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MARCO TRADING

Access

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4017	60p	4033	1.25
4018	60p	4034	1.46
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TRANSISTORS DIODES

Type	Price (£)
AC127	0.30
AC128	0.30
AC128K	0.34
AC132	0.55
AC141	0.26
AC141K	0.40
AC142	0.26
AC142K	0.48
AC151	0.45
AC152	0.45
AC176	0.28
AC176K	0.46
AC187	0.42
AC187K	0.48
AC188	0.44
AC188K	0.50
ACY40	0.88
AD142	1.10
AD143	1.10
AD149	0.96
AD161	0.42
AD162	0.42
AD161 162	0.98
AF106	0.48
AF114	2.10
AF115	2.10
AF116	2.10
AF117	2.10
AF118	0.85
AF121	0.62
AF124	0.48
AF125	0.48
AF126	0.48
AF127	0.48
AF139	0.68
AF178	0.68
AF239	0.68
AF279S	0.75
AL100	2.50
AL102	5.90
AL113	2.20
ASY80	1.75
AU110	1.40
AY102	4.32
BA102	0.34
BA110	0.67
BA121	0.40
BA129	0.38
BA148	0.16
BA154	0.08
BA155	0.10
BA156	0.08
BA157	0.28
BA164	0.14
BB104B	0.52
BB105B	0.30
BB105G	0.48
BB110B	0.42
BC107	0.10
A or B	0.12
BC108	0.10
A B or C	0.12
BC113	0.14
BC114	0.12
BC115	0.12
BC116	0.15
BC117	0.22
BC118	0.17
BC119	0.30
BC125	0.12
BC140	0.28
BC141	0.42
BC142	0.30
BC143	0.30
BC147	0.08
A or B	0.10
BC148	0.08
A or B	0.10
BC149	0.09
BC157	0.10
BC158	0.10
BC159	0.10
BC160	0.30
BC161	0.30
BC168B	0.12
BC169C	0.10
BC170	0.14
BC170B	0.12
BC171	0.10
BC171	0.10
BC182L	0.09
A B or C	0.09
BC183	0.09
A B or C	0.10
BC183L	0.08
A B or C	0.12
BC184L	0.10
A B or C	0.10
BC207	0.15
BC208	0.16
BC212	0.09
A B or C	0.10
BC212L	0.08
A B or C	0.10
BC213	0.09
A or B	0.10
BC213L	0.10
A or B	0.10
BC237	0.11
BC238	0.12
BC239C	0.14
BC251	0.12
A B or C	0.14
BC301	0.30
BC302	0.32
BC303	0.32
BC307	0.10
BC308A	0.10
BC323	0.99
BC327	0.14
BC328	0.14
BC337	0.12
BC338	0.12
BC350	0.14
BC440	0.30
BC441	0.32
BC461	0.32
BC547	0.12
BC548	0.12
BC549	0.12
BC550	0.18
BC550C	0.18
BC557	0.12
BC558	0.12
BCX34	0.27
BCY70	0.15
BCY71	0.17
BCY72	0.18
BCZ10	1.68
BCZ11	1.45
BD124P	0.80
BC130Y	0.68
BD131	0.34
BD132	0.34
BD131 132	0.95
BD135	0.32
BD136	0.36
BD137	0.36
BD138	0.38
BD139	0.38
BD140	0.38
BD144	1.60
BD145	1.82
BD150A	0.51
BD159	0.65
BD160	1.65
BD165	0.45
BD175	0.60
BD182	1.00
BD183	1.10
BD184	1.20
BD201	0.72
BD202	0.87
BD204	0.80
BD222	0.80
BD225	0.86
BD232	0.45
BD233	0.60
BD234	0.62
BD235	0.63
BD236	0.63
BD237	0.65
BD238	0.56
BD241	0.60
BD243A	0.80
BD244A	0.85
BD375	0.32
BD410	0.76
BD434	0.68
BD436	0.68
BD437	0.76
BD438	0.75
BD439	0.68
BD507	0.48
BD508	0.53
BD509	0.54
BD510	0.48
BD511	0.56
BD520	0.66
BD699	1.25
BD707	0.88
BDX18	2.35
BDX32	2.10
BF115	0.32
BF117	0.54
BF119	0.82
BF120	0.38
BF123	0.40
BF125	0.42
BF127	0.38
BF152	0.16
BF154	0.23
BF157	0.40
BF158	0.22
BF159	0.24
BF160	0.23
BF167	0.30
BF173	0.25
BF177	0.42
BF178	0.30
BF179	0.32
BF180	0.35
BF181	0.35
BF182	0.32
BF183	0.32
BF184	0.32
BF185	0.32
BF194	0.08
BF195	0.10
BF196	0.10
BF197	0.10
BF198	0.14
BF199	0.16
BF200	0.26
BF222	0.48
BF224	0.20
BF224J	0.16
BF240	0.20
BF241	0.20
BF244	0.26
BF244A	0.28
BF244C	0.24
BF245A	0.28
BF254	0.15
BF256	0.40
BF257	0.32
BF258	0.30
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
BF839	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	0.38
BFW10	0.79
BFW44	0.76
BFX29	0.28
BFX30	0.30
BFX80	3.56
BFX84	0.24
BFX85	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
BRC4443	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
BT100 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	3.60
BT121	3.02
BT138 600	1.30
BT151 560R	0.90
BT151 300R	1.15
BTY79 400R	2.80
BU130A	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
BUY101	0.48
BY118	1.10
BY122	0.68
BY126	0.12
BY127	0.10
BY133	0.16
BY135	0.25
BY164	0.44
BY179	0.66
BY182	0.87
BY184	0.40
BY187	0.72
BY198	0.44
BY199	0.47
BY206	0.24
BY207	0.24
BY210 400	0.25
BY210 600	0.26
BY210 800	0.30
BY233	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
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OA47	0.10
OA90	0.08
OA91	0.09
OA95	0.18
OA200	0.06
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	2.46
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
IN4001	0.05
IN4003	0.05
IN4004	0.06
IN4006	0.07
IN4007	0.07
IN4148	0.05
IN5400	0.12
IN5402	0.15
IN5405	0.16
IN5406	0.18
IN5408	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
2SC495	0.65
2SC1172Y	2.90
2SC1173Y	0.82
2SC1302	1.40
2SC1226	0.84
2SC1279	0.50
2SC1306	0.92
2SC1307	1.40
2SC1413A	2.70
2SC1444	1.45
2AC1449	0.63
2SC1507	0.63
2SC1678	1.06
2SC1758	0.68
2SC1909	1.20
2SC1923	0.30
2SC1945	2.88
2SC1953	0.74
2SC1957	0.76
2SC1969	2.88
2SC2028	0.73
2SC2029	2.10
2SC2078	1.05
2SC2091	0.73
2SC2098	2.90
2SC2122A	3.20
2SC2166	1.20
2SC2314	0.80
2SC2335	1.50
2SC2371	0.90
2SC2749	2.70
2SC2752	0.60
2SD234	0.64
2SD348	3.30
2SD986	0.62
2SJ50	5.20
2SK134	3.80
2SK135	4.60
3N126	1.90
3N211	2.52
3SK45	0.76
3SK88	0.66
3SK135	5.20

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10nF 1000V DC **22p**

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22nF 300V AC **32p**

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400mW Plastic 3V-75V **8p each 10/75p**
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CA3065	1.75
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CA4102	3.30
CA4250	3.50
CA4400	2.98
CA4422	3.07
LC7120	5.33
LC7130	5.26
LC7137	5.16
LM380N	1.65
LM1303N	2.52
HA1151P	3.12
MC1307P	1.85
MC1310P	1.85
MC1312P	2.25
MC1327P	1.25
MC1330P	0.83
MC1349P	1.85
MC1350P	1.20
MC1351P	2.50
MC1352P	1.50
MC1357P	2.88
MC1358P	1.30
MC1496L	1.15
ML231B	2.10
ML232B	2.10
ML237B	2.30
MRF475	2.50
MRF479	5.20
MRP477	10.00
NE555	0.50
C-mos 555	0.88
NE556	0.80
SAA1024	5.35
SAA1025	8.40
SAS560A	2.50
SAS560S	1.85
SAS570S	1.85
SAS580	2.85
SAS590	2.82
SC9503P	1.10
SL432A	4.00
SL901B	5.20
SL917B	7.25
SL1327Q	1.10
SN76003N	2.44
SN76013N	1.90
SN76023ND	2.90
SN76033N	2.45
SN76110N	1.12
SN76115N	2.00
SN76131N	1.65
SN76226ND	1.80
SN76227N	1.10
SN76530P	1.40
SN76533N	1.60
SN76650N	1.05
SN76660N	0.75
SN76666N	0.80
STK015	6.50
TA7108P	3.20
TA7120P	2.20
TA7129AP	3.65
TA7130P	1.65
TA7172P	1.80
TA7193	5.50
TA7172P	1.80
TA7176	2.50
TA7202P	4.18
TA7204P	1.86
TA7205AP	1.50
TA7208P	3.27
TA7210P	6.50
TA7222P	2.12
TA7223P	3.68
TA7227P	5.60
TA7310A	1.80
TA7609P	4.28
TA7611AP	2.88
TAA263	2.48
TAA310A	2.68
TAA550	0.50
TAA570	1.99
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TBA120B	1.30
TBA231	1.45
TBA281	2.65
TBA395	1.20
TBA480Q	1.50
TBA400	2.30
TBA510	2.60
TBA510Q	2.60
TBA520 Q	1.60
TBA530/Q	1.30
TBA540/Q	1.40
TBA550/Q	1.52
TBA560C	1.70
TBA560CQ	1.60
TBA570	1.50
TBA641BX1	4.50
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
TDA1006A	2.40
TDA1035S	4.50
TDA1044	4.30
TDA1170S	3.00
TDA1190	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	3.80
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
TDA3950A/B	2.60
UPC554C	1.32
UPC557H	0.90
UPC566H	2.95
UPS75C2	3.20
UPC1018C	1.10
UPC1025H	2.90
UPC1032H	0.90
UPC1156H	4.20
UPC1158H	0.76
UPC1163H	0.98
UPC1181H	1.60
UPC185H2	3.75
UPC1212C	1.30
UPC1228H	0.54
UPC1230H	3.90
UPC1350C	4.25
UPC1367C	3.40
UPC1378H	3.40
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9 15 25

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Solder 0.75 1.00 1.50
Angle 1.40 2.00 2.40
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Solder 1.00 1.45 1.85
Angle 1.50 2.00 2.40
COVERS
0.80 0.80 0.80

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2 amp 12 way **0.19**
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Universal Ni-Cad charger charges PP3, AA, C,D Price **£6.00**

Rechargeable Batteries
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C (HP11) **£1.75** 10/**£1.65** **each**
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PP3 **£3.00** 10/**£3.70** **each**

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IC SOCKETS

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8 pin	0.08	0.70/10
14 pin	0.10	0.95/10
16 pin	0.11	1.00/10
22 pin	0.21	1.95/10
28 pin	0.30	2.75/10
40 pin	0.34	3.10/10

CO-AXIAL CABLE

50ohm UR43 type **34p per metre**
75ohm UR202 type **22p per metre**

MINIATURE MULTI-CORE

4-core **37p per metre**
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TWIN FIGURE 8

Grey & Clear **10p per metre**

TEST LEAD WIRE

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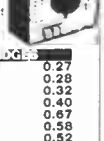

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800V	0.58
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85p A **£1.84** [illegible] **£1.84** [illegible] **£2.82** 20mm
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LM3914N	2.55
LM3915N	2.60
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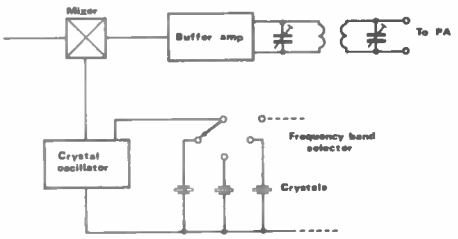
Front cover: Yaesu FRG8800 reviewed in this month's Receiver Special (p20).
Photo by Jay Moss-Powell G6XIB.

We regret to inform readers that owing to continually rising production costs and to enable us to maintain the high standard of content in **Amateur Radio** the price of the magazine will be £1.10 from this issue



SERVICES

LOWE SHOPS TRIO

TS830S

hf transceiver

Whenever you enter a LOWE ELECTRONICS' shop, be it Glasgow, Darlington, Cambridge, Cardiff, London or here at Matlock, then you can be certain that, along with a courteous welcome, you will receive straightforward advice. Advice given, not with the intention of 'making' a sale, but the sort which is given freely by one radio amateur to another. Of course, if you decide to purchase then you have the knowledge that LOWE ELECTRONICS are the company that set the standard for amateur radio shops and after-sales service. The shops are open Tuesday to Friday from 9.00 to 5.30 pm, Saturday from 9.00 to 5.00 pm except Glasgow, which on Tuesdays opens at 10.00 am. For lunchtime closing arrangements, please check with the individual shop.

In Glasgow the LOWE ELECTRONICS' shop (the telephone number is 041 945 2626) is managed by Sim GM3SAN. Its address is 4/5 Queen Margaret's Road, off Queen Margaret's Drive. That's the right turn off Great Western Road at the Botanical Gardens' traffic lights. Street parking is available outside the shop and afterwards the Botanical Gardens are well worth a visit.

In the North East the LOWE ELECTRONICS' shop is found in the delightful market town of Darlington (the telephone number is 0325 486121) and is managed by Don G3GEA. The shop's address is 56 North Road, Darlington. That is on the A167 Durham road out of town. A huge free car park across the road, a large supermarket and bistro restaurant combine to make a visit to Darlington a pleasure for the whole family.

Cambridge, not only a University town but the location of a LOWE ELECTRONICS' shop managed by Tony G4NBS. The address is 162 High Street, Chesterton, Cambridge (the telephone number is 0223 311230). From the A45 just to the north of Cambridge turn off into the town on the A1309, past the science park and turn left at the first roundabout, signposted Chesterton. After passing a children's playground on your left turn left again (between the shops) into Green End Road. Very quickly, and without you noticing it, Green End Road becomes High Street. Easy and free street parking is available outside the shop.

For South Wales, the LOWE ELECTRONICS' shop is located in Cardiff. Managed by Richard GW4NAD, who hails from Penarth, the shop (the telephone number is 0222 464154) is within the premises (on the first floor) of South Wales Carpets, Clifton Street, Cardiff. Clifton Street is easily found, being a left turn off Newport Road just before the Infirmary. Once in Clifton Street, South Wales Carpets is the modern red brick building at the end of the street on the right hand side. Enter the shop, follow the arrows past the carpets, up the stairs and the 'Emporium' awaits you. Free street parking is available outside the shop.

LOWE ELECTRONICS' London shop is located at 223/225 Field End Road, Eastcote, Middlesex (the telephone number is 01 429 3256). The shop, managed by Andy G4DHQ is easily found, being part of Eastcote tube station buildings and as such being on the Metropolitan and Piccadilly lines (approximately 30 minutes from Baker Street main junction). For the motorist, we are only about 10 minutes' driving time from the M40, A40, North Circular Road (at Hanger Lane) and the new M25 junction at Denham. Immediately behind the shop is a large car park where you can currently park for the day for 20p. There is also free street parking outside the shop.

Although not a shop there is on the South Coast a source of good advice and equipment – John G3JYG. His address is 16 Harvard Road, Ringmer, Lewes, Sussex (telephone 0273 812071). An evening or weekend telephone call will put you in touch with John.

Finally, here in Matlock, David G4KFN is in charge. Located in an area of scenic beauty a visit to the shop can combine amateur radio with an outing for the whole family. May I suggest a meal in one of the town's inexpensive restaurants or a picnic on the hill tops followed by a spell of portable operation.

The TRIO TS830S is for the operator who wants a dedicated amateur bands only transceiver, who is used to and wants a pair of rugged 6146B valves in the PA stage and who wants a compact rig which has its own in-built power supply. The TS830S is for the radio amateur who requires a rig capable of rising above today's crowded band conditions, a rig that has, as standard, the necessary features that will produce consistently good contacts where other lesser equipment would fail. The TRIO TS830S, a proven rig with an impeccable pedigree.

The TS830S covers on USB, LSB and CW the full amateur bands from 160 through to 10 metres.

Convenient to use, the transceiver has its own in-built power supply.

VBT (variable bandwidth tuning) enables the operator to, at will, vary the IF filter passband width and establish optimum IF bandwidth relative to the interference being experienced.

The IF shift control allows the IF passband to be moved up or down in frequency without having to retune the receiver. Hence, an unwanted signal, present in the IF passband, may be attenuated significantly by moving the passband in the appropriate direction.

As the IF shift and VBT are independently adjustable they can, to advantage, be used together.

The tunable notch filter in the TS830S is a high-Q active circuit in the 455KHz second IF. Sharp, deep notch characteristics will eliminate a strong interfering carrier within the passband of the receiver section.

The RF speech processor in the TS830S provides added audio punch and increases the average SSB output power whilst suppressing sideband splatter. Compression levels can be monitored and controlled from the front panel.

To cope with pulse type (such as ignition) noise, the transceiver has an in-built noise blanker.

For perfect listening, a tone control adjusts receiver audio frequency response to suit operating conditions.

Both RIT and XIT, transmitter as well as receiver incremental tuning are included to aid operating, XIT being a distinct advantage when calling a station that is listening 'off frequency'.

It is possible to monitor the transmitted audio in order to assess the effects of the speech processor: a most useful feature ensuring perfect signal reports.

TS830S amateur band transceiver.....£832.75 inc VAT, carr £7.00

LOWE ELECTRONICS
Chesterfield Road, Matlock, Derbyshire. DE4 5LE.
Telephone 0629 2817, 2430, 4057, 4995. Telex 377482.

TH41E

Up and down the country are many 70 centimetre repeaters, some 118 as compared with the 62 on 2 metres. Perhaps it is this wealth of equipment that can be summoned up at the sound of a 1750 Hz tone that now accounts for the increase in activity on 70 centimetres.

TRIO, with the introduction of the TH41E, have a worthy transceiver for the 70 centimetre band. The rig is small but size is not its most important feature. It's just the way the transceiver feels when picked up, impossible to put down. I am not going to give its dimensions, just compare it with the mouse.

Power output is switchable, 1 watt high and 150 milliwatts low. Operation could not be easier. Frequency selection is by means of thumbwheel switches and the TH41E not only has simplex and 1.6 MHz repeater shift but full reverse repeater as well enabling you to quickly check the input, if possible QSY and make for better use of the band.

I have personally used a TH41E through my local repeater, GB3DY and I must admit that after years of listening and operating nothing has given me as much pleasure as operating the TH41E. As an owner and with the rig always on your person, the hobby of amateur radio expands to an all-day event. Never miss a contact, never miss a friend.

1 watt output in high power position, 150 mW in low position.

Full coverage of the 70 centimetre band from 430 to 440 MHz.
(TH21E . . .2 metre band from 144 to 146 MHz.)

Frequency selection by simple thumbwheel switches.

Full repeater facilities including reverse repeater.

The transceiver comes complete with nicad pack, wrist strap, antenna and charger.

TH41E . . . 70 centimetre micro transceiver .....£214.50 inc vat.
TH21E . . . 2 metre micro transceiver .....£188.46 inc vat.

TS430S

The TS430S combines the facilities of a solid state HF transceiver with those of a general coverage receiver. It's the ideal rig for the radio amateur who not only wants to communicate with his fellows but also enjoys listening to the world. As an amateur band transceiver the rig covers top band to ten metres, as a short wave receiver coverage is from 150KHz to 30MHz. Operating on AM, FM, USB, LSB and CW the TS430S is extremely compact and, as such, is the perfect transceiver for mobile, portable or base station operation.
TS430S HF transceiver with general coverage receiver .....£769.50 inc VAT.

TW4000A

Taking into account the amount of activity on the 2 metre FM channels it is not surprising that many people have turned their attention to the wide open spaces of 70 centimetres. With the TW4000A, TRIO have produced a dual band FM transceiver that gives its owner the best of both worlds. Facilities include 10 memories, two VFO's, priority channel, full repeater operation, band scan and memory scan. In memory scan mode the rig can be instructed to look for either 2 metre or 70 centimetre signals. The transceiver produces 25 watt RF output on both bands and comes complete with mobile mount and microphone. For greater safety whilst mobile the optional VS1 board will announce frequency, memory channel and whether or not the rig is set on repeater shift.
TW4000A dual band FM mobile.....£536.51 inc VAT.

R600

For those who are banned from the house and have to operate from the shed at the bottom of the garden, why not consider an R600 to monitor the bands from the comfort of the fireside. No wife would forbid such an attractive looking receiver in the lounge, after all it could also be used to listen to *Women's Hour*. The R600 is a basic receiver covering from 150KHz to 30MHz and having switched upper and lower sidebands, wide and narrow am and cw. It has a 20dB attenuator and a noise blanker fitted as standard. Operation is simple, select the mode of operation, turn the MHz dial to the correct band and, by using the VFO knob, tune to the desired frequency. The clear digital readout makes station selection simple. The TRIO R600, your passport to comfortable listening.
R600 general coverage receiver.....£299.52 inc VAT.

L·E·T·T·E·R·S

LEGAL CROSSBAND?

I must take issue with Glen Ross' comments regarding crossband working in the February issue. I have investigated this subject in some detail and have taken legal advice from my tame QC. We are of the opinion that it is quite in order for any amateur to work crossband to any other amateur for the following reasons.

The first point to understand is that the conditions under which any amateur station is operated are set out in the individual licence as amended by notices published in the various gazettes from time to time. In the case of the 50MHz permits the individual licence is also varied by the terms of the permit. The licence is a legal document and as such is subject to the normal rules of interpretation.

If we look at specific clauses in the licence we see that under clause 1 (b) the licensee is only allowed to send to and receive from other licensed amateur stations. Note that there is no distinction between class A or B.

The classes of emissions which may be used are as governed by clause 2 (b), which states which classes of emissions may be used in particular frequency bands. The wording of this clause governs the *emissions* made by the station. This clause places no restrictions on the modes or bands that may be *received*. In fact, anyone may freely receive amateur transmissions in the UK without any licence whatsoever.

To summarise, it is therefore quite legal for any licensee to transmit on the bands for which he is licensed, and to receive on any frequency for which the transmitting station is licensed. Now who would like a 10GHz to Top Band QSO with me?

P L Crosland G6JNS, Worcester

The Editor kindly forwarded a copy of the above letter to me and I should like to respond to Mr P Crosland's interpretation of the law with regard to crossband working.

There is no doubt that a literal reading of the regulations may well substantiate Mr Crosland's views and advice. Unfortunately he loses sight of the fact that in this country we live by the interpretation of the law not the letter of it.

Until a test case is brought to try the validity of these clauses and to set a precedent then we must live by the rules as they are understood at the present time. These are quite clear in the opinion of the DTI and are as stated in my article.

Mr Crosland would do the amateur community a great service if he were to invite prosecution on this point and so clarify the position. I feel sure that his view would be vindicated but until it is I am afraid it is a case of 'status quo'.

Glen Ross G8MWR

A HUMBLE G6

Let's get one thing straight, I'm not qualified to estimate equipment properly, I'm just a humble G6 awaiting a G0 to appear in the post.

I've searched the market for an ATU to suit my needs, which are as follows: one, Top Band; two, at least one coaxial output and three, one wire and ground output. Most ATUs cover these requirements and the Jap ones from the main stables also have twin meters for VSWR and power. So far so good.

I would like to use a full sized G5RV, which seems to be a good compromise to suit my garden and along with my 10FM quarterwave it would make a good start to my antenna farm. But now to the crunch; every time I see the G5RV in a magazine article or my ARRL or RSGB handbooks alarm bells seem to ring loud and clear! Unbalanced to balanced equals problems, so I've been told, a fact which comes to bear when listening around. Some stations have been having trouble on 80m and 40m; surely a balun must be used? But where?

Anyway the problem can be bypassed by running a length of 75 ohm balanced twin feeder from the ATU to the 300 ohm ribbon. As long as the ATU has a balun built in, no problem (so I'm told) should arise.

Have you tried to buy an ATU with all the above features plus balanced output? They are very rare beasts indeed. After searching the local shops I came down to two, the TAU SPC3000 (beautiful but out of my price bracket) and the SEM Transmatch 1.8 to 30MHz, with or without Ezitune built in.

They seem to have the market to themselves. Why is 75 ohm twin so rare? Do the makers of ATUs know something I don't (more than likely)? Am I right in thinking that 75 ohm twin is: one, less lossy, two, cheaper and three, less prone to TVI if feeding a balanced antenna?

Anyway, I'm off to enjoy my investment, hopefully without any TVI. Keep up the good work, and how about a big all-comers contest to sort these ATUs out!

Dino Bragoli, London N20

S-UNIT

With reference to Bill Mantovani's statement that there is no agreed definition of an S-unit on page 53 of the February edition of *Amateur Radio*.

Surely the agreed IARU Region 1 standard is that at frequencies up to and including 30MHz, S9 represents a signal of 50μV across a 50 ohm load, and that 1 S-point represents a 6dB (4:1) change in power. At VHF/UHF a different standard applies.

I would also like to point out that the second paragraph of my letter published in the same issue *(Speculation,* p6) has got a bit jumbled at the end.

It should read – 'with a reference to the fact that grounding the screen (of the co-ax) gave better stray radiation/pick-up properties'.

Probably my poor writing; I've tried harder this time.

J W Barker G3WAL, Rugby

HEY HO!

I was delighted to learn that the RSGB HF subcommittee are favourably disposed towards the introduction of a novice licence.

Really these days there's no need to exert oneself to achieve anything – someone will do it for you, even if you're able to do it yourself!

I just can't wait until – armed with my free novice licence – I fit my trusty FT101Z into my new electric car and go bombing down the M1, calling /M on full power. Just think of all that lovely chaos!

Regulations? Well I suppose there'll be some, but if the 'other lot' can get away with murder, then so shall we.

Get a proper licence? Well, I suppose I could, I'm certainly brainy enough – but what a waste of my valuable time. After all, all I want to do is get on the HF bands with the minimum of effort, and the RSGB are putting their collective feet in the door to help me!

Hey ho! What a life! Now where did I put that 500 watt linear?

N Kirk G3JDK, Yorks

INTERNATIONAL SWL

I am an international short wave listener of many years and I have owned many short wave receivers during this time, and have tuned into radio stations worldwide.

At the present time I have two receivers, one of which is a Hitachi portable receiver and the other is a Realistic communication receiver. I also have the Halicrafter's X140 amateur receiver with which I tune into amateur radio stations.

Over the past few years I have become interested in being a licensed amateur operator, and I am now studying to be one.

In Guyana we do not have books on amateur radio as at the present time Guyana is experiencing a serious economic crisis along with a restricted amount of foreign exchange. This is one of the reasons why I find *Amateur Radio* magazine so helpful. Thank you for an informative magazine.

Stanley Browman, Guyana

L·E·T·T·E·R·S

THEIRS AND OURS

I am a keen reader of your magazine and I look forward to my copy each month. Thank you for an excellent monthly, if I might use such a term.

I am writing to you concerning the article on page 22 of the February edition, entitled *Justice/Injustice.*

At last someone has had the courage to stand and be counted. I have been driving large trucks for 20 odd years and I can tell you that this article is only the tip of the iceberg. I have often spoken of police harassment and the hopelessness of trying to do anything about it.

I came into amateur radio via CB, dare I say it. I mention this because one of the real benefits of CB to the trucker is that he can at least be warned of certain law enforcement agencies lurking in discreet places to harass, guess who?

I was appalled at the incident reported in the magazine and I wish I could do something to help anyone who finds himself in this predicament. Ignorance of the law is no excuse if you are to be prosecuted but it is fine if the law is ignorant – that does not count. You have to remember that these days there are two sets of rules. Theirs and ours.

I am a respecter of the law and have never done anything to be ashamed of in the amateur radio field, but I don't know how I would react to the kind of treatment described by Mr G3XSE. I would not be a happy man at all.

R Henderson G1ITC, Oxon

RSGB AGM

For some years now it appears that the RSGB council has successfully gagged its members by not allowing items to be brought up under AOB, even to the point of disallowing items for the agenda notified within the time limits set by company law.

It is no wonder that membership of the RSGB is on the decline when they adopt such an undemocratic stance.

The staff at RSGB HQ do a very good job and I have much praise for them, but I feel that they are handicapped by the RSGB council who on the whole are an inward looking bunch.

Please let's have some openness in the running of the RSGB and give its members a better chance to voice their opinions by debate. Perhaps then many of those who have left will return and we will attract new members.

I have chosen to write this letter to *Amateur Radio* because I feel that the censor at Potters Bar would probably not allow it to be printed.

I would be interested to hear from other members and non-members who share my view.

M J Butler G4UXC, Worcs

CLASS B 10m FM?

I work in the electronics industry and after many years of legal CB operation I became interested in radio and took my RAE last November; I am awaiting my result any day now.

In your magazine I've read about all these wonderful conversions possible to my legal CB set to turn it into a 10m FM radio but whereas it was legal for me to use FM CB it is illegal for me to use 10m FM as I will only be a class B licensee.

When you are first starting out in amateur radio money can be very scarce (I know), the price of VHF or UHF rigs can be expensive and even secondhand equipment tends to be pricey, especially to someone who is not sure how their hobby will progress.

A 10m FM rig, ie converted CB, can be bought for £40 or less and a complete mobile outfit including SWR meter and aerial could be purchased for under £60.

What I would like to see is the provision for class B amateurs to be able to use the 10m band FM portion only for mobile-mobile or mobile-homebase operations. The other alternative of course is for me to stay on FM CB but that's not why I took the exam.

I look forward to hearing your readers views on this proposal.

N Bristow, Herts

THE MAG FOR ME

I will be taking the RAE in May and to supplement my studies I have picked up various radio magazines to help me.

It was not until I bought *Amateur Radio* and read a couple of copies that I decided this is the magazine for me each month.

Keep up the good work.

Brian Navier, Hull

MORE FOR SWLs

GW40XB's hornet's nest (February 1985) deserves to be stirred up as much as possible until SWLs, especially beginners like me, get more consideration.

Whilst there is no doubt that *Amateur Radio* makes a greater effort for us than other publications, there should also be less jargon to enable the newcomer without electronic knowledge, or even a proper receiver, to get a general idea of the hobby.

As one who unashamedly falls into this category with ownership of a Fidelity RAD21, my own experience is of being inundated with technical information about instruments I can never hope to afford.

Much as I would love to progress by acquiring something more professional, like a Trio R600 or a Yaesu FRG8800, I see no prospect of doing so while the radio magazines continue to bombard me with incomprehensible abbreviations.

Firoz Mohamed, Derbyshire

SWLing IN 1959

May I thank you for producing a very readable and interesting magazine. I first started short wave listening in the late 1940s and my hobby reached a peak around 1960, when DX conditions were excellent on the HF bands.

In 1959 I bought an Eddystone 840A and this receiver is still going strong and has not developed any faults throughout its life.

Comparing the October CQ Contest of 1959 with 1984; in 1959 a wealth of DX was heard on 28MHz, all AM: ie, JA2, KG6 (Guam), VK4, VQ2, LU9; KR6 (Okinawa), BV1 (Formosa), UL7 (W Siberia), HH2 (Haiti) etc. Similarly on 21MHz it was all AM with JA6, VP8, FM7 (Martinique), ZL2, 3, 4, VK4/5/6, VU2 (India), VS1 (Singapore) and ZS6. DX on the LF bands was just non-existent.

However, by 1961 G3FPQ was heard working ZL and VK on 80 metres SSB. It is a great pleasure to hear David working the DX on 80 even now, and the thrill I got hearing those ZLs on 80 will remain with me for the rest of my life.

By contrast in the 1984 October affair I heard nothing of interest on 28MHz. On 21MHz however I heard YA1, V2 (Antigua), ZS1, LU4, 4K1 (USSR Antartica) and XT2 (Volta).

In the 1959 contest the first SSB stations were appearing on 14MHz; ie, VE7 (British Columbia), LU4, KL7 (Alaska) and ZS5. In 1984, as far as I could tell, all operations on phone were SSB. 14MHz produced UZ9, JH1, JA9, VK2 and 5N24.

But the great difference was on the LF bands. No less than 15 countries on Top Band! 80 metres was producing a host of DX including UW9, VP2, Ws etc, and 40 metres was also being used to good effect.

In 1959 I had a 67 foot long wire outdoors, whereas I now have a folded dipole for 21MHz in the loft space, but the receiver is still the Eddystone 840A.

One station was heard in both 1959 and 1984 contests; HZ1AB!

Just as a final note, I am sorry that the amateur fraternity looks down so on CB. In my area it works quite well and I have spent many happy hours chatting and DXing on 27MHz using legal equipment. Incidentally I may soon appear on the 'higher' bands as I now have my class B licence.

73s and keep up the high standard of the magazine and its friendly approach.

Philip Davies G1EMD, Shropshire

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STRAIGHT & LEVEL

All the latest news, comment and developments on the amateur radio scene

1985 RSGB CONVENTION PREVIEW

The 1985 RSGB National Convention will be held on Saturday 13th and Sunday 14th April at the National Exhibition Centre in Birmingham. Last year's event was an outstanding success with well over 10,000 visitors in two days, and everybody is hoping that 1985 will set new records.

It is not difficult to see why the NEC exhibition ranks as *the* big event of the year: traders from all over Britain, large and small, are on hand with large stocks and special offers, brand new products and rare items; clubs and committees representing all the different interests of radio amateurs are in attendance, meeting old members and signing up new ones, spreading 'the gospel' and (of course) selling their specialist wares; lectures on a vast range of radio topics, whether for the beginner or the expert, are taking place throughout the two days – yes, all this and more, and all under the same roof!

The event is held in and around that high-tech aircraft hangar, Hall 3 of the NEC. The doors are open from 10am to 6pm (5pm on Sunday), and admission will be £2.50 (£1 for children). Judging by previous years it certainly pays to get there early: the queue which inevitably builds up before opening doesn't take too long to clear, and it does seem that the early birds always catch the most bargains (and manage to get a seat in the bar!).

What's on

Without doubt one of the big attractions of the NEC convention is the unique collection of traders together in one place. The 'big names' are always well represented, touting their full ranges of goodies from the latest all-singing, all-dancing Japanese 'black box', through a host of kits and add-ons to the simplest accessory. The NEC 'bash' is one of those affairs where nearly everybody appears to be walking around with a big grin on their face and an even bigger cardboard box containing their latest purchase under their arm. Perhaps it's time you treated yourself to a new toy . . .

Birmingham is a major event in the trade calendar, so keep an eye out for new equipment, latest models and special prices and deals: you could probably save the cost of getting to Birmingham in the first place. With traders of all sizes offering their goods, there's bound to be something to suit everyone's needs *and* pocket.

It would be wrong to think that the NEC convention is only about buying and selling, since there is so much else to see and do during the day. Clubs and special interest groups, including RSGB Affiliated Societies and not forgetting the RSGB itself, are always on hand to promote their activities.

The RSGB is quite obviously there in force, and as well as organising the whole event and providing stewards and a central information point for the duration of the show, have a complete bookstall service on hand offering their full range of books, maps, RSGB paraphernalia and accessories.

While on the subject of the RSGB, it is worth remembering just how much work Norman Miller (G3MVV) and his committee put in to ensure the smooth running of the event: planning for the forthcoming show started even as the doors were closing on last year's success. Indeed, it is their forethought and close liason with the people who run the NEC, backed up by the lessons learnt over the last two years, which augur so well for another triumph in '85.

All this and more . . .

With all this going on in the main hall, you might think that there would be neither time nor space for anything else – but there, my children, you would be wrong. Tucked away in several of the reception rooms that make up part of the Hall 3 complex takes place a comprehensive series of lectures on various amateur radio topics. It is these talks and forums that turn the NEC show into a 'convention' in the truest sense of the word.

Full details of the programme are not yet available,

Find out what it's all about

but it is hoped that as many as five lecture streams will be running, so there certainly should be something of interest for everyone.

This year the talks will mostly be limited to one hour in length, to allow people time to sample as much as possible of what the convention has to offer. Careful note should be made of timings and locations of the discussions that interest you: obviously this will help to ease some of the problems of keeping to schedule, and prevent you from missing out.

Famous names . . .

If last year's talks are anything to go by, these lectures certainly are worth all the trouble it takes to get in to hear them: famous names and callsigns are there on show, waiting to be heard and later questioned. In my opinion the talks are of such a high standard that it is well worth organising the rest of your day at the NEC in order to fit them in.

This year's event also features something a bit different. If you happen to hear a stream of 12wpm Morse at some point during the day then the chances are that it will be Mr G H Williams (G3CYP), who will be at the NEC for the duration of the convention conducting BTI Morse examinations.

Facilities

Amidst all this talk of seeing and doing, buying and selling, one should not forget that the NEC also offers one of the largest gatherings of amateur radio enthusiasts of the whole year. The visitor certainly gets a feeling that he or she 'belongs' (unlike when a neighbour is busy complaining about TV!!). The show's position as a big social occasion, though perhaps lacking some of the cosiness (and cowpats) of a Woburn or Longleat, is certainly helped by the facilities on offer at the NEC.

Full restaurant, bar and snack bar facilities are available, providing the bargain-hunter with a chance to sit down for a while, chat with old friends or make new ones. The 'discussions' between amateurs in these various locales are sometimes almost as interesting as the officially organised lectures!

A full range of accommodation is available for those who wish to take in both days, ranging in price and sophistication from simple bed & breakfast to the up-market Metropolitain Hotel, itself part of the NEC complex.

How to get there

Birmingham's central position, combined with the special travel facilities provided for the NEC, help minimise the headaches involved in getting to the convention, even for those with relatively long journeys to make.

By road, there is easy access to the NEC from the many motorways which lead into the Midlands. The NEC itself is well signposted, with special exits taking visitors straight into the complex. Once again the RSGB has managed to obtain free parking for those driving to the exhibition, and on arrival there is a frequent and free shuttle bus to take you from the large parking area right to the entrance of the hall, and return you, and your purchases to your car at the end of the day.

For rail travellers the destination is Birmingham International station, this being located within the NEC complex and linked to the hall by escalators and covered walkways. It is worth noting that the NEC is only 80 minutes by rail from London (Euston).

Jet-setters will find Birmingham Airport adjacent to the NEC, a short bus or taxi ride away. As well as shuttle flights to and from London, the airport has connections to many major European cities.

