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Amateur RADIO

For all two-way radio enthusiasts

Icom IC48E reviewed

50MHz – what to expect

The project book

Countermeasures

On test: Trio R5000 general coverage receiver

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YAESU FRG9600/RWC MK3 HF-UHF SERIES

After many months of research and development RWC LTD are pleased to announce their latest HF modification for the Yaesu FRG9600 which now includes LF/HF/VHF/UHF coverage from 100kHz to 950MHz and improved 'S' Meter and a typical receiver *sensitivity now >2μV pD HF, >1.5μV 60-950MHz all @ 12dB SINAD. (Please contact us for detailed specifications).

We have fitted a High performance HF Front-End made for us by AKD. The new HF section **is fitted internally** with switching circuits and a small toggle Switch on the rear apron to enable band change whereby the display changes to read actual frequency (100kHz-60MHz). The standard SO239 antenna connector has now been changed for an 'N' connector for coverage from 60-950MHz and an SO239 connector fitted for HF coverage 100kHz-60MHz. (UHF extended coverage is now standard as per our original MK2 modification up to 950MHz).

As an 'N' connector is now fitted to all RWC FRG9600s for VHF-UHF coverage it is possible to use a wide-band discone antenna such as the ICOM AH7000 which is supplied with low-loss coaxial cable and 'N' connectors. A dipole or long-wire antenna can be used for HF coverage with very good results. **This facilitates use of two antennas for all bands.**

All modifications are Fully Guaranteed for twelve months from date of purchase/modification providing our modifications seals are unbroken.

* We reserve the right to change specifications due to continuous development and modification of this product.

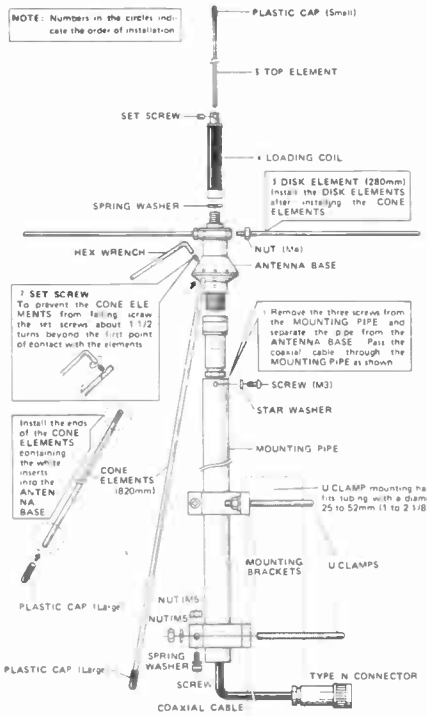
FRG9600/RWC MK3

AM-FM (WIDE & NARROW) LSB, USB. 100kHz-950MHz

Generous part exchange available on your existing receiver *(call for details)*
FRG9600 MK2 Model 60-950MHz 'N' connector @ £519.00 + £5.00 carriage. (Modified unit only).
FRG9600 MK3 Model 100kHz-950MHz 'N' connector and SO239 for HF @ £625.00 + £5.00 carriage. (Modified unit only).
RWC Exclusive Base Station Complete HF-UHF Package FRG9600 MK3 Model, Icom AH7000 ant, G5RV HF multiband, PA4C ac-13V dc adaptor, inclusive carriage UK £725.00.

ICOM AH-7000

SUPER WIDEBAND OMNIDIRECTIONAL ANTENNA



SPECIFICATIONS

Frequency coverage	Receive	25 to 1300MHz
	Transmit	50 144 430 900 1200MHz bands
Input power rating		200 watts
Input impedance		50 ohms
Supplied connectors		Type N
Supplied coaxial cable		5D-2V (50 ohm)
Type of antenna		Discone
Length		1.7 meters
Weight		1kg

Icom AH7000 @ £82.50 (inc free carriage UK mainland).

YAESU/RWC FRG9600 Options

PA4C ac adaptor £16.50 inc post.
FIF232C RS232 computer interface @ £75.00 inc post.
Raycom GP900 900-950MHz 3dB, base station ant @ £22.00 inc post.
AM-FM wide & narrow IF filters POA.
RWC 9600 MK2 owners HF mod @ £99.00 inc carriage (send unit).
FRG9600 existing owners HF & UHF mod – 100kHz-950MHz. Send unit carriage paid @ £129.00.
YAESU FRG9600 Service Manual (inc Cat Prog) @ £12.50 inc post.
Raycom VHF-UHF Discone 60-600MHz SO239 connector @ £27.50 inc carriage.
RWC Modified Video Unit. 6.00MHz IF video (modified from NTSC) @ £27.50 inc post.

EXPORT & TRADE ENQUIRIES INVITED.

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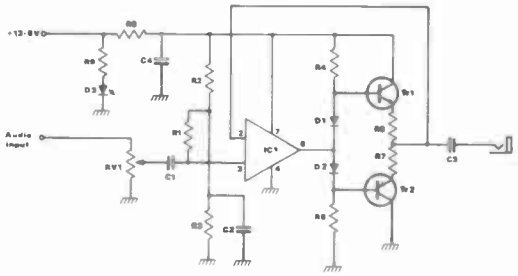

SERVICES

We regret to inform readers that due to constantly rising production costs, and to enable us to maintain the high standard of content in ***Amateur Radio,*** the price of the magazine will be £1.40 from this issue.

