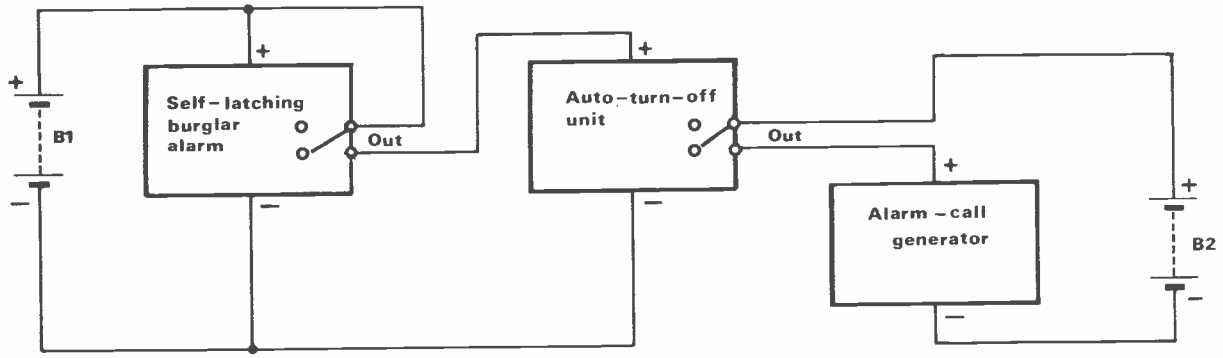

Fig 4 *Method of connecting an alarm-call generator to a burglar alarm via an auto turn-off unit, using individual supply batteries*

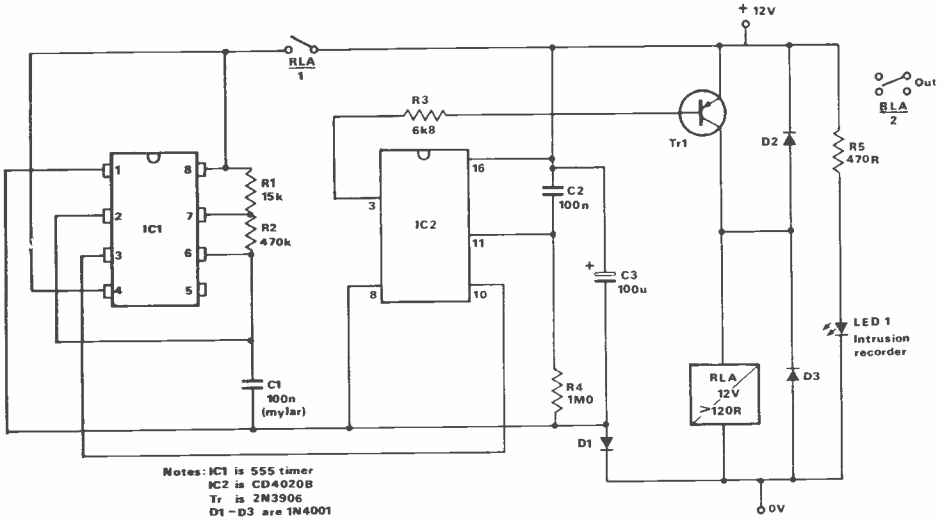

Fig 5 *An auto turn-off unit giving a delay of about 8 minutes*

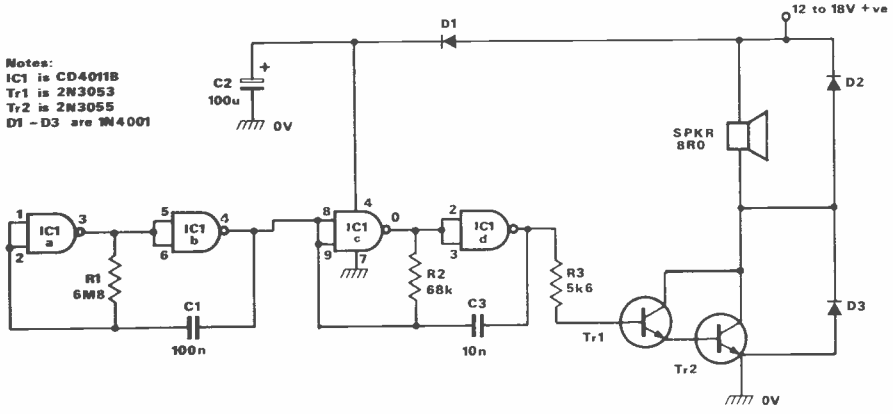

Fig 6 *High-power pulsed-tone alarm-call generator*

period is proportional to the C1 value, and can be doubled (for example) by giving C1 a value of 200nF.

The operating principle of the *Figure 5* circuit is fairly simple. IC1 is a free-running 555 astable or 'clock' generator, and operates at a basic frequency (with the component values shown) of about 17Hz (about 1000 cycles per minute), and feeds output 'clock' pulses to the input of IC2. IC2 is a 14-stage binary counter, which changes state on the arrival of each 8192nd clock pulse.

When power is first applied to the *Figure 5* circuit, the output of IC2 is set to the 'low' state via C2. As the output goes low the relay is driven on via Tr1, and contacts RLA/1 close and complete the supply connections to the IC1 clock generator, which then starts operating and feeding pulses to the input of IC2.

On the arrival of the 8192nd clock pulse (after roughly eight minutes, with the component values shown) the output of IC2 flips high and turns the relay off via Tr1, thereby opening contacts RLA/1 and breaking the supply connections of the clock generator. The operating sequence is then complete.

The *Figure 5* circuit provides a relatively long timing period (roughly eight minutes), but does so without resorting to the use of high-value electrolytic capacitors or resistors: the timing period is determined primarily by the values of R2 and by Mylar capacitor C1, and the timing thus has excellent thermal stability and repeatability.

Note in the above circuit that LED1 illuminates so long as a voltage supply is connected to the output of the self-latching burglar alarm. This LED thus acts as a visual 'Intrusion Recorder' which continues to glow even when the alarm-call generator has switched off at the end of the 8-minute timing period.

Electronic siren circuits

An alarm-call generator can take the form of an electro-mechanical bell or siren, or of an electronic siren or sound generator.

In some cases it may be an advantage to use two types of generator, either operating directly in parallel or operating simultaneously via a multi-contact relay. An electronic siren may, for example, be used to sound inside a house while an alarm bell sounds outside.

Electronic 'sirens' can take a number of different forms and may be designed to generate very distinctive and easily recognizable sounds. *Figures 6* to *11* show half a dozen useful designs that can easily be built by the electronics hobbyist or engineer.

The *Figure 6* circuit generates a 'bleep-pause-bleep-pause' pulsed-tone signal. IC1 is an inexpensive CMOS chip. IC1a-IC1b form a simple 1Hz astable multivibrator, which alternately gates the IC1c-IC1d 1 KHz astable oscillator on and off via pin-8. The resulting pulsed-tone signal is amplified by transistors Tr1 and Tr2 and reproduced at a level of several watts in the 8R0 speaker. The available

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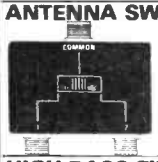

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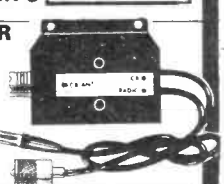

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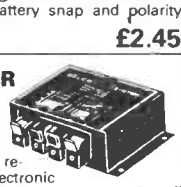
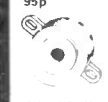
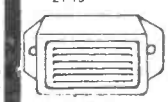


ELECT & PIEZO BUZZERS

PIEZO
Miniature round piezo electronic buzzer White plastic Low consumption
Frequency 4kHz approx
Output 70dB (A) @ 1 typ
Power 12Vd.c 4mA
Dims 22 (dia) × 11.5mm
Fixing Centres 26.5mm
O/No VP 107
95p



PIEZO
Piezo buzzer White plastic 90mm leads For use on a.c mains
Frequency 3.5kHz approx
Output 85dB (A) @ 1m typ
Power 240Va.c 5mA
Dims 32 (dia) × 14mm
Fixing centres 38mm
O/No VP 108
£1.15



ELECTRONIC
Miniature electronic buzzers Solid state Ivory plastic 150 leads Frequency 500 Hz approx
Dims 22 × 16 × 15mm
Output 82dB (A) @ 1m typ
Fixing centres 26mm
3V 25mA O/No VP 82 — 6V 25mA VP 83
9V 25mA O/No VP 84 — 12V 25mA VP 86
80p each

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A neat swivelling disc provides close tolerance substitution resistors of 36 preferred values from 5ohms to 1Kohm. Simply fix clips into circuit and swivel until optimum result is achieved
O/No VP 112 **£4.75**

MINIATURE VICE

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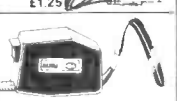
O/No VP 88 **£1.25**

METRIC & BRITISH MEASURES



Steel tapes in sturdy ABS plastic case. Silk wrist strap. These yellow coated convex tapes have inch and metric graduations. Automatic push-button return

2m long × 13mm wide	O/No VP 89	£1.00
3m long × 13mm wide	O/No VP 90	£1.50
5m long × 16mm wide	O/No VP 91	£2.00

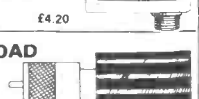
BATTERY TESTER

Tests all types of battery including standard, NICAD, Alkaline etc. Takes all standard sizes including 6V lantern batteries and watch/hearing aid cells. Also tests fuses and lamps by means of internal 9V (PP3) battery. Can also be used to recharge NICAD batteries by means of external 3-12Vd.c power supply (not included)
Full instructions provided. Dims 185 × 103 × 30mm (approx)
O/No VP 101 **£7.00**

FM MONITOR

FM monitor for 2 metre band. All metal. Attached earphone. PL259/SO239 connectors. 144MHz. 10W maximum. Dims (Body) 55 × 30 × 23mm
O/No VP 120 **£4.20**

DUMMY LOAD



50 ohms 30W
UHF co-axial plug fitting (PL259)
O/No VP 121 **£5.20**

PICK-UP COIL

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O/No VP 87

VALUE PACKS

Pak No	Qty	Description	Price
VP1	300	Assorted Resistors Mixed Types	£1.00
VP2	300	CarbonR esistors ¼ Watt Pre-Formed	£1.00
VP3	200		£1.00
VP4	150	¼ Watt Resistors 100 ohm 1M Mixed	£1.00
VP5	200	Assorted Capacitors All Types	£1.00
VP6	200	Ceramic Caps Miniature Mixed	£1.00
VP7	100	Mixed Ceramics Disc 1pf 56pf	£1.00
VP8	100	Mixed Ceramic Disc 680pf 0.15pf	£1.00
VP9	100	Assorted Polyester/Polystyrene Caps	£1.00
VP10	60	C280 Type Caps Metal Foil Mixed	£1.00
VP11	100	Electrolytics All Sorts	£1.00
VP12	60	Bead Type Polystyrene Mm Caps	£1.00
VP13	50	Silver Mica Caps Ass 5.6pf 150pf	£1.00
VP14	50	Silver Mica Caps Ass 180pf 4700pf	£1.00
VP15	50	High Voltage Disc Ceramic 750v 8Kv Mixed	£1.00
VP16	50	Wirewound Res 9W (avg) Ass 1 ohm 12K	£1.00
VP17	50	Metres PVC Covered Single Strand Wire Mixed Colours	£1.00
VP18	30	Metres PVC Covered Multi Strand Wire Mixed Colours	£1.00
VP19	40	Metres PVC Single/Multi Strand Hook Up Wire Mixed	£1.00
VP20	6	Rocker Switches 5 Amp 240v	£1.00
VP21	20	Pcs 1 2 & 4 mm Plugs & Sockets Matching Sizes	£1.00
VP22	200	Sq Inches Total Copper Clad Board Mixed Sizes	£1.00
VP23	20	Assorted Slider Pots Mixed Values	£1.00
VP24	10	Slider Pots 40 mm 22K 5 × Log 5 × Lin	£1.00
VP25	10	Slider Pots 40 mm 47K 5 × Log 5 × Lin	£1.00
VP26	20	Small 125 Red LEDS	£1.00
VP27	20	Large 2" Red LEDS	£1.00
VP28	10	Rectangular 2" Green LEDS	£1.00
VP29	30	Ass Zener Diodes 250mW 2W Mixed Vlts Coded	£1.00
VP30	10	Ass 10W Zener Diodes Mixed Vlts Coded	£1.00
VP31	10	5 Amp SCR's TO 66 50 400v Coded	£1.00
VP32	20	3 Amp SCR's TO 66 Up To 400v Uncoded	£1.00
VP33	200	Sil Diodes Switching Like IN4148 DO 35	£1.00
VP34	200	Sil Diodes Gen Purpose Like OA200/BAX13/16	£1.00
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output power of the above circuit can be greatly increased by modifying the design so that the supply to IC1 is limited to a 'safe' value of 12 volts (by a resistor and zener diode), while limiting the speaker-supply voltage to 30 volts maximum, as shown in *Figure 7.*

This particular circuit generates a 'dee-dah' warble-tone alarm signal, similar to that of a British police car siren, but is otherwise very similar to that of *Figure 6*, except for the use of R4 and ZD1, and for the fact that the IC1a-IC1b 1 Hz astable is used to frequency-shift the IC1c-IC1d tone generator.

This circuit can generate a maximum output power (into an 8R0 load) of 18 watts when used with a 24 volt power supply.

The frequency-shift 'symmetry' of the above circuit depends somewhat on the characteristics of the individual chip that is used in the IC1 position.

Figure 8 shows an alternative warble-tone generator that does not suffer from this defect. The modulation frequency of this circuit can be varied via R2, and the 'tone' frequency can be varied via R5.

Note that this design is based on the use of a pair of 555 'timer' chips, rather than on the use of a single CMOS chip, and that IC1 is wired as a low-frequency (1 KHz) astable, and IC2 functions as a high-frequency (a couple of KHz) astable. IC1 frequency-shifts IC2 by feeding a square-wave signal to the pin-5 'modulation' terminal.

Figure 9 shows a variation of the above circuit. This particular design generates a 'wailing' or alternately rising and falling tone, similar to that of an American police car siren. This action is obtained by using emitter-follower Tr1 to buffer the 'sawtooth' 1 Hz signal of IC1 and feed it to the pin-5 'modulation' terminal of the IC2 high-frequency astable oscillator.

The *Figure 10* circuit generates a 'zeep-zeep' sound that is similar to the 'Red Alert' alarm signal used in the 'Star Trek' programme. The period or interval of this signal can be varied via R2 and the tone can be varied via R6. This circuit is an ideal project for the experimenter.

Finally, *Figure 11* shows how the warble-tone alarm-call generator of *Figure 7* can be modified for use with an inexpensive VN67AF VMOS output stage, which feeds 6 watts into the 8R0 speaker when the unit is powered from a 12 volt supply.

D1 and C2 are used in this circuit to ensure that the astable actions are not adversely influenced by voltage transients induced into the battery supply leads via the (inductive) speaker.

Touch/proximity alarms

A commonly-used home-security technique is that of arranging baited 'traps' (such as door handles, clocks, metal trays, etc) in such a way that they activate an alarm whenever they are touched.

If the bait is a relatively small metal object, one possible way of achieving this action is to use a 'hum-detecting' touch alarm of the type in *Figure 12.*

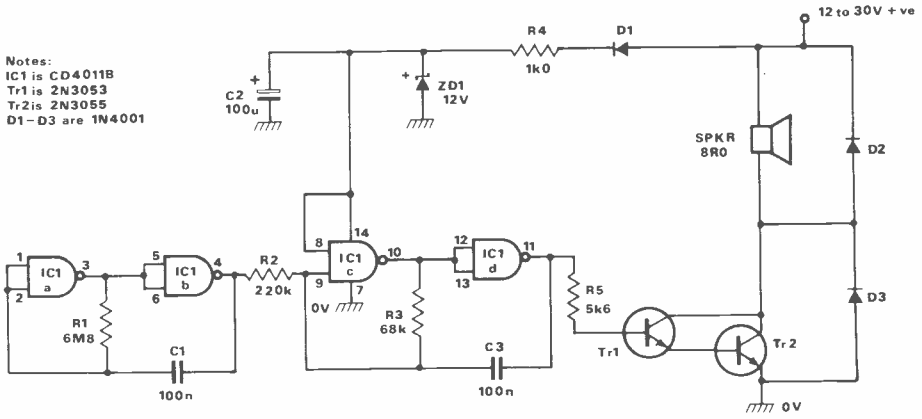


Fig 7 *High-power warble-tone alarm call generator*

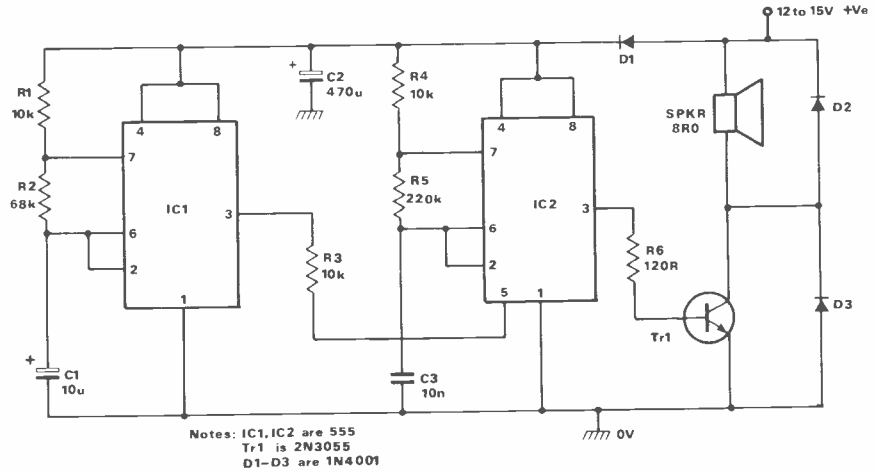


Fig 8 *Alternative warble-tone alarm-call generator simulates a British police car siren*

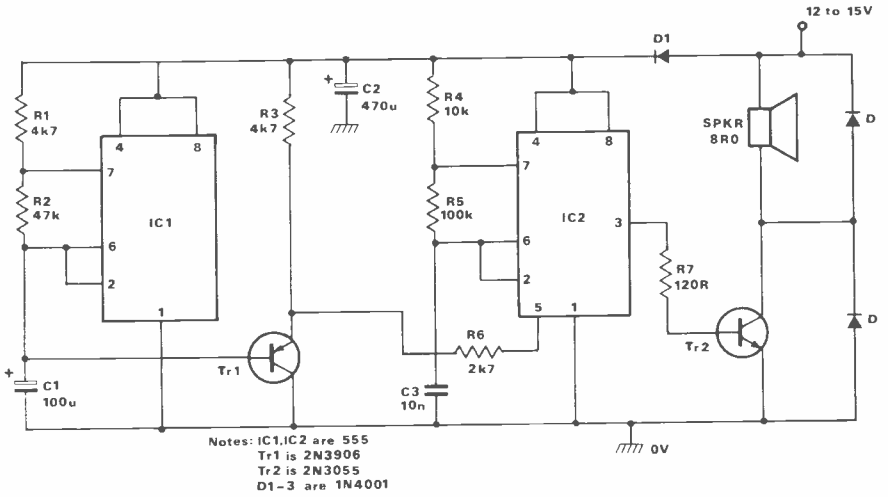


Fig 9 *'Wailing' alarm-call generator simulates an American police siren*

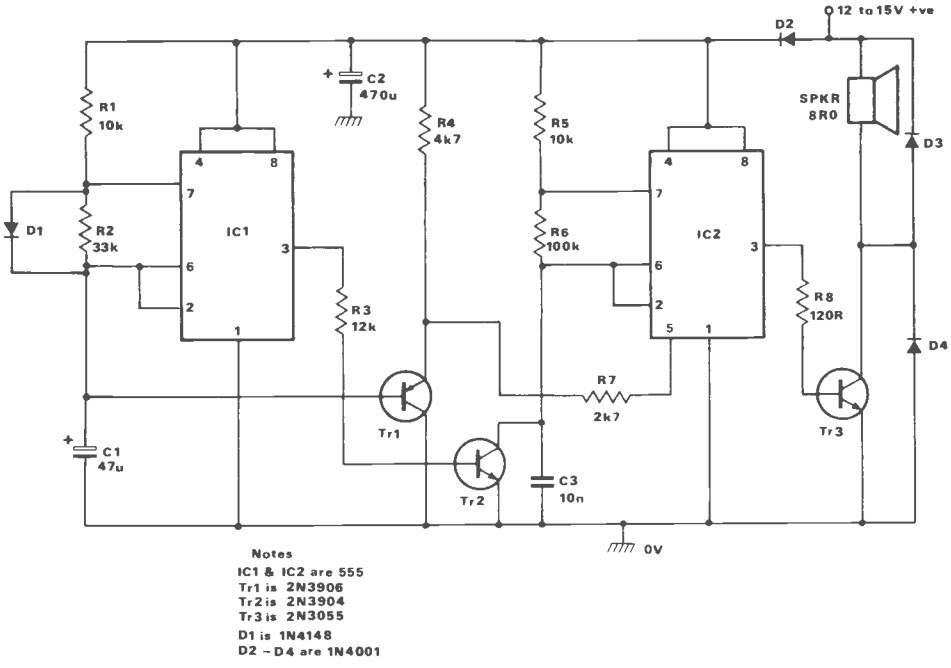


Fig 10 *'Red Alert' alarm-call generator simulates 'Star Trek' alarm signal*

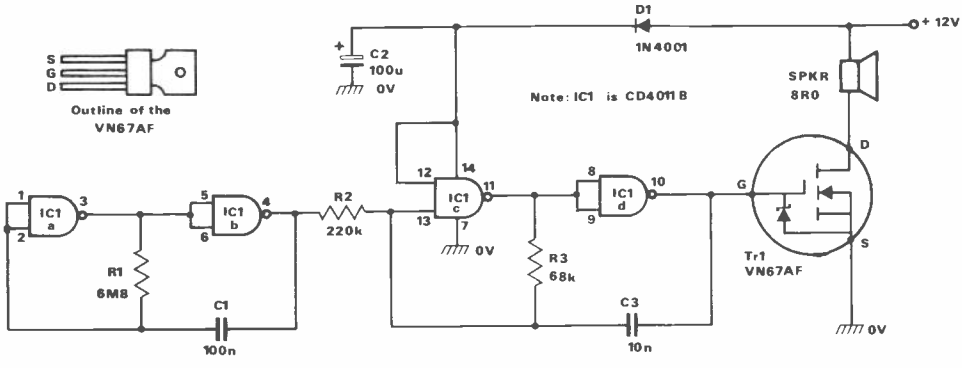


Fig 11 *6 watt warble-tone alarm-call generator with VMOS output stage*

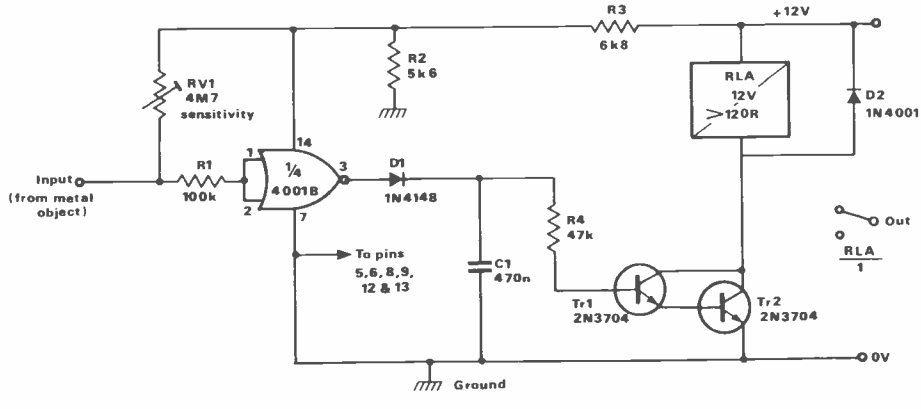


Fig 12 *'Hum-detecting' touch alarm*

The *Figure 12* circuit detects the ac hum that is picked up by an electrical contact when it is touched by a human finger (when the person is in the proximity of ac power lines). Here, one of the gates of the CD4001B CMOS chip is wired as a simple pulse-inverting amplifier, and has its input terminal connected to the external metal object via R1. This gate is powered from a 5 volt supply derived from the 12 volt line via R2 and R3, and is biased via RV1 so that its output is normally low.

When a pick-up signal with a peak amplitude greater than a couple of volts appears at the input point, the gate output takes the form of a 5V square wave of line frequency, and this signal is used to activate the relay via Tr1-Tr2 and the D1-C1-R4 network.

Sensitivity control

In use, sensitivity control RV1 is adjusted so that the relay turns on (and activates an external alarm) when the metal object is touched, and turns off when the object is released.

Note when using the above circuit that the low side of the 12 volt supply must be correctly grounded. The circuit draws a quiescent current of about 1 mA. If the external metal object is placed more than 10cm from the input of the unit, the connections to it must be made via screened leads (to prevent pick-up of unwanted signals).

Figure 13 shows another circuit that can be used to activate an alarm whenever a metal object is touched.

In this case, the metal object forms part of the 'antenna' of an RF oscillator. The circuit works on the capacitive-loading principle, in which the gain of the RF oscillator is criticaly adjusted to a point at which oscillation is barely sustained, and in which the antenna forms part of the tank circuit. One of the supply lines of the circuit is correctly grounded.

Consequently, any increase in the antenna-to-ground capacitance, such as is caused by touching or nearing the antenna, causes enough damping of the tank circuit to bring the oscillator gain below the critical level, and the oscillator ceases to operate. This cessation of oscillation is then used to make the alarm generator activate.

In *Figure 13,* Tr1 is wired as a 300 KHz (approx) Colpitts oscillator, with its gain adjustable via RV1, and the antenna coupled into the 'tank' via C5. The output of the oscillator is buffered via Tr2 and converted to dc via D1-D2, etc, to produce a positive bias that is fed to the base of common emitter amplifier Tr3.

Thus, when Tr1 is operating normally, Tr3 is driven to saturation and Tr4 is cut off, so relay RLA is off. When the antenna (or external metal object) is touched or additionally loaded, however, the Tr1 oscillator ceases to operate, causing Tr3 to cut off.

Under this condition, the base of Tr4 is positively biased via R8, causing the relay to switch on and activate the external alarm.

Note that the Tr1-Tr2 section of the *Figure 13* circuit is fed from a 6V supply via ZD1, to ensure good oscillator stability.

Figure 14 shows an alternative output stage that can be used with the above circuit, to give direct activation of a self-interrupting 12 volt bell or buzzer (with a current rating of 2A or less) via an SCR.

The *Figure 13* (or *14*) circuit is very simple to set up. First connect a suitable antenna, then turn RV1 towards the ground rail until the alarm (relay) just activates. Next, turn RV1 back a fraction so that the relay just turns off, then check that the alarm goes on when the antenna is touched or closely approached, and goes off again when the touch is removed. If necessary, adjust RV1 again for maximum sensitivity.

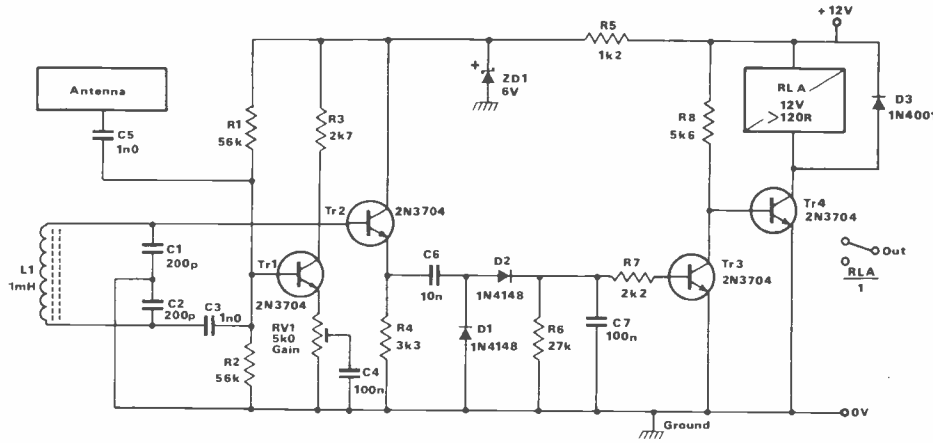


Fig 13 *Relay output 'proximity' alarm*

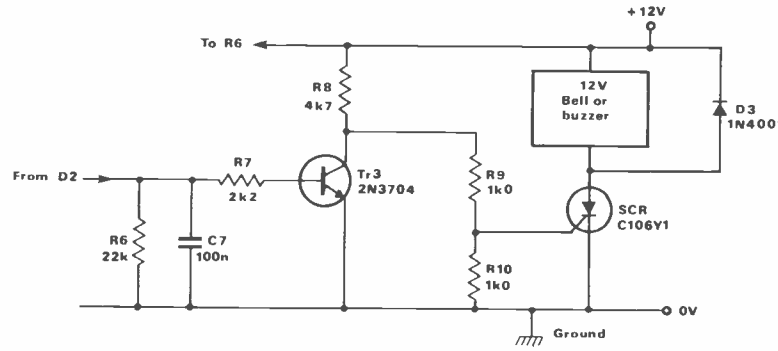


Fig 14 *Alternative 'direct' (2 amp) output stage for the Figure 13 circuit*

Sound & vibration alarms

Sound-activated alarms can be made to activate when an intruder enters a protected area and creates noise. Vibration-activated alarms can be made to activate when an unauthorised person opens the drawer of a cabinet or the door of a cupboard, etc, and thus creates a small amount of vibration in a protected object.

Both types of circuit can use the same principle of operation, as illustrated in the block diagram of *Figure 15*.

Here, a microphone or similar transducer is used to pick up the basic noise or vibration, and the resulting signal is selectively amplified and then converted to dc, which is then used to activate the alarm-call generator.

Figure 16 shows the circuit of a simple but useful signal detector and alarm activator, which needs an input of about 1 volt RMS to turn on relay RLA. The circuit action is such that the relay turns on rapidly when a suitable input signal is connected, but turns off slowly when the signal is removed. The turn-off time is determined by the R1-C2 time constant, and can be changed to suit specific requirements by altering the C2 value.

The *Figure 16* circuit can be made self-latching by wiring a spare set of relay contacts across Tr2, as shown in the diagram. It can be used as a sound – or vibration – activated alarm by feeding an ac input to it from a pick-up transducer via a suitable amplifier stage.

In vibration-alarm applications, the amplifier should be designed to pass low-frequency signals only, and in sound-alarm applications it should be designed to pass only the selected audio band.

Figure 17 shows a practical speech-amplifier circuit that can be used in conjuction with *Figure 16* to make a sensitive sound-activated alarm. The CA3035 IC (manufactured by RCA) is an ultra-high-gain wide-band amplifier array, and gives a voltage gain of about 120 dB between input pin-1 and output pin-7. In the diagram, R1 and C1 are biasing components, RV1 gain control, and most other components determine the bandwidth of the amplifier.