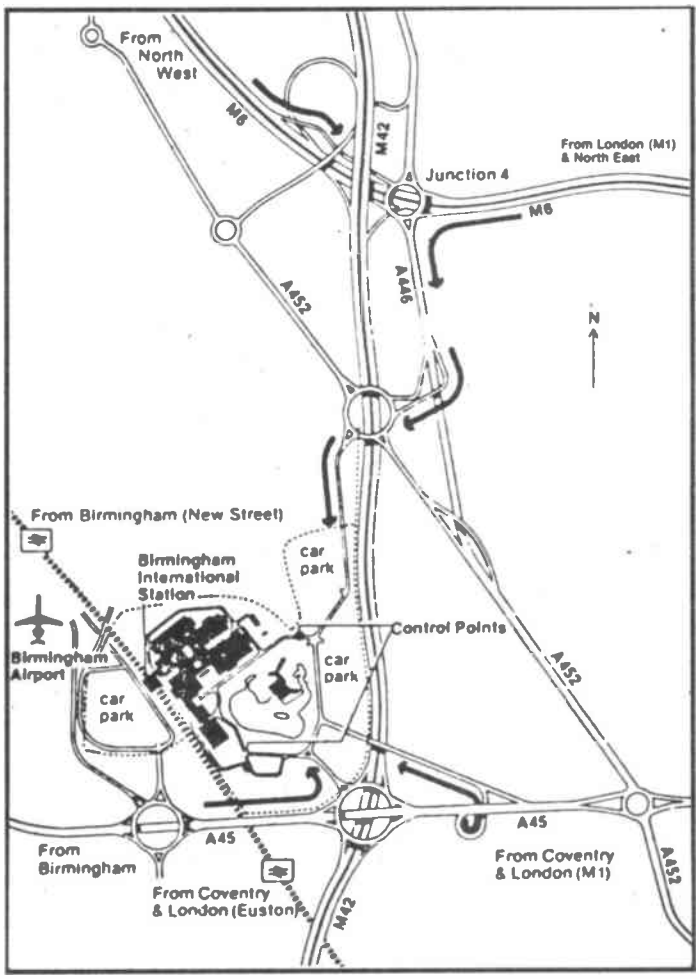
For the family

Unlike Woburn, which boasts a park full of wild animals to which the kids can be fed for the afternoon, there is not much natural beauty in the immediate surroundings of the NEC. So, if your trip to the convention cannot be accomplished without the presence of the XYL and/or other little passengers, it is worth noting that Birmingham New Street station is only 10 minutes away by rail, placing the city's shopping and entertainment facilities at their disposal. Other towns of interest are within easy reach by road or rail.

Don't miss it!

So there you go, hours of harmless fun awaiting you at Birmingham on 13-14 April. If you've been before you'll know just how interesting and worthwhile it can be: you certainly won't need to be reminded of the various bargains to be had. If you haven't been before, there's only one way to find out what you've been missing up to now, and that's to get along there and see for yourself.

Without doubt the NEC provides a great opportunity to look, listen, learn, do some shopping, mix with other amateurs, and have an enjoyable day while you're at it! See you there?



STRAIGHT & LEVEL

PRECISION GOLD MULTIMETERS

The Maplin Precision Gold test meters are designed to serve all situations where fast and accurate measurements are required. Initially, the range comprises five products, but further items will be added over the next few months.

The pocket multimeter is a rugged, easy to operate, general purpose multimeter. Its compact size and ease of portability makes it ideal for those situations where fast, accurate measurements are required. Ideal for use in the house, boat, car etc. Mail order price: £6.95.

The M102BZ is a wide range multimeter having a 90° three colour mirrored scale with a double jewelled precision moving coil movement. There are 23 measuring ranges and the meter costs £14.95.

The M2020S is a professional quality, comprehensive multimeter having a 90mm, full 90° arc, mirrored two-colour scale and a knife-edge pointer needle. In addition to the usual multimeter functions this product also has a transistor and diode checking facility which can determine transistor type and operational integrity. Incorporated are one green and one red alternately flashing LEDs which are very easily interpreted. The mail order price is £19.95.

The M5050E electronic multimeter is an accurate VVM type multimeter which uses FET input stages to present a very high input impedance, and thereby negligible loading to the circuit under test. This versatile multimeter is also calibrated to read peak-to-peak ac voltages as well as rms. The mail order price for this model is £34.95.

The M5010 digital multimeter is a high performance piece of equipment at a highly cost effective price. It has a 0.5in high, 3½-digit LCD display with polarity and battery state indicators. The DMM has 31 ranges, which in addition to providing for the measurement of dc/ac voltage, dc/ac current and resistance, includes continuity and diode testing facilities.

The continuity test sounds an audible buzzer if the resistance measured is below a minimum threshold. In addition the meter circuitry is built onto a gold-plated PCB for long-term reliability and consistently high accuracy. The mail order price is £42.50.

The Maplin Precision Gold range of test gear is available by mail order direct from the company or from the Maplin retail stores in Southend, London, Birmingham, Manchester and Southampton.

For further information contact: Maplin Electronic Supplies Ltd, PO Box 3, Rayleigh, Essex SS6 8LR.

RWC MODS

R Withers Communications are about to launch their latest innovation after six months of development by their design team.

The new product is a modification for the Yaesu FT757GX and serves two purposes: to improve VFO tuning and eliminate 'VCO GLITCH' and to increase tuning speed from 5KHz per dial revolution to 50KHz (selectable on the 500KHz step switch).

The unit comprises a small PCB designed to fit onto the existing microprocessor (Q67) and has two microchips, some small components and only eight connections.

Three of the connections are made to the micro pins direct and the other five are easily made to existing terminals on the main PCB and display board. The modification can easily be installed by an experienced constructor and will be available from selected dealers who will offer a fitting service.

The price is £29.50 for the PCB with fitting instructions and £39.50 plus carriage for a unit factory fitted and tested.

A complete modification board designed to fit CB radios that incorporate the Sanyo LC7137 series of synthesiser chips has also become available. The unit comprises a small PCB with six microchips and fits almost all legal (CB 27/81) radios.

The unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts.

The board costs £22.50 plus £1 P & P and is exclusive to R Withers Communications.

For further information contact: R Withers Communications Ltd, 584 Hagley Road West, Oldbury B68 0BS. Tel: (021 421) 8201.

'THE LIMPET'

How many times have you heard the story of the man who put a ⅞th aerial for 2 metres on to a magnetic mount and then found that every time he travelled at more than 30 miles per hour the magnetic mount parted company with the car. Well, now a magnetic mount that should put an end to that sorry tale of woe has been found.

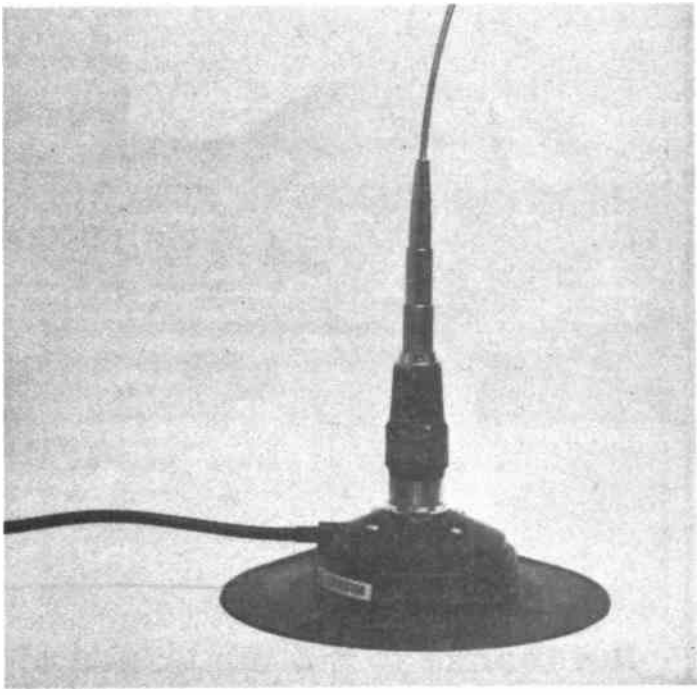
This new magnetic mount (which could aptly be named 'the limpet') is more than three times stronger than the conventional magnetic mount. Its special design means that for normal car mounting surfaces and the legal driving limits, the aerial will stay put.

Tests have indicated that there is every likelihood of the aerial base breaking before the adhesion between the car metal work and base is lost.

The SO239 mount comes complete with 50 ohm cable and PL259 plug. Made in Japan and selling for around £15.00, this unit will be found in most good amateur radio shops from March.

Alternatively, the unit can be ordered direct from the importers at £16.75 incl P+P.

For further information contact: Waters & Stanton Electronics, 18-20 Main Road, Hockley, Essex.



STRAIGHT & LEVEL

STOLEN GOODS

The following amateur radio equipment was stolen on the night of 13/14 February from Roy Bailey (G6WLE) and we felt his plight was worth a mention in these columns:

Yaesu FT708R, serial no 041387 with speaker mic, nicad battery and ¾ wave whip.

70cm linear amplifier, home-made from a Wood & Douglas 70LIN10 kit. It comprises an aluminium die-cast box, approximately 4¾in x 3¾in x 1½in, with a black heatsink of almost the same length fixed to the underside. The controls on the outside of the box are marked by blue Dymo tape on which the lettering is almost unreadable.

Oscar 2m/70cm dual-band antenna. This is mounted on an old mag mount that originally held a cheaper antenna.

Duplexer. Home-made, in an aluminium die-cast box, approximately 1½in square and 1in thick, with a BNC socket at one end and two leads, approximately 35cm long, at the other.

Yaesu PA3 car adapter/charger. Standard item, with cigar socket plug on one lead and a double power and charger plug on the other.

If you are offered any of these items, or you have knowledge of any attempt to sell them, please contact your local police station, or Ron Bailey, tel: (048839) 441.

A UNIQUE TRIP

Five radio amateurs from Goole, Yorkshire, are planning a unique trip for the first weekend in May – to the most northerly, southerly, easterly and westerly points of mainland Britain.

Determined to arrange 'something completely different' to publicise the hobby generally and their town's Radio and Electronics Society in particular, they asked Renault UK Ltd to lend them a new car for the gruelling, 2,000-odd mile exercise. The French manufacturer, which has been importing vehicles through the port of Goole for more than 10 years, duly obliged.

They intend driving up to the north of Scotland on the Friday night/Saturday morning, reaching their first 'target' – Dunnet Head – well before noon. Their next destination will be the most westerly tip of mainland Britain, Ardnamurchan Point, which they hope to reach by Saturday afternoon.

All they will have to do then (!) is drive down to the Lizard, probably completing that leg of the trip first thing on Sunday morning and then tackle the long haul to Lowestoft, which should be reached by mid-afternoon. They aim to be back at Goole by the evening.

The Goole Society believes the journey should be possible without too many difficulties and intends to operate non-stop on 144/145MHz throughout the weekend; a severe test for any rig, let alone the poor Renault 5! There are hopes that a special event callsign – GB8 Round Britain Trip/M – will be issued, although it's by no means certain that the DTI will approve such a mobile identification. If not, the society's own callsign, G8HSG, will be used.

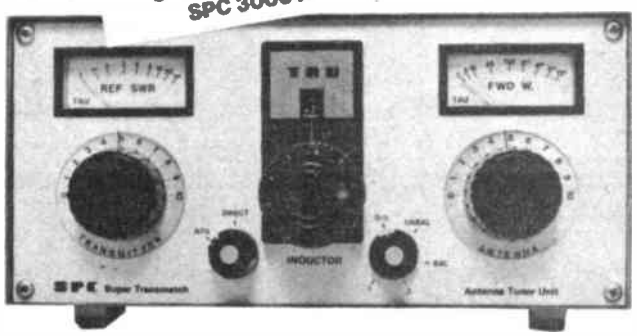
Either way, the weekend-trippers will issue special QSL cards to those lucky enough to link up with the Renault. It's hoped that fellow amateurs will donate at least 50 pence or £1 for each card, as one of the principal aims of the trip will be to raise money for charity.

Two good causes have been earmarked for help – the £100,000 'Stop-the-Rot' appeal at Goole Parish Church, which needs major repairs, and the National Society for the Prevention of Cruelty to Children. Sponsor forms will also be available for people guessing the precise distance covered.

The team of five are all members of the Goole Radio and Electronics Society, namely: Steve Anderson G6VBU, the society's public relations officer; Ray Thornton G6KCE, secretary; Richard Sugden G8IOH, treasurer; Geoff Cowling G8ERX and Dennis Lockwood G6REL.

If they succeed on this venture they are going to plan something a little more challenging next year!

COMPETITION RESULTS . . .



AT LAST. **The Lucky winners of the competition featured in the December issue have been decided and are as follows:**

The first prize of a TAU SPC3000 ATU donated by TAU Systems goes to:

H G Hall of Trimpley, Worcs

and the runners-up prizes of the ATU in kit form donated by TAU Systems and Cirkit Holdings go to:

P Varkalis of St Albans, Herts

and

M Kessel of Stoke-on-Trent, Staffs

Our thanks to the thousands of you who entered the competition.

DX DIARY

News for HF operators compiled by Don Field G3XTT

Saturday evening, 16 February. The phone rings. The message is that Carl and Martha Henson are active from Equatorial Guinea as 3C1BC and 3C1YL and will be there for two weeks. They have no permission for 40 metres, but are expecting to be active on all the other bands including 160. My informant had tried to call me earlier but, as always seems to happen when there is a new one on the bands, we were out.

Desperate need

What to do? Equatorial Guinea is one I need desperately for an all time new country, having missed earlier operations from there (the last was 3C1JA by a Japanese operator about 3 years ago). The first snag is that, having recently moved house, I have yet to get the beam in the air and I am limited to wire antennae hung from a 42ft mast which I have temporarily put up against the house wall.

The good news is that Carl and Martha are first rate operators, with a record of having put on the air several rare countries from Africa in recent years (Zaire, Uganda, Annobon and Tchad, that I know of). They never publicise their operations in advance so there are no disappointed operators if things don't work out. When they do arrive and get the licence they refuse to work via lists or nets but can be found on CW and SSB, on or near the usual DX frequencies. Incidentally, their home calls are WB4ZNH and WN4FVU.

What next?

Having thought about the above I have to decide how I am going to catch them. Initially I have some doubts about the likelihood of working them on 160, and feel that 80 will be rather hectic in the early days of their operation. So will the higher bands but, always the optimist, I decide to start with 15 metres.

First thing Sunday morning up goes a 40m inverted vee (resonant as one and a half wavelengths on 15) and around midday I am busy in the pile-up calling Martha who is on 21288KHz, listening 300 to 310. Not surprisingly, however, I find myself getting nowhere against the people with beams and quads.

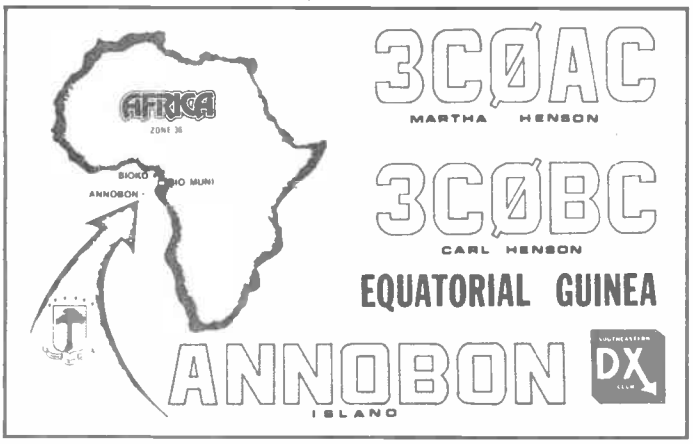
Not wanting to miss this new country I decide, against my better judgement, to go out that afternoon to the QTH of a local who has a 60ft tower and triband quad. By the time I arrive however propagation has swung towards the States and I am wasting my time. Just as well really. I wouldn't have got any particular satisfaction from working the 3C from someone else's station.

By Monday more news is available. On the 2m DX net I learn that several G stations got through on 80 yesterday evening. Carl was apparently quite strong, but was limited to transmitting on 3595KHz, although he could listen anywhere in the band. A phone call to a leading Top Band DXer also reveals that Carl was giving out a fair signal on 160 CW shortly after midnight.

The first QSO

On Tuesday evening my plan is to check 80m to see whether this band is likely to be my best bet. Sure enough a number of Southern Europeans are working Carl, but there is a teletype transmission right on top of him and I can barely read him. While listening to this there is news on 2m that K4LTA/J7 is on 20 CW. I need a CW QSL from Dominica, so I load up the 40m dipole (high SWR, but the feeder losses shouldn't be too bad!) and call him. He comes back at about the third call (not such a rare one as 3C!), and while in QSO I ask him when he will be on 160. He tells me midnight GMT so, having given up on the 3C for tonight, I go out in the dark, take down the dipole and put up the Top Band quarter-wave inverted L.

QSL from an earlier operation by the Hensons



No sign

At midnight there is no sign of the J7 but, about 15 minutes later, who should show up but 3C1BC on 1821KHz with a 559 signal. He is working US stations and the occasional European. The pile-up is small at first but soon starts to increase. Then Carl disappears. My guess is that he has decided it is time to work split frequency and, sure enough, I find him up on 1828KHz calling CQ 'QSX D8'. In other words he is listening 8KHz down on 1820KHz.

Most of the crowd are still unaware of what has happened and are still calling on 1821, with the result that I am able to raise Carl on the second call. A quick exchange of reports and, I have 3C in the bag and on 160 of all bands!

Other commitments prevent me from trying again until late on the Thursday evening. Shortly before midnight I hear Carl on 3595KHz, listening on 3604KHz. Out into the dark again, this time to take down the Top Band antenna and put up the 80m inverted vee. Back into the shack and load up the rig.

Carl is a good 57 signal tonight and very soon he calls 'the G3 go ahead please'. I

give my call again, together with a report, and Carl acknowledges, giving me a 59 report. Nothing particularly significant in the report though. He is giving everybody 59, probably to make the QSLing easier for his manager back home.

Who needs a beam?

Friday is now with us and, fortunately, I had already arranged a day off work. Shortly after midday I hear a pile-up just below 14200KHz, and 5KHz further down the band is Martha with a reasonably strong signal. She is working into Europe and after a week of operation, and also with it being a weekday, the pile-up is small.

I rush outside to adjust the length of the 160m inverted L so that I can resonate it on 20m. Fortunately the top section runs roughly to the South, so there should be some modest gain towards 3C. Back into the shack and in less than 5 minutes I have her in the log.

The final QSO comes on Sunday on 15m SSB. Carl is operating on 21288KHz, listening on 21294KHz. Although it is 1430GMT he seems to have no propagation to the USA, so I may be in luck. The first few calls are fruitless, but then Carl tries to spread out the pile-up by announcing that he is listening 21295-21300KHz.

Fourth contact

The second station to raise him is one of my locals and I am able to jump on the same frequency before others spot where Carl is listening and have my fourth 3C contact in the log. Four bands, with one CW and 3 SSB QSOs. Now all I need are the QSLs.

K4PHE is handling Carl's cards, and N4NX is handling those for Martha. This week's DX News Sheet, which arrived on Thursday, contains full addresses for both managers. What more could I ask?

Why have I used so much space to relate the saga of my chase for Equatorial Guinea? Not to blow my own trumpet, but rather to illustrate from a practical situation how it is possible to work DX successfully even without a big tower and beam. Some readers may have the impression that DXing is the preserve of the 'few', and if my tale encourages more modestly

K1TN, publisher of 'The DX Bulletin'

equipped amateurs to join the fray then I will be well pleased.

Other lessons

There are some other lessons to be learned from my tale, ones which I have covered in earlier columns but which are worth emphasising. Good up to date information is vital to the DXer, and other DXing friends are often the best source of this. A willingness to keep odd hours and put up with the inconvenience of messing about with antennae at night with snow on the ground also helps!

In the case of the 3C operation the ability for split frequency working was also vital, either by use of a second VFO or an outboard receiver.

Finally, I should point out that (on SSB) a linear amplifier helps when no beam is available, though a good speech processor can give a similar boost to the signal strength. In my case I use both.

Navassa Island

From 4-9 April look out for an operation from Navassa Island near Jamaica. A large group of operators are planning to go, including 6Y5IC and, possibly, his brother G3RFS. Navassa Island is 75 miles northeast of Jamaica and 30 miles west of Haiti, and is the subject of a dispute between the two countries. In amateur radio terms this manifested itself in July 1981 when a group of Haitian amateurs were airlifted to the island by the Haitian military and operated as HHON. Needless to say, the QSLs were never accepted by the ARRL for DXCC purposes.

The most recent operation from Navassa was in March 1982, when a group of US amateurs operated as KP2A/KP1, making 33,552 QSOs. The expedition was written up in *Time* magazine (3 May 1982 issue).

When arriving at Navassa by sea the landing is accomplished by jumping on to a wire rope ladder that dangles about 40 feet from a cantilever catwalk. There is no assistance because the island is normally uninhabited, being home only for an unattended lighthouse and various species of wildlife.

The LF bands

LF band conditions continued to improve during February and, once again, 160m was the star of the show. I have already mentioned the appearance of 3C1BC on the band; other exotica included G3ZGC/J6L, HH7PV, HK0HEU, J87UEE, TG9NX, 6Y5IC, 7X5AB, 3B9CD, ZL2BT and others. Speaking of ZL2BT, at the time of writing he was laid up with a damaged hip and I am sure readers would want to wish him a speedy recovery. On 80m recent DX has included DJ6SI/5V, TL8CK, KL7U, 9M2RT, T3OAT, ZL7OC and much more.

Other news

If you hear or work FR5DX, this is Herick, ex-FR0FLO, the best known operator from Reunion Island. FG5DL/FS will be operational from the French island of St Barthelemy in the Caribbean for about 2 years.

Cards for A61AA are now being accepted for DXCC credit; good news for those who worked Des last year. Des is now back in England and has no plans to return to A6 at present. Another one which the ARRL is accepting is PS7ABT/S9.

The latest news about ZR6AOJ is that he failed his medical and will not be going to Marion Island. It looks as if we will have to wait for another year or more before ZS2MI is heard on the bands again.

Welcome news

One piece of welcome news is that Thai amateurs are back on the air. Although the club station HS0A has been sporadically active in the last couple of years, there was a ban on operation by individuals.

This news is particularly important for anyone chasing the 5-band Worked All Zones Award, because Thailand is the only currently active country from Zone 26.

On a similar note, the first official amateur licences for many years are now being issued in Turkey.

Although there has been continuous acitivity from Turkey in recent years there was no official licensing procedure. ON5NT will operate from Burundi from 5-15 April using 9U5JB's station and callsign (ON5NT is 9U5JB's QSL manager). Chis will be using all bands including, possibly, 160.

Contests

There are no major contests time-tabled for April, but a couple of the RSGB's local events may be of interest: the ROPOCO Contest on 7 April and the Low Power Contest on 21 April; and, of course, don't forget the CQ WPX SSB at the very end of March. I hope to be participating in this with a group of others, signing with a special GB prefix from darkest Berkshire. Hope to hear you on the air.

Finally

Finally, I hope to meet some of you at the RSGB National Convention in the NEC on 13/14 April.

I am scheduled to give a talk about HF operating at some point, and particularly look forward to meeting some readers of *DX Diary*.

ICOM AT T

Come and hear the Icom range on stand A68-70 at the RSGB National Amateur Radio Exhibition

This year at the NEC, Thanet Electronics will only have demonstration facilities on their main stand, but the range and scope of these will enable you to appreciate fully the superb specifications and quality of all ICOM Amateur Radio Equipment.

You will be able to try out receivers and transceivers as base stations, mobiles and hand-portables in all the popular frequency ranges.

Buying ICOM equipment at the NEC. will not be a problem as it will be readily available at any of the authorised ICOM dealers exhibiting at the show.

A new exciting set will be seen at this years show, it is the ICOM IC-3200E FM Dual-band transceiver (144-430/440 MHz). This is the smallest transceiver available.

The IC-3200E employs a function key for low-priority operations to simplify the front panel. LCD display is easy to read in bright places, showing frequency, VFO A/B, memory channel duplex mode and S/RF meter information.

New! IC-3200E

Other features include a 10 channel memory able to store operating frequencies, Simplex or Duplex. A memory lock-out function allows the memory scan to skip programmed channels when not required. The IC-3200E has a built-in duplexer and can operate on one antenna for both VHF and UHF. Options include: IC-PS45 DC. power supply, HS-15 mobile mic, SM6 and SM8 desk mics. SP-10 external speaker and UT-23 speech synthesizer.

A great future is predicted for the IC-3200E against its rivals, due to the reasonable price of this model. For more details come and see us on stand A68-70. BCNU.

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290D is the state of the art 2 meter mobile, it has 5 memories and VFO's to store your favourite repeaters and a priority channel to check your most important frequency automatically Programmable offsets are included for odd repeater splits, tuning is 5KHz or 1KHz.

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You can scan the whole band between VFO's/scan memories and VFO's Adjustable scan rate 144 to 146 MHz, remote tuning with optional IC-HM1 microphone. Digital frequency display. Hi Low power switch. Optional Nicad battery system allows retention of memory.

Soon to be announced!
IC-735 New Compact HF and R7000 VHF/UHF Receiver.

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THE N.E.C.

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Beamrite, Cardiff, 0222-486884.
Booth Holding (Bath) Ltd., Bristol, 02217-2402.
Bredhurst Electronics Ltd., W. Sussex, 0444-400786.
Dressler (UK) Ltd., London (S. Harrow), 01-558 0854.
D.W. Electronics, Widnes Cheshire, 051-420 2559.
Hobbytronics, Knutsford Cheshire, 0565-4040.
Photo Acoustics Ltd., Buckinghamshire, 0908-610625.
Radcomm Electronics, Co. Cork, Ireland, 01035321-632725.
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Scotcomms, Edinburgh, 031-657 2430.
Tyrone Amateur Electronics, Co. Tyrone, N. Ireland, 0662-2043
Reg Ward & Co. Ltd., S.W. England, 0297-34918.
Waters & Stanton Electronics, Hockley Essex, 0702-206835.

Listed here are authorised dealers who can demonstrate ICOM equipment all year round. This list covers most areas of the U.K., but if you have difficulty finding a dealer near you, contact Thanet Electronics and we will be able to help you.

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G6 AND BEYOND!

by Shelagh Ibbs G4TCD

To me the RAE was an evil necessity. I had been attracted to Morse for many years, and when my husband started to learn it for his G4, I realised that to fulfil my desires I had to enter the mysterious realm of radio. Centuries later, being the proud owner of G6HJT, I cast envious eyes over my husband's equipment. Prepared for this eventuality, Steve presented me with my own beautiful PF70, modified for 70cm, and suggested we try it out on a family trip to London.

After arranging various skeds, we went our separate ways, intending to meet at the Science Museum to see GB2SM. Two hours and one sore throat later I arrived, and after hoarsely tirading Steve for callously ignoring me, he pointed out that I seemed to have misplaced the helical aerial. The resultant blown PA marked my entrance onto the radio scene.

Unabashed by the London experience, I turned to mobile operation. After all, with a gutter-mounted aerial and the rig jammed between the seats, where could I go wrong? The moment I sat in the car the problems began. In which hand should I hold the microphone? If in the right, the steering wheel assumed a life of its own every time I changed gear... if in the left, the mic-lead got inextricably tangled around the gear lever.

There is a tendency to forget the basics of driving whilst being involved in an interesting QSO; only last week I slowly became aware of a pungent smell of burning and an inability to go above 30mph.

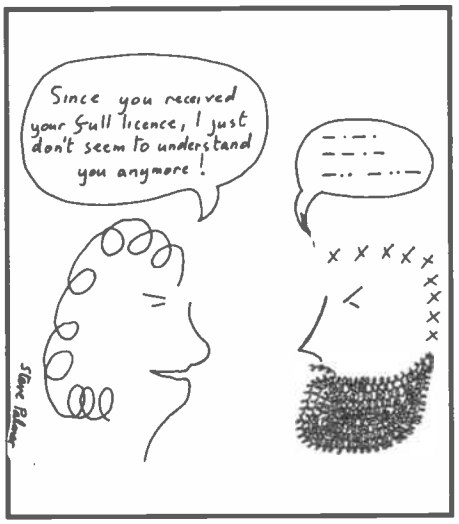
Fortunately the hand-brake and brake-pads don't seem any the worse for wear... at least my husband hasn't noticed anything yet. And, as if a mic doesn't present enough problems, one G4 told me recently that his most interesting QSOs are Morse/mobile!

I've discovered a new twist to this radio world; it's called Morse tutors, both male and mechanical. Both are hard, relentless, and 50% wrong (at least according to my copy). Their sole purpose in life is to reduce me to a jibbering wreck by always going at least six words a minute faster than I require. Still, flushed with the success of my radio night class, I decided to join up again...

Morse class

A cold bleak Wednesday evening saw me sitting with 20 or 30 like-minded innocents waiting for the tutor. Suddenly the tension eased for there he was, a pleasant-faced man with an engaging grin, clutching the key (for the uninitiated this is a gadget able to make the most stoic of false teeth stand on edge repeatedly). I felt that life in this class would be a walk-over, pure fun. Unfortunately I didn't realise for whom. Now, I can take a joke with the best of them; after my driving lessons I needed a sense of humour. However I can't find anything funny in a tutor who tries to get into the Guinness Book of Records whilst assuring me it's only test speed.

Here let me give a hint to prospective Morse candidates. If you receive the first sentence complete, and the last sentence yields only 'O's and 'T's, you aren't becoming more dense by the minute; the innocent looking fiend on the key has decided that you are enjoying yourself and feels it his bounden duty to change all that by speeding up.



Should your tutor have a speck of compassion hidden deep in his soul he will read back the double-dutch he has sent and your shame is hidden beneath a muttered 'Well that's not what I heard'. However, if he is called Malcolm G4DVE he requires 10 minutes of purgatory while we all try to piece together what we have received – 'Astri pofp apermayb eputa tthe bottom' being one example of what was on my paper, I decided that silence was golden. The highlight of the evening was the coffee break, not only to uncramp the fingers, but like all students the desire to talk shop was irresistable, and I spent much of the time convincing everyone that there is life on 70cms.

Fortified by coffee we headed back, determined to show that our powers of concentration were now at their height and we had only been warming up before. Unfortunately the tutor felt likewise, and so the sword of Damacles fell as he suggested that we would like to have a go at numbers. Now numbers are logical, consistent and all have one dot or dash more than you expect. Added to this he liked them to be written in groups of five, so misplace one and you are sunk without trace. Malcolm, oblivious to our sickly protestations, started at a leisurely pace, rising to a full-blown gallop in five agonising minutes. By this time in the evening my fervent wish was for a hot cup of tea and a sympathetic husband.

Some hope! When finally I got home and picked my way through the living room (the aerial is now permanently attached to our radiator, and the rig on a coffee table two yards away), Steve shouted down from the shack that he'd love a cup of tea now that I'd finished gallivanting off. Unfortunately, even though there are a thousand more convenient places, our shack is in the loft, so it subtley changes character with the seasons; a very effective freezer in winter, and an undoubted sauna in the summer.

I never actually decided to take the Morse exam. It was a crafty male ploy. Malcolm sent an easy passage (normally unheard of), then in the bonhommie of 100% copy produced the application forms. Still, easy come easy go. It was Steve's money I happened to have with me! Little did I realise what a stake this gave Steve in the exam. Suddenly the key appeared on the breakfast table, in the kitchen or whilst watching my favourite TV programme, and I didn't dare argue.

Wishing for escape

The date of the test was set for March. A gentleman of immense experience was leaving the salty air of a coastal station to spend two days in land-locked Wolverhampton, just for our benefit, and I was beginning to wish for any honorable way of escape. It was at this point that the key decided to develop a marked stutter every time I touched it. Steve suggested that it might have something to do with the fact that I clutched it as tightly as one of his £5 notes... very technical I thought!

With feelings too deep for words I climbed into the car on the night of the test, one hand clutching pen and paper, the other a large flask of hot sweet tea. At the appointed time I was sitting in the dreaded room with twelve equally green-faced colleagues waiting for the first passage. In no time at all I had 100% copy on my paper and by the smug looks on everyone else's faces so had they!

Back to the waiting room for a brief cup of tea then I was ushered in to 'send'. The grating of teeth as I desperately tried to concentrate was embarassing, but at least this key didn't stutter. As I left the room I caught sight of the examiner and saw him in a different light. He was tall dark and handsome...quite a dish, but I just hadn't noticed before! Back in the waiting room I shared my tea with the others and beamed reassurance to all, knowing I couldn't have done better, and believing secretly that my pass slip was on its way.

Now officially known as G4TCD I can look upon my stuttering key as a friend and the airwaves as a place of intriguing possibilities... a long way from catching sporadic dots and dashes on a dusty old wireless when I was still wearing ankle-socks.

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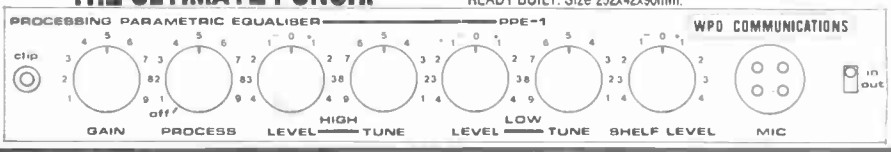

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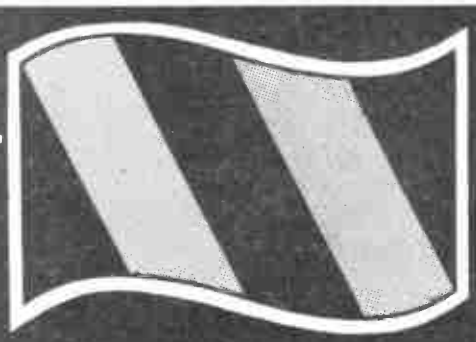

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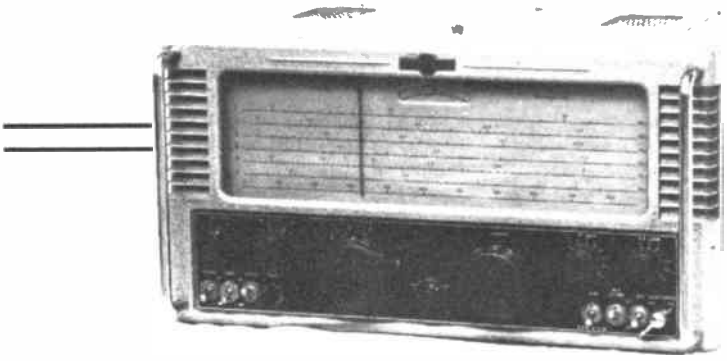
AMATEUR RADIO RECEIVER SPECIAL

EDDYSTONE 888



A classic receiver described by Ken Williams

As I described in *'The Eddystone Story'* (*Amateur Radio*, September, 1984), prior to the 1939-45 war Stratton and Co produced a series of receivers using 'straight' (ie not superhetrodyne) circuitry, which gained the firm a considerable reputation for quality and reliability.

About 1939, the company designed their first commercial communications receiver, the 358X, and based on this experience, in the years following the end of WWII, produced a number of excellent, moderately priced receivers for both professional and amateur operators.

Starting with the 504 and the rather less expensive 640, these pieces of equipment all exhibited the hallmarks of quality – good electrical design coupled with sound mechanical engineering.

To many operators, the ultimate of these was the 888A which was introduced in the late 1950s.

In this, the traditional Eddystone features of a large, easily-read dial and silky flywheel tuning were allied to a sensitive double superhet circuit of great stability and superb selectivity.

Returning to use one of these receivers after a gap of many years, I have been amazed by its performance and, although by modern standards it is lacking a little in sensitivity on 10 and 15 metres, on lower frequencies I am of the opinion that it can more than hold its own with equipment presently available.

The circuit

The traditional design principles of superhetrodyne receivers dictated that the intermediate frequency should be high to ensure adequate image rejection, but low to provide adequate adjacent channel selectivity.

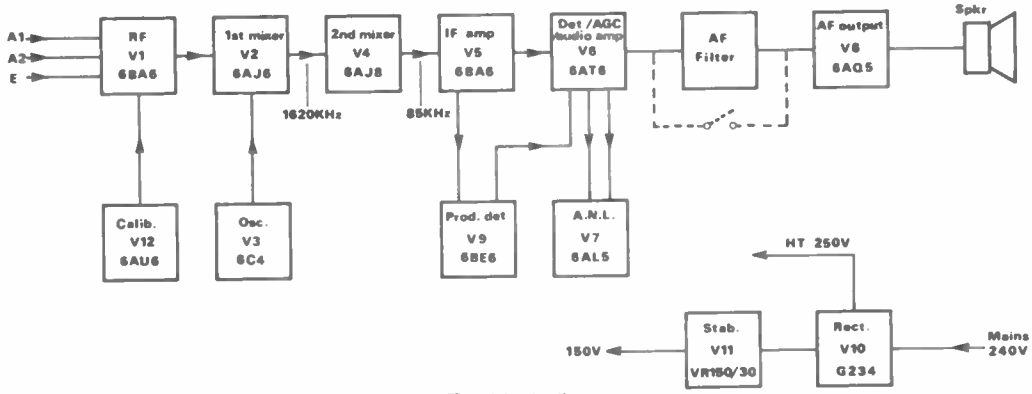
Until the introduction of high frequency crystal filters, these conflicting demands were resolved by the use of two or more intermediate frequencies. Following this principle, the 888A is a double superhet.

The 888A tunes the six pre-WARC amateur wavebands between 1.8 and 30MHz, with each covering the majority of the 12 inch horizontal tuning scale.

The input to the receiver comprises two aerial and earth terminations, a common arrangement at that time. When a balanced aerial is used (such as a dipole with balanced twin feed), the two aerial connections marked A1 and A2 are used, but for unbalanced feed (such as coaxial feeder) the centre core attached to A1 and A2 is connected to the screen and earth. A series tuned circuit tuned to the first intermediate frequency is connected between A1 and A2 to act as an IF rejector circuit.

The signal then feeds, via the wavechange switch, to the radio frequency (RF) stage. This utilises a 6BA6 vari-mu pentode in a conventional circuit. In the cathode of this stage a potentiometer forms the RF gain control and an additional fixed resistor, normally short-circuited, serves to reduce the sensitivity of the receiver when the crystal calibrator is being used.

The signal then passes from the RF stage to the frequency changer, where it is mixed with a local oscillation to



The block diagram

produce an intermediate frequency of 1620KHz.

This stage uses two valves – an ECH81 (6AJ5) as a frequency changer and, to ensure optimum stability, an EC91 (6C4) as the local oscillator. The 1620KHz IF signal derived in this stage then passes to a second frequency changer, again using an ECH81, which converts the signal to 85KHz. At this frequency the signal is amplified by a 6BA6 before being demodulated.

The two 85KHz IF transformers each incorporate variable coupling between their two tuned circuits. At maximum selectivity the coupling is critical, giving a bandwidth of approximately 1KHz for CW operation, whilst at the minimum selectivity position overcoupling broadens the bandwidth to 5KHz for amplitude modulated telephony. Between these extremes the bandwidth is continuously variable.

The second diode of the 6AT6 second detector is capacitively fed from the anode of the 6BA6 IF stage and provides an automatic gain control voltage to each of the previous stages.

For AM signals diode detection is used, but for SSB or CW operation the output from the detector diode is open circuited and the audio taken from V9, a 6BE6 pentagrid valve which operates as a product detector. It is interesting to note that this term had not come into general use at the time of manufacture of the receiver and in the Eddystone leaflet the stage was called a 'CW/SSB converter'.

The triode section of the 6AT6 operates as a conventional audio frequency amplifier and, unusually for a communications receiver, an external audio input is provided. This stage is fed directly from the product detector or from the diode detector via a double diode series noise limiter (V7).

The output of the 6AT6 then drives the 6AQ5 audio output stage. Between these, however, is a switchable audio filter, tuned to 1KHz, for CW operation. This gives a total bandwidth of just over 100Hz at the 10dB point.

The circuit is completed by a valve rectifier (GZ34), a VR150/30 stabiliser for the HT of the various oscillators and a 100KHz crystal calibrator stage.