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AN239	2.50	MC1358	1.58	STK463	11.50	TBA810P	1.65	TDA2593	2.95		
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LA4430	2.50	SL1327Q	1.10	TAA570	1.95	TDA1190	1.95	UPC1167C2			
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LA4461	3.95	SN76023N	3.95	TBA120AS/B/C	1.00	TDA2002	1.70		1.25		
LC7120	3.25	SN76033N	3.95	TBA395	1.50	TDA2003	2.95	UPC1182H			
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LM380N8	1.75	SN76533N	1.65	TBA520Q	1.10	TDA2521	3.25	UPC1353C			
LM383T	2.95	SN76544N	2.65	TBA530	1.10	TDA2522	1.95		2.45		
LM390N	3.50	SN76650N	1.15	TBA530Q	1.10	TDA2523	2.95	UPC1365C			
M51513L	2.30	SN76660N	0.90	TBA540	1.25	TDA2524	1.95		3.95		
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MB3756	2.50	STK078	11.95	TBA560Q	1.45	TDA2541	2.15	556	0.65		
MC1307P	1.00	STK085	8.95	TBA570	1.00	TDA2560	2.15	723	0.50		
MC1310P	1.95	STK415	7.95	TBA651R	2.50	TDA2571	2.95	741	0.35		
MC1327	1.70	STK433	5.95	TBA720A	2.45			747	0.50		
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								7812	0.65		
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CV2185	15.00	D16-100GH/79	69.00	M31-182GR	55.00	V6048J	49.00
CV2191	19.00	D16-100GH97	55.00	M31-182GV	53.00	V6052GR	65.00
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AC128	0.28	BC213	0.09	BD701	1.25	BRY39	0.45	TIP33C	0.95		
AC128K	0.32	BC213L	0.09	BD702	1.25	BT100A/02	0.85	TIP34B	0.95		
AC141	0.28	BC214	0.09	BD707	0.90	BT106	1.49	TIP41A	0.45		
AC141K	0.34	BC214C	0.09	BDX32	1.50	BT116	1.20	TIP41C	0.45		
AC142K	0.45	BC214L	0.09	BF115	0.35	BT119	3.15	TIP42C	0.47		
AC176	0.22	BC237B	0.09	BF119	0.65	BT120	1.65	TIP47	0.65		
AC176K	0.31	BC238	0.09	BF127	0.39	BU105	1.95	TIP120	0.60		
AC187	0.25	BC239	0.12	BF154	0.20	BU108	1.69	TIP125	0.65		
AC187K	0.28	BC251A	0.12	BF158	0.22	BU124	1.25	TIP142	1.75		
AC188	0.25	BC252A	0.15	BF160	0.27	BU125	1.25	TIP146	2.75		
AC188K	0.37	BC258	0.25	BF167	0.27	BU126	1.60	TIP161	2.95		
AD149	0.70	BC258A	0.39	BF173	0.22	BU204	1.55	TIP2955	0.80		
AD161	0.39	BC284	0.30	BF177	0.38	BU205	1.30	TIP3055	0.55		
AD162	0.39	BC300	0.30	BF178	0.26	BU208	1.39	TIS91	0.20		
AD161/2	0.90	BC301	0.30	BF179	0.34	BU208A	1.52	TV106/2	1.60		
AF106	0.50	BC303	0.26	BF180	0.29	BU208D	1.85	ZRF0112	16.50		
AF114	1.95	BC307B	0.09	BF181	0.29	BU326	1.20	2N1100	6.50		
AF121	0.60	BC327	0.10	BF182	0.29	BU326S	1.50	2N1308	1.35		
AF124	0.65	BC328	0.10	BF183	0.29	BU407	1.24	2N1711	0.30		
AF125	0.35	BC337	0.10	BF184	0.28	BU500	2.25	2N2219	0.28		
AF126	0.32	BC338	0.09	BF185	0.28	BU508A	1.95	2N2905	0.40		
AF127	0.65	BC347A	0.13	BF194	0.11	BU526	1.90	2N3053	0.40		
AF139	0.40	BC461	0.35	BF195	0.11	BU807	2.25	2N3054	0.59		
AF150	0.60	BC478	0.20	BF196	0.11	BUY20	2.15	2N3055	0.52		
AF178	1.95	BC527	0.20	BF197	0.11	BUY69B	1.70	2N3702	0.12		
AF239	0.42	BC547	0.10	BF198	0.16	MJ3000	1.98	2N3703	0.12		
AU106	6.95	BC548	0.10	BF199	0.14	MJE340	0.40	2N3704	0.12		
AY102	2.95	BC549A	0.10	BF200	0.40	MJE350		2N3705	0.20		
BC107A	0.11	BC550	0.14	BF241	0.15	MJE520	0.48	2N3706	0.12		
BC107B	0.11	BC557	0.08	BF245	0.30	MJE2955		2N3708	0.12		
BC108	0.10	BC557B	0.08	BF257	0.28	MPSA13	0.29	2N3733	9.50		
BC108B	0.12	BC558	0.10	BF258	0.28	MPSA92	0.30	2N3773	2.75		
BC109	0.10	BC639/10	0.30	BF259	0.28	MRF237	4.95	2N3792	1.35		
BC109B	0.12	BCY33A	1.60	BF271	0.26	MRF450A		2N4280	3.50		
BC109C	0.12	BD115	0.30	BF273	0.18		13.95	2N4427	1.95		
BC114A	0.09	BD124P	0.59	BF336	0.34	MRF453	17.50	2N4444	1.15		
BC116A	0.15	BD131	0.42	BF337	0.29	MRF454	26.50	2N5294	0.42		
BC117	0.19	BD132	0.42	BF338	0.32	MRF455	17.50	2N5296	0.48		
BC119	0.24	BD133	0.40	BF355	0.37	MRF475	2.95	2N5298	0.60		
BC125	0.25	BD135	0.30	BF362	0.38	MRF477	14.95	2N5485	0.45		
BC139	0.20	BD136	0.30	BF363	0.65	OC16W	1.95	2N5496	0.95		
BC140	0.31	BD137	0.32	BF371	0.25	OC23	9.50	2SA329	0.95		
BC141	0.25	BD138	0.30	BF394	0.19	OC25	1.50	2SA715	0.60		
BC142	0.21	BD139	0.32	BF422	0.32	OC26	1.50	2SC495	0.80		
BC143	0.24	BD140	0.30	BF423	0.25	OC28	5.50	2SC496	0.80		
BC147B	0.12	BD144	1.10	BF457	0.32	OC29	4.50	2SC931D	0.95		
BC148A	0.09	BD150C	0.29	BF458	0.36	OC32	5.50	2SC1096	0.80		
BC148B	0.09	BD159	0.65	BF467	0.68	OC42	1.50	2SC1106	2.50		
BC149	0.09	BD160	1.50	BF595	0.23	OC44	1.25	2SC1172Y	2.20		
BC153	0.30	BD166	0.95	BF597	0.25	OC45	1.00	2SC1173	1.15		
BC157	0.12	BD179	0.72	BFR39	0.23	OC70	1.00	2SC1307	1.75		
BC158	0.09	BD182	0.70	BFR40	0.23	OC71	0.75	2SC1364	0.50		
BC159	0.09	BD201	0.83	BFR81	0.25	OC72	2.50	2SC1449	0.50		
BC161	0.28	BD202	0.65	BFR88	0.30	OC75	1.50	2SC1678	1.25		
BC170B	0.15	BD203	0.78	BFR90	1.50	OC81	1.00	2SC1945	3.75		
BC171	0.09	BD204	0.70	BFR91	1.75	OC84	1.50	2SC1953	0.95		
BC171A	0.10	BD222	0.46	BFT42	0.35	OC16W	2.50	2SC1957	0.80		
BC171B	0.10	BD223	0.59	BFT43	0.35	OC139	12.50	2SC1969	1.95		
BC172	0.10	BD225	0.48	BFW61	0.80	OC171	4.50	2SC2028	1.15		
BC172B	0.10	BC232	0.35	BFW92	0.85	OC200	4.50	2SC2029	1.95		
BC172C	0.10	BO233	0.35	BFX29	0.30	OC201	£5.50	2SC2078	1.45		
BC173B	0.10	BD234	0.35	BFX84	0.26	OC205	10.00	2SC2091	0.85		
BC174A	0.09	BD236	0.49	BFX85	0.32	R2008B	1.45	2SC2098	2.95		
BC177	0.15	BD237	0.40	BFX86	0.30	R2010B	1.45	2SC2166	1.95		
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BC182	0.10	BD242	0.65	BFY50	0.21	R2323	0.66	2SC2371	0.36		
BC182LB	0.10	BD246	0.75	BFY51	0.21	R2540	2.48	2SC931D	0.95		
BC183	0.10	BO376	0.32	BFY52	0.25	RCA16334	0.90	1SD234	0.50		
BC183L	0.09	BD410	0.65	BFY90	0.77	RCA16335	0.80	2SD325E	1.65		
BC184LB	0.09	BD434	0.65	BLY48	1.75	S2060D	0.95	3SK88	0.95		
BC204	0.10	BD437	0.75	BR100	0.26	SKE5F	1.45				
BC207B	0.13	BD438	0.75	BR101	0.49	TIP29	0.40				
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BAX16	0.12		0.60	IN4007	0.08
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BT151	0.79	BYX71-600	1.75	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
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VA1104	0.70
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DH77	0.90
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DH149	2.00
DK91	0.90
DK92	1.20
DL35	2.50
DL63	1.00
DL70	2.50
DL73	2.50
DL91	1.50
DL92	0.95
DL93	1.10
DL94	2.50
DL96	2.50
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EB34	1.50
EB41	3.95
EB91	0.85
EBC33	2.50
EBC41	1.95
EBC81	1.50
EBC90	0.90
EBC91	0.90
EB91	0.60
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	5.50
EC92	1.95
EC93	1.50
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ECC84	0.50
ECC85	0.75
ECC86	2.75
ECC88	0.95
ECC91	2.00
ECC180	0.72
ECC189	1.95
ECC801S	3.50
ECC803S	4.95
ECC804	0.60
ECC2000	12.00
ECF80	1.15
ECF82	1.15
ECF86	2.25
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	3.50
ECH42	1.50
ECH81	1.00
ECH83	1.00
ECH84	1.00
ECH2000	1.50
ECL80	0.60
ECL82	0.79
ECL81	0.55
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.95
ECL805	0.69
EF22	2.50
EF37A	2.50
EF39	1.50
EF40	4.50
EF42	3.50
EF50	2.50
EF55	4.95
EF70	1.20
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.95
EF85	0.50
EF86	2.25
EF86 Mullard	4.50
EF89	1.50
EF91	1.95
EF92	2.15
EF93	0.95
EF94	0.95
EF95	1.95
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
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EF800	11.00
EF805S	13.50
EF812	0.65
EFL200	1.50
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EL32	0.95
EL33	5.00
EL34	2.50
EL34 Mullard/Phillips	4.50
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EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL83	7.50
EL84	0.95
EL85	4.50
EL86	1.25
EL90	2.15
EL91	6.00
EL95	1.75
EL153	12.15
EL95	1.75
EL153	12.15
EL183E	3.50
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EL500	1.40
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EL509	5.25
EL519	6.95
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EY91	5.50
EY500A	1.50
EY802	0.70
EZ35	0.75
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EZ41	2.15
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GTR150W	1.00
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GXU50SS	14.50
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GY802	1.50
GZ30	1.50
GZ31	1.50
GZ32	1.50
GZ33	4.50
GZ34	2.15
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HABC80	0.90
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HBC91	0.80
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KT61	8.00
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M5143	155.00
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M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	7.95
M8161	6.50
M8162	5.50
M8163	5.60
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
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ME1401	29.50
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N37	12.50
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OA2WA	2.50
OA3	2.50
OB2	0.85
OB2WA	2.50
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65
PCF82	0.60
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL800	0.80
PCL805	0.90
PD500	3.50
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PL36	1.75
PL38	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	2.95
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PL5727	2.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
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QP25	1.00
QQEO2/5	19.50
QQEO3-12	7.95
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QQVO7-50	63.50
QQZO3-20	42.50
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QS92/1D	6.00
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	3.15
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50
QU37	11.50
QVO3-12	4.95
QVO5-25	2.50
QVO6-20	29.50
QV2-250C	45.00
QVO8-100	145.00
QY3-125	65.00
QY4-250	70.00
QY4-400	76.00
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1-125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	35.00
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/600	5.00
SC1/1100	6.00
SC1/1200	5.00
SC1/1300	6.00
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SD6000M	45.00
SP4B	4.95
SP41	5.00
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ST11	1.50
STV280/40	11.95
STV280/80	19.95
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TB2 5/300	85.00
TB2-300	45.00
TB3 2000	395.00
TBL-2-300	276.00
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TD03 10E	40.00
TD03 10	35.00
TD03 10D	40.00
TD03 10F	40.00
TD1-100A	25.00
TD3-12	4.00
TP25	1.50
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TT21	45.00
TT22	45.00
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TTR-31MR	65.00
TY2-125A	85.00
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U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	2.25
UBC81	1.50
UBF89	1.00
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	2.50
UCH42	2.50
UCH81	1.00
UCL82	1.75
UCL83	2.50
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.00
UL84	1.50
UL41	5.50
UL44	3.50
UL84	0.85
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UU7	8.00
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1A3	4.50
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1B35A	45.00
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1K3GT	2.50
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1N5GT	2.50
1P28	25.00
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1S5	0.70
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1U5	1.00
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2AS15A	11.50
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2C39BA	39.50
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3A4	1.10
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3AU6	0.65
3B2	3.00
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3B7	4.50
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3B26	24.00
3B28	12.00
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3C4	2.50
3C45	24.00
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3CS6	0.95
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5Z4GT	1.50
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6AG5	1.50
6AG7	1.95
6AH6	2.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.95
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6AQ8	0.85
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6AT6	0.75
6AT8	1.75
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6AU6	0.95
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6BA7	4.50
6BA8A	3.50
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6BE6	0.95
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.50
6BK4	4.00
6BK7A	1.95
6BL8	1.15
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	3.95
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	1.15
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6BZ6	2.50
6BZ7	2.95
6C4	1.25
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C18	2.50
6CA4	4.95
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6CB5	3.95
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6CG7	2.25
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6EM5	2.50
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6EU7	£1.95
6EU8	1.75
6EV7	2.95
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6EW6	1.50
6F1	2.00
6F5	4.95
6F7	5.50
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	17.00
6FH8	12.50
6G6G	5.50
6GH8A	0.80
6GK5	1.50
6GK6	1.95
6GM6	0.95
6GS7	2.15
6GV7	2.50
6GW8	0.80
6H1	9.50
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6HF5	5.50
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6J4WA	3.15
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6J6	2.05
6JB6A	3.95
6JE6C	6.50
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6JS6C	6.50
6JU8	2.50
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6LF6	7.50
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6MJ6	4.95
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6N7GT	2.50
6P15	1.50
6P25	4.00
6P26	4.00
6P28	2.00
6Q7	1.75
6Q7GT	1.20
6R7G	3.15
6S4A	1.50
6SA7GT	1.35
6SC7	1.50
6SG7	2.50
6SH7	1.35
6SJ7GT	1.35
6SK7	1.35
6SK7GT	1.35
6SL7GT	0.85
6SN7GT	1.35
6SQ7	1.35
6SS7	1.95
6U4GT	1.75
6U8	1.15
6U8A	1.50
6V6GT	1.50
6X2N	1.00
6X4	1.50
6X5GT	1.00
6X5GTY	1.00
6X8A	2.25
7A6	4.50
7A7	2.00
7AD7	1.75
7AU7	1.50
7B6	3.50
7B7	2.50
7C6	2.50
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7J7	8.50
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10GK6	1.95
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10P18	0.70
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11E3	55.00
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12AG8	1.50
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12AT6	1.25
12AT7	1.15
12AT7WA	2.50
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12AZ7A	1.95
12B4A	4.50
12BA6	1.50
12BE6	1.95
12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CA5	1.95
12CX6	1.20
12DQ6B	3.50
12DW4A	3.50
12DW7	2.50
12E1	17.95
12E14	38.00
12GN7	4.50
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12K7GT	1.50
12K8	1.95
12SA7GT	1.95
12SG7	4.75
12SH7	1.95
12SK7	1.95
12SJ7	1.50
12SN7GT	1.85
12SQ7GT	1.95
13D3	3.20
13D7	3.20
13D7	2.50
13D9	3.20
13DR7	2.95
13EI	145.00
13EM7	3.50
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17EW8	0.95
17DW4	2.50
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17JZ8	4.50
18D3	6.00
19AQ5	3.50
19AU4GT	2.50
19G3	17.00
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
20P5	1.15
21JZ6	3.15
21LU8	3.75
24B1	39.50
24B9	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
29KQ6	6.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95
30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
31JS6A	5.50
33A/158M	19.50
35A5	4.50
35L8GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
42	6.95
47	6.00
50A5	1.50
50C5	0.95
50CD6G	1.15
50EH5	1.50
52KU	2.00
53CG	15.00
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60JY6	2.98
61SPT	4.50
75B1	3.50
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83	8.50
83AI	9.00
84	3.00
85A1	6.50
85A2	2.50
90AV	15.00
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92AV	15.00
95A1	6.50
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150B2	6.50
150C2	2.50
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185T	1.50
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572B	55.00
5636	1.50
6146A	7.50
6158	3.20
6386	14.50
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7703	395.00
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805	39.00
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811A	15.00
813	27.60
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829B	14.50
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884	5.50
927	15.00
930	9.95
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958A	1.00
1299A	0.60
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5642	9.50
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5654	1.95
5663	1.95
5670	3.25
5672	4.50
5687	4.50
5692	3.50
5696	4.50
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
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5763	4.95
5814A	3.25
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5842	11.00
5847	10.95
5879	5.00
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5899	4.50
5963	2.00
5965	2.25
6005	1.85
6012	16.00
6021	3.65
6057	3.75
6058	3.95
6060	2.25
6062	4.50
6063	2.00
6064	2.95
6067	7.00
6072	4.20
6080	7.95
6132	10.00
6146B	9.50
6688	6.50
6887	9.50
6080	7.95
6080WA	9.50
6096	5.50
6132	10.00
6136	2.50
6146B	9.95
6157	2.50
6201	6.45
6211	2.50
6267	2.25
6550A GE	10.95
6550RCA	15.00
6350	3.50
6688	6.60
6870	11.60
6887	9.50
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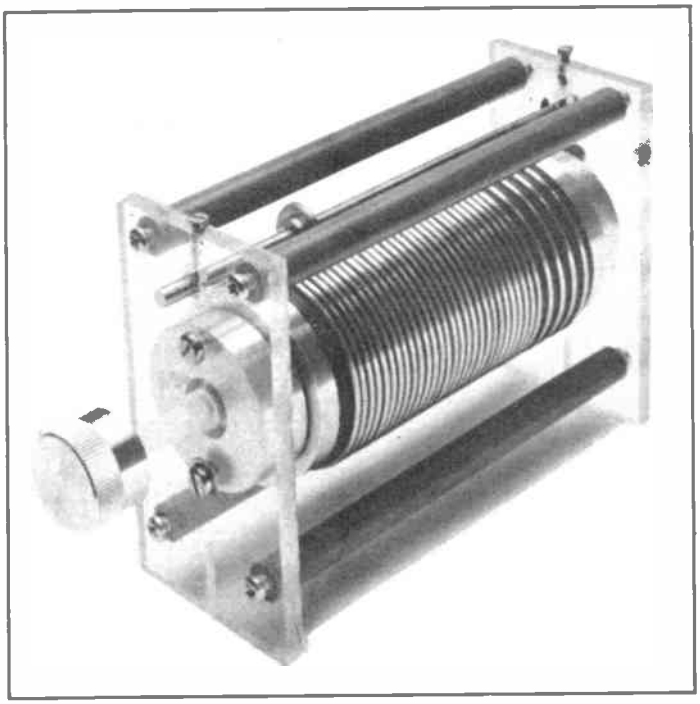


ROLLER COASTER

Telecomms, specialists in communications, sound and lighting equipment, have announced the release of a new British made Roller Coaster coil.

The coil has been manufactured in response to the demand for a low cost, high quality unit that will cover the 1.8-30MHz range.

The RC26 has been designed to sit between 250pF and 500pF capacitors to make a low cost 1kW all band antenna tuning unit.

At a price of £24.00, the RC26 is available from: *Telecomms, 189 London Rd, North End, Portsmouth, Hants PO2 9AE. Tel: (0705) 698113.*

RF COMPONENTS

Bonex (RF Components) Ltd have been supplying the radio industry for over five years, and offer a large range of products at competitive prices.

Their latest stock catalogue lists their whole range of components, which includes CMOS devices, linear devices, transistors, diodes, voltage regulators and moulded coils, with their individual prices, diagrams and additional information.

Orders can be made by telephone on 01-993 7631 or 01-992 7748, and payment by Access and Barclaycard is welcome on orders over £10.

To obtain your copy of their catalogue write to: *Bonex Ltd, 102 Churchfield Road, Acton, London W3 6DH.*

4 in 1 SCREWDRIVER

A four-in-one screwdriver based on a novel and tough design, Dura-Drive, provides two standard and two 'posi-drive' style tips to cover the majority of DIY and home maintenance requirements. Available from Electronic and Computer Workshop Ltd (ECW), Dura-Drive has a very simple and effective lever action to shift the most stubborn screws.