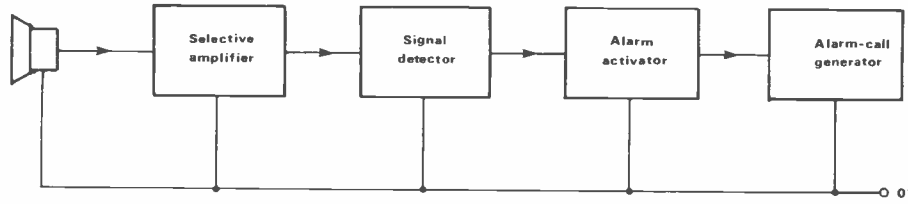


Fig 15 *Block diagram of a typical sound- or vibration-alarm circuit*

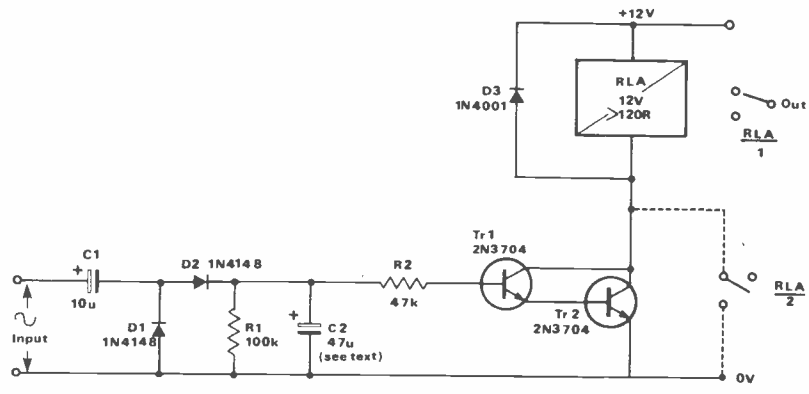


Fig 16 *Simple relay-output signal-detecting alarm activator*

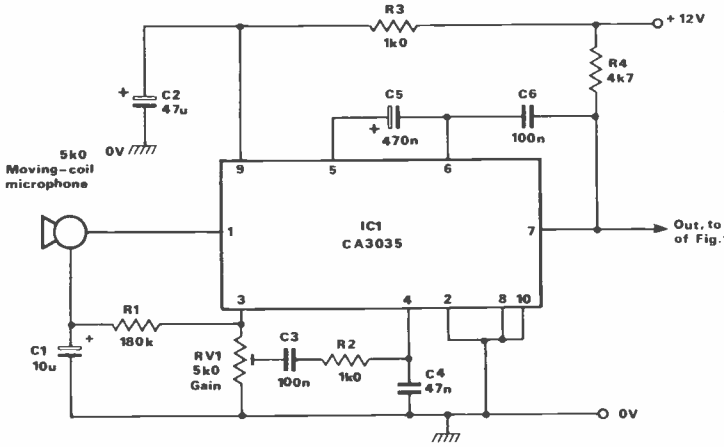


Fig 17 *Speech-frequency amplifier: can be used in conjunction with Figure 16 to make a sound-activated alarm*

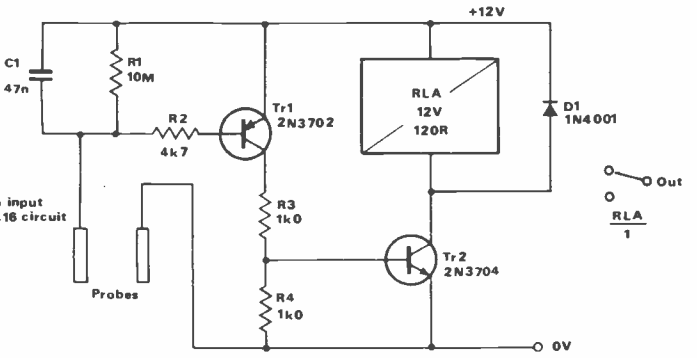


Fig 18 *Simple water-activated 'flood alarm' with relay output*

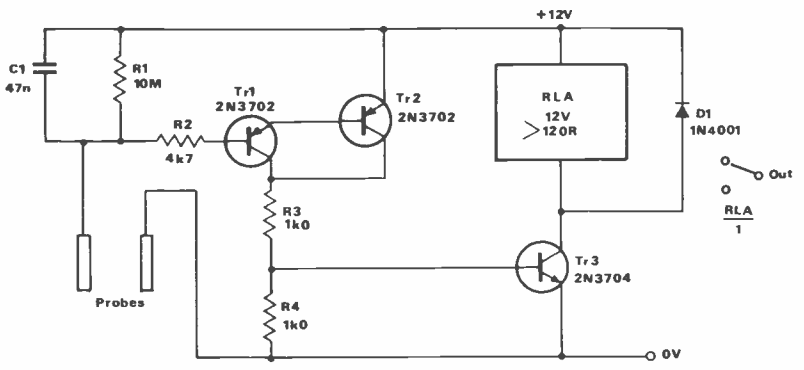


Fig 19 *Sensitive water-activated 'flood' alarm with relay output*

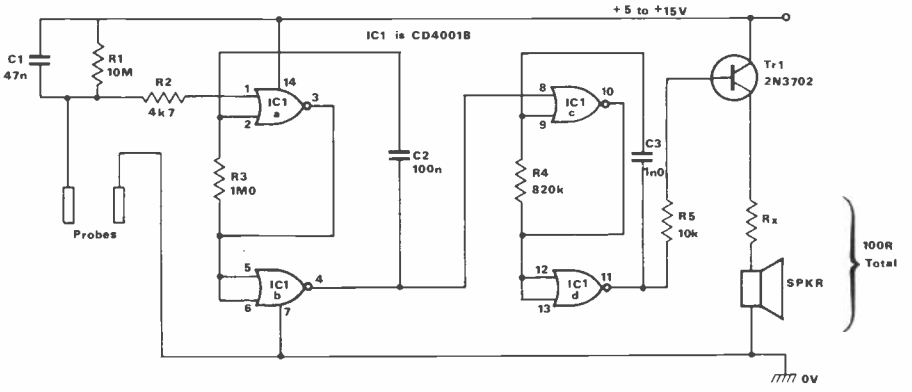


Fig 20 *Sensitive 'flood' alarm with pulsed-tone output*

'Flood' alarms

One of the many dangers facing the house holder is that of 'flooding', such as occurs when a water cistern develops a fault and overflows, or when a water-pipe bursts, or when heavy rain causes flooding in a cellar, etc.

Fortunately, these dangers can be greatly reduced with the aid of a simple 'flood' or water-activated alarm, and *Figures 18* to *20* show three practical circuits of this type.

Each of the *Figure 18* to *20* circuits uses the same basic principle of operation, and uses a pair of metal probes to resistively detect the presence or absence of the liquid.

In the absence of the liquid the probes 'see' a near-infinite resistance, but in the presence of the liquid (directly across both probes) the probe resistance falls to a relatively low value, causing the alarm to activate. The value of probe resistance depends on the type of 'medium' being detected. In the case of rain or tap water, the resistance may be less than a few kilohms, but in the case of steam or oil may be several megohms.

The operation of the *Figure 18* circuit is very simple. In the absence of a liquid, Tr1 is held cut-off via R1-R2, so Tr2 and RLA are also cut off. In the presence of a liquid (between the two probes), however, Tr1 is biased on via the probe resistance, thereby biasing Tr2 on via R3 and causing the relay to turn on. An external alarm-call generator can be activated via the relay contacts.

The *Figure 18* circuit can be activated by any probe resistance less than 500K or so. *Figure 19* shows how the above circuit can be modified to give a sensitivity of about 10M, by simply using a Darlington-connected pair of transistors in the 'Tr1' position.

Finally, *Figure 20* shows a flood alarm that generates a pulsed-tone alarm signal in a small speaker when activated. This circuit has a sensitivity of about 20M, consumes a quiescent current of about 1 μA, and when activated generates an 800 Hz tone that is pulsed on and off at a 6 Hz rate.

Power-failure alarms

Electrical power-failure alarms can be made to activate when power is removed from a deep-freeze unit, or when a power line is cut, or when a machine overloads and blows its fuses. Three practical power-failure alarms are described in this final section of this month's Data File.

Figure 21 shows a simple relay-output power-failure alarm which can be used to activate any external alarm device via the relay contacts. The power line input is applied to a step-down transformer which gives an output of 12V. This output is half-wave rectified by D1, smoothed by C1 and fed directly to the relay coil. The normally-closed (n-c) contacts of the relay can be used to apply power to any external alarm device.

Thus, when power is applied, the relay is driven on, its contacts are open, and the alarm is off. When power is removed, the relay turns off, its contacts close, and the external alarm is activated. The relay can be any 12V type with a coil resistance of 120R or greater and with one or more sets of n-o contacts: T1 needs a current rating of 100 mA or greater.

An alternative type of power-failure alarm is shown in *Figure 22*. Here, the output of T1 is rectified and smoothed via D1-C1 to give roughly 12V dc at the D1-D2 and D2-D3 junctions. The actual alarm device, which is a self-interrupting bell or buzzer with a current rating less than 2A, is used as the anode load of the SCR and is powered from a 9V battery.

Normally, when 12V dc is developed at the D1-D2 and D2-D3 junctions, Tr1 is driven to saturation via R1, and the R2-R3 junction is pulled down to zero volts. Under this condition no drive is applied to the SCR gate, so the alarm is off and D3 is reverse biased, and no current is drawn for B1.

When the ac input power is removed, the D1-D2 junction falls to zero volts and Tr1 turns off. Under this condition, current feeds to the SCR gate from the 9V (B1) battery via D3-R2-R3, so the SCR and alarm turn on.

Finally, to complete this edition of Data File, *Figure 23* shows a medium-power power-failure alarm (about 10W) that generates a pulsed-tone signal in the loudspeaker under the 'failure' condition. Here, the CD4001B is wired as a gated pulsed-tone generator (like *Figures 6* and *20*), and feeds a simple power-booster stage.

In this circuit the power line signal is again stepped down, rectified and smoothed by T1-D1-C1. When power is applied, the voltage across C1 is greater than the battery supply voltage, so IC1 is gated off.

Under this condition, the circuit consumes only a small leakage current from the battery. When the input power is removed, however, the C1 voltage falls to zero, and under this condition the IC is gated on and an alarm signal is generated in the speaker. This signal has a basic frequency of about 800 Hz, and is gated on and off at a 6 Hz rate.

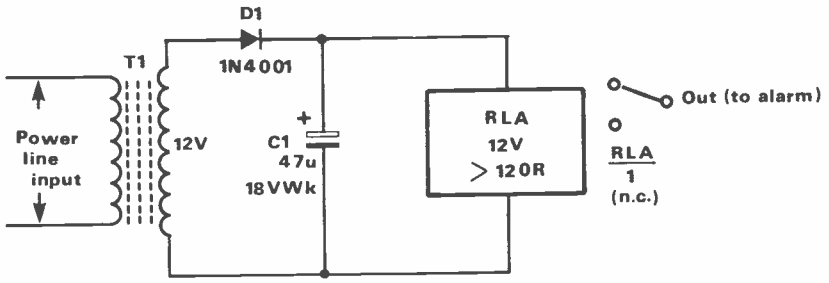


Fig 21 *Simple power-failure alarm with relay output*

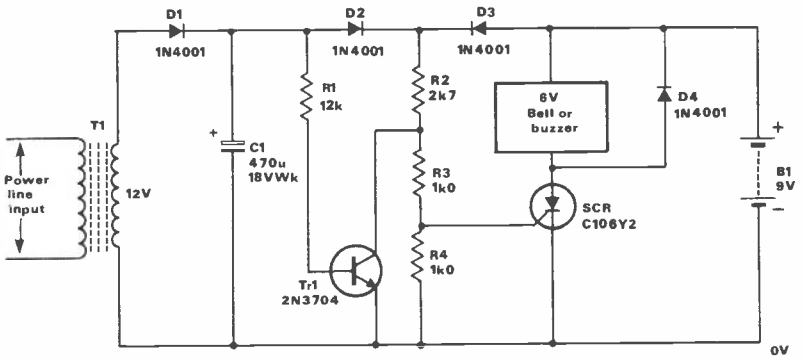


Fig 22 *Simple power-failure alarm with bell/buzzer output*

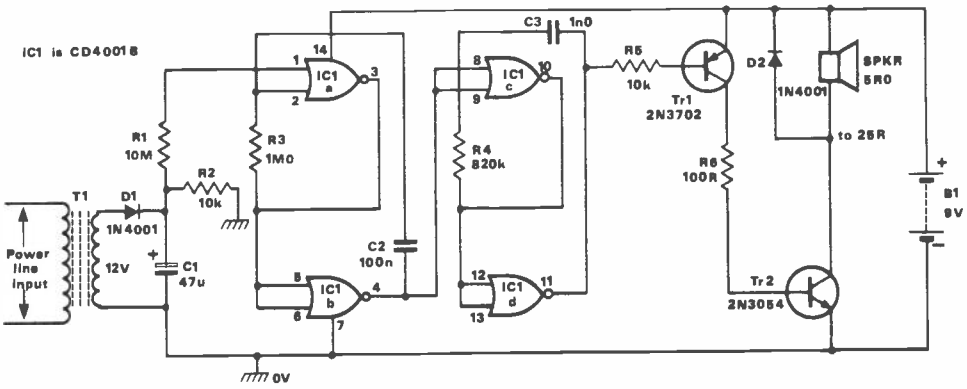
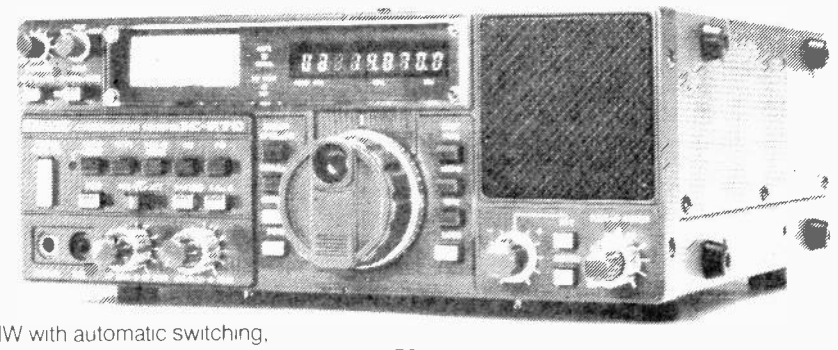


Fig 23 *Power-failure alarm with pulsed-tone output*

ICOM

FOR THE SWL...

IC-R70, £565.



The R70 covers all modes (when the FM option is included), and uses 2CPU-driven VFOs for split frequency working, and has 3 IF frequencies. 70MHz, 9MHz and 455KHz, and a 100dB dynamic range. It has a built-in mains supply. Other features include input switchability through a pre-amplifier, direct or via an attenuator, selectable tuning steps of 1KHz, 100Hz or 10Hz, adjustable IF bandwidth in 3 steps (455KHz). Noise limiter, switchable AGC, tunable notch filter, squelch on all modes, RIT, tone control. Tuning LED for FM (discriminator centre indicator) Recorder output, dimmer control.

The R-70 also has separate antenna sockets for LW-MW with automatic switching, and a large, front-mounted loudspeaker with 5 8W output. The frequency stability for the 1st hour is ± 50Hz, sensitivity – SSB/CW/RTTY better than 0 32 uv for 12dB (S + N) ÷ N, Am – 0.5 uv. FM better than 0.32 for 12dB Sinad. DC is optional.

Ever since its introduction the IC-R70 has proved to be a popular and reliable HF receiver making your listening hours a pleasure. Please contact us for further details on this excellent set.

IC-R71E, £649.

For those who like the easy life, the R71E has the option of an infra-red remote control unit, making it a very sophisticated rig indeed, here are some details.

100 KHz – 30 MHz all mode (with FM option). Quadruple conversion superhet. IF frequencies 70MHz,9MHz and 455KHz with continuous bandpass tuning and notch filter. Virtually immune from adjacent channel interference with 100db dynamic range Adjustable AGC, noise blanker and switchable pre-amplifier. Direct keyboard into twin VFO's with 32 programmable memories. 5 year lithium memory backup cell. Memory and band scan with auto-stop. Tuning rates 10Hz, 50Hz and 1 KHz with 6 digit readout. AC mains operation Auto squelch tape record function.

OPTIONS:- Synthesized voice readout, infra-red remote controller, 12 V DC kit, mobile mounting bracket, two CW filters 500 and 250 Hz, FM unit, computer interface, headphones.

You can get what you want just by picking up the telephone. Our mail-order dept. offers you free, same-day despatch whenever possible, instant credit, interest-free H.P., telephone Barclaycard and Access facility and a 24 hour answering service

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Give it a visit, BCNU.

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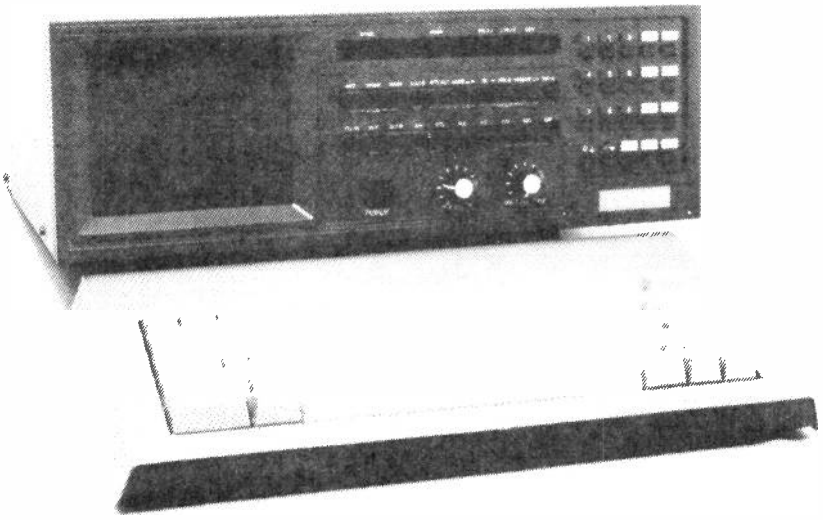
TONO COMPUTERS

Tono 5000E, £829.

From the famous TONO stable comes the new THETA – 5000E now ready to send and receive AMTOR as well as CW, RTTY, and ASCII.

Features include:- 5" high resolution monitor displaying 400chr. x 16 lines x 2 pages, ARQ/FEC, time clock, Selcal (Selective calling), high speed RTTY demodulator – up to 300 bauds (600 baud using TTL level); 3 shifts (170,425 and 850 Hz) and two tones (2125 and 1275 Hz); manual or automatic Tx/Rx; Battery back-up memory (72 chars x 7 channels and 24 chars x 5 channels); type ahead correctable buffer memory; Morse code 5 – 100 wpm (variable weights) + autotrack on receive; CW practice feature with random generator; Automatic CR/LF with wrap around display; Automatic letters code insertion; Printer interface; Bargraph LED meter for tuning; TOR A, B and L – the list goes on and on..... Power requirements by the way are AC mains or 13.8v DC.



Tono 9100E, £729.

The famous TONO THETA 9000E has had AMTOR modes A, B and L added to its functions providing transmit and receive facilities with selective calling on AMTOR, RTTY (with 3 selective shifts and 2 tone pairs), CW with built in practice function and random generator, and ASCII with full Duplex facility. The 9000E requires an external VDU. The battery backed memory covers 256 characters x 7 channels with Channel 6 which is divided into 16 subsections of 16 characters each and Channel 7 into 8 subsections of 32 characters. Any of the subsections may be used individually and messages can be repeated 1 – 9 times from a keyboard command.

Please note that we now have a new retail branch at 95, Mortimer Street, Herne Bay, Kent. Give it a visit, BCNU.

Agent: Gordon G3LEQ, or telephone Knutsford (0565) 4040. Please telephone first, anytime between 0900 – 2200 hrs.

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Thanet Electronics
Dept RW,143 Reculver Road, Herne Bay, Kent.
Tel:(02273)63859/63850

AA117 9p	BC328 6p	BFX85 20p	TIP112 54p	2N3773 100p	BYX70/500 31p	OY802 45p	4042 58p	7482 70p	74LS367 52p	HA-1368 190p	TBA990 80p
AA119 9p	BC557 6p	BFX87 15p	TIP115 45p	2N3819 29p	BYX70/800 36p	ECC82 40p	4043 57p	7485 45p	74LS399 85p	LA-1201 120p	TCA270 40p
AAY32 150p	BCY32 150p	BFX88 15p	TIP117 55p	2N3866 68p	BYX71/500 80p	ECC83 43p	4044 58p	7486 28p	74LS670 130p	LA-1365 170p	TCA800 80p
AC107 28p	BCY33 150p	BFY50 14p	TIP120 43p	2N4031 25p	OA47 6p	ECC84 40p	4047 68p	7489 100p		LA-3301 180p	TCA940 85p
AC126 17p	BCY34 150p	BFY51 14p	TIP121 46p	2N4036 25p	OA90 4p	ECC85 40p	4048 48p	7490 35p	**LINEAR IC'S**	LA-3350 150p	TDA1170 90p
AC127 15p	BCY42 20p	BFY52 14p	TIP122 47p	2N4037 25p	OA91 4p	ECH81 40p	4049 40p	7492 45p	LM324 30p	LA-4031 140p	TDA1412 60p
AC128 15p	BCY56 18p	BFY56 25p	TIP125 47p	2N4443 76p	OA200 7p	ECH84 62p	4050 40p	7493 35p	LM380 60p	LA-4032 190p	TDA2002 80p
AC128K 23p	BCY70 18p	BFY57 25p	TIP126 58p	2N4444 76p	OA202 7p	ECL80 57p	4051 62p	7495 48p	LM381 100p	LA-4051 250p	TDA2003 150p
AC141K 23p	BCY71 28p	BFY64 25p	TIP127 56p	2N5061 20p	IN914 2p	ECL82 56p	4052 61p	7497 80p	LM709 Dil 30p	LA-4101 140p	TDA2020 140p
AC142K 22p	BCY72 18p	BFY90 60p	TIP147 100p	2N5294 30p	IN4001 4p	ECL84 57p	4053 61p	LM723 32p	LA-4102SK	TDA2030 140p
AC153K 23p	BD115 26p	BR100 14p	TIP2955 34p	2N5296 30p	IN4002 4p		4054 85p	74111 52p	LM741 Dil 15p	**140p**	TDA2522 90p
AC176 18p	BD124P 50p	BSX20 15p	TIP3054 38p	2N6106 40p	IN4003 4p	ECL85 67p	4055 90p	74116 85p	LM741 Met	LA-4420 150p	TDA2530 90p
AC176K 20p	BD124 110p	BT106 90p	TIP3055 34p	2N6107 40p	IN4004 4p	ECL86 49p	4056 85p	74119 85p	**45p**	LA-4430 150p	TDA2532 90p
AC187 15p	BD128 35p	BT109 90p	TIS43 45p	2N6109 40p	IN4005 4p	EF80 31p	4060 72p	74122 40p	LM3900 25p	MB3712 150p	TDA2540 75p
AC187K 20p	BD131 25p	BT116 80p	TIS44 40p	3N128 85p	IN4006 4p	EF85 34p	4066 42p	74123 20p	NE555 16p	MC1327 70p	TDA2560 75p
AC188 17p	BD132 28p	BT119 100p	TIS61 15p	3N143 68p	IN4007 5p	EF89 43p	4068 25p	74125 40p	NE556 40p	SAS560 110p	TDA2593 100p
AC188K 23p	BD135 20p	BT120 100p	TIS88A 45p		IN4148 2p	EF183 45p	4069 27p	74126 45p	AN-214P 200p	SAS570 110p	TDA2690 90p
ACY18 48p	BD136 20p	BU104 100p	TIS90 15p	**JAPANESE TRANSISTORS**	IN5400 9p	EF184 53p	4070 27p	74132 42p	AN-240P 150p	SN76003N 140p	UPC-555H 60p
ACY19 48p	BD137 20p	BU105 80p	TIS91 18p		IN5401 10p	EL34 190p	4071 27p	74141 55p	AN-360 120p	SN76013N 140p	UPC-556H 80p
AD142 60p	BDY92 100p	BU108 100p	TIS93 20p	2SA73 30p	IN5402 10p	EY86 31p	4072 27p	74145 70p	AN-7110 150p	SN76023N 140p	UPC-575C2 100p
AD149 45p		BU110 110p		2SA104 32p	IN5403 11p	EY87 31p	4073 27p	74153 45p	AN-7114 170p	SN76033N 150p	UPC-577H 150p
AD161 22p	BD138 20p	BU111 140p	VK1010 88p	2SA1198 22p	IN5404 11p	PC97 100p	4075 27p	74155 45p	AN-7115 180p	SN76110N 70p	UPC-592H2 120p
AD162 22p	BD139 20p	BU126 70p	VN10KM 80p	2SA203 30p	IN5405 12p	PCC85 42p	4076 70p	74157 45p	AN-7120 150p	SN76115 70p	UPC-1025H 300p
AF124 25p	BD140 20p	BU204 75p	VN46AF 88p	2SB54 25p	IN5406 13p	PCF80 58p	4077 27p	74160 50p	AY3-1270 680p	T2800D 52p	UPC-1026C 140p
AF125 25p	BD144 90p	BU205 70p	VN66AF 100p	2SB77 32p	IN5407 13p	PCF200 135p	4078 27p	74164 50p	AY3-1350 300p	TA-7120 100p	UPC-1028H 160p
AF127 25p	BD150 30p	BU208 75p	VN88AF 115p	2SB337 120p	IN5408 13p	PCF801 110p	4081 27p	74167 35p	AY3-8910 380p	TA-7137P 110p	UPC-1031H2 180p
AF139 22p	BD157 38p	BU208A 80p	VN89AF 110p	2SB405 22p	**LOW PROFILE**	PCF802 67p	4082 27p	74173 50p	AY3-8912 400p	TA-7200 200p	UPC-1032H 70p
AF239 22p	BD158 38p	BU208D 120p		2SB435 21p	**SOCKETS**	PCF806 115p	4093 46p	74174 75p	AY5-3600 570p	TA-7201 200p	UPC-1156H 200p
AL112 70p	BD166 30p	BU326 85p	ZTX107 11p	2SC495 90p	8pin 9p	PCH200 100p	4094 85p	74175 65p	CA270 40p	TA-7203 240p	UPC-1181H 120p
AL113 80p	BD175 30p	BU406 85p	ZTX108 11p	2SC733 40p	14pin 8p	PCL81 54p	4098 85p	74176 45p	CA3046 60p	TA-7204 110p	UPC-1182H 150p
ASZ15 100p	BD177 30p	BU407 75p	ZTX109 12p	2SC1161 110p	16pin 9p	PCL82 63p	4099 82p	74180 50p	CA3048 190p	TA-7205P 90p	UPC-1185H2 250p
ASZ17 100p	BD179 32p	BU408 100p	ZTX212 27p	2SC1172Y 150p	18pin 12p	PCL84 50p	4501 40p	74182 45p	CA3060 280p	TA-7210 200p	
AU110 110p	BD181 45p	BU500 110p	ZTX300 13p	2SC1279 24p	20pin 14p	PCL85 58p	4502 55p	74192 40p	CA3080E 70p	TA-72222AP	**MEMORIES**
AY102 180p	BD182 60p	BU526 80p	ZTX301 16p	2SC1306 100p	22pin 16p	PCL86 58p	4503 52p	74196 40p	CA3086 25p	**120p**	2114 200p
AY106 180p	BD183 60p	C106D 120p	ZTX302 18p	2SC1307 100p	24pin 16p	PCL805 55p	4504 75p	74197 45p	CA3089E 150p	TA-7310P 100p	2716 300p
	BD201 33p	MJ2500 100p	ZTX303 24p	2SC1520 25p	28pin 20p	PFL200 85p	4506 110p	74393 70p	CA3090AQ 150p	TAA550 16p	2516 200p
BA145 10p	BD202 38p	MJ2501 110p	ZTX304 17p	2SC1969 130p	40pin 25p	PL36 80p	4507 45p		**300p**	TBA120S 45p	2532 400p
BA148 10p	BD203 42p	MJ2955 55p	ZTX320 29p	2SC2029 120p		PL504 95p	4508 125p	74LS00 60p	CA3130E 80p	TBA395 60p	2732 400p
BA154 6p	BD204 42p	MJ3000 115p	ZTX326 29p	2SC2078 120p	**ZENERS**	PL508 190p	4510 57p	74S04 45p	CA3130S 100p	TBA396 60p	2764 700p
BA157 12p	BD222 31p	MJ3001 115p	ZTX500 13p	2SC2122A 200p	400MV	PL519 450p	4511 57p	74LS08 20p	CA3140E 45p	TBA520 75p	4116 75p
BB101 13p	BD225 31p	MJE29A 30p	ZTX501 13p	2SC2952 27p	BYZ88 Range	PY81 70p	4512 57p	74LS09 18p	CA3189E 250p	TBA530 80p	4164 380p
BB103 16p	BD232 31p	MJE30A 30p	ZTX502 18p	2SD234 37p	2V7 to 39V 6p	PY88 45p	4513 120p	74S10 35p	CA3240E 190p	TBA540 75p	6116 600p
BB105B 18p	BD234 32p	MJE340 25p	ZTX503 16p	2SK135 400p	1.3W Zeners	PY500A 160p	4514 110p	74LS11 18p	HA-1156W 180p	TBA560 80p	6802 220p
BB205B 24p	BD237 21p	MJE350 80p	ZTX504 25p	MB3712 150p	BZX61 Range		4516 65p	74S14 40p	HA-1197 180p	TBA750 100p	6809 600p
BC107 7p	BD238 24p	MJE520 30p	ZTX550 24p	TA7205 90p	2V7to39V 12p		4518 65p	74LS20 25p	HA-1306W 220p	TBA800 35p	6821 150p
BC108 7p	BD433 28p	MJE2955K 90p		UPC575 100p		**CMOS**	4520 65p	74LS30 35p	HA-1319 250p	TBA810S 60p	6840 320p
BC109 7p	BD437 28p		2N1131 28p		**VOLTAGE REGULATORS**	4000 27p	4522 60p	74LS32 60p	HA-1339 220p	TBA820 75p	6850 130p
BC115 10p	BD535 38p	OC28 100p	2N1132 28p	**DIODES**		4001 27p	4526 60p	74LS38 40p	HA-1342 200p	TBA920 80p	8116 80p
BC118 11p	BD536 38p	OC29 80p	2N1613 24p	AA119 9p	7805 35p	4002 27p	4527 60p	74LS73 28p	HA-1366WR 200p	TBA950 80p	
BC140 19p	BD537 40p	OC35 100p	2N1711 24p	BY100 40p	7812 35p	4006 80p	4528 68p	74LS74 35p			
BC141 19p	BD538 40p	OC36 120p	2N2218A 24p	BY103 32p	7815 35p	4007 27p		74LS75 38p			
BC142 19p	BDX32 100p	OC45 50p	2N2219 24p	BY126 6p	7818 35p	4008 65p		74LS76 30p			
BC143 19p	BDX65 80p	OC71 30p	2N2221 23p	BY127 8p	7824 35p	4009 50p	**74 SERIES**	74LS86 38p			
BC147 6p	BF180 18p	OC72 50p	2N2222 23p	BY133 8p	7905 35p	4010 50p	7400 22p	74LS112 40p			
BC148 6p	BF181 18p	OC200 180p	2N2369 15p	BY164 22p	7912 40p	4011 27p	7401 16p	74LS113 32p			
BC149 6p	BF183 20p		2N2484 20p	BY176 85p	7915 40p	4012 27p	7402 18p	74LS125 45p			
BC157 6p	BF184 20p	R2008B 80p	2N2646 38p	BY179 35p	7918 40p	4013 50p	7403 22p	74LS138 50p			
BC159 6p	BF185 20p	R2010B 80p		BY182 32p	7924 40p	4014 60p	7404 18p	74LS139 45p			
BC182 6p	BF194 5p		2N2904 20p	BY184 32p	78L05 28p	4015 60p	7405 10p	74LS151 45p			
BC182L 6p	BF195 5p	TAG06-60 42p	2N2905 20p	BY187 32p	78L12 28p	4016 45p	7406 100p	74LS153 60p			
BC183 6p	BF196 6p	TAG521-200 72p	2N2906 18p	BY196 20p	78L15 28p	4017 65p	7407 80p	74LS157 35p			
BC183L 6p	BF199 6p	TAG4443 75p	2N2907 18p	BY206 11p	78L18 28p	4018 60p	7408 25p	74LS161 65p			
BC184 6p	BF200 18p	TAG4444 76p	2N2926 8p	BY207 11p	78L24 28p	4019 60p	7410 25p	74LS163 70p			
BC184L 6p	BF240 18p	TIP29 15p	2N3019 28p	BY208 18p	79L05 40p	4020 75p	7413 35p	74LS164 80p			
BC212 6p	BF241 10p	TIP29A 22p	2N3053 18p	BY210 22p	79L12 45p	4021 58p	7414 45p	74LS174 60p			
BC212L 6p	BF255 12p	TIP29C 25p	2N3054 35p	BY223 72p	79L15 48p	4022 58p	7417 32p	74LS192 50p			
BC213 6p	BF256 18p	TIP30 16p	2N3055 32p	BY225 120p	LM309K 100p	4023 27p	7420 22p	74LS197 52p			
BC213L 6p	BF257 18p	TIP31A 24p	2N3055H 38p	BY227 18p	LM317K 220p	4024 47p	7421 25p	74LS221 80p			
BC214 6p	BF258 18p	TIP32 24p	2N3440 58p	BY227 19p	LM317T 180p	4025 26p	7425 15p	74LS240 95p			
BC214L 6p	BF259 18p	TIP32A 24p	2N3442 85p	BY228 32p	LM323K 420p	4026 80p	7430 22p	74LS241 100p			
BC237 7p	BF336 20p	TIP33 50p	2N3702 9p	BY296 20p	LM723 32p	4027 38p	7437 28p	74LS244 180p			
BC238 7p	BF337 20p	TIP34 50p	2N3703 9p	BY298 26p	78HGKC 570p	4028 48p	7447 60p	74LS245 180p			
BC300 16p	BF338 20p	TIP41A 22p	2N3704 9p	BY299 28p	78HO5KC 520p	4029 55p	7442 45p	74LS247 50p			
BC301 18p	BF362 30p	TIP41C 25p	2N3705 9p	BY476 90p	78GU1C 190p	4030 36p	7450 22p	74LS248 50p			
BC302 18p	BF422 21p	TIP42A 22p	2N3706 9p	BYX10 15p	79GU1C 215p	4032 67p	7451 10p	74LS251 30p			
BC303 18p	BF456 19p	TIP42C 25p	2N3707 9p	BYX55/350 30p	79HGKC 670p	4034 145p	7454 25p	74LS257 55p			
BC327 6p	BF459 19p	TIP47 40p	2N3708 9p	BYX55/600 30p		4035 70p	7470 30p	74LS266 25p			
BC328 6p	BFX29 20p	TIP48 40p	2N3771 85p	BYX55/800 32p	**VALVES**	4038 71p	7473 30p	74LS290 30p			
BC337 6p	BFX84 20p	TIP110 47p	2N3772 90p	BYX70/300 29p	DY87 53p	4040 57p	7475 25p	74LS293 30p			
						4041 40p	7481 90p				

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WOOD & DOUGLAS

★ NEW CATALOGUE ★ NEW PRODUCTS ★ NEW TELEPHONE NUMBER ★ NEW PRICES ★

OUR FULL current product range is listed below but keep in touch at rallies and exhibitions throughout the Summer for our latest developments for you the **active** amateur.