No S-meter is fitted to the receiver but an octal socket is fitted at the rear to feed an external meter for which a circuit

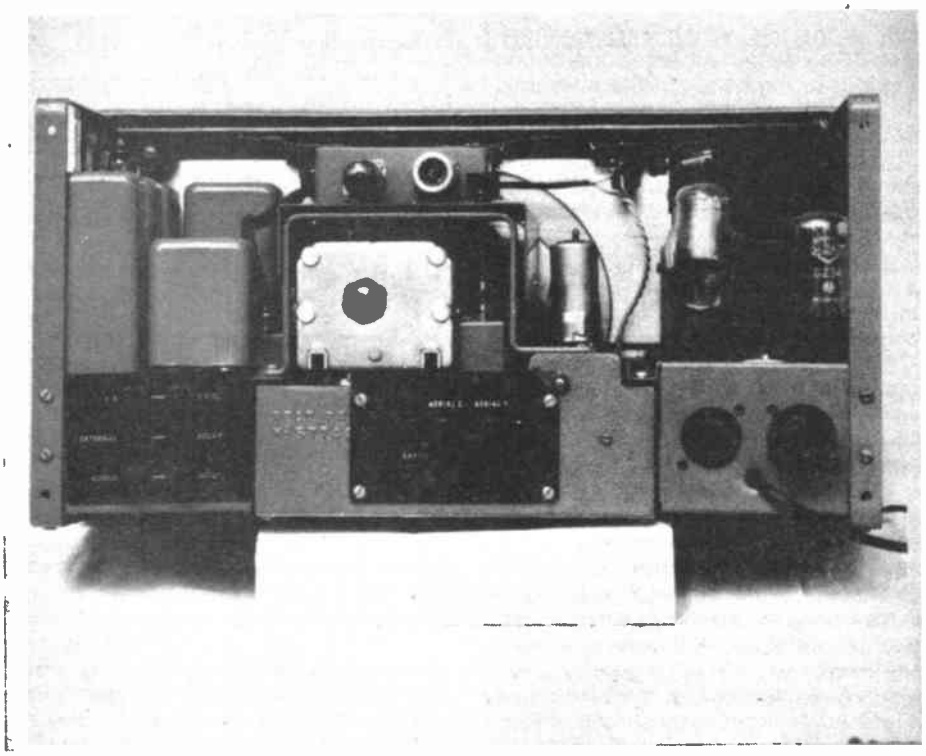


diagram was provided, although Eddystone could supply a ready constructed item mounted in a matching die-cast box.

A further octal socket on the rear of the receiver permitted operation from external power supplies, eg for portable operation.

Mechanical construction

On seeing the 888, two features immediately impress the viewer (see photo). Firstly, unlike so much modern equipment, the case is of solid diecast construction and secondly, the exceptional length of the frequency scales.

Beneath the frequency scale the controls are symmetrically laid out, these being dominated by two large knobs, the left hand one being the bandswitch and the right hand the tuning.

Above these are two pairs of smaller knobs which control (left to right) RF gain, BFO tuning, IF gain and AF gain. Below, arranged in two sets of four controls along the lower edge of the facia are (again left to right) mains on/off, send/receive, AGC on/off, crystal calibrator, AM/SSB, AF filter in/out, noise limiter and bandwidth. Between the two large knobs on a lower level is a local oscillator adjustment for use when calibrating the tuning scales.

On opening the case the impression of rugged construction persists. The complete coilpack and tuning assembly are mounted on a solid diecast frame and the remaining circuitry seems to almost fill the (by present standards) generously sized cabinet.

Due to this extremely rugged construction the receiver is surprisingly heavy. Ventilation, however, is quite good and considering the high packing density and number of valves, the equipment remains surprisingly cool even after prolonged operation.

In contrast with many modern receivers, the 888 requires a period of acclimatisation to obtain optimum results.

This is largely due to the lack of automatic gain control when receiving SSB or CW and the consequent necessity to achieve an optimum balance between the RF, IF and AF gain controls. This very weakness, however, gives rise to one of the great strengths of the receiver for, when this balance is achieved, conditions for good cross modulation performance also exist with obvious advantages.

In the demodulation of SSB, the incoming signal at intermediate frequency is mixed with a locally produced oscillation to form an assymetric amplitude modulated signal, which is then demodulated.

Should the level of this incoming signal approach that of the locally generated oscillation the effect will be the same as an overmodulated amplitude modulated signal. In modern receivers this effect is prevented by the action of the AGC system. However, on receivers

Valve Types and Functions

V1	6BA6	Radio frequency amplifier
V2	6AJ8	1st mixer (signal frequency to 1620KHz)
V3	6C4	Oscillator
V4	6AJ8	Frequency changer (1620KHz to 85KHz)
V5	6BA6	IF amplifier
V6	6AT6	AM demodulator, AGC and first audio
V7	6AL5	Noise limiter and S-meter diodes
V8	6AQ5	Audio output stage
V9	6BE6	Product detector for SSB and CW
V10	GZ34	Rectifier
V11	VR150/30	Stabiliser
V12	6AU6	Crystal calibrator oscillator

such as the 888, which were designed when SSB was in its infancy, the control of gain is in the hands of the operator.

Optimum results

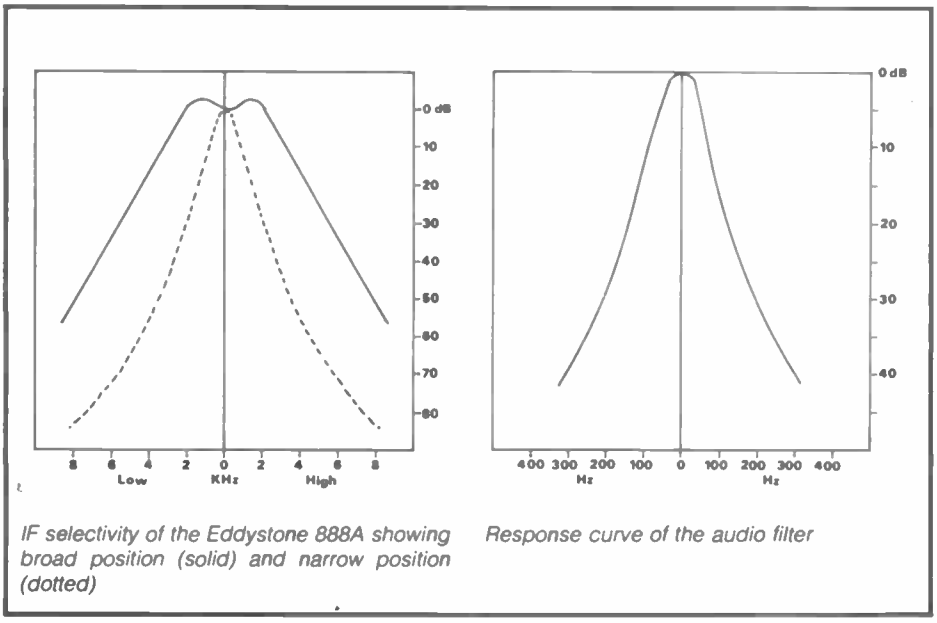
In general it will be found that optimum results are obtained when the AF gain is quite high, the IF gain is set about half way and the RF gain is advanced sufficiently to bring the loudest signals on the band just below the point of limiting. Overall control of gain can then be achieved by use of the IF gain control.

The 888 was originally designed when amplitude modulation was the common form of transmission. As a result of this the design called for a maximum bandwidth of about 5KHz. This, of course, is far too wide for SSB reception but the selectivity adjustment is continuously variable and if a position of about two thirds maximum is selected this will be found adequate, although the shape factor of the response curve does not remotely compare with modern equipment.

For CW operation the selectivity control is advanced to maximum, giving a bandwidth of 1KHz at the 10dB points. This is adequate for most conditions, but if congestion gets really bad, Eddystone have provided another weapon in the armoury – an excellent audio filter which is so sharp that it can find gaps on forty metres on a Sunday morning!

Bandspread

The tuning and frequency scales on the 888 could hardly be bettered. Almost 12 inches of bandspread is available on each of the six amateur bands covered and, to ensure their accuracy, a crystal calibrator is also fitted. Any discrepancy found may be corrected by a panel mounted trimmer. The tuning control is backed with a heavy flywheel which gives a silky feel and also makes possible a very rapid move from one end of the band to the other.



IF selectivity of the Eddystone 888A showing broad position (solid) and narrow position (dotted)

Response curve of the audio filter

RF tuning

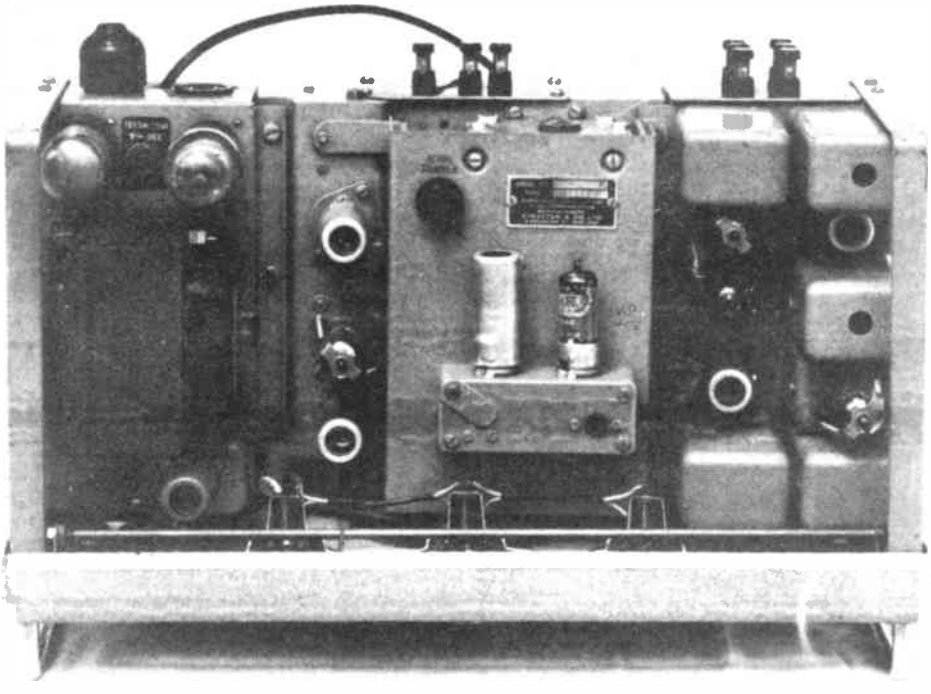
On changing band it is often necessary to retrim the RF tuning. This is achieved by a small trimmer inside the cabinet which is accessed by lifting the hinged top cover. This is the subject of my only real criticism of the equipment, bearing in mind its date of design. I feel that this control could, and should, have been brought to the front panel as its present position makes mounting in a console impossible.

At present I am considering whether to modify the receiver to extend this control to the front panel or to put up with the inconvenience in order to leave the receiver in 'collectors condition'.

In the accompanying leaflet Eddystone provide no sensitivity figures, so it was not possible to compare my sample of the receiver with the original specification. However on a qualitative check, as might be expected from a receiver of this vintage, I found the performance more than adequate on the lower frequency bands but lacking a little in sensitivity on 10 and 15 metres.

Overall, and in particular on the lower bands, I find the 888 a delight to use and I unhesitatingly recommend it for any SWL or radio amateur who requires an amateur bands receiver.

The top view of the Eddystone 888



Comparison

Finally, two questions must be asked. Firstly, can it be maintained? The obvious thought is for the availability of replacement valves. All, however, are available through the pages of the various radio magazines. Secondly, does the 888 compare with the Drake 2B which I described last year? The answer to this is yes and no! The shape factor of the IF circuits on the 2B seem to be superior to the 888, with obvious advantage during SSB reception.

At maximum selectivity however, the 888 seems sharper and the assistance of the audio filter makes the superiority even more evident. In fairness though, it must be remembered that the 2B was described without the Q-multiplier or audio filter add-on units. In sensitivity and stability I found little to choose between the two receivers.

If pressed to make a choice between the two receivers, I think that the final decision would be made on price and availability rather than technical merit.

On the secondhand market the 888 can be purchased at a cost of between £35 and £75. Despite this low price, it will easily out-perform most new receivers costing up to several times as much and consequently must be seriously considered as a 'best buy'.

A SURVEY OF RECEIVER REVIEWS

by Hilary Humphries

Unlike the hi-fi enthusiast, the short wave listener is not particularly well served in the matter of receiver reviews. Magazines that have broad appeal, such as *Which?*, pay scant attention to the short wave performance of sets that come their way and the SWL has nothing like the excellent range of publications entitled *Hi-Fi Choice* aimed at the music lover.

This position was confirmed by Lowe Electronics when I wrote to them concerning the availability of a review of the NRD515. They replied that magazines for the amateur radio enthusiast concentrate more on transceivers than on receivers alone. This article attempts to help readers by indicating those publications that carry reviews of specific models. I have also attempted to compare the RF performance of a number of popular sets and have included brief details of older professional receivers available on the surplus market.

Choice

It seems reasonable to suggest that, home brews apart, one's choice of Rx will fall into one of three categories: (a) the domestic portable with above average short wave performance; (b) sets aimed specifically at the amateur market; (c) professional receivers, subject to availability.

Firms such as Racal and Plessey do not deal with the public and since current models sell for £4,000 and upwards they would be out of the range of all but the wealthiest amateur anyway.

When I wrote to Plessey concerning their PR155G they were not interested in confirming the figure for 3rd order intercept point that I had worked out from their data sheet, so it seems the gods who sit on Mount Olympus have no dialogue with mere mortals. Luckily older models such as the PR155G and the RA17 can be bought for between £200 and £500.

In their day they represented the very best and still give a good account of themselves.

The *World Radio & TV Handbook*, which I will refer to as the *Handbook*, is published annually and its reviews cover the three types of set mentioned above.

Reviews of modern professional receivers are useful since they provide the yardstick by which other sets may be judged. Three such state-of-the-art receivers were reviewed in the 1982 *Handbook* and a glance at the summaries shows that these doyens of the airwaves score over their amateur counterparts, not so much in terms of sensitivity as in the quality of their construction, ease of servicing, reliability, robustness, dynamic range and frequency stability.

Whereas the better ham Rx will tune in increments of 10Hz, readout is normally only to the nearest 100Hz. Racal's current RA6790Gm, on the other hand, has a readout to 1Hz and is accurate to within plus or minus 2Hz, stability which is quoted as bordering on the absolute.

It appears that manufacturers of amateur receivers are not over generous in the number of bandwidths they provide. The NRD515, rated second only to Drake's R7A, has two positions for selectivity, one for MCW and one for SSB, with a choice of two for CW. Racal offer over 20 and this figure does not include the range of offset SSB filters. The former start at 40Hz (-3dB) for CW and extend to 13KHz, affording superb AM reception during daylight hours.

Another thing that becomes apparent from reading professional receiver specs is that the big boys do not cater for knob twiddlers. Racal will provide an RF amp on request but it is not switchable from the front panel. Its gain is pre-set to the user's requirement and is not adjustable externally. It is fair to state that while the professional user will have a number of receivers tailor-made to do specific jobs supremely well, the SWL and amateur must be content with a maid of all work designed to perform a number of tasks on a strict cost-versus-performance basis.

At one time it was sufficient to compare receivers on the basis of their sensitivity and selectivity, but this is no longer the case. The advent of the transistor with its inherent shortcomings at RF has altered the position considerably. As *Radio & Electronics World* stated in its excellent July 1983 article, it is now intermodulation distortion and the effects of reciprocal mixing that dictate the overall performance of a receiver. Third order intermodulation distortion (IMD) consists of an unwanted in-band product caused by two strong out of band signals mixing in the receiver, and great care must be taken in the design of the front end to keep these to a minimum.

Dynamic range

There are a number of ways in which a set's ability to cope with weak signals in the presence of strong ones can be quoted. Icom prefer the term dynamic range, given in dB (Trio and Yaesu omit the figure from their specs). Racal refer to the strength of certain signals required to give distortion of one microvolt. muTek prefer to speak of the 1dB compression point, while Plessey quote the strength of two signals required to give a specific S/N ratio ref a receiver of known noise factor.

Since 3rd order IMD rises faster than the increase in the signals producing it there is an imaginary level at which the distortion would be equal to the level of

Make	Model	Third Order Intercept Point dBm
Racal	RA17L valve Rx	+43
Racal	RA1770	+28
Icom	IC751 transceiver	+25
JRC	NRD515	+22
Icom	ICR70	+21
Icom	ICR7IE	+21
Drake	R7A	+20
Icom	IC745 transceiver	+18
Racal	RA1217	+13
Plessy	PR155G	+ 2 (see text)
Yaesu	Surrey Electronics FRG7700	− 2
Yaesu	FRG7700 unmodified	−10
Magpie	Autoscan 5000 CB transceiver	−11
Trio	R2000	−17

Plessey PR155G

Frequency Range:	60KHz to 30MHz continuous with slight loss of performance down to 30KHz
Modes of Reception:	CW, MCW, DSB
Frequency Stability:	After 5 hour warm up less than 30Hz drift per hour at constant temperature
Selectivity:	-6dB / -60dB 1. 12KHz / 36KHz 2. 6KHz / 18KHz 3. 3.5KHz / 12KHz 4. 1.4KHz / 5.5KHz 5. 300Hz / 3KHz 6. 150Hz / 1.8KHz
Sensitivity:	CW 300Hz bandwidth. 2 microvolts for 26dB S/N ratio MCW 3KHz bandwidth 30% mod, 4 microvolts for 10dB S/N.
Noise Figure:	Not worse than 10dB up to 20MHz, not worse than 13dB above 20MHz.
Tuning:	30 1MHz bands, 84 inch scale length per band.
IF and Image Rejection:	70dB or better.
Intermodulation:	3rd order. 2 signals of 5mV each to give 20dB S/N ratio with reference to a 10dB noise factor receiver.
Power:	Mains or 24V dc at 1 amp approximately.
Weight, dims:	Suitable for rack mounting. Height 7ins, depth 17ins weight 39lbs.

the interfering signals. This level, measured in dB with reference to 1mW at given impedance, is called the 'third order intercept point', and is favoured by reviewers. In order to compare sets I have listed several in descending order of intercept point. The higher the figure in a positive sense, the better the receiver.

Intermod performance

It was on account of its poor intermod performance that Angus McKenzie felt unable to give the R2000 his wholehearted recommendation when he tested it in April '84 and reciprocal mixing on the unmodified Yaesu FRG7700 was also disappointing. This parameter is an indication of poor selectivity caused by oscillator sidebands mixing with unwanted signals to give an in-band product. None of the manufacturers of amateur equipment include this measurement in their specs and thus draw a veil over what otherwise might reveal a multitude of sins.

It is depressing to read in receiver reviews that their RF performance is often below that of the receive sections of transceivers made by the same company. The *Amateur Radio* review of the FRG7700 pointed out that the Rx portion of the FT757 was in a totally different class while the January edition proclaimed the IC751 transceiver to be even better than the ICR70, this being borne out by reference to the above

RECEIVER REVIEWS

Make	Model	Publication	Date
AOR	2001 VHF/UHF Scanner	Amateur Radio	Apr 84
Collins	75A-4	Amateur Radio	Jun 83
Collins	451S-I professional	The Handbook	1982
Drake	2B	Amateur Radio	Sept 83
Drake	R4C	QST	May 81
Drake	R7	QST	Jan 80
Drake	R7A	The Handbook	1982
Drake	4245 professional	The Handbook	1982
Eska (Denmark)	RX12PL	The Handbook	1983
GE	World Monitor II	The Handbook	1983
Grundig	Yacht Boy	The Handbook	1983
Grundig	Satellit 1400	The Handbook	1981
Grundig	Satellit 3400	The Handbook	1982
Icom	ICR 70	The Handbook	1983, 1984
Icom	ICR 70	Radio & Electronics World	Jun 83
JRC	NRD 505	The Handbook	1980
JRC	NRD 515	Radio & Electronics World	May 82
JRC	NRD 515	QST	Nov 81
JRC	NRD 515	The Handbook	1982
JRC	NRD 515 (Gilfer Mod)	The Handbook	1982
McKay Dymek	DR106-6	The Handbook	1982
McKay Dymek	DR33-C	The Handbook	1980
National Panasonic	RF2200/DR-22	The Handbook	1981
National Panasonic	RF3100	The Handbook	1983
National Panasonic	RF9000	The Handbook	1982
National Panasonic	RF6300/DR-63	The Handbook	1982
National Panasonic	RF085	The Handbook	1981
National Panasonic	RF2600/DR22	The Handbook	1981
National Panasonic	RF2900/DR29	The Handbook	1981, 1982
National Panasonic	RF4900/DR49	The Handbook	1980
National Panasonic	RF4900 (Gilfer)	The Handbook	1980
Racal	RA6790GM with ref to R2174 (P) URR, RA1792	The Handbook	1982
Radio Shack	DX302	QST	Aug 81
Realistic	DX300	The Handbook	1980
Sherwood	SE3 PLL ECSS Detector	The Handbook	1983
Sony	ICF2001	The Handbook	1981, 82, 83
Sony	ICF6800W (orange)	The Handbook	1983
Sony	ICF6800 early version	The Handbook	1980, 1981
Sony	ICF7600A	The Handbook	1981, 1983
Sony	CRF 1	The Handbook	1982
Sony	ICF6500W	The Handbook	1983
Trio	R600	The Handbook	1983
Trio	R1000	Radio & Electronics World	Dec 81
Trio	R1000	QST	Dec 80
Trio	R1000	The Handbook	1980
Trio	R2000	Amateur Radio	April 84
Trio	R2000	The Handbook	1983
Yaesu Musen	FRG-7	The Handbook	1980
Yaesu Musen	FRG7700	Radio & Electronics World	Dec 81
Yeasu Musen	FRG7700	Amateur Radio	Apr 84
Yaesu Musen	FRG7700 (Surrey Electronics)	Amateur Radio	Apr 84
Yaesu Musen	FRG7700	Hi-Fi News	Feb 82, Apr 84

figures. If the SWL is expected to part with between £300 to £600, or even £1,000, of his money then he should get the best, which sadly is not the case. It would appear that tranceivers represent the real money end of the market where competition is fiercest and the standard of performance of prime importance.

High cost

Compared with some other electrical goods the cost of all specialist radio gear seems high. If a black and white television was sold today in accordance with its 1950's price it would come complete with aerial and installation at around £1000, but there have been considerable reductions.

One can compare the cost of a video disc player with that of a compact disc player. The video machine gives high quality sound and vision and, because it is aimed at the general public, sells for around £180. The compact disc player works on the same principle, is smaller, provides sound only, yet because it is for the specialist music lover can command a £400 price tag. Considering the mechanical engineering that goes into a video tape recorder the price of £400 and upwards seems reasonable.

Short wave receivers contain virtually no moving parts aside from the controls and yet are in the same price bracket. However, in business you charge what the market will stand and an object is worth what someone is prepared to pay. *Radio & Electronics World* stated the NRD515 would be much more realistically priced were it to cost around £300 less. I am prepared to go even further and say this type of equipment should be priced at roughly half the present asking price.

An alternative to current Japanese receivers is provided by British made professional equipment sold as government surplus. Because these are not reviewed in the normal way like new sets I include brief specifications together with some suppliers names and addresses.

Racal RA17/L/E

It is the considered opinion of one short wave listener that the RA17 is the finest DX receiver of all time, with the exception of the current Drake R7A. When the RA17 appeared in the fifties it incorporated a revolutionary concept in design in the form of the Wadley Loop. This provided tuning in 1MHz bands but without a wave change switch and all the complicated wiring that goes with it. Two tuning knobs are provided, one marked MHz, the other KHz. Moving the MHz control advances the frequency in increments of 1MHz instead of giving a gradual change in frequency.

This is achieved by a frequency compensating circuit which locks the output of the variable oscillator to a series of 1MHz harmonics obtained from a crystal. The set thus gives VFO tuning with the stability normally associated with crystal control, a sort of half way house between the old system and today's synthesiser.

Being a valve receiver it is both large and heavy, either 67lbs for rack mounting or 97lbs with a cabinet. The various versions (RA17, RA17 MkII, RA17L and RA117E) are all based on the RA17 and incorporate later modifications: ie the RA117E has an extra IF stage.

An early professional transistorised model is represented by the Racal RA217 with derivatives RA1217, specially designed for rack mounting with a height of only 3.5 inches, the RA1218, featuring electronic digital frequency readout, and the RA1219 which also has extra frequency stability of the synthesiser type.

RA17

Frequency Range:	1 to 30MHz in 30 effective bands with slight loss of performance down to 0.5MHz.
Stability:	After warm up less than 50Hz per hour with constant conditions.
Tuning:	Effective scale length is 145 feet, approx 6ins per 100KHz.
Sensitivity:	CW 1 microvolt for 18dB S/N ratio in a 3KHz bandwidth MCW 3 microvolts for 18dB S/N ratio, 30% mod 3KHz bandwidth.
Intermodulation:	Better than 100 dB down for interfering signals 10% removed from wanted signal.
Selectivity:	Six bandwidths are available by means of a switch:

	-6dB	-66dB
1.	13KHz	35KHz
2.	6.5KHz	22KHz
3.	3.0KHz	15KHz
4.	1.2KHz	8KHz
5.	0.3KHz	Less than 2KHz
6.	0.1KHz	less than 1.5KHz

Spurious Responses:	Internally generated spurious responses are below noise level. Image signals are 60dB down.
Noise Factor:	Less than 7dB throughout the tuning range.
Controls:	Megahertz tuning, kilohertz tuning, aerial band switch, aerial tuning, aerial attenuator, tuning lock, 1F gain, 1F bandwidth, system switch, AGC time constant, BFO on/off BFO note, AF volume line O/P level, limiter on/off speaker on/off, power on/off meter switch.

RA1770/71/72

Cross Modulation:	With a wanted signal greater than 300 microvolts EMF in a 3KHz bandwidth, an unwanted signal 30% modulated and removed not less than 20KHz will be greater than 300mV EMF to produce an output 20dB below the output produced by the wanted signal.
Reciprocal Mixing:	With a wanted signal of less than 100 microvolts EMF in a 3KHz bandwidth, an unwanted signal more than 20KHz removed will be greater than 70dB above the wanted signal level to give a noise level 20dB below the output produced by the wanted signal.
Blocking:	With a wanted signal of 1mV EMF, an unwanted signal more than 20KHz removed must be greater than 500mV to reduce the output by 3dB
Intermodulation Products:	
(a) Out of Band	With two 30mV EMF signals separated and removed from the wanted signal by not less than 20KHz the third order intermodulation products are not less than -85dB below either of the interfering signals and typically better than -90dB.
(b) In Band	Two in band signals of 30mV EMF will produce third order intermodulation products of not less than -40dB.
Spurious Responses:	
(a) External	External signals 20KHz removed from the wanted signal must be at least 80dB above the level of the wanted signal to produce an equivalent output
(b) Internal	Not greater than 3dB above noise level measured in a 3KHz bandwidth

Racal Series RA1770/71/72

News of Racal's RA1770 and its derivatives broke on the amateur scene when the set was pictured in *Short Wave Magazine* in February 1972. Early transistorised HF receivers which incorporated bi-polar transistors suffered from poor intermod performance, but the figures associated with the RA1770 can be regarded as text book. At the time, Racal's brochure claimed 'unsurpassed signal path performance' and this claim still holds good 12 years on. Unfortunately I have not heard of this set appearing on the surplus market yet.

Racal claim the bottom end of the frequency range to be 15KHz, though *Short Wave Magazine* gave a figure of 50Hz; perhaps this is attained with loss of performance. The RA1770 employs a free running oscillator. In the case of the RA1771 the frequency is synthesised and selected by means of 6 decadic switches so tuning is of the preset variety. The RA1772 is synthesised but tunes with one switch for the MHz bands and a rotary control for KHz in either 10Hz or 100Hz steps.

Its performance characteristics are virtually identical to the ideal receiver as envisaged by *Radio and Electronics World* in July 1983. Listed in the table are performance figures taken from Racal's own data sheet.

In addition to the table the data sheet gives information relating to 23 other parameters. It is a pity the makers of amateur gear cannot do likewise. The amateur does not seek an amateur approach in this respect. Two dealers known to the author who carry a varied stock of surplus Rxs are: *John's Radio, Whitehall Works, 84 Whitehall Road East, Birkenshaw, Bradford BD11 2ER, tel: (0274) 684007*, and *RT & I Electronics Ltd, Ashville Old Hall, Ashville Road, London E11 4DX. Tel: 01-539 4986.*

Suggested reading

Radio & Electronics World ran articles on HF receiver design in February and July 1983. Back issues are available at £1 per issue, inclusive of postage from the *R & EW Back Issues Department, Radio and Electronics World, Sovereign House, Brentwood, Essex CM14 4SE.*

RA1217

Frequency Range:	1 to 30MHz with slight loss of performance down to 200KHz.
Modes:	DSB, MCW, CW, SSB, (USB or LSB).
Tuning:	Mechanical digital readout similar to mileage meter in units of 1KHz with interpolation to 200Hz.
Frequency Stability:	After 2 hours plus or minus 50Hz over 8 hours at constant temperature.
Sensitivity:	CW and SSB 1 microvolt for 15dB S/N ratio in 3KHz band. MCW and DSB 30% mod, 3 microvolt, 15dB S/N 3KHz band.
Selectivity:	Three IF filters as standard with provision for two extra to be fitted. Standard filters: (3dB bandwidth) 8KHz, 3KHz, 200Hz. Additional filters 13KHz, 1.2KHz, 500Hz.
Spurious Responses:	Internally generated, not greater than 2dB above noise level in a 3KHz bandwidth.
Controls:	Meter switch (AF/RF level), frequency readout, MHz tuning, KHz tuning, system switch, det. BFO mode, BFO tune, RF/IF gain, AF gain, AF line level, RB band switch, RF tune, RF attenuator, tuning lock, calibrate/fine tune, bandwidth, switch, ext/int 2nd VFO.
External Connections:	Antenna input, IF, output, 2nd VFO output, 2nd VFO input, 1MHz output, 1MHz input, 1.7MHz input/output, LF adaptor, input, panoramic, adaptor output, ac supply input, AF line out, AF phone output, -16 volt output, diversity AGC muting contact, LF adaptor HT, LF adaptor AGC.
Weight:	30lbs.

Wireless World, October 1974 (pages 413-417), published an article on synthesised receivers by RFE Winn of Racal Communications Ltd. Unfortunately the *Wireless World* back issues department can no longer supply this item. Bound copies of *Wireless World* may be seen free of charge at the Science Reference Library, 25 Southampton Buildings, Chancery Lane, London WC2 which is two minutes walk from Chancery Lane underground station.

Turn left on leaving the station and then first left into Southampton Buildings; the library faces you at the end of the road.

Until recently, bound copies of journals such as *Wireless World, QST, 73* etc, were all held at the library and could be inspected at will. Now, due to lack of shelf space, these have been removed to a nearby warehouse, so anyone wishing to read them should reserve copies the day before by contacting the library inquiry desk.

The most comprehensive pictorial survey of the latest military radio equipment from all countries is that produced under the title *'Jane's Military Communications'* published by Jane Publishing. Copies, which cost in the region of £60 each, can be ordered from any public library.

The *World Radio & TV Handbook* retails for around £12 and is available from public libraries, either to order or held in their reference section.

Good hunting and good DXing.

ALIGNMENT OF OLDER RECEIVERS

KEN WILLIAMS

There is, I believe, a growing realisation in this age of rapidly escalating equipment costs that on most HF bands many of the older receivers of 1947-65 vintage can perform just as well as their more modern brethren costing several times their price. Of course they do not have synthesisers or digital readouts but, nevertheless, their mechanical dials can often be set to an accuracy of better than 1KHz. Furthermore, in the high signal strength/heavy QRM conditions prevailing on the lower frequency bands, they can often out-perform their modern counterparts due to superior cross modulation characteristics.

Some people, however, on purchasing one of these older receivers find that they are somewhat disappointed with the performance and after a spate of valve changing decide that they were misled. What they forget is that the receiver is, in all probability, well over twenty years old and during that life components have deteriorated slightly. No matter how carefully the receiver has been used, it has received many knocks and bumps over the years which have probably slightly displaced trimmers and inductor cores.

In consequence, to bring the performance back to its original standard all that is necessary is an electrical check to replace any leaking capacitors or faulty valves and an alignment, both of which are well within the capability of an average amateur possessing a multimeter and a signal generator covering the tuning range of the receiver and preferably the intermediate frequency.

Principles

Before embarking on an alignment it is a good idea to recap on the principles of a basic superhetrodyne communication receiver.

The incoming signal arrives first at the aerial tuned circuit from whence it is directly coupled to the radio frequency amplifier. This may consist of one or two valves or semiconductors and its purpose is to raise the level of the received signal to the point where the noise generated in the input tuned circuit is greater than that generated in the succeeding stage, the mixer. In this stage the received signal is mixed with another produced by the *local oscillator,* whose frequency is displaced from the incoming signals by an amount equal to the intermediate frequency.

The effect of mixing the two signals is to produce two other signals, each modulated similarly to the incoming signal, one on a frequency which is the sum of the incoming and local oscillator frequencies and a second on the difference. The output of the mixer stage is tuned to the latter and the signal at this frequency (known as the *intermediate frequency)* passes first to a selective filter, which may be crystal or mechanical, and then to the intermediate amplifier. This comprises two or three stages coupled by intermediate frequency transformers and its purpose is to raise the IF signal to a suitable level, usually 2-3 volts, for the detector circuit.

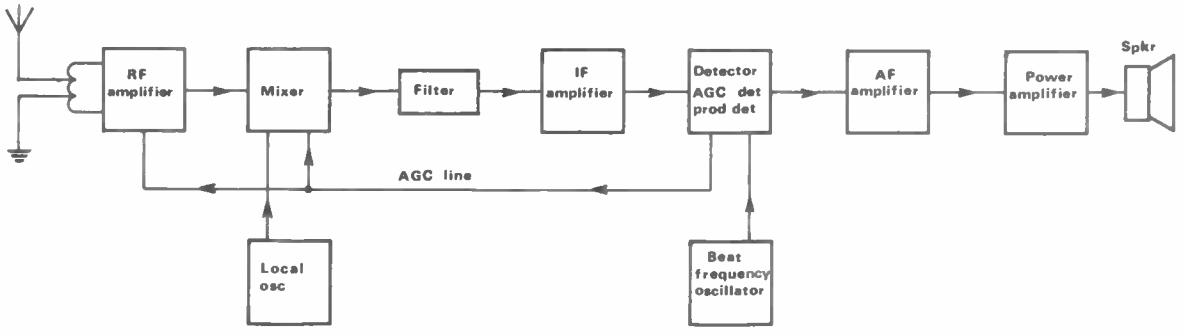
In older receivers the detector usually consisted of two diodes in parallel, one of which retrieved the audio component of the signal and the other monitored the mean signal level which was then fed back to the amplifiers, both RF and IF, as automatic gain control. The audio component was enhanced by the audio frequency amplifier and then brought to a suitable level to drive the loudspeaker by the power output stage.

To enable reception of unmodulated (CW) signals a beat frequency oscillator (BFO) was fitted. This operated at approximately intermediate frequency and can be adjusted so that it is displaced from the incoming IF frequency by a convenient amount, usually about 1KHz; the resulting audio beat makes possible the reception of continuous wave signals. It could also be used to provide a local carrier for the reception of single sideband transmissions.

Variations

There are several possible variations of this basic layout: there could be two separate intermediate frequencies, one high to minimise second channel breakthrough and the other low to provide good selectivity, or alternatively the first mixer local oscillator could be crystal controlled and the tuning (over the width of an amateur band) could be achieved in the second mixer. Nevertheless, it is possible to lay down certain guidelines and procedures which are applicable to all receivers with only slight adaptation for individual circuits.

As said previously, an adequate alignment can be carried out using only a signal generator and a multimeter, the latter being used on the ac range as an output indicator. Although the use of a wobbulator and oscilloscope will, if used correctly, give a superior result, they are not essential. The first section of the receiver to be aligned is the intermediate frequency amplifier.



Block diagram of classic style of communications receiver

The IF amplifier is situated between the anode (in valve equipment), collector or drain (in solid-state receivers) of the mixer and the detector stage. It comprises a selective filter, either mechanical or crystal, followed by two or three stage or amplification-coupled IF transformers.

If the filter is mechanical, which is rare in older receivers, it cannot be adjusted. If the filter is crystal it may be one of two types: half or full lattice, which uses several crystals, or a single crystal filter with phasing controls, these being very common in wartime and early post war receivers.

The coupling between amplifier stages uses IF transformers. These comprise two tuned circuits resonated to the intermediate frequency. The tuned circuits are mounted in such a way that their coupling is over-critical.

If two L-C circuits tuned to the same frequency are brought into close proximity, any signal existing in one will be induced into the other. The efficiency of the signal transfer will be dependent on several factors, one of which is their separation. By reducing this separation, the signal transfer will improve until a point is reached where transfer is maximum.

This is known as critical coupling. If coupling is increased further, the induced signal will not increase but the bandwidth of the combination will widen. This is known as over-critical coupling. In receivers using low (below 1MHz) intermediate frequencies, in order to obtain the bandwidth necessary to satisfactorily receive amplitude modulation signals, it was necessary to overcouple the tuned circuits in the IF transformers. This immediately gives problems in alignment, for when overcoupled, the tuned circuits mutually interact and, without using special techniques, it is not possible to tune both circuits to the same frequency.

Aligning the IF amplifier

The purpose of an IF alignment in a communication receiver is to adjust the intermediate tuned circuits such that they are all tuned to the same frequency.

The first task is to install some type of output level indicator. This can most conveniently be achieved by connecting a multimeter switched to a low ac range across the loudspeaker. The next task is to disable the automatic gain control system, for if this is not done the variation in gain caused by the improving amplifier gain will be partially marked by AGC action, thus making the output indications less definite. Some receivers have an AGC on/off switch for this but if not the AGC line will have to be located and short circuited to earth.

The signal generator has to be connected next. This can be most conveniently achieved by switching the wave change switch to a low frequency range and connecting the generator to the input (grid, base or gate as appropriate) of the mixer, the easiest place usually being on the tuning capacitor. To ensure that no confusion is caused by signals coming through from the aerial, disable the local oscillator – the simple method being to temporarily short circuit the appropriate section of the tuning capacitor.

Having completed these preliminaries, the alignment may be commenced. The initial task is to tune the signal generator to the intermediate frequency of the receiver. If there are no crystal or mechanical filters present this is merely a matter of setting the signal generator dial correctly. Older receivers often have a single crystal filter with panel or internally mounted phasing controls. If your receiver is one of these, adjust these controls for maximum selectivity and tune the signal generator for maximum on the output meter. Re-adjust the phasing controls for broad selectivity and proceed with the alignment.

More modern receivers use a lattice or mechanical filter. For these it is necessary to determine the centre of the passband. To achieve this, slowly tune the generator across the IF passband, noting the output level at each frequency. From these figures sketch the passband of the receiver and from this determine the centre frequency. This can be simplified if the later IF transformers are detuned. Should the receiver possess separate filters for upper and lower sidebands it will be necessary to find the mid-point between the two.