When not in use the bits fold back into the tough Dupont plastic handle. This method avoids losing the bits and protects both the tips and the user from the sharp ends. The effective lever action is achieved by employing one of the unused tips folded out at 90° from the handle. Thus tightening and untightening difficult screws is possible with very little effort.

The Dura-Drive is offered by ECW at a mail-order price of £8.57, including post/packing and VAT.

Further information is available from: *Electronic and Computer Workshop Ltd, 171 Broomfield Rd, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.*

AMSAT DATA

AMSAT UK have now produced the *Fuji Data and Technical Handbook,* which is part of the *AMSAT UK Handbook* which has been in print for some years now.

As in all things, amateur satellite books printed today will be outdated tomorrow. To try to keep the information in the publication up to the minute, AMSAT are now producing update sheets, the first of which are already available.

The cost of the *Fuji Data and Technical Handbook* is £2.95 to AMSAT UK members and £3.50 to non-members (including postage and packing), and the update sheets cost £1 to members and £1.25 to others.

Anyone interested in obtaining a copy of the complete handbook, the Fuji Data handbook or the update sheets should contact: *R J C Broadbent G3AAJ, 94 Herongate Road, London E12 5EQ.*

OPEN DAY

Following the success of their open day on 21st September last year, South Midlands Communications have decided to hold another on Sunday 13th September this year.

As well as giving you the chance to 'meet the communicators', there will be a variety of interesting activities for the whole family. Discounts on admission to the Marwell Zoo and Broadlands should occupy the XYL and offsprings, while you bury yourself in bootfuls of bargains in the car boot sale organised on behalf of the RAIBC.

The open day is being held at South Midlands Communications, School Close, Chandler's Ford Industrial

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

Estate, Chandler's Ford, Hampshire SO5 3BY (just off the A33 at Eastleigh).

Further information on SMC's special day is available from Colin Ward, on (04215) 55111 ext 139.

NEW BBC SHOP

London's first shop specialising in coverage of the rapidly growing world of international television and radio opened on 16th February, less than a month after the premises were flooded and existing stock destroyed.

The BBC World Shop, located on the corner of the Bush House Arcade in the Strand, is now offering a comprehensive range of specialist books and other reference material relating to international broadcasting.

Management has taken advantage of January's flood to revamp the look and the content of BBC World completely in the hope that the shop will become the most reliable and authoritative source of information about radio and television internationally.

The shop plans to develop its mail order business and expand its work in selling BBC English by radio and television courses.

BBC World will also continue to stock a range of BBC special gifts, including tee-shirts, ties, mugs and golf umbrellas, plus paper weights made of stone fallen from the fabric of Bush House itself (corny! – Ed).

Further information on their mail order service is avialable from: *BBC International Press Office, PO Box 76, Bush House, Strand, London WC2B 4PH. Tel: 01-257 2941/51.*

TESTING TIME

The new Maplin catalogue features many new testers for the workshop.

The 'star buy' is a robust Hobby multimeter unit which provides for accurate measurement of dc and ac voltages, direct currents, resistance and decibels on a linear meter, priced £8.95.

Also new are a large range of multimeters, including: the pocket digital at £24.95, hobby digital at £28.95, push-button digital at £39.95, high precision digital at £41.95, auto ranging digital at £45.95, and the multi-purpose digital at £64.95.

Maplin can also provide the battery power required to keep the testing gear up and running: The Maplin standard nickel-cadmium battery charger has been reduced to just £6.95. The unit features a battery-test facility. Also reduced in price, to £7.95, is the popular Maplin universal charger. Both units of course can only be used with rechargeable cells and batteries which are available from Maplin at competitive prices.

All Maplin products are available by mail-order or from the local Maplin stores. *The Maplin 1987 Buyer's Guide to Electronic Components* is also available in high street shops such as W H Smith at £1.50.

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

KIT NEWS

Cambridge Kits now have the latest issue of their 'Kits News' leaflet available, which gives details of the range of equipment produced by the company.

Included in the leaflet are the range of Cambridge Kits antennas, ATUs, sound meters, oscillators, speech compressors and converters as well as useful tips for the amateur.

Copies of the leaflet are available by sending an SAE or two IRCs to: *Free Kit News, Cambridge Kits, 45b Old School Lane, Milton, Cambridge CB4 4BS.*

MULTIMETER VALUE

Two new Hung-Chang multimeters, model numbers HC5010EC (£52.50 plus VAT) and HC775 (£33.50 plus VAT), are being distributed by Cirkit in the United kingdom.

The model HC5010EC, offers a range of facilities matching those of much more expensive digital multimeters, and is equipped with a continuity tester giving both audible and visual indications as well as diode and transistor testers. This enables accurate capacitance, conductance and temperature measurements to be taken.

Capacitance measurement is provided in three ranges: 200pF with 1pF resolution and an accuracy of ±(1.5 per cent full scale +5 digits), 2μF with 0.001μF resolution and ±(2 per cent FSD+5 digit) accuracy and 20μF with 0.01μF resolution, and accuracy to ±(2 FSD+5 digits). Conductance is measured in the 200nS range with a resolution of 0.1nS and an accuracy of ± (1.5 per cent reading +10 digits) and the temperature range is – 20°C to +137°C, with a resolution of 1°C and an accuracy of ±3°C +1 digit.

The model HC775 is a pocket-sized auto-ranging voltmeter with many extra features, including low and high power resistance and ac/dc current measurement.

This meter also has a memory mode, which can be set manually, and overload protection.

Other features include a 3½ digit 10mm high LCD, auto-polarity and mode display, and low battery indication. The dc voltage ranges are 200mV, 2V, 20V, 200V and 1000V with 100μV resolution, whilst the ac voltage ranges are 2V, 20V, 200V and 750V with 1mV resolution. Accuracy is to ± (0.75 per cent + 1 digit).

For further information contact: *Cirkit Distribution, Park Lane, Broxbourne, Herts EN10 7NQ. Tel: (0992) 444111.*

LCR METER

Thandar Electronics Limited have anounced the launch of a hand-held digital LCR meter.

The TC200 will measure capacitance, inductance, resistance and the dissipation factor over a wide range. The measured values are displayed on a 3½ digit LCD display with automatic decimal point positioning. The display provides warning for low battery and overrange conditions.

The TC200 is supplied complete with test clips at a price of £85.00 plus VAT.

For further details contact: *Thandar Electronics Limited, London Road, St Ives, Huntingdon, Cambs PE17 4HJ. Tel: (0480) 64646.*

NEW WORK HOLDER

At last there is a much more convenient and versatile alternative to the outmoded G-clamp, that solves problems associated with its simple but often infuriating design. The Crab-clamp is a very versatile new universal work clamp, designed and manufactured in the UK. It simplifies work holding and fixing in a wide variety of applications and is now available from Electronic and Computer Workshop Ltd.

The Crab-clamp uses a radically new approach, with a cantilevered 'pinch' jaw movement that does not twist work during tightening – always a major problem with G-clamps. The new clamp is just as strong as the old design and features an all-steel construction with a precision adjuster screw thread that is guaranteed for life against stripping.

Revolving steel jaws offer up to 24 different clamping combinations, including vee slots for secure holding of small diameter tubes and irregular sections. Combinations of tubular, tapered, flat and irregular objects are held together easily. Even two tubes or rods can be firmly clamped at 90° to each other. Push-fit nylon pads are available for protecting work surfaces, and this eliminates the inconvenience of loose packing pieces.

Another important aspect when used by inexperienced operators is that the jaws are machine chamfered to avoid jamming should they be struck with a hammer or other heavy tools. At present, standard jaw range is from 0 to 4½ inches, but larger jaw sizes will shortly be available. The throat design enables work to be carried out close to the jaw without the screw adjuster obstructing the work. For example, a hole can be drilled using the jaw vee slot as a guide.

The Crab Clamps have a flat base, so that two clamps will automatically form a stable stand that will raise the work off the bench surface. The finish is a plastic powder coated paint, of extremely tough wear characteristics and with a bright colour, easily identifiable on a work bench.

ECW offers the Crab-clamp at a price of £9.99, including post/packaging and VAT.

For further information please contact: *Electronic and Computer Workshop Ltd, 171 Broomfield Road, Chelmsford, Essex CM1 1RY. Tel: (0245) 262149.*

CARPHONE ANTENNA

Cellmaster, a roof mounted cellular carphone antenna, has won Les Wallen Manufacturing Ltd of Ramsgate, Kent a 1987 British Design Award.

Because of its dramatic reduction in size, the Cellmaster is discreet. The 3½ inch high mast will not resonate in the wind and will not get in the way in car washes, so can be left in position. It is also vandal-proof as it is difficult to get a firm enough grip to bend or dislodge it.

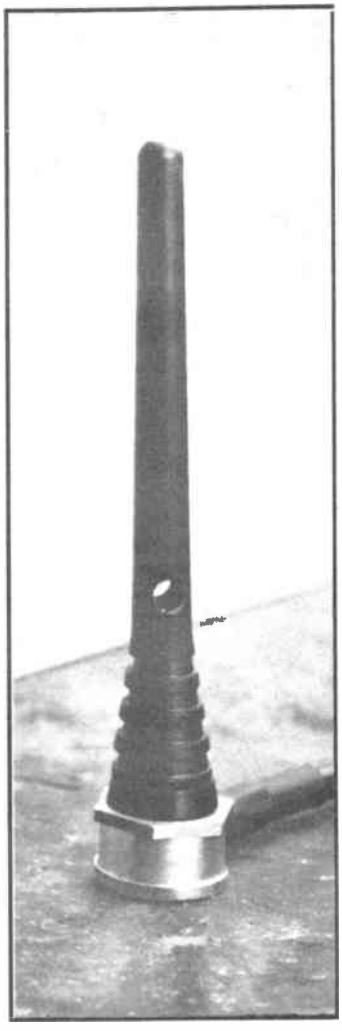
Wallen Manufacturing Ltd's success was announced by the Design Council on Tuesday, 17th February, and the awards will be presented by HRH The Duke of Edinburgh at a ceremony in London in March.

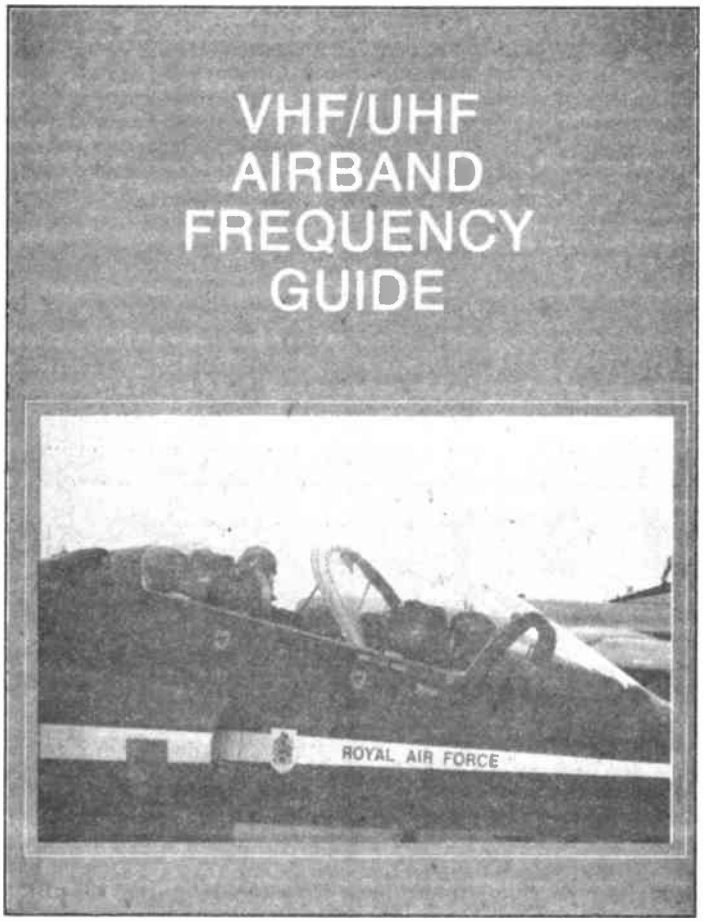
The panel of judges thought the appearance unobtrusive, neat and were impressed by its simplicity. This unique and efficient design works well and as the judges stressed, 'It takes just as many considerations to get a small component right as when working on a full vehicle'.

Shape and size were considered a high priority. Size is related to frequency – the higher the frequency, the smaller the antenna, but the increased diameter gives a greater bandwidth than conventional antennas. The antenna covers a 70MHz range from 890 to 960MHz, and no matter which channel is in use the performance will not vary. The shape is not only aesthetically pleasing but also lends itself to good bandwidth.

Cellmaster was designed by Les Wallen for his own company, which he set up six years ago. The small company, employing just twelve people, assembles antennas for all forms of mobile radio communications (PMR, marine, amateur and cellular). It recently moved from Sandwich to Ramsgate where its other half, Mobile & Marine Radio Technology, is based. Les Wallen was previously employed as a marine engineer, working on the designs of racing engines. He has always been a radio enthusiast and much of what he knows today is self-taught.

When CB was legalised, the Department of Trade and Industry issued specifications for the antenna, but the resulting designs gave a low performance. Consequently, Les Wallen decided to design a higher quality antenna and produced the Modulator, an antenna for CB radio, within the specifications. Following this success, Les Wallen Manufacturing was prompted





to progress into professional two-way radio antennas before eventually moving into the cellular market. Through the experience gained in this area, the award winning Cellmaster was developed.