Package Prices	Kit
1. 500mW TV T/mit (70FM05T4 + TVM1 + BPF433)	35.00
2. 500mW TV T/ceive (As 1 + TVUP2 + PSI 433)	60.00
3. 10W TV T/mit (As 1 + 70FM10 + BDX35)	65.00
4. 10W TV T/ceive (As 2 + 70FM10 + BDX35)	90.00
5. 70cms 500mW FM T/ceive (70T4 + 70R5 + SSR1 + BPF)	75.00
6. 70cms 10W FM T/ceive (As 5 + 70FM10)	105 00
7. 2M Linear/Pre-amp 10W (144PA4/S + 144LIN10B)	40.00
8. 2M Linear/Pre-amp 25W (144PA4/S + 144LIN25B)	42.00
9. 70cms Synth 10W T/ceive (R5 + SY + AX + MOD + SSR + 70FM10)	150.00
10. 2M Synth 10W T/ceive (R5 + SY + SY2T + SSR + 144FM10A)	120.00
11. 2M Crystal Cont'd 10W T/ceiver (R5 + T3 + BPF + 144FM10 + SSR)	85 00
12. 70cms Linear/Pre-amp (70LIN10 + 70PA2/S)	45.00

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FM Receiver (with PIN RF c/o)	70FM05R5	65.40	45.80
T'mitter 6 Channel Adaptor	70MC06T	21 30	14.25
Receiver 6 Channel Adaptor	70MC06R	25 20	17.90
Synthesiser (2 PCB's) -ditto- Transmit Amp	SY35B	88.00	62.25
-ditto- Modulator	A-X3U-06F	34.15	22.10
Bandpass Filter	MOD 1	8.95	5.50
PIN RF Switch	BPF 433	6.50	3 30
Converter (2M or 10M i.f.)	PSI 433	7.55	5.35
TV Products	70RX2/2	27.10	20.10
Receiver Converter (Ch 36 Output)	TVUP2	27 50	22.80
Pattern Generator (Mains PSU)	TVPG1	42 25	36.50
TV Modulator (For Transmission)	TVM1	9.85	5.75
Ch 36 Modulator (For TV Injection)	TVMOD1	9.80	5.50
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500mW to 10W	70FM10	41.45	33.45
3W to 10W	70FM3/10	23.95	18.30
10W to 40W	70FM40	65.10	52.35
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GaAs FET (16dB)	0PA5	20.10	12.80
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Converter (2M i.f.)	6RX2	28.40	20.80

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FM Receiver (with PIN RF c/o)	144FM2R5	65.50	47.20
Synthesiser (2 PCB's) -ditto- Multi/Amp (1.5W O/P)	144SY25B	78.75	60.05
	SY2T	27.80	20.65
Bandpass Filter	BPF 144	6.50	3.30
PIN RF Switch	PSI 144	7.55	5.35
Power Amplifiers (FM/CW Use)			
1.5W to 10W (No c/o)	144FM10A	24.15	18.50
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SLOW-SCAN TV FOR THE BBC MICRO

by Terry Weatherley

With the increasing popularity of home computers, some of the more esoteric modes of transmission used by radio amateurs worldwide are enjoying an upsurge in popularity. RTTY programs are available from many sources and now G3LIV and G8UEE have devised an add-on for the BBC computer which enables the user to receive slow-scan television transmissions that can be found on the HF and VHF bands. The pictures are displayed in fast scan on the computer monitor.

Origins of SSTV

Slow-scan television was devised in 1958 by Copthorne Macdonald, a young engineering undergraduate at the University of Kentucky. He was investigating the possibility of reducing the bandwidth of a wideband TV signal to be compatable with the narrow band voice signals that were at that time used for amateur communication.

A normal fast scan television picture occupies about 10MHz of bandwidth, while an SSB signal occupies about 3KHz. His experiments centred on reducing the amount of picture information sent and increasing the time taken to send each frame of the picture.

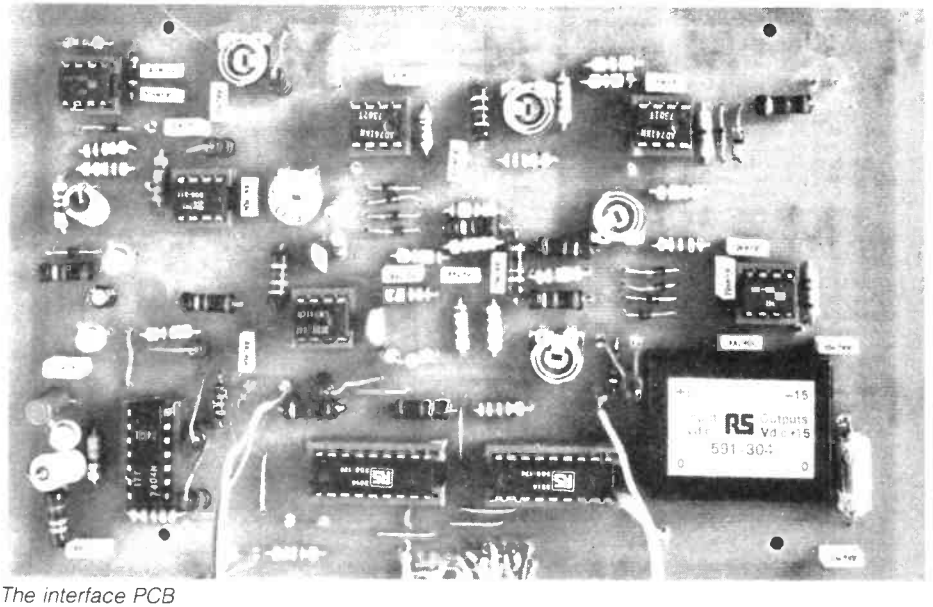
His experiments showed that the normal picture, at that time consisting of 525 lines, could be reduced to around 120 lines without degrading the picture too much. To achieve the desired bandwidth the picture information was to be built up on the tube over as long a period as possible. At that time storage scopes were very expensive, but surplus radar tubes with P7 phosphors were cheap and easily obtained.

Further experiments showed that a persistence of over 8 seconds could be expected from the P7 tube.

It was thought an advantage to link the horizontal line frequency to mains frequency band and thus 15Hz (60Hz/4) was chosen. This gave a 120 line picture over 8 seconds and was adopted as an SSTV standard.

Cop's original system used an AM subcarrier with the picture information transmitted as amplitude variations of a continuous tone of fixed frequency. Using a special licence he transmitted 'blind' on ten metres over a period of thirty days and was successful in sending pictures to G3AST in England. The tests and pictures received were reported in *QST* in March 1960.

Reception of a slow scan signal is quite



The interface PCB

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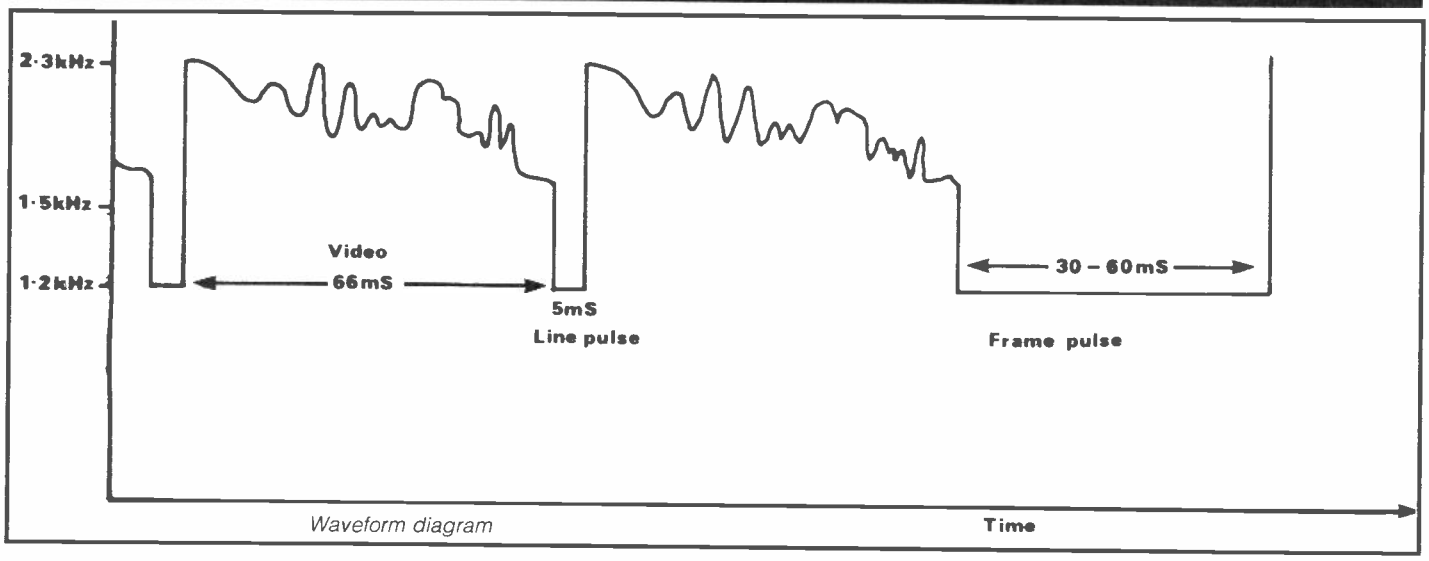


Comparison of normal 120 line mode (above & left) and 'fill' mode (right)

simple using conventional amateur receiving equipment. Tuning around 14.235MHz will usually locate an SSTV signal.

It is the display of the slow scan picture that has always been the difficult part. In the old days ex-radar CRTs with a long persistence phosphor were reasonably easy to obtain. Ex-TV scan coils driven by 741s completed the home-brew equipment.

SSTV is transmitted by modulating an SSB transmitter with an audio frequency corresponding to the light intensity at a particular point in the picture. Tones of frequencies of between 1500Hz and 2300Hz are used to represent the shades of grey used to build up the picture, 1500Hz being black with 2300Hz being white. Sync pulses are transmitted at 1200Hz.

The diagram above shows the waveform of two lines of SSTV picture. To the ear the SSTV picture sounds like a 'dialing tone' with 7 second 'pips'.

I remember building up a set of printed circuit boards from MK electronics to complete my first home-brew monitor. I was delighted to receive pictures from G3WW when it was completed. SSTV was certainly a mode for the experimenter.

More recently there have been some designs for SSTV receivers using modern memory chips. These digitise the received picture, store it in RAM and display it on a fast scan monitor or TV set.

G3LIV's interface turns the BBC model B computer into a quite sophisticated SSTV receiver. The interface consists of a single PCB which plugs into the BBC Micro's user port. Power to run the interface is taken from the computer's own supply.

Signal processing

Audio from a suitable receiver is fed into the interface and using the software provided the SSTV picture is displayed on the monitor screen.

The interface can be considered as a number of modules. The power supply section takes the computer's 5 volt supply and using a solid state voltage converter produced the ±15 volts required for the ICs.

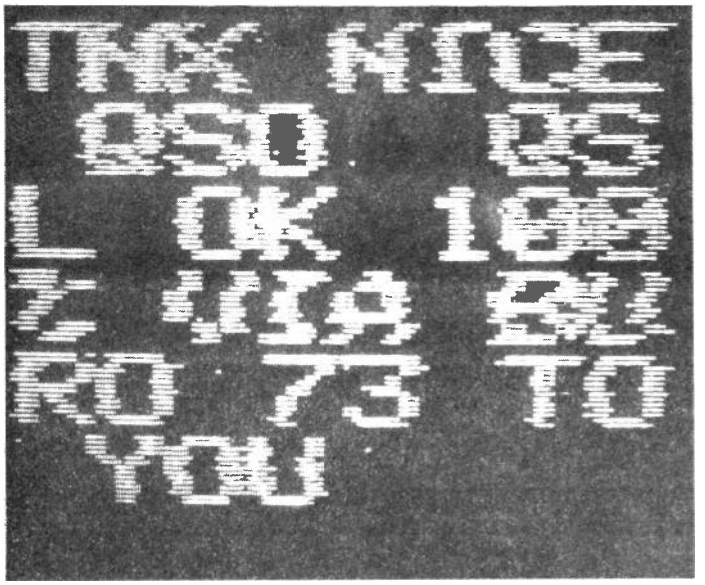
The incoming video is limited and filtered using active filters and this analogue signal is then digitised using a pair of LED bar-driver ICs. The line and frame sync pulses are detected using more active filters and all this data is then fed to the computer user port.

The software accompanying the package allows the user to control the output format. In standard mode the picture fills the whole of the screen.

SSTV format gives a square picture, and picture width, which is related to local mains frequency, can be adjusted from the keyboard. A condensed mode displays the picture in the top quarter of the screen and gives the appearance of a higher definiton picture.

The FILL mode fills in the alternate lines and gives a 'pixel picture'. This mode makes captions easier to read. A negative mode which reverses the black/white completes the software. The spacebar enables the user to either retrigger the picture or clear the screen.

The complete package is available



either as a built unit or as a bare PCB with the software cassette from G3LIV. On the reverse of the software cassette are some SSTV signals for setting up the unit including circles, checks and grey scale. The pictures overleaf come from this tape. The software makes provision for the newer 256 line mode which has a frame time of 32 seconds.

As can be appreciated this 'standard' gives excellent definition and may well become more common as modern digital receiving equipment becomes more cheaply available. This interface should encourage more people to receive SSTV and should help to popularise the mode.

SSTV has come a long way since the days of a smeary image on a surplus radar tube.

The photographs accompanying this article are taken from the TV screen and show the results obtained with the interface. The pictures overleaf illustrate the difference between the normal 120 line mode and the 'fill' mode. The pictures above are 'off-air' and show captions from OH5ZJ generated by a VIC 20.

G3LIV's address is: Mr J Melvin, 2 Salters Court, Gosforth, Newcastle, Tyne and Wear NE3 5BH. All enquiries should be accompanied by a stamped self-addressed envelope.

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HAVE YOU THOUGHT OF BECOMING AN AUTHOR?

We are always interested in receiving articles to be considered for publication and are particularly keen to hear from anyone who has something to say related to the amateur radio field. As mentioned before, projects for fellow readers to build are most welcome.

You don't need to be an expert writer. If you can get your ideas down on paper, preferably typed, with drawings that we can follow and photographs where relevant, we will sort out the style, grammar, spelling etc.

If you have an idea for an article, or have designed and built a project that you think others would be interested in, but still have doubts about becoming an author, why not write (giving brief details and your *telephone number*) or telephone the editorial dept. . and of course you will be paid for your effort.

LATEST LITERATURE

Clubs, manufacturers, publishers and agents are invited to send details of new books; catalogues, data sheets, etc for inclusion on this page

RADIO REPAIR

Second edition, by Les Lawry-Johns

Available since April of this year, this 106 page paperback forms part of the Newnes Question and Answer series.

It has been extended over the first edition, published in 1979, with more information in the chapter on valved radios and the addition of a final revision chapter on fault-finding procedure.

Although only a small book, it contains much useful information on the more common faults occurring in radio equipment.

Basic theory is not covered, as companion volumes are available for this, and the emphasis is very much on the practical side.

The very first page of chapter one has a list of basic equipment needed, with the assumption that the reader does not have access to a signal generator, an oscilloscope, or the other more expensive test instruments.

Also very useful is the appendix, a spare parts list detailing a few components to be kept on hand to allow repairs to be made immediately without carrying a large expensive stock.

Ideal for beginners and students as a clear and concise pocket book, it is probably also worthy of consideration by those with a little more experience.

Available from Newnes Technical Books at £2.65

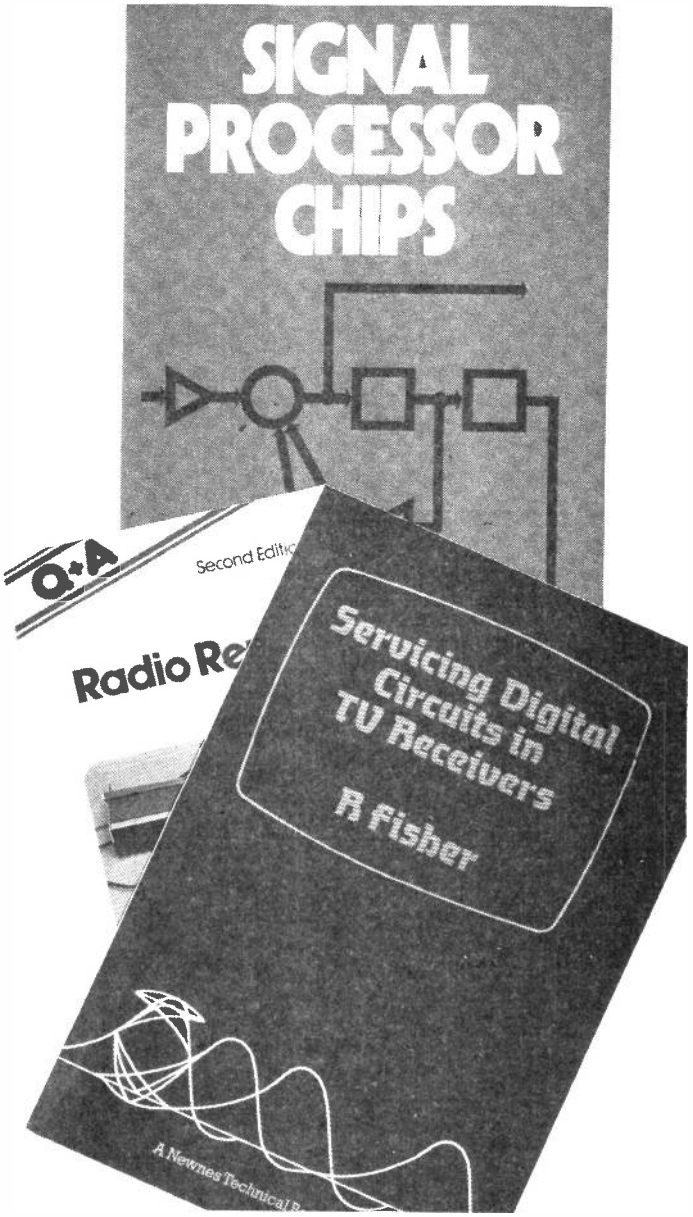
MOTOROLA RF DATA MANUAL

This updated third edition of Motorola's RF Data Manual contains detailed information on this company's RF product line.

In addition to the list of devices (more than 500) and their data sheets, there are nineteen application notes, twenty-two engineering bulletins, and a combined index and cross-reference.

Recent additions to the Motorola range are included, such as dual-gate GaAsFETs for low-cost operation at 1GHz, and state-of-the-art 800MHz discretes and hybrids for cellular base station and mobile radio designs.

Available from Motorola Distribution Centre, PO Box 20924, Phoenix, Arizona 85036, USA at $6.25, with discounts for orders of ten or more (reference DL110)



SERVICING DIGITAL CIRCUITS IN TV RECEIVERS

By R Fisher

This technical book, published in July, was written primarily for the qualified TV engineer and the student studying for the City and Guilds course 'Digital Information and Reception'.

This should not deter the interested amateur, since it is intended to give a solid grounding to those who have a certain knowledge of analogue techniques but no experience at all of digital circuits.

The first half of the book covers basic digital techniques which are widely used throughout logic systems, with the later chapters covering specialist applications.

It is a clearly-written, well-illustrated theoretical textbook rather than a guide to the practical side of TV servicing and, even with the more generally applicable digital theory, is probably only a worthwhile investment for the keenest ATVer.

Available from Newnes Technical Books at £13.95

SIGNAL PROCESSOR CHIPS

Edited by David Quarmby

Published in August, this is another technical book for engineers and students in their later years of study.

It covers three programmable signal processors, the Intel 2920, the Texas Instruments TMS320, and the Nippon Electric Company NEC7720.

The chapters on each chip are written by an expert in a senior position with the relevant company, with the editor contributing chapters giving background and applications, the commonly used algorithms, and a summary of future trends.

The style is unusual for such a textbook; mathematics have been avoided totally, although references are given, and it reads easily and clearly, assuming the reader has a sound knowledge of basic theory.

The outlook is a predominantly practical one, giving detailed examples of uses for each device. However, for all its clarity and good style, it is a textbook intended for use by professionals and aspiring professionals.

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BC119	0.24	BD115	0.30	BF258	0.28	MRF237	3.45	2SC496	0.80
BC125	0.25	BD116	0.60	BF259	0.28	MRF450A		2SC931D	0.95
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BC140	0.31	BD131	0.42	BF273	0.13	MRF453	17.50	2SC1106	2.50
BC141	0.25	BD132	0.42	BF336	0.34	MRF454	23.50	2SC1172Y	2.20
BC142	0.21	BD133	0.40	BF337	0.29	MRF475	2.50	2SC 1173	1.15
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D13-33GM	49.00	F31-10LC	65.00	M36-141LA	75.00	V7031/67A	59.00
D13-47GH/26	55.00	F31-10LD	65.00	M36-141LG	75.00	V7035A	49.00
D13-47GH/34	55.00	F31-12LC	65.00	M36-141W	75.00	V7037GH	45.00
D13-47GH	55.00	F31-12LD	65.00	M36-170LG	75.00	V8004GR	65.00
D13-51GH/34	85.00	F31-13GR	65.00	M38-100GR	65.00	V8006GH	65.00
D13-51GL/26	85.00	F31-13LD	65.00	M38-101GH	65.00	V8010A	65.00
D13-51GM/26	85.00	F31-13LG	65.00	M38-103GR	65.00	2BP1	9.00
D13-450GH/01	55.00	F41-123LC	160.00	M38-113GH	65.00	3BP1	13.50
D13-471GH/26	55.00	F41-141LG	160.00	M38-120W	65.00	4EP1	30.00
D13-550GH	65.00	F41-142LC	185.00	M38-120WA	65.00	3H/OBM	55.00
D13-600GM	59.00	M7-120W	19.00	M38-121GR	65.00	5BP1	9.00
D13-610GH	59.00	M14-100GM	45.00	M38-121GHR	65.00	5BHP1	30.00
D13-610GM	59.00	M14-100KA	55.00	M38-121LA	65.00	5BHP1FF	30.00
D13-611GH	59.00	M14.100LC	45.00	M38-121WA	65.00	5BHP31	30.00
D13-611GM	59.00	M17-151GVR	175.00	M38-122GH	65.00	5CP1	10.00
D13-630GH	59.00	M17-151GR	175.00	M38-122GW	65.00	6EP7/S	39.00
D14-120GH08	65.00	M19-100GY	55.00	M38-140LA	65.00	13BP1	13.50
D14-121GH09	65.00	M19-101GR	55.00	M38-141LA	65.00	13BP4	17.50
D14-150GH	75.00	M19-103W	55.00	M38-142GR	65.00	17DWP4	25.00
D14-150GM	75.00	M23-110GH	55.00	M38-142LA	65.00	32J/1085	69.00
D14-172GH/84	59.00	M23-111W	55.00	M38-340P31	65.00	88D	15.00
D14-172GR	55.00	M23-111GH	55.00	M38-341GR	65.00	89B	15.00
D14-172GV	55.00	M23-111LD	55.00	M38-341P31	65.00	89D	15.00
D14-173GH	55.00	M23-112GM	55.00	M38-344P39	65.00	89L	15.00
D14-173GM	53.00	M23-112GV	55.00	M40-120W	59.00	1273	39.00
D14-173GR	55.00	M23-112GW	55.00	M43-12GM/01	65.00	1564	39.00
D14-181GH/62	65.00	M23-112KA	55.00	M43-12LG/01	65.00	1844	45.00
D14-181GH/98	65.00	M23-112LD	55.00	M44-120LC	65.00	55451GM	75.00
D14-181GJ	55.00	M23-112W	55.00	M44-120GR	65.00	9442E1	80.00
D14-181GM	53.00	M24-120GM	59.00	M47-25GR/22	65.00	95447GM	75.00
D14-181GM50	59.00	M24-120GR	59.00	M50-120GH	65.00	95449	75.00
D14-181W	55.00	M24-120LC	59.00	M50-120GR	65.00	7709631	79.50
D14-182GH	59.00	M24-120WAR	59.00	M50-120GV	65.00		

DIODES

AA119	0.08	BY210-800	0.33	1N23B	2.95
BA115	0.13	BY223	0.90	1N23C	2.95
BA145	0.16	BY298-400	0.22	1N23ER	2.95
BA148	0.17	BY299-800	0.22	1N23WE	2.95
BA154	0.06	BYX10	0.20	IN4001	0.04
BA156	0.15	BYX36-150R		IN4003	0.04
BA157	0.30		0.20	IN4004	0.05
BAX13	0.04	BYX38-600R		IN4005	0.05
BAX16	0.06		0.60	IN4007	0.06
BB105B	0.30	BYX55-600	0.30	IN4148	0.02
BT151	0.79	BYX71-600	1.10	IN4448	0.10
BY126	0.10	BZX61	0.15	IN5401	0.12
BY127	0.11	BZY88	0.10	IN5402	0.14
BY133	0.16	BZY95C30	0.35	IN5403	0.12
BY164	0.45	CS4B	4.50	IN5406	0.13
BY176	1.20	CS10B	8.45	IN5407	0.16
BY179	0.63	OA47	0.09	IN5408	0.16
BY182	0.56	OA90	0.05	ITT44	0.04
BY184	0.35	OA91	0.06	ITT923	0.15
BY199	0.40	OA95	0.06	ITT2002	0.10
BY206	0.14	OA202	0.10		
BY208-800	0.33	1N21DR	2.95		

BASES

B5D	5.50
B7G	0.15
B7G SKTD	0.25
B8G	0.70
B8H	0.70
B9A	0.25
B9ASKTD	0.40
B9G	0.75
B10B	0.20
B13B	0.50
B14A	3.00
12 Pin CRT	
	0.95
Nuvistor	2.95
Octal	0.35
SK610	35.00
UX5	1.75
UX7	1.75
Valve Can	0.30
8 Pin Dil	0.14
14 Pin Dil	0.15
16 Pin Dil	0.17
18 Pin Dil	0.18

WIREWOUND RESISTORS

4 Watt 5R6-10K	0.20
7 Watt R47-22K	0.20
11 Watt 1R5-15K	0.25
17 Watt 1R-15K	0.30

ZENER DIODES BZX61 0.15

6V2 7V5 8V2 9V1 10V
11V 12V 13V 15V 16V
18V 20V 22V 24V 27V
30V 33V 36V 39V 47V
51V 56V 68V 75V

THERMISTORS

VA1040	0.23
VA1056S	0.23
VA1104	0.70
VAT8650	0.46
VA1097	0.25

BZY88 0.07

2V7 3V 3V3 3V6 3V9
4V3 4V7 5V1 5V6 6V2
6V8 7V5 6V2 9V1 10V
11V 12V 13V 15V 18V
20V 24V 27V 30V

BATTERIES

7V Power Mike batteries TR175 £2.25 ea other prices on request

LINE OUTPUT TRANSFORMERS

DECCA 100	7.95
DECCA 1700 MONO	9.95
DECCA 1730	8.95
DECCA 2230	8.25
GEC 2040	8.95
GRUNDIG 1500	15.45
GRUNDIG 5010-6010 2222, 5011-6011	13.45
ITT CVC20	8.20
ITT CVC30	8.25
PHILIPS G8	8.50
PHILIPS C9	8.99
PHILIPS G11	13.39
PYE 725	10.95
RBM T20A	12.40
TANDBERGE 90	11.15
TELEFUNKEN 711A	11.15
THORN 1590	9.50
THORN 8000	9.20
THORN 9000	9.95
THORN 9800	22.40
THORN MAINS TRANSFORMER 3000/3500	9.70

SOLDERING EQUIPMENT

25W Antex Iron	4.59
Weller Instant Heat Gun	11.30
240V Weller Marsman	4.74
½ Kilo Solder 60/40	6.95

EHT MULTIPLIERS

ITT CVC20	6.35
ITT CVC30	6.35
PHILIPS G8 550	6.96
RANK T20A	6.91
THORN 3000/3500	7.57
THORN 8500	5.50
THORN 9000	8.00
UNIVERSAL TRIPLER	5.45

REPLACEMENT ELECTROLYTIC CAPACITORS

DECCA 30 (400-400/350V)	2.85
DECCA 80/100 (400/350V)	2.99
DECCA 1700 (200-200-400-350V)	3.55
GEC 2110 (600-300V)	2.25
ITT CVC20 (220/400V)	1.80
PHILIPS G8 (600-300V)	2.25
PHILIPS G9 (2200/63V)	1.19
PHILIPS G11 (470/250V)	2.35

POTENTIOMETERS

STANDARD VERTICAL POTS	0.12
MIN VERTICAL POTS	0.12
STANDARD HORIZONTAL POTS	0.12
MIN HORIZONTAL POTS	0.12
CONVERGENCE PRE-SETS	0.30
SLIDERS LOG	0.48
SLIDER LINEAR	0.48

SPARES & AIDS

FOAM CLEANSER	0.79
FREZE IT	0.82
SOLDA MOP	0.64
SWITCH CLEANER	0.79
WD40	1.25
PUSH PUSH MAINS SWITCH (DECCA GEC RANK THORN ETC)	1.02
PYE IF GAIN MODULE	6.99
ANODE CAP (27KV)	0.69