Having set the signal generator on the correct frequency, one small item has to be constructed before starting alignment. This comprises a 500 or 1000pF capacitor with a crocodile clip on each lead.

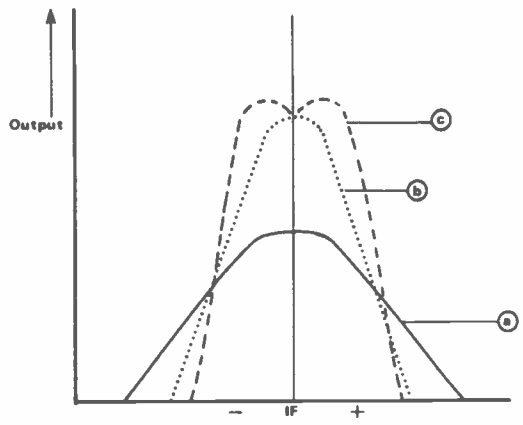
Set the output level on the signal generator so that it gives about half scale deflection on the meter and locate the primary winding of the IF transformer at the input of the amplifier. Earlier in this article I said that the tuned circuits in an IF transformer were overcoupled and that the tuning of each interacts with the other. The method of accurately tuning, therefore, is to detune one circuit to the degree that it will not interact. This is the purpose of our capacitor with the crocodile clips on the leads. Connect this across the secondary winding and the primary winding can be accurately tuned for maximum indication on the output meter. With the primary winding tuned the capacitor can be removed, placed across the primary and the secondary tuned.

Warning

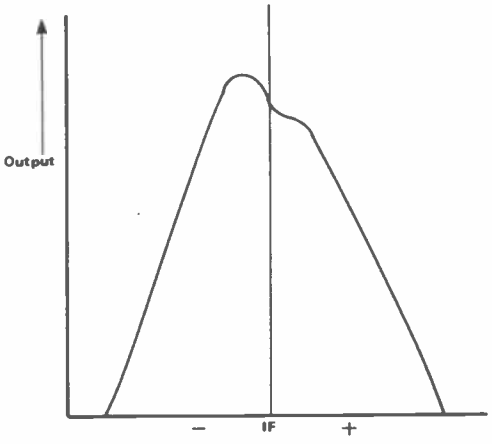
A word of warning at this point: take great care that you have the correct trimmer tool, for if not there is a great danger that you will break one of the cores in the transformer and then you will have a serious problem on your hands, for the core *must* be removed and replaced before the receiver can be considered serviceable.

Having aligned the first IF transformer proceed with the next transformer in exactly the same way, detuning the secondary winding and tuning the primary and then vice versa. This technique is repeated until all IF transformers have been aligned.

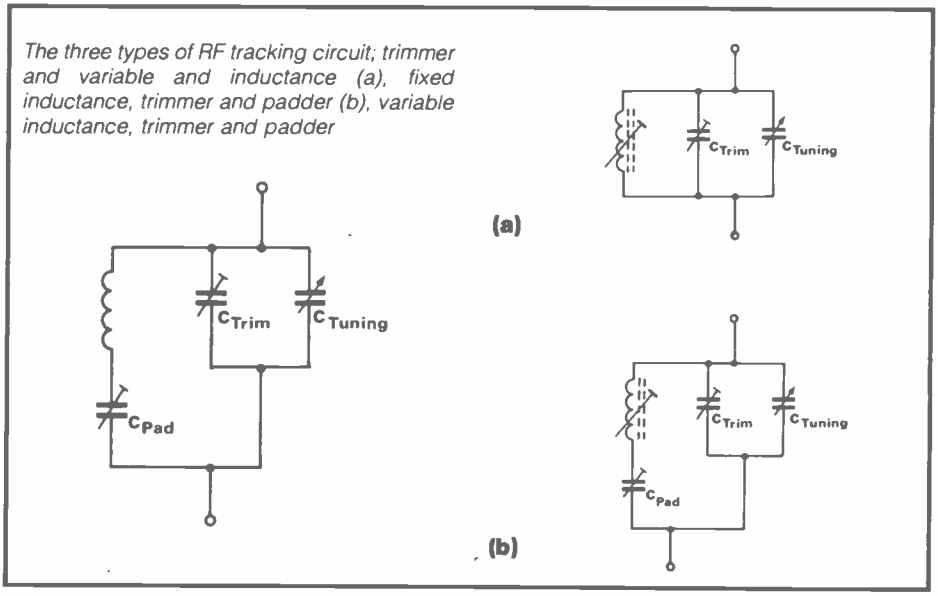
The beat frequency oscillator (BFO) of the receiver now needs to be adjusted. If



Effect of under (a), critical (b) and over (c) coupling of IF transformers



Effect of IF transformer response if the tuned circuits are not on the same frequency



The three types of RF tracking circuit; trimmer and variable and inductance (a), fixed inductance, trimmer and padder (b), variable inductance, trimmer and padder

this can be tuned from the front panel, switch on and set the tuning knob in the centre of its travel. Switch off the modulation of the signal generator and adjust the preset BFO tuning to zero beat. This will ensure that the panel control will tune to either side of the pass band and in consequence be suitable for upper or lower sideband operation. If the BFO has no panel control, set the pitch of the beat note between BFO and signal generator to about 1KHz; on the high frequency side of the signal generator if the main station interest is 40-80-160 metres, or on the low side if the main interest is on the DX bands.

This article has so far described the IF alignment of a single superhetrodyne receiver. If, however, your receiver is a double superhet the technique is almost exactly the same, the only difference being that the second intermediate frequency stages are dealt with first, followed by the first IF.

Some receivers, however, particularly those with tuneable first IFs (such as the Drake 2B) or with mechanical methods of varying the selectivity (such as some of the Eddystone range), require the use of techniques unique to the particular model. This equipment should not be adjusted without careful perusal of the instruction manual.

RF alignment

Having completed the alignment of the intermediate frequency stages it is now time to align the RF and mixer stages. The purpose and technique for this is completely different from the previous task for, whilst the purpose of the IF alignment was to ensure that all the circuits were set to precisely the same frequency, the RF alignment procedure is required to adjust two sets of tuned circuits so that when the tuning control is varied the frequency of one set of circuits maintains a constant frequency difference from the other. This process is known as tracking.

This is accomplished in one of three ways, the first of which is to provide a small variable capacitor, known as the trimmer, in parallel with the tuning capacitor and a variable (slug tuned) inductance in each tuned circuit. The second uses a fixed inductance with trimmer and a further variable capacitor (the 'padder') in series with the paralleled tuning and trimming capacitors. The third method uses trimming and padding capacitors together with a variable inductance.

As the trimmer and padder capacitors are effectively in series across the inductance, adjustment of one affects the other and when the inductance can also be varied this also interacts. Thus it is obvious from the outset that the alignment process could well be time-consuming. The temptation to tune to the middle of an amateur or other band of interest and 'tweak' for strongest signals must be resisted at all costs for, with patience and care, an accurate alignment can be achieved.

There are slight differences in alignment procedures depending on which type of circuit is incorporated in the receiver. However, these will be explained at the appropriate time.

Less sensitive

The equipment required is a signal generator covering the wave bands to be aligned and an audio output indicator, such as a multimeter switched to an appropriate ac range as described for IF alignment. Alternatively the receiver S-meter may be used, but my experience is that this is less sensitive and furthermore may be difficult to observe whilst working inside the equipment; but a multimeter or AF output meter can be placed in any convenient, easily seen position. If an output indicator, as distinct from the S-meter, is being used first disable the AGC line, switch the receiver to its lowest frequency waveband and connect the signal generator to the aerial socket.

The frequencies at which the alignment is to be carried out have then to be decided. One of these will be near the lower frequency end of the scale and the other near the upper. If you have the handbook on the receiver (as distinct from 'instructions for use') these will be given in the text. If this information is not available then a choice has to be made. Many people select frequencies corresponding to the highest and lowest frequencies marked on frequency scale, but the author prefers to use the second frequency calibration from either end.

The signal generator is first tuned to the frequency corresponding to the lower frequency calibration point and the receiver tuning scale is set to indicate the same frequency. The *trimmer* is then adjusted to between half and two thirds capacity.

The next step depends on the type of tracking circuit. If this comprises only a trimmer and variable inductance then adjust the core of the inductance for maximum meter indication. If the inductance is fixed, adjust the padder for the same result. If the inductance is variable but there is also a padder, set the slug about two thirds of the way into the coil, lock and proceed as if the inductance was fixed. Next, return the signal generator to the frequency corresponding to the tracking point at the high frequency end of the scale and adjust the trimmer for maximum meter indication.

Re-adjustment

As the trimmer and padder (or inductance) each affect the other, the padder (or inductance) must be re-adjusted at the low frequency tracking point and that complete, the trimmer must be re-adjusted at the high frequency point. After two or three repetitions the frequency being received should agree with the receiver frequency scale. The only circumstances where it may not is if the circuit contains both a padding capacitor and a variable inductance in which case it will be necessary to vary the inductance. If the frequency swing is excessive, reduce the inductance. If the swing is too little, increase the inductance.

With the oscillator accurately aligned, a similar method is used to align the RF tuned circuits. However, care should be taken whilst adjusting the mixer stage for this might also pull the oscillator frequency a little. If an externally adjusted aerial trimmer is fitted, set this to approximately two thirds of maximum capacity. Each wave band is aligned in exactly the same way. When complete, the frequency scale should accurately reflect the frequency to which the receiver is tuned, second channel responses will be minimised and the equipment will be operating at optimum sensitivity throughout its range.

The accurate alignment of older communication receivers can be accomplished in the average amateur workshop. Although the task may seem daunting, with care and patience it can be performed, achieving both a receiver performing at its best and the self-satisfaction of a job well done.

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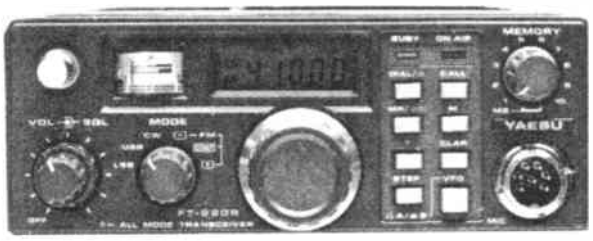

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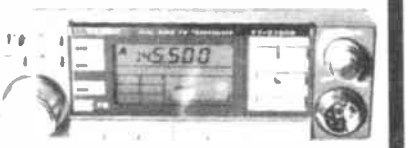

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STATE-OF-THE-ART: YAESU FRG8800

ANGUS McKENZIE G3OSS

A year ago I looked at three receivers in the middle price bracket: the Trio R2000, which in spite of its excellent ergonomics had a rather poor front end, and the normal and Surrey Electronics modified versions of the Yaesu FRG7700.

The problem with the 7700 was that of poor ergonomics with very poor audio quality on the normal version, although these were much better on the Surrey Electronics one. Yaesu have now introduced a new model, the FRG8800, which I suggest is in a totally different class to the earlier three, for it is one of the best short wave listening quality receivers on the market, although more esoteric rigs may be better in some areas.

The rig covers the frequency range of 150KHz to 30MHz and 118 to 174MHz with the optional VHF adaptor. AM, FM, USB, LSB and CW modes are included. On AM both wide and narrow filters can be switched, whilst on CW either the SSB filter or a much narrower one can be switched in.

An optional wide filter is available for FM, but I cannot see any use for it unless you were using the box as an IF for a very much higher frequency, the normal FM filter being around 12.5KHz wide.

Frequency can be entered from a keypad on the front panel by depressing the MHz followed by the MHz button, then the KHz followed by the KHz button. On any particular MHz band you can QSY in KHz by just inserting the new KHz frequency on the buttons or of course using the normal tuning dial, which can be set to give 25Hz or 500Hz steps (6.25 or 125KHz per dial revolution).

The set has 12 memories in which one can put frequency, mode, and narrow or wide filter as appropriate. Most useful is the fact that one can transfer from memory direct to VFO and then tune away from the memory frequency. Thus if you are using the VHF converter, you could, for example, put 144.3MHz (the 2m SSB calling frequency) into memory and VFO from it.

The push pad includes facilities for pushing 0 to 9, MHz, KHz, memory recall, VFO to memory (memory store), memory selective scan, normal memory scan, pause (for stopping scanning), programmable band scan (sweeps between any two adjacent memories), memory select, memory to VFO and, finally, go to VFO.

Other front panel facilities include a continuously variable RIT, memory channel switch, RF attenuator pot with click off for auto AGC, audio gain, squelch (operating on all modes) and tone control. Additional push-buttons select mode, filter, fast/slow AGC, noise blanker on/off (narrow wide selector on the rear panel) and display dim on/off. On the front panel there is also a quarter inch headphone jack and a mini record feed jack (3.5mm).

The loudspeaker projects forward and is mounted on the front panel together with the frequency display (resolution 100Hz) with status indications of many controls. The S-meter is included in the front panel display (a very large LCD) and indicates S units up to 9 and above the latter in 10dB steps. The tuning dial runs very smoothly indeed and has no backlash whatsoever, as it only has to turn an optical interruptor mechanism.

Also provided on the front is a clock function combined with on/off and sleep functions, allowing you to hear your favourite programme from Radio Tirana, Albania when you like. Two separate clock times can be present eg BST and GMT, which is useful as many of us get confused between summer and winter times.

Rear panel

On the rear panel is an SO239 socket for the LF/HF antenna input complemented by four spring-lever clamps for earth, low Z or high Z aerial connections and a mute allowing an external transmitter to mute this receiver when on Tx. The VHF adaptor fits in the back and also has an SO239 socket and a telescopic whip. By the socket is a DX/local switch, which is basically a 10dB antenna attenuator.

The mains input is on an IEC socket with a fuse by its side. Two phono sockets are provided, one of which is normally closed with the other normally open, both being switched by the internal alarm system. These sockets can be used to switch on an external recorder, the voltage/current limit being 15V/1A.

Two countersunk 3.5mm jack sockets are provided for an external speaker and tape recorder audio drive (this is at a fixed level coming from before the receiver audio gain control). It is nominally set to give a level of just under 800mV from a source impedance of around 600 ohms.

Note that the recorder jack on the front panel is rated to give a rather lower level from a higher source impedance specified at 50K ohms for feeding DIN inputs on cassette decks etc.

Two DIN sockets on the rear are called accessory and CAT. The accessory socket (5 pin DIN) provides on pin 1 earth, 2 AGC, 3 no connection, 4 11V dc and 5 blocking bias. The CAT 6 pin DIN is for interconnection with a Yaesu FIF series computer interface unit.

The optional interface unit type FIF232C was supplied to us with leads, but these were not compatible with my BBC 'B' and we did not have the appropriate adaptor so we could not actually try it. Full computer control of the rig is provided including frequency, mode, and filters and status can be extracted.

The rig is supplied in a smooth dark grey metal cabinet, with a carrying handle on the right side cheek and small rubber pressure pads fitted as feet on the left side cheek. Large feet are underneath the rig, the front ones having miniature bail pull forward legs. The whole presentation and ergonomics are superb and amongst the best that I have seen on a Yaesu product.

Subjective tests

I have spent many happy hours listening to broadcasting stations and amateurs right across the board from 150KHz to 29.999MHz. I was struck by the far better than usual AM quality which was nearly as good as the Surrey Electronics version of the older model, which in any case is now more expensive.

The SSB reproduction was superb. However, the filter was much wider than usual, causing the selectivity to be only fair, although it seemed better than that of the old model. CW reception was surprisingly good, and the narrow filter helped a lot. Whilst the audible response on AM and SSB was very good, I found FM was very muffled, even with the tone control at maximum treble.

Sensitivity was surprisingly good throughout and the absence of front end intermodulation distortion was most welcome, for I had no troubles on Top Band, 80 or 40 metres provided that I used an external filter to cut below 1.8MHz.

Audio quality was particularly clean, but whilst there was plenty of audio gain for AM, SSB and CW, gain was lacking on FM. Low deviation FM including that on CB, 10m FM and PMR FM on VHF, reproduced only with very limited volume, even with the gain control flat out. An external speaker did not help this, and I would have liked at least 10dB more available gain here.

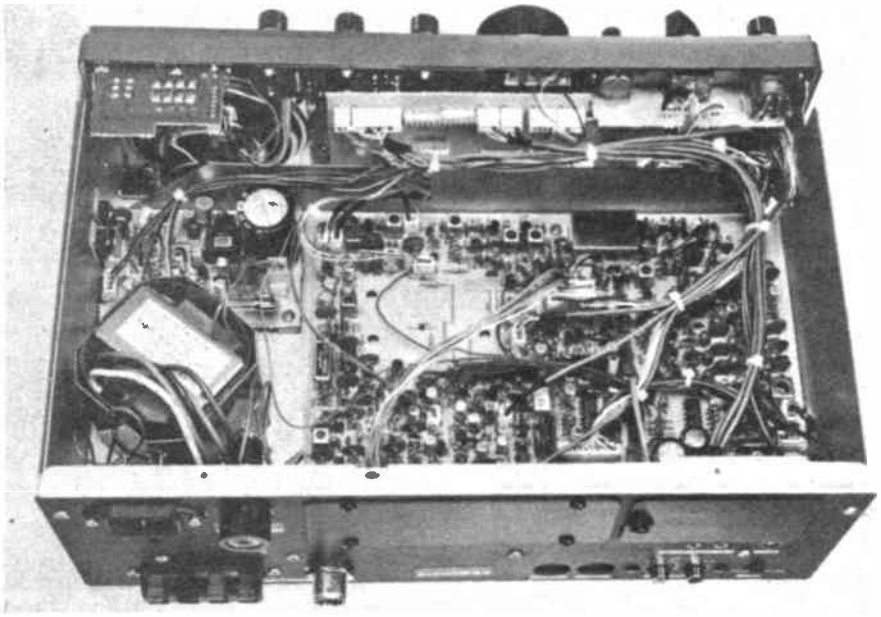
The signal-to-noise ratio on strong signals was excellent and both the fast and slow AGC actions were very good, but you couldn't turn AGC off, although the RF attenuator, which seemed to be a normal type RF gain control, did back off input gain well, which further improved AM distortion on extremely strong signals.

I found the VFO steps just about right for general use and it was easy enough to use the RIT miniature rotary if I wanted to get SSB pitch exactly right. There was some slight spillage from the opposite sideband on SSB, showing that the IF filter skirts were a little wide below around -40dB.

I was a bit surprised to find that the maximum available audio output power was rather limited, and not really quite adequate for some purposes, although the built-in speaker is reasonably sensitive.

VHF adaptor

The VHF adaptor arrived a few days before I wrote this review, and I was surprised at how good it actually was when interconnected with my Discone. I used it to listen on all sorts of fun frequencies and I heard a clarity of general coverage VHF reception that I have not heard on any previous rig, showing that the VHF local oscillators are much quieter than on most scanning receivers.



The VHF sensitivity was good in the context of the general coverage reception, although it was on average slightly inferior to the sensitivity of a good 2m rig.

I did not note any intermodulation products, and in my general listening tests I did not actually find any image problems until we found out where they would be after the lab tests! However, I wish the VHF tuning range had been extended to cover down to 50MHz or even lower, but perhaps this is requiring the lily to be gilded.

Good quality

I also had a long listen to SSB signals on 2m using my 17-element Tonna with the masthead pre-amp switched on and heard many stations transmitting surprisingly good quality, which only shows up with a wider than average SSB filter. Needless to say, the bad stations sounded dreadful! The noise blanker worked well.

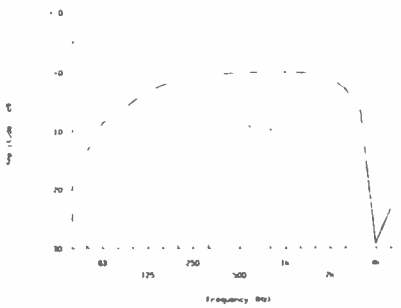
There were comparatively few spurious carriers around, and none of these seemed to crop up on important frequencies. I did notice one peculiar glitch in the tuning at every 1KHz when in the slow tuning rate position, this coming up when the display switched from 400 to 500Hz, but this did not seem too worrying. I checked all the basic functions of the radio and they all seemed to work well, including scanning, memories and all modes.

Laboratory tests

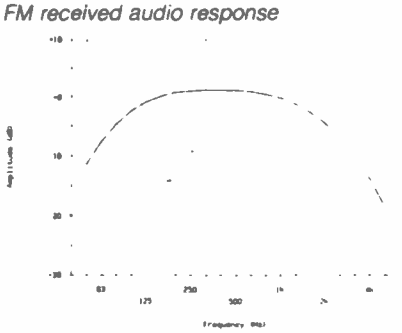
The RF sensitivity was as good as one would ever want from LF up to around 21MHz, but by 29MHz it had become just reasonably adequate. Bearing in mind the wide IF bandwidth, the actual noise figure is good, and so much better than that of the old 7700. The apparent FM sensitivity though was just a little lacking on 10m, although it would probably be good enough.

We took a good look at the RFIM performance as it had seemed so good 'on air'. We were pleased to find that it was excellent for a general coverage rig, and dramatically superior to the older Trio and Yaesu models. The intercept point was retained even at 20/40KHz spacings, although it degraded by 12dB for spacings of 10/20KHz because of the bandwidth of the first roofing filter. The freedom from blocking from very strong

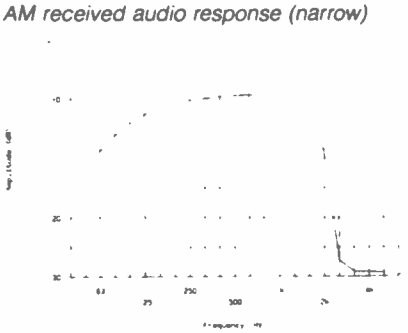
SSB received audio response



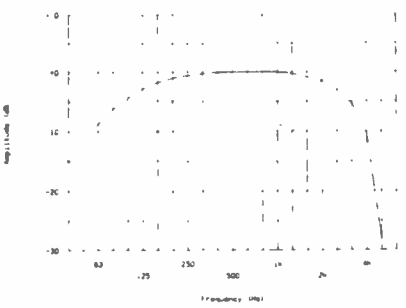
FM received audio response



AM received audio response (narrow)



AM received audio response



YAESU FRG8800 LABORATORY TEST RESULTS

Sensitivity; SSB, level required to give 12dB sinad

28.55MHz	-120dBm
14.2MHz	-121dBm
3.75MHz	-122dBm
1.93MHz	-122dBm

Sensitivity; FM, 1KHz modulation at 29.55MHz
level required to give 12dB sinad
3KHz deviation; -116dBm
5KHz deviation; -117.5dBm

Selectivity (SSB)

3dB bandwidth	3.3KHz
6dB bandwidth	3.7KHz
40dB bandwidth	5.2KHz
60dB bandwidth	6.5KHz
70dB bandwidth	26.1KHz
80dB bandwidth	30KHz

Selectivity (FM)

+12.5KHz	53.5dB
-12.5KHz	24.5dB
+25KHz	65dB
-25KHz	64dB

Capture ratio (FM) 5dB

Quieting (FM) 12.7dB

S-meter; levels required to give the following readings

	FM	SSB
S1	-104dBm	-102dBm
S9	-80dBm	-77dBm
S9+60	-24dBm	-21dBm

Intercept point on 28MHz band
+100/+200KHz spacing; -3dBm
+20/+40KHz spacing; -3dBm
+10/+20KHz spacing; -15dBm

Reciprocal mixing; off channel signal input level to noise floor ratio for 3dB S/N degradation

+100KHz spacing;	108dB
+50KHz spacing;	105dB
+20KHz spacing;	94dB
+10KHz spacing;	88dB

Product detector distortion (SSB)

AGC fast;	1.4%
AGC slow;	1.3%

Distortion (FM)

2.5KHz deviation;	0.8%
0.5KHz deviation;	1.6%

Output power (10% THD at 1KHz modulation, 5KHz deviation, 8 ohms); 1.3W

Output power (10% THD, SSB, 1KHz modulation)

8 ohms;	1.3W
4 ohms;	1.5W

AM distortion, slow AGC, -50dBm at rig, 30% modulation depth

1KHz modulation;	2.3%
300Hz modulation;	2.7%

Size; 334W x 118H x 225D

Weight; 6.1Kg

YAESU FRV8800 VHF CONVERTER

Sensitivity; level required to give 12dB sinad on FM

144.8MHz	-117.5dBm
125MHz	-121dBm
151MHz	-116dBm
160MHz	-120.5dBm
170MHz	-117dBm

Intercept point;

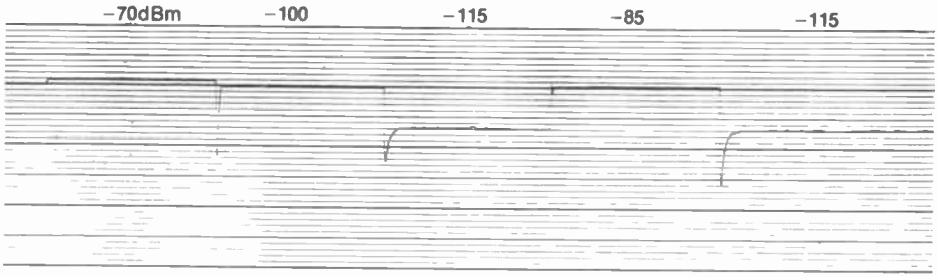
+100/+200KHz spacing;	-13dBm
+50/+100KHz spacing;	-13dBm
+1/+2MHz spacing;	-8.5dBm

Typical image response -65dB (NB images between 34MHz and 91MHz)

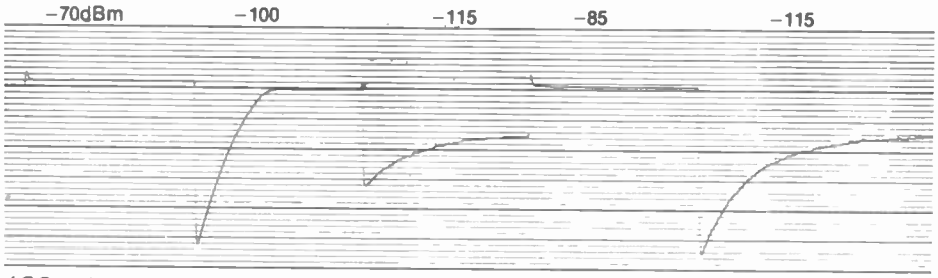
DX/local ATT; 10dB

Sensitivity; level required to give 12dB Sinad on SSB

144.8MHz	-123dBm



AGC action – fast



AGC action – slow

signals from ±10 to ±30KHz is actually better than that of most Icom rigs, which is fascinating.

The reciprocal mixing tests revealed a very reasonable performance indeed for a synthesised VFO, although we did note synthesiser sprogs at 25KHz intervals, which degraded the RM results by around 20dB when the receiver was tuned precisely to them. This is not too serious, however, since the RM ratios are pretty good anyway.

The IF selectivity on SSB was indeed very wide at 3.7KHz bandwidth for -6dB points, the shape factor coming out at 2:1, which is not too bad for a general coverage radio. 70dB selectivity however showed the skirt to widen out to 26KHz bandwidth whilst the 80dB selectivity was around 30KHz wide, so presumably there was some breakthrough at very low level around the SSB filter, with the first IF roofing filters providing the main selectivity here.

Selectivity

The AM selectivity was extremely well optimised in the wide position but of course very muffled in the narrow position, which one would only use when there is very bad adjacent channel interference. FM selectivity was surprisingly sharp but lopsided, although once again the skirts opened out below -50dB or so. The CW selectivity on narrow was fairly sharp, but not razor sharp as one is used to on a really good transceiver.

The capture ratio measured well and the AGC characteristics were rather as I like them, for it took around 4 seconds for full gain recovery in the slow position, which allowed dynamic range to be well maintained on an average SSB signal. The AGC threshold was at a higher level than usual though, so it was necessary to bring up the audio gain on weak SSB signals.

Product detector distortion was at a reasonably low level and AM distortion measured surprisingly well, particularly with AGC on slow. We had a look to see the input level required from a signal of 300Hz modulation at 90% depth to give very audible distortion, and found that we had to come up to the stunningly high level of -10Bm for distortion to reach 16.5%. When one considers the 90% modulation, this is quite remarkable. When we then backed off the RF gain control the distortion fell to 4.4%, which is even more remarkable, distortion rising to 9% at 1KHz.

At lower RF levels distortion readings were typically around 2.5% with AGC slow, rising to 4.3% with AGC fast. It has to be said that these figures are far superior to those of many other rigs on AM. FM distortion at 2.5KHz deviation also measured extremely well at substantially below 1%.

Hallelujah! The S-meter worked surprisingly well on FM as well as on the other modes, and was certainly far better than many. There was 24dB difference between S1 and S9, and above the latter the law remained surprisingly logarithmic.

Audio power

The audio power output was indeed very limited at only 1.3W for 10% THD. Power only marginally increased into 4 ohms, and I feel that this is a slightly unfortunate limitation. Frequency responses on SSB and AM were excellent, but FM seemed very muffled and 3KHz was some 9dB down, although 5KHz had only fallen another 9dB. Considering that the response was taken from a pre-emphasised signal, it should have been flatter at 3KHz, but have fallen more rapidly above this frequency. Frequency accuracy was quite reasonable throughout.

We had a good look at the VHF converter and it was actually on average better on sensitivity than the main rig, the SSB sensitivity being very good although FM was not so good. Stability was excellent, and the RF input intercept

point was quite acceptable at -13dBm on 2m. This improved by 4.5dB at a very wide spacing of +1 and +2MHz.

As we had no circuit diagrams, for it was an early imported sample, we had to do some detective work, and found the VHF coverage splitting into three frequency regions, 118-136MHz, 136-155MHz and 155-174MHz. One of three crystal controlled local oscillators at 84.95, 103.95 and 122.95MHz respectively automatically switches in as appropriate to mix the signals down to a lower IF, which eventually mixes down to an IF of around 47MHz, feeding the final IF of 455KHz which contained the filters.

We checked the average image ratio produced by the VHF converter, and this was around 65dB. The images, however, were between 30MHz and Band II, and trouble would only be likely to occur from strong local FM radio stations at the very bottom of Band II, causing very slight breakthrough at around 156.8MHz (image from 89.1MHz, for example).

Yaesu had obviously taken great care in the design of the wide coverage VHF adaptor, and we did notice that it was reasonably free from birdies, just a few popping up here and there.

Conclusions

I have been looking for a recommendable general coverage receiver that could give good audio quality on all

modes for years, and surprisingly, the FRG8800 appears to be as good as any I have checked before, even if it has some limitations in its IF filters.

I most strongly recommend this radio as a general shack receiver, which would be particularly welcome for general short wave reception of broadcast stations, whilst being adequate as an excellent tunable IF for crossband working from VHF, UHF and microwave transverters.

I praise most highly Yaesu's superb ergonomics, for they have put so much right that has been wrong in the past. Considering all the facilities that are provided, I think the price is reasonable (£525 including VAT), with the VHF adaptor at £95 including VAT, and the FIF232C computer adaptor at £58.65 including VAT.

Very many thanks to SMC for loaning me the review sample so soon after first receiving it from Japan, and to my colleague Jonathan G1LMS who has enjoyed playing with it about as much as I have. Clearly one of the best designed rigs I have looked at for quite a while.

INTEGRATED CIRCUITS

AN124	2.80			STK437	7.95	TBA651R	2.60	TDA2581	2.25
AN214Q	2.50	MC1351P	1.50	STK439	7.95	TBA720A	2.45	TDA2582	2.95
AN239	2.50	MC1357	2.35	STK461	11.50	TBA750Q	2.65	TDA2593	2.95
AN240P	2.50	MC1358	1.58	TA7061AP	1.50	TBA800	0.89	TDA2600	5.50
AN264	2.50	MC14518CP		TA7108P	1.50	TBA810AS	1.65	TDA2610	2.50
AN612	2.15		7.50	TA7120P	1.65	TBA810P	1.65	TDA2611A	1.95
AN362L	2.50	MC1495	3.00	TA7129P	2.50	TBA820M	0.75	TDA2640	3.50
AN7140	3.50	MC1496	1.25	TA7130P	1.50	TBA820Q	1.45	TDA2680A	2.75
AN7145	3.50	MC145106P		TA7137P	1.00	TBA890	2.50	TDA2690	2.45
AN7145M	3.95		7.95	TA7176AP	2.95	TBA920	1.65	TDA3310	2.95
AN7150	2.95	MC1723	0.50	TA7193P	3.95	TBA950/2X		TDA4600	2.50
BA521	3.35	MC3357	2.75	TA7203	2.95		2.35	TDA9503	3.15
CA1352E	1.75	MC3401L	2.50	TA7204P	2.15	TBA990	1.49	TDA3560	3.95
CA3086	0.46	ML231B	1.75	TA7205AP	1.15	TBA990Q	1.49	TEA1009	1.35
CA3123E	1.95	ML232B	2.50	TA7222AP	1.80	TCA270	1.10	UPC566H	2.95
CA314OT	1.15	MSM5807	8.75	TA7227P	4.25	TCA270SQ		UPC575C2	
ETT6016	2.50	PLL02A	5.75	TA7310P	1.80		1.10		2.75
HA1339A	2.95	SAA500A	3.50	TA7313AP	2.95	TCA650	2.50	UPC1025H	
HA1366W	2.75	SAA1025	7.25	TA7314P	2.95	TCA800	2.95		1.95
HA1377	3.50	SAA5010	6.35	TA7137P	1.00	TCA830S	1.95	UPC1028H	
HA1156W	1.50	SAS560S	1.75	TA7314P	2.95	TCA900	2.50		1.95
HA1551	2.95	SAS570S	1.75	TA7321P	2.25	TCA940	1.65	UPC1032H	
LA1230	1.15	SAS580	2.85	TA7609P	3.95	TDA440	2.20		1.50
LA4102	2.95	SA/SB/T/U		TA7611AP	2.95	TDA1001	1.95	UPC1156H	
LA4140	2.95		1.00	TA4310A	1.95	TDA1002A	1.95		2.75
LA4031P	1.95	SL901B	4.85	TAA320A	1.95	TDA1003A	3.95	UPC1158H	
LA4420	1.95	SL917B	6.65	TAA350A	1.95	TDA1004A	3.25		0.75
LA4430	2.50	SL1310	1.80	TAA550	0.25	TDA1006A	2.50	UPC1167C2	
LA4400	4.15	SL1327	1.10	TAA570	1.95	TDA1010	2.15		1.15
LA4422	2.50	SL1327Q	1.10	TAA661B	1.20	TDA1035	2.50	UPC1181H	
LA4461	3.95	SN76003N	1.95	TAA700	1.70	TDA1037	1.95		1.25
LC7120	3.25	SN76013N	1.95	TBA120AS/B/-		TDA1044	2.15	UPC1182H	
LC7130	3.50	SN76023N	2.75	C	1.00	TDA1170	1.95		2.95
LC7131	5.50	SN76033N	1.95	TBA395	1.50	TDA1190	2.15	UPC1185H	
LC7137	5.50	SN76110N	0.89	TBA396	0.75	TDA1270Q	3.95		3.95
LM1011	3.15	SN76115N	1.25	TBA440N	2.55	TDA1327	1.70	UPC1191V	1.50
LM324N	0.45	SN76131N	1.30	TBA480Q	1.25	TDA2002	1.95	UPC1350C	
LM380N8	1.50	SN76226DN		TBA510	2.50	TDA2003	2.95		2.95
LM380N8	1.75		2.95	TBA510Q	2.50	TDA2010	1.95	UPC1353C	
LM383T	2.95	SN76227N	1.05	TBA520	1.10	TDA2020	2.95		2.45
LM390N	3.50	SN76533N	1.65	TBA520Q	1.10	TDA2030	2.80	UPC1365C	
M51513L	2.30	SN76544N	2.65	TBA530	1.10	TDA2140	3.95		3.95
M5155L	2.95	SN76570N	1.00	TBA530Q	1.10	TDA2151	1.95	UPC2002H	
M51521L	1.50	SN76650N	1.15	TBA540	1.25	TDA2160	2.50		1.95
MB3712	2.00	SN76660N	0.90	TBA540Q	1.35	TDA2521	3.25	555	0.35
MB3756	2.50	STK014	7.95	TBA550Q	1.95	TDA2522	1.95	556	0.42
MC1307P	1.00	STK015	5.95	TBA560C	1.45	TDA2523	2.95	723	0.50
MC1310P	1.95	STK043	9.50	TBA560Q	1.45	TDA2524	1.95	741	0.35
MC1327	0.95	STK415	7.95	TBA570	1.00	TDA2530	1.95	747	0.50
MC1327Q	0.95	STK433	5.95	TBA641A12		TDA2532	1.95	748	0.35
MC1349P	1.20	STK435	7.95		2.50	TDA2540	1.95	7808	0.60
						TDA2541	2.15	7805	0.65
						TDA2560	2.15	7812	0.65
						TDA2571	2.95	7815	0.65