The Cellmaster is engineered, hand assembled and not mass produced. It is entirely machined from solid aluminium and brass, and the components are then assembled at the Ramsgate site. The antenna is stove enamelled in black for a more sleek appearance which fits in with today's cars better than the traditional chrome. This black anodising will not peel off like most paint finished antennas and resists salt air and other corrosive bodies.

For further information contact: *Les Wallen Manufacturing Ltd, Unit 1, Trinity Place, Ramsgate, Kent CT11 7HJ.*

AIRBAND GUIDE

The latest issue of the *VHF/UHF Airband frequency Guide* is now available from Waters & Stanton Electronics. Since its introduction some 18 months ago nearly 6000 copies have been sold to enthusiasts around the UK. This fourth edition is the largest and most comprehensive yet. It covers both civil and military frequencies from the smallest grass fields to the largest of international airports. It also includes full airways listings and many other frequencies in the aeronautical bands 118-136/225-400MHz.

The large format presentation makes for easier reading and will enable the reader to make amendments to the frequencies, should any of them change subsequent to publication date. As there are constant small changes in the allocation of frequencies in the aeronautical band, each book is supplied with the latest up-date. It is planned to continue this service at regular intervals. Any readers who have purchased the latest edition can obtain subsequent up-dates free of charge providing they return their old up-date plus a stamped addressed envelope. New up-dates will be issued in June and December.

The book is available from most amateur radio dealers and specialist book shops or direct at £5.95 plus 70p p&p from: *Waters & Stanton Electronics, 18-20 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835.*

QUESTIONS ANSWERED

The *Radio Amateurs Question & Answer Manual* by R Petri G8CCJ is now available in its third edition.

The first feature of this book to strike the reader is that it is all set out in multiple-choice style. Although not a course as such, it has been planned in such a way that it can be used as a revision aid to supplement other RAE courses.

It is divided into 23 sections covering specific aspects of the RAE syllabus, with many of the 1100 questions covering areas of the syllabus often neglected in books and courses. In this way, the book does not just test your knowledge, but can *increase* it.

Included in the new third edition are a number of pictures of various components, etc and two new sections which the author thought necessary for all RAE students: circuit recognition, aimed at improving and testing the student's circuit knowledge; and for those who find difficulty using a *scientific* calculator, a section which solves some of the mysteries of operating the calculator using real examples from the book.

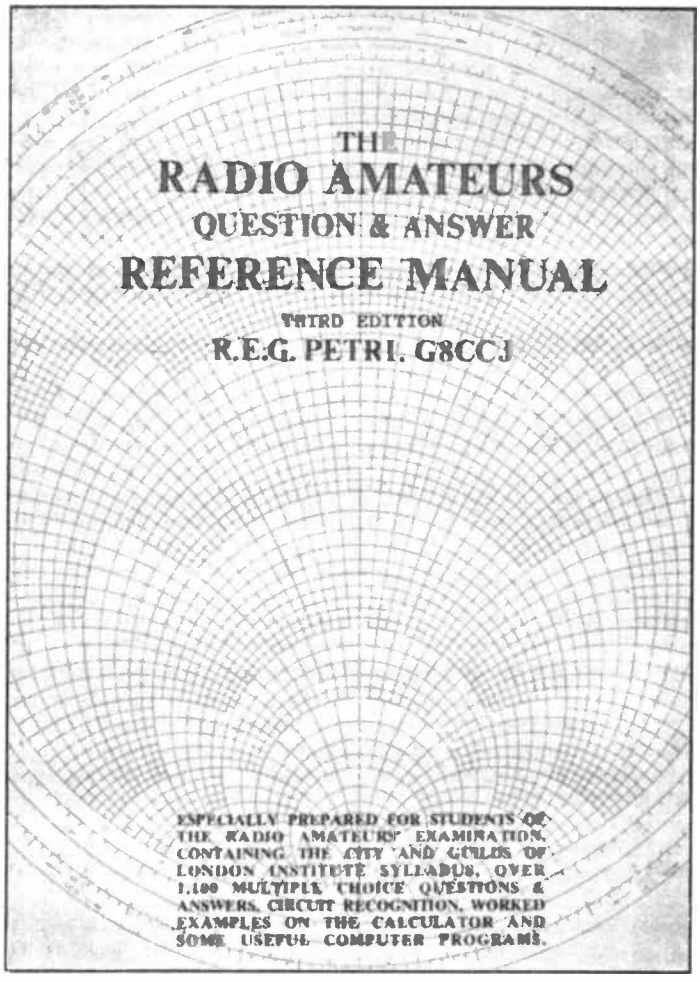
Certainly for all those a bit uncertain about taking the RAE, the book provides excellent practice in the multiple-choice format of questioning.

As appendixes, the book also contains the full City and Guilds syllabus, and a computer program to enable the reader to perform various calculations. The book is available, priced at £6.95 plus £1 p&p, from: *WP Publications, 11 Wayville Rd, Dartford, Kent DA1 1RL.*

BATTERY ASSOCIATION

British makers of dry cell batteries have joined together in a new trade association which will look after the common professional interest of the members in relation to central and local government, dealers, users and other trade associations.

Founder members of the British Battery Manufacturers Association are British



Ever Ready, Crompton Vidor, Duracell, Ray-O-Vac, SAFT (UK), and Venture Technology. Stuart Chinn, Director and General Manager of SAFT's Storage Battery Division has been appointed chairman and Michael Evans, an experienced trade association administrator, becomes secretary.

The Association has established offices at *7 Buckingham Gate, London, SW1E 6JS. Tel: 01-630 5454.*

ELECTROVALUE

Electrovalue have launched their new Spring catalogue, which contains more pages, more illustrations and sixty more items.

The new catalogue has been redesigned, making it even easier to refer to, particularly when it comes to finding one type of transistor out of the hundreds listed. Items included range from spacers to computers, covering software and opto-electronic components.

For your copy of the catalogue, free of charge, write to: *Electrovalue Ltd, Freepost, 28 St Judes Road, Englefield Green, Egham, Surrey TW20 8BR, or telephone (0784) 33603.*

CORRECTION

In Richard Marris' article entitled *Table Topper*, published in the February issue of *Amateur Radio*, a couple of small omissions seem to have slipped through.

Anyone contemplating the construction of the aerial should note that:

(1) The VC extension spindle should be of insulation material, and

(2) It is essential that the Table Topper is placed adjacent to the transmitter or receiver when in use.

Please accept our apologies for any inconvenience caused by these omissions.

CLUB NEWS

Solent Fortification Award

April 1987 sees the introduction of a new award for amateur radio enthusiasts. Based on the many defences of the Solent, a maximum of 26 locations will be selected and it is hoped to activate all stations for at least four consecutive weekends each year.

Operating will be conducted by local clubs and both VHF and HF are catered for (signal reports from short wave listeners are welcome).

The callsigns to listen for will range from GB0 and GB1 to CD (standing for coastal defence), the last prefix being the means of identifying either fort or castle. Contacts should be made from 4th April, and each will merit a detailed QSL card.

Awards will be issued in five categories:

HF (zone 14). Basic, 7 contacts. Silver, 10 contacts. Gold, 13 contacts.

HF (outside zone 14). Basic, 3 contacts. Silver, 5 contacts. Gold, 7 contacts. All modes and all bands accepted. Please state for CW, phono or mixed modes.

VHF (80km radius). Basic, 7 contacts. Silver, 10 contacts. Gold, 13 contacts.

VHF (400km radius). Basic, 3 contacts. Silver, 5 contacts. Gold, 7 contacts.

VHF (outside 400km radius). Basic, 1 contact. Silver, 2 contacts. Gold, 3 contacts.

Distances will be determined by Maidenhead locations. Repeater contacts are not valid.

QSL cards are not required on application, but a list showing full details of the contacts should be certified by two licensed amateurs and forwarded enclosing £2.50 (cheque or POs only please) to Mr V H Harris G6MWY, 72 Elmore Avenue, Lee-on-Solent, Hants PO13 9ES.

St George's Award

Three special event stations are scheduled to be active between the 19th April and the 16th May, to celebrate St George's Day.

The three stations, GM0SGD, GM4SGD and GM6SGD, are hoping to be active on all bands, and a special QSL card will be available either direct via G4KHF (QTHR), or through the bureau.

A QSO with any one of the three will count towards the St George's Day Award, which is now in its fifth year of operation. The award is also available to SWLs on a 'heard' basis.

Those wishing to apply for the award must also contact eight additional stations in England if resident, five additional stations if resident in Europe and three additional stations if resident anywhere in the rest of the world. All contacts must be made during the period between the 19th April and the 16th May.

QSL cards are not required, but log extracts must be submitted together with £1.50 (6 IRCs from Europe and 8 IRCs from the rest of the world) to David Wilkinson G4KHF, 'Leon', Lutton Gowts, Long Sutton, Spalding, Lincs PE12 9LQ.

Hamigos en le sol

The Association of foreign radio amateurs on the Costa del Sol was the idea of Richard Robinson EA7DGA (ex G2ANX) who has been living in Spain since 1971. The objective behind the operation was to help visiting and resident foreign amateurs to make contact with others in the area.

The group meets at the Restaurante Hawaii, in Torremolinos, for brunch on Sundays between 12.00 and 3.00pm local time.

The restaurant is owned by Carlos EA7ASI and his wife Christine who offer an excellent menu. Carlos also offers the use of his shack and HF rig with beam to visiting amateurs. Usually the group operate on 14,170 at 1.00pm GMT (12.00 noon GMT in summertime) looking for members who are not in Spain at the time.

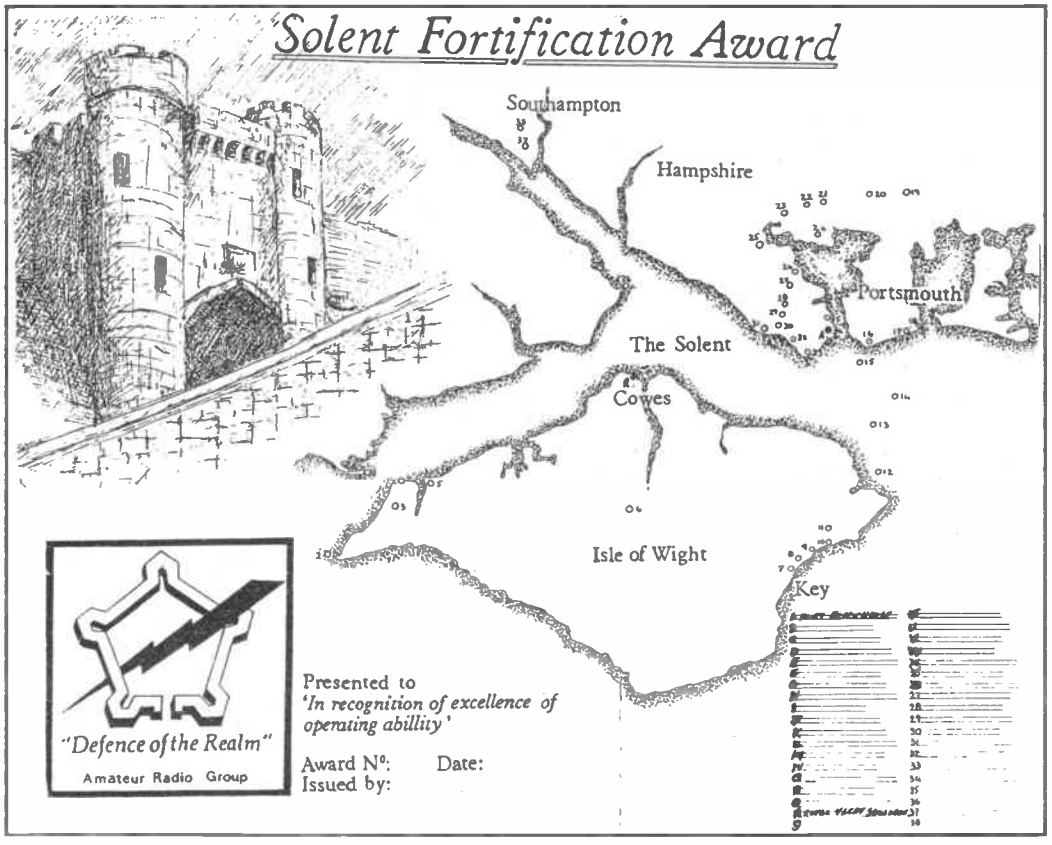
A member's list including personal details and skeds is circulated within the association so that contact may be made.

Spen Valley ARS

The Spen Valley Club was formed in 1946, so in its 1986-87 programme it will be celebrating its 40th anniversary. The Spen Valley stretches in a south-westerly direction from the outskirts of Leeds towards Huddersfield and contains the towns of Cleckheaton, Heckmondwike, Birstall, Birkenshaw and its present base Mirfield. Other surrounding towns which form part of its membership catchment area are Dewsbury, Batley and Brighouse, it is also within a 20 minute car journey of Leeds, Bradford and Halifax.

The club is administered by a committee which is elected annually, and the present committee is under the able chairmanship of John Bowyer G4KGS, a principal lecturer in electrical engineering at Huddersfield Polytechnic. As a former RAE tutor he has the right sort of background to know the needs of potential radio hams. Any new club members will certainly receive the right sort of guidance.

The present secretary, Ian Jones G4MLW, has been running a CW class through the summer, preparing members for the test in October, and another committee member, Mike Cox G8HUA (former Secretary of the BATC), has his own video/satellite business and is an active fast-scan operator. Mike is always ready to advise anyone wanting to set up a TV station. The club has several new younger members who are very interested in satellite television and microwaves, so they seem to be keeping abreast of the times.