PUSH BUTTON UNITS

DECCA ITT CVC20 6 WAY	7.95
ITT CVC5 7 WAY	0.19
PHILIPS G8 (550) 6 WAY	14.49

VARICAP TUNERS

ELC1043/05 MULLARD	8.65
ELC1043/06 MULLARD	8.65
U321	8.25
U322	8.25

20MM ANTI SURGE FUSES

100MA-800MA	15p each
1A-5AMP	12p each

20MM QUICK BLOW FUSES

100MA	8p each
200MA-5AMP	5p each

PHONE 0474 813225 3 LINES

P.M. COMPONENTS LTD

DEPT REW SELECTRON HOUSE, WROTHAM ROAD MEOPHAM GREEN, MEOPHAM, KENT DA13 OQY

VISA

TELEX 966371 PM COMP

A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714	18.50
A1998	11.50
A2087	11.50
A2134	14.95
A2293	6.50
A2599	37.50
A2792	17.50
A2900	11.50
A3042	24.00
A3283	24.00
AC/THI	4.00
ACT22	59.75
AC/S2PEN	8.50
AH221	39.00
AH238	39.00
AL60	6.00
AN1	14.00
ARP12	0.70
ARP34	1.25
ARP35	2.00
ATP4	2.50
AX50	5.50
AZ11	4.50
AZ31	2.50
BL63	2.00
BS450	67.00
BS810	55.00
BS814	55.00
CIK	19.00
C3JA	21.00
C1112G	70.00
C1108	64.95
C1134	32.00
C1148A	115.00
C1149/1	130.00
C1150/1	135.00
C1534	32.00
CCA	2.80
CC3L	0.90
CL33	2.00
CV Nos Prices on request	
D63	1.20
DA41	22.50
DA42	17.50
DA90	4.50
DA100	125.00
DAF91	0.45
DAF91	0.70
DAF96	1.00
DC70	1.75
DC90	1.20
DCX4-1000	12.00
DCX4-5000	25.00
DET16	28.50
DET18	28.50
DET23	35.00
DET24	39.00
DET25	22.00
DF91	0.70
DF92	0.60
DF96	0.65
DF97	1.00
DH63	1.20
DH77	0.90
DH79	0.56
DH149	2.00
DK91	0.90
DK92	1.20
DK96	2.50
DL35	2.50
DL63	1.00
DL70	2.50
DL73	2.50
DL91	1.50
DL92	0.95
DL93	1.10
DL94	2.50
DL96	2.50
DLS10	13.50
DLS16	10.00
DM70	1.95
DM160	2.75
DY51	1.50
DY86/87	0.65
DY802	0.72
E80CC	9.95
E80CF	11.00
E80F	13.50
E80L	11.50
E81CC	3.15
E81L	12.00
E82CC	3.50
E83CC	3.50
E83F	5.50
E86C	9.50
E88C	7.95
E88CC	3.50
E88CC Siemens Special	5.95
E90CC	7.95
E90F	7.95
E91H	4.50
E92CC	3.95
E99F	6.99
E130L	19.95
E180CC	6.50
E182CC	9.00
E180F	6.50
E186F	8.50
E188CC	7.50
E280F	19.50
E283CC	10.00
E288CC	13.50
E810F	18.15
E1148	1.00
E1524	6.95
EA50	1.00
EA76	1.95
EA79	1.95
EAA91	0.60
EABC80	0.70
EAC91	2.50
EAF42	1.20
EAF801	3.50
EB34	1.50

EB41	3.95
EB91	0.52
EBC33	2.50
EBC41	1.95
EBC81	1.50
EBC90	0.90
EBC91	0.90
EB91	0.60
EBF33	2.50
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	5.50
EC92	1.25
EC93	1.50
EC95	7.00
EC97	1.10
EC8010	12.00
ECC32	3.50
ECC33	3.50
ECC35	3.50
ECC81	1.15
ECC82	0.55
ECC82 Mullard	1.50
ECC82 Philips	1.10
ECC83	0.65
ECC83 Philips	1.95
ECC84	0.50
ECC85	0.60
ECC86	2.75
ECC88	0.85
ECC91	2.00
ECC180	0.72
ECC189	0.78
ECC801S	3.50
ECC803S	3.50
ECC804	0.60
ECC807	2.50
ECC2000	12.00
ECF80	0.85
ECF82	0.85
ECF86	1.70
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF804	6.00
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	2.15
ECH42	1.00
ECH81	0.65
ECH83	0.78
ECH84	0.69
ECH2000	1.50
ECL80	0.60
ECL82	0.65
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.80
ECL805	0.69
EF37A	2.00
EF39	1.10
EF41	3.50
EF42	3.50
EF50	2.50
EF55	4.95
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.50
EF85	0.50
EF86	1.25
EF86 Special quality	2.50
EF89	0.85
EF91	1.50
EF92	2.15
EF93	0.95
EF94	0.95
EF95	1.00
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
EF732	3.50
EB800	11.00
EF805S	13.50
EF806S	14.50
EF812	0.65
EFL200	1.50
EH90	0.72
EK90	0.72
EL32	0.95
EL33	4.00
EL34	2.25
EL34 Mullard	3.95
EL34 Philips	4.50
EL36	1.50
EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL84	0.75
EL85	4.50
EL86	0.85
EL90	1.50
EL91	6.00
EL95	0.70

EL153	12.15
EL183E	3.50
EL183P	3.50
EL360	6.75
EL500	1.40
EL504	1.40
EL509	5.25
EL519	6.95
EL802	3.65
EL821	8.50
EL822	12.95
EM1	9.00
EM4	9.00
EM80	0.70
EM81	0.70
EM84	1.65
EM85	3.95
EM87	2.50
EN10	8.00
EN32	13.50
EN91	1.10
EN92	4.50
ESU872	25.00
EY51	0.80
EY81	1.50
EY83	1.50
EY84	5.95
EY86/87	0.50
EY88	0.55
EY91	5.50
EY500A	1.50
EY802	0.70
EZ35	0.75
EZ40	2.75
EZ41	2.15
EZ80	0.75
EZ81	0.75
EZ90	1.50
F6064	2.95
FW4/800	2.95
G55/1K	9.00
G180/2M	9.00
G240/2D	9.00
G400/1K	14.00
GC10B	17.50
GC10D	17.50
GC10/4B	17.50
GC10/4E	17.50
GC12/4B	17.50
GD86W	6.00
GDT120M	5.00
GE10	9.00
GN4	6.00
GN10	15.00
GR10G	4.00
GS10C	16.50
GS10H	12.00
GS12D	12.00
GT1C	14.00
GT1C S/S	13.00
GTE175M	8.00
GTR150W	1.00
GU20	35.00
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.20
GY802	1.00
GZ30	1.00
GZ31	1.00
GZ32	1.00
GZ33	4.50
GZ34	2.15
GZ37	4.50
HAA91	1.00
HABC80	0.90
HBC90	0.75
HBC91	0.80
HF93	0.75
HF94	1.50
HK90	1.06
HL2K	3.50
HL23DD	4.00
HL41	3.50
HL42DD	3.50
HL90	0.70
HL92	1.50
H133/DD	3.50
HR2	4.00
HY90	1.00
HVR2	3.00
K391A	95.00
K3118	86.00
KR6/3	45.00
KT8C	7.00
KT33C	3.50
KT36	2.00
KT44	4.00
KT45	4.00
KT61	4.00
KT63	2.00
KT66 OSRAM	10.50
KT66 USA	6.90
KT66 GEC	14.95
KT77 Gold Lion	9.50
KT81	7.00
KT88 USA	9.00
KT88 Gold Lion	15.95
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
L63	1.50
L102/2K	6.95
L120/2K	12.00
LB7-20	95.00
LS9B	6.95
M502A	60.00
M537A	60.00
M5143	155.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50

M8099	5.00
M8100	5.50
M8136	7.00
M8137	5.50
M8161	6.50
M8162	5.50
M8163	5.50
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.50
ME1401	29.50
ME1402	29.50
ME1501	14.00
MH4	3.50
MHLD6	4.00
ML4	4.50
MS4B	5.50
MU14	1.50
N37	12.50
N78	9.85
OA2	0.85
OA2WA	1.50
OA3	2.50
OB2	0.85
OB2WA	1.25
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65
PCF82	0.60
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL200	1.60
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PFL200	0.95
PL21	2.50
PL36	0.95
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802	5.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
QB-110BA	47.50
QB3-300	69.50
QEO3-10	3.50
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEO3-12	6.50
QQEO3-20	27.00
QQVO2-6	16.50
QQVO3-10 Mullard	9.50
QQV03-10	5.50

QQVO3-20A	16.50
QQVO3-20B	32.00
QQVO6-40A	23.95
QQVO7-50	63.50
QQZO3-20	42.50
QQZO6-40A	45.25
QS72/20	1.50
QS75/40	3.00
QS92/1D	6.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	2.00
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50
QU37	11.50
QVO3-12	4.95
QVO5-25	1.75
QVO6-20	29.50
QV2-250C	45.00
QVO8-100	145.00
QY3-125	49.50
QY4-250	65.00
QY4-400	71.95
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RG4-1000	10.00
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	33.50
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/800	5.00
SC1/1100	6.00
SC1/1200	5.00
SC1/1300	6.00
SC1/2000	9.00
SD6000M	45.00
SP2	1.50
SP4B	4.95
SP41	5.00
SP42	3.00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2 5/300	65.00
TB2-300	45.00
TB3/2000	395.00
TBL-2-300	275.00
TD1-100A	25.00
TD03-10F	28.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT15	34.95
TT21	29.00
TT22	29.00
TT100	57.00
TTR-31MR	65.00
TY2-125A	60.00
TY4-400	70.00
TY7-6000A	365.00
TY8-600W	365.00
TYS2/250	375.00
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00

U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	2.95
UBC81	1.50
UBF89	0.60
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	1.20
UCH42	1.35
UCH81	0.65
UCL82	1.75
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.50
UL44	3.50
UL84	0.85
UU5	3.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XP1002	29.00
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	99.50
Y65	6.95
Y503	25.00
Y602	12.00
YD1100	75.00
YJ1060	265.00
YL1020	29.00
YL1070	115.00
YL1071	109.00
YL1290	85.00
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.60
Z759	19.95
Z800U	3.00
Z803U	18.95
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1A3	4.50
1AC6	1.20
1B3GT	1.95
1B22	10.00
1B24	14.95
1B35A	29.50
1BC2A	2.50
1C1	2.50
1C5GT	2.50
1D5	2.50
1FD1	2.50
1G3GT	2.50
1K3GT	2.50
1L4	0.60
1LA6	1.00
1N1	4.50
1N2	4.50
1P28	25.00
1N5GT	2.50
1P28	25.00
1S2	0.55
1S5	0.70
1T4	0.70
1U5	1.00
1X2B	1.40
1Z2	8.95
2B22	69.50

2C21	1.00
2C39A	23.50
2C39BA	39.50
2C40	37.00
2C40A	55.00
2C42	29.50
2C51	0.75
2C53	32.00
2CY5	1.50
2B7	1.50
2D21	0.95
2D21W	2.50
2E26	7.95
2J42	93.00
2K25	24.95
2K25 Ray	75.00
2K26	95.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3B2	3.00
3B4	7.00
3B7	4.50
3B24	10.00
3B26	24.00
3B28	12.00
3BZ6	1.50
3C4	1.00
3C45	24.00
3CB6	1.50
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3D22	19.50
3E22	49.50
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3EJ7	1.95
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4C27	25.00
4C28	25.00
4CB6	1.95
4CX250B ITT	37.50
4CX250B EIMAC	49.00
4CX250B surplus ex-government	12.50
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4CX250K EIMAC	95.00
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4GV7	2.25
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5A-206K	10.00
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4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
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5B.110M	10.00
5B-254M	14.50
5B-255M	14.50
5B255M	19.50
5B/256M	9.00
5B-257M	9.00
5B-258M	14.50
5C22	69.00
5R4GB	2.80
5R4GY	2.80
5T4	5.95
5U4G	1.95
5U4GB	2.50
5V4G	1.25
5Y3GT	1.95
5Z4GT	0.85
6/30L2	0.70
6A/203K	9.00
6A7	4.95
6A8G	1.50
6AB8	0.66
6AC7	2.00
6AF4A	2.50
6AF9	4.15

6AG5	1.50
6AG7	1.95
6AH6	1.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.00
6AK6	2.00
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.50
6AN5	2.65
6AN8A	2.65
6AQ5	1.50
6AQ8	0.65
6AR8	3.95
6AS5	1.50
6AS6	1.50
6AS7G	4.50
6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BD4	1.50
6BD6	1.00
6BE6	0.72
6BF5	1.60
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.20
6BK4	4.00
6BK7A	1.95
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	2.35
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	0.65
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BS8	2.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6BZ6	2.50
6BZ7	2.95
6C4	1.10
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C15	2.50
6C18	2.50
6CA4	3.50
6CA7	3.50
6CB5	3.95
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CH6	6.95
6CL3	3.95
6CL6	3.25
6CL8A	2.00
6CM5	1.60
6CM7	2.95
6CS6	0.75
6CW4	6.50
6CY5	1.00
6CY7	2.50
6DC6	2.95
6DK6	1.15
6DQ5	3.35
6DQ6B	2.50
6DW4	2.15
6EA4	4.95
6EA7	2.50
6EA8	2.50
6EB8	1.75
6EM5	2.50
6EM7	2.50
6EU7	£1.95
6EU8	1.75
6EV7	2.95
6EW7	4.50
6EW6	1.50
6F1	2.00
6F5	4.95
6F7	5.50
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F22	0.70
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.26

6F33	17.00
6FG5	1.95
6G6G	5.50
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GS7	2.15
6GV7	2.50
6GW8	2.50
6H1	9.50
6H3N	1.10
6H6	1.95
6H6GT	1.95
6HS6	4.95
6J4	1.10
6J4WA	3.15
6J5	2.50
6J6	0.65
6JB6A	3.95
6JE6C	4.95
6JS6C	4.95
6JU8	2.50
6J7	2.50
6K7G	0.70
6K8Y	3.95
6KD6	5.50
6KM8	2.50
6KT8	2.95
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC (GE)	3.95
6L6GT	1.15
6LD20	0.60
6LF6	4.50
6LJ8	2.50
6LQ6	4.95
6L15	3.15
6N7	2.50
6N7GT	2.50
6P15	1.50
6P25	4.00
6P26	4.00
6P28	2.00
6Q7	1.20
6Q7GT	1.20
6R7G	3.15
6S4A	1.50
6S7	1.10
6SA7GT	1.00
6SC7	1.50
6SG7	1.20
6SH7	1.20
6SJ7GT	1.20
6SK7	0.80
6SK7GT	1.20
6SL7GT	0.85
6SN7GT	0.65
6SQ7	0.80
6SS7	1.95
6U4GT	1.75
6U8	0.85
6U8A	1.50
6V6GT	0.85
6X2N	1.00
6X4	1.50
6X5GT	0.55
6X5GTY	1.00
6X8A	2.25
7A6	4.50
7A7	2.00
7AD7	1.75
7AU7	1.50
7B7	2.50
7C6	2.50
7E7	2.50
7J7	5.50
7V7	4.15
7Y4	1.95
8B10	2.50
8BQ5	1.95
8D8	2.50
8EQ7	1.95
85A8	1.50
10D2	1.25
10DE7	2.50
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD11	1.00
10LD12	0.65
11E2	16.50
11E3	55.00
12A6	3.95
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	0.95
12AT7	1.15
12AT7WA	2.50
12AU6	1.50
12AU7	0.55
12AV6	0.80
12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	3.50
12BA6	1.50
12BE6	1.95
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12BZ6	4.95

12CA5	1.95
12CX6	1.20
12DQ6B	3.50
12DW4A	3.50
12DW7	2.50
12E1	17.95
12E14	28.00
12GN7	4.50
12HG7A	4.50
12J7GT	3.50
12K5	1.00
12K7GT	0.60
12K8	1.10
12SA7GT	1.00
12SG7	4.75
12SH7	1.00
12SK7	1.00
12SJ7	0.60
12SN7GT	1.85
12SQ7GT	1.50
13D3	3.20
13D7	3.20
13D7	2.50
13DR7	2.95
13EM7	3.50
14S7	1.00
17EW8	0.96
17JZ8	2.75
18D3	1.60
19AU4GT	2.50
19G3	17.00
19H4	23.95
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
20P5	1.15
21LU8	2.50
24B1	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95
30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
31JS6A	5.50
33A/158M	19.50
44A/158M	19.50
35A5	4.50
35L6GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
42	6.95
47	6.00
60B5	1.60
50A5	1.50
50C5	0.95
50CD6G	1.15
50EH5	1.50
53CG	15.00
60JY6	2.95
52KU	2.00
61SPT	4.50
75B1	2.50
75C1	2.50
83	6.50
84	3.00
85A1	6.50
85A2	1.50
90AV	10.00
92AG	19.50
92AV	12.50
95A1	6.50
108C1	1.50
150B2	6.95
150C2	1.50
150C4	2.15
155UG	26.00
274A	15.00
1858T	1.50
307	5.00
328A	15.00
388A	17.50
404A	10.95
425AF	[illegible]
431U	2.00
5636	5.50
5678	7.50
572B	35.00
5847	10.95
5879	8.50
5886	13.95
6058	2.50

6064	2.95
6158	3.20
6205	6.95
6688	6.50
6870	11.50
6887	9.50
6973	4.50
705A	8.00
708A	8.00
715A	6.00
715C	45.00
7167	3.95
7189A	2.95
7199	4.95
7233	7.95
7239	17.50
725A	275.00
7462	15.00
7475	5.00
7486	75.00
7551	5.48
7558	9.45
7586	15.00
7587	26.95
7591A	4.95
7609	40.00
7788	18.50
7733	5.50
7868	3.95
803	14.95
805	39.00
807	1.60
810	45.00
811A	12.95
813	18.50
813USA	45.00
829B	14.50
833A	60.00
866A	3.50
872A	19.00
873	60.00
884	5.50
8012	15.00
8042	45.00
8102	3.95
8106	2.95
8136	1.00
8156	10.95
8245	107.50
8298A	6.50
8417	5.95
9001	1.50
9006	0.90
927	15.00
930	9.95
931A	13.95
954	1.00
955	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
1927	25.00
2050W	4.50
2050	2.75
3545	4.00
4313C	4.00
4328D	9.00
5642	9.50
5651	2.50
5654	1.95
5663	1.95
5670	3.25
5672	4.50
5687	4.50
5692	3.50
5696	2.75
5702	5.50
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
5751	2.95
5763	4.95
5814A	3.25
5829WA	6.50
5840	3.50
5842	11.00
5894	39.50
5899	4.50
5963	2.00
5965	2.25
6005	1.85
6012	10.00
6021	3.65
6057	2.50
6059	3.75
6060	2.25
6062	4.50
6063	2.00
6094	3.25
6067	1.95
6072	4.20
6080	4.75
6080WA	8.50
6096	2.85
6132	10.00
6136	2.50
6146B	7.50
6157	2.60
6201	6.45
6211	2.50
6267	1.50
6350	2.00
7025	2.50
7189A	2.95
7247	2.00
7360	8.95
7475	5.00
7587	26.95
7591A	4.95
7609	40.00
8417	5.95
18042	10.00
18045	10.00

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NOTES FROM THE PAST

The opening remarks made by Centre Tap in 1951 were in the days when the BBC had a broadcasting monopoly and regular TV transmissions were in their infancy. The workshop tip is of interest and the comments on patenting are just as relevant today.

Once or twice this column has had a few words to say on the question of wired, or relay, radio.

It gives, of course, freedom from interference as well as other advantages. The disadvantage that it might also further strengthen the BBC monopoly was also considered. It is bad enough to have only one employer of broadcast talent, without the poor listener having the only door of escape slammed in his face.

Not that I have ever yet found anybody who listens to foreign broadcast propaganda – even to the Russian transmissions which, despite good reception over here, are deadly dull and pyschologically feeble.

I cannot imagine the audience for BBC Russian transmissions is much bigger. Those who should know tell me that in the towns, at least, radio diffusion is installed in every block of workers' tenements. No doubt the local Commissar sees that any foreign propaganda is excluded.

According to recently published intimate close-ups of Hitler, he is quoted as having been anxious to introduce wired radio in Germany so that the State would be better able to control what the people should hear – and what they should be prevented from hearing! Apparently it was too big a job for the Propaganda Ministry to push through in time.

The bright side

During recent months I have had quite a number of visitors to the Shack who have commented on the brightness of all exposed aluminium and steel parts. Not that I have kept everything as spick and span as I should have liked. In fact, this year I missed out the annual Spring clean. Frankly I admit to being unhygienic enough to prefer a good old-fashioned warm fug as a Shack atmosphere in the winter months – I like to put a real finish on a job of construction as it is completed. Preferably one that will last until the next Spring clean at least. This one is guaranteed to withstand the thickest tobacco smoke haze. I have used it for some years and proved it not only durable, but finger-mark proof, although it is probably far from being original.

Dissolve a few strips of clear celluloid in amyl acetate – the stuff with the pear drop odour – and keep dissolving it until you get a varnish like, syrupy consistency. (Yes, old timer, the same dope we used to paint on our stretched linen diaphragm speakers way back in 1926 before moving coils were thought of). And don't forget to keep it stoppered while dissolving. That is not a quick process either.

I could just say, then spread it on plated parts, aluminium dials, etc, and leave it at that, but the last time I discussed metal treatments (that time it was matt and satin finishes) quite a number of readers wrote in for more details to be sure of getting the best results. So here's the full story.

A single application will last for a very long time providing the surface is clean and that it is not put on when the metal is very cold.

Plated parts just need wiping, but plain surfaces should be polished with a non-abrasive preparation. Most proprietary polishes will do, but I prefer finely powdered whiting and ammonia applied with cotton wool, and finished with a soft cloth, especially with 'soft' metals.

Before you put the lacquer on, warm the object slightly to assist the mixture spreading smoothly. There is no need to heat it. Normal summer room temperatures are just about right. In the winter months no other warming is necessary if the metal has been in a warmed room for a few hours.

German TV

Regular TV transmissions have begun in Western Germany, from Hamburg. At least, at regular intervals of two-hour-programmes three times a week – the same basis as used in Holland for some time past. The definition is rather higher than that used by the BBC although from what I have seen earlier this year of European higher definition systems, one cannot detect much difference between theirs and ours. In fact, whatever difference there was, the BBC transmissions at their best leave a slight balance in our favour.

The Germans expect to have nightly programmes laid on this month, and three other stations – Hannover, Langenburg and Cologne – are scheduled for early operation.

Soon, maybe, some keen listener will report reception in England. It will be quite a feat as the wavelength used is only 1¼metres, and this, incidentally, as far as I know, is the first serious attempt in the world to exploit so high a frequency for TV. No doubt other national systems are watching with close interest. TV, when it really gets into its stride, is going to cause many a headache in the matter of wavelength congestion if everybody wants to stick around five or six metres.

Does it pay?

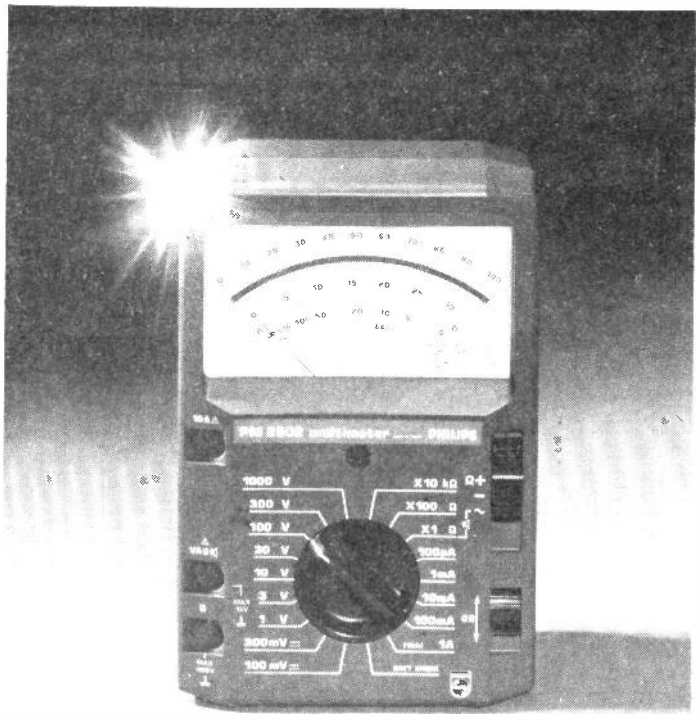
I have been asked about the patenting and marketing of a reader's invention. The only advice I can give is for him to put the matter in the hands of a reputable Patents Agent. It is a very tricky business, and an idea has to be something out of the ordinary not to be covered in some way by existing patents.

As to the marketing, that nowadays can be a disheartening job, whether you try to do it yourself or get someone else interested in it.

It is not generally realised what a big difference there is between the actual cost of the manufactured article and the price charged for it in the shops. Just after the War I took up the question of the possible marketing of an article designed by a friend and myself, primarily for our own use, but apparently of considerable interest to others.

To make it to a reasonably high standard of finish the cost came out to rather less than £4, disregarding the cost of tools which would have run into several hundreds. The selling price after allowing for tools, advertising retailers' profits, etc, (plus a little for us) was very little short of fiteen pounds! Even comparatively large scale production would not have brought it down to a price which would have assured a wide sale, and a capital of many thousands would have been required to take a chance on that.

Without being discouraging, I can only give him my view. It is easier to invent things than to make a profit out of them! The tax authorities (who stand to lose nothing) get by far the largest whack. The man who passes it over the counter gets the next. The chap who makes it gets a modest sum, but the poor fellow who invented it is often lucky if he is not actually out of pocket after he has paid the patenting expenses.



TESTING! TESTING!

Get the most out of your test gear with a little help from...

Frank Ogden G4JST

This month – multimeters

There are several truisms about test gear. The first is that you shouldn't believe everything that it tells you; secondly, the greater the reliance placed upon its readings, the greater is the tendency to misinterpret the results; thirdly, the more competent the engineer the less test gear he needs to fulfill a given task.

In short, using test equipment effectively is all about looking at the results obtained in context.

Accuracy vs cost

Up-market test equipment tends to carry price tags resembling telephone numbers. Some of it goes towards the purchase of the big-name logo but, in fairness, the larger proportion goes towards versatility and measurement accuracy. Provided that it is used in the correct way, it offers a very direct route to evaluating the ins and outs of your latest circuit module.

However, most of us will never need the accuracy of a synthesised Marconi signal generator for our applications; indeed, the majority would be happy to trade a couple of decimal places on the price for a slightly more roundabout route to achieving the sucessful debugging of the latest project.

For instance, an absorption wavemeter costing around £20 (less if you build it yourself) can be used to align a transmitter multiplier chain. The same instrument will also indicate the presence of unwanted harmonics in the output provided that it covers a wide enough range.

An engineer working for a big electronics company could do the same job with an £8000 H-P spectrum analyser in a fraction of the time. However, the end result would be no different. He might be able to say that harmonic output was 63dB down on the fundamental, whereas the chap with the wavemeter could say that there wasn't anything nasty in the output.

Since the value accuracy of electronic components is usually around 10 per cent – dc characteristics for a given transistor type may spread by 500 per cent – all the equipment really needs to give the operator is a ball park figure for a given parameter. What it should be able to do with guaranteed accuracy is to make comparisons between values. This often holds far more useful information than knowledge of an absolute value.

It goes almost without saying that a sensitive multimeter is the most useful of all pieces of equipment.

It measures volts, amps and ohms and can easily be persuaded additionally to act as a transistor, JFET and MOSFET tester.

Fitted with an RF probe it provides invaluable information about the tuning of RF power circuits, parasitic oscillations in both AF and RF amplifiers,and can act as a guide to many other equally useful observations.

The author's own preference is for the traditional moving coil type of instrument. For a start, the brain assimilates the positon of a needle much quicker

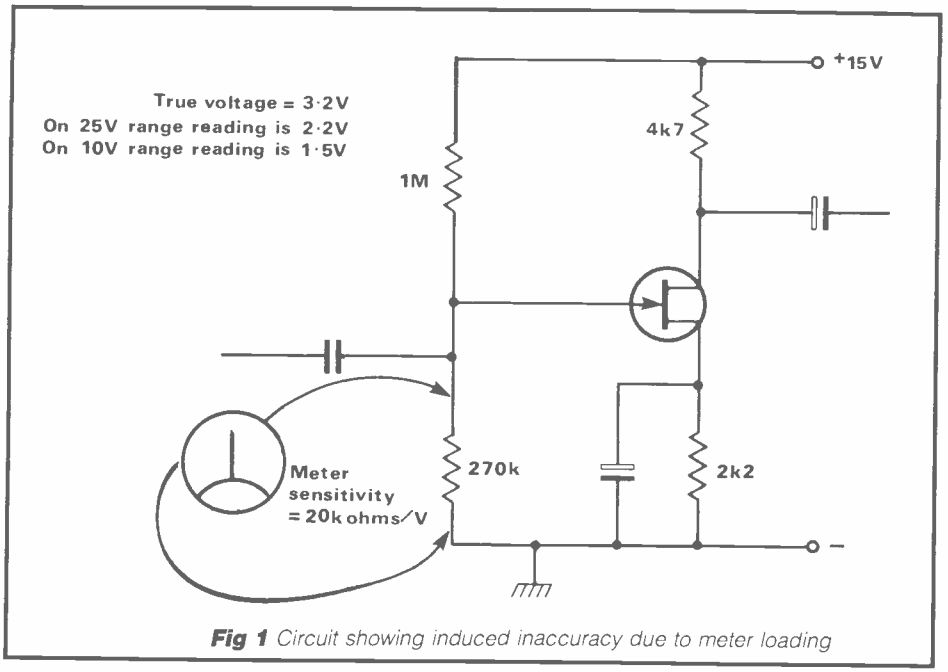


Fig 1 *Circuit showing induced inaccuracy due to meter loading*

than a string of numbers. Secondly, small fluctuations in the course of a reading are easily spotted and are not masked by the quantitisation time of a digital meter. Thirdly, because the instrument is essentially simple, the readings are more reliable. Using a digital instrument in a strong RF field is asking for trouble.

Volts, amps and ohms

The sensitivity of an instrument is quoted in ohms/volt and is tied up with the current required to produce full scale deflection. 20K ohms/volt, typical for a moving coil instrument, requires that a current of 50 microamps passes through the instrument at FSD. Thus the 10V range presents a resistance of 200K ohms and the 100V range, 2M ohms, etc.

When taking voltage readings off high impedance circuitry, the resistive loading of the multimeter should always be taken into account. As a rule it is best to use the highest voltage range possible since the reading inaccuracy inherent in the low level of deflection tends to be more than offset by the reduced loading on the external circuitry.

Figure 1 illustrates the degree of inaccuracy that meter loading can induce.

The measurement of ac voltages using a simple multimeter is full of inaccuracies. For a start the instrument sensitivity is much lower, with the implication that external circuit loading will be higher.

Useful results are only obtained where the circuitry under test is known to be of low impedance.

Because the semiconductors used in the meter rectifier are insensitive to signals below a few hundred millivolts, readings at the bottom end of the scale tend to be cramped and inaccurate. This, of course, is an area where electronic and digital multimeters score heavily over the traditional type.

With all types of instrument, the calibration holds true for sine waves only. Any other type – square waves (reading higher) voice and music waveforms (generally reading lower) – will require some correction to interpret the reading as RMS.

RMS, incidently, stands for root mean square and is an indication of power contained in an ac waveform. Essentially it relates to the square root of the area contained by the waveform.

Thus an ac voltage of 240V RMS has the same heating potential as a dc voltage of 240V applied across the same resistor. If the 240V RMS is quoted in terms of a sine wave, then the peak voltage will be $240\sqrt{2}=325$V(approx). A 240V RMS square wave would have a peak voltage of 240V. Think about it.

Using a multimeter on the amps and ohms ranges generally speaks for itself. There are a few caveats though.

An instrument set to a current range, particularly in the low milliamp or microamp region, will have appreciable resistance. This resistance, when inserted in series with the power lead to certain types of circuitry, notably audio preamplifiers and certain types of TTL logic, can lead to instabilty or data corruption. Planting a large electrolytic capacitor across the multimeter terminals drastically reduces the ac resistance introduced by the meter. Watch the polarity though.

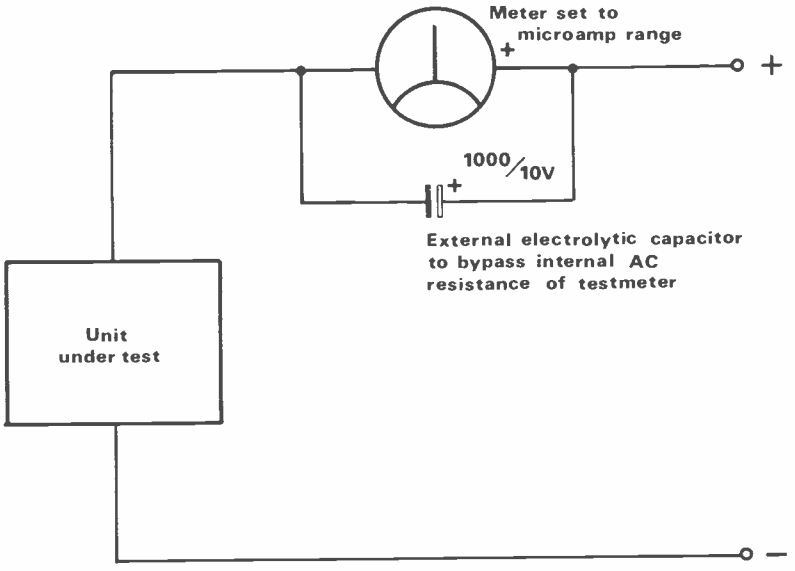


Fig 2 *Circuit showing protection against switch-on power surge*

This type of connection, shown in *Figure 2*, also has the benefit of protecting the delicate meter movement against switch-on surges.