SEMICONDUCTORS

AAY12	0.25	BC182	0.10	BD238	0.40	BFX88	0.25	TIP32C	0.42
AC126	0.45	BC182LB	0.10	BD242	0.65	BFY50	0.21	TIP33B	0.95
AC127	0.20	BC183	0.10	BD246	0.75	BFY51	0.21	TIP34B	0.95
AC128	0.28	BC183L	0.09	BD376	0.32	BFY52	0.25	TIP41A	0.45
AC128K	0.32	BC184LB	0.09	BD410	0.65	BFY90	0.77	TIP41C	0.45
AC141	0.28	BC204	0.10	BD434	0.65	BLY48	1.75	TIP42C	0.47
AC141K	0.34	BC208B	0.13	BD437	0.75	BR100	0.26	TIP47	0.65
AC142K	0.30	BC208B	0.13	BD438	0.75	BR101	0.49	TIP120	0.50
AC176	0.22	BC212	0.09	BD520	0.65	BR103	0.55	TIP125	0.58
AC176K	0.31	BC212L	0.09	BD538	0.65	BR303	0.95	TIP142	1.75
AC187	0.25	BC212LA	0.09	BD597	0.95	BRC4443	1.15	TIP146	2.75
AC187K	0.28	BC213	0.09	BD701	1.25	BRY39	0.45	TIP161	2.95
AC188	0.25	BC213L	0.09	BD702	1.25	BT100A/02	0.85	TIP2955	0.60
AC188K	0.37	BC214	0.09	BD707	0.90	BT106	1.49	TIP3055	0.55
AD142	0.79	BC214C	0.09	BDX32	1.50	BT116	1.20	TIS91	0.20
AD143	0.82	BC214L	0.09	BF115	0.35	BT119	3.15	TV106/2	1.50
AD149	0.70	BC237B	0.09	BF119	0.65	BT120	1.65	ZRF0112	16.50
AD161	0.39	BC238	0.09	BF127	0.39	BU105	1.95	2N1100	6.50
AD162	0.39	BC239	0.12	BF154	0.20	BU108	1.69	2N1308	1.35
AD161/2	0.90	BC251A	0.12	BF158	0.22	BU124	1.25	2N1711	0.30
AF106	0.50	BC252A	0.15	BF160	0.27	BU125	1.25	2N2219	0.28
AF114	1.95	BC258	0.25	BF167	0.27	BU126	1.50	2N2905	0.40
AF121	0.60	BC258A	0.39	BF173	0.22	BU204	1.65	2N3053	0.40
AF124	0.65	BC284	0.30	BF177	0.38	BU205	1.30	2N3054	0.59
AF125	0.35	BC300	0.30	BF178	0.26	BU208	1.39	2N3055	0.52
AF126	0.32	BC301	0.30	BF179	0.34	BU208A	1.52	2N3702	0.12
AF127	0.65	BC303	0.25	BF180	0.29	BU208D	1.65	2N3703	0.12
AF139	0.40	BC307B	0.09	BF181	0.29	BU326	1.20	2N3704	0.12
AF150	0.60	BC327	0.10	BF182	0.29	BU326S	1.50	2N3705	0.12
AF178	1.95	BC328	0.10	BF183	0.29	BU407	1.24	2N3706	0.12
AF239	0.42	BC337	0.10	BF184	0.25	BU500	2.25	2N3708	0.12
AU106	4.50	BC338	0.09	BF185	0.28	BU508A	1.95	2N3733	9.50
AU107	3.50	BC347A	0.13	BF194	0.11	BU526	1.90	2N3773	2.75
AU110	3.50	BC461	0.35	BF195	0.11	BU807	2.25	2N3792	1.35
AY102	2.95	BC478	0.20	BF196	0.11	BUY20	2.15	2N4280	3.50
BC107A	0.11	BC527	0.20	BF197	0.11	BUY69B	1.70	2N4427	1.95
BC107B	0.11	BC547	0.10	BF198	0.15	MJ3000	1.98	2N4444	1.15
BC108	0.10	BC548	0.10	BF199	0.14	MJE340	0.40	2N5294	0.42
BC108A	0.11	BC549A	0.10	BF200	0.40	MJE350		2N5296	0.48
BC108B	0.12	BC550	0.14	BF241	0.15	MJE520	0.45	2N5298	0.60
BC109	0.10	BC557	0.08	BF245	0.30	MJE2955		2N5485	0.45
BC109B	0.12	BC557B	0.08	BF257	0.25	MPSA13	0.29	2N5496	0.95
BC109C	0.12	BC558	0.10	BF258	0.25	MPSA92	0.30	2SA329	0.95
BC114A	0.09	BC639/10	0.30	BF259	0.28	MRF237	3.45	2SA715	0.60
BC116A	0.15	BCY33A	1.60	BF271	0.28	MRF450A		2SC495	0.80
BC117	0.19	BD115	0.30	BF273	0.16		12.50	2SC496	0.80
BC119	0.24	BD124P	0.59	BF336	0.34	MRF453	17.50	2SC931D	0.95
BC125	0.25	BD131	0.42	BF337	0.29	MRF454	23.50	2SC1096	0.80
BC139	0.20	BD132	0.42	BF338	0.32	MRF455	17.50	2SC1106	2.50
BC140	0.31	BD133	0.40	BF355	0.37	MRF475	2.50	2SC1172Y	2.20
BC141	0.25	BD135	0.30	BF362	0.38	MRF477	10.00	2SC1173	1.15
BC142	0.21	BD136	0.30	BF363	0.65	OC16W	1.95	2SC1306	1.00
BC143	0.24	BD137	0.32	BF371	0.28	OC23	1.50	2SC1307	1.50
BC147A	0.12	BD138	0.30	BF394	0.19	OC29	2.25	2SC1364	0.50
BC147B	0.12	BD139	0.32	BF422	0.32	OC36	2.25	2SC1449	0.50
BC148A	0.09	BD140	0.30	BF423	0.25	OC42	0.75	2SC1678	1.25
BC148B	0.09	BD144	1.10	BF457	0.32	OC44	0.75	2SC1909	1.45
BC149	0.09	BD150C	0.29	BF458	0.36	OC45	0.55	2SC1945	2.65
BC153	0.30	BD159	0.56	BF467	0.68	OC70	0.45	2SC1953	0.95
BC157	0.12	BD160	1.50	BF595	0.23	OC71	0.55	2SC1957	0.80
BC158	0.09	BD166	0.56	BF597	0.25	OC75	0.95	2SC1969	1.95
BC159	0.09	BD179	0.72	BFR39	0.23	OC81	0.80	2SC2028	1.15
BC161	0.28	BD182	0.70	BFR40	0.23	OC16W	2.50	2SC2029	1.95
BC170B	0.15	BD201	0.83	BFR81	0.25	R2008B	1.45	2SC2078	1.45
BC171	0.09	BD202	0.65	BFR88	0.30	R2010B	1.45	2SC2091	0.85
BC171A	0.10	BD203	0.75	BFR90	1.50	R2322	0.58	2SC2098	2.95
BC171B	0.10	BD204	0.70	BFR91	1.75	R2323	0.66	2SC2166	1.95
BC172	0.10	BD222	0.46	BFT42	0.35	R2540	2.48	2SC2314	0.80
BC172B	0.10	BD223	0.59	BFT43	0.35	RCA16334	0.90	2SC2371	0.36
BC172C	0.10	BD225	0.48	BFW61	0.50	RCA16335	0.80	2SC931D	0.95
BC173B	0.10	BD232	0.35	BFW92	0.85	S2060D	0.95	1SD234	0.50
BC174	0.09	BD233	0.38	BFX29	0.30	SKE5F	1.48	2SD325E	1.58
BC174A	0.09	BD234	0.35	BFX84	0.26	TIP29	0.40	3N211	1.95
BC177	0.15	BD236	0.49	BFX85	0.32	TIP29C	0.42	3SK88	0.55
BC178	0.15	BD237	0.40	BFX86	0.30	TIP30C	0.43		
						TIP31C	0.55		

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D13-47GH/34	55.00	F31-13LD	55.00	M38-121GR	55.00	5BP1	9.00
D13-47GH	55.00	F31-13LG	55.00	M38-121GHR	55.00	5BHP1	30.00
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D13-630GH	59.00	M19-101GR	55.00	M38-344P39	55.00	1564	39.00
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D14-150GM	75.00	M23-111W	55.00	M43-12LG/01	55.00	9442E1	80.00
D14-172GH/84	59.00	M23-111GH	55.00	M44-120LC	55.00	95447GM	75.00
D14-172GR	55.00	M23-111LD	55.00	M44-120GR	55.00	95449	75.00
D14-172GV	55.00	M23-112GM	55.00	M47-25GR/22	55.00	7709631	79.50
D14-173GH	55.00	M23-112GV	55.00	M50-120GH	55.00		
D14-173GM	53.00	M23-112GW	55.00	M50-120GR	55.00	**TAPE HEADS**	
D14-173GR	55.00	M23-112KA	55.00	M50-120GV	55.00	Mono Head	1.50
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D14-181GM	53.00	M24-120LC	59.00	S6AB	45.00	**ELECTRO-OPTICAL**	
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D14-182GM/98	55.00	M24-121LC	59.00	SE42BP31	55.00	XP1002	29.00
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				T948H	55.00		

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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	0.15	BZY95C30	0.35	IN5403	0.12
BY164	0.45	CS4B	4.50	IN5406	0.13
BY176	1.20	CS10B	8.45	IN5407	0.15
BY179	0.63	OA47	0.09	IN5408	0.15
BY182	0.55	OA90	0.05	ITT44	0.04
BY184	0.35	OA91	0.06	ITT923	0.15
BY199	0.40	OA95	0.06	ITT2002	0.10
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BY208-800	0.33	1N21DR	2.95		

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B7G SKTD	0.25
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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

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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

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20MM ANTI SURGE FUSES

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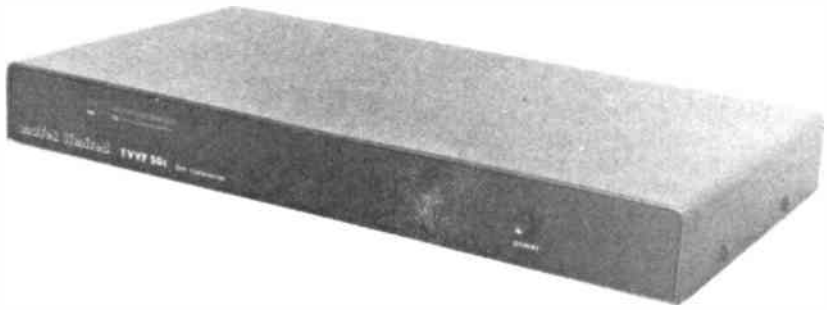
1A-5AMP	12p each

20MM QUICK BLOW FUSES

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

ANGUS MCKENZIE TESTS: MUTEK TVVF 50c 6m TRANSVERTER

It is always stimulating when muTek release a new product, for they have a happy knack of getting things right. Recently I warmly recommended their HF transverter and now this 50MHz one follows which clearly has tremendous export potential. Hopefully we will all have the 50MHz band soon, so one day the muTek will be an obvious and excellent method of getting going on 50MHz. They will also be introducing a 28MHz IF version fairly soon which may be more convenient for many users.



Metal case

The transverter is supplied in a flat metal case, its front panel having just an on/off button and an output power display using five LEDs, with an additional one acting as an on/off indicator. The equipment requires an external stable 13.8V dc supply and at least a 4A capability is required.

The rig contains a special locking 5-pin DIN socket with its mating locking plug supplied with it. The 144MHz interconnection is on a BNC socket and the 50MHz antenna socket is an SO239. Since the transverter is very thin I suggest that it can be placed almost anywhere in the shack. Tx/Rx changeover is basically RF sensed with a reasonably long hold time for Tx, but a hard PTT override is provided on one of the pins of the DIN socket. This PTT input is high impedance, thus being compatible with more PTT lines than usual.

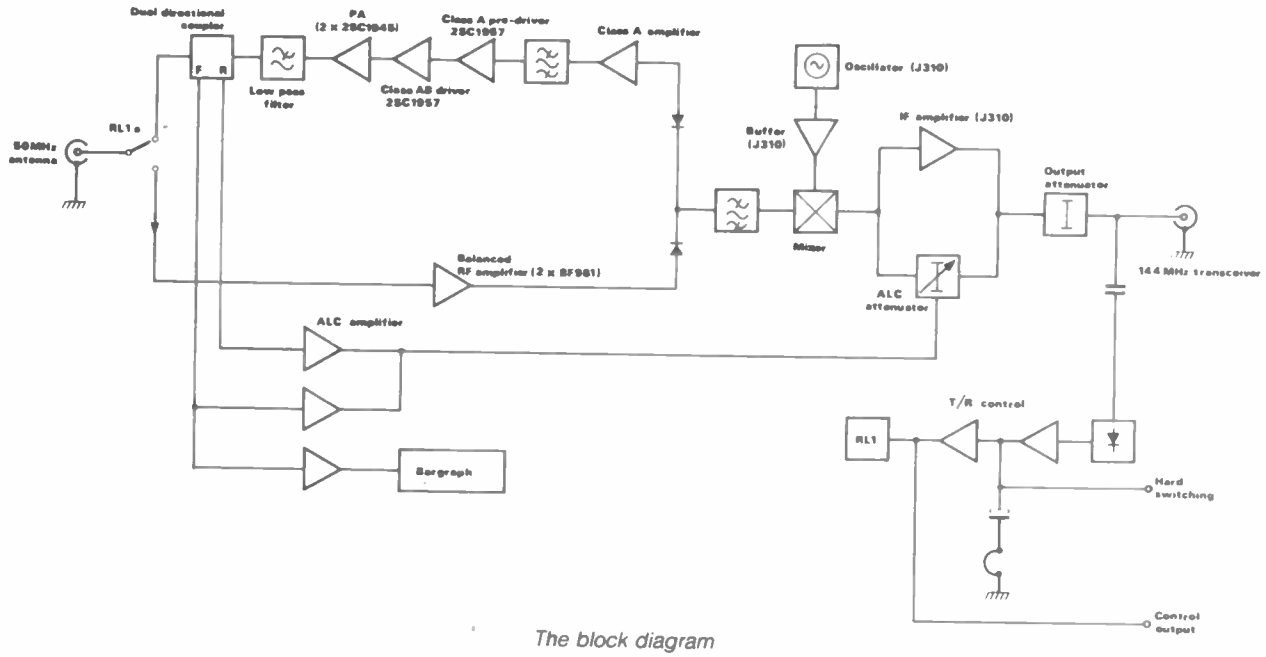
Another pin is supplied with 12V dc when the rig is switched on and this voltage can be used to switch accessory indicators, although it is not intended to give a high current. muTek have announced that they will be introducing a transverter control system in the future using this facility.

Another pin is open circuit on Rx and approximately 30 ohms on Tx for operating external relays or switching lines on linears, for example. This pin is controlled by a power FET having both a diode and protection resistor in series.

The transverter can accept peak input from 1W to 10W on 144MHz to give full output of around 10W on 50MHz. An input preset can be adjusted so that at maximum input RF drive the output is just on the onset of ALC. Well-written instructions inform the user of the precise setting up procedure. The ALC loop around the transmitter section is fed from a direction coupler on the output back to a pin diode attenuator on the input.

LEDs

The forward power from the coupler also feeds the row of LEDs to give output power indication. The reverse (SWR) output from the coupler is also designed to shut down the transverter drive if a bad SWR is present on the output. Many of



The block diagram

the circuits in the transverter are common to Rx and Tx, and the block diagram shows the general circuit arrangements. It can be seen that there are many bandpass filters, all of which clearly contribute to excellent harmonic and spurious rejections.

Receive

On receive, after the signal from the antenna has come through the relay it passes straight into push/pull BF981s, which are input tuned and noise matched at 50MHz. The output then goes through a bandpass filter and accurate impedance transformation to a bilateral diode ring mixer. On Rx, the output is then very accurately impedance transformed to the input of an IF stage, a J310. This stage makes up the loss of the mixer, and its output is then switched through to the 6dB power attenuator, also used for Tx input, which feeds directly through to the 144MHz socket.

muTek have taken considerable trouble with mixer matching, so that all frequencies are subject to 50 ohm loading on all the ports. The crystal controlled local oscillator is a J310, in which the circuitry has been designed to give very low phase and amplitude noise on the injection. The LO output is buffered by another J310 and carefully impedance matched into the mixer.

It is very clear that muTek's care in accurately loading their mixer contributes to the excellent RF intercept point, and this should be a lesson to many, for it is at least 15dB better than that of most other transverters on other bands that I have looked at.

It is quite clear that muTek's type of circuitry should work superbly well with a good HF transceiver. They will use it in the design of a 28 to 144MHz transverter which should have an intercept point better than 0dBm and it is thus strange that others do not adopt the same design principles.

Transmit

The transmitter section takes the output from the 6dB power attenuator into a preset attenuator, which is user adjustable having removed the lid. This is followed by a pin diode attenuator which is controlled by the ALC loop. The IF then feeds into the mixer, with output through the same bandpass filters that are used on Rx.

The Tx amplifiers are in class A up to the driver and the output stage is 2 x 2SC1945 in push/pull combined with transmission line transformers, which are followed by a seven element low pass filter which then feeds the lumped component directional coupler, followed by the antenna relay.

Laboratory tests

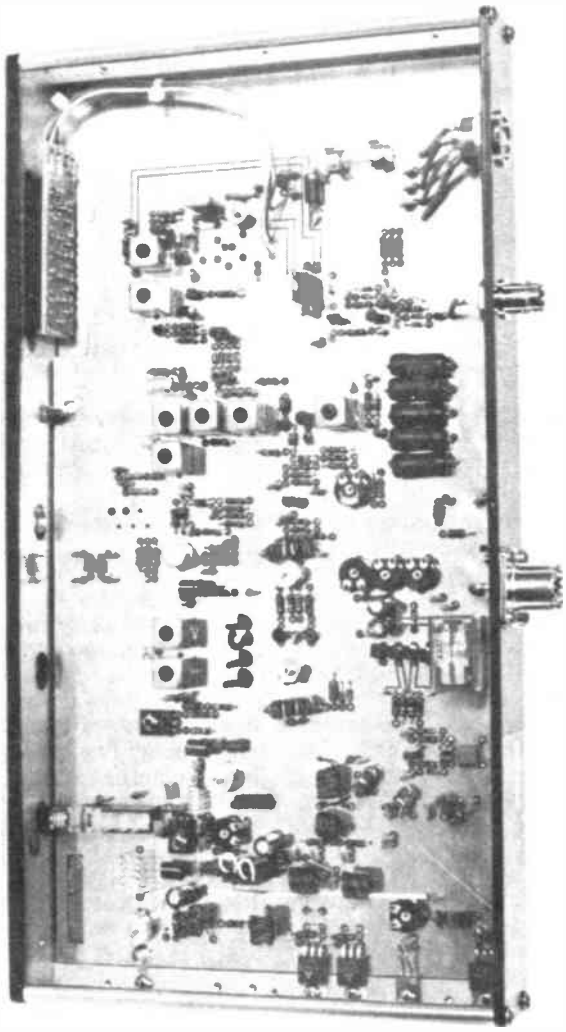
The receive noise figure was just over 2dB, and the overall receive gain was maximum at 50MHz, being around 10.3dB. Note the gain plot versus frequency 50MHz in and 144MHz out *(Figure 1)*. It will be seen that the bandpass characteristic is excellent and there is very good rejection outside the 50MHz band.

The RF intercept point measures out at about +4dBm and this is a first class performance on VHF. The local oscillator at 94MHz gave a breakthrough at the IF socket of −67dBm (100μV) and this is hardly likely to be a problem to anything. We did not note any image problems and the transversion was considered very clean indeed.

As we needed an extremely clean 1W PEP source for driving the IF input on Tx, we used two 2m rigs with a home-made crude hybrid which gave sufficient port isolation between sources, so that the worst IM product of the source was −56dB ref full carriers.

Figure 2 shows the transverter output well into ALC at 14W PEP, from which it will be seen that even into ALC the products were at a reasonably low level.

Figure 3 shows the output obtained at 4W PEP, and note that the IPs are way down, and the overall shape is superb. Note also that the carriers were 100KHz apart, this being convenient due to the sources used, and figures for closer spacings should be no worse.



Inside the beast – a wealth of good design

FM or not?

On FM a full 10W output can be reached, but so far I have not heard an FM transmission on the band, and frankly I do not particularly want to! The transversion frequency accuracy was very good (−140Hz on switch on, rising slowly to +100Hz after one hour of continuous Tx). We very carefully checked harmonics at an output level of 10W, and the important second harmonic

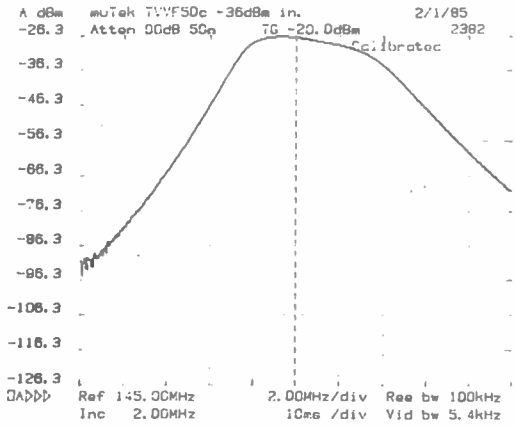


Fig 1 *Gain plot versus frequency*

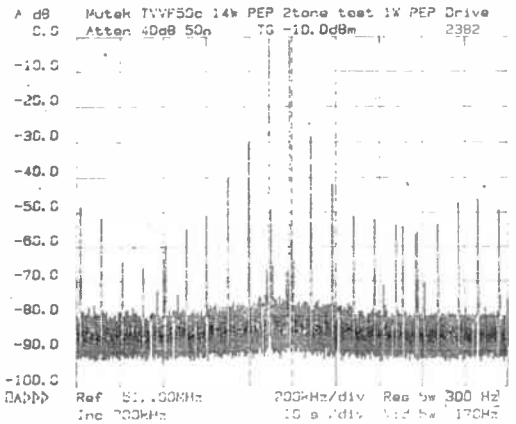


Fig 2 *Output obtained at 14W PEP*

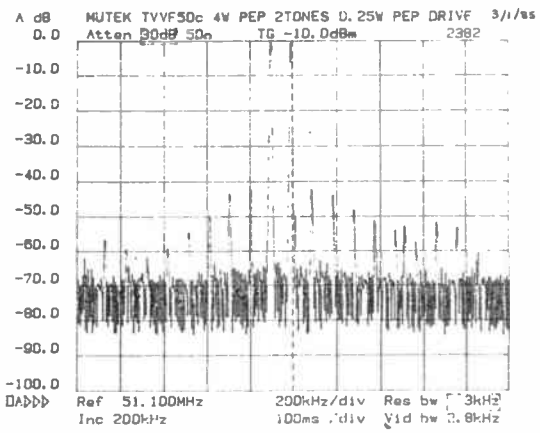


Fig 3 *Output obtained at 4W PEP*

is way down at −71dB, the worst one being at −66dB at 200MHz which should not present any problem.

94MHz breakthrough on the output was not at all visible, so it was below −90dB. This is actually very important, for the local oscillator frequency is slap bang in the middle of Band II FM radio. 144MHz breakthrough on the output was at −56dB which should not pose too much of a problem, for it should be further rejected once you add on a linear which most would do.

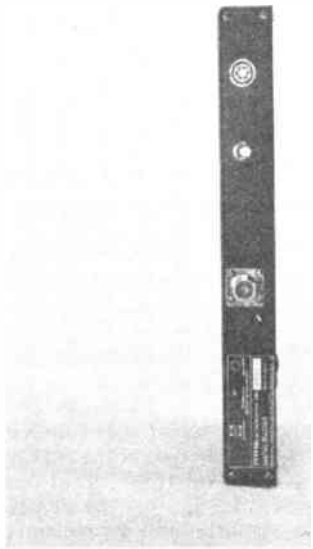
Subjective tests

For the subjective trials I used the rig with a TS711 2m multimode and the received performance of the complete system was excellent. Sensitivity was clearly better than that needed on the band but I must admit that the band noise at my QTH varies from fairly poor to bad because of local thermostats etc.

I cannot really comment about the subjective RFIM performance for at no time were there signals on the band strong enough to cause a problem, but the measurements show that nobody should ever have a problem anyway. Tx quality was excellent, and now several stations are using the transverter on 6m.

There was one trouble initially with the review sample in that the local oscillator went intermittent. By fiddling around with the circuit board we managed to get it reliable but I understand from muTek that a faulty batch of crystals was responsible and they have now put matters completely right by obtaining crystals from another source.

This transverter has no frills for it is so simple, but it has to be emphasised that



within this simplicity is a superbly designed piece of equipment which should further enhance muTek's reputation.

Conclusions

muTek's 6m transverter is an excellent way of getting on to the band; the performance almost certainly outclasses that of any other 6m rig and it will be entirely the performance of the main exciter that will control the quality of transmitted and received signals.

Just before sending this review in to the editor, Chris Bartram confirmed that he is about to produce a 28/144MHz model with a very similar specification to this 50MHz one, although the receive gain will be much higher to give enough through to the average exciter so as to overcome front end noise figure problems.

Also imminent is a 28/50MHz model, again with similar specifications but higher gain. These should certainly be worth waiting for, and prototypes may well be shown at the forthcoming VHF convention.

I can very strongly recommend the TVVF50c and Chris Bartram, its designer, is to be heartily congratulated for producing such a fine design. The price of the complete transverter is £189.90 including VAT, P&P £5.00. muTek expect that the 28/50MHz version will be available shortly after this appears in print but the price will be slightly higher as the circuitry is rather more complex.

The new version should accommodate levels from −10dBm to +27dBm at 28MHz to meet virtually all requirements. The receive converter gain should be at around 20dB so as to overcome HF transceiver noise problems, although the RF intercept point should be retained at the excellent +4dBm figure.

Thanks to muTek Ltd for lending me the review sample and to Myles Capstick G4RCE and Jonathan Honeyball for assisting me with all the measurements.

TRIO TH41E 70cm HANDHELD

I recently reviewed the 2m version of this handheld, which I regarded very favourably. The TH41E is virtually identical except that the badge, of course, is different and the plug-in antenna is identified by two green rings around its top, whereas the TH21E whip has orange rings.

Built in repeater shifts of 1.6MHz upshift on Tx and true reverse repeater are provided, a three position switch on the back panel selecting these or simplex. With repeater shift selected it is, unfortunately, still enabled if you transmit at the top of the band, so that you could transmit up to 441.595MHz if you are not careful.

Coverage

The entire band is covered from 430 to 439.995MHz, and the unit is very flexible. The recessed thumb wheels are again better than many and easy to rotate, the three covering MHz and hundreds and tens of KHz. Two miniature buttons on the top select 5KHz upshift and auto toneburst on/off.

The volume control incorporates the on/off switch and is very easy to use, whilst the similar squelch control is slightly more difficult to turn as it is nearer the panel.

The antenna socket is a phono type having around its base a thread which takes the special thread locking phono plug fitted at the base of the whip. An optional adaptor BNC socket to thread phono plug is available but is rather expensive, allowing other antennae to be used.

The supplied whip is quite thin and very flexible, although it did not seem to have much gain. Two miniature jack sockets are provided for external mic with PTT and speaker interconnections. On the left side cheek is the PTT lever which occasionally stuck down in operation and I would have preferred it to be more positive. The rig uses the same battery as the TH21, which slides out sideways for recharging.

A high/low power output switch is also mounted on the back panel. The rig is extremely small and virtually all the comments that I made about the TH21 apply to the TH41.

Subjective tests

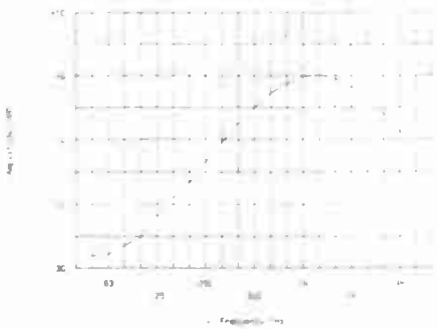
When I used this unit at home as a handheld it was, frankly, rather difficult to access any repeaters at ground level, and even on the first floor I only managed to get into one or two. However, I must admit that no repeaters are particularly strong under roof height at my QTH. When connected to an outside antenna the rig worked admirably, easily accessing very many repeaters.

Both transmitted and receive quality were excellent, although received volume was rather limited but adequate in the context of a handy-talkie. Volume would not really be adequate for mobile use however. I did try my whip from the FT790, and this gave an S-point improvement over the Trio whip and easily enabled repeater access from my first floor.

So, whilst the normal whip will be satisfactory if you have a very local repeater, you will undoubtedly need a better one for many locations. The adaptor really is required, although a phono plug to BNC lead should give a satisfactory interconnection with outside aerials, a normal phono plug fitting the antenna socket. All the facilities worked well, but I do wish that we could have had 25KHz steps instead of 10KHz ones.

Laboratory tests

The RF input sensitivity measured well, although one or two larger handy-talkies were slightly more sensitive. At the top end of the band sensitivity fell just slightly but was not bad. The RF intercept point was quite satisfactory in the context of a handy-talkie, although for home station use it might have been a little better. Nevertheless, it is slightly better than other competitive models.



Received audio response

Selectivity for 25KHz spacing was adequate, but wider spacings were better. Limiting characteristics were excellent and the capture ratio superb, thus even a slightly stronger station will capture reception from a weaker one.

The maximum audio output power was 390mW into 8 ohms, and this is of course rather limited, but no worse than most other portables. This is actually very good for its size as the internal speaker seems quite sensitive. FM distortion measured reasonably well and signals seemed clean.

The received frequency response shows a fairly steep LF cut which is welcome on a handy-talkie so that important diction frequencies can be reproduced at a slightly higher level than if the low frequency had been maintained. The high frequency shape was just about ideal, although attenuation above 4KHz could have been a little bit steeper. No improvement to performance could be gained by off-setting the signal generator slightly, thus the rig was tuned up very accurately on frequency in quality control.

The transmitted maximum output was 1.5W into a 50 ohm load, which is 50% above the specified level and is quite useful. The lower output at 250mW was also rather above spec, but probably about right for most users. The transmitted frequency accuracy was excellent, simplex being only 110Hz high, whilst duplex was only 70Hz high.

The 1750Hz tone was within 2Hz accuracy, the toneburst deviation averaging just under 5KHz for about 0.5 secs. The maximum provoked audio deviation was well held; at 5KHz and average deviation it was peaking at around 4.8KHz, thus showing a well designed threshold limiter with mic gain set just about right.

No spurii of any consequence were noted on the RF output and harmonics were very well suppressed.

Trio TH41E shown actual size

Conclusions

I feel that this is a very nice little handy-talkie to have, whose nearest rival for size would be the IC4E. The Icom rig is much larger and heavier but is marginally more sensitive. I feel that the TH41E is very practical as it is easily portable and does not make it obvious that you have a rig with you. There is no necessity for a belt clip, nor will you wear out the linings of your overcoat pocket!

I thoroughly recommend this little rig and I am sure it will do very well indeed. Unfortunately its price has just increased by 5% due to the £/yen situation and it now costs £214.50 including VAT, whip, battery and charger. The antenna adaptor, type AJ3, costs an additional £7.64 including VAT.

Thanks to Lowe Electronics for the loan of the review sample and to my colleague, Jonathan Honeyball G1LMS, who has just passed the RAE and received his new callsign.

TRIO TH41E LABORATORY TESTS

Receiver Tests	
Selectivity	
level required to give 12dB sinad ratio	
432.025MHz	-121.5dBm
433.400MHz	-121.8dBm
435.975MHz	-121.3dBm
438.975MHz	-120.8dBm
Selectivity	
+/- 25KHz	47.8/45.5dB
+/- 50KHz	52.54dB
Quieting	16dB
3dB limiting point	-126.7dBm
Calculated intercept point	-23dBm
Maximum audio output power into 8ohms at 10% THD	0.39W
THD distortion at 1V output	
1KHz modulation frequency	
3KHz deviation	2.3%
1KHz deviation	3.0%
Capture ratio	3.7dB
Transmitter Tests	
Maximum RF output power	
High	1.5W
Low	0.25W
Tx accuracy	
Simplex	-110Hz
Duplex	-70Hz
Toneburst frequency	1748Hz
Toneburst deviation	5KHz
Maximum provoked deviation	5KHz
Normal deviation	about 4.8KHz
Dimensions inc projections	57mm (W) x 120mm (H) x 28mm (D)
Weight	290g inc antenna and Ni cad batteries

BUILD AN EXPERIMENTAL SCREENED LOOP ANTENNA FOR 80m

RICHARD MARRIS G2BZQ

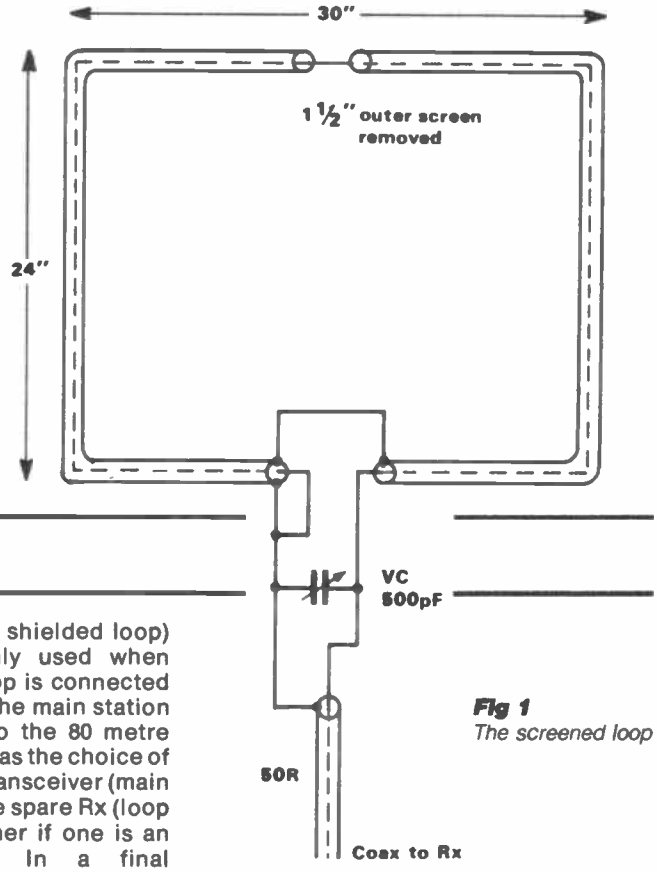


Fig 1 *The screened loop*

Have you listened or operated on the 80 metre CW band lately? If not then try it during the hours of darkness, especially before dawn.

You will hear the most diabolical racket . . . QRM . . . QRN . . . howls and screams and crash bang wallop! It is even worse, some weekends, when our Eastern European friends have one of their frequent CW contests. It is similar on the phone band.

Experimental

With this in mind the writer recently constructed an experimental screened (or shielded) loop antenna to try and separate wanted CW signals from the general racket on a receiver. It may be of interest to the licensed amateur and the SWL.

The target was to produce a working experimental prototype not a finely engineered model at this stage.

The use of a screened loop on 80 metres is controversal. You will either come to hate it or love it! The writer experienced both love and hate, but found it intriguing in the end. Either way the cost is minimal, as it uses mostly bits and pieces found in the junk box.

A total of under £3 was expended on TV coaxial cable, offcuts of wood from the local DIY shop, and 15p was given for an old bread board, for the base, which was obtained from the local Age Concern shop. Well, £3 is about 1½ gallons of petrol, or 3 pints of beer, and neither last very long.

The screened loop (or shielded loop) to be described is only used when actually needed. The loop is connected to a spare receiver and the main station antenna is connected to the 80 metre transceiver, so that one has the choice of either receiving on the transceiver (main station antenna) or on the spare Rx (loop antenna), or both together if one is an accomplished juggler. In a final engineered version of the loop it would be preferable to have an antenna selector switch to select the main antenna, or loop, on receive.

In the following story of the loop the writer has *put the cart before the horse* by commencing with a general description and the operation of the loop, prior to describing its construction. The article then ends with suggested refinements and improvements for anyone who wishes to proceed a stage further.

Description and operating

Screened loops are not often used these days. Their application in the past has usually been for direction finding on the lower frequencies, and in the USA they are sometimes used to reduce interference on the 160 metre band.

The overall circumference of the screened loop should not exceed .08 wavelength but this usually has to be reduced, because of space considerations, down to say .035 wavelength. The circumference of the conductor on this 80 metre loop is slightly over 9 feet or about .035 wavelength; this being the largest structure that the writer can accommodate when the loop is standing

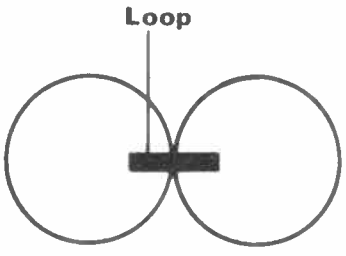


Fig 2 *Directional pattern*

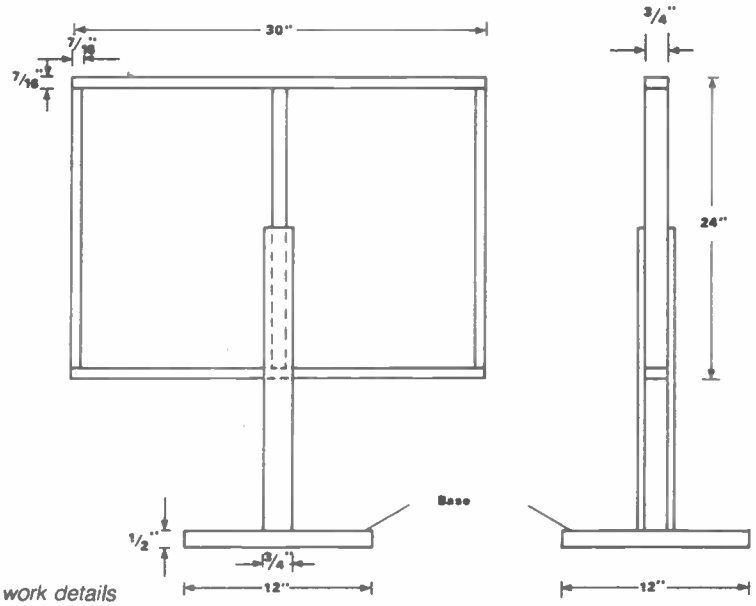


Fig 3 *Frame work details*

on a small table near the operating position.

Research

While researching the small amount of literature on screened loops, the writer came across the following statements in an old edition of the *ARRL Antenna Handbook*, when talking about the use of such a loop on 160 metres:

1. Shielded loops are not affected noticeably by nearby objects and can therefore be installed indoors or out after being tuned to resonance. Moving them from one place to another does not significantly affect the tuning.

2. During DX and contest operations on 160 metres it helped to prevent receiver overloading from nearby 160 metre stations that share the band. The marked reduction in response to noise has made the loop a valuable station accessory when receiving weak signals. Reception of European DX signals (on 160 metres) has been possible from New England at a time when other antennae were totally ineffective because of noise.

3. It was also discovered that the effect of approaching storms (with attendant noise, ie atmospheric) could be nullified considerably by rotating the loop away from the storm front. It should be said that the loop does not exhibit meaningful directivity when receiving skywave signals. The directivity characteristics relate primarily to ground wave signals. This is a bonus feature in disguise, for when one is nulling out local noise or interference, one is still able to copy skywave signals from all compass points.

Reference to *Figure 1* will show that the 80 metre loop consists of one turn of coaxial cable on a frame 30 inch x 24 inch (ie 9 feet). It is tuned to resonance by the capacity between the inner and outer conductors of the coaxial cable, plus variable tuning by VC. VC is a 500pF variable capacitor (one section of an old 2 gang capacitor is used).

The coaxial cable used was reputed to be the best quality TV co-ax with an overall diameter of 9/32 inch with semi airspaced polythene dielectric. Reference to tables indicated that TV coaxial cable has a capacity of 20/30pF per foot between inner and outer conductors, depending on the type used. So the loop has a 'built in' fixed capacity of say ±225pF in this case.

It was found that it could conveniently be brought to resonance with VC when the capacitor plates were approximately half meshed. Therefore, in practice, any variation in coaxial cable used could be compensated by a small adjustment of VC. The writer used 50 ohm coaxial cable to connect the loop to the Rx. Here again ordinary 70/80 ohm feeder should be all right.

In use

Using the screened loop for the first time is quite a shock. The immediate reaction is that it is just not working!

The Q of the loop is quite low, so that the tuning is not critical. The adjustment of the tuning capacitor VC will easily cover the whole of the 80 metre band, and checking on a general coverage receiver indicated that it was usable over the range 70 to 110 metres.