The club meets at the Old Bank Working Men's Club, in Mirfield, where the bowling-green floodlight poles come in very handy for HF antennas, and the concert room, where meetings are held, has a flat roof making a convenient base from which to erect VHF/UHF beams and dishes. The club site is also quite a good VHF/UHF site, as there is a clear path to all points of the compass.

Formal meetings are held on the first and third Thursdays in the month, with alternate weeks being natter and noggin nights (some say these are more popular than formal meetings). Springtime sees the club mount what is now an annual event, a DXpedition to the Yorkshire Dales. A base is available at an outward-bound cabin which belongs to a school at which two of its teachers are club members! The DXpedition lasts from Friday to Sunday and the main aim is to put 2m SSB and 10m FM stations on the summit of Pen-y-Ghent (694m) using the callsign GB4SVC.

In the summertime various shows are attended, where emphasis is put on HF operation, usually 80m, as most shows tend to be held in river valley bottoms.

Autumn sees the club involved with the JOTA weekend. A station is set up in the scout headquarters attached to the Parish Church at Battyeford in Mirfield and the callsign used is GB2XKB (Christ the King Battyeford). This occasion is usually eventful as it normally sees the start of autumn gales.

Since the AGM, in April this year, the new committee has been very active. One of the first motions was to draw up a questionnaire to find out what sort of activities the members wanted, what equipment should be bought, what increase in subs they would pay, and whether they would like a proper shack. When the returns came in it was decided to approach the Working Men's Club committee to discuss the provision of a proper secure shack area. Other decisions were left until this was sorted out – except that subs would go up next year.

Further information on membership can be obtained from Malcolm Lindley G6JML on (0924) 498568.

Vintage interest

The British Vintage Wireless Society's purpose is to promote the study of wireless history and encourage the preservation of early equipment.

To this end they hold a number of regional 'swap meets' to enable members to dispose of surplus equipment, obtain items to restore equipment and trade data and information. The membership now stands at 582, but they are always eager to swell the numbers with other dedicated amateurs or historians.

The next scheduled society meeting is on the 1st March in Bristol at Clarence House, Portishead, from 10.30am until 4.00pm. Meetings are for members only, so if you wish to attend, ensure that you have obtained your membership from the membership secretary, Gerald Wells, before the event. The address to write to is the Vintage Wireless Museum, 23 Rosendale Road, West Dulwich, London SE21.

However, if you can't make it to the March meeting, gatherings are scheduled for the 10th May in Shifnal, nr Telford, and 28th June and the 25th October in Harpenden.

Membership costs £10 for UK members, £12 for European members and £15 for World-wide members, which covers the cost of producing the professional and informative BVWS Bulletin, in addition to the organisation of meetings and events.

Further information on the society is available from the membership secretary at the address above.

40th year

The Dorking and District Radio Society have a number of interesting lectures scheduled for the next few months, including a demonstration of test equipment by G6XVW on the 24th March and a talk on the 'Bonsai Aerial Farm' by G3OLM on the 28th April. Both meetings will be held in Ashcombe School, Dorking.

In addition to their monthly lectures, the society meets for an informal meeting on the second Tuesday of the month in the Falkland Arms, the date for March being the 10th.

1987 is the 40th anniversary year for the society and it hopes to mark the event with a special event station and a dinner dance at some point during the year. Anyone interested in supporting the idea should contact G3AEZ on (0306) 77236.

Club nets are run on Sundays at 8.30am on 3780MHz and 8.30pm on 144.775MHz, and make a good opportunity to chat to a few of the members about the club. Alternatively, information on the club and its activities can be obtained from G3AEZ as above.

Bring your own?

The Coventry Amateur Radio Society meet each Friday for 8.00pm at Baden Powell House, 121 St Nicholas Street, Radford, Coventry.

Meetings for March include a computer evening (bring your own if poss) on the 6th, a talk on 'Broadcast band DXing' on the 20th and Morse tuition and 'a night on the air' on the 13th and 27th.

Visitors are always welcome and further information is available from Bill Hahn G3UOL, 91 The Chesils, Coventry CV5 9NA. Tel: (0203) 414684.

Swindon Rally

The Swindon and District Amateur Radio Club is holding an Electronics Rally on Sunday 10th May. As in previous years, the rally will be held at the Oakfield School, Marlowe Avenue, Swindon, and doors open at 10.00am.

In addition to the rally, a film show and other amusements will be available for children, and parking is free. Talk-in will be provided on S22 and SU8/GB3TD on 70cm.

Further information is available from the rally organiser, G8SFM on (066689) 307.

Scarborough Rally

Sunday the 26th July is a day to mark in your diary if you live in the area of Scarborough, for it is the day of the annual rally held by the Scarborough Amateur Radio Society.

Doors open for 11.00am at The Spa, Scarborough, and talk-in will be available on 144MHz (S22) and 432MHz (SU8 and RB0-GB3NY).

Further details on what's happening are available from the rally secretary, Ian Hunter G4UQP (QTHR), on (0723) 376847.

L·E·T·T·E·R·S

ANY REGRETS?

I'm not sure if anyone will be interested in this advice, but I hope someone will take note of my experience.

Six months ago I decided to sell my Yaesu receiver with a view to raising some cash for the purchase of an expensive SLR camera. What a drastic mistake!

Having been awarded the Silver and Gold listeners' awards from Trevor Morgan GW4OXB, I thought I had come to the end of what short wave listening had to offer. How wrong I was.

I have since received many colourful Xmas cards from various broadcast stations and a beautiful wall calendar from Radio Peking. How can one desert such friends?

The chance to replace the receiver is remote, as I am now unemployed – as is the camera upstairs in its padded holdall. At the moment I am waiting for a 20 metre receiver kit to be built for me, but it will be so limited in comparison.

So, think on readers – I wish I had.

Dave Howes ex-BRS87894, Rochester, Kent

DISAPPOINTED

On trying to obtain a copy of the January issue of *Amateur Radio*, my local newsagent informed me that the issue had not reached the distributor yet!

I was most disappointed at not being able to obtain my copy as I enjoy reading the magazine and like its content, style and presentation. In particular I enjoy Tony Smith's G4FAI 'Morse Report', and the 'letters' column.

Have you any idea why it takes so long to get here?

G C Dick GM4ZGD, Glasgow

Please accept our apologies for the difficulty you have had in obtaining your copy of the magazine. We are looking into the problem and hope to ensure that you do not have the same trouble again.

Obviously, with the large number of hobbyist magazines on the market at the moment, not every newsagent can carry copies of each one.

Consequently, they tend to carry the magazines ordered by their customers most frequently.

To ensure of your copy of Amateur Radio *just complete the newsagents' order form on page 33 and hand it in to your local newsagents. He will then ensure that your copy is waiting for you on publication.*

Alternatively, take out a post free subscription by completing the order form on page 10 and your copy will arrive on your doorstep before it is available in the shops.

Whatever you decide, don't give up. Write to us and let us know where the magazine is difficult to obtain, so that we can look into the problem at this end.

Many thanks – Ed.

MURPHY'S LAW

May I submit an extension to Murphy's Law which has been formulated over the past three years:

Any frequency on which a 5 × 9 QSO is taking place will within three minutes become the only frequency on the planet for RTTY, AMTOR, CW and machine generated telegraphy. This may be expressed as

$$\frac{\text{SSB QSO}}{5 \times 9^{\text{EW}}} = \frac{2\pi}{\text{CW, telegraphy etc}} = \frac{\text{QSO}}{\text{QRM}}$$

Regular users of the 80 metre band who have studied this phenomenon will of course realise that the law will apply only if (a) the QSO is interesting, (b) a club net, (c) a regular schedule, or (d) DX work.

Ivan Rosenbury G4XEW, Middlesex

STARS

The Stourbridge Amateur Radio Society meet on the first and third Mondays of each month for 8.00pm at The Robin Wood's Centre, School Street, off Enville Street.

Scheduled activities include an 'on air night' on the 6th April and a club meeting on the 27th (Nb one week late due to Easter break). Looking ahead the club has arranged a summer surplus sale on the 20th July and is hoping to participate in a number of the season's contests.

New members and visitors are welcome to all club meetings, further details on which are available from the club secretary, on (0384) 288900.

MARS

Anyone interested in AMTOR should pop along to the Midland Amateur Radio Society's meeting on Tuesday 14th April, as Bob G4YUI is giving a demonstration.

In addition to the monthly club meeting on the third Tuesday in every month, the club runs a Morse class every Wednesday evening at 7.00pm and a night on the air every Thursday evening.

On the 19th May a junk sale/natter night has been arranged, providing an ideal opportunity for visitors to go along and meet the crowd.

Further information can be obtained from Norman G8BHE (QTHR) on (021) 422 9787, or Tom G8GAZ (QTHR) on (021) 357 1924.

New home

The Bury St Edmunds Amateur Radio Society have moved. The club now meets on the third Tuesday of each month for 7.30pm at the County Upper School Beetons Way, Bury St Edmunds.

On the 21st April G4XRK is giving a talk and demonstration on Packet radio, and on the 19th May the third in a series of lectures on Marconi is being delivered.

Those interested in joining the club or requiring further information should contact Chris G1FUU on (0359) 50271.

Fractured shack?

The North Wakefield Radio Club starts its activities in April with a junk sale on the 2nd, followed by a lecture on 'first aid for the shack' (is it really in that much of a state? – Ed) on the 9th. On the 16th the lucky members are getting a 'good talking to' by the RIS and the month is closed with a meeting on the 30th.

Meetings are held at The White Horse Public House, Fall Lane, East Ardsley, Wakefield for 8.00pm, although we're sure a few members get there nice and early to prepare themselves!

Anyone making enquiries about the club should contact the secretary, Steve Thompson G4RCH on Morley (0532) 536633.

Morecambe Bay ARS

The above club has a new secretary following their AGM. Mr D H Wood pulled the short straw, and will be more than pleased (!) to deal with any enquiries you may have about the club. He can be contacted at 29 Oakville Road, Higher Heysham, nr Morecambe, Lancashire.

Club meetings are held every Tuesday evening at the Trimpell Sports & Social Club, Out Moss Lane, Morecambe, Lancashire. The normal starting time is 7.30pm, and every alternate Tuesday is dedicated to a Morse tuition group. Prospective new members are assured of a warm welcome, but due to the premises being licensed, it is a requirement that members of the society are also members of the Sports & Social Club, of which the club forms a section. The other Social Club facilities are also available to members.

The present membership fee totals £8.00, this being composed of £6.50 for Social Club membership and £1.50 towards the running costs of the society.

Loughton ARS

The Loughton and District Amateur Radio Society meet for 8.00pm at the Loughton Hall, Rectory Lane, Loughton, Essex, on alternate Fridays.

On the 10th April the club is holding its AGM, to which all members are encouraged to attend. On the 24th, members are planning to install the aerials required for the special event weekend over the 25th and 26th.

Visitors are always welcome to all club meetings, details on which are available from John Ray G8DZH, 9 Albion Hill, Loughton, Essex.

DX DIARY

News for HF operators compiled by Don Field G3XTT

Once again in February the bands echoed to the sounds of DXpeditions and the accompanying QRM from the self-styled 'policemen'. However, the major efforts from Revilla Gigedo (XF4DX) and Cocos-Keeling (VK9YS and VK9YW) were relatively easy to work from the UK, and enabled many UK amateurs to put a couple of new ones into the log. As I write this a further expedition is now active on the bands, which promises to be a major and prolonged activity from the Andaman and Nicobar Islands, the first for some years. This operation has been on the cards for some time, but apparently required representations to the Prime Minister himself (as an amateur, Rajiv Gandhi would understand what the request was about) before permission to operate from the islands was forthcoming.

Andaman and Nicobar

The principal organiser behind this operation is Miss Bharathi VU2RBI, whose photograph appeared in my December column and who was one of the first operators on the islands, operating as VU4APR/RBI. As with the expedition to the Laccadive Islands three years ago, each operator is appending his or her suffix to the callsign, and it is necessary to indicate this on the QSL, as each operator keeps a separate log. VU4APR is the callsign being used from the Andamans and VU4NRO the callsign being used from Nicobar. Both island groups count as the same DXCC country, but separately for the Islands on the Air Award. Previous operations have all been from the Andamans.

I have used the present tense above because there is a good chance that the group will still be active when you read this column. An operation lasting some six to eight weeks was promised, with teams of up to half a dozen operators taking turns to travel to the islands and man the stations. It was reported in *DX News Sheet* that some Finnish amateurs had asked to be allowed to participate, but I would have thought, on the basis of previous experience, that the permission would be restricted to Indian nationals only.

Location

The Andaman and Nicobar Islands consist of some 300 islands and islets, with a total land area of 3215 square miles and a total population of about a quarter of a million (living on just 35 of the islands). The islands form a 600 mile arc from Burma to Indonesia in the eastern Bay of Bengal.

Currently much of the land area of the islands is virgin forest, and within these forests live some of India's last Aboriginal tribes, little changed since the Stone Age. To avoid interference with either these tribes or the fragile ecosystem, visitors are restricted to just seven of the islands and travel there by air or by one of four steamers which shuttle between the islands and the Indian mainland.

The written history of the islands dates back to the 17th century, with various attempts by France, Austria and Denmark to colonise and to convert the islanders. In 1789 Britain established a penal colony in the Andamans and again later following the Indian mutiny. As a result, the majority of the non-Aboriginal population consists of descendants of the convicts and administrative personnel of those penal colonies. Britain took possession of the Nicobar Islands in 1869, and the two island groups have been jointly administered since 1872.