When attempting to measure resistance of a component in an assembled circuit, watch out for the effect of transistor junctions brought into conduction by the measurement current. The EMF across an ohmmeter is typically 1.5V (red lead negative, black plositive) and a conducting transistor junction, essentially a diode, will upset the reading completely. *Figure 3* illustrates this.

Measurement of RF voltages

The rectifier circuitry of general purpose testmeters is far too slow to detect, never mind measure, RF voltages. Some sort of a diode probe must be used.

This type of probe rectifies the RF right at the tip of the prod, feeding back pure dc for indication on the test meter.

Unless the RF probe carries some sort of correction circuitry the simple diode probe of *Figure 4* will read rather high. This is because the diode charges the decoupling capacitor to a value

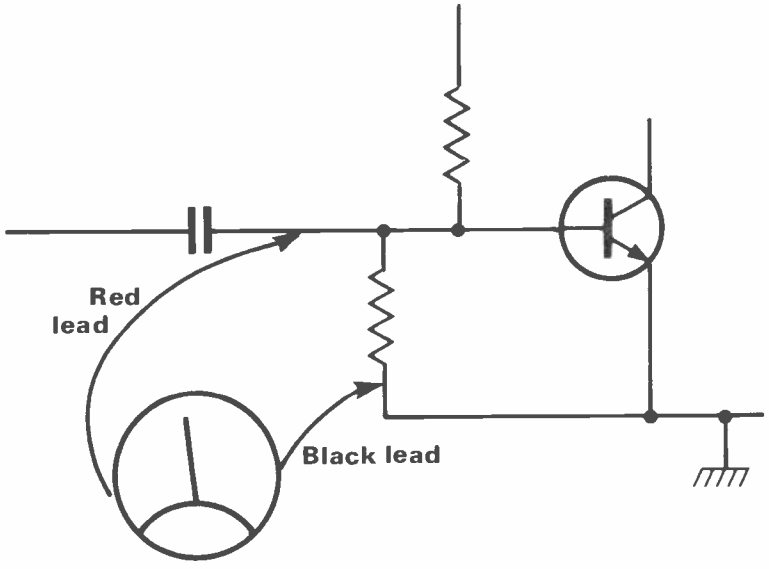


Fig 3 *Circuit showing effect of transistor junction in parallel with resistor*

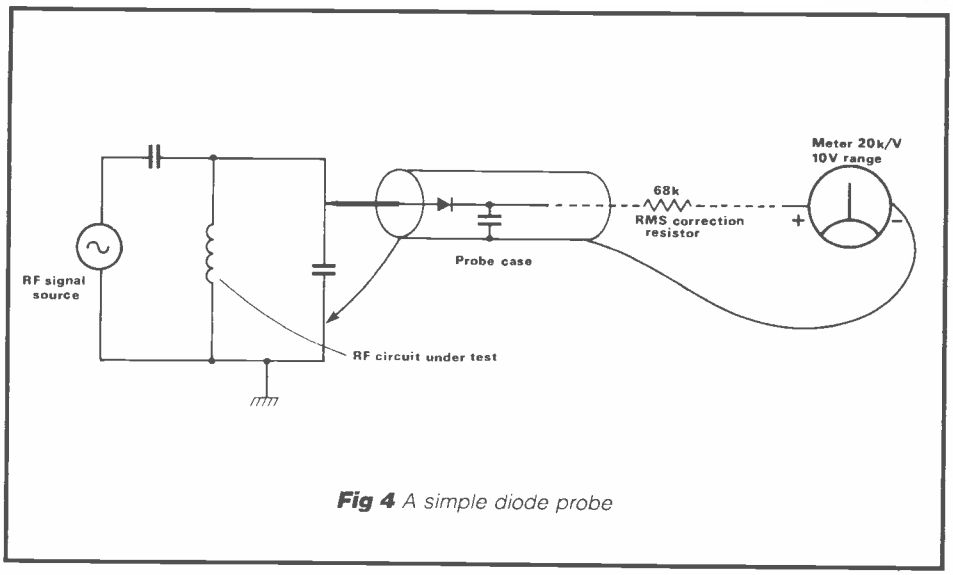


Fig 4 *A simple diode probe*

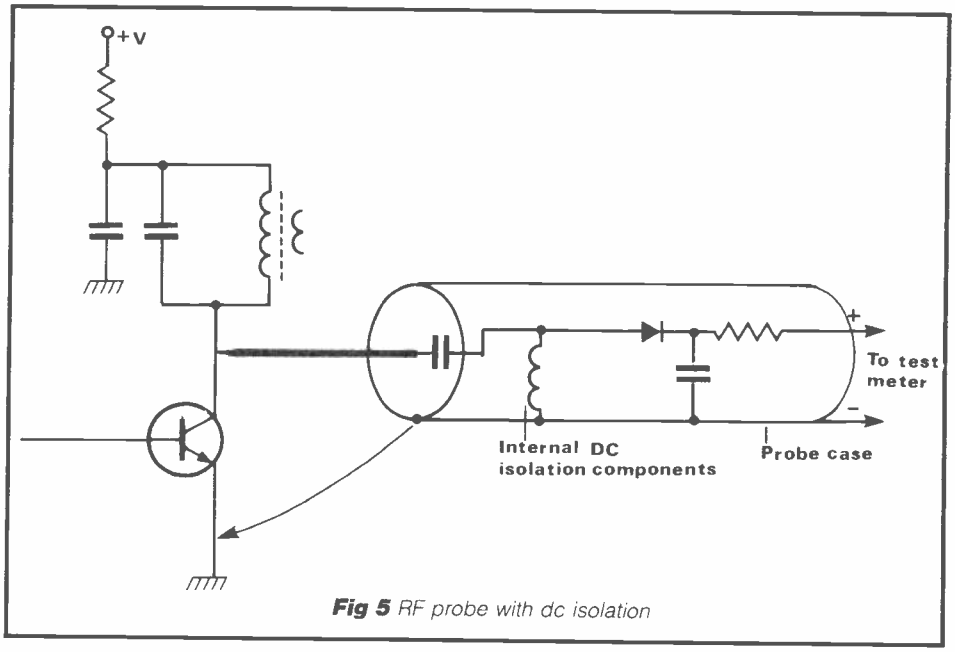


Fig 5 *RF probe with dc isolation*

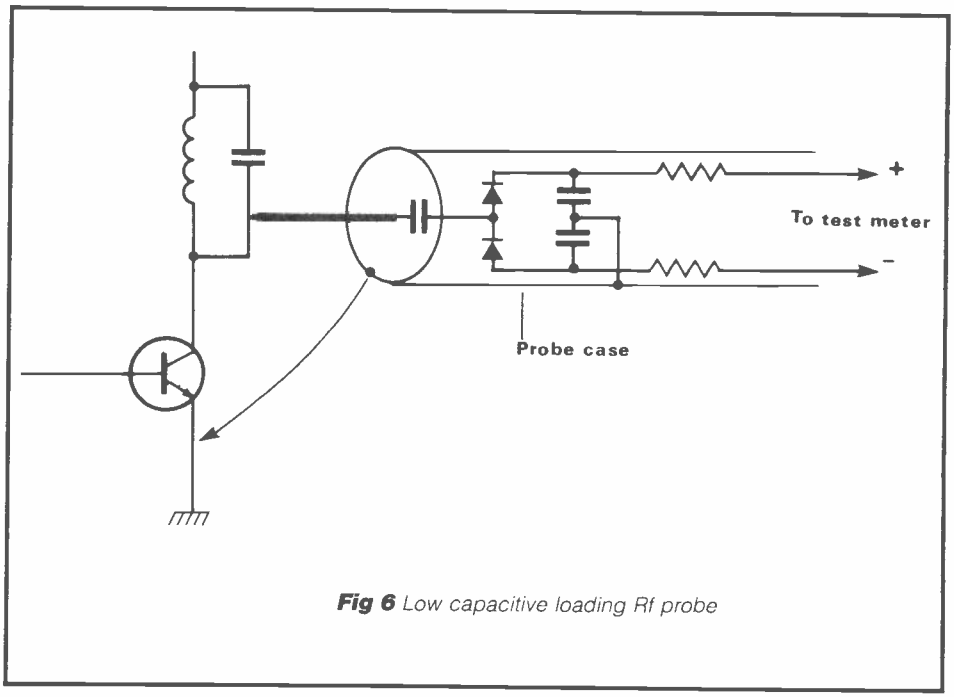


Fig 6 *Low capacitive loading Rf probe*

approaching the peak voltage of the RF waveform – in actual fact the peak voltage minus the barrier potential of the diode.

Adding a resistor between the decoupling capacitor and the test meter with a value approximately 30 per cent of the test meter resistance will correct the basic diode probe to an equivalent RMS reading. Thus a 20KV meter will require an additional 68K ohm resistor to correct a diode probe for the 10V range.

Many RF circuits also carry a standing dc potential. This of course would completely upset the reading obtained by a simple diode probe.

A series dc isolating capacitor cannot be used because the meter circuit requires a dc return. Similarly, an RF choke connected as in *Figure 5* may prove unsatisfactory because its reactance and, possibly, spurious resonance at the measurement frequency may generate wildly inaccurate readings.

The answer is the arrangement shown in *Figure 6*. The voltage doubler diode arrangement requires only an RF ground return. Even this is unnecessary at VHF and UHF because RF current in the test leads themselves constitute a ground return.

Note that the basic rectified voltage of the *Figure 6* arrangement is approximately equal to the peak-to-peak value of the RF waveform. Thus the correction resistor to be placed in series with one of the tests leads needs to take this fact into account. It should be roughly 1.6 times the value of the effective test meter resistance.

The hypothetical 20K ohm/volt instrument would require a 330K series resistor for the *Figure 6* arrangement.

Use as a transistor tester

A multimeter set to its ohms range can be made to work very effectively as a go/no-go transistor tester.

Inside the instrument the ohms function is effected by connecting a 1.5V battery in series with a resistor of a value such that when the terminal leads are shorted together, the current flowing through the meter and the internal resistor from the 1.5V battery is equal to the FSD current of the meter movement.

If the black lead, which actually has a positive voltage on it, is connected to the collector of an NPN transistor and the red lead to the emitter, then initially no reading should be shown on the meter.

If the base and collector leads are then touched with a lightly damped finger, the transistor will start conducting, causing a sizeable deflection on the meter as in *Figure 7*. If the transistor is misconnected to the test meter, then an open circuit or high steady state reading will result.

PNP transistors can be tested in the same way with, of course, the polarity of the test prods reversed.

Field effect devices

MOSFETs and JFETs can be tested in much the same way. For N channel

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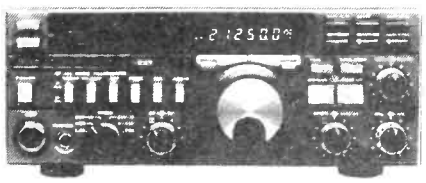

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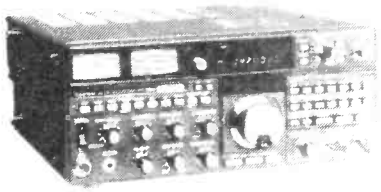

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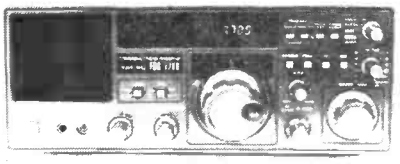

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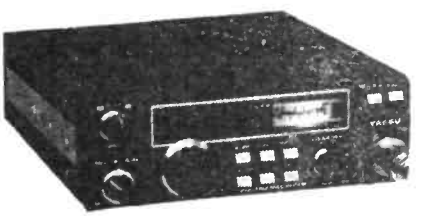

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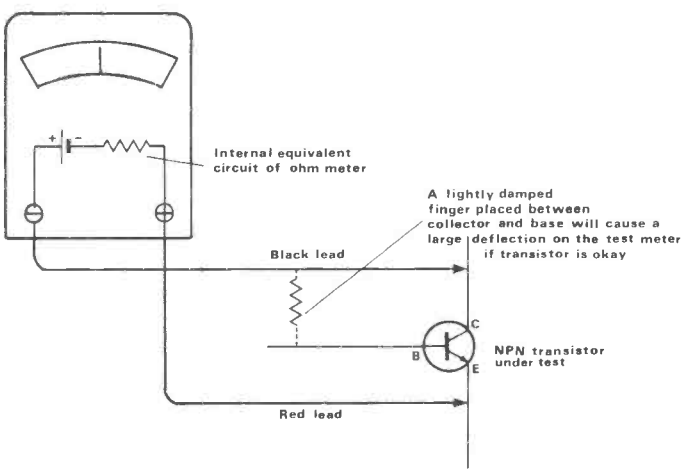


Fig 7 *Ohmmeter doubling as a transistor tester*

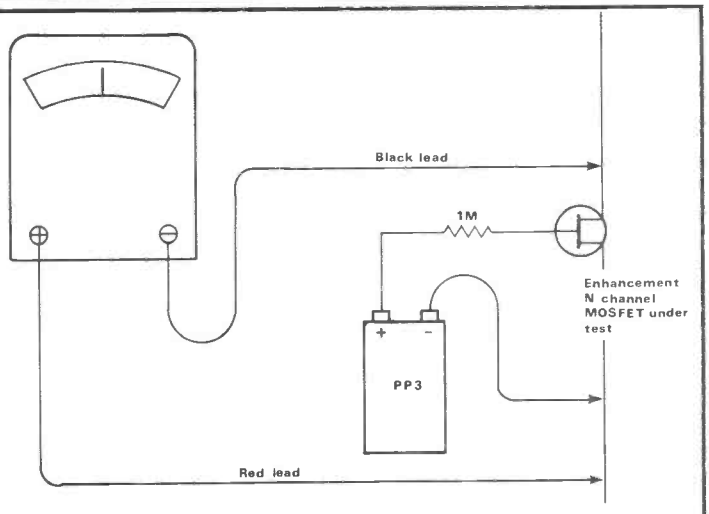


Fig 8 *Test meter used as go/no-go indicator for FETs*

devices, the black lead is connected to the drain and the red lead to the source. The initial reading on the meter may be high or low depending on the polarity of residual charge on the base lead.

Momentarily touching the gate lead of a JFET – without touching any other connection – should produce a very sizeable change in meter deflection due to the ac mains field switching the device on and off with 50Hz hum. Dc static voltages which are nearly always left on the gate after such a test will cause a slow change in meter movement after the finger is removed as the charge leaks away.

More care

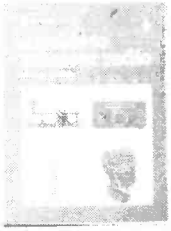
MOSFETs require a little more care since a gate voltage much in excess of around 15V may cause the gate oxide to rupture.

It is best to connect up the transistor as for a JFET (black to drain, red to source) and use a separate PP3 battery to provide the gate test switching voltage through a high value resistor as in *Figure 8*.

Note that electronic multimeters may operate with such a low test current that the results stated in the 'transistor tester' section may not be obtainable. This is another very good reason for not throwing out your old moving coil multimeter!

Next month – oscilloscopes.

RSGB BOOKS



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CROSSWORD

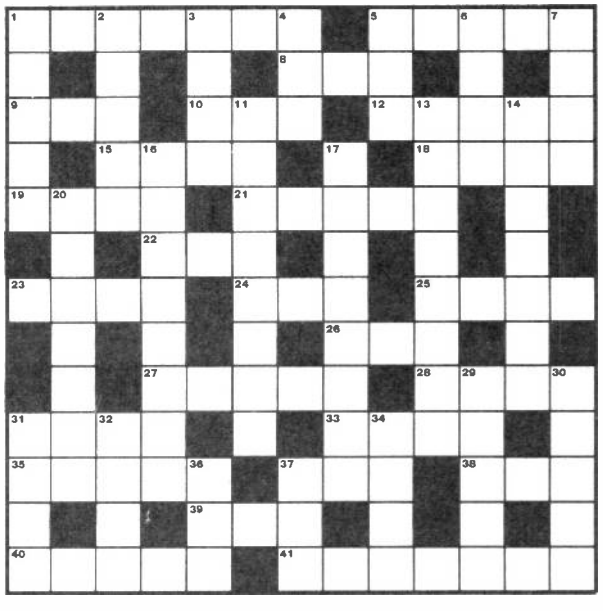
By T R Mowbray G3VUE and
D V Pritchard G4GVO

Clues across

1. Could be MacNamara's lot on AM sometimes. (3,4)
5. Note the Russian mountains certainly heard. (5)
9. Pam goes up in cartography. (3)
10. Could be cheek as well. (3)
12. Collector too of a Source of moisture. (5)
15. East Canadian station goes north for a flat response. (4)
18. Ease away from the margin. (4)
19. Artist and Royal Engineer both after that sort of DX. (4)
21. Revolves around the tone and strength of central vessel – possibly Greek. (5)
22. Certainly questions in higher aerial problems. (1,1,1)
23. What's left of the wine – if you get the connection. (4)
24. Activity after a program of salts? (3)
25. Direction zero for Royal Marine. It's customary. (4)
26. Large mass in that morse again. (3)
27. Note Norwegian station I'm calling my own. (5)
28. For for-next loops, dipoles – or strictly for the birds. (4)
31. Good earth in parts – and a lot of it... (4)
33. I 0? Thanks! Not that I give a jot. (4)
35. Instruments of tintinabulation. (5)
37. Home sweet home, usually. (1,1,1)
38. Ah!, we hear the report at the top of the street. (1,1,1)
39. The OM's, not the XYL's. (3)
40. Mood for an instrument? (5)
41. Does he or it go with the good eggs? (4,3)

Clues down

1. Could be an old one. Tick if correct. (5)
2. Father stands by Latin to read it. (5)
3. Jack probably in a cab leaving for home. (4)
4. Gate, grid, or just lucky. (3)
5. At this conjunction Dan gets confused. (3)
6. Note the revolutionary takes for computer command. (4)
7. Hot perhaps... or just for washing. (4)
11. Pause in travel? QRX one... (8)
13. That Royal Engineer's on a little aerial – but good if it's this. (8)
14. Make it mixed gin and minerals but still take no notice. (7)
17. Confused Stan meets resistance with German – but might have QSO. (8)
20. Nodes I note in a covering. (7)
29. The artist's confused, but comes to ground. (5)
30. Drop of rum little Emma took for the pole. (5)
31. A wager you'll need aid to go with this. (4)
32. '..and all the... the flesh is heir to...' (4)
34. Law observed on official covers. (4)
36. Little Michael often this at first. (3)
37. Bravo! Queenie takes some sugar before fading. (1,1,1)



The solution will be printed in the next issue

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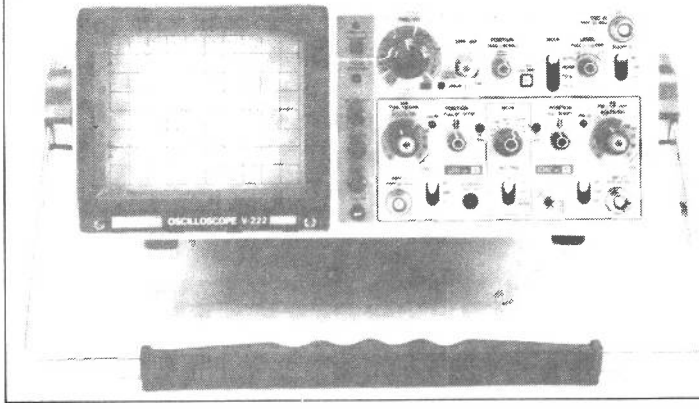

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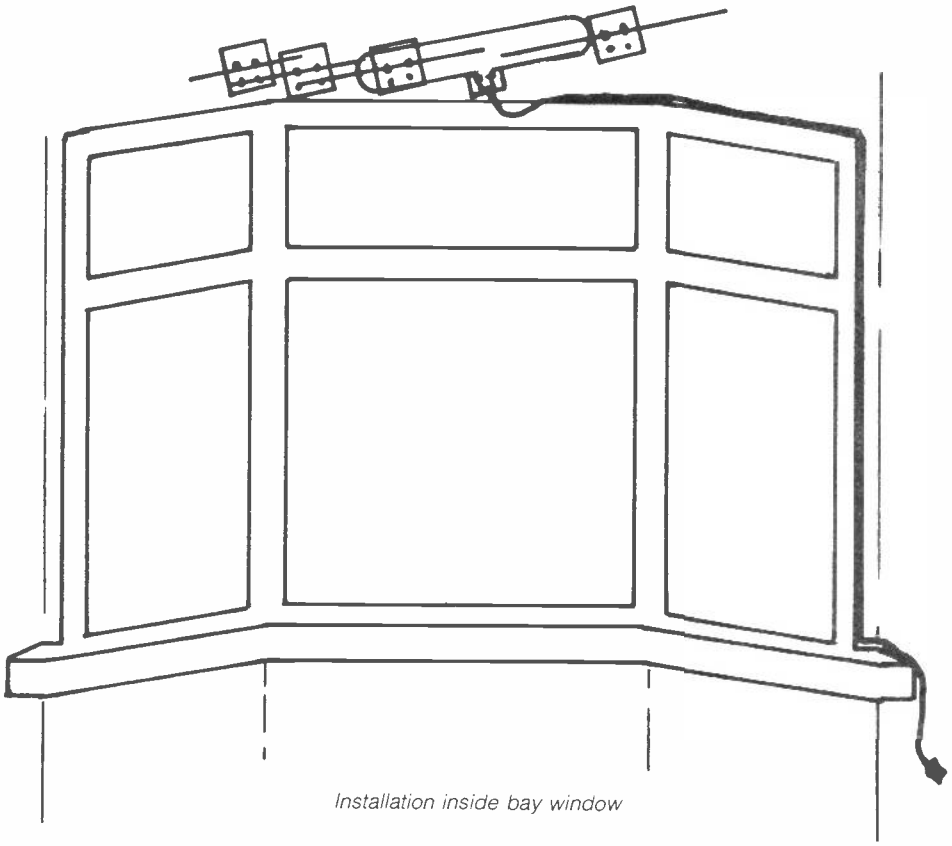
ONE NIGHT'S WORK

Ivor Nathan presents a simple design for a wide-band, high-gain UHF television aerial



Installation inside bay window

In locations where an outside television aerial is impracticable, or where a second receiver is used but cannot conveniently share an existing aerial, the following type of indoor aerial can easily be contructed.

It is made from heavy-gauge self-supporting wire, and readily-available 'cut off' plastic terminal blocks. Consequently, it can be mounted unobtrusively at the top of a window frame, at ceiling level (which also ensures maximum signal pickup) and out of the way of any drawable curtains.

Basic aerial

Figure 1 shows the basic aerial, which is a modified folded dipole that includes an integral director; the aerial is terminated into 75ohm low-loss cable, which can be kept as short as possible to reduce signal losses and to keep the installation tidy.

The folded dipole is cut from heavy-gauge wire to a total length of 20 inches, and then folded to the dimensions shown so that the aerial is 9 inches across to make it a resonant half-wavelength.

The integral director consists of two separate 4 inch pieces of the same type of wire as used for the dipole; connections are made between the 75ohm coaxial feeder cable, the folded dipole and the integral director by using a '4 hole' piece of plastic terminal block as shown.

If difficulty is experienced in fitting the dipole end-connections and the integral director halves into the same holes (ie two heavy-gauge wires into one hole) the problem can be overcome by first soldering each half of the director to its respective dipole-end, at a distance such

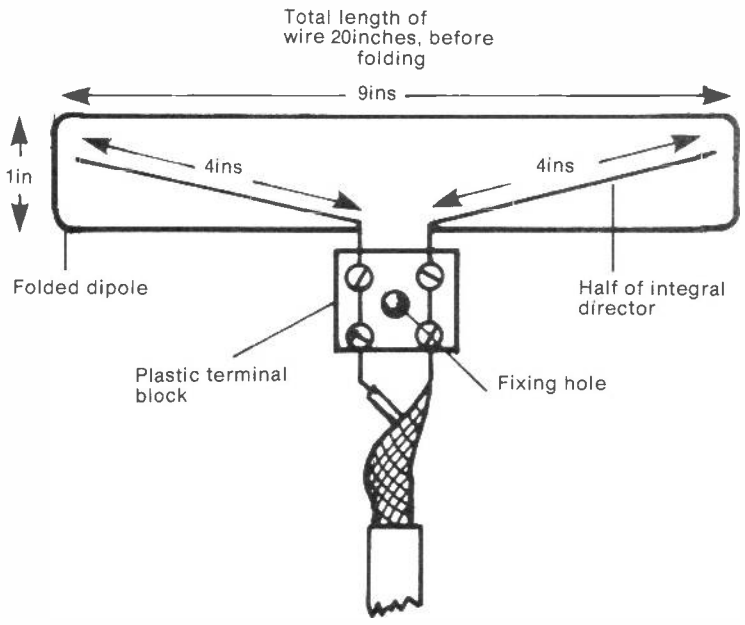


Fig 1 *The basic aerial*

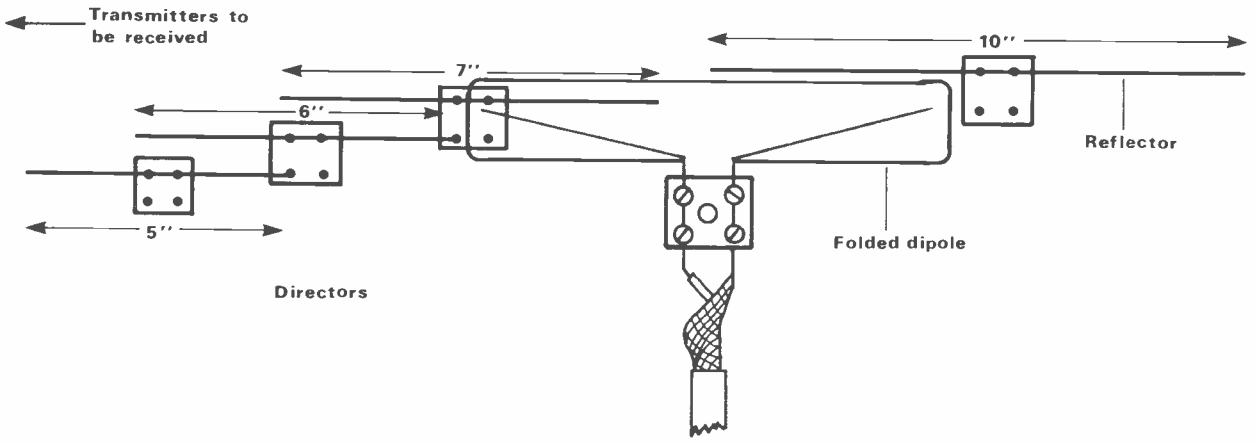


Fig 2 *Adding the directors and reflector*

that only one piece of wire actually enters each hole.

Ensure that the integral director is bent into a slight 'V' so that its only electrical connection with the dipole is at the feeder termination.

Once this part of the assembly has been completed the best position for mounting the aerial can easily be found, with the aerial connected to the receiver and the receiver is switched on.

Important

It is essential to avoid the possibility of electric shock by using a mains-isolating type of aerial plug, because otherwise the metal portions of the aerial will be 'live' if the television has a live chassis.

Remember to check all local UHF channels for optimum placing of the aerial; it is well worth spending sufficient time to find a position that provides uniform reception before fixing the terminal block (using a woodscrew through its fixing hole) to either the ceiling or the window frame.

The feeder cable can be either stapled or adhesive-taped along the window frame, preferably out of sight behind any curtain rail.

Directors

The next step consists of adding directors, one at a time, to the basic aerial, until an 'offset' Yagi array is formed as shown in *Figure 2.*

The first director is cut to 7 inches, and each director is cut progressively shorter than the previous one – working away from the dipole and towards the transmitters – by one inch, being cut from the same heavy-gauge wire (but each one a continuous piece) as the dipole.

Each director is mounted on its own plastic terminal block, again cut from a strip, so that each block has four holes plus its fixing hole. Terminal blocks are spaced ¼-wavelength apart.

As shown in *Figure 2.* each terminal block not only suppports its director element but also helps to secure adjacent directors to each other (but electrically insulated from each other) to form a neat, rigid assembly.

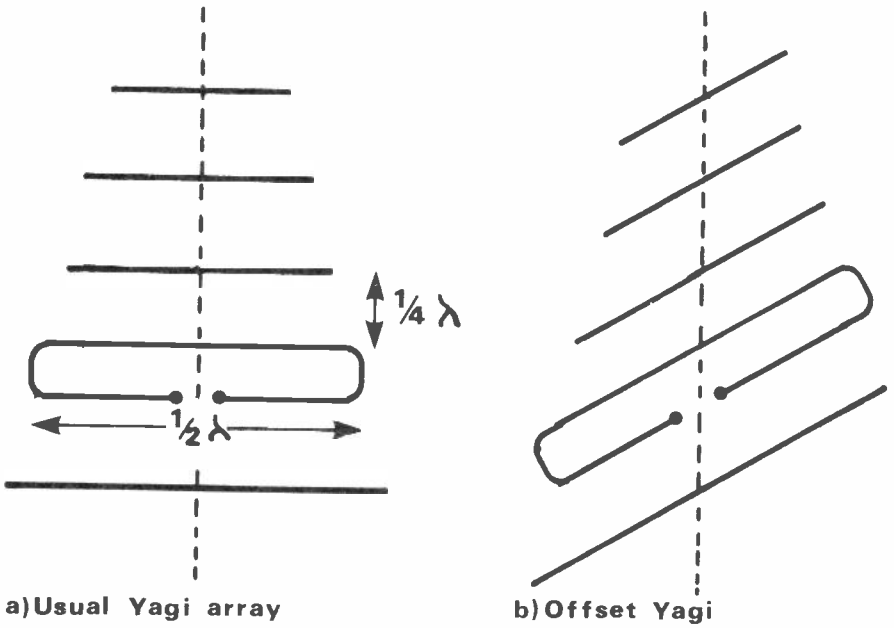
It was also found advantageous to add a reflector – made in the same way as the directors – of length 10 inches and placed at an optimum distance behind the folded dipole, this optimum distance being found by trial and error with the television switched on, while the spacing between dipole and reflector is varied until maximum gain (on the weakest channel) and minimum ghosting are achieved.

If this offset Yagi array is mounted within the confines of a curved bay-window, as shown on page 63, it will be necessary to correspondingly bend each element of the array to suit the contours of the room; ensure that each element still retains its electrical insulation from adjacent elements.

In the author's case, used in a ground-floor room, the finished aerial consisted of 5 elements, including the basic folded dipole with its integral director, and was found to give an indoor window top gain equal to that afforded by a commercially-available 7 element log-periodic aerial which could only be stood on the indoor window-sill. Used in an upstairs room, performance would be even further improved.

Readers may wish to construct a more rugged version of this aerial, using small-bore copper or aluminium tubing rather than heavy-gauge wire, for installation in a loft-space that might be too confined to take a larger, conventional array.

In this case, the aerial couid be 'pre-built' onto a suitable insulated boom prior to installation.