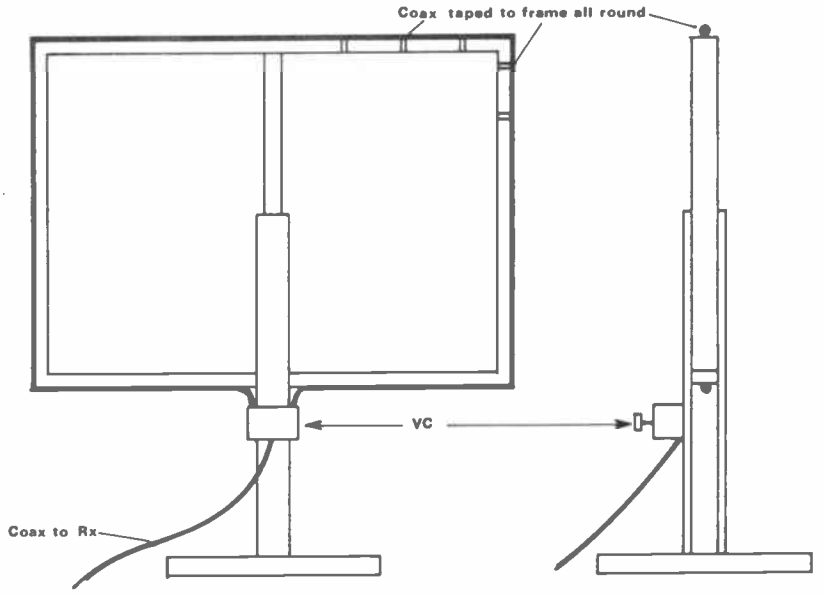


Fig 4 *Details of the frame/co-ax arrangement*

On CW

The writer uses CW only, and it has been found that by adjusting VC to the middle of the CW band, no further adjustment has to be made to cover the entire 80 metre CW band.

Next there is a radical reduction in noise level over the main station antenna, which is disconcerting at first. The strength of the received signals is up to 15dB less than when using the main antenna *but* the noise and interference can be reduced by at least 30dB, or even nulled out completely, by rotating the loop until it is 90 degrees from the source of interference. It is easier to decode a weakish signal with low interference than a medium strength signal with heavy interference (ie when using the main station antenna).

Now take the case of two signals on top of each other. Unless they are on the same bearing, rotation of the loop to left or right will find a spot where the wanted signal 'comes up' and the unwanted signal (fairly local) 'goes down'. It took the writer several hours of practice to get the hang of it.

All in the mind

Using the main station antenna over the years, one gets used to trying to decode weak, medium or good signals from even stronger QRM. Therefore with the loop, at first, it is mentally quite difficult to accept a weakish signal with little or no interference, but it is much easier on the eardrums when using headphones! To prove this, peak the readability of the wanted signal against noise (QRM/QRN) on the loop and then change to the main station antenna. It is quite a shock! *Figure 2* shows the directional pattern of the screened loop.

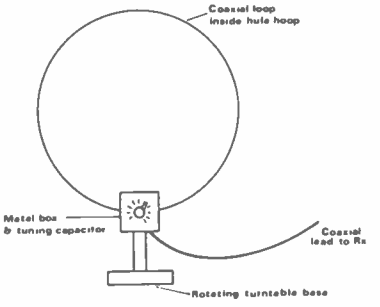
Construction

Reference to *Figure 3* will show that the frame is constructed of ¾ inch x 7/16 inch timber. The outside circumference is 30 inches x 24 inches giving a total of 9 feet. The type of timber used is not critical, but the type used in this case was considered the minimum possible to give a robust structure. A centre vertical member is put in to brace the structure, and to enable the frame to be fitted to the baseboard as shown.

A length of best TV coaxial cable was obtained. As this comes in metres these days, the length purchased was 3 metres, which is slightly more than required.

At the exact centre of the coaxial cable a length of 1½ inches is stripped off the outside screen conductor as shown in *Figure 1*. The coaxial is then strapped with plastic tape around the outside of the frame as shown in *Figure 4*.

The variable capacitor, VC, is mounted at the bottom of the loop, and the two ends of the cable are terminated at that point, as shown in *Figures 1* and *4*. This means cutting off a few inches from the ends of the coaxial cable. A length of 50 ohm coaxial cable is run to the Rx, connections being as in *Figure 1*.



A possible refined version of the loop antenna

THE 11m CB TO 10m AMATEUR BAND CONVERSION GUIDE

PART FIVE
A look at the UK CB specification and the conversion of rigs using the LC7137 PLL chip to the 10m band

ROGER ALBAN GW3SPA
BSc. C ENG, MIEE

In April 1981 the Radio Regulatory Department of the Home Office issued a performance specification No MPT1320 for CB equipment for use in the UK. The specification for the UK Citizens Band service differs radically from the specification issued by the FCC in America. The Home Office released forty channels in the 27MHz band which did not coincide with the American channels. I presume this measure was taken to prevent American AM sets from being converted for use on the new frequencies, and thus stamp out the use of AM. Additionally, the upper half of the 27MHz band was being used by CB operators using illegal sideband equipment.

Concentrating the UK FM CB service on this part of the 27MHz band reduced the number of CB operators using illegal equipment. However, moving the UK CB frequencies into the upper half of the 27MHz band also created problems for the set designers and manufacturers.

The current customised PLL chips could not be used to generate the correct frequencies required for UK CB. Early set designers had been using PLL chips such as the PLL02 and MC145106 discussed earlier in the series. I can recall at the time many pundits were forecasting that the Home Office specification would lead to sets costing £300 or more!

Fig 1 *LC7137 program data and ÷N ratio*

Frequency	Ch No	Program code P0	P1	P2	P3	P4	P5	Rx (T/R=1)	Tx (T/R=0)
27.60125	1	1	0	0	0	0	0	3381	2760
27.61125	2	0	1	0	0	0	0	3383	2761
27.62125	3	1	1	0	0	0	0	3385	2762
27.63125	4	0	0	1	0	0	0	3387	2763
27.64125	5	1	0	1	0	0	0	3389	2764
27.65125	6	0	1	1	0	0	0	3391	2765
27.66125	7	1	1	1	0	0	0	3393	2766
27.67125	8	0	0	0	1	0	0	3395	2767
27.68125	9	1	0	0	1	0	0	3397	2768
27.69125	10	0	0	0	0	1	0	3399	2769
27.70125	11	1	0	0	0	1	0	3401	2770
27.71125	12	0	1	0	0	1	0	3403	2771
27.72125	13	1	1	0	0	1	0	3405	2772
27.73125	14	0	0	1	0	1	0	3407	2773
27.74125	15	1	0	1	0	1	0	3409	2774
27.75125	16	0	1	1	0	1	0	3411	2775
27.76125	17	1	1	1	0	1	0	3413	2776
27.77125	18	0	0	0	1	1	0	3415	2777
27.78125	19	1	0	0	1	1	0	3417	2778
27.79125	20	0	0	0	0	0	1	3419	2779
27.80125	21	1	0	0	0	0	1	3421	2780
27.81125	22	0	1	0	0	0	1	3423	2781
27.82125	23	1	1	0	0	0	1	3425	2782
27.83125	24	0	0	1	0	0	1	3427	2783
27.84125	25	1	0	1	0	0	1	3429	2784
27.85125	26	0	1	1	0	0	1	3431	2785
27.86125	27	1	1	1	0	0	1	3433	2786
27.87125	28	0	0	0	1	0	1	3435	2787
27.86125	29	1	0	0	1	0	1	3437	2788
27.89125	30	0	0	0	0	1	1	3439	2789
27.90125	31	1	0	0	0	1	1	3441	2790
27.91125	32	0	1	0	0	1	1	3443	2791
27.92125	33	1	1	0	0	1	1	3445	2792
27.93125	34	0	0	1	0	1	1	3447	2793
27.94125	35	1	0	1	0	1	1	3449	2794
27.95125	36	0	1	1	0	1	1	3451	2795
27.96125	37	1	1	1	0	1	1	3453	2796
27.97125	38	0	0	0	1	1	1	3455	2797
27.98125	39	1	0	0	1	1	1	3457	2798
27.99125	40	0	0	0	0	0	0	3459	2799

Sanyo LC7137

Sanyo came to the rescue with the LC7137 PLL chip. The LC7137 is a single crystal PLL system similar in its configuration and pin connections to the LC7130. In fact the only thing different between them is the contents of the ROM which selects the required 'divide-by-N' numbers for each channel on transmit and receive. The program code and 'divide-by-N' ratio are given in *Figure 1*. You will see that the program code is the same as for the LC7130 (see last month, *Figure 5*).

Typical UK CB rig

The UK CB sets using the LC7130 PLL chip is configured as shown in *Figure 2*. The operating frequencies specified for UK CB make it difficult to obtain and maintain exact 10KHz spacing. The manufacturer has had to use a 5.000226KHz reference frequency, derived by dividing by 2048 in the normal way, but with a 10.24046285MHz crystal. In practice a standard 10.24MHz crystal can be pulled this far by a trimmer capacitance.

On receive, the VCO is fed to the receiver first mixer. Taking Channel 1 as an example using a 'divide-by-N' ratio of 3381, the VCO will be operating at a frequency of 3381 x 5.000226KHz = 16.9057641MHz. The VCO frequency is injected into the receiver first mixer with the first IF frequency of 10.695MHz, resulting in a receive frequency of 27.6007641MHz. Not exactly 27.60125, but 486Hz low.

On transmit, the VCO frequency is doubled to give the required operating

frequency. It is also easier to achieve linear FM by starting at half the output frequency. The transmit 'divide-by-N' ratio for Channel 1 is 2760 and the corresponding VCO frequency is 13.8006238MHz, so the final transmit frequency is 27.6012476MHz, which is 2.4Hz low. The resulting frequency at Channel 40 is 27.99078MHz on receive and 27.99126MHz on transmit – well within the tolerance of the UK specification.

LC7137 conversion to 10m

It has proved difficult to modify rigs containing the LC7137 PLL chip. If one considers the previous techniques of adding a mixer and crystal oscillator into the phase loop *(Figure 3)*, then we require two crystal oscillators: one for transmit and another for receive. If one examines closely the relationship between the mixing frequencies and the reference frequency of 10.24MHz there exists a near fixed ratio.

Hugh Allison G3XSE[1] has suggested a relatively cheap method of conversion *(Figure 4)*. If one happens to divide the 10.24MHz reference frequency by 6, we obtain 1.706666MHz which is close to the required frequency of 1.70875MHz on receive, and if the reference frequency is divided by 12 we arrive at a frequency of 0.853333MHz which is close to the required frequency of 0.8533718MHz.

However, life is not always simple. It is difficult to ensure that the correct filtering will take place after the mixer to ensure that '*Fin*' does not respond to the VCO frequency. This is especially difficult on transmit with only some 853KHz separating the two frequencies. Problems can also be experienced with '*Fin*' if there is interference from CB operating in close proximity.

The resulting frequencies obtained by using this cheap modification are not exactly on the required frequency. For example, on Channel 30 the transmit frequency is around 2KHz low, and the receive frequency is nearly 2.5KHz lower than the required frequency of 29.6MHz. G3XSE claims that no problems have been observed because he believes the first IF is so wide that it can accommodate the frequency offset.

For those of you contemplating this modification, the frequency calculations in *Figures 5* and *6* will be of assistance to you.

Memory board

Another method of modifying this type of set or American CB rigs containing the LC7130, is to scrap the PLL chip and replace it with an all-singing, all-dancing multi-purpose PLL chip. The program information for the 'divide-by-N' register will need to be held in some sort of memory because of the different values of 'N' required for transmit and receive. The most common form of memory device used is the ultra-violet erasable electrically programmable read only memory (EPROM) which will be dealt with in detail later.

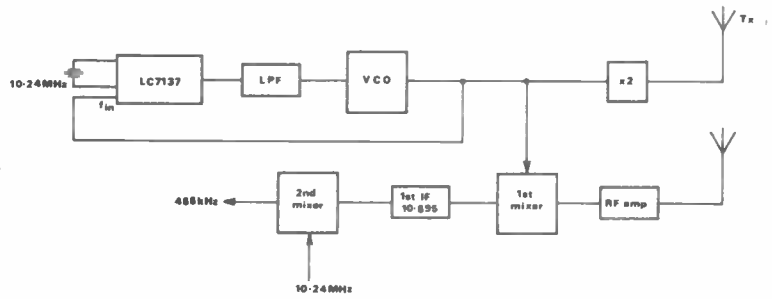


Fig 2 *Block diagram of typical UK CB using LC7137*

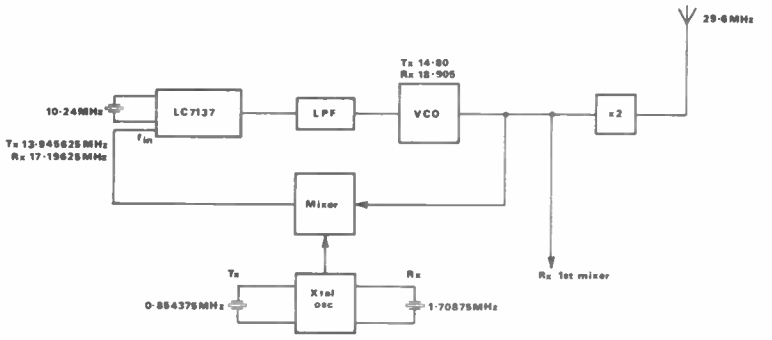


Fig 3 *Block diagram of rig using LC7137 converted for 10m*

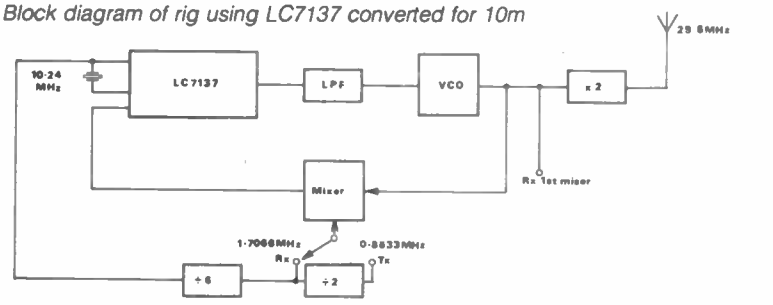


Fig 4 *Modified UK CB rig for use on 10m FM*

Fig 5 *Transmit frequency chart for the G3XSE modification*

TRANSMIT						
Chan	**+N**	**Fin /MHz**	**Fvco/MHz**	**FTx/MHz**	**Req freq**	**Error/KHz**
1	2760	13.80062376	14.65399556	29.30799112	29.31	−2.009
5	2764	13.82062466	14.67399646	29.34799292	29.35	−2.007
10	2769	13.84562579	14.69899759	29.39799518	29.40	−2.005
15	2774	13.87062692	14.72399872	29.44799744	29.45	−2.003
20	2779	13.89562805	14.74899985	29.4979997	29.50	−2.000
25	2784	13.92062918	14.77400098	29.54800196	29.55	−1.998
30	2789	13.94563031	14.79900211	29.59800422	29.60	−1.996
35	2794	13.97063144	14.82400324	29.64800648	29.65	−1.994
40	2799	13.99563257	14.84900437	29.69800874	29.70	−1.991

Fig 6 *Receive frequency chart for the G3XSE modifications*

RECEIVE						
Chan	**+N**	**Fin /MHz**	**Fvco/MHz**	**FRx/MHz**	**Req freq**	**Error/KHz**
1	3381	16.905763	18.612507	29.307507	29.31	−2.493
5	3389	16.945765	18.652509	29.347509	29.35	−2.491
10	3399	16.995767	18.702511	29.397511	29.40	−2.489
15	3409	17.045769	18.752513	29.447513	29.45	−2.487
20	3419	17.095771	18.802515	29.497515	29.50	−2.485
25	3429	17.145774	18.852518	29.547518	29.55	−2.482
30	3439	17.195776	18.90252	29.59752	29.60	−2.48
35	3449	17.245778	18.952522	29.647522	29.65	−2.478
40	3459	17.29578	19.002524	29.697524	29.70	−2.476

Motorola MC145151

The general purpose PLL chip selected for this modification is the Motorola MC145151. This PLL chip has a 14-bit program line which gives a 'divide-by-N' ratio from 3 up to 16383. The reference divide values can also be selected. *Figure 7* shows the internal configuration of the MC145151 and the associated pin connections. The reference 'divide-by-R' codes are shown in *Figure 8*. The three reference program inputs define one of eight possible divide values for the total reference divide.

The output of the phase detector gives a dc signal output to drive the capacitance diode in the VCO circuit. Alternatively an additional phase detector output 0R and 0V is also provided. These phase detector outputs can be combined externally to produce a loop error dc signal. There is also provision to offset the 'divide-by-N' ratio by 856 when pin T/R is low, with no offset when T/R is high. This is normally used for offsetting the VCO frequency by an amount equal to the IF frequency of the transceiver. A pull-up resistor ensures that no connection will appear as a logic one, causing no offset addition.

The MC145151 also provides an on-chip reference oscillator when a crystal is connected to the terminals of OSC out and OSC in. A lock detector signal LD is provided at pin 28 and is set at '1' when the loop is locked. The 'divide-by-N' program inputs are connected to on-chip pull-up resistors, thus ensuring that if left open the inputs remain at logic '1' and require only a single pole, single throw (SPST) switch to alter the programming line to logic '0'. The PLL chip is a low-power complementing MOS device capable of operating at an '*Fin*' in excess of 30MHz.

It is unfortunate that the 'divide-by-N' offset between transmit and receive on this chip has been fixed at 856. The offset for the American AM rig is 91, with 881 for the UK FM rig. To obtain the required values of 'N' we will have to use an EPROM to contain the required code for each channel.

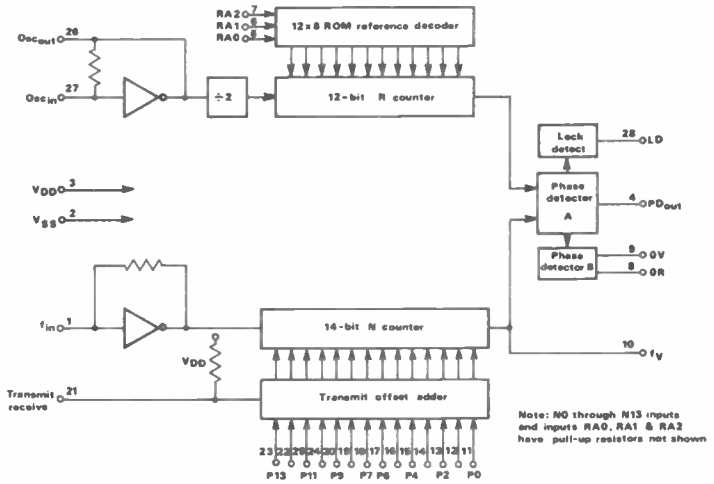


Fig 7 *Motorola MC145151 PLL chip*

Reference Address Code			Total Divide Value
RA2	RA1	RA0	
0	0	0	8
0	0	1	128
0	1	0	256
0	1	1	512
1	0	0	1024
1	0	1	2048
1	1	0	2410
1	1	1	8192

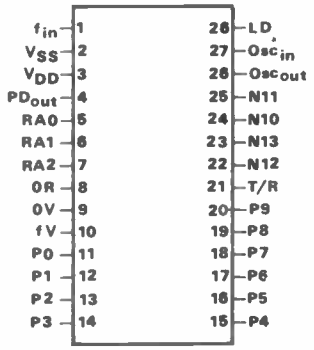


Fig 8 *Motorola MC145151 reference address code*

The American rig

In both the American rig using the LC7130 and the UK set using the LC7137, the chip can be removed and substituted with a PCB containing the MC145151. In the LC7130 and LC7137 chips the 'divide-by-R' ratio is fixed at 2048. To obtain this same divide ratio with the MC145151, pin 6 (RA1) needs to be earthed (see *Figure 7*). *Figure 9* shows an experimental circuit using simple switches to program the 'divide-by-N' register.

If this experimental circuit is used in an American AM rig which previously used the LC7130, then the required 'divide-by-N' ratios for transmit and receive for the rig to operate on 29.6MHz will be as follows. The VCO will be operating at a

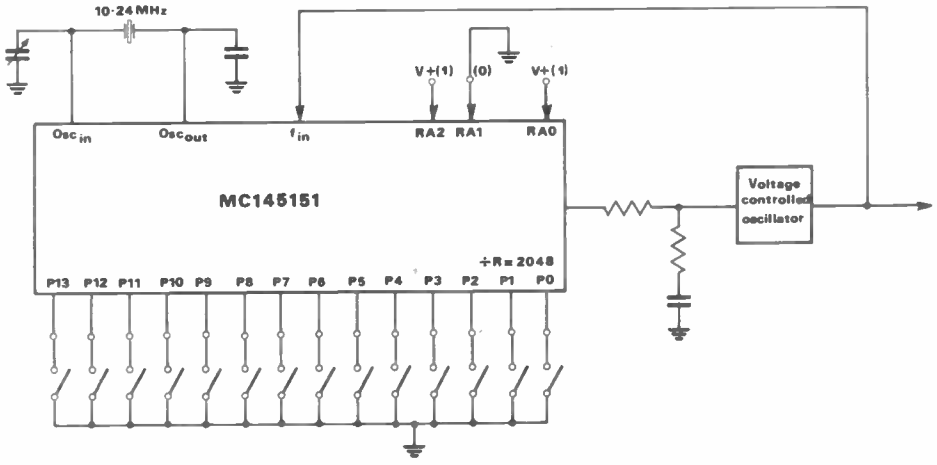


Fig 9 *The MC145151 used in an experimental circuit*

frequency of 19.36MHz on transmit and 18.905MHz on receive (see *Figure 6* last month). The corresponding 'divide-by-N' ratios, with a 'divide-by-R' ratio of 2045 will be 19.36MHz, which divided by 5KHz yields an N value of 3872 for transmit and 3781 on receive.

To obtain a 'divide-by-N' value of 3872, P_{11}, P_{10}, P_9, P_8, and P_5 need to be at logic level '1' (switches open circuit), with all other switches closed. For an 'N' value of 3781, P_{11}, P_{10}, P_9, P_7, P_6, P_2 and P_0 require to be at logic level '1' with other switches closed to ensure logic level '0'.

The Motorola MC145151 is easily interfaced into the rig. The existing 10.24MHz crystal oscillator is used together with the low pass filter. A small amount of difficulty was experienced at first with getting the loop to lock. Eventually it was discovered that both the LC7130 and LC7137 require a reasonably high level of '*Fin*' to operate successfully.

The MC145151 is quite happy operating at a much reduced level and initially tended to be overwhelmed by the high level input. This problem was overcome by reducing the value of the coupling capacitor C305 (see *Figure 8* last month) from 100pF down to 22pF. By initially using switches to preset the program code, the VCO and transmit mixer together with the power amplifier and receive front end can be tuned prior to adding the EPROM containing the programming codes for each channel.

The UK rig

If this experimental circuit is used in a UK FM CB rig which previously used the LC7137 it will be necessary to make minor modifications to the VCO circuitry. *Figure 9* shows a popular circuit using the LC7136/LC7137. The LC7136 differs from the LC7137 because its ROM does not contain the facility to automatically select Channel 9 and Channel 19.

You will recall from *Figure 2* that the VCO frequency differs by a large extent between transmit and receive, partly because the VCO is oscillating at half the operating frequency on transmit. To overcome some of the possible problems of making a capacitance diode swing the VCO over 4.5MHz, the set designers have introduced a switching transistor Tr115, which switches into the VCO tuned circuit (on transmit) C221, which is nominally selected by the factory on tune up, but is generally around the 33pF value. To ensure that the VCO operates without difficulty and is easily tuned on 10m, C221 should be exchanged for a 50pF trimmer.

It may also be necessary to reduce the level of '*Fin*' by reducing the value of the coupling capacitor C198. Again the 10.24MHz reference crystal and associated circuitry can be directly coupled to the Motorola chip. However, if you wish to utilise the lock detector output LD, you will have to invert the output.

If one again requires Channel 30 to be on 29.6MHz, then from *Figure 3* you will see that the VCO must operate at 14.80MHz on transmit and 18.905MHz on receive. The corresponding 'divide-by-N' numbers are 2960 for transmit and 3781 for receive. To obtain these values the program lines P_{11}, P_9, P_8, P_7 and P_4 must be at logic level '1' with all other switches closed. On receive P_{11}, P_{10}, P_9, P_7, P_6, P_2 and P_0 must be at logic '1' with all other switches closed.

In practice I have used the midband frequency corresponding to Channel 20 on 29.50MHz as the frequency on which to tweak up the rig's transmitter and receiver tuned circuits.

Next month

Next month we examine the EPROM (an Intel 2176) used to store the program codes required in these conversions, and the design of the memory board PCB.

Reference

1. How to convert unconvertible CB rigs, by Hugh Alison G3XSE, Short Wave March 1984.

BACK TO BASICS

Bill Mantovani G4ZVB continues his common-sense approach to passing the RAE. This month:

TRANSMITTERS

As pointed out last month, it is necessary to understand the meaning of the term modulation and the various modulation methods because of the possible effects to both your own transmission, and to that of other users of the radio frequency spectrum if modulation is not performed correctly.

Overmodulation, for instance, not only causes the transmitted signal to sound distorted but results in the PA stage being overdriven and generates unwanted harmonics which are then radiated as spurious sidebands. The signal splatters over a wide bandwidth, invariably interfering with other transmissions; if you have ever sat listening to DX only to have it obliterated by splatter from someone on an adjacent frequency who is obviously overdriving, you will know exactly what I mean and understand how bad a problem this can be.

This type of interference isn't just restricted to users in the same frequency band – anything that incorporates a tuned circuit may be affected. There are many ways in which the interference can manifest itself and if the pursuit of your hobby suddenly starts to interfere with someone else's enjoyments, relationships can become strained very quickly.

Not everyone can hope for a QTH sited well away from his nearest neighbour, so the easiest way of tackling interference is to be able to recognise the possible causes of such problems and their prevention before they actually happen. This has a great bearing on how freely you will be able to enjoy the hobby of amateur radio once you get your licence and are ready to start transmitting.

The first (one hour) paper of the RAE is in fact set to test you on your knowledge of transmitter interference, so this topic will be more thoroughly covered in a later part of this series. First though, you must understand how the more common methods of modulation are performed.

Keying

Information can be conveyed by a transmitter in a number of forms, such as speech, visual signals, teleprinter messages or Morse code. Taking a simple continuous carrier wave, one way of transmitting intelligence is to break-up this carrier into long and short pulses, ie the dots and dashes of Morse code. This switching on and off of the transmitted signal is known as *keying*.

The keying of a circuit should take place at a point where the current or power flowing through the contacts of the key will be at a minimum in order to reduce sparking (itself a source of interference) and, for the sake of the operator's safety, to avoid exposing him to any danger from electric shock (many Morse keys have their metal parts completely uncovered). It is *not* advisable to directly key the VFO as this may cause *chirping* or small changes in transmitter frequency. As the VFO is usually followed by an isolating buffer or frequency multiplier stage, this is the logical point where keying should be performed, although in certain designs keying at other points is quite possible without any problem.

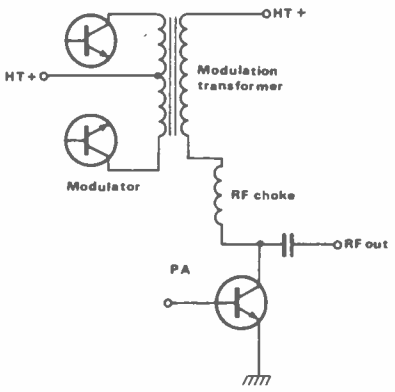


Fig 1a *Amplitude modulation of a transistor PA using a modulation transformer*

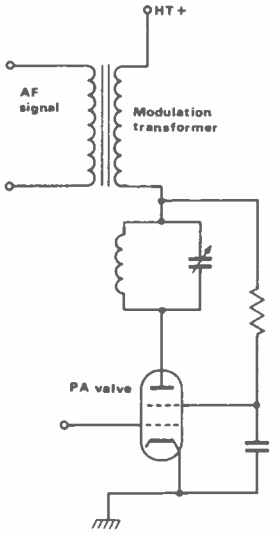


Fig 1b *Amplitude modulation of a valve PA stage using a modulation transformer*

Amplitude modulation

As it implies, with amplitude modulation the speech waveform is used to control the amplitude of the radio frequency signal envelope. This can be done by taking the audio picked up by the microphone, amplifying it and superimposing it onto the HT supply to the transmitted RF power amplifier stage using a *modulation transformer*. *Figures 1a* and *1b* show how the modulation transformer couples the amplified audio signal to a transistor and valve PA stage respectively.

Common emission modes

Type	Symbol
CW (on-off keying)	A1A
SSB	J3E
AM/DSB	A3E
FM	F3E
RTTY (fsk)	F1B
Slow-scan TV	F3C

For 100 percent modulation the speech amplifier must be capable of increasing the dc input power to the PA by about 50 percent. Thus, the RF power output of a fully modulated carrier wave is one and a half times the level of the unmodulated carrier wave output. This extra power, added to the power amplifier HT supply by the modulation transformer as explained, is supplied by the modulation stage or *modulator*, which is in effect a high power audio frequency amplifier. To 100 percent modulate the carrier wave of a PA stage working at 100W input, the modulator would be required to supply 50W of AF power.

In practice, slightly more than this figure is needed because the efficiency of the modulation transformer must also be taken into consideration. In the above example therefore, to supply an effective 50W of AF power into the PA, the modulator must be designed for an actual AF power output of about 70W.

You will remember that a characteristic of the Class C amplifier is that the output voltage is directly proportional to the HT voltage. This is useful because if the PA stage is arranged to operate in Class C, the shape of the RF envelope will be a true replication of the AF waveform and a high efficiency is achieved.

Fig 2 *Frequency modulation. (a) unmodulated RF signal (b) AF signal (c) modulated RF signal*

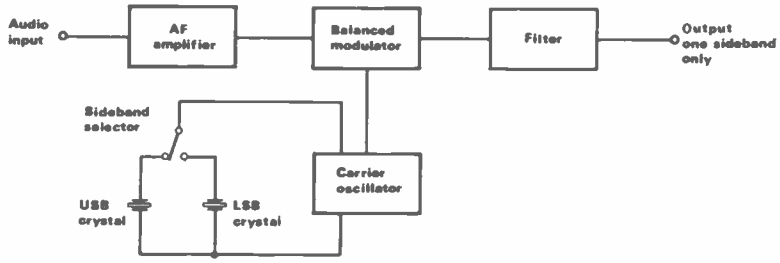


Fig 3 *SSB generator block diagram*

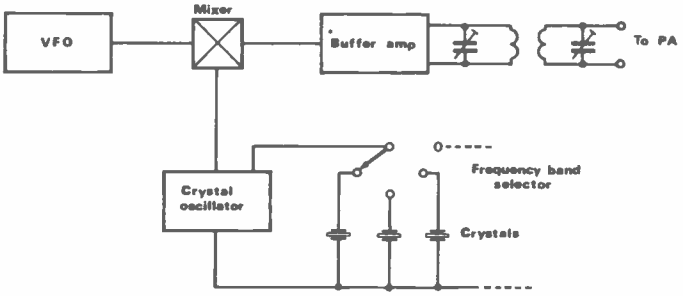


Fig 4 *Mixer-type exciter block diagram*

This is the most effective method of amplitude modulation, but it does have its disadvantages. A high-power AM transmitter would require the use of a large and expensive modulation transformer and high-power audio amplifier to achieve full-power operation, so whilst AM in this form is technically simpler than SSB, it can be a more costly method, especially for input powers over 100W. There are various other lower cost approaches to amplitude modulation but these all tend to have a lower efficiency than the above method.

Frequency modulation

With AM, the amplitude of the audio signal varies the transmitted power, but with frequency modulation it is the frequency of the carrier wave that is changed. This can be done in several ways depending upon the type of oscillator used.

Reactance modulation of the VFO is one method of producing FM, the change in oscillator frequency being achieved by varying the reactance of the tuned circuit in the VFO. In practice this can be done using a *varactor,* a form of diode whose capacitance varies according to the reverse voltage applied across it. One of the benefits of this method over AM is that very little audio amplification is required.

It must be remembered that any frequency multiplication that may take place after the oscillator stage will also multiply the frequency deviation by the same factor, so in an HF band FM transmitter steps must be taken to adjust the oscillator deviation relative to the amount of multiplication required for each band so that the bandwidth of the transmitted signal is not excessive.

On the VHF and UHF bands most FM operation takes place on specified frequencies, and for good stability a crystal-controlled oscillator is generally used, again with a varactor to deviate the frequency.

Single sideband generation

To produce a single sideband signal it is necessary to do two things – remove one of the sidebands and suppress the carrier wave. The latter is achieved by using a *balanced modulator,* so called because when fed with an AF signal and an RF carrier it balances out the RF input producing a *double sideband suppressed-carrier*(DSB) signal at the output. It is then a simple matter to remove the unwanted sideband by means of a filter. This arrangement is known as the sideband generator and is shown in *Figure 3.*

It is not possible to use frequency multiplication to cover a number of bands with this method of SSB generation, because the width of the sideband itself also becomes multiplied. A frequency mixing process is the approved alternative for multiband operation and *Figure 4* gives the block diagram of a mixer-type exciter.

In order to provide good rejection of the unwanted product, the mixer is followed by a buffer amplifier employing tuned circuit coupling in the output, and the frequency of the VFO and crystals are chosen so as to keep the wanted and unwanted products from the mixer well apart.

If you listen on the amateur bands you will have noticed that lower sideband is used below 10MHz, whilst above this frequency upper sideband is transmitted. This is purely by convention and not due to any particular regulation. The PA stage of an SSB transmitter must be a *linear amplifier* (ie, operate in Class B or Class AB) to minimise distortion, but with lower efficiency.

Obviously, frequency stability plays an important part in SSB communication and it has been found advantageous to combine the transmitter and receiver circuits into one design, hence the *transceiver.* Study the SSB transceiver block diagram in the *RAE manual* to familiarise yourself with which stages are common to receiver and transmitter sections and why.

Permitted power

The schedule in the Amateur Radio Licence indicates the maximum power allowed for the various bands. This is quoted in dBW and for all modes refers to the RF output power supplied to the antenna. This is specified by carrier power except for emissions having a suppressed carrier, such as SSB, where the power is determined by the *peak envelope power* (PEP) under linear conditions. For CW or AM it is much easier to measure the input power, and a table of input powers corresponding to maximum permitted carrier powers is given in the *RAE manual* for reference.

The maximum carrier power permitted by the UK amateur licence on most bands is 20dBW (100W) or 26dBW (400W) PEP. Symbols are used to designate the various classes of emission and the more common ones are given in the table. It is a licensing condition that the class of emission rather than the type be recorded in the log, so remember them – a question on this often crops up in the exam.

A final note about transmitter adjustment and tuning. Never adjust a transmitter on a radiating antenna, to avoid causing obvious interference problems to others: the transmitter should first be connected to a *dummy load* made from a non-inductive resistance. Adjustment of commercial equipment should rarely be necessary with today's all-solid-state designs. Care should be taken to avoid overmodulating, and any tuning up of the transmitter output stage should also be performed with it connected to a dummy load.

Power supplies

All equipment needs a power supply or power source to operate. With some it is

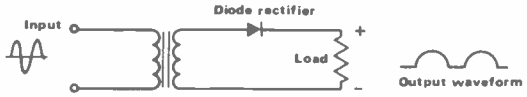


Fig 5(a) *Half-wave rectifier circuit*

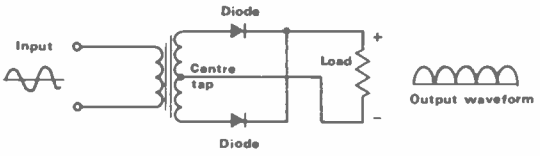


Fig 5(b) *Full-wave rectifier circuit*

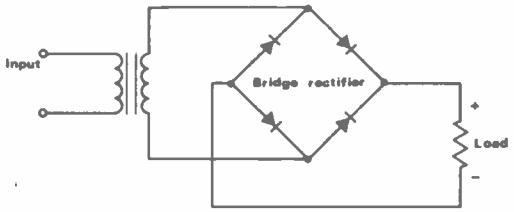


Fig 6 *Bridge rectifier circuit*

an integral part of the equipment itself, whilst with others it is a separate unit providing the necessary supply. With portable or mobile equipment requiring a supply of 12V this can usually be obtained from batteries, but for fixed equipment it is more common to utilise a power unit to transform, rectify and smooth the 240V 50Hz domestic mains supply.

Today, the silicon diode has taken over as the rectifying element from the valve or metal rectifier of earlier equipment. These are very efficient devices despite their small size, having a low forward resistance and high reverse resistance. *Figures 5a* and *5b* show a half-wave and a full-wave rectifier circuit together with their respective input and output waveforms.

With the half-wave rectifying circuit, the silicon diode only allows current to flow during positive half-cycles of the ac voltage applied to it, but by combining two such circuits full-wave rectification is achieved because each diode conducts on alternate half-cycles. The output is termed a direct or dc voltage because whilst the output waveform varies in amplitude, it never changes polarity. This variation is called *ripple* and is 50Hz for the half-wave circuit and 100Hz for the full-wave circuit.

Bridge rectifier

Another rectifier circuit is the bridge rectifier of *Figure 6*, where the transformer secondary winding centre tap has been eliminated. This circuit has two diodes carrying current in series at any one time, to also give full-wave output with 100Hz ripple.

The next step is to find some way of storing energy during the positive half-cycles and to supply it to the load during negative half-cycles. For this a capacitor is used and you can see what effect this *reservoir capacitor* has on the output waveform from *Figure 7*.

The use of a reservoir capacitor also has a bearing on the rating of the silicon rectifier diode to be used. Assuming for a moment that the load in *Figure 7* is disconnected, the capacitor will charge up to have a voltage across it equal to the peak value of the ac voltage that the diode is trying to rectify.

On the negative half-cycle the reverse voltage or *peak inverse voltage* (PIV) across the diode is double this figure, so allowing also for fluctuations in the mains supply, the diode chosen must have an adequate PIV rating. The PIV across diodes in half and full-wave circuits is taken to be π times the dc output voltage, whilst for the bridge circuit it is half of this value.

Smoothing

As you can see from *Figure 7*, the output from the rectifier circuit consists of a fluctuating direct voltage. This fluctuation is known as the ripple voltage and can be greatly smoothed out by adding a choke to the circuit to oppose the alternating voltage superimposed on the output, and another capacitor to provide a low impedance path to earth for this voltage.

The choke may sometimes be substituted by a resistor, although the smoothing will not be as effective. This however is often the answer in a high-current supply where the smoothing choke required would be expensive and large. The value of this resistor must be low so as to avoid any great voltage drop across it, whilst the value of the smoothing capacitor will thus be quite high.

To obtain a high voltage at low current, such as would be required in an oscilloscope circuit, a *voltage multiplier* can be used of which one of the more common is the *voltage doubler* circuit. Typical RAE questions might be to state the purpose of the choke, or to identify the half-wave, full-wave or bridge rectifier circuits or the output waveforms from such circuits, so make sure you know them well.

The bridge rectifier can be made up of four individual diodes or bought as four diodes in one single package. Note the radio circuit symbol for a bridge rectifier shown in the practical power supply circuit in the manual. Whilst silicon diodes form ideal rectifiers for PSU circuits, it must be remembered that they can be easily destroyed, which in turn may lead to damage of other components in the unit such as the transformer.

It is not unknown for such a failure to cause the output voltage to far exceed the correct level for the equipment it is supplying, resulting in further, often expensive, destruction. It is good practice therefore to provide some sort of protection against such occurrences, even if it is as simple as the inclusion of an appropriately rated fuse at some point in the output.

Silicon diodes are far less tolerant than other forms of rectifier because they are only capable of withstanding their rated forward current or PIV but no more. Excessive current or voltage surges exceeding these values, even if only momentary, will quickly ruin the device, so it is essential that the possibility of such surges are minimised in the design of the supply. For instance, switching the supply on results in a strong current surge as the reservoir or any high value capacitor charges up, so such *transients*, as well as the other factors mentioned earlier, all have to be catered for in the rating of the diode.