The islands were occupied by the Japanese during the Second World War and, in 1947, came under the administration of newly-independent India.

The new Hong Kong?

Very little is heard of the Andaman and Nicobar Islands, though recently there have been attempts by Indian businessmen to establish them as a new 'Hong Kong' when that colony reverts to Chinese administration.

However, for the time being they remain off the beaten track and, after the current operation, may well disappear once again from the amateur bands for some years to come.

One point of major interest to many amateurs is that this particular DXCC country lies within CQ Zone 26, one of the hardest zones to catch for the Worked all Zones awards (only the HS stations, XU1SS and XZ9A are active and these are all quite rare).

Revilla Gigedo

The XF4DX operation, which I mentioned earlier, netted some 15,000 contacts, 60% of which were on CW. Six hundred contacts were made on Top Band (including some with the UK), and about 4,500 on both 40m and 20m. The group deserves particular thanks for making such a determined effort to work Europe. They frequently asked stations from other continents to stand by while they listened for Europe, which certainly made life easier for UK DXers over what can sometimes be a rather difficult propagation path. QSLs for the expedition go to K9AJ, M McGirr, 13 Oak Hill Drive, Crete IL 60417, USA.

A rather curious feature of the operation was a silence for about 24 hours in the middle, while certain 'paperwork' difficulties were ironed out back in Mexico. No doubt we shall eventually learn what the problem was, but at least they managed to get back on again and completed about six days of operating in total. Once again this was one of the operations which was announced at the last minute, although I have mentioned the persistent rumours about an XF4 operation in recent columns.

Problems

The Cocos-Keeling operation by Jim Smith VK9NS/VK9YS, and bob Winn W5KNE/VK9YW, started off with problems due to bad manners on the bands, and interactions between the two stations when they tried to operate simultaneously, even on

different bands and modes. However, the technical problems were gradually overcome and the pile-ups eventually started to tail off, so that many UK amateurs were able to work Jim and/or Bob on 20m, 40m, 80m, and in a few cases, 160m. QSLs go to their respective home calls. Jim planned to operate from Christmas Islands as VK9XS on the way home, but Bob (who edits the US bulletin *QRZ DX*) was due to return directly to the USA.

News in brief

KA1CRP is due to sign /FP from St Pierre & Miquelon on all bands from 1st to 9th April. A new club station (HS0B) is now operational from Thailand, and some effective LF antennas are planned. Roger G3ZDW/ZD8CW, will be on Ascension until mid-May. His LF routine is to operate on 7005kHz from 2200GMT on Saturday until 0100GMT on Sunday, and then to QSY to 3535kHz if he can stay awake! Manolo 3C1MB is back on the air following a holiday. *DX News Sheet* reports that Les Sampson 7Q7LW is prepared to make skeds between now and when he leaves Malawi in May.

Write to him at Box 24, Mtakataka, Malawi, marking the envelope *Sked*. Please note that Les has power only from 0200-0600, 1000-1200 and 1500-2200GMT.

Ambergris Cay

WB8YUC was due to operate from Ambergris Cay in Belize from 26th March until 7th April, taking in the CQ WPX SSB Contest. W1BIH is once again signing /PJ2 from Curacao, this time until mid-April. WB4LFM is a missionary in Africa and will sign 5V7SA for three years. KC6IN is on leave for six months, but will then return to the Carolines. VE3FXT is reported to be trying to get permission to operate from Marion Island (now ZS8) in early April, although I have my doubts about whether this will be forthcoming.

And finally, the Maryland Apple Dumpling Radio Amateur Society (yes, really!) will operate as KT4A from Tangier Island in rare Accomack County, Virginia, from 15th to 18th May. This one counts as NA83 for the Islands on the Air Awards. QSLs go to K3KMO.

Libya again

5A0A has continued to be very active, including regular appearances around dawn at the very bottom of 40 metres. He has been weak but workable, apparently running 300mW by keying a signal generator directly into the antenna! By the time you read this he should have been back to Poland and returned to Libya with his FT101, so we can expect a better signal for the remainder of his stay. The DXCC now accepts Herbert's QSLs for award credit, which should give added incentive to his efforts. I was delighted to receive the QSL almost by return of post from his Polish manager, SP6BZ.

Tromelin Island

FR7AI/T was due to be active from Tromelin Island from 3rd March until 3rd April, running just 120W to a dipole. Check 15 and 20 metres around 1200GMT on CW and 1530-2200GMT on either CW or SSB. Tromelin Island is another particularly rare one. Located to the north of Reunion and 260 miles off the African mainland, Tromelin is a wildlife sanctuary, only one mile long and uninhabited except for the crew of the weather station. These crews are rotated between Tromelin, Juan de Nova, Europa and Glorioso and only rarely include a radio amateur, so we have to wait for the occasional visitor. I'm not sure whether FR7AI works for the weather service, but he has managed to operate from several of these islands from time to time in the past.

The African/Indian Ocean DXpedition, by the Colvins, was interrupted shortly after their arrival in the Maldives when Iris suffered a fall and had to be airlifted to Sri Lanka for surgery. However, at the time of writing it looked as though they may be active as 8Q7QL before returning to the USA in time for the Visalia DX Convention in April. They made 9,000 contacts with 130 countries while operating as S79KG from the Seychelles, so have qualified for yet another DXCC award to add to their already record-breaking collection.

Activity on 10MHz continues to increase. A number of additional countries have been given access to the band since 1st January, including ON and LZ. Most notable, though, is Singapore. 9V1TL and 9V1VS have both been active, and on 20th February I heard them simultaneously about 2kHz apart, both working Europe and with good signals. 9V1TL has also been active daily on 18MHz around 1000GMT and has worked into Europe at this time. Not surprisingly, though, he reports that activity is low.

Contests

April is a relatively quiet month for contests. The SP-DX Contest takes place over the weekend of 4/5th from 1500GMT on the Saturday until 2400GMT on the Sunday. The mode alternates, this year it is to be a CW event. The Swiss Helvetia Contest is on the last full weekend of the month (25/26th), and is a mixed CW/phone event running for 24 hours, from 1300GMT on the Saturday.

This latter is a good opportunity to work Swiss cantons for the H-26 award. For this award, confirmed contacts are necessary with each of the 26 full and half cantons, and stations worked during the contest give a two-letter identification of their canton so you can see how well you are doing. The award is administered by HB9ALF.

WAB Contests

Looking further ahead, G4GEE has sent me details of this year's WAB Contests. The HF events include the LF Phone Contest on 17th May from 1400 to 2100GMT and the 80 metre CW Contest on 8th November from 0930 to 1230GMT. There are also two VHF contests in the WAB calendar. Full details, contest log sheets, etc can be obtained by sending a large SAE and three first class stamps to Bob at his callbook address.

St George's Day

The Wisbech & District Amateur Radio and Electronics Club will be operating three special event stations to celebrate St George's Day. The three stations – GB0SGD, GB4SGD, and GB6SGD – will be operational from April 19th until May 16th, and a QSO with any one of the three will count towards a special award. To obtain the award it is also necessary to work eight further English stations during the same period. The award, which costs £1.50, can be obtained by sending a log extract to G4KHF, who is also acting as QSL manager for the special event stations.

DX Nets

I have recently received details of the sixth edition of his publication *DX Nets Around the World* from OE2DYL. He also now produces *DX Beam Headings*. This latter is computed on the basis of your own location, and gives beam headings to more than 450 DX locations around the world. If any readers are interested in either of these I can provide further details.

It is interesting to note the number of such DXing aids which are now available from amateurs around the world. ON4UN has, for some years, produced a full directory of sunrises and sunset times, as well as a beam heading printout, much the same as that offered by OE2DYL.

HF software

John is also now selling a whole range of HF oriented software, including antenna design, propagation predictions, and much else. This is available for IBM, Apple II, Commodore, etc but not for the BBC, which is hardly known outside the UK. SM5CAK and SM5DQC publish what they claim is the most complete QSL manager list ever printed. And so it goes on.

I am aware that a number of UK amateurs have done similar work in producing data and software, but often for their own use, rather than for public consumption. If you have anything which you would like to share and which is of HF interest, I would be happy to review it for this column.

Congratulations

Finally this month, congratulations to G3BDQ and GM3WTA, the latest UK amateurs to apply for the prestigious 160 metre DXCC Award. And to G3MIR, the first and only UK applicant to date for the *CQ Magazine* WAZ5O Jubilee Award. Also to GW4OFQ, who has amassed 220 countries worked on 80 metres since getting his licence, and 110 worked on the band in the first two months of 1987. Well done Roger.

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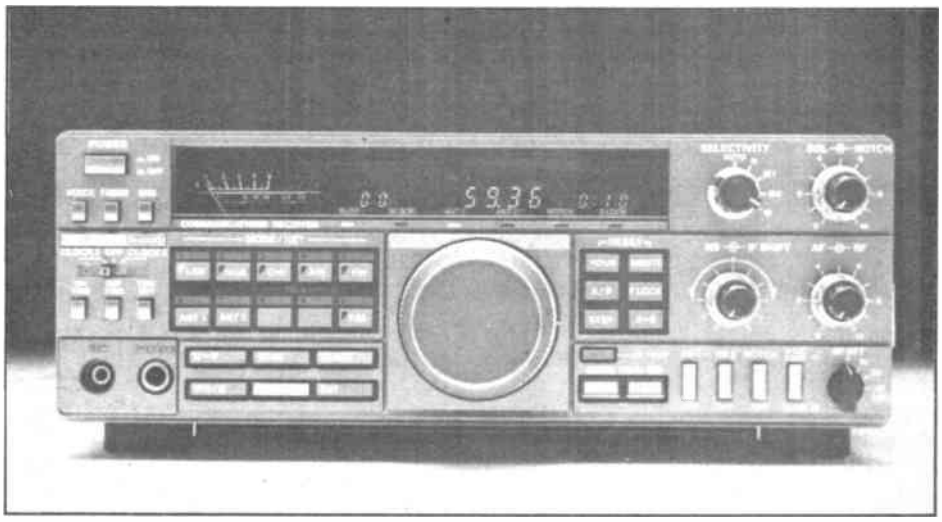


TRIO R5000

Communications receiver

The three big names in amateur radio equipment, Icom, Yaesu and Trio Kenwood, have all released various HF receivers in the past, but with the possible exception of the Icom R70 and R71 models, the performance of these receivers has been considerably poorer than their HF transceivers. For example, the Trio R2000 has a very poor input intercept point, whilst the TS430, let alone the later 440, are so much better, and the Yaesu FRG8800 is considerably inferior to recent Yaesu HF transceivers.

I have so often suggested that the receiving sections of the best transceivers should be made available as separate receivers in their own right, my ideal choice being a receiver based on the TS940S. The Trio R5000, however, is based on the TS440S, but there are some important differences, which will be described later. In general, the facilities are almost identical to those of the TS440S, even if some of the circuitry is different.

Front panel facilities

The receiver tunes from 30kHz to 30MHz in 10Hz or 100Hz steps on CW, SSB and RTTY, 100Hz and 1kHz steps on AM, and 2.5/5kHz steps on FM. When the smaller step size is selected, rapid rotation of the tuning knob greatly increases the tuning rate, allowing the user to tune across a band very rapidly. Two VFOs are provided, each having separate frequency and mode information. Buttons select VFO A or B, or A=B, and can store or recall frequencies into any of 100 memories or memory back to VFO. These memories can store frequency, mode and antenna input status, as there are two separate inputs. The first input is on an SO239 socket on the rear panel for 50 ohm systems, whilst the second is on terminals, with 50 and 500 ohm connections, the latter being unbalanced, and the 500 ohm one being suitable for random lengths of wire.

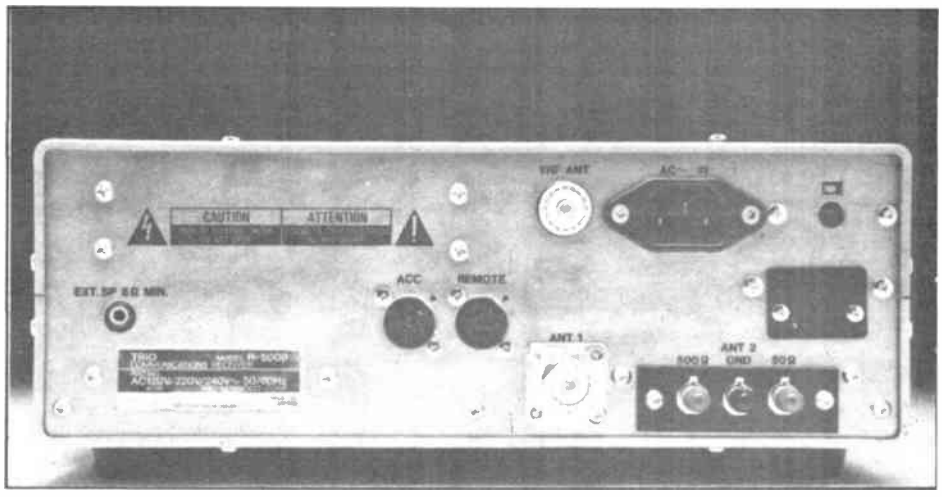
Both memory and programmable scanning are provided and it is possible to program in a skip over memories that are not required to be scanned. The programmable scanning feature is fascinating, for this type of scan takes the start frequency and mode from the 8th memory in each bank of 10, and sweeps to the frequency in memory 9 in each bank. This therefore allows 10 different searching bands from memory 08 through to memory 98.