The development of the offset Yagi for indoor use

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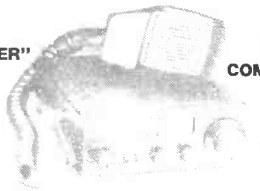

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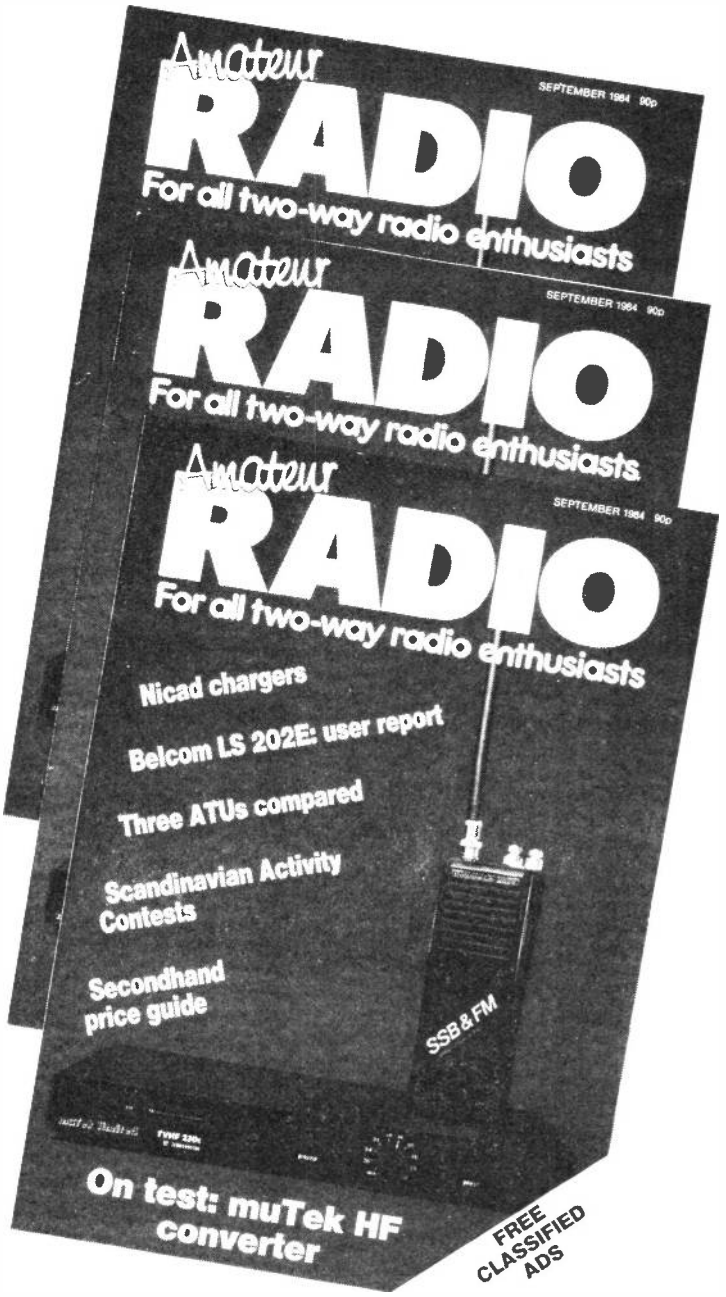

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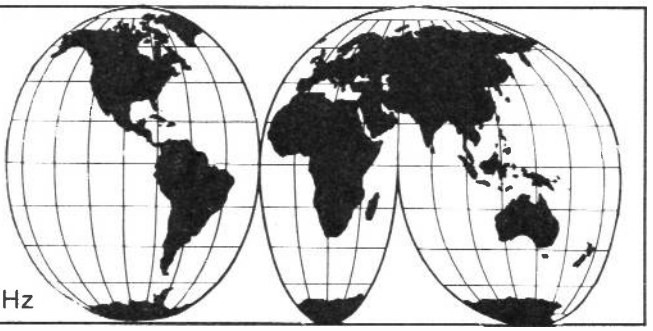
SHORT WAVE NEWS FOR DX LISTENERS



By Frank A Baldwin

All times in GMT, **bold** figures indicate the frequency in KHz

The reception of clandestine stations has been mentioned many times in this feature. They are of great interest to DXers, some of whom specialise in seeking and logging them.

The term 'clandestine' does not apply to the so-called pirate stations operating either on or offshore and usually featuring endless pop music programmes. It does include those stations broadcasting political propaganda directed against a particular regime.

Most clandestine stations are 'white', ie they radiate programmes which, in content, are stridently and unreservedly in opposition to the governments of their respective target areas. A few are 'black' in that they purport to be based in, and in support of, a particular country, cause and government.

The latter type is, of course, far more subtle in its propaganda but is rare these days. At one time it was possible, on odd occasions, to log stations claiming to be located in China, whereas they were sited in neighbouring territories.

Details of the following clandestines were correct at time of writing but frequencies and transmission times may change.

National Voice of Iran

Operates on **5915** and in parallel on **6025** from 1730 to 1815 and from 1930 to 2000 in 15 minute periods of Persian and Azeri. The policy is pro-Soviet and pro-Iranian Tudeh Party (anti-Khomeyni). The transmitter is USSR based. I have logged this one several times, the station identification in Persian being 'Seda-ye Melli-ye Iran'.

Radio 15th September

Is hostile towards the Nicaraguan government and was operating when I last logged it on **6905** at 0053. The main language used is Spanish with a few items in local vernaculars and English at odd times. The station identification in Spanish is 'Radio Quince de Septiembre'. The transmitter is thought to be located in Honduras and now reportedly operating on **6510.**

Voice of the Resistance of the Black Cockerel

Supports the UNITA organisation which is hostile towards the present Angolan government and may be logged on **4950** around 1900(I logged it at 1905). Portuguese and local vernaculars are used and it operates from 1730 to 1930 on Tuesday, Thursday and Sunday.

Voice of the Iraqi People

Was on **7860** where I logged it somewhile ago at 1655, OM with the Kurdish programme from 1630 to 1700 then a marching chorus, OM with announcements, slogans and off at 1703 after some military music. Now on **6952** signing off at 1430.

Radio Bardai

Operates on **6009** at which point on the dial I heard it at 1915, a few bars of pipe music then OM in a local vernacular. It uses French from 1800 to 1830, Arabic from 1830 to 1900 and vernaculars from 1900 to 2000.

The policy is hostile to the government of Chad and claims to be located in Bardai in north Chad just south of the Libyan border, but more than likely sited to the north of that boundary.

Radio Salvation of Iran

Is on **11660** from 1900 to 2000 in Persian. I logged it at 1850, YL with a long harangue in Persian before the jamming transmitter caught up with them. This one is pro-monarchist and against the present Persian regime. The station identification in Persian is 'Radyo Nejat-e Iran'.

Radio Free Surinam

Last logged here on **6850** at 0102, OM with a marching song interspersed with exhortations by OM and YL alternately in a local vernacular. Off at 0110 and no further details from the computer on this one.

Voice of the United Muslim Fighters of Afghanistan

Heard here at 1552 on **15305,** OM in Pashto then recitations from the Holy Quran prior to obliteration by the almost inevitable jammer at 1554. This one is hostile to the government and Soviets in Afghanistan.

More next month.

AROUND THE DIAL

Here are some transmissions recently logged, the times, the frequencies, some target areas and programme content.

AFRICA

Central African Republic

Bangui on **5035** at 1853, OM with announcements in French during a programme of local folk music. This channel is a difficult one owing to the co-occupant Alma Ata in the USSR. It is possible to pick up signals from Bangui but it requires a very selective receiver. Bangui is the capital city and is a port situated on the River Ubangi.

Bangui is on the air from 0430 to 0700 and from 1630 to 2300 with a power of 100KW but the frequency is likely to vary from **5033** to **5038** on occasions.

Djibouti Republic

Djibouti on **4780** at 1909, OM with a talk in vernacular, presumably Somali, the signal being predominant over that of Petrozavodsk in the USSR. Formerly 4KW, Djibouti now has a 20KW transmitter and reportedly operates from 0300 to 0800 (Friday from 0500 to 0900) and from 0900 to 2000 (until 2200 during Ramadan). The programme languages are Somali, Afar and Arabic.

Egypt

Cairo on **21465** at 1212 with a programme of local-style music until 1215, when there was a newscast in the Thai transmission to South East Asia, scheduled from 1130 to 1215.

Gabon

Africa No 1, Moyabi on **4810** at 1840, OM with a talk in French then into a pop session. This is an easy to log African for beginner listeners – the power is 250KW and it is on the air from 0500 to 0800 and from 1700 to 2300 in French.

Moyabi Relay on **21575** at 0747 with a Radio Japan programme consisting of a Japanese/English language lesson in an English programme of the General Service directed to the Americas, the Far East, Europe and the Middle East and timed from 0700 to 0800. OM with the station identification at 0750 as 'Radio Japan, Tokyo'.

Kenya

Nairobi on **4915** at 1815, OM with announcements in Swahili followed by some military marches.

The National Service on this frequency is operated from 0255 (Sunday from 0330) to 0630 and from 1330 to 2005 (Saturday until 2115). The power is 100KW.

Liberia

ELWA Monrovia on **3230** at 1945, OM with a talk in vernacular, the signal rising over that of Johannesburg in Portuguese to Africa. ELWA (Eternal Love Winning Africa) is on the air from 0600 to 0800 and from 1805 to 2230, this being the Home Service in vernaculars. The power is 10KW.

LBS (Liberia Broadcasting System) Monrovia on **3255** at 1947, OMs with a discussion in vernacular and then some hymns during a religious programme. LBS Monrovia is on channel from 0500 to 0900 and from 1900 and 2400 with a power of 25KW.

Libya

Tripoli on **3200** at 1920, OM with a talk in Arabic in a

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programme of Voice of the Greater Arab Homeland, now on this frequency from 1900 to 2200, all in Arabic of course.

Namibia

Windhoek on **3270** at 0127, pop records in the All Night Service which can be logged on this channel from 2200 to 0400. The 100KW transmitter is also on channel from 0400 to 0630 and from 1445 to 2200.

Niger

Niamey on **3260** at 1950, African drums and music in the local style during a Home Service 1 programme. Niamey is scheduled on this frequency from 0530 to 0700 (Sunday until 0900) and from 1700 (Saturday and Sunday from 1630) to 2200 (Saturday until 2300). The power is 4KW. Niamey is the capital of the Republic of Niger and is one of the termini of the trans-Sahara motor routes.

Nigeria

Radio Nigeria, Lagos on **4932** at 0518, OM with a talk in English about water-borne diseases, prevention and cure. This was a programme in the Educational Service which operates on this channel from 0400 to 2300.

South Africa

RSA (Radio South Africa) Johannesburg on **17780** at 0650, OM with a talk about local trade unions, their traditions and achievements, all in an English transmission for Europe, South, East and West Africa, timed from 0630 to 0730.

RSA Johannesburg on **25790** at 1146, OM with a talk about medical research in South Africa. This was during an English programme directed to Europe, the Middle East and Central, East and West Africa, being scheduled from 1100 to 1200.

Swaziland

TWR (Trans World Radio) Mpangela on **4760** at 1820, OM with a ballad in English complete with guitar backing then OM with announcements in vernacular during a programme for local consumption and timed from 1800 to 1845. The power is 25KW.

Tanzania

Dar-es-Salaam on **5050** at 0230, chimes time-check, OM with station identification in Swahili, the National Anthem and news at the opening of the National Service which is scheduled on this frequency from 0300 to 0700 (the Commercial Service is timed here from 1300 to 2015). The power is 10KW.

Togo

Radio Diffusion de Kara on **3222** at 1940, OM with a newscast in French. This one is on the air from 0525 to 0835, from 1200 to 1435 and from 1630 to 2305 (Saturday and Sunday from 0530 through to 2305). The power is 10KW.

ZBS (Zambia Broadcasting Service)

Lusaka on **4910** at 1808, YL with a newscast in English. The Home Service in English and vernaculars is on this channel from 0350 to 0530 and from 1530 to 2105 (Friday and Saturday until 2205). The power is 50KW.

THE AMERICAS

Brazil

Radio A Voz do Oeste, Cuiaba on **4775** at 0411, OM with a local pop song, OM with announcements and station identification in Portuguese. The schedule is listed as around-the-clock although it has recently been reported signing on at times varying between 0900 and 0930. The power is 1.5KW.

Radio Cultura da Bahia, Salvador on **4895** at 0235, OM with a football commentary in Portuguese. Sign-off without the National Anthem at close of play at 0237.

The schedule is listed as being from 0900 to 0100 at 10KW so this was obviously an extended schedule for this particular game.

Colombia

Radio Super, Medellin on **4875** at 0503, OM with promos in Spanish, YL with a local pop song. This one works on a 24-hour schedule, the power being 2KW.

Radio Santa Fe, Bogota on **4965** at 0219, OM with a football commentary in Spanish during its 24-schedule at 2.5KW.

Haiti

Radio 4 VEH, Cap Haitien on **4930** at 0120, OM with a talk in French just audible amid the QRM from the co-channel USSR transmitter at Ashkabad. Radio 4VEH operates from 1100 to 1500 and from 1900 to 0400. The power is 2KW.

Netherlands Antilles

Radio Nederlands Relay, Bonaire on **9715** at 0736, OM with the news during an English transmission for Australia and New Zealand, timed from 0830 to 0825.

Ecuador

Sistema de Emisora Atalaya, Guayaquil on **4792** at 0320, YL with a local pop song in Spanish. This one operates irregularly from 0900 to 1330 and from 0100 to 0455 with a power of 5KW.

My experience is that the best chance of hearing signals on this channel is at weekends.

Peru

Radio Chanchamayo, La Merced on a measured **4896** at 0342, OM with a talk in Spanish about La Merced – it was mentioned several times. The schedule is from 1030 to 0500 (Sunday from 1130 to 0300) and the power is 0.4KW.

Venezuela

Radio Mundial, Bolivar on **4770** at 0008, OM with pop songs, OM with promos for a local bank. Radio Mundial is on the air from 1000 to 0400 in Spanish and the power is 1KW.

La Voz de Carabobo, Valencia on **4780** at 0259, OM with the station identification, promos (one featured a trumpet fanfare) and then some local-style dance music. LV de Carabobo is on channel from 0855 to 0400 (Sunday from 1000 to 0300) with a power of 1KW.

ASIA

Iran

Teheran on **4980** at 1906, OM with a marching song in Persian also heard in parallel on **9022.** Originally on **4990,** Teheran is on the former channel from 1615 to 1830 and from 1900 to 2030, although these details may have changed by the time this appears in print.

Syria

Damascus on **12085** at 1913, OM with a talk in Arabic in a relay of the Domestic Service, timed on this channel from 0900 to 2200. OM with station identification at 1915 then Arabic songs and music.

CLANDESTINE

'Radio Camilo Cienfuegos' on **10040** at 2314, YL with an anti-Castro talk in Spanish, OM with identification at 2316, chimes, slogans in a CID programme. Schedule not known but it was still on channel at an 0415 retune, OM identification, 'Musica Libre' programme and anti-Castro slogans.

NOW HEAR THIS

Radio Santa Ana, Yacuma, Bolivia on a measured **4803.6** at 0013, YL with a talk in Spanish, musical interlude then YL again. Schedule is 1000 to 0400 and the power is just 0.25KW.

SWL PUBLICATIONS

Jonathan Marks of Media Network (Radio Nederland Wereldomroep) has forwarded two recent publications which should prove of interest to active SWLs and DXers.

The first is *Receiver Shopping List (7th Edition),* a 24-page booklet with information on many of the short wave receivers currently available, listed in price order with an assessment of performance. Home-base units, portables and in-car receivers are all featured.

Anyone interested in purchasing a short wave receiver should read this publication.

The second is entitled *The Booklist,* and also has 24 pages, with advice on where to obtain further information about short wave listening and DXing.

The seven sections are:

Listening Guides: it informs where these may be obtained, the price and methods of payment.

Mass Market Periodicals: presents details of publications worldwide or in specific areas on news-stands.

Yet again, *Radio & Electronics World* is recommended for SWLs, the only English language magazine to be given this accolade.

Books and Pamphlets for the SWL: Tape Recordings for SWLs and DXers: Miscellaneous Titles and Reviews: Technically Oriented Books and *Further Addresses.*

Both publications are free and post free, on application to *English Section, Radio Nederlands, PO Box 222, 1200 JG Hilversum, The Netherlands.*

DX-TV RECEPTION REPORTS

Compiled by Keith Hamer and Garry Smith

Looking back, June wasn't a bad month for Sporadic-E DX reception. Although not as active as previous years there were several days when intense openings produced signals from very low-power relays in Band I.

These conditions, coupled with extremely high MUFs, meant a few new transmitters for many enthusiasts, especially for those equipped with receiving facilities for out-of-band channels such as R3, IC and R4 located between 77 and 84MHz.

Settled weather conditions produced tropospheric DX in Band III and UHF on the 8th and 9th with evidence of tropospheric ducting from distant West German stations at UHF. As one enthusiast commented, it was difficult to decide which band to concentrate on especially when Band I was jammed with Sporadic-E signals!

More exotics

Greece is now officially listed as having a transmitter in operation on channel E3 (see this month's Service Information).

It has been well received several times already this season. On June 17th shortly after breakfast, Ray Davies at Happisburgh on the Norfolk coast telephoned to say that the Greek PM5534 test card was present on E3 carrying the 'EPT' identification at the top and digital clock two hours ahead of BST.

A check on this channel here in Derby confirmed the presence of a very weak PM5534. Reception lasted for almost an hour but it was only just above the noise level.

The transmission changed to colour bars at 1015, only to be swamped by strong signals from Yugoslavia on the same channel.

An Arabic transmission appeared on E3 at Derby on June 7th from 1647 until 1730 with programmes and captions.

Meanwhile, over in Norfolk the 'exotics' were only just beginning. Clive Athowe noted ZTV from Zimbabwe between 1750 and 1805 on channel E2, which was accompanied by Italy on channels IA and IB.

At 1754 the new Rumanian FuBK test card appeared with the identification 'TVR BUCURESTI' on channel R2. At the same time Greek cordless telephones were monitored at 49MHz.

On channel E3 at 1824 a news programme was resolved with a male reader on the left and a female on the right. Monitoring on a scanner revealed Greek sound.

Prior to the Greek reception, colour bars were noted on channel E2 from the south-east at 1822, but their origin remains a mystery. A concert from RTS-Albania on IC was in progress at the time.

An intense Sporadic-E opening which lasted all day on the 30th meant a jammed band at times.

Despite this, several low-power relays were received by Kevin Jackson in Leeds. Reception included Portugal (RTP) on E4 from the 35W relay at Valenca Do Douro, and Austria (ORF) on E3 from the 100W outlet at Birkfeld. The latter signal is Kevin's star performer this season.

Very high MUFs were present during the day, and a radio ham colleague situated about five miles north of Leeds made contact with another amateur located in the Canary Islands on 2 metres via Sporadic-E.

The highest MUF noted at Derby was at 103MHz with several strong Spanish FM transmissions heard throughout the band. Even one of the local radio stations went flamenco for a while!

New test cards

The FuBK test pattern, radiated by Ceskoslovenska Televize for a few minutes prior to the programme opening sequence, has gained a large digital clock in the lower right-hand corner of the display. This was noted by Kevin Jackson on June 8th.

An unusual version of the Norwegian test card has been seen recently, again just prior to the start of programmes.

The test card was carrying the identification 'NORGE' and 'NRK', but minus the digital clock insert and the vertical centre bar of the pattern.

Another odd feature was the greyscale. There were ten steps instead of the more usual six. This was noted at 1703 on June 24th.

Televiziunea Română are radiating a colour bar pattern from time to time. This has been seen prior to the FuBK test card, which is normally transmitted from 1745 until the start of programmes.

DX Log for June

This month we are including details of reception noted here in Derby. The log is as follows:-

4/6/84: DDR:F1 E4 (East Germany) on test patern: ORF (Austria) E2a radiating the monochrome test card (Telefunken type) with 'ORF FS1' identification; DR (Denmark) E3 from the Fyn transmitter on PM5544 test pattern.

5/6/84: TVE (Spain) E3 showing the GTE colour test card.

7/6/84: JTV (Jordan) E3 between 1647 and 1730 with programmes and Arabic captions; RAI (Italy) IA on tennis programme.

8/6/84 RAI IA and IB on PM5544; TVE using a variety of regional test patterns, ie 'GAMONITEIRO 3' on E3; 'AITANA 3' on E3; TVE colour bars with 'tve ARAGON' identification on E3 from the La Muela transmitter; 'TVE ANDALUCIA' colour bars E4 from Guadalcanal; ORF E2a on telefunken test card; TSS (Russia) R1, 2 and 3 on programmes with good SECAM colour at times; DR (Denmark) E3 with clock and news; JRT (Yugoslavia) E4 with 'JRT ZGRB1' FuBK test pattern; RTS (Albania) IC with news/current affairs programme during the late afternoon.

9/6/84: TSS R1 and 2 on programmes; RAI IA on test pattern; West Germany E10 on 'SWF HGR1' FuBK pattern from Hornisgrinde via trops.

11/6/84: CST (Czechoslovakia) R1 on 'RS-KH' test pattern in SECAM colour; TSS R2 on 'HOBOCTN' current affairs programme.

12/6/84: RAI IA and IB on lunchtime news programme.

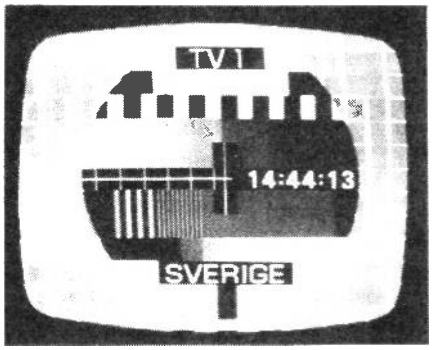

Fig 1 *New Swedish PM5534 test card with enlarged digital clock insert*

Fig 2 *Test pattern from Andalucia in Spain (regional service)*

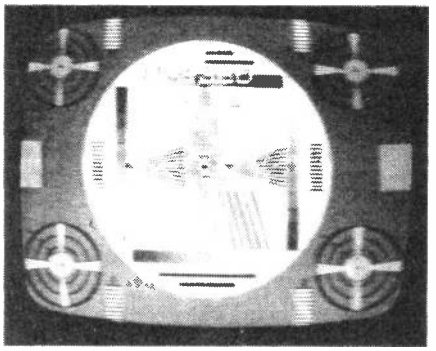

Fig 3 *Telefunken T05 monoscope test card radiated by ORF Austria*

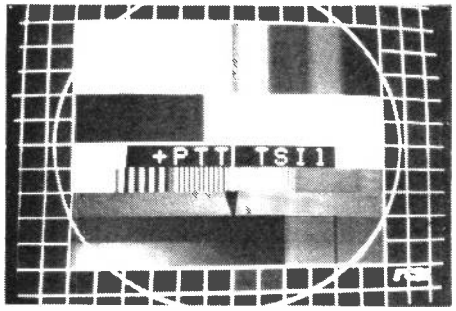

Fig 4 *Swiss FuBK test card. Note 'rtsi' ident in the corner*

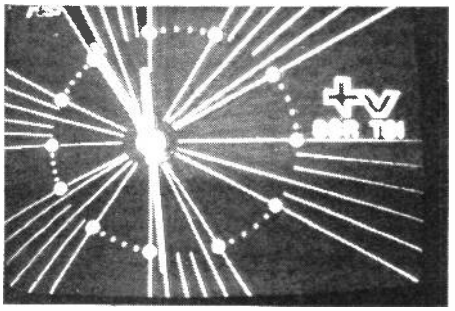

Fig 5 *Clock caption used by Switzerland Courtesy of Alessandro Müng*

Fig 6 *Identification caption form Italy's teletext service 'Televideo'*

16/6/84: Unidentified SpE on E2 and R1.
17/6/84: RAI IA and IB on religious service; TSS R1 on programme; EPT (Greece) E3 on PM5534 test pattern between 0920 and 1015; RTS IC on programmes; JRT E3 showing feature film; ORF E2a on 'ORF FS1' PM5544 at 1254; MTV (Hungary) R2 on frequency gratings pattern; ZTV (Zimbabwe) E2 at 1826 on programmes for 5 mins; TSS R1 and 2 with 'HOBOCTN' in colour; TVE E2, 3 and 4 with football; RAI IA and IB on programmes from 1950.
18/6/84: CST R1 and R2 on 'RS-KH' test pattern; CST R2 with 'SR1TV BRATISLAVA' PM5544; ORF E2a on PM5544; JRT E3 on programmes; TSS R2 on 'UT 0167' electronic test pattern.
19/6/84: MTV R1 on frequency gratings pattern; CST R2 on 'SR1TV BRATISLAVA' PM5544; RTP (Portugal) on 'RTP – PORTO' FuBK pattern on E2, 3 and 4; TVE E2 and E4 on regional programmes; JRT E3 with identification caption – also seen at 1825 with adverts, TVB1 caption and DNEVNIK news from the Beograd network; JRT E4 with 'RTZ' clock and identification caption at 1829 from the Zagreb network; TVR (Rumania) R2 and R3 with station opening sequence and news.
20/6/84: TVE E2, 3 and 4 on programmes; MTV R1 with cartoons and identification caption; JRT E3 with subtitled film; TSS R2 at 1953 with female announcer and digital clock in the lower left-hand corner of the screen.
21/6/84: NRK (Norway) on PM5534 test pattern from the following transmitters:- Steigen E2, Melhus E2, Hemnes E3, Gamlemsveten E3 and Bremanger E4; SR (Sweden) E3 with 'TV1 SVERIGE' PM5544.
22/6/84: ORF E2a on Telefunken monoscopic test card; SR1 E2 on 'TV1 SVERIGE' PM5544.
23/6/84: Feature film – Spanish sound but German subtitles from the south of E2; RAI IA on PM5544.
24/6/84: NRK E3 with 'NORGE NRK' PM5544 pattern at 1705 without the central vertical bar – see New Test Cards; TSS R1 with 'BPEMЯ' at 1800; Unidentified feature film on E4 at 2330.
25/6/84: TVE E3 and 4 with bullfighting; TSS R1 and 2 on programmes.
26/6/84: TSS R1 and 2 on programmes.
27/6/84: TSS R1 on programmes at 0735; TSS R2 on 'UT 0167' colour test pattern at 0735.
28/6/84: TSS R2 with 'EESTI TV' test pattern (blockboard type) at 0800; TVP (Poland) R1 and 2 on PM5544 followed by clock and announcer at 0830; TSS R1 on 'UT 0167' test pattern at 0830; TSS R1 at 1800 with clock followed by 'BPEMЯ'.
29/6/84: RAI IA on PM5544 at 0735; TVE R2 and R3 at 1740 with colour bars and FuBK test pattern followed by opening sequence and programmes at 1800; TSS R1 and 2 on 'BPEMЯ'.
30/6//84: All day SpE opening with Band I jammed with signals most of the day. Spanish FM heard on frequencies as high as 103MHz during the early evening.

Reception reports

Simon Hamer of Powys has been taking advantage of the high MUFs encountered during the month, and has successfully resolved Russian signals on channels R3 and R4 which are on 77.25MHz and 84.25MHz respectively. This occurred during an intense opening on the 8th.

The Italian channel C has also been received twice, thus confirming that the 16KW transmitter at Torino is still operational. Reports suggest that this channel is to eventually close.

Simon lives in a sheltered valley and reception from the west is very difficult, but he has found a solution.

Armed with a Hitachi K2300 VHF/UHF (5.5MHz and 6.00MHz sound) portable television, he drove up to the Radnorshire Hills where he received RTE (Eire) for the first time. Reception was from the second network on the recently opened channel J.

Granada ITV on channel E59 was 'crystal clear' at over 100 miles, even when using the receiver's own telescopic aerial trained towards the Winter Hill transmitter. 'Wait until I take the Yagis up there!' comments Simon.

Several FM stations were also noted back at his farm via Sporadic-E, the most notable being Yugoslavia on 96.1 MHz on June 17th at 1330.

Our Sheffiled correspondent Graham Angel noted Band III trop signals in colour from Scandinavia on the 8th. These consisted of the PM5534 test card from Norway on E5 (from Stord), E6 (Bjerkreim) and E9 (Bergen).

The PM5544 pattern was noted from Denmark on channel E7 (Soenderjylland) and E10 (Vestjylland).

A caption in colour with the word 'PAUZE' positioned diagonally, followed by a large '1' symbol, confirmed reception of NOS-1 (Netherlands) in Band III.

Most European countries have been logged by Graham during active Sporadic-E conditions in Band I, and despite having a local channel B2 transmitter, DX came through from time to time on E2 and R1.

A mystery signal in the form of a news programme appeared briefly on E2 with identification 'YENE△' (YENED) at 1705 on June 10th. YENED used to be the Greek Armed Forces TV Service until being recently disbanded. Did anyone else see this?

Colour reception of the 'ORF FS 1' PM5544 from Austria appeared on the 18th on channels E2a and E3 – the latter being a 100W outlet located at Birkfeld.

Kevin Jackson (Leeds) has received a reply from the Belgian TV service regarding the RTBF 2 programmes radiated on channel E49, which have been seen by several enthusiasts during recent trops.

The transmitter (so far unlisted) is a new installation at Profondeville and operates with 50KW ERP.

Kevin also queries a Belgian satellite TV caption recently received on channel E56. Apparently the transmitter responsible for this is situated in Brussels and radiates the TV 5 service with 800W ERP. This relays the ECS5 satellite broadcasts.

Snow-free pictures from distant West German UHF outlets were seen by Kevin on the 8th, indicating tropospheric ducting since nearer stations were either absent or only just detectable. At closedown the FuBK test card was radiated by Bayerischer Rundfunk with the identification 'BR-MCHN' from the outlet at Rhoen near the Czechoslovakian border.

The morning of the 9th was outstanding for high signal levels from distant transmitters.

The first station noted by Kevin was La Dôle (Switzerland) on channel E34, radiating the '+PTT TSI 1' FuBK test card with snow-free quality. A floater from the Säntis outlet was also seen beaming the same test card.

The E32 Rigi transmitter (central Switzerland) was noted with extremely strong signals, so strong that Channel 4 from Belmont was wiped out. The Rigi E6 outlet was resolved in Band III, together with the Swiss FuBK from La-Choux-De Fonds on E9.

This was the first time that Kevin had seen Swiss signals in Band III.

Also of note was a new French test card on channel F3 (192MHz) but we do not have any details regarding the originating transmitter.

A few Band I outlets which are classed as rare by Kevin were logged during June via Sporadic-E propagation. These included Yugoslavia on E4 from Pelister (listed as having an ERP of 10KW) which is situated close to the Greek border, and JRT on E3 from Pisvir (25W) radiating the FuBK with the identification 'JRT-SA 1' from the Sarajevo relay.

Also of interest were West Germany on E3 from the Bayerischer Rundfunk outlet at Kreuzberg, NRK (Norway) from Hadsel on E4 and the Canary Islands (RTVE) on E3 from the Izana transmitter.

Bob Brooks of South Wirral has sent in a full log this month. Within an hour of installing his newly acquired D-100 DX-TV Converter he received RAI from Italy and CST from Czechoslovakia radiating the 'RS-KH' test card.

Bob reckons that the D-100 is ideal for newcomers to DX, as it can be used on almost any domestic UHF set. During June he received no less than 14 countries on most channels within Band I. From Norway he noted the PM5534 test card with various transmitter identifications including Gamlem, Melhus, Steigen, Hemnes, Hadsel and Bremanger.

DX-TV for beginners

Newcomers to the hobby of long-distance television reception often write to us with numerous questions concerning the techniques involved with reception of good quality signals.

Well, many of these queries are covered by a new 8-page pamphlet called 'TV-DXing For Beginners'. Written by DX-TX enthusiast Simon Hamer of Powys (no relation, incidentally) it deals with the main aspects of the hobby.

European transmission standards are discussed with a table showing the various parameters. There is also a chart indicating Band I vision frequency allocations.

The main modes of propagation are covered, with notes on Sporadic-E, Tropospherics, the F2-layer, Meteor Scatter, Trans-Equatorial Skip and Auroral Reflection. There are several photographs showing examples of off-screen reception to illustrate reception via different forms of propagation.

A section on suitable receivers and equipment for DX-TV work will be of particular interest to the novice. Useful suggestions are given to help enthusiasts select the correct type of receiving equipment.

When signals from distant countries do finally appear on the screen it's always a good idea to have some method of capturing the event in order to show other enthusiasts. Until quite recently the only way was to take an off-screen photograph. Today, video recorders have mainly taken over this task. Both methods are briefly described by Simon.

The final section deals with equipment suppliers and publications suitable for further reading on the subject of DX-TV. We're pleased to report that *Radio & Electronics World* is mentioned here!

'TV-DXing For Beginners' is published by North of England Radio Club International and is available from them at 4, Bryn Bank, Wallasey, Merseyside L44 1AU. An sae should be enclosed with any enquiries.

Service information

Faeroe Islands: A private TV service began on April 3rd. Sjonvarp Foroya broadcasts Friday to Sunday only between 2000 and 2330 local time, from the main transmitters at Torshavn (channel E6 with 145KW ERP), Suduroy (E9,5.6KW) and Eysturoy (E10 with 0.75kW).

Czechoslovakia: Two new transmitters have recently been taken into service by Ceskoslovenska Televize (CST). They are located at Stara Lubovna (channel R27) and Sturovo (channel R31). both outlets operate with 100KW ERP.

Poland: A new transmitter at Krakow is expected to come into service later this year. It will radiate with an ERP of 1000KW on channel R33 and will be used for the TVP-2 service.

United Kingdom: Following the successful transmission of an all-digital stereo TV sound broadcast from the Crystal Palace outlet, BBC engineers are confident that a digital system will best fulfil the requirements for stereo TV sound from terrestrial transmitters.

Stereo TV tests first began in October 1983 from the Wenvoe transmitter in South Wales. The ruggedness of digital stereo TV in areas of difficult reception was confirmed. The tests on May 24th from Crystal Palace proved that no significant interference is caused to sound or vision reception on existing receivers.