It may be necessary to provide the diode itself with some means of surge protection, such as connecting a capacitor in parallel with it to absorb some of the energy in the pulse. A resistor on the input to the diode will also serve to limit the current surge, but the resultant voltage drop may be undesirable.

It is permissible to connect several diodes in series to provide a higher PIV capability as an alternative to using a single, high PIV rated diode. Each should have a surge suppressing capacitor connected in parallel across it together

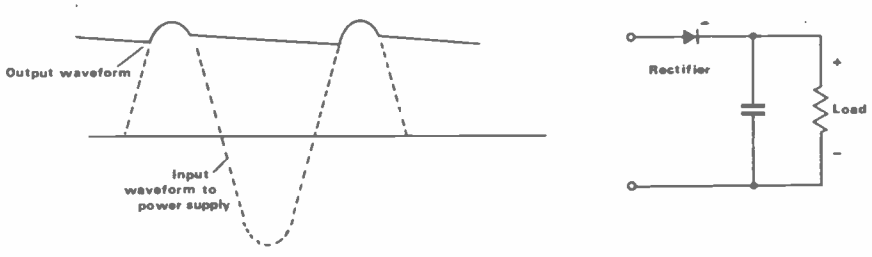


Fig 7 *Waveforms for a rectifier circuit using a reservoir capacitor C*

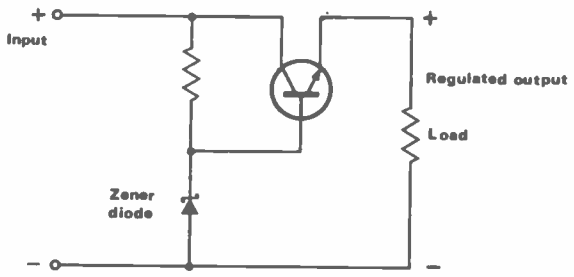


Fig 8 *A simple voltage regulator circuit*

with a resistor, the latter to equalise the volt-drop across the individual diodes. Like a single diode, diode chains should also be conservatively rated.

Supply characteristics

A requirement of most PSUs is that the output should be smooth, ie contain very little ripple. For oscillator circuits the supply must also be capable of providing a constant voltage irrespective of the amount of current being drawn to ensure good frequency stability. Such a supply is said to have *good regulation*.

Factors which cause the output voltage of a power supply to vary include any changes in the mains voltage supply and the effect of the impedance or resistance of that part of the PSU circuit through which the load current flows.

Just as the best battery is one with a low internal resistance, so the ideal power supply is one which has a *low source impedance*. This can be achieved by careful design, but the more efficient answer is to use some form of regulator circuit which will automatically compensate for any changes.

Regulated supplies

Simple voltage regulation can be done using the Zener diode, as described when we looked at solid-state devices. This method is suitable for, say, the supply to a VFO and is reasonably good for supplies up to about 150V, but a more effective method is the circuit shown in *Figure 8*. This uses a transistor as the regulator. The transistor is connected in series with the supply to the load and a Zener diode of the appropriate value keeps the base at a constant forward voltage, so that if the load increases the transistor conducts more to maintain the output voltage at a constant level.

To provide better control, an extra transistor working as a dc amplifier can be used in what is called a *balancing circuit*. It is thus possible to compensate for changes in both the load on the power unit and the mains input voltage to the PSU.

Circuits often incorporate other features such as diodes to protect the supply (and equipment) from surges or incorrect connection, or some form of current limit to guard against thermal overload.

Integrated circuit regulators

All of the various elements of the regulator circuit, the various transistors, resistors, error amplifier and reference voltage source can now be obtained in one complete, small, integrated circuit package. The more complex IC regulators also have various protection circuits inbuilt, are relatively cheap to buy and offer a big advantage over building the same circuit up from individual components.

Integrated circuit regulators are available up to a maximum regulated current of about 10A and are quite common in today's power supply designs. For higher currents a number of regulators may be connected in parallel.

The Darlington pair discussed earlier in this series is often used in power regulator circuits and also comes in an IC package, complete with diode protection.

Safety

Before we finish power supplies, here is a safety note which cannot be voiced too often. Not everyone appreciates the high peak voltages that can be present at times in a power supply.

For example, for a CW transmitter with a conventional full-wave rectifier supply, when the Morse key is not depressed the load on the supply is effectively removed and the dc voltages can rise to a very high level. These may be considerably greater than the transformer ratings so it is wise to ensure that everything in the circuit, not just the diodes, is adequately rated. This will avoid breakdowns and flash-overs of the transformer or capacitors, reducing any safety hazard, especially with the close presence of RF.

Such voltages can be lethal, as can low-voltage high-current supplies, a point not always realised. The latter may not give you an electric shock but the current may be sufficient to melt metal if accidentally shorted to earth by a screwdriver or even a ring on one's finger.

Remember also that large value capacitors can retain their charge for a very long time unless it is allowed to leak away to earth and so present another safety hazard. There has sometimes been a question or two on this in the RAE.

Next month we'll be taking a look at propagation and antennae.

Acknowledgements and references

Radio Amateurs' Examination Manual – GL Benbow, G3HB (RSGB)
City and Guilds of London Institute
A Guide to Amateur Radio – Pat Hawker, G3VA (RSGB)

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Hello again! This month I was going to present some of the topics raised by the many letters I have received and give a user report on a new computer program.

This is still the plan of action, but firstly I have a most enjoyable duty to perform. Today, 22 January, I received the first claim for the *Amateur Radio Prefix Award*. Don Robertson GM3JDR, of Caithness, Scotland submitted a claim for 250 prefixes. Not only is Don the first claimant, but the claim is for *all worked CW!*

Whilst congratulating Don most heartily, I note that his list was nicely laid out with the callsigns, date and frequency as per the rules with the signed declaration.

Don was using a Yaesu FT101ZD into a half rhombic at 60ft. His QTH is a ¼ of a mile from the cliffs, so the sea obviously helps enormously with the ground wave signals. He certainly took the award seriously and worked the 250 prefixes in 15 days between 0700 and 1700 GMT. As a lighthouse keeper, Don's time on the air has to be fitted in with his variable shift duties.

Another noticeable thing about the list is the lack of so called 'exotic DX' and the list proves that anyone keen on short wave listening could reach this level reasonably easily.

I'm sure I echo the congratulations of all the readers of this column to Don.

Considerable interest

Over the past few weeks many of the letters that I have received have been about the *Amateur Radio Prefix Award* showing a considerable interest by listeners and licensed amateurs in working for awards such as this. For some of the newer listeners, the term 'prefix' seems a bit confusing so I will repeat the rules here.

1. The prefix is the first part of a callsign, eg GW4, GW1, G3, G2. These all count as separate prefixes as do DL6, DL9, UK2, UK4, UK8 etc, even if they are in the same area.

2. Stations working /A count as the actual QTH, eg DL6/G4ZZZ counts as G4, W6/ SV1ZZ counts as SV1.

3. Stations working /M or /MM count as separate claims.

4. *Only* registered amateur callsigns count. Pirates or other dubious calls will be deducted from submitted scores. In this vein, The Geoff Watts Country/Prefix/Zone List will be the reference (this list is available from Geoff Watts, 62 Belmore Road, Norwich NR7 0PU, for 75p).

5. Lists must be for prefixes heard or worked from 1 January 1985.

6. Claims must be in alphabetical order giving callsign, date and frequency. RST reports or other details are not required. It is not necessary to send QSL cards.

7. A simple signed statement that the submitted claim is made in the spirit of the competition must be attached or entered at the bottom of the claim.

I look forward to receiving the first listener's claim....judging by the mail, it won't be long arriving either!

Review

So for this month's review. Over the past month, I have had the pleasure of trying a new (for me, anyway) mode of communication. Unfortunately, time has been extremely limited and a really in depth use of this new mode has been impossible, but enough use has been made of it to get me extremely interested.

RTTY has been the name of the game and a new program for the Spectrum computer by Pearsons Computing under the label 'G1FTU RTTY' proved to be the catalist for the new interest.

'G1FTU RTTY' is supplied nicely packaged to order and is a program used for transmitting and receiving RTTY using the Spectrum without an interface. However, I feel that, in the true sense, an interface of sorts *is* required and, in this case, the unit published in this column in the November '84 issue was used (which proved it works anyway!).

On loading the program you will be presented with a command menu on the monitor screen (please see table).

Connection of the computer to the receiver or transceiver is as explained in my previous article on Morse reception, using the same switching unit or 'interface'.

As with Morse, the signal should be carefully tuned and the tuning indicator in the program is helpful here. Simply centralise the markers at the bottom of the screen and you have the signal tuned correctly.

With RTTY, most amateur stations use a baud speed of 45 so this should be the selection made using the menu. Commercial stations use a variety of speeds so it's a matter of trying the speeds until you get the right one.

My first attempts were on the 2 metre band on 145.300MHz and the signals here needed no tuning at all. A number of stations were copied either calling 'CQ' or in QSO. Due to my bad VHF location some return signals were not fully heard, so only part of the QSO was translated, the rest being a garbled mess.

Changing the leads over to the TS130, I listened around 14.090MHz and found F5YM calling CQ. Although I waited some time no reply came, so I thought it time to try the program on transmit.

It was not without a little nervousness that I selected the transmit mode in the menu and selected *memory 1*, which had been pre-programmed by Pearsons to include my own callsign (part of the service).

No-reply

My first couple of attempts brought no reply and F5YM was still calling CQ. It was then that I realised that I hadn't selected transmit on my interface – *twit!*

The next attempt resulted in an instant reply with a beautiful signal from Marseilles and a 599 report in return. My first RTTY QSO logged!

As I was reviewing the program from the listener's angle, I scanned the bands for more and found the program well up to the task with British, Italian, Dutch and French stations copied with

COMMAND MENU

TRANSMIT	Output RTTY tones to MIC socket
RECEIVE	Receive RTTY from ear socket with split screen
RECEIVE ONLY	Receive RTTY from EAR socket with full screen
ENTER TEXT	Enter text into buffer prior to QSO
EDIT MEMORIES	Change contents of memories 2-9
SAVE MEMORIES	Save memories 2-9
LOAD MEMORIES	Load memories 2-9 from cassette
SET TONES	Adjust 'mark' and 'space' tones
SET BAUD RATE	Change transmit and receive baud rate 45-110 baud available
UNSHIFT ON SPACE	Switches UOS on or off
TUNING INDICATOR	Switches indicator (seen at screen bottom) on or off
BORDER EFFECTS	Switches border effects on or off
SOUND EFFECTS	Switches transmit sounds off
DEMODULATOR	Selection of one of three tone demodulators
INVERT INPUT	Reverses 'mark' and 'space' tones
EXIT PROGRAM	Clears computer

ease. I've yet to have a real DX contact but with the bands in a sorry state they will come in time, no doubt.

Two metre contacts have been a delight with very few problems. One point brought to my notice was that, when sending direct from the keyboard, some stations received asterisks between the letters and this made accurate translation difficult from their end, especially as my typing speed is slow. This aside, the program certainly does what it is planned to do.

The instruction manual is an 8 page leaflet and covers just about every problem you might face when using the program. As a complete novice at RTTY, I found it very easy to follow.

I must admit that I have never had any aspirations towards RTTY working but this program makes operating so simple and, once you have got the hang of switching from receive to transmit, is quick to use.

The back-up of the memories makes a QSO very easy to conduct and all of your station details can be memorised and transmitted in any sequence. The *type ahead* on the lower section of the screen while receiving is a must and allows you to compose your reply as you read the incoming signal.

In conclusion

All in all, this is a superb program and I have only two criticisms. These are that for transmitting a CW ident could have been incorporated (perhaps into memory 9?), and for receiving, a *copy* mode could have been included as some listeners would like *hard copy* to use for QSL claims.

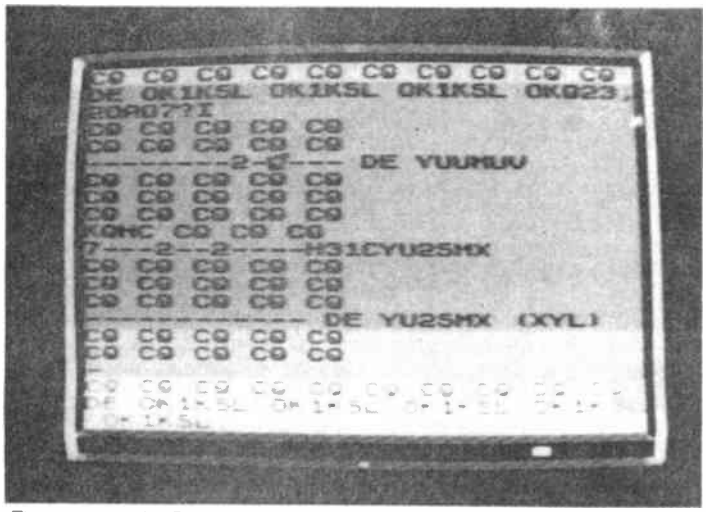
At only £10 a throw, Pearson Computing have come up with a winner for the SWL and amateur using a Spectrum.

Incidentally, my thanks to Paul Martin G1JOU, for his comments on the program which arrived as I was trying it out, and to GW6JMU (Jim) and GW1DTA (Mark), who put up with some terrible noises from my end while I was trying to type faster than the computer could translate! Many thanks lads.

The mailbox

So to the mailbox – and quite a response to the aforementioned *Prefix Award*, with parts of lists as samples and queries about

The 'winter quarters' at the GW4OXB QTH showing the line-up used for the review



The program in 'Practice only' mode

the rules (which I now hope are clear).

One or two of our readers have tried the interface published in this column in November '84 and it appears to be working out well. Thank you for your comments. If you do have a problem with it please let me know and I'll try to help. Most of the queries refer to the connections to the receiver/transceiver when Yaesu rigs are in use as these have six or eight pin connections, unlike the Trio which has only four pins on the mike socket. Remember, you only connect the PTT line and the audio input lines. For those who don't know the circuit mentioned, send me an SAE and I'll send you a copy.

One of the constant problems with using a computer with receivers is the ability of the receiver to pick up RF from the computer. Readers have tried many methods to overcome this without success. Apparently, the better the receiver, the worse the problem. A letter from Philip Cole of Bristol to Commodore brought no joy either, and lining the computer with foil didn't work. Has *anyone* got a solution to the RF problem?

One letter, from Den Marriott in Kent, raised a query regarding aerials. Having used a 60m endfed wire, he tried a ½ size G5RV and stated that it seemed more selective than the wire. Actually Den, you'll probably find it less efficient than the long wire and maybe, depending on how you have it erected, a bit more directional, so perhaps this is what you mean. The wire with the ATU could pick up signals that were not received by the ½ G5RV.

I'm also receiving quite a few letters regarding the 'Information Mailing List' mentioned a few months ago. I am computerising the information received (never thought it would be so useful!) and as soon as we have a reasonable list I'll send it out to those interested.

This will be good news for a reader in Lincolnshire who seems to be having a few teething problems with his receiver, as I am sure that one of our readers will be able to help.

Individual choice

I receive many letters asking me to recommend a particular receiver, and as much as I would like to help, it would be most imprudent of me to recommend any particular brand.

I have stuck to one brand myself and been rewarded with good performance and reliability. But then so have many other listeners and amateurs, so it is a difficult to pass comment.

There is, as in the world of cars, cameras etc, a form of camaraderie with users of Trio, Yaesu and Icom, each being loyal to his choice in the same way as owners of Ford, Austin, Nikon and Minolta.

Each person makes his choice according to his pocket and requirements and if he is happy with his choice he will sing the praises of that particular brand and protect its name against any other. That's perfectly natural.

The problem is that, as a contributor to *Amateur Radio* it is sometimes taken that my views are those of the magazine.

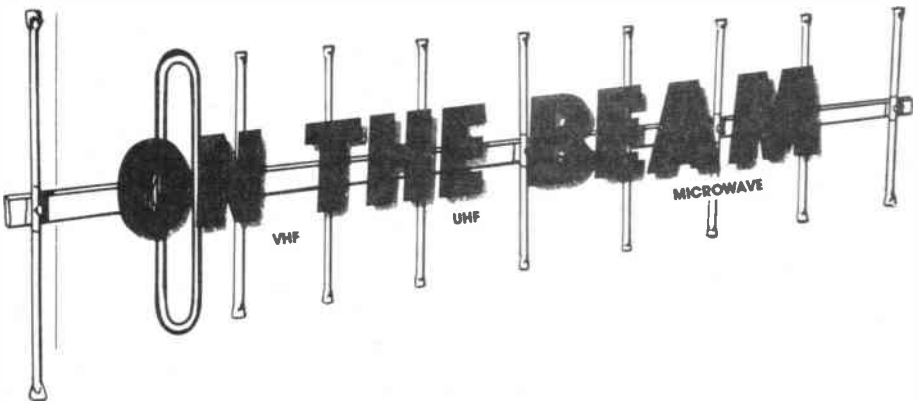
Impartial

It's hard for some people to realise that any reviews undertaken by writers in this (and any other) magazine must be impartial and unbiased, so if I state that a particular piece of equipment is good value (or otherwise), that is my opinion and is open to argument either way; and I still say the Niblic MK7 is the best receiver money can buy – so there!

Please send your letters to: *1 Jersey Street, Hafod, Swansea SA12HF.*

Next month I'll be looking at the bands again from a listener's viewpoint and trying out the multiband 'Dipole of Delight' on transmit and receive.

Meanwhile, keep the mail coming and have a good month on the bands. Good listening, all.



News and comment from Glen Ross G8MWR

SSB Repeaters

As is now well known the Sheffield SSB repeater is on the air. The idea behind this one was not that it should be a DX machine but that it should operate in the same way as any other 'local' repeater. If it can be shown to be a workable project, and there seems to be no reason why this should not be the case, then it would open the door to a significant increase in the number of repeaters that could be placed in the existing allocation, due to the much narrower bandwidth required by the SSB system.

This all seems to be fairly state-of-the-art stuff and G3RKL is to be congratulated on getting it up and running.

Good ideas

Our report on the SSB repeater has brought a most interesting letter from Mike Pinfold ZL1BTB, of Rotorua, New Zealand. He sends details of a new 'linear' repeater which he has constructed and which is now used as the local repeater.

This repeater is, in effect, a grounded satellite system and functions much along the lines of Oscar 10. It is centred on an input frequency of 144.950 with the output on 144.350MHz, the big difference being that it has a bandwidth of 30KHz. Now, if you think of the SSB end of two metres on a busy contest weekend you will get some idea of just how many signals you can squeeze into 30KHz!

The other really big advantage is that you can handle all types of modulation, so it is possible to use data, RTTY etc all at the same time.

Technical stuff

The maximum output power is about 8 watts and is proportional to the received signal level. This means that if there are two signals on the input and one is twice as strong as the other this ratio will also be found on the output, unlike the conventional repeater where the transmitted power is always the same irrespective of the input signal level.

The aerials are a pair of 5-element vertically polarised Yagis mounted on a forty foot pole with a separation of ten feet between the two aerials. By this means a starting isolation of 40dB is achieved, this is then backed up with two high Q cavities in each feeder giving a rejection notch of −78dB for each cavity, with an insertion loss of around 2dB.

Power for the unit is derived from solar panels with battery back-up (even in New Zealand the sun does not shine at night time!). It seems that a lot of work has gone into developing this repeater as Mike tells me that it is the third unit they have installed, the other half of 'they' being ZL4DO. Bear in mind that it can handle all those signals at the same time and do it in virtually the same space as is used by *one* of our repeaters.

April Fools Day

Those of you who have applied for a letter of variation allowing class B operators to use Morse will have received them by now and included with it you will find a guide to operating produced by the RSGB. It really is vital that you stick to these guidelines because any problems which arise from stupid or thoughtless operating could result in the experiment being completely withdrawn or, more importantly, not being written into our licence as a permanent facility.

This is a tremendous relaxation of the rules that has been obtained for us, please do not foul it up. For those who have not heard about the facility (!) simply write to the RSGB, Lambda House, Cranborne Road, Potters Bar EN6 3JW. Enclose two stamps and ask for the 'letter of variation'. You do *not* have to be a member of the RSGB to get the permit but if you are not you will probably get a nice letter explaining why you ought to be. Give it some thought, there are worse ways of spending a few pounds. The experiment starts on 1 April, hence the headline.

Bandplans

We have had several enquiries from newcomers to the hobby as to what 'the bandplans' are and what purpose they serve. First let it be understood that under the terms of your licence you can transmit any mode anywhere in the band. If you did that the result would be chaos; there are so many people trying to use the bands that the only sensible system is to have a gentleman's (gentleperson's?) agreement as to what is going to happen where.

The bandplans have evolved over the years and, although still not perfect, do serve reasonably well to give all interests a fair crack of the whip. This month we will have a look at the two metre listing.

CW only

This runs from 144 to 144.15MHz; the section from the bottom of the band to 144.025 is set aside for Moonbounce working. 144.05 is the CW calling frequency and 144.1 serves the same purpose for meteor scatter.

SSB and CW

This covers the area 144.15 to 144.5MHz. 144.25 is used on Sunday mornings for the RSGB news broadcasts and 144.26 is used by Raynet. The microwave talkback is on 144.175 and the normal SSB calling spot is 144.3. 144.4 is used for the meteor scatter SSB reference frequency.

These fellows have a very organised system of QSYing and MS operation can spread ±25KHz of the calling frequency. When you consider the weak signals available on this mode it is really criminal of people to sit on this spot and natter away on FM! An MS contact can take up to a couple of hours to complete and you can ruin it with a ten minute chat across town.

All Modes

This section of the band is from 144.5 to 144.845 and even here there are several frequencies to avoid. First there are several calling frequencies, these being 144.5 for SSTV, 144.55 for microwave, 144.6 for RTTY, 144.675 for data transmission, 144.7 for FAX and 144.750 for ATV. In addition to these 144.775 to .825 are designated for Raynet use.

Beacons

These are in the section 144.825 to 145 and this should *never* be used for any other purpose. The point of beacons is that they indicate band conditions in various directions and people spend many hours monitoring them when looking for openings.

Contrary to most peoples' idea you do not spend time listening to the beacons you can normally receive but rather you are waiting for a normally unheard beacon to appear out of the noise. The fact that you can hear nothing on the frequency that you intend using for a local chat is all the more reason for keeping clear of it. One odd fact here is that Raynet have yet another spot at 144.85.

Repeaters' Inputs

These are located between 145 and 145.175 and the normal SIMPLEX frequencies are from 145.2 to 145.575. There are still more frequencies to be avoided however. These are yet more Raynet

spots at 145.2 and .25, 145.25, which is used for the RSGB slow Morse transmissions and 145.3 which is the frequency that is used for RTTY FM calling. 145.3 is the general calling channel and .525 is used on Sunday mornings for the RSGB news broadcasts. Another one to check on Sundays is 144.550 which is the accepted 'Talk in' frequency for rallies and exhibitions.

The easy bit

The area between 145.6 and .775 is for repeater outputs and from 145.8 to the top of the band is for the amateur satellites. Apart from only using these parts for the designated service there are no special frequencies to stay clear of – *yet!*

As you can see the list is quite formidable and one sometimes wonders how we manage to find a space to get a contact on.

The answer is that by keeping to the bandplan at least some order is brought into what would otherwise be a chaotic situation, and as you can see most interests have got at least some space to work in.

It makes a lot of sense to have some 70cm gear available; we will look at that band next month and two things will be immediately obvious: one is that we have five times as much space available than on two metres and, secondly, there are nowhere near as many spots to be kept track of.

Certificates

Our new certificates are causing a lot of interest; we have already had two claims for two metre Bronze certificates. A lot of people have commented on the fact that getting the QSLs can take a long time and that they are anxious to get a foot on the ladder as soon as they can.

To make this possible, and also to lighten the workload involved in running the award scheme, we have decided that all claims shall be presented as a copy of your log entries and that the copy log must be signed by two other amateurs as confirmation of your claim.

Please include your locator and also that of the station you are claiming for the distance part of the award so that we may check the claim.

Contest news

The dates for the various cumulative contests have now been announced. The 3.4GHz event is on 16 June, 5.7GHz on the 11 August and 24GHz on 21 April, 10 May, 14 July and 15 September.

These events coincide with 10GHz activity on all these dates and are timed from 0900 to 2000 GMT. The Microwave Society's 10GHz activity day is also to be held on 21 April so this should be a very busy day. Have a listen around 144.175 to see how they are getting on, or perhaps even visit a site and see how they do it on microwaves!

The weekend of 13/14 April is the BARTG VHF/UHF Contest and on the 21 April there is the RSGB 70MHz Contest. Looking forward into May there is the 432 to 24000MHz contest over the weekend of the 4th and 5th and the RSGB 144MHz affair on the 18/19th.

Sporadic E

The new season will soon be upon us, although some evidence suggests that there may be limited activity at any time of the year with reports coming in of activity around Christmas time.

One new country that may be available this year is Turkey, which has just started issuing callsigns again after a lapse of many years. It seems they have all bands available, more or less as our own licence, with up to 400 watts. It certainly would not be impossible, Israel was worked a few years ago, and it would certainly constitute a first if you can manage it.

Tailpiece

That about wraps it up for this time, please keep sending those letters and let us have as much information as you can about what is happening in your area of interest. The address is 81 Ringwood Highway, Coventry.

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

An apology

Some time ago a retired listener wrote to the magazine asking where he could get hold of a manual for his CR100 and the editor passed the letter on to me. I knew that a friend of mine had recently bought a manual for this receiver and phoned him. Unfortunately he was working night shift for the month so I had to wait to get the information.

I now have the information but have lost the original letter. Thus, if you are a retired listener who wrote to this magazine ages ago asking for details of where you can get a CR100 manual, please accept my apology for keeping you waiting and try 'The Moorings', 41 Halvarras Road, Truro, TR3 6HD. Tel: (0872) 862575.

'One crystal per channel' rigs

I've had a couple of letters from amateurs attempting to repair rigs themselves who are confused by the fact that the rig is crystal controlled on both transmit and receive, but only has one crystal per channel. The method employed was quite popular just before the outbreak of synthesised rigs and was used in, for example, Palm 2s and 4s, and a few 'Standard' transceivers. It obviously had the advantage of making it cheaper to install extra channels into the rig.

The receiver path is quite normal. Let us take an example of a rig 'tuned' to 145.7MHz (R4) and with a 10.7MHz first IF.

Since the receiver is a superhet, we require a local oscillator on 145.7 minus 10.7, which equals 135MHz. This is normally obtained by a crystal that has been multiplied up three times, so the actual crystal frequency will be 135 divided by 3, which equals 45MHz, all fairly basic stuff.

The clever bit is on transmit. Instead of having another crystal oscillator/multiplier stage as per normal, you keep your receiver local oscillator running and mix it (at the final frequency, in this case 135MHz), with a 10.7MHz oscillator to give you a carrier on the frequency that you were listening on. This is then amplified up to give you the required transmit power.

What about repeaters, you may well ask? Simple, instead of mixing on transmit with 10.7, just mix with 10.1MHz (ie a crystal 600KHz lower), then 135 plus 10.1, which equals 145.1MHz; just what we want.

Servicing 'one crystal' rigs

If you have grasped the above it should be obvious that you FM modulate the 10.7/10.1MHz injection oscillator. What many people fail to realise is that this deviation has to be to full system deviation, ie if you want 5KHz deviation you have to shift your 10.7/10.1MHz 5KHz. In the more 'normal' two crystal rigs the deviation is much less since the deviation is multiplied up as the frequency is increased.

For example, a 12MHz crystal deviated by 1KHz will end up, after being multiplied by 12, as a 144MHz signal deviating 12KHz. This fact was overlooked by a colleague who was repairing a rig with low deviation. He said the 10.7MHz oscillator was deviating by 1KHz on speech peaks, which should be more than enough when multiplied up!

Another big problem is when the rigs go off frequency. Some of the rigs employing this technique are now over five years old, and a quick glance at the frequency stability characteristics of the cheap crystals used in some of these rigs will soon indicate the reasons for reports of off channel, either on receive or transmit.

One reader was stumped as to why his rig worked on receive and on simplex transmit but was consistently 5KHz low on repeaters. If you follow the example above through carefully it should become apparent that the 10.1MHz 'repeater' mix crystal was low in frequency. In practice I normally measure the frequencies of the two crystals before touching individual channel crystals.

The Palm II and IV

These rigs are examples of the above technique, for two and seventy respectively. The IF of the IV was 32.2MHz.

The two meter version has a bit of a reputation for blowing output transistors. This is bad news since they are the collector isolated from the can type and are consequently expensive. As I explained recently, the output transistor goes open circuit; this causes the driver to run into a mismatch, causing it to draw a high current and causing the Tx/Rx change over transistors to burn out.

Treat the two meter rigs with care, never run them without an aerial and don't 'tweak' them for maximum output. Don't run them off dodgy power supplies either. Funnily enough, the 70cms version seems to have a much more rugged PA and failures are uncommon. Both variants seem to suffer from dry joints, this being the common reason for their appearance on the workbench.

It may be because of the unreliability of the 2 metre variant's PA, or it may reflect the greater desire for 70cm equipment, but the 2 metre variant sells for much less than the 70cm one. £55 to £60 for two, £70 to £75 for the 70cm seem to be the going rate for secondhand examples during the 1984 rally season.

The rigs came complete with chargers when new, and I would recommend that you try and get one with your rig. The batteries in the transceivers are really excellent. I recently bought a very dead Palm II for £15 which the owner assured me had been lying untouched in his shack for three years, yet the batteries (ni-cads) came up like new after the first charge.

Both rigs have adequate receive sensitivity and good battery life. I regularly go for a one hour walk chatting through the local repeaters and the rigs will normally last for two outings before requiring recharging, and there are often listening only periods in between. The cases will keep out the odd shower, but I wouldn't recommend using them in a downpour.

The Palm II and IV have only recently been discontinued, and recently a few emporiums have been selling off their last few at quite attractive prices. I would recommend giving the rig a good shake on transmit and receive prior to buying, to pinpoint any dry joints that may be present. If all appears OK then you've probably got yourself a good buy, but don't take chances with the aerial on the 2 metre variant!

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Get more fun out of amateur radio with one of our easy to build kits. How about building yourself a station around our CTX transmitter and DcRx receiver kits for portable and holiday use during the summer?
All HOWES kits come complete with a good quality printed circuit board that is drilled and tinned and has the component locations screen printed on it for easy assembly. All board mounted components are included, as are full, clear, instructions. The kits are also available ready assembled. This is an important part of our quality control. Because we assemble the kits for sale ourselves, we are continually checking that there are no design or component problems with the kits. You can be confident that our designs will prove a success in your station.

CTX80 QRP CW TRANSMITTER FOR 80 METERS.
The CTX80 is proving to be very popular indeed. Read the review by G3VTT in the March 85 issue of Shortwave Magazine. This straightforward CW transmitter will run up to about 5W RF output (the power is adjustable) and features key-click suppression and a five element low-pass output filter. The CTX80 is crystal controlled (one crystal supplied), but can be driven by our CVF80 VFO for full band coverage. Easy to build and great fun to use. There are hundreds of stations equiped for QRP CW on 80 Meters, there is no lack of contacts to be had! We will be producing versions of the CTX for other bands when time permits. The CTX80 works on 12 to 14V DC.
CTX80 kit £12.95. Assembled PCB module £18.95.

CVF80 VFO FOR 80 METERS.
This is a fully featured VFO for use with our cTX80 transmitter or other homebrew equipment. Stable FET oscillator, dual independent buffered outputs, onboard voltage regulator, IRT (clarifier) control etc. The circuit includes 9 transistors and can drive both a CTX80 and DcRx80 receiver for transceive operation. Requires a 50pF tuning capacitor for full band coverage. We can supply a suitable device giving just under full band coverage (no chance of inadvertant out-of-band operation) at £1.50. Versions of the CVF for other bands will be available later in the year.
CVF80 kit £9.30. Assembled PCB module £14.90.

DcRx DIRECT CONVERSION RECEIVER.
This design was originally conceived to meet the needs of the newcomer to the hobby. It enables a simple, single band receiver, of surprisingly good peformance, to be built by a novice at a sensible price. The kit was reviewed in the May 84 issue of Shortwave Magazine by G3RJV and over the last few months since our CTX80 transmitter has been available, more and more experienced amateurs have been building these receivers as part of a simple low cost QRP setup. It took careful design to produce a simple receiver that would work this well. Compare the DcRx with that expensive black box that sits in your shacks. Not quite as good of course, but I bet you can still hear most of the stations you can receive on the other radio.
The DcRx is available for 20, 30, 80 or 160 Meters. It requires a 12 to 14V DC supply and will produce upto a watt of audio into a speaker or 'phones. Modes: SSB and CW. A case and two tuning capacitors are the ony major parts to add to finish your receiver. We have suitable capacitors for all but the 160M version at £1.50 each.
DcRx Kit £14.80. Assembled PCB £19.90. PLEASE STATE WHICH BAND YOU REQUIRE.

AP3 AUTOMATIC SPEECH PROCESSOR.
The AP3 can add a really useful boost to your transmitted signal. The extra 'punch' added to your modulation by the AP3 helps to cut through the noise and QRM, so enabling you to make contacts that are not possible without it. The AP3 was described in an article in the September 83 edition of "Ham Radio Today" by Dave G4KQH, and since then we have sold over a thousand units. The AP3 works from a 9 to 14V DC supply and automatically turns itself on and off from your microphones normal PTT switch output. You simply select the amount of clipping you require (4 steps of approx. 6dB), and speak into the mic. The AP3 automatically compensates for changes in speech levels, so you can still work the DX even if you whisper! Ideal for multi-operator contests! The unit can be used with high or low impedance mics, and is very easy to build. Could an AP3 help your station make a bigger impact on the bands?
AP3 kit £15.90. Assembled PCB module £21.40.

CM2 QUALITY DESK/MOBILE MICROPHONE.
The CM2 is a good quality microphone kit that consists of an electret condenser microphone capsule and a small electronics module that incorporates a Plessey "VOGAD" chip to give automatic control of modulation levels. The unit produces a nice clear audio signal for your transmitter, no matter whether you talk loudly or quietly, near or further away from the mic, the modulation level is maintained correctly for you. Ideal for a desk microphone or for use in the car as a "hands free" unit. The CM2 can be remotely keyed by a foot or gear-stick switch if required. The unit will work on an 8 to 14V DC supply, drawing only about 30mA from a 9V battery, and then only in transmit mode. The electronics turn off automatically when switching back to receive, no separate on/off switch is required. The CM2 builds into a clean sounding microphone that you will be proud to use on the air. It is always nice to receive complimentary audio reports, especially when you can have the satisfaction of saying "I built it myself".
CM2 kit £10.25. Assembled PCB module + mic. capsule £13.75.

ST2 CW SIDE-TONE or PRACTICE OSCILLATOR.
The ST2 provides a nice sounding sine-wave note of approx 800Hz for monitoring your sending or Morse practice. It will produce up to 1W of output into an 8 Ohm speaker or 'phones. It can work by direct connection to your key, or by sensing the RF from your transmitter. Will work with HF QRP rigs of as little as half a watt!
ST2 Kit £7.30. Assembled PCB module £10.80.

If you would like more information on any product, simply drop us a line, enclosing an SAE. We have an information sheet on each kit.

PLEASE ADD 60p P&P to your total order value

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73 from Dave, G4KQH Technical Manager.

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I understand that if I am not fully satisfied I can return the equipment within 21 days for full reimbursement. 14 days delivery. AR

Access VISA

Decisions, decisions

I like the Maidstone rally. It is a bit small compared with most, but it is friendly and well organised. It is an oddball since it only happens once every two years, but I have bought some memorable bargains there over the years. For instance, a Hallicrafters SX27 for a fiver and a Microwave Modules 'ten in seventy out' transverter for £15 which were bought at the last one.

I also like the Wireless Revival. This rally dares to be different. For example, it was the first rally to try the car boot sale idea. I am a big fan of these at rallies since they give the seller the chance to flog really small items, like relays and variable capacitors, which would be impractical to sell via the bring-and-buy. Another advantage of the car boot sale, for the organising club, is that the whole show can be organised by one man. There is also the advantage that there is no come back on the club if a rig is stolen, always a problem.

It was thus that my heart was broken when I found out that both of the above rallies were on the same day (26 May). It strikes me as a bit silly having two rallies on the same day at such close venues. The RSGB run a diary service designed to prevent this sort of disaster and it only takes a phone call to the MSO (Membership Services Officer) to check that the day is clear. I appreciate that with so many amateur events to be fitted into a year there have to be clashes, but it would seem sensible to try and avoid an event within, say, a 200 mile radius.

There has been a lot of discussion on the bands about who is going to which rally hereabouts, so it's obvious that attendance at both will be down. It took your scribe ages of heart searching to make my decision because I've been going to both since they started, but in the end the revival won. My son likes the model flying display!

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FOR SALE

■ WS38 MKIII no mods or bits with circuit and army technical sheet. Set of valves for RF24 unit case and chassis G4EUW, QTHr. Tel: (020630) 3071 Brightlingsea.

■ R1000 communications receiver, 200KHz-30MHz. Includes dc kit. Can deliver/demonstrate south-east England. £215. Tel: (07914) 2823. (Brighton area) evenings/weekends only.

■ HF transc Uniden 2020 150 watt PEP digital/analog readout. CW matching LS, mic. Built-in ac and 12V dc power supply. Excellent condition, and complete with all cables and manual. Sommerkamp HF linear FL1000, needs attention. PA valves ok. Philips BX925 420KHz-30MHz gen coverage receiver. Ex merchant navy model needs attention, CW spares. The lot for quick sale GM5DTA, Gevers, Aberdeen. Tel: (0224) 35760.

■ Simpson digital volt ohm ammeter, built in nicad batt charge facility, auto polarity 1000 volt dc 600 volt ac, zero to 20 meg ohm, six ranges zero to 10 amp ac dc, £70. Remmer, 11 Blencarn Walk, Leeds LS14 6SP. Tel: (0532) 735543.

■ Boxed 2m Kenwood TR2400 handheld mains slow charger, car quick charger. Tel: Chelmsford 59298, work Braintree 48330.

■ Heathkit DX100 CW/AM 100W Tx complete with manual in good clean cond. 33 foot fibre glass vertical antenna made in approx 4ft screw in sections complete with base mounting plate, offers invited. Buyer must collect due to size and weight. Tel: Harry, Castleford (0977) 552862.

■ Trio / Kenwood SM220 station monitor / scope (new) £220 ono. Metalfayre 2 metre 6 ele cross yagi (new) £33 ono. NEC 12in video monitor b/w comp video input (as new) £75 ono. Tel: Paul G4XHF Crawley (0293) 515201.

■ FWO vintage Eddystone 840 HF/MF comms Rx covering MW SW, broadcast bands thru ham 1.8 to 28KHz. AM, ANL for SSB, an efficient and handsome gen cov Rx £80. L Rogers, 156 Franklin Ave, Tadley, Hants RG26 6EV. Tel: Tadley 2476

■ Standard C110A handheld case and two spare Ni-cad packs, plus home brew unit for operation off 13.8 volts or car electrics. 12 months old, new condition in original packing, surplus to requirements £120. Mizhuo SB2M 144.200 144.400 SSB complete with Ni-cads, two spare xtals for 144.100 144.200 £65. G2ATK, 8 Holloway Drive, Pershore, Worcs WR10 1JL. Tel: Pershore 553735.