Direct entry of frequency is enabled with second functions of many of the control buttons to the left of the VFO knob. You first press 'enter' followed by the required frequency (with a 0 first if below 10MHz) to as many digits as you like. After frequency entry, you press 'enter' again, and the receiver springs to the new frequency. If you enter the frequency to 10Hz resolution, you hear a pip, and the receiver automatically jumps to it without you having to press the enter button again. Memory access can be either by direct access using the number pad, or you can tune round the memories with the VFO knob. There are also 1MHz up and down buttons, and when you are in the memory mode, these also allow you to step through the memories.

One particularly useful facility is scrolling, allowing you to search through the memories by number and frequency without leaving the VFO mode, the VFO frequency continuing to be monitored.

Modes are selected with buttons, also used for numerical entries, and when you press a mode button, the first letter of the selected mode comes through the speaker on CW, ie L for LSB, U for USB, C for CW etc. A selectivity switch selects an auto position in which the most appropriate filter is automatically selected for the mode in use, but an additional four positions allow direct choice of various filters, several of which are options. The CW filter can be either the YK88C (500Hz) at £48.59 including VAT, or the YK88CN (270Hz) at £50.68. For SSB, the receiver is normally supplied with the YK88S, but an option is the YK88SN (1.8kHz) at £49.29. For AM the rig normally has a fairly wide selectivity, but the YK88A1, costing £50.68, gives extremely good selectivity at around 5.5kHz overall bandwidth. The different selectivity positions are actually labelled 'auto', 'N', 'M1', 'M2' and 'W'.

Additional buttons select fast/slow AGC, notch filter in/out (with pot tunable over a range of approximately ±2.5kHz), and either of two noise blanker circuits. A pot selects the noise blanking



threshold. The antenna input circuit has a 10dB stepped attenuator having a maximum attenuation of 30dB, as in the TS940S. Other buttons select: frequency lock; HF or VHF (a VHF converter option is available; type VC20, at £176.32, which permits tuning between 108 and 174MHz); memory to VFO; memory write; memory or VFO; clear entry; antenna 1/2; voice frequency readout enable (the VS1 voice board is an optional extra at £34); display dim; programmable and memory scan; and many clock timer controls, which allow the setting of two separate times, eg GMT and EST. The timers can also be used to switch the receiver on at a pre-determined time to wake you up with your happiest station!

Concentric rotary controls are provided for AF/RF gain, squelch (all modes) and notch filter frequency, and noise blanker level/band pass tuning (centre indented). Incidentally, the notch filter is actually in the audio circuitry and is active as a notch on SSB, AM, FM and FSK, but acts as a tunable audio peaking circuit on CW. The front panel display gives frequency to 10Hz resolution where applicable, and also includes basic status indications and memory information. The S meter is scaled from S1 to 9+60dB. The front panel also contains two jack sockets, a quarter inch stereo type for headphone connection and a 3.5mm one for feeding a tape recorder or external audio feed to various types of terminal.

The rear panel

The mains connection is on an IEC socket and there is an ac voltage selector. The main antenna socket (antenna 1) is on an SO239, and antenna 2 includes terminals for 50 ohms, 500 ohms and earth. A 7 pin DIN socket includes connections for external mute control of receiver, and receiver timer control for an external tape recorder. An accessory socket (a six pin DIN) is provided for use with an external accessory, the IF232C (£72.89), which gives RS232 data control for computer interfacing when the internal optional data interface board is fitted (IC10, £29.15). A 3.5mm jack socket is provided for feeding an external speaker, and another option is a dc adaptor type DCK2.

The optional VHF converter has its own separate SO239 socket into which you can connect an antenna, such as a discone (the Icom one is strongly recommended here), or a 144MHz beam, for example. There is a bail stand under the front of the receiver which lifts it up about 2in, but which can be folded back. The loudspeaker is mounted underneath the top cover, and is of quite good quality. There is a carrying handle on the right side cheek, and miniature feet on the left. The set is in a grey metal case, and is well styled. Finally, the VF dial feels really smooth and the tuning tension can be stiffened or slackened at will by using an adjustable slip collar behind the knob.

Basic circuitry

After the antenna input switch, the RF signal passes through one of the input bandpass filters to the antenna attenuator, switchable to 0, −10, −20 or −30dB. The signal then passes to the RF preamplifier, the first stage being a single FET amplifier feeding into a FET buffer which drives the first mixer, a balanced pair of FETs. The first IF is at 58.1125MHz, and includes two crystal filters, giving around 20kHz bandwidth and some IF amplification.

The second mixer is a balanced pair of single gate FETs, driving the second IF at 8.83MHz. This second IF includes the noise blanker take-off point, and the feed to a third mixer for driving a 455kHz FM strip with two limiters and discriminators. The FM filter is a CFW455F, and various 8.83MHz filters can be switched in for SSB, CW and AM. The SSB/CW product detector operates at 8.83MHz, as does the AM active detector. The noise blanker circuit doubles back into a second gate of one of the second IF amplifiers. The tunable notch filter operates at audio, after the mode source switching, each source having its own audio preamplifier and frequency response tailoring.

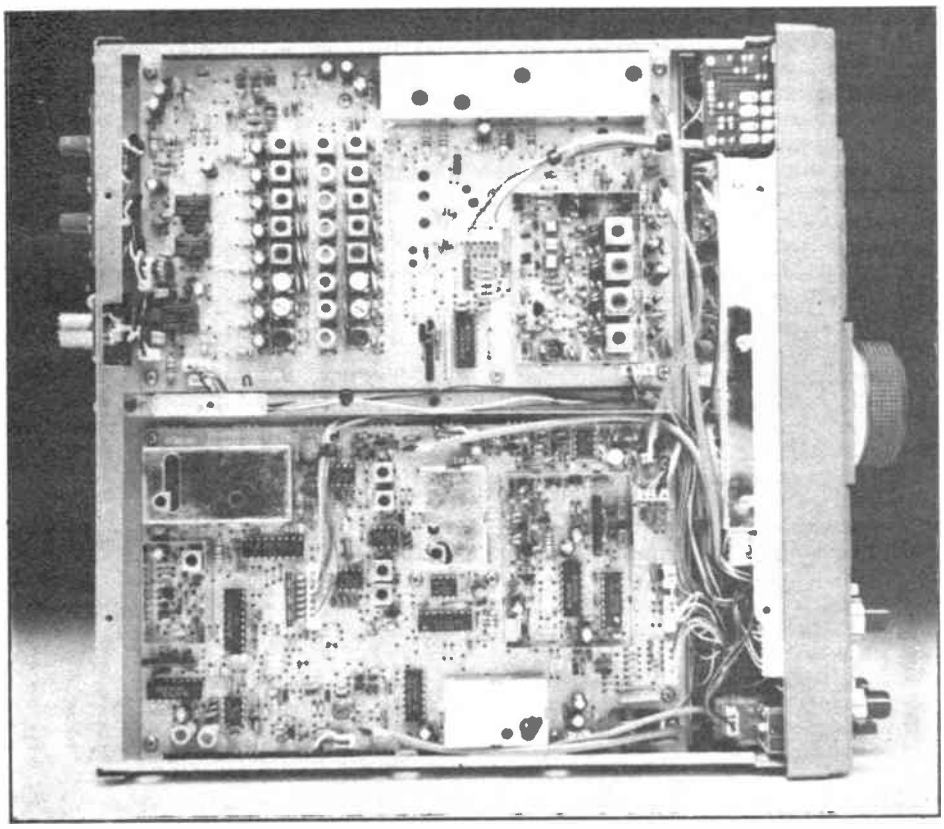
The filters on the main SSB and AM line are actually switched in series with buffers to gain improved skirt selectivity, and this certainly helps in the general excellent selectivity performance on SSB. There is no 455kHz IF for SSB and AM, which is one of the differences when compared to some of the Trio transceivers. The bandpass tuning, therefore, acts by offsetting the second mixer and product detector local oscillator frequencies.

VHF converter option

The VC20 is an optional extra, which is provided with its own plate on the back containing a separate SO239 antenna input socket. It is switched on by simply pressing the HF/VHF button on the front panel. If you have stored a VHF frequency and mode in a memory, then when you access this memory, the VHF converter is automatically switched on and the VHF frequency comes up. The converter operates in four band segments, and the bottom one, from 108 to 123MHz, has a reduced sensitivity, approximately 10dB less than that of the higher segments (123 to 138MHz, 138 to 155MHz and 155 to 174MHz). I have to assume that this is to reduce any possibility of intermodulation problems in the bottom segment from very strong signals in Band II (88 to 108MHz). For the higher segments, the converter has a phenomenally good sensitivity, equivalent to that of the Trio 751E, or a muTek front end Icom rig. The converter has four different local oscillator frequencies, and the final output from the converter is fed directly into the first IF of the main receiver itself, and thus the converter also has to mix down to the centre of the IF passband.

Ergonomics

The tuning knob mechanism feels very free and smooth and is of the interrupter type, so that when it is turned rows of pulses cause the microprocessor to add or subtract to the first local oscillator frequency. When the step rate button is in the finer step mode, ie 10Hz on SSB/CW, or 100Hz AM, the tuning rate speeds up considerably when the knob is



rotated rapidly. Somewhat curiously, this facility is not provided in the larger step modes, and this is quite a nuisance. I rather like to be able to feel what I am doing, and the absence of a finger hole with a bearing on the front of the tuning knob may be annoying to some, as it certainly is to me, and so it is also on the TS440S and 940S models. I would welcome Trio supplying an alternative optional knob for these rigs, for finger hole knob rotation is more predictable and quicker than spinning at random.

The MHz buttons are most useful, both for changing a band, and for going up and down the memories, but it might have been useful to have the programmable step facilities that were on the Yaesu FT767. The memories were very easy to access, but you might think at first that 100 memories are a bit ridiculous. However, many amateurs, as well as short wave listeners, will want to put in banks of frequencies on various bands, and some users may well want to reserve various groups of 10 for different VHF, UHF and microwave bands. I personally find that 40 memories on my TS940S are not enough, as I like to put all the important beacons on each band into memory, eg 70, 23 and 13cms. The R5000 will thus make an ideal high quality receiver for use in dual band operation, especially as it is multimode.

Switchable selectivities

I very much liked the switchable selectivities, the auto position being that normally used, but there are so many occasions when you want to narrow or widen selectivity on any particular mode. I wish it had been possible however, to have incorporated the superb variable selectivity facility as on the TS940S. You will find the 10dB stepped antenna attenuator most useful, especially on the LF bands. However, I wonder why Trio have never offered a function in which the antenna input can be jumped over the first pre-amp, so as to feed directly into the mixer but still via the bandpass filters. This technique is used by Icom in almost all their HF rigs, and it gives perhaps 6dB inferior sensitivity, but improves the RF intercept point by 10dB, thus increasing the available overall dynamic range of the front end. Perhaps Trio should consider providing this facility on the –10dB attenuator position, followed by 10 and 20dB input attenuations for the 20 and 30dB gain reduction positions. This would most certainly help the performance at the top end of medium wave.

Blind people will especially like this receiver, as the voice frequency readout is very clear and can be made quite fast by an appropriate connection on the voice board. So many of the functions are accompanied by beeps or CW letters when they are accessed, and this is a constant reminder that one is in the process of making a change – and gives you that extra confidence in operation. I was a little surprised that you cannot turn the AGC off, and this may be a disadvantage to some CW listeners who like to work the Rx gain flat out for receiving weak signals.

I was quite surprised to find that the tunable notch filter works at audio rather than at a low IF. In the case of the R5000 there is no final 455kHz IF on SSB and RTTY, and it would have been difficult to have had such a high Q circuit at a higher IF. Furthermore, the product detector distortion is so low (below 0.7%), that having the filter in the audio is quite sensible. What would have been annoying would have been the harmonics of the beat tones of an interfering carrier which were not rejected when the carrier itself was rejected at audio. This phenomenon occurs if you use the excellent Datong or Daiwa units on the audio output of a receiver, with a badly distorting product detector, such as one I found in an old Yaesu FT101B.