Eastern Europe: There are a number of Eastern-bloc countries which radiate programmes from TSS (Russia). Originally it was thought that the Russian repeaters were purely for armed forces personnel stationed in the various satellite states. However, it now appears that TSS are planning to broadcast nationwide throughout some of the Eastern-bloc countries.

Russia: There is a new transmitter operating on channel R33 in Moscow beaming programmes from TSS-1. Information regarding the ERP is not available at the moment.

Greece: Following reception of EPT (Elliniki Radiophonia Tileorassis) in the UK recently via Sporadic-E, we have details about the channel E3 outlet. The 1.58KW transmitter is located at Akarnaika about 430 metres above sea-level. This is just to the south of Albania. It opened on September 10th 1983 and broadcasts the first network of EPT.

Service Information this month was kindly supplied by Alexander Wiese (West Germany), Kevin Jackson (Leeds) and the BBC.

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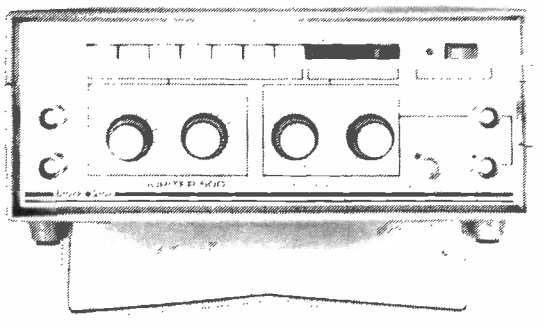

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ATV on the Air

Presented by Andy Emmerson, G8PTH

I have remarked previously about the timewarp which affects this column: although it is intended to appear in September, I am in fact writing it on a boiling hot Sunday in July. Let's just hope there is still some decent weather to be had in the autumn.

The theme of this month's article is practical TV operating, with the emphasis on the outdoor side. Holiday time is a bit of a paradox; every penny is spoken for, yet thoughts turn to outdoor operation and that may mean a portable video outfit.

I am not saying that this is the time to go out and buy a portable video recorder and camera, but there is no harm in planning ahead and doing a bit of window shopping at the same time.

Summer and early autumn is a time when money for non-essentials is traditionally a bit short, and many dealers have special offers to liven up what is a pretty slack sales period. Beyond this they must clear stocks of existing models to make way for the new season's ranges.

In any case, the present is quite an exciting time for portable video, both on the camera and recorder side. There are also combined camcorders, just to confuse things!

Monochrome cameras for domestic users are all but a thing of the past and you are unlikely to find any in the shops now. Colour cameras, however, have become (somewhat) more affordable and they certainly do marvellous things now.

Virtually all modern cameras work in low light levels previously considered unusable without a kilowatt of lighting, and some models now feature solid-state CCD pickup devices instead of tubes. Even the 'old technology' cameras, which use vidicon derivatives, tend to be extremely compact and lightweight.

Most cameras feature zoom lenses with power operation, and some of the pricier examples have built-in character generators intended for movie titling but useful also for callsign idents!

Video recording formats tend to be a rather partisan thing, and few users would admit to the superiority of another format.

Let's dispose of the Funai/Technicolor and Video 2000 formats first: although virtually obsolete, they feature in extremely cheap portable outfits which some shops are dumping in 'close-out' sales.If, however, you desire tape compatibility with another Beta or VHS machine, you will be better advised to leave these well alone!

Camcorders rule?

On the Beta side, the Sony F1 is probably the favourite portable machine. It's not exactly a lightweight but most users find it very satisfactory and there are plenty of accessories for it.

Newer than this is the clever Sony Betamovie, a combined camera/recorder. This is truly a miracle of engineering.

It lacks only one feature, playback through the camera viewfinder, so you will have to take the tape home to check whether a scene 'took' properly.

This problem has been avoided in the VHS group's camcorders, which use the VHS 'C' format. A camcorder taking a full-size VHS cassette would be too large, so instead they use the 30 minute 'C' (compact) tapes, which can be replayed by means of an adaptor in a normal VHS machine.

The VHS camcorder replaces or at least complements the separate compact recorder/camera combinations and these can now be had at incredibly low prices. I have never quite seen the point of camcorders, unless it is to tempt home movie addicts. Unlike a film camera, there is no light path which must be kept intact and there is no need to combine camera and recorder in one unit.

A single unit of this kind may be smaller than two separate items, but it does increase the total weight that has to be held up at eye level. For ATV use it is in fact an advantage to have a separate camera and recorder; the camera can be used on its own in the shack and the recorder can be kept handy for playing out what our USA friends call 'brag tapes' (in English: boring 45 minute demos of the shack/endless DX I have worked/ highlights of what my new effects generator can do/etc).

Perfection at last!

Folk who might be suspicious as to the recording quality of tiny tapes in tiny machines – don't be! The quality is in fact superb, enough to make you wonder why more 'living room' machines do not achieve this standard. For all this I can understand why people might prefer not to diversify into VHS 'C' format, and it must have been these same people whom Panasonic had in mind when they designed their new portable.

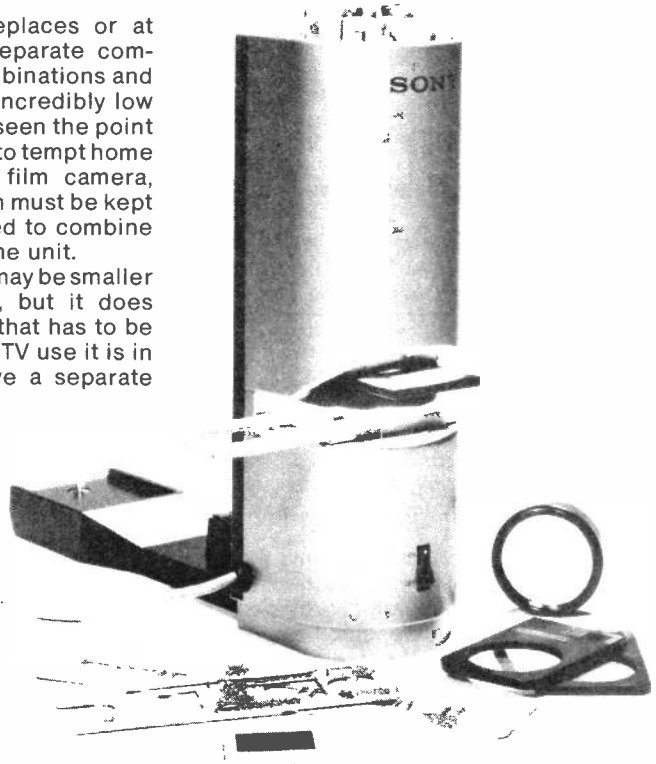
Launched this summer, it is known as the NV-180 and represents a major achievement in miniaturisation.Retaining a diecast aluminium one-piece chassis for rigidity, space has been saved by mounting components on both sides of the PCB. A redesigned video head cylinder employs an innovative oil film bearing (instead of ball bearings), and four ultra-flat lightweight direct-drive motors for the take-up and supply reels.

A new two double-head video system gives super-clear pictures in all modes (manufacturer's claim – I have not played with one yet). Picture search, back-space assembly edit and insert edit are all featured.

There are also two types of remote control and a companion tuner-timer, but I don't think we need these for ATV.

Weight of the recorder, including 1 hour battery, is just 2.7 kilos and size is 215 x 69 x 263mm. The snag of course is the price, £600.

Panasonic NV-180B new compact lightweight portable video system



Sony's HVT-3000 Nega-Posi adaptor

In theory this is below the list price of a VHS 'C' machine, but we all know what list prices are and you can in fact get a 'C' recorder and old-style camera for £599. Substitute the proper compact camera and the bill is £699.

Ah well, I think my plans to get a portable outfit will have to wait for the next quantum leap in technology, though I am not aware if Sir Clive intends to get into video.

Just think, I used to have a HR-4100, which was as portable as a 12in television set. It was recently stolen, and I wish the burglars many hours of fun with it since I am sure they will be unable to unload it on anyone else!

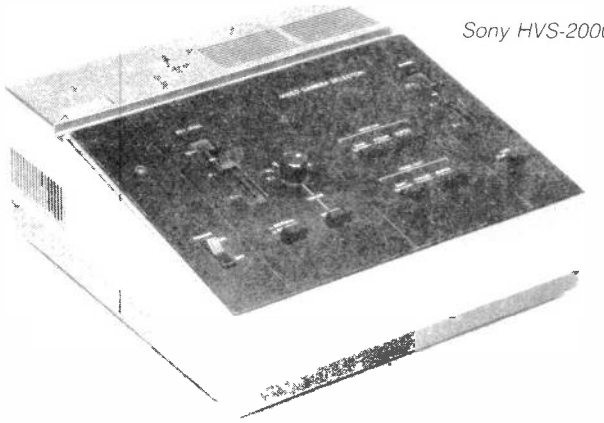
Sale bargains

If all this talk of heavy spending has put you off let's return to smaller figures.

Several Sony dealers are having a bit of a sale at the moment, and if you are into 'creative' accessories you might find a bargain. The Nega-Posi converter is not some kind of arcane voltage generator but a means of displaying slides on TV. It is beautifully made and works fine, the only snag being that it really only fits their HVC-4000 camera.

Still, if you want one at about 25 per cent off try a Sony dealer. Sony also make a handy titling stand, which holds a caption card firmly in front of the camera.

At a sale price it could be a bargain, although true amateurs will make their own with additional lighting.



Sony HVS-2000P special effects generator

What is worth seeking out is the HVS-2000P special effects amplifier. Now familiar to many ATVers it still represents a superb piece of engineering apart from being a useful power supply for two cameras.

It allows you to select between two cameras and superimpose captions and backgrounds. A black and white camera can be trained on a caption which the HVS-2000P 'slices' or digitises and then converts to a selected colour.

This caption can then be inlaid in your main picture, faded in or superimposed. See Sony's free literature at a dealer for further details.

Initially users were put off by the non-standard pulses used to synchronise the slave caption camera, but an article by John Hammond in the June 1984 issue of *Television* explained how to get round this. A full technical description was given in the February 1981 issue of the same magazine.

This piece of equipment is highly prized by many ATVers and should be snapped up if it appears in a sale.

That's all for this month and next time I'll try and avoid talking about spending money. If you have taken any photographs of outdoor ATV activity, why not send them in for publication? (NB: G4MDU and G6LTZ need not apply!) 73s until next time . . .

CORRECTIONS AND MODS

Whilst every effort is made to minimise errors in diagrams we will correct these as they come to our knowledge and we also appreciate the co-operation of our readers in notifying us of these.

We occasionally receive suggested modifications from readers who have constructed projects form ***Radio & Electronics World*** and we will publish those that would interest other readers.

For example, it may be possible to extend the use of a particular item by minor circuit changes or re-arrangement only. If this can be done for minimal cost and the idea has been proved in practice, others may benefit from the information.

Write to Corrections and Mods, ***Radio & Electronics World,*** Sovereign House, Brentwood, Essex, CM14 4SE

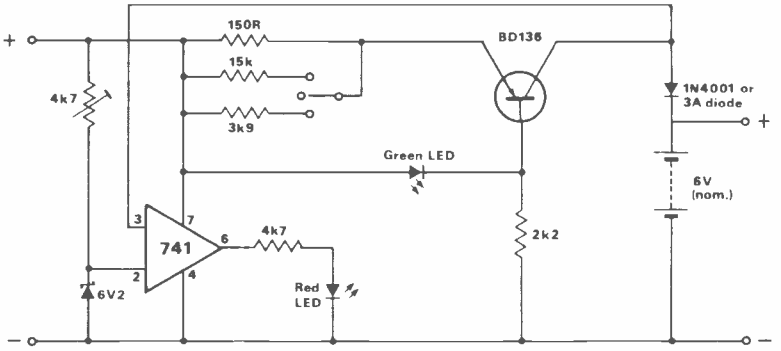
Modification to the EP44 (August 1984)

Since we published the trickle charge circuit for the Brother EP44 portable typewriter and printer, A M Tucker has experienced a risk of discharging the batteries when completing a series of large listings.

To overcome these problems he suggests the following modification.

The addition of a high charge position by the use of a three position switch and an extra resistor, to avoid a risk of overcharging a comparator, which lights a red LED when the battery voltage rises on full charge.

Prevention of feedback from the battery is achieved by the insertion of a diode in series.



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POINT OF CONTACT

The general interests of some of our readers and of club networks are shown below. If you have similar interests why not establish a contact at the time and on the band indicated.

If you or your club wish to be included in this scheme, would you please complete and return the form below and send to: ***Radio & Electronics World***, Sovereign House, Brentwood, Essex CM14 4SE.

MOST IMPORTANT — include a **telephone number** — if you have a particularly interesting contact so that we can contact you for details for publication.

RAE COURSES 84/85

Brighton
The course commences at Brighton College of Technology, Pelham St, Brighton, on Mondays with enrolments on September 10th and 11th from 4.00pm.
Further details are available from RA Bravery c/o the college. Tel: 0273 685971.

Derby
The course commences on the 19th September at the Derby College of Further Education, Wilmorton, Derby. Further details from the course tutor, F Whithead G4MLL at the college.

Hemel Hempstead
The classes start on Wednesday 26th Setpember at 6.30pm. If there is sufficient demand Tuesday evenings will also be used. Mr C B Burke, G3VOZ. Further details from Dacorum College, Marlowes, Hemel Hempstead. Tel 0442 63771.

Kirkcaldy
Enrolment for the course at the Balwearie High School, Balwearie Road, Kirkcaldy, is on Monday Setpember 17th, between 7.30 and 9.30pm. Further details from the course tutor, K Horne, GM3YBQ. Tel 265789.

London (Brixton)
The course commences on Wednesday 12th September, at 6.30pm. Further details available from Brixton College, Ferndale Road, London SW4. Tel 01-737 2323.

London (Dalston)
The course commences on the 24th September at the De Beauvoir Evening Institute, Tottenham Road, Dalston, London N1. Further information from the course tutor G4BZW, QTHr. Tel 01-249 1843.

Princes Risborough
The course starts at 7.30pm at the Adult Education Centre, Merton Road, Princes Risborough, Bucks, on the 26th September. Further details from the Head of Centre, Mrs S Wallace. Tel 08444-4977.

Slough
The theory class is on Wednesdays at 7.00pm, and operating techniques on Thursdays at 7.00pm. Enrolments take place on the 11th and 12th September. Further details from A J Parcell G8BIX, c/o the college.

Rayleigh Adult Education Centre
The course will be run on Tuesday evenings starting at 7.30pm. Further information available from the centre, at Fitzwimarc School, Hockley Road, Rayleigh.

Canvey Adult Education
The course will be run on Wednesday evenings starting at 7.30pm. Further information is available from the centre, at Furtherwick School, Furtherwick Road, Canvey Island.

SPECIAL EVENT STATION

Manchester University Amateur Radio Society
The society will be running a special event station during the Universities Introductory Week, at the University. Further details are available from the secretary Khee Chan G5MUR either by writing to: Manchester University Amateur Radio Society, The Students Union, Oxford Road, Manchester, or QTHr. The societies callsigns are G3VUM and G8FUM.

Wacral
The World Association Of Christian Radio Amateurs and Listeners have a net Sunday mornings at 0715 GMT on approximately 3777KHz. This net has now been running for about 20 years. Controllers include G3AGX, G4 OTP, G3 TWS and G4 NPM. All amateurs are welcome.
They also have a CW net Mondays at 1930 GMT on approximately 3560 KHz.

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Name/Club..... Address.....
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Type of licence A..... ☐ B..... ☐
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Operating days M T W T F S S Times .....
Equipment .....
Phone/CW .....
Special interests eg DX,AMSAT etc.....
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Most interesting contact made to date .....
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DATES FOR YOUR DIARY

Dates for your diary is updated every month.
Club secretaries and organisers are requested to send information of forthcoming events as early as possible to ***Radio & Electronics World,*** Dates for your diary, Sovereign House, Brentwood, Essex CM14 4SE

Date	Function	Location	Contact
16 Sept	AGM	Glenrothes & District AR Club	GM4 LYQ
16 Sept	Mobile Rally	Vange AR Society, St Nicholas School, Basildon	G4IFD QTHr
19-23 Sept	The Personal Computer World Show	Olympia 2	
20 Sept	Ian Wade on Amtor, Packet Radio & RTTY	Cray Valley Radio Society Christchurch Centre, Eltham High Street	Brian G4LYU or Graeme G6CSY
20 Sept	Junk sale	Shefford & District Radio Society Church Hall, Ampthill Road, Shefford	Alan G4PSO QTHr
21 Sept	Surplus equipment sale	South Manchester Radio Club, Sale Moor Community Centre	David Holland G3WFT 061 973 1837
23 Sept	National car boot sale	Dunstable Downs Radio Club, Old Warden, Beds	Phill Morris G6EES Dunstable 607623
28 Sept	Junk sale	Radio Society of Harrow, The Harrow Arts Centre	Dave Atkins G8XBZ Rickmansworth 779942
30 Sept	Welsh Amateur Radio Convention	Oakdale Community College Blackwood, Gwent	GW3KYA QTHr
4 Oct	Grand surplus sale	Cray Valley Radio Society Christchurch Centre, Eltham High Street	Brian G4LYU Graeme G6CSY
7 Oct	Annual rally	Gt Lumley Community Centre	Gt Lumley AR Society G4OCQ
13 Oct	Midlands VHF Convention	BT Training College, Stone, Staffs	Peter Burdem G3UBX
14 Oct	QRP Convention	Preston School, Monks Dale, Yeovil	G3GC QTHr
18 Oct	Ian Wade on Amtor & Packet Radio	Shefford & District Radio Society Church Hall, Ampthill Road, Shefford	Alan G4PSO QTHr
31 Oct	Bring & buy night	South Bristol AR Club	Len Baker G4RZY 0272 834 282
2 Nov	AGM	Axe Vale AR Society 'The Cavalier', West Street, Axminster	Roger G3YMK Upottery (040486) 468
5 Nov	23cm & 13cm — How to get started	Stowmarket District AR Society	G3ZQU Stowmarket 676 288
21 Nov	Junk sale	Braintree & District AR Club, St Peter's Church Hall	G6 OIX QTHr
2 Dec	Coulsdon Club Flea Market	St Swithuns Church Hall, Grovelands Rd, Purley	G4BOX QTHr

J-A-R-G-O-N

A TREATISE ON BAFFLEMENT

BY JAMES DICK

I moved house last week, and while wading through the chaos which had been left behind by the removal men, I stepped on something soft (thankfully recalling that the cat had been sent on sabbatical to a relation) which, when reconstituted from its now crumpled parts, turned out to be an old *Dictionary of Electronics*.

Chaos forgotten, I sat down on the nearest packing case to browse through this relic. The pages were definitely no longer in order. I flicked aimlessly through them. The first word to catch my eye was *'spaghetti'* – defined as flexible tubing. Logical, I suppose. But what of a *'wobbulator'*? Apparently, this is a signal generator whose output is periodically varied over a defined range and used for aligning IF transformers (no doubt now blandly described as a sweeping signal generator). How about *'leakance'* or even *'leapfrog test'*? The former is (obviously?) a measure of an insulator's effectiveness; the latter is a test carried out on a computer, so called because (very obviously) an oscilloscope trace will jump when code relocation takes place into the part of address-space that the 'scope is monitoring.

Janet

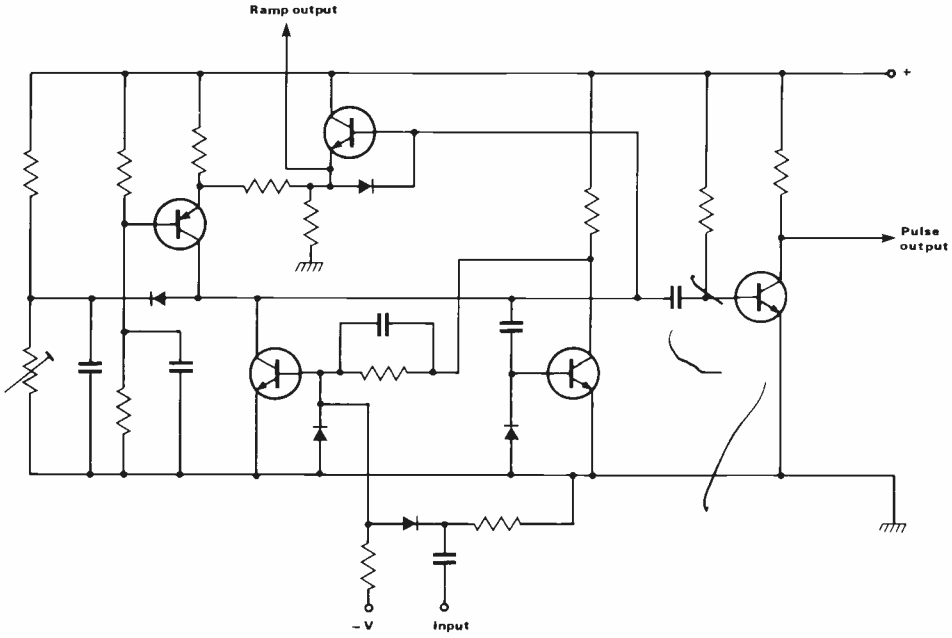
'Janet' appears to be an alternative name for meteor-scatter techniques. *'Ceraunograph'*, tentatively pronounced with a hard 'c' at the beginning, is an instrument to record lightning strikes. I wonder how that works? Perhaps that is the trouble with small dictionaries – they provide you with information but not really any form of explanation.

The next word to draw my attention sounded distinctly spiritual: *'phantastron'*. A ghost measuring device, perhaps, I thought. In fact, it is defined as a circuit which can exist in astable, bistable, and monostable configurations. Somewhere a brain cell stirred. Had I not come across this before? A climb over two tea-chests and a rummage in a cardboard box marked 'old books' revealed a rather dusty *Handbook of Electronic Circuits* which had been purchased, a few years back, from a secondhand book dealer in Edinburgh. Skimming through it, I suddenly stopped with the circuit of a solid-state phantastron facing me.

I read through the textual description eagerly. After all, a circuit with a name like that and ten semiconductors must do something of interest. A pulse at the input. . .causes a linear ramp at one output. . .and, as the ramp terminates, a pulse at another output. . .? Sounds rather like a sweep generator for an oscilloscope! Pity: the phantastron had such promise.

The last cluster of pages revealed *'hodoscope'* – not for examining brick-holders (Germanic roots) but, rather, for determining the path (Greek origin) of cosmic rays; I also found the *'additron'* – a valve device for adding two electron beams under the control of electrostatic deflection plates. Would this now be replaced by an AND-gate?

I put the old dictionary down and wondered what would have happened in the (presumably long past) re-write. Surely the emergence of the computer must cause the greatest impact. But what had interested me was the number of odd-sounding words. Yes, I mused, what of the words themselves – will jargon have replaced jargon? Or will the amount of jargon have gone up or down? I thought over as many computer terms as came into my mind.



'The Phantastron'

Sideways

It struck me that there *is* a trend. Not up or down – but sideways. The hoards of obscure proper nouns have been replaced by armies of acronyms. For example: ROM – the omnipresent read-only-memory. Jargon has gone: killed off by the acronym. Clarity is here because everyone can understand what the causal words of an acronym mean.

Rubbish! True, jargon may have gone but obscurity remains. This is because although an acronym is understandable once you know what the letters represent, without that knowledge the meaning is still hidden, so that some people will mutter 'j-a-r-g-o-n'. But why should we, the electronics and computing contingent, be ashamed of our obscurities? Obscurity is with us in every part of our lives – especially if you travel to a foreign country and do not speak the language used by the inhabitants. Even at home, I am regularly baffled by friends in economics *(Keynesian?)*, music *(counter-fugue?)*, and astronomy *(syzygy?)*.

So why can we not accept the present level of obscurity that we display? The reason is that mankind has to use and, preferably, understand the technology that we present to it and, as technology spreads into every area of life, the task of lowering the level of obscurity becomes more important. Half the battle is realising the problem is there – then the solution may easily be found. The next time the wife's aunt comes round, tell her how your home computer helps you solve everyday problems and expound on how easy it is to use – do keep off your treatise on multitasking architectures. After all, as one of my friends said, we just have to make our words more *EXOTERIC!*

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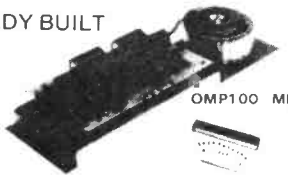

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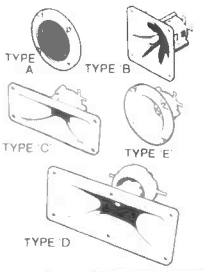

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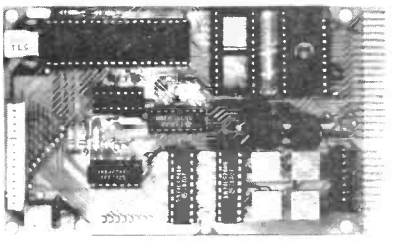

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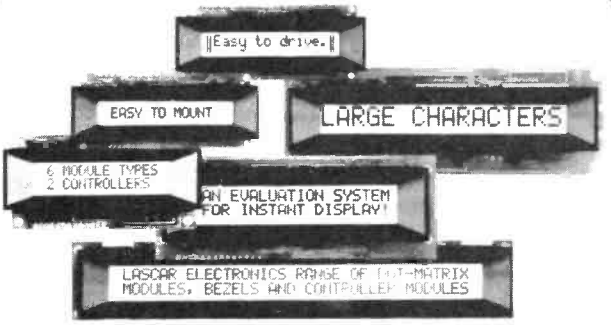

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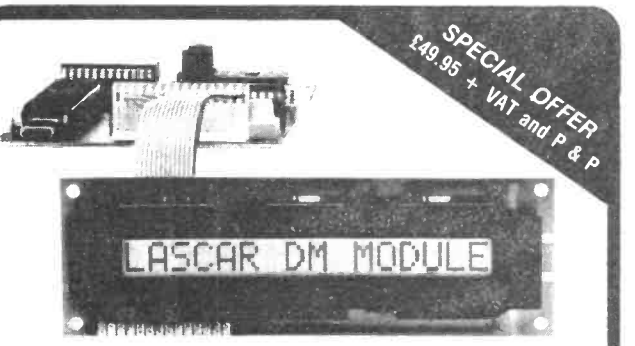

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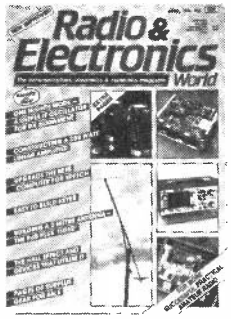
FEBRUARY 1984
Designs – Switched Mode Power Supplies, Crowbar Protection Circuit; Switched Step Attenuator, Universal NiCad Charger; Communications Building Blocks (IF Amplifiers); Real Time Calendar Clock. *Features* – Data File on Op-Amps, Six Antennas from Three Wires (Double your directions without doubling your cost), Designers Update (Helical Filters); Moving Pictures from Wax – 'Phonovision'; Computers, Communications and Applications; Data Brief – Low cost, wide range varicap diodes.

MARCH 1984
Designs — Modifying the Pye PF1 Pocketfone Receiver; Communications Building Blocks (IF Amplifiers); One Night's Work (Audio-Amp); 200W PEP Transmatch. *Features* — Sony ICF 7600D Receiver; Data File on Op-Amps; UOSAT-B, AKD Absorption Wavemeter, Data Brief — Hitachi HA 1197 AM Tuner, Oscar 10 and its Orbit Parameters; Programmable Sound Generator (the AY8910 family); Random Morse Computer Program; ICOM World Clock.

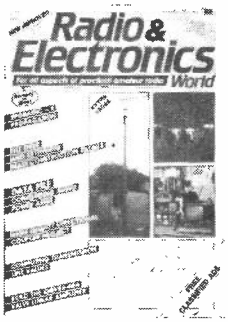


APRIL 1984
Designs — One Night's Work (IF Oscillator) ; HF Linear Amplifier, The Piano Keyer — only £5 for Perfect Morse; Peak-Reading LED RF Wattmeter; Speech and the Computer — Make the Beeb Micro Talk!; 2 Metre Tiger Antenna. *Features* — Hall Effect Devices — Exploiting Magnetisms' Effect on Conductors; Data File — CMOS Bilateral Switches and Multiplexer/ Demultiplexer ICs, Data Brief-TD 2002A Linear IC

MAY 1984
Projects –One Week's Work (VHF/UHF Frequency Meter); Spectrum Analyser Update; Assembling a Logic Probe Signal Generator; 2 Metre J-Stick Aerial; SX-200 Relative S-Meter. *Features* – Data File – 4046B Phase-Locked Loop CMOS IC; Hamey HM203-4 Oscilloscope review; A Beginners Guide to Meteor Scatter Propagation; High & Low Measurements – A Guide to Measuring Outside the Conventional Ranges

JUNE 1984
Projects – Microprocessor Controlled Dot Matrix Printer; One Nights Work – Replacement Plug-in Module for 2532 EPROM. A low-cost Frequency Standard, Radio Frequency Bridge; Modifying the RGB Interface for the Ferguson TX90. *Features* – High Speed Data Transmission; Trio-Kenwood TS-430S Transceiver; ZX Spectrum Data Transmission Program; Data File – National Semiconductors LM Range of Dual Audio-Preamplifier ICs, Data Brief – MC 1648 (SL 1648) Voltage Controlled Oscillator; HP41CX Calculator Review

JULY 1984
Projects — VLF converter, a unit for the very low frequency; Teleprinter Terminal Interface; Multifunction Test Instrument, a versatile piece of test equipment; Building the Fortop TVT-437; Improving Indoor Aerials, getting better reception without an aerial amplifier; Logic Probe for CMOS and TTL's. *Features*; Amplicon Digital Panel Printer; Oscar 10; Yaesu FC102 Review, Data File — audio power amplifiers; Images of the World, a new publication review.



AUGUST 1984
Projects – High Quality Directional Coupler, a coupler for frequencies above 432 MHz; QQV06-40A Linear amplifier, a 100 watt valve linear amplifier; 40ft Tilt-over and extending mast, a home construction project; One night's work, adapting a portable typewriter; BBC Micro volume control; TV and Video interface. *Features* – Twenty Questions; Sporadic-E propagation; Data File – Audio amplifiers; BBC Micro Morse tutor; Improving Resistors; Data Communication; Computing Transmission Lines

SEPTEMBER 1984
Projects – Low Power Transmitter, an 80m CW design; AM RAD, an experimental signal generator; Spectrum Analyser, further update on this project; Five Station Scanner, an add on unit for the 720 channel airband receiver.
Features – Computing Inductances, a program for winding coils; Data File, a look at alarm systems; Satellite Update, more information about weather satellites; Noise, a look at this electronic phenomenon; Distance and Bearing Program, an aid for station location; Super-Transmatch, a review of Tau Systems ATU kit.