■ Immaculate Eddystone model 840C. Recently serviced one knob missing but otherwise in fantastic condition. Have got original operation manual only. £280 ono for quick sale. Mr Ali, 469 Oakwood Lane, Leeds L58 3LG. Tel: Leeds 401500.

■ Global AT1000 ATU as new £25, suitable for any HF receiver. Vertical antenna multiband HF5V, 10-80 metres £20. N G Powell, 732 Hagley Road, West Oldbury, Warley, West Midlands. Tel: (021) 422 7515.

■ FT225RD mint £475 with muTek. FT902DM mint £600, FT707, FP707, FC707, £400, Nag 144XL 2 metre 250W linear, new valve mint £300, Robot 400 SSTV unit £325, FL2100B HF amplifier mint £295, Datong Morse keyboard, ideal for MS £80, standard C8800 2 mtr FM mobile £140, 6 ele quad 2 mtrs £15, Lucas 10FM mobile £25, genuine reason for sale, going QRT for 2 years. GM4TXX Jim Atkinson, Bridgedaff, Main St, Inverkip PA160AS. Tel: (0475) 521661 or (0475) 707604.

■ Army radio sets all complete less batteries in good complete order, 19, 62, 38MK3, 31, B44MK3. Xtal calib No 10. Remote 31 and 88 set aerials (new). Might barter but I want Bird 43 (thruline) watt meter inserts. MJ Buckley, 12 Ranmore Ave, Croydon, Surrey CRO 5QA. Tel: 01-654 2582.

■ Yaesu FR101 receiver with matching speaker with 2 metre and 6 metre, mint condition £250. Also pair of KW40 antenna coils, some text books, good condition, ideal for anyone to study RAE, buyer please collect. Tel: 01 253 6725

■ Yaesu FT102 with SP102 speaker. GWO £475 ono AM-FM board fitted. G4YUC Tel: 01-697 8436 (SE6 London)

■ Bearcat BC100FB handheld 16 channel scanner, 8 band coverage, very robust, includes charger, case and instructions, good condition, £270 ono. Richard Tel: 01 445 7093.

■ AR2001 scanner 25 to 550MHz £290. Realistic tandy DX302 0.01 to 30MHz receiver, their top model with digital readout, including separate aerial tuner unit £150. Jim Hicks, G4XRU, 33 Hayling Rise, Worthing BN13 3AL. Tel: (0903) 690415.

■ Stereo cassette radio, the ultimate, with many cassettes. Dolby, auto-reverse, metal tape etc keen to sell or exchange for HF radio or equipment with cash either way. G1 ELN. Tel: (06632) 2545.

■ Receiver AR88D 500KHz to 32MHz. Has just had a new set of valves fitted. Very good condition. £60 ono. Tel: (0632) 834876 after 6pm.

■ Yaesu FRG7700 with 12 ch memory plus FRV7700, FRT7700, FRA7700 vgc £350. Tel: (051) 264 0291.

■ Tri-band HF beam 4 element TET as new £140. Tel: Cheltenham 514357.

■ Racal 17L (17T) complete with instructions, good condition, £225 or exchange for FRG7700 with ATU or similar. Also Redefon Rx Tx VHF FM radio telephone £45. Mr T Hoyle, 35 Marton Grove, Inglemire Lane, Hull HU6 8NZ. Tel: 801771.

■ FLDX500, FRDX500 Rx fitted FM, £250 ono. Would exchange for QRP rig, eg FT7, Argonaut 509. Above being sold old licenced operator. 1 Dunphail Road, Glasgow G34 0BX.

■ Hundreds of valves for sale new and used will sell or exchange for anything interesting, WHY. Tel: Jim G4XWD (0562) 3674.

■ FT757GX. HF SSB CW AM FM transceiver with everything fitted. General coverage 500KHz to 30MHz receiver, two VFOs, eight memories, RF Amp, RF attenuator. Noise blanker, audio processor and compressor, CW keyer, full QSK, VOX, IF shift, variable bandwidth, fan, etc £550. FP301D 20Amp PSU for above if required £75. GM4SID. Tel: (0224) 584774.

■ Kenwood TS530S, VF0240, SP230, MC50 mic £625. FT107M trans. £625. All equipment is in unmarked and pristine condition. Buyer to collect. Stuart G4OOK QTHr. Tel: (0642) 211685.

■ FTDX560, sure desk mike, fan, 160m, 30m, spkr, manual, spare valves and dummy load, £250. FT207R with charger. £110. Will swap both for either FT77 (FM), FT707 (FM), or TS130V or TS130S with cash adjustment. Leson TW-232 desk mike, £16. Tel: Tisted 306 after 5pm ask for Darren.

■ SX400 scanning receiver 26MHz to 520MHz, data interface socket for computer control and converter socket for extended coverage 150KHz to 3.7GHz, brand new boxed £489.00. Mr T Manning, 24 Croftdown Road, London NW5. Tel: 01 485 4251.

■ Selling, complete RTTY system comprising Creed 444 printer, Redifon terminal unit, spare paper and perf rolls. Sell for £60.00 the lot. Tel: Tony (0632) 567305.

■ Uniden portable receiver with digital readout, keyboard operation, six memories preset, mains or battery operation, complete with batteries and mains adaptor, £100.00 or would exchange for 2m handheld rig. Mr GA Latter, 4 Rainville Rd, London W6 9HA. Tel: 01 385 5723.

■ FT290 mobile mount, hardly used. £15.00. Contact John Wyatt G6MBD. Tel: 01 449 5145 (Barnet).

■ SX200N scanning receiver VHF/UHF, excellent condition, little used, £210. Tel: (0793) 823973.

■ FT757GX multimode HF transceiver plus general coverage on receive, plus matching heavy duty PSU plus scanning up down mic, all in mint condition 2 months old, redundancy forces sale. £750 ono. Tel: Stoke on Trent (0782) 44737 or 44877.

■ TRS-80 computer system including CPU, green screen monitor, cassette deck, printer, £200 + software vgc £250 ono. Also Trio TR-2300, vgc, including Nicads, charger, manual, helical whip, boxed £100 ovno. Exchange both for TR-9130 or similar. Buyer inspects and collects. Tel: (0625) 614510 Andy G1HEH.

■ Trio JR-60 communication rcvr, 550Kc to 30MHz and 142 to 148MHz built in crys Cal and 'Q' mplr. Also Icom IC-240 mobile FM programmable 144 to 146MHz 10W O/P and Heathkit RA-1 comm rcvr converted to 2 and 10 mtrs inc MW modules converter. JR-60 £90.00. IC-240 £80.00. RA-1 £30.00. Tel: Wolverhampton 20636.

■ Trio TS130V HF transceiver 10m to 80m including warc bands. SSB and CW, with fitted narrow SSB filter. Operates from 12V supply, 25W output, only used for SWLing and driving transverters. Genuine reason for sale going to Microwave. Price £350 ovno including mic, lead, manual and original packing. VHF-UHF transverter switching box with ALC voltage dropper only £30. Graeme Caselton G6CSY. 19 Cowden Road, Orpington, Kent, BR60TP. Tel: Orpington (0689) 29230 evenings.

■ Yaesu FT280 (American version) of the F480 2 meter multimode, covering 143.5 to 147.5MHz 10 watts out, with YM48 condenser mike. £200 ovno. Also Morse master CWR600 RTTY CW reader, but without instructions, £80 ono. Also ATE RTTY scope? No details but open to offers. Tel: Chris (02407) 5036 anytime.

■ Trio TR7800 and PS10, £150. MFJ901 versa tuner, £50. GM4DHJ. Tel: (041) 889 9010.

■ Yaesu FT101ZD AM used mainly on Rx. Complete with fan, FF-501DX, YE-7A mike, £450. Also Amateur Radio and Ham Radio from first edition to Dec 84, offers. Tel: (0484) 655568 evenings or weekend.

■ TS930 Trio (Kenwood) transceiver simply excellent, complete with workshop manual £925.00. Wrasse, slow scan converter type SC422A 3 memories colour Rx & Tx superb picture quality £510.00. Sony monochrome video camera with zoom lens £75.00. Doublebeam scope telequipment type 43 £67.00. Newbrain computer type AD £147.00. 2 Sanyo taperecorders £6.00 each. G4GPL. Tel: 01 953 6921 (home), 01 953 9021 (work).

■ Ham shack Compton concrete sectional shed, fully lined 8ft x 8ft £230 ono. Tel: Neath 59213.

■ For sale or swap Fletcher Arrow sportsboat, cover, trailer and 40HP Johnson outboard, £700. Require amateur equipment, cash adjustment either way Jennings. Tel: (0242) 34916.

■ 70MHz transverter. FTV107R transverter with 4m module, £95 ono. G3SYS, c/o CP van Hagen G1BIJ, 18 Fraser Court, Handbridge, Chester. Tel: (0244) 676570.

■ Argonaut 509 in good condition, fine QRP rig £235 incl Securicor delivery. Tel: (05047) 66151.

■ Two 12ft x 2in dia scaffold poles suitable for aerial mast £5. Condenser analyzer and resistance bridge, mains operation, old but working, £5. Buyer collects. Niall, 4 Ham Road, East Worthing, Sussex.

■ FDK multi palm II 2m £75.00. Yaesu FL2010 10watt linear for FT290R £40.00. Microwave Modules 144/28 converter £15.00. Ex WD 33CW11-75 set including battery £20.00. Tel: (021 373) 9068.

■ Trio TS510 Tx/Rx plus PS510 PSU £190.00. HRO receiver with full set of coilpacks. HRO general coverage and band spread coilpacks. HRO parts, offers. Tel: St Albans 39333.

■ Drake T4XB, R4B, AC4 PSU, manuals, spare valves, excellent condition £425. Yaesu FR50B vgc £80. Tel: (0532) 659227 after 8pm or weekends.

■ Sinclair Spectrum 16K with cassette recorder and tapes, little use. £70 or swap for AR88 in good condition. R M Hall, 57 Farnham, Blandford, Dorset. Tel: Tollard Royal (07256) 306.

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■ FDK multi 2700 2m multi-mode, £220. Yaesu FT301D + FP301 PSU/SPKR + FC301 ATU, £385. Racal RA17 Rx + RA98 sideband adaptor, £250. Yaesu FT208R 2m handie Tx/Rx + NC7, base, charger + hand mic + 2 nicad packs etc, £175. Possible exchange any of above items for good 35mm photographic equipment. K Smith (G3TLB), 'Sheerland', Blackness Road, Crowborough, East Sussex, TN6 2NB. Telephone (08926) 5527.

■ 80ft Tower & Radio shack 12ft x 8ft, £40,000, includes 3 bedroom stone house in SW Wales, all mod cons close to sandy beach (7mls), bus and rail service, well productive garden, any antennae possible from 160m dipole to EME array. For further details tel: (0554) 890502

■ 20 – 25amp, 0 – 19V power supply unit. Fully protected. £40, post extra. Prefer buyer collects. Tel: (0253) 45431.

■ Sommerkamp FR500, FL500, £190, the pair, good condition with spare valves. Carriage at buyers expense. Tel: (0563) 34383.

■ KDK 2030 2m transceiver. Full scanning facilities, 10 memories and priority channel. Complete with mobile mount, scanning mic, handbook and original packing. Rotator system plus 7 element Yagi, £185. G4ANW. Tel: (0730) 61859.

■ ASC11 keyboard with display electronics, RS232 in/out, 16 lines x 64 chans per line. With case, £20. Datong D70 Morse tutor, £30. muTek preamp SLNA144S, as new, £28. Sharp pocket computer, PC1251, with cassette and printer expansion unit, complete with case and manuals, excellent condition £90. G8AWV. Tel: 01 751 2262. After 6.00pm.

■ Belcom liner 2 SSB 2 metre mobile all mods, circuits good cond, plus Leson base mike suit same: £85 or pref swap for 2 metre FM rig (not hand held) any cond but must work. Can collect 50 miles radius. Chris G6XRN, 83 Wood Road, Derby, DE2 4LZ. Tel: (0332) 679474 office hours.

■ FT301D Tx/Rx HF 1.8MHz – 30MHz, mint condition, also matching FP30ID PSU solid state unit. Also FV301 matching VFO analogue, also FO301 monitor scope and two tone generator, also matching FC301 ATU. All the above in as new condition, inc all hand books etc. The complete line-up for only £750. First to see will buy, carriage or delivery by agreement. D Kitson, 5 Bott House Lane, Colne, Lancs. Tel: (0282) 867350 after 6.00pm.

■ Radcom article 84 4 band transceiver/2 bands, spare PCBs fitted for 2/3 other bands, odd components fitted, all eight crystals (need calibrat). SWL builder not able to get any further. At present needs full setting up, (not receiving) no equipment myself to do this. Will sell for £100+ ono or exchange for 2 mtr Tx/Rx, (SSB/FM) preferred, any age, or Rx HF/2mtr plus cash adj. R W Sharman, 58 Lancaster House, Oxford Street, Avenham, Preston, Lancs, PR1 3RY.

■ Hy-gain 18 AVT, 5 band vertical, good condx, £50. HF5 ground plane kit £20. Heathkit SB102 transceiver + spkr + P/S, good clean condx £200. 100W CTE linear 28-30 MHz as new, 240V ac £35. 24-28V dc 10A, Gesham P/S £15. BC906 frequency meter, in wooden case £8. SX27 VHF Rx 27-143MHz, works ok, but 100% with a pre-amp £25. Discone ant £8. AVO 2001 dig/multimeter + case, brand-new (I have AVO 8) £80. 3HP Rotavator as new £50. MM2001 RTTY to TV in box, perfect order £90. Hammarlund-HQ170 £180. Exchanges etc, I want a Racal frequency counter, to match RA17L. Also Belcom LS102L multimode Tx/Rx, or good gen/cov Rx. Tel: (0908) 314095.

■ Trio 7500 mint and boxed, a rare opportunity to acquire what Lowe Electronics described as probably the best two metre mobile ever made, complete with mike, bracket mounting and instruction book. £150.00 ono. Tel: Brighton (0273) 421211.

■ IC271E+ muTek front end Adonis 503 mic £600. Tokyo hi-power linear pre-amp 3 or 10W in, 160+ out £150. Coutant ex-comp PSU 13.8V 30A continuous £75 ono. Tuning unit APR-4 38-95MHz 300-1000MHz CW PSU £30. Complete package £800. G6YRT. Tel: Reading (0734) 596485 after 8pm, anytime weekends.

■ Circuit diagrams for a TV signal injector, an outstanding useful device for finding faults in TVs, full constructive data for building and operating. £1.70. Universal transistor/diode tester, full data to build and use this inexpensive device £1.75. Plans for mini transmitter output up to 5 watts 9 to 12V dc, frequency range approx 60MHz to 145MHz FM only. 15 components needed. Plans £1. Please include SAE. D Martin, 6 Downland Gardens, Epsom, Surrey KT18 5SJ.

■ FTV 107R complete with 2m module vgc, used for monitor only, boxed original package, manual included, £100 or nearest offer. Tel: (0294) 72803.

■ FRG 7 with add-on digital freq meter exc cond £140, reason for sale, upgrading. ZX81 computer with all leads and keyboard fitted £15 ono. George Jacob, 23 Waterloo Gdns, Penylan, Cardiff CF2 5AA. Tel: 487299.

■ Trio TR7010 2 MSSB Tx/Rx like new, in box, mobile mount etc. £90. KDK 2m FM 2.5W mobile, good working order £90. MMS2 talking Morse tutor £125. Would exchange either or both transceivers for general coverage receiver of similar value. Tel: Dave Northampton 36914.

■ Eddystone 730/4 receiver. RCA UHF signal generator 370 to 560MHz (110V). Hewlett Packard SWR indicator model 415B. BTH crystal set with original headphones cc1921/2. Swap WHY camera/and accessories. C Barnet, 58B High Street, Halstead, Essex CO9 2JG.

■ Yaesu FT207R 2m transcvr, NCZ charger/ac adapter, speaker mike, mag, mount,⅝ whip, nicads, case £150. Tel: (07072) 71524 Hatfield.

■ Radio amateur computer programs BBC disk based programs to locate world callsign Prefixes, countries, continents, zones etc. Also band plans, world local-times and locator programs all interactive and on BBC 40 track disk £6.75 inc P & P. Send to R Wilmot G4PEY, Retreat Cottages, Church Lane, Broadbridge Heath, Horsham, Sussex RH12 3ND. Tel: (0403) 69835 for details

■ Pair of Spendor BC2 monitor loud speakers. £200. Pair of BC2 stands £18. Quad electro-static speaker-bronze £175. Garrard 401 turntable. £40. Dual 10 band graphic equaliser. Professional £195. NRD NDH515 24ch memory unit. £125. Racal dual diversity unit. MA168B plus handbook £45. Sparkrite SX2000 electronic ignition unit. £20. AKG D509 mic £20. All carriage extra. B J Whitty, 'Fourways', Morris Lane, Halsall, Ormskirk, Lancs L39 8SX. Tel: (0704) 840328

■ FT101ZD FM mint cond £495. FC902 ATU £90. FTV 901R transverter with 2m module fitted £120. SP901 spkr £20, or £680 the lot. Also Sony ICF2001 gen cov rec with P/S £105. Tel: Maidstone (0622) 859129

■ Acorn Atom: Do you have one of these marvellous machines? £2.50 will buy my Ross software utility ROM. Also some Atom games free to a good home. A J Anderson, 44 The Spring, Market Lavington, Devizes, Wilts SN10 4EB.

■ Satellite TV system. Comprises 1.8 metre fibreglass dish tested at 4 and 12GHz plus tunable C-band LNC (3.6-4.3GHz 1.5dB noise figure plus indoor FM receiver (PLL) with tunable audio. Can be seen working on horizontal complete £450 or may split. Multistandard DX-TV receiver. Nordmende 22 inch remote control teletext PAL/SECAM. Digital tuning all VHF/UHF channels. Covers systems I/BG DK/L (all European standards). Scart plug for video/RGB etc, £400 as new. Also Teleton 14 inch mono TV with VHF/UHF tuning plus switchable 5.5/6MHz sound £50. Also Schrader tunable masthead UHF preamplifier £20. R J Crossley G6BEX Tel: (0582) 604767

■ Panasonic RF3100 LBE 31 bands synthesized receiver, new Sept 1984, cost £199 (now £219), am asking £140. Tel: Worthing 49978

■ SEM multi filter as new £25. Tel: Leeds 677101

■ BCC A14 HP man-pack Tx/Rx 2-8MHz VFO-Xtal 3-30W complete with ni-cads, handset, CW key, dipole, h/book etc, £90.00. WWII signal corps 1-177 valve tester with handbook/charts, 110V to 240V mains unit in working order £35.00. Tel: Swindon (0793) 813644 after 7pm

■ SX400 scanning receiver covers 26MHz to 520MHz, has data interface socket for computer and converter socket for extended coverage, had couple of hours use only, new boxed £489.00. Mr T Manning, 24 Croftdown Road, London NW5. Tel: (01) 485 4251

■ Creed 75 teleprinter, Redifon terminal unit type TT11 and isolation transformer £40. Marconiphone superhet radio type T19A, manufactured about 1935. Good working order, collectors item. Best offer around £40. Olivetti computer terminal, 600/1200 bands, type 349 some data, no means of testing so sold as seen £40. M Levers, 'Waverley', Independent Hill, Alfreton, Derby DE5 7DG

■ Collector's item: Ferguson 146 radio, excellent condition and excellent working order, SW, MW and LW band coverage, genuine offers. Please tel: Wargrave 2037. Buyer collects.

■ IC271E 2m multi-mode, two months old, unused, £575, with new matching PS15 £650, or would take in part exchange FT290R, TR9130, TR9000 or FT77. Also for sale FDK700AX, Mars model £135, postage extra. Mr Waters, 42 Tregundy Rd, Perranporth, Cornwall TR6 0EF

■ Uniden CR2021 comms receiver. 1.5-30MHz, as new. £120 or exchange for Signal R532 airband scanner or similar. Tel: Ware, Redhill, Surrey 66712

■ Receivers Eddystone 840C comm Rx 500KHz-30MHz with circuit diagram. £85. Codar CR70A comm Rx needs service but is in full working order £25. PSU 13.8V 5 amp £10, or £105 the lot. Tel: (654) 1361 (Croydon)

■ QQV03-40A/20A valve bases £1 each. Pye Airel changeover relays £1 each. Pye low band AM Cambridges could be converted to 4m £10 each. Advance PG5002D pulse generator £20. ITT UHF Starphone repeater, could be converted to 70cm £85. Mr S Ritson, Wragmire Cottage, Carleton, Carlisle, Cumbria CA4 0BT. Tel: Southwaite 439

■ Icom 1050 27MHz transceiver modified squelch £25. Pye 4 channel receiver low band £8. Class D wavemeter £5. Icom 1050 on ten metres portable with ni-cads and flexi aerial £35. RCA 813 with ceramic holder £18. Pye base tulip mike £3. American valve car radio £3. Tandy DTMF encoder built in die-cast box £10, 3 soldering irons £8. All items plus postage. McCarthy, tel: Ipswich 215047

■ Retired radio engineer selling up service sheets, manuals for valved radios. 790 includes 400 pre-war, also 200 valves, obsolete types, many new boxed inc types 1.4 volt, 2 volt, 4 volt, 6 volt, International and Mazda Octals; UX, equipment big AVO, AVO test bridge small megger, oscilloscope. Biddlecomb, 42 Drayton Rd, Portsmouth 0PO 2BX. Tel: (0705) 664753

■ Yaesu FRV7700D converter £58. Datong 2 metre converter complete with mains power unit converter £32. Global AT1000 aerial tuner, suitable any short wave receiver £30. All in good condition, complete with details, and post paid. F W Moore, 76 High Street, Ide, Exeter, Devon EX2 9RW. Letters only please

■ BC348M internal ac power pack. OK condition, offers, hundreds of valves. Pre-war octals, UX, 4 pin, 7 pin, British and American. SAE for lists please. A E Jeffrey, 42 Dennis Road, Padstow, Cornwall PL28 8DF

■ BC348M modded mains pack internal. Hundreds of valves all unused, American UX. Octal. 4 pin. British types, 5 pin. 7 pin. Pre war types SAE for lists please. A E Jeffrey, 42 Dennis Rd, Padstow, Cornwall PL28 8DF

■ BBC computer add ons. Viewsaset ROM etc as new £35 or exchange ultracalc. RGB wire frame monitor no case £85. Watford DFS ROM £15. Cheetam internal plug-in voice board £15. Disc drive 40 track with leads but no case £45. 27128 EPROM unused £9. Acorn Kenneth Kendal speech chips and sockets excellent unused £38. Tel: Harrogate (0423) 872045, Mr Graham

■ Quality gear for sale. Racal general coverage transmit receive system, comprising RA117E receiver as new and in wooden crate, MA79 drive unit in very good condition, RA218 SSB unit, TA940 100W linear amplifier and power supply etc, £950. Also for sale Redifon SDI synthesised drive unit, current price believed to be over £3,000, my price £300. Sony CRF320 receiver, cost £850, my price £395. Please tel: (0254) 823038 (Lancs)

FREE CLASSIFIED ADS

■ Amateur Radio – The Easy Way, Ham Radio course video £24. 1 Grice Close, Kessingland, Lowestoft

■ Ex-WD infra red binoculars with power pack and controls, some spares and instruction book, no lamps, £30 ono. M Brown, 15 Hamilton Row, Waterhouses, Co Durham DH7 9AU. Tel: Durham 731585

WANTED

■ SWL wants a modern digital general coverage receiver, no modifications fullest details, Vic, 5 Egremont Road, Exmouth, Devon EX8 1RX.

■ Wanted by collector, complete T1154/R1155 rig as featured in *Amateur Radio* January issue, or any separate units, in particular the receiver, your price paid, will collect. Contact Paul, 194 Perth Street West, Hull. Tel: (0482) 445107.

■ Any information or mod circuits for a Lafayette HF40 communications Rx, also all expenses paid for a photocopy or original circuit diagram of this receiver. This Rx is a 4 valve type. John Vernon, 21 Crossbank Close, Lowsight, Manchester.

■ Have Fortop TVT435 TV Tx, and MM receive converter. Would exchange for good 2m, multimode Tx, ie 290R or similar. When writing please include tel no if any. Mr David Bird GI4XIR, 198 Ashmount Gardens, Hillhall Estate, Lisburn BT27 5DB.

■ Army radio WS11, power units, carrier, connectors, control boxes, in restorable condition, £60 offered for radio, more for complete set. Warner, 45 Eastry Close, Ashford, Kent TN23 2RI. Tel: (0233) 36185.

■ Wanted two metre transverter capable of taking 10 watts input. Home brew would be OK, but must be cheap. Tel: (0723) 366360.

■ Pye Pocketfone 70 (PF2) or Burndept 470/471 in good working order on VHF. Low band to be converted. Good prices paid. Mr M Jones, PO Box 4, West-Derby, Liverpool L14 4DH.

■ Murphy type 618 HF Tx AP100333 and power unit AP100336. Also Marconi Kestrel Tx and any other Marconi marine gear. G4FUY QTHr. Tel: (0734) 733633.

■ Nato 2000 must be in perfect condition. Also FT7[B] or FRG7700 or EC10 Eddystone urgently wanted. Belcom LS102L, cash waiting. Will the radio ham from Hebbon-on-Tyne tel: (0283) 221870.

■ Transmitter monitor oscilloscope. Any information on circuit for signal corps radio transmitter BC625A (100-160MHz) valve linear amplifier. R Lucking G1IIU, 62 Ember Farm Way, East Molesey, Surrey KT8 0BL. Tel: 01 398 3603.

■ *Ham Radio Today* required by collector. The following issues are required; Jan 83, Aug 83, Sept 83, Nov 83, Dec 83, June 84. Also wanted the first issue of *Amateur Radio*. I will pay your price. G1IMR (T Smith). Tel: (0326) 280470.

■ Storno type car hand-set. Tel: (0245) 400760.

■ Service and operating manual for IC290E 2 metre all mode transceiver, to buy, will pay p+p also. J H Clifton, 21 Park Road, Hilton Estate, Featherstone, Wolverhampton, WV10 7HS. Tel: (0902) 735043.

■ Trio R820 receiver must be in A1 condition. Price and details please, all letters answered. Mr J P Wright, 12 Norn Hill, Basingstoke, Hants, RG21 2HD. Tel: (0256) 468649.

■ Wanted postwar American receivers, AR88 Hallicrafter, HRO, or Collins. Also Realistic DX300. Waldock, 'Barden', Moorgate Grove, Rotherham, S Yorks. Tel: (0709) 63232. Any time.

■ Exchange my FT757GX plus HD PSU plus auto ATU for FT902DM plus matching speaker and matching ATU plus FRG7700 receiver. Bob. Tel: (0268) 697906.

■ Television servicing Vol 2 by G N Patchett, Norman Price (publishers) Ltd. Reasonable price paid for good clean copy inc postage and package. Tel: Bob, 01 764 0951.

■ FT707 transceiver. Tel: (0563) 34383.

■ Wanted circuit diagram for WKS1001, will pay reasonable price, also postage. Please contact Mr Martin Fuller, 37 Green Field Close, Eccles, Nr Maidstone, Kent. Tel: Maidstone 70485.

■ Two meter multimode mobile. IC290, TR9000, FT480. Must be good condition and reasonable price. I D Porter, G1DHV. Tel: (0902) 50890.

■ Cassette recording of SSTV audio signals off the air or from SSTV converter for testing out homebrew send and receive SSTV converter. Stan G3XON, 14 Dagden Road, Shalford, Guildford, Surrey, GU4 8DD. Tel: Guildford 36953.

■ Yaesu FT290R multimode. Chris Smith, 35 Allendale Road, Earley, Reading, Berks, RG6 2PD. Tel: Reading 661075 (eve), 875123 ext 6207 (day).

■ Yaesu FT101ZD MKIII plus FC902ATU. Both items must be in excellent condition. Will pay up to £500. Must be prepared to send both items to Scotland. Prepared to pay carriage fee. Tel: Midcalder 880345.

■ Any information on RTTY or AMTOR using Tandy TRS80 Model 1 48K computer with RS232, disk drives and printer. Porter, 47 Milford Avenue, Wick, Bristol, BS15 5PP. Tel: Abson 2641.

■ DNT 10m FM Tx/Rx with repeater, £30.00. Tel: St Albans 39333.

■ Panel working or not for Marconi TF1330 scope or complete unit in any condition. Service/instruction manual for Cossor 1035 MK2A scope will buy or hire to copy or swap for pre-war radio gear. A Keys, Mill Lane Farm, South Somercotes, Louth, Lincs.

■ Exchange 2m SSB for 70cm FM, in other words I'll exchange a TR9130 for a TW4000A. Also want TS780. David Rickwood G6UDM. Tel: (0902) 783338.

■ National Panasonic DR48 digital general coverage receiver. Also Yaesu YK901 keyboard to go with YR901 CW RTTY reader. Tel: 394336 (Colchester, Essex).

■ TS780 225RD + 70cm multimode. Tel: Reading (0734) 596485 after 8pm, anytime weekends.

■ Is there a licensed amateur reading this who might enjoy writing to an RAE student? I am seventeen and need a friend who can respond to my inquisitive nature! I am not looking for a cheap alternative to a proper course and I am genuinely interested in all aspects of radio. Please write for more details (all letters will be answered). Jonathan Baker, Victoria Cottage, 67 East Street, Selsey, West Sussex, PO20 0BT.

FREE CLASSIFIED AD FORM

Send to: Amateur Radio Classified Ads · Sovereign House · Brentwood · Essex CM14 4SE

Classification: (tick appropriate box) If you want to insert ads under more than one classification use separate sheets for second and subsequent ads

For Sale ..... ☐ Wanted ..... ☐

USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone							

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

CONDITIONS: Ads will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted

Amateur RADIO SMALL ADS

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Marine Radio also Bought and Sold.

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for
RTTY — MORSE — AMTOR

PL1 RTTY mod/demod	£14.50k	£18.50a
MF1 Morse demod	£12. 50k	£18.50a
FP1 Power supply/amp	£11. 50k	£14.50a

a = assembled PCB, k = kit of parts. Software available for — Dragon VIC20 CBM 64 BBC Amstrad CPC464 Acorn ATOM. Please ADD VAT at the current rate.

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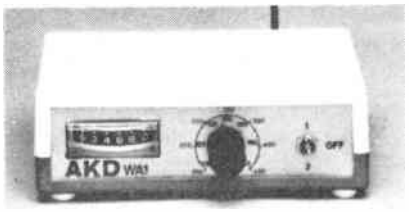
Covers 120-450 MHz. Extremely sensitive. Low-profile. Requires PP3 battery **£24.95**



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NEXT ISSUE OF Amateur RADIO ON SALE Thursday 25th April

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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 £7.00, 3 — £6.60, 6 — £6.30, 12 — £5.60.

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Telephone (0534) 81392

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A pre machined cavity to make a 10GHz wavemeter using your micrometer. Can be fixed direct to your wave guide.

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Pinehurst Data Studios, 60 Pinehurst Park, West Moors Wimborne, Dorset BH22 0BP.

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Cheques should be made payable to Radio & Electronics World. Overseas payment by International Money Order, or credit card.

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Signature .....

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

ABC membership approved pending first audit Jan-Dec 1985

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	⅛ page	£86.00	£82.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

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	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

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 & small ad	mono artwork	on sale thurs
May 85	28 Mar 85	3 Apr 85	4 Apr 85*	25 Apr 85
Jun 85	25 Apr 85	1 May 85	3 May 85	23 May 85
Jul 85	30 May 85	5 Jun 85	7 Jun 85	27 Jun 85
Aug 85	27 Jun 85	3 Jul 85	5 Jul 85	25 Jul 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 the publication date.
Overseas payments by International Money Order or credit card.
FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Commission to approved advertising agencies is 10%.
CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

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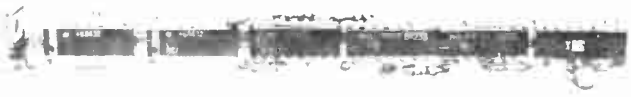
This is a complete modification board designed to fit all CB radios that incorporate the SANYO LC7137 series of sythesizer chip, the unit comprises of a small pcb with six microchips and fits almost all current legal (CB 27/81) radios, the unit is supplied with full fitting instructions and can be fitted easily by most enthusiasts, with the current upserge in interest in this band demand has been high as this means that over 90% of current CB radios can now be used on 10mtr amateur band.

PRICE £22.50 + £1.00 post and packing



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A complete range of linear and fm amplifiers for use with both VHF and UHF hand portables and multimode portables such as the YAESU FT290R and FT790R. Power output from 15W to 45W depending on model, (eight are available). All units feature Mitsubishi or Toshiba power modules as used in the majority of mobile and base radio transceivers. Two versions are also available for business radio applications.

PRICE from £39.50 for the 15W vhf model + £2.00 post

A.R.M. MULTI P6 ANTENNA

This is one of the most exciting new products to be launched by RWC and is the result of many months of development by Antenna Research Manufacture based in Devon.
The antenna has been designed to meet the growing popularity in multimode portable and mobile operation and is capable of being used on both vhf and uhf in both horizontal and vertical polorization modes, both portable and mobile. The antenna has the facility of being used as both omni-directional or directional modes as well as having capability of DF function. No ground-plane or radials are required and the antenna can therefore be used in a variety of applications on frequencies between 140-450 mhz. ★ See review in March Amateur Radio.
Further details are available upon application
PRICE £29.50 + £2.50 carriage

LOWE TX40G on 10 METRES

RWC are pleased to offer this very fine radio modified on 10 metres complete with repeater shift built-in. The unit has all of the features remaining except the high/low switch now controls the offset.
This high quality Japanese made unit hs RF gain control, RIT, P.A. facility, and has a very sensitive receiver, along with >4W RF output power, and typical deviation of 4Khz.
The unit comes complete with mobile mount, and is guaranteed for six months. This unit has the RWC mod board unit fitted and represents excellant value for money as this radio still sells for £33.00 on 27mhz.

PRICE £49.50 + £2.50 carriage (price subject to increase when existing stocks are sold)

RWC also stock a comprehensive range of matching linears and antennas specifically designated for 10mtr operation.

COMING VERY SOON . . .

RWC WAVEMETER,
RWC PHASING HARNESS,
RWC DUAL BAND BASE ANTENNA (VHF-UHF)

ANNOUNCING THE SUPER YAESU FT757GX

Following the release of the RWC 10mtr MOD BOARD for the SANYO LC7136/7 series of cb sythesizer chip, and its successful launch onto the UK amateur radio market, the RWC design team are now ready to announce their latest innovation.

This new product is aimed at the world market and is a mofication for the popular YAESU FT757GX.

After over six months of development by our design team led by G3SBI, with G8FBX and G4KZH, and successful field trials, the modification has been perfected to enable installation by the end user.

The modification serves two major purposes:

(1) To improve VFO tuning and eliminate "VCO GLITCH"
(2) To increase tuning speed from 5khz per dial revolution to 50khz per dial revolution (selectable on the 500khz step switch).

BRIEF DESCRIPTION

The unit comprises of a small pcb designed to fit onto the existing microprocessor (Q67) and has two microchips and some small components and only eight connections, three of which are connected to three of the micro pins direct. The other five wires easily connect to existing terminals on the main pcb, and also the display board. The modification can easily be installed by experienced constructors and will be available from selected dealers who will be able to offer a fitting service.

Each mod board will be supplied complete and tested (as per the RWC 10mtr. mod board) no kits of parts will be available. Registered design pending.

PRICES

UK price is £29.50 for the built and tested pcb with complete fitting instructions and £39.50 plus carriage for a unit factory fitted and tested. User warranty will not be affected on units supplied by RWC. All prices include value added tax at the current 15%. Export enquiries are welcomed.

All the above products have been designed and built in the UK and are exclusively available from:

R WITHERS COMMUNICATIONS LTD
584 Hagley Road West, Oldbury, Warley B68 0BS
Tel: 021 421 8201 (PBX) Telex: 334303 G

DEALER AND EXPORT ENQUIRIES ARE WELCOME

DEWSBURY ELECTRONICS

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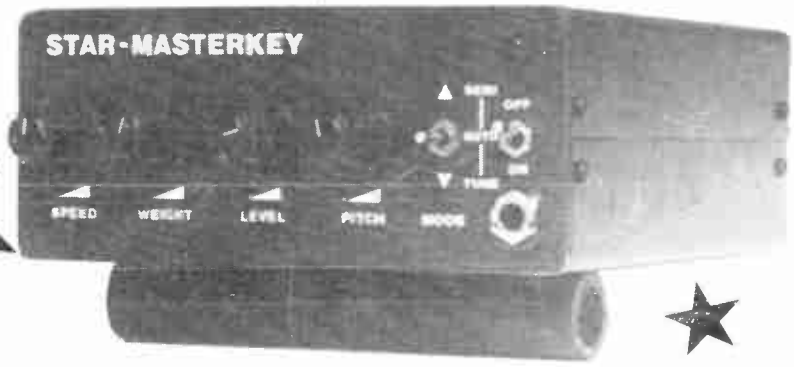

THE NEW ELECTRONIC KEYER STAR – MASTERKEY

The STAR-MASTERKEY has been designed with both the established CW operator and the newcomer in mind.

Featuring full IAMBIC keying, together with the facility for SEMI-AUTOMATIC keying, the STAR MASTERKEY has DASH/DOT memories, SPEED ranges from 1-55 WPM, and the facility to allow the user to select either POSITIVE OR NEGATIVE keying, thus suiting both the latest transistorised transmitters and the valved transceivers.

The built in SIDETONE OSCILLATOR and LOUDSPEAKER offer the facility of monitoring the generated morse code. For practice purposes a HEADPHONE socket has been provided on the rear panel.

Power may be derived from a user supplied 9 volt battery (internally mounted) or from a 6-15 volt DC external power supply, making the KEYER ideal for shack or field day and portable use.

The STAR-MASTERKEY is attractively packaged in a custom designed black vinyl covered steel enclosure with screen printed, anodised aluminium front panel.

The STAR-MASTERKEY has been BRITISH built in response to the soaring cost of imported equipment, and is fully guaranteed for a period of five years.

The STAR-MASTERKEY is available, complete with DC power lead and all necessary plugs from DEWSBURY ELECTRONICS and other discerning dealers for only £49.95 including VAT.
Available by mail order Post and Packing £3.00.
Suitable mains power supply £10.00 P&P £1.50 Paddles available for the above from £15.00.

Dewsbury Electronics offer a full range of **Trio Equipment** always in stock

We are also stockists of DAIWA – MET ANTENNAS – MUTEK – WOOD & DOUGLAS – TASCO TELEREADERS – MICROWAVE MODULES – IC's AMTOR – AEA PRODUCTS – DRAE

Dewsbury Electronics, 176 Lower High Street, Stourbridge, West Midlands
Telephone: Stourbridge (0384) 390063/371228
Telex: 337675 TELPES G

VISA

Access

Instant finance available subject to status. Written details on request.