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■ Receiver SRX30 by Lowe good condx £60. Carriage extra. Colley, 13 Ferry Road, Wawne, Hull HU7 5XU 822276

■ 70cms 4CX250 coaxial linear amplifier 250 watts RF out. £50, sorry no psu. 100PF Jackson C804 variable capacitors £2.50. N type plugs for RG58/U coax £1.25. N free socket for RG58/U coax £1.50. John Moxham G8KBQ. Tel: 0458 34105 after 5pm

■ Yaesu FT757GX HF Rx/Tx, brand new, £585. Four element vertical aerial to suit HF, offered free with rig or will sell separate, offers G4WSA Tel: 021 308 0357, north Birmingham

■ Hameg HM 312 scope DC-20MHz dual trace manual all probes. As new. £190.00 ono. Other items for sale also. A Raithby, 35 Rose Ave, Horsforth, Leeds, West Yorks. Tel: Leeds 581827

■ Nascom II 32K cased extras include all manual circuit tapes etc first £100 – BBC program tapes No1 and 2. Plus book and BBC home finance £20 the lot. A R Cooper, 41 Kingsway Ave, Paignton, Torbay, Devon, TQ4 7AA. Tel: Churston 843350

■ Complete VHF FM station, Yaesu FT230R, Welz SP15M, swr pwr meter, Bremi 10A psu, 6 element quad, all boxed and in immaculate cond. Offers around £290 will split if enough enquiries. If required I will send photograph, cost 50p. Tel: South Wales: 0685 74061

■ Signal generator, Farnell Modular System 2, 1-100MHz in 5 ranges, with calibrator, CW sweeper, 1-122dB unit step attenuator, as new, worth £300 selling £110 or offers. Tel: 0630 84476

■ Unidem 2021 new boxed offers cash or part exchange. Also Fujion portable RDF battery model DF 535 1600KHz 1.6 to 42MHz VHF 145-174 £100. IMC marine bands hand held fitted 10 crystals nicads charger case handbook £45. Tel: Bradford 676556 after 6pm

■ Yaesu F480R 2m multi mode £295. Pye PF2 pocket phone 3ch 2m portable £35. Pye PF2 pocket phone, 3ch, 70cm portable £35. Lattice tower 40ft £145. 2m power amplifier 10 in 80+ out £15. LO Band Westminster £40. H T Volz, 32 Carlton Ave, Rose Green, West Sussex. PO213LR. Tel: Pagham 5220

■ Pye Cambridge 4m AM transceiver, 3 xtals £18. 2m five-eighths ring plane, boss and cable £14. RAF xtal monitor in transit case £5. Ex-WD type 88 set VHF FM transceiver £8. Type 10 xtal marker, £6. Aldis lamp, mini key, filters, in case £3. Garrard record deck and mono, amp £4. Many valves, coils, capacitors, xtals etc. Collect or add carriage/postage. A W McNeill, 40 Turnpike Road, Newbury, Berks. RG13 3AS. Tel: Newbury 40750

■ Yaesu FT 101 HF transceiver, 160m – 10m, plus G3LLL FM (built in) transmit and receive, Repeater shift, Tone burst, fine working order, unbelievable clean condition £250. Bargain. Magnum Two transverter, 10m – 2m, FM/AM/SSB 100W out, superb condition £60. Trio JR 599 Rx, Custom special, 160m – 2m CW/SSB/AM/FM, again unmarked condition, £155. Oscilloscope 'BWD' Electronics model 509B, all solid state, up to 10MHz super instrument, £75 bargain. Marconi in situ universal bridge L, C & R all solid state, ranges will amaze you, 0-1pF to 10,000mF. 0-1Ω to 100MΩ 1μH to 110KH, super condition (cost several hundred) £40. Advance sig gen, 100KHz – 70MHz first class £20. 2m Bantex ⅝ wave hold fixing type, 2m ¼ wave gutter clip on type, £5 for the two. All the above instruments include service manuals and instructions. No rubbish offered, demo with pleasure, prefer buyers collect or carriage by Securicor only at your cost. Must make space. Tel: Ron (G3VCJ) 042-434726 (QTHr)

■ 'QRA/Maidenhead calculation and conversions' and 'QRA/Maidenhead distance, bearing and contest score' both programs for 16/48K Spectrum or BBC micro £4.50 each inc p&p. B W Kenzie, 6 Emsons Close, Linton, Cambs CB16NB. Tel: (0223) 892 064 after 6pm

■ Astro-Plane CB ant' £20. SX27 VHF Rx 27-143MHz + Discone ant £50. HY-gain 18AVT ham band ant £50. HF5 ground plane kit for above £25. Very large collection 1/96 scale military vehicles die cast. AVO 240v multimeter CT38 £18, no RF head. Small testmeter cost £25, £12. Hammarlund SP600JX .54-54MHz good working order, gen coverage, ideal for SWL who knows how to use a quality receiver £150. Telequipment scope S32A?? rack job £50. HRO Rx 4 coils and p/pack £50. Leak 'Variscope 2' amp, and pre-amp £25. Very rare collectors Rx Howard 450 USA 1937 gen coverage only 3 known in UK (1964) made by Howard Hughes Corp £100 ono all items god cond. Tel: 0908 314 095 (Milton Keynes)

■ I have built up an extensive collection of technical service information sheets and manuals over the years and am willing to part with copies. Data available for many makes and models from vintage wireless to video recorders. CTVs audio, radio old and new. Sae with your 'wants' and I will see if I can help. Maurice Small, 8 Cherry Tree Road, Chinnor, Oxfordshire, OX9 4QY

■ Yaesu FRG-7700 gen cov receiver. Mint condition with FRT-7700 ATU manual. Original packing. Securicor delivery £245. G13GTR, 3 Rhanbuoy Park, Holywood, Co Down, BT18 0DX. Tel: Holywood 6466

■ Realistic DX 300 communications receiver 10KHz to 30MHz also AM CW SSB signals, with Datong convertor model DC144/28 both vgc £130 with manual and instructions. Tel: 01-330 3687

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■ Hammond G102 tonewheel organ with drawbars and presets. Also printed circuit making gear. Exchange for HF/VHF transceiver or separates or general coverage receiver. Can deliver. Phone 097-422-326

■ Toshiba RPF11L portable receiver with FM, MW, LW and 8 shortwave bands. Quartz dual conversion tuning, LED band indicators, and signal strength meter. Mint condition in original packing, complete with earphone and carrying case £60, or nearest offer, including postage to anywhere in UK. John Lightfoot, 32 Woolley Drive, Bradford-On-Avon, Wilts, BA15 1AU. Tel: 02216 3654

■ Two transformers 200VA, 240volt or 120volt primary 24volt or 12volt secondary. Cost £24 each, sell for £3.00 each. Chalk, Parkside, The Twist, Wigginton, Herts. Tel: Tring 5903

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tuner £39 ono, one Arena stereo amplifier 20W output model F210 £15 ono, and for CBers one Commtel new A/R ⅝ wave for use on CB FM AM SSB 27-28MHz, still in box £19 ono, buyer must collect as transport is limited. Ask for Adam. Tel: 904 3956

■ Yaesu FT227R 2 meter FM synthesiser transceiver – hardly used. Excellent condition £110. Phone Romsey 513208

■ Gestetner 360 duplicator good working order £50 ono. Singer electric typewriter with RTTY copy tape punch needs attention £10 ono. Pair of car head rests £5. Solid oxy welding set £20, garden gate 4ft high 3ft wide waney edged £15. J Anderson, 72 Saffron Amington, Tamworth, Staffs B77 4EP. Tel: (0827) 51591

■ PF70 fully converted to 70cm. Three channels, portable, includes 3 batteries, extra RF preamp, auto toneburst, 10 way multi-charger, leather case. Superb condition £75 nearest. S Ibbs, 44 Sherborne Road, Bushbury, Wolverhampton. Tel: W'ton (0902) 788207

■ DX 200 communication receiver, 150KHz to 30MHz. AM SSB, good fully working condition includes circuit and owners manual £45: Rama F-50. 50MHz frequency counter with 455KHz IF offset £10. B Murray, 17 Glendevon Road, Edinburgh, EH12 5XG

■ Jen Synth SX1000 great for a beginner makes hundreds of different sounds costs new £350 will accept £120 or swop for ham int multimode or similar SSB radio with linear or good power regulator. Customer must collect. Please call after 6.00pm weekdays. Tel: Burton Upon Trent 0283 33526

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■ Realistic Dx-160 communications receiver 160-10 metres 240 volt or 12 volt. It was bought new by myself despite age. It has had very little use. If interested more details from c/o 'Les Yard', Aughton, Collingbourne, Kingston, Nr Marlborough, Wilts

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■ SX200N scanning Rx with power supply vgc £180 ono. Approx 230 valves, mostly new, Rx and Tx types. Any sensible offers considered. Buyer collects or carriage extra. D Bemister, 69 Woodfield Drive, Gidea Park, Romford, Essex RM2 5DD

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■ ATV 70cm Tx lens camera monitor, ready to go on the air £200 or will exchange for good cond FT290, MM2001. RTTY-to-TV converter £100. 2 aerials for 2 mtrs. Colin, ⅞ mobile mag base, both for £30. Tel: Northwich 45584

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■ Ham Concorde 2, AM, FM, SSB, mint cond, hardly used, conv to 10M easily, offers around £100. Tagra BT104 Sigma 4 copy never assembled £45 ono. Sinclair Spectrum 48K, brand new, never used, bargain at £100 ono. T N Howchen, 28 Morley Hill, Corringham, Essex. Tel: 0375 676685 (after 5.30pm)

■ Realistic 5-channel stereo mixer very good condition, £15. Alpine FL1500 stereo cassette deck vgc £24. Practical Wireless back issues from April 74 to Mar 80 45 pence each inc post all in clean condition, write first for full list David Wyatt, 6 Whittington Rd, Oswestry, Shropshire SY11 1HY

■ FT 208R handheld two nicad packs, spkr, mic, charger £155 or PX for FT290R. Also Scarab RTTY i/face plus software. For ZX81 £12.00. G4UKO (QTHr). Tel: Maidstone (0622) 859129

■ Yaesu FT720R and FT290R, boxed, plus 2M aerials and nicads for FT290. Class B licence holder giving up amateur radio, £350 the lot. Will split. Also ANO valve tester, offers? J Stevens, 71 Elers Road, Ealing, London W13 9QB. Tel: 01-567 6874

■ Polyskop II sweep generator £10. Marconi 801A generator £25. UHF generator TF1060/2 £115. Electron system analyser 10, 300MHz, £100. HP power meter 430c £60. Generator 801D £120. Telequipment oscilloscope calibrator £50. HP 1712A oscilloscope, as new, £1,250. Eric Falkner, 14 St Albans Ave, Hanworth, Middx. Tel: 01 898 0678

■ Gear for sale – property of Silent Key Colin G8TTA. Heathkit equipment as follows: all complete with manuals. CO 1015 ignition analyser (5in CRT) £48. IG 5280 RF oscillator £29. IG 5282 audio generator (sine/square) £11. IPA 5280-1 power supply for IG5280 series £9. IG 4505 oscilloscope calibrator £24. ID(4) 101 electronic switch £12. HD 1250 Solid State dip meter 1.5 – 250MHz £31. IT 7410 logic probe TTL/CMOS £10. IT 12 signal tracer £12. IM 18 vacuum tube voltmeter & RF probe £27. IT 28 capacitor checker £13. IT 121 FET transistor tester £17. AR 240 HT synthesised 2mtr transceiver £68. UHF TV colour bar generator £54. AVO model 8 MkII multimeter £57. SMC 150 PL 50 Ohm dummy load 150W £15. SMC T3-170L SWR/power indicator £10. Revco MA 200 mag-mount with 2mtr ¼ & ½ wave Aes £9. Black & Decker metal detector £5. Amplifier 125W 2mtr in di-cast box (1.5W input) £18. RCA 3in oscilloscope BW flat to 500KHz £33 (1MHz at -6dB sweep to 350KHz – 125VAC mains input). RS auto transformer 100VA tapped 240/115 etc £15. E & V 250V Megger (hand cranked in case) £48. 12V 8A power supply £32. 500 mA PSU tapped 3, 4.5, 6, 7.5, 9 & 12V £8. Third hand PCB clamp £2.50. RCA Volt-Ohm milliameter £12. EICO R & C substitution box £6. Sinclair ZX80 16K RAM pack ZX80 stabilised power supply – best offer secures. RSGB publications as follows: Interference Manual 2nd edition £1. Amateur Radio Operating Manual £2. VHF/UHF Manual 3rd Edition £2.50. Test Equipment 2nd Edition £2.50. Amateur Radio Techniques 6th Edition £2. Radio Data Reference Book £1. Miscellaneous books as follows: 5 in no – books on Oscilloscopes £2.50. 4 in no – books on Test Instruments £3. 9 in no – books on TV Servicing £4.50. 4 in no – books on Radio Servicing £1.50. 11 in no – Bambi paper-back Instruction books £3.50. 12 in no – General Radio books £5. 2 in no – books on Gyroscopes £1. 7 in no – books on Calculator/Microprocessors £4.50

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■ Radio & Electronics World back issues January & February 1982. May be able to collect. 41 Tollgate, Peacehaven, E Sussex BN98ED. Tel: 07914 2823 evenings or weekends

■ Test report or review of Yaesu FT48OR 2 meter radio. Will refund postage or duplicating cost to person sending copy. Thanks. Mr K Mott, 191 Joyners Field, Harlow, Essex CM18 7QD. Tel: 26647

■ Trio QR666, Realistic DX160 or similar general coverage receiver must be in good working order. Also require Codar PR30 preselector or similar. David Wyatt, 6 Whittington Rd, Oswestry, Shropshire SY11 1HY

■ Tandy PC4 portable computer, printer, t/inface, recorder, additional 1K RAM, charger, manual, in briefcase. Swap Dragon d/drive or printer RS232/Centronics. Tel: 01-908 0519 (evenings)

■ Manual or circuit diagram for a Tektronix 454A oscilloscope buy or borrow or photocopy with expenses paid. K R Maynard, 15 Highfield Road, Chesham, Bucks HP5 2DT

■ Trio PSU PS20 urgently, also VFO 120. Please write with details and price. Mr C Booker, 54 Lodge Hill Lane, Chattenden, Nr Rochester, Kent ME3 8NR

■ FB 100 Bearcat hand held scanner receiver. Please tel Burnley 0282 59320 anytime

■ Revcone antenna for SX 200N scanner must be reasonable. Tel: Burnley 0282 59320 anytime

■ Circuit or manual Codar Mk2 70A cheap spares accessories also. Write J Bloice, 16 Patricia Close, Oulton Broad, Lowestoft, Suffolk NR32 3NT

■ Replacement transformer and bench type case (have rack case available for swop?) – for Solartron CD1400 'scope – I've got a full technical manual for copying if anyone wants one. Tel: Leeds (0532) 866897

■ Sinclair ZX Spectrum computer must be the 48K

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only the computer is needed, not looking for anything too expensive as cash is very very short at the moment, anything in the range of £60. Tel: 904 3956 in the evenings

■ FT101ZD MkIII must be in mint condition. Tel: Colchester 394336

■ Yaesu YR-901 CW RTTY reader in very nice condition. Tel: Colchester 394336

■ Racal RA63 SSB adaptor, BC221 manual (not charts). Mains CB linear up to 500W. Mods for HR also Bearcat or similar scanner, not hand held. Cash or exchanges. Also want quality xtal calibrator. Tel: 0908 314095 (Milton Keynes)

■ Lecturer requires all types of home computer. Fair price paid and will collect. Tel: Peter (01) 979 6129 after 7pm

■ Circuit diagram or manual for Star Rx SR40. D J Plant, 15 Heathcombe Rd, Bridgwater, Som TA6 7PD. Tel: 0278 423288

■ Pye pocket phone 70's wanted. S Ritson, Wragmire Cottage, Carleton, Carlisle, Cumbria CA4 0BT

■ Oscilloscope. Must be complete and in reasonable working condition, age not too important, preferably with probe. Willing to pay up to £25 and p&p. Tel: Peter 01 641 3302 evenings

■ Yaesu FT102, Tx/Rx or similar. For sale FRG-7 £115. Widespace variable, suitable 2KW linear, £15. Tel: Thanet 0843 69068

■ Yaesu FL7010 linear amp for FT 790R G3DSV. Tel: Tedburn St Mary 472 day, 753 evenings

■ Heathkit HD-1410 electronic keyer kit or assembled unit. Also Shure 444 desk mike or non working body shell please. Tel: Herne Bay (02273) 3511 evenings or weekends

■ Pre-war American Scott receivers. American Rider manuals also required. John Howes, 11 Crendon Park, Southborough, Tunbridge Wells, Kent TN4 0BE. Tel: 0892 40022 (evenings)

■ Wanted for Trio valve receiver 9R59DE a mains transformer, 160-0-160 85mA DC with secondary of 6.3V 1.5A and 6.3V 3A. Martin Butch, Bognor Regis 820440 after 6pm

■ Exchange, a Burndept UHF portable in good cond for a PF8 on 70cm with charger and nicads in good cond. Tel: Allan 0782 612868

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■ Books and magazines, dealing with the construction of induction coils, spark coils and 'Tesla' coils, or any 'Tesla' equipment giving high voltage and long spark discharge. Mr V H Fell, 154 Finch Lane, Dovecot, Liverpool, L14 9QB

■ Required by hopeful hobbyist intent on restoring, rebuilding test equipment for own use. 'Service Manual complete with full circuit diagram' and 'Users Instruction Book', for Solartron CD1400 oscilloscope. Will purchase originals, or fee for copy. Would also be interested in any sub-assemblies for this instrument if price right. Offers please to Ray Fox, 46 Lovett Way, St Raphaels, Neasden, London NW10. All offers will be respected with the courtesy of a reply.

■ Any CB magazines, handbooks, circuits or scrap equipment. Repair any CB test equipment. Any CB repair books, any service manuals, anything on CB. Can you help? Please write to Mr G E Ford, 42 Princes Street, Normanton, Derby. Thank you.

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■ Manual for FDK Multi 750A. Copy if original not for sale, all expenses repaid. Also good, reasonably priced HF GEN Coverage receiver wanted. Ring with details or write: Alan Elcoate, 199 Rising Grove, Laindon, Essex SS15 5NR. Tel: Basildon (0268) 45575 after 6pm.

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Single County Guide	3 ..... £47.00 ☐	6 ..... £88.00 ☐	12 ..... £158.00 ☐
Double County Guide	3 ..... £94.00 ☐	6 ..... £176.00 ☐	12 ..... £316.00 ☐

PAYMENT ENCLOSED £ —

Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

Conditions — Payment must be sent with order form. No copy changes allowed. Ads accepted subject to our standard conditions, available on request.

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C P I

RTTY
THE EXPANDING MODE

Build your own terminal unit to interface your micro to a receiver or transceiver.

PL1 PLL T.U. . . . Kit..... £13.50
built module..... £18.50
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built module..... £14.65

Software also available – please enquire
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Please add VAT to all prices

PNP Communications (REW)
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East Sussex BN9 95B
Telephone (0273) 514465

Complete, full-size sets, any published service sheets £2 + large SAE — except CTV's/Music Centres from £3 + large SAE
Manuals from 1930 to latest. Quotations, free 50p magazine, price lists, unique technical publications, for large SAE.
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TISREW
76 Church Street, Larkhall, Lanarkshire ML9 1HE
Phone: 0698 883334

G W MORSE KEYS
4 Owen Close, Rhyl, Clwyd
Wales LL18 2LQ

THE GW MORSE KEY
A joy to use and to look at this key is made from solid brass polished and mounted on a slate base here in GW land (not JA) Mounting the key on slate stops all movement of the key when in use £34.50 pp £2.00 ea

24 HR LCD CLOCK
Clear ½" high lcd readout repeat alarm clock battery powered (2 AA pencells) No R/F problems known Complete with batteries £9.50 pp £0.50 ea

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The full range of Gwhips always in stock for quick and prompt delivery or collection

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NEW GWHIP PRODUCTS NEW
NEW AVAILABLE SOON NEW

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For full information and price list please send SAE

BRASS CALL PLATE
Your callsign engraved on a brass plate for fixing to the GW morse key or any of your radio equipment £1.00 only

NO POST & PACKING CHARGE FOR ORDERS OVER £50.00

The following Trade Marks were assigned on the 22nd April 1975 by Lank Electronics (London) Limited of 91-93 King Street, London W6 to Radofin Electronics (UK) Limited of 91-93 King Street, London W6 WITHOUT THE GOODWILL OF THE BUSINESS CONCERNED IN THE GOODS FOR WHICH THE TRADE MARKS ARE REGISTERED:-

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MANTA	B992433	9	Electrical and electronic apparatus and instruments, and parts of all the aforesaid goods included in Class 9
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TRITON	992435	9	Radio and television receiving apparatus, record players, tape recorders, cassette recorders; magnetic tapes for recording and cassettes for tapes.
TRITON	1026989	9	Radio and television receiving apparatus record players, tape recorders, cassette tape recorders, audio amplifiers, magnetic tapes for recording and cassettes for use with magnetic tapes, electronic calculators
RADOFIN	1039851	9	Radio apparatus, television apparatus, sound recording and sound reproducing apparatus record players tape recorders players for reproductive sounds from cassettes of magnetic tape magnetic tape and cassettes therefore, electric amplifiers stereophonic instruments and apparatus, electronic calculating machines

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Telephone the advertising department on: 0277 219876 for details

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A leading UK Alarm System Company now offers components and complete systems for DIY.

- ★ Self contained full feature system — just 10 minutes to set up for full protection. Supplied fully fitted in a superb teak finish cabinet — blends unobtrusively into any decor. Can be expanded to cover any points. **Only £74.50 inc VAT and delivery OVER 20,000 UNITS SOLD.**
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All products guaranteed. Top quality. Competitive prices. Immediate delivery.
Send for full details:

Dept.REW, Nortek Systems Ltd
4 Birchanger Road
London SE25 5BB
Tel: 01-771 1657

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82 SEAFORTH ROAD, LEEDS LS9 6AJ
All types of Ex-Computer gear in Stock Software for most Home Micros + full range of Velleman Kits, RD Tracers etc Also 2 metre & 70 cm RF AMPS, Spares etc Send Large SAE for list/enquiry or phone 0532-491366. Visits by appointment only

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RADIO CANADA

RADIO PEKING, RADIO AUSTRALIA, VOICE OF AMERICA
A Vega 206 (6x SW/MW/LW). Pulls these and dozens more. £23.95.
Year's guarantee. Return dispatch.
RADIOWATCH, Building 109, Prestwick Airport KA9 2RT

Trade Mark No 714791 'VALRADIO' registered in respect of 'Radio apparatus and parts thereof included in Class 9' was assigned on the 5th September 1983 by Valradio Limited of Browells Lane, Feltham, Middlesex to BALUBHAI GOVINDBHAI PATEL of, 90 North Drive, Hounslow, Middlesex WITHOUT THE GOODWILL OF THE BUSINESS CONCERNED IN THE GOODS FOR WHICH THE TRADE MARK IS REGISTERED.

S.E.C.
One Stop Electronics

announce the opening of:- **their new shop for the sale and servicing of *all* radio communication equipment.**

Components & Kits
V.H.S. Equipment
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Decent selection of most popular I.C's, components, transistors, etc.

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2+ books p&p free

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Stanley, Perth PH1 4QQ. Tel: 073882-575 RE10

Radio & Electronics World

For all aspects of practical amateur radio

SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £9.65, 3 — £9.15, 6 — £8.65, 12 — £7.75.

RADIO & ELECTRONICS WORLD SMALL AD ORDER FORM

TO: **Radio & Electronics World · Sovereign House**
Brentwood · Essex CM14 4SE · England · (0277) 219876

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue.....☐ 3 issues.....☐ 6 issues.....☐ 12 issues.....☐

COPY enclosed.....☐ to follow.....☐

PAYMENT ENCLOSED:..... £ — Cheques should be made payable to Radio & Electronics World. Overseas payments by International Money Order

CHARGE TO MY ACCOUNT.....☐

COMPANY .....

ADDRESS .....

SIGNATURE .....TELEPHONE.....

.....

C P I

ADVERTISERS INDEX

Radio & Electronics
For all aspects of practical amateur radio World

ADVERTISING RATES & INFORMATION

ABC membership approved pending first audit Jan-Dec 1984

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛page	£91.00	£86.00	£82.00	£73.00
128 x 90 or 61 x 186	¼ page	£160.00	£150.00	£145.00	£125.00
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£560.00	£530.00	£475.00
263 x 394	double page	£1140.00	£1070.00	£1020.00	£910.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£420.00	£395.00	£375.00	£335.00
297 x 210	1 page	£810.00	£760.00	£730.00	£650.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area = 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof and small ad	mono artwork	on sale thurs
Nov 84	13 Sep 84	19 Sep 84	21 Sep 84	11 Oct 84
Dec 84	11 Oct 84	17 Oct 84	19 Oct 84	8 Nov 84
Jan 85	8 Nov 84*	14 Nov 84*	16 Nov 84*	13 Dec 84
Feb 85	6 Dec 84*	12 Dec 84*	14 Dec 84*	10 Jan 85

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations.

Printed — web-offset.

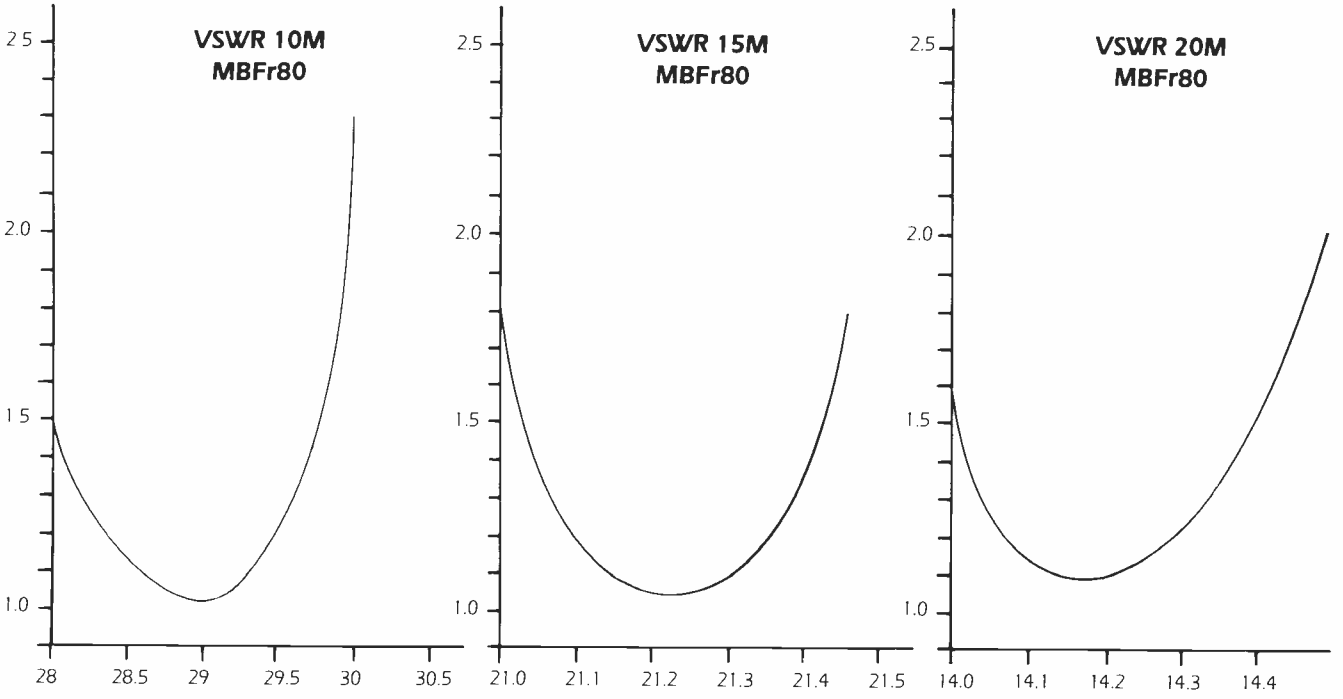
PAYMENT
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by publication date.

FOR FURTHER INFORMATION CONTACT
Radio & Electronics World, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Overseas payments by International Money Order.
Commission to approved advertising agencies is 10%.

CONDITIONS
10% discount if advertising in both Radio & Electronics World and Amateur Radio. A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

HI-SPEC FROM HIGHTECH



MBFr80 breaks new barriers in antenna design

Have you ever been in the situation of working rare DX when a short skip signal comes in on the back of your beam and wipes out your QSO? Most beam antennae commonly available today rarely better an F:B ratio of 30dBd. With the **MBFr80** an F:B ratio of 43dBd is easily attainable. **MBFr80** is not a traditional parasitic array but uses absorption techniques to achieve this 'quantum leap' in performance. Over 3 years of research work has been put into development of this type of antenna and extensive proving trials have shown us that in many cases the quoted specifications will be exceeded.

MBFr80 presents an input impedance of 50Ω (unbalanced) yet does not require a conventional balun due to methods of capacitive coupling used within the driven elements.

Due to the use of linear frequency decoupling conventional traps (i.e. coil and capacitor) are not required, hence reducing losses to a very low level. This means that **MBFr80** can sustain a maximum power input of 2kW (100% duty cycle) and 5kW peak at reduced duty cycles.

Unlike conventional 'trapped' antennae, this array has a much greater bandwidth. The plots above speak for themselves — solid state transmitters do not normally require an ATU with **MBFr80**. A conventional three element tri-band beam often has as many as 12 separate traps, leading to excessive losses, narrow bandwidth and limited power handling capabilities.

Using aircraft grade (fatigue tested) aluminium and high quality poltruded GRP, our antennae exhibit extreme durability, corrosion resistance and strength.

The **MBFr80** is exceptional value for money at £189.95 inc. VAT and P&P and is expandable through upgrade kits which will shortly become available for 2M (interlace) and HF (extra parasitic element). For users who demand maximum performance on a restricted budget, **MBFr80** only requires a lightweight mount and with careful siting may be used on a chimney mount without significant degradation in performance.

TECHNICAL SPECIFICATIONS

Input impedance	50Ω (unbalanced)
Max. power input	2kW (100% duty cycle) 5kW peak (reduced duty)
Forward gain	Better than 4.5dBd
F:B ratio	Better than 43dBd
Max. boom length	4m
Max. element length	2.3m
Boom diameter	40mm
Turning circle	3m
Net weight	8kg
Max. wind survival velocity	100mph

H I G H T E C H

Antennae (Scotland) Ltd

To: HTA (Scotland) Ltd., 24 Gremista Ind. Est., Lerwick, Shetland Is. ZE2 0PX

Please Supply ..... **MBFr80** Antenna(e)

@ **£189.95** incl. VAT & P & P

Name (please print) .....

Address (please print) .....

..... Postcode .....

REW1

I enclose a cheque/PO payable to HTA (Scotland) Ltd value £ .....

or debit my Access Card No. ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

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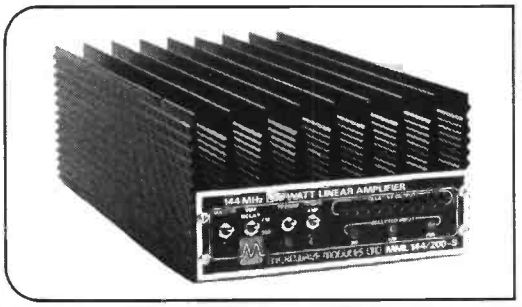
Credit Card Hotline 0595 - 5949 Please allow 28 days for delivery Offer valid UK only

MICROWAVE MODULES LTD

NEW!

MML 144/200-S: 144 MHz 200 WATT LINEAR AMPLIFIER

NEW!



FEATURES

- 200 watts Output Power
- Linear All Mode Operation
- Suitable for 3, 10 & 25 watt Transceivers
- Ultra Low-Noise Receive Preamp — Front Panel Selectable
- Relative Output LED Bar Display
- Equipped with RF Vox & Manual Overide
- LED Status Lights for Power, Transmit, Preamp on and input level

£245 inc VAT (p&p £4.50)

144 MHz HIGH PERFORMANCE RECEIVE CONVERTER: MMC 144/28 HP

NEW!

FEATURES

- Excellent strong signal handling characteristics
- Gasfet RF amplifier
- High level double-balanced mixer
- Harmonic-free, regulated oscillator

Input frequency range:	144-146 MHz	**Image rejection:**	60 dB
Output frequency range;	28-30 MHz	**Input/output impedance:**	50 ohm
Typical gain:	20 dB minimum	**Power requirements:**	13.8V at 75mA
Noise figure:	2 dB	**Power connector:**	5 pin DIN socket
3rd order intercept point:	+ 19 dBm (output)	**RF connectors:**	SO239 or BNC, please specify

Size: 110 x 60 x 31 mm (4⅜ x 2⅜ x 1¼")

£42.90 inc VAT (p&p £1.25)

1296 MHz GaASFET PREAMPLIFIER — MMG1296

NEW!

This GaASFET 1296 MHz preamplifier is constructed on high-quality Teflon glass-fibre pcb and includes a microstripline filter which provides excellent rejection to mixer image frequencies and out of band signals. It has a power gain of 15dB and a noise figure of 1.2dB. The power requirements are 13.8V at 35mA and the unit is fitted with 50 ohm BNC sockets.

£59.95 inc VAT (p + p £1.25)

MMC50/28S — 6M CONVERTER

This new Converter has switched oscillators to provide coverage of 50-54 MHz on a 28-30 MHz receiver. The design utilises MOSFETS in the RF amplifier and mixer stages, and the local oscillator is regulator controlled.

INPUT RANGES:	50-52 MHz 52-54 MHz	**OUTPUT RANGE:**	28-30 MHz
OVERALL GAIN:	30dB	**NOISE FIGURE:**	2.5dB

£34.90 inc VAT (p + p £1.25) NEW!

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CALLERS ARE WELCOME, PLEASE TELEPHONE FIRST

HOURS:
MONDAY-FRIDAY
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E. & O.E.