Filters

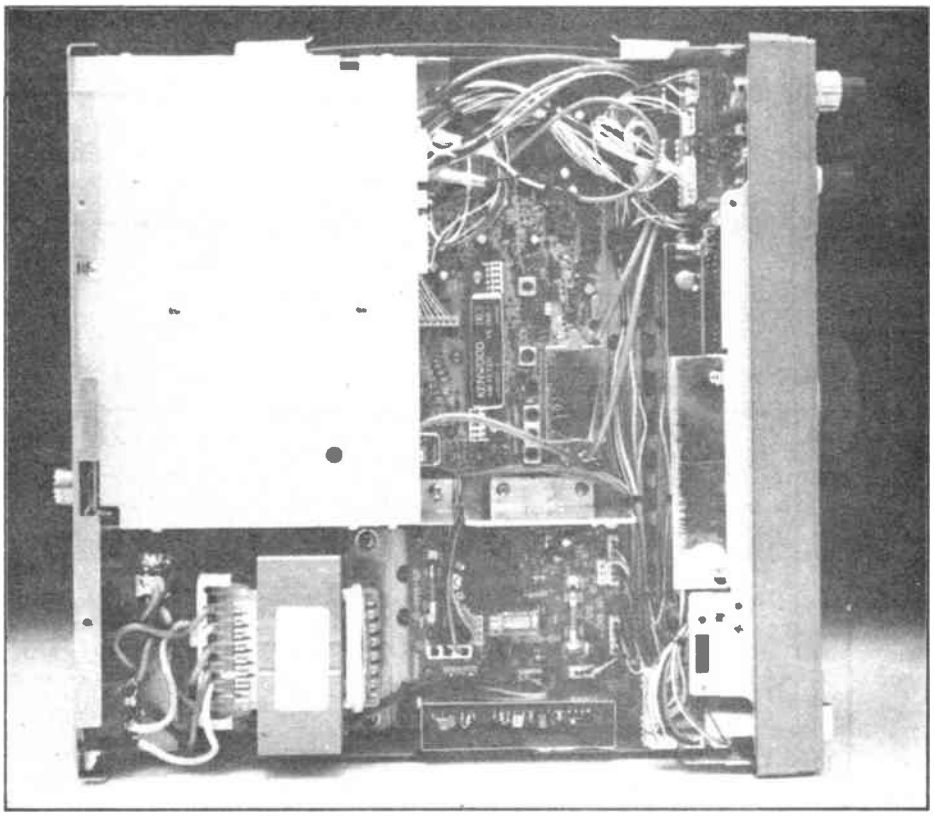
If you use the tunable filter in the CW mode, you will find that it has a fairly broad tuning peak. This helps remove mush at frequencies either side of the CW beat note, which all helps readability. I have one criticism of the notch filter, which concerns its use on AM. If you do not have the optional, and quite expensive, excellent AM filter, and just rely on the rather wide band AM response without it, you will find 5kHz whistles here and there when tuning across the various short wave broadcast bands. The limited filter tuning range will not allow you to notch out a 5kHz whistle, which is unfortunate. The skirt selectivity of the optional filter is so good, however, that keen AM listeners who put it in will not be disadvantaged.

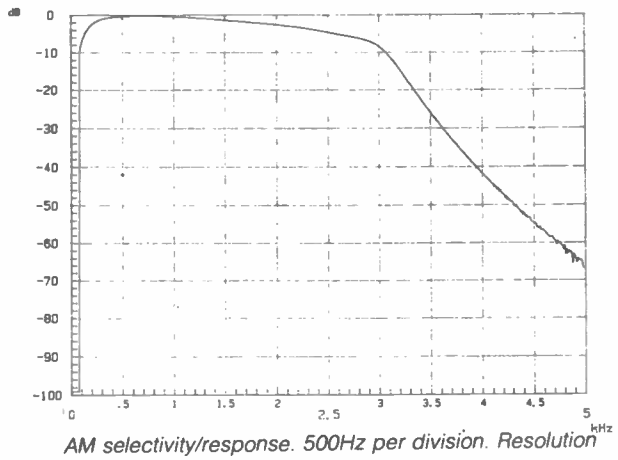
The bandpass filter has a centre indent and worked very well, and mounted with it is a noise blanker threshold control which also worked well. Ignition pulses could be removed, but I don't think anything could cope with the thermostat noise that I get from some horrific beast in my locality! I am simply waiting for the year in which the offensive animal eventually burns itself out with a puff of smoke, for I cannot find it!

I have no doubt that the overall ergonomics of this rig are not only very good comparatively, but eclipse the earlier R1000 and R2000 models, both of which I have had considerable moans about in the past. Trio have obviously thought out the ergonomics very carefully.

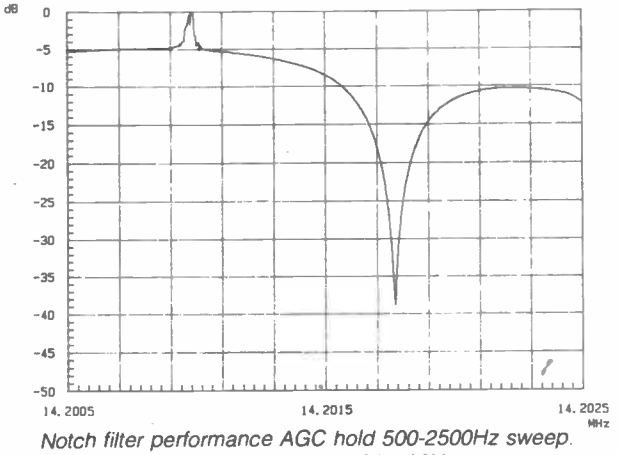
Subjective performance

I was most impressed with the front end, as it is far superior to much of the competition. The selectivities of the various filters on CW, SSB and AM were excellent, and even the FM selectivity seemed quite good, but not quite good enough for 12.5kHz channelling, despite the fact that it has a 455F filter in it. I am slightly puzzled about this, but I did note more interference than usual from 12.5kHz adjacent channels. The AGC speeds seemed well compromised in the fast and slow positions, and there was no nasty pumping on AGC slow, allowing a wide dynamic range to be received from strong SSB signals. The subjective signal to noise ratio of the entire receiver to loudspeaker output seemed very good, and audio distortion was certainly better than average, AM signals being particularly clean, certainly far cleaner than average. The internal

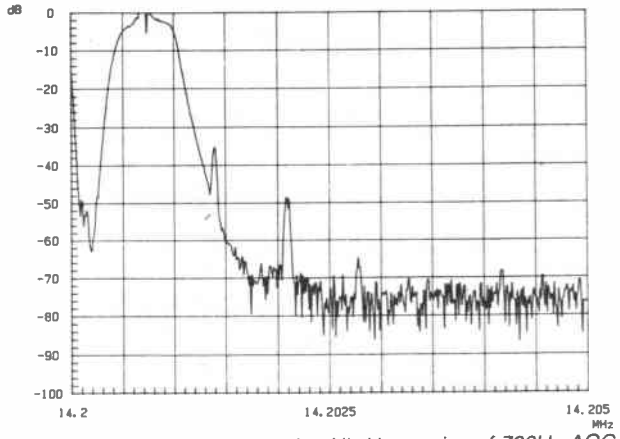




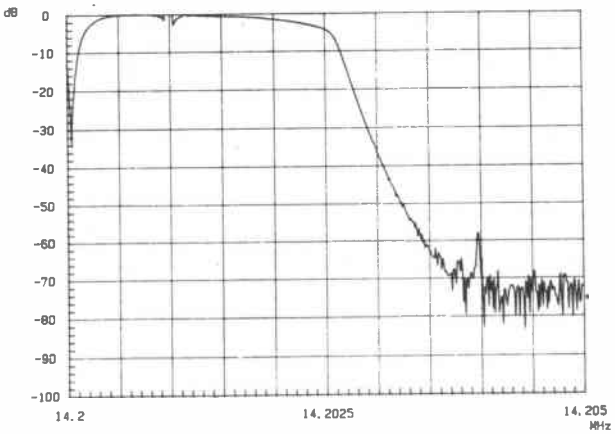
AM selectivity/response. 500Hz per division. Resolution band width 30Hz



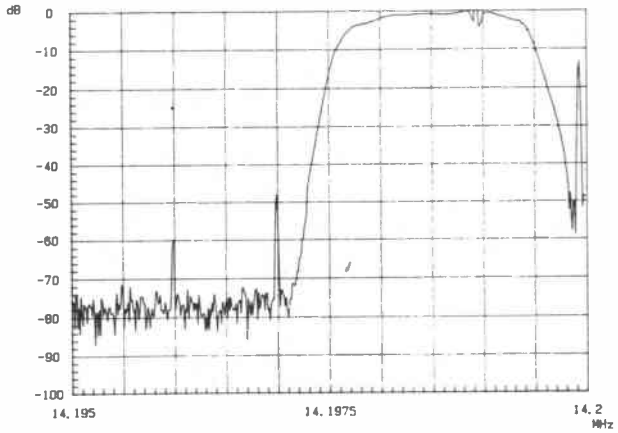
Notch filter performance AGC hold 500-2500Hz sweep. Notch 1776Hz. Resolution bandwidth 30Hz



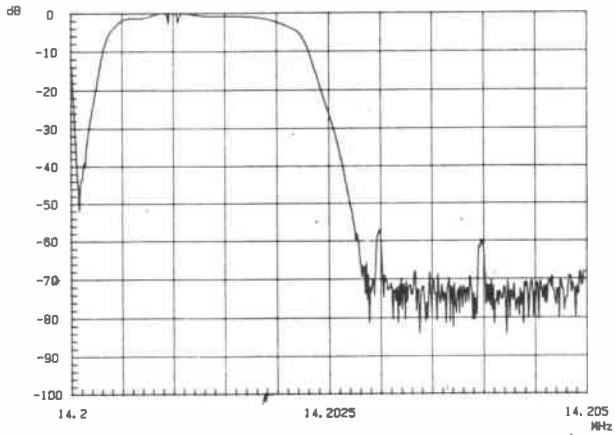
CW Filter RF/AF selectivity. Nb Harmonics of 700Hz AGC hold time. 500Hz per division



USB M2 RF/AF selectivity. Ignore mixer carrier on left margin. 500Hz per division



LSB M1 RF/AF selectivity NAR SSB filter. Ignore R margin mixer spike. 500Hz per division



USB M1 RF/AF selectivity NAR SSB filter. Ignore L margin mixer spike. 500Hz per division

speaker was quite efficient, and the quality good. The notch filter seemed most effective on SSB and it was useful to have the peaking action on CW, although I would have preferred it to have a higher Q when peaking. I particularly liked the antenna attenuator which was especially useful on the LF bands, both the amateur and broadcast ones.

The VHF converter was particularly good above 123MHz, but I am afraid it did lack sensitivity on the portion of the air band below 123MHz, although it was not significantly worse than the performance of an average scanner. The point is that it far outshone scanners above 123MHz.

When originally switched on, the frequency accuracy was quite amazing, with only a 20Hz error being noted at 28MHz. After two or three hours warm-up on one occasion, my wife and I spent many hours taking the selectivity plots at 14.2MHz, and I am very pleased to write that in well over three hours the receiver only drifted 1Hz, the generator used being locked to a Rugby 60kHz standard. I consider this quite a sensational performance, making the receiver one of the most stable that I have ever tested.

I very much enjoyed using this receiver, and I personally feel that it is the one to recommend most strongly of all the separate receivers that I have so far tested. It is not only one that many radio amateurs will enjoy using, and one that in no way is the compromise of competition such as the Yaesu FRG8800, but is an ideal short wave listener's model.

The provision of a 500 ohm input impedance, as well as 50 ohms, will also make it that much more adaptable for use with lurking long wires!

Laboratory tests

The sensitivity on SSB, CW, AM and RTTY modes was excellent right up to 30MHz, and I hardly think that anyone would need anything better. On FM, however, it was not quite so hot, and I am a little baffled about this as I have measured somewhat better on some of the competition.

On medium wave the sensitivity is quite a lot worse, and you might find it inadequate if you are in a valley somewhere, you have any local interference, or there are no strong stations nearby. This lack of sensitivity might be particularly noticeable during the daytime, but in an evening, with a good antenna, it should be more than adequate. The long wave sensitivity appears to be better, and I was able to pick up Rugby very well on 60kHz.

The RF input intercept point measured very well for a sensitive receiver, and less than usual blocking was noted at fairly close spacings. The very close-in performance was also adequate, although some expensive transceivers are somewhat better. The reciprocal mixing performance, whilst being better than that of even the more expensive Yaesu rigs, was not as good as that of the latest Icom ones, nor was it as good as an unmodified TS940S. However, I don't think this will be too much of a drawback as so many other technical points about the receiver are so good.

We took many plots of the selectivity on CW and SSB and you will see that all the filters are very good. I used my recently developed plotting method for these, and there is nearly 80dB dynamic range displayed on the LSB M1 narrow SSB filter. Note that the mixer injection is not quite on the right margin, and that the 1kHz probe tone is slightly offset, as I had to use an uncalibrated sweep to smooth out the noise. This test method was described in the September issue of *Amateur Radio* last year.

The review sample was fitted with the optional AM filter, and the AM response plot shows a very steep skirt above 3kHz, which is excellent. I strongly recommend this filter for AM, as it will knife out a required station from an adjacent channel. The FM IF strip with its 455F filter does not seem to provide quite enough selectivity for 12.5kHz channelling, although the skirt is extremely steep. It seems that the particular sample of filter in this set must be slightly on the wide side.

S meter

The S meter on SSB displayed an average of 22dB between S1 and S9, although this range changed very slightly with time. On FM the meter displayed a 19dB range, but was 6dB more sensitive at S9. The AGC threshold was at around the 1μV level, which is about right for an HF receiver.

Frequency response tests showed that there was some roll-off above 2.5kHz in the output amplifier, which is in addition to any de-emphasis noted on FM. The FM response cut steeply below around 300Hz and was also fairly steep above 3.2kHz, although it had already fallen by 4.6dB at 2.5kHz. On AM a flat response was maintained down to 200Hz, and below this it fell down fairly slowly, whilst the response was attenuated very rapidly above 3kHz.

Detector distortions all measured very well indeed, and I must particularly praise the extremely low AM distortion, 80% modulation at 1kHz measuring below 1% THD, with an RF input level of −50dBm. The AM distortion increased gradually from 1% at −45dBm to 10% at −28dBm, so you will have to use the input attenuator to hold down the input levels of strong AM stations. I suspect that the AGC line needs better smoothing and is not pulling down the IF gain enough before the second mixer. SSB product detector distortion was even lower at below 0.7% on a 1kHz beat note. FM distortion was again very low at around 1%, and this is one of the lowest distortion measurements that I have noted on an NBFM IF strip and discriminator.

Notch response

I have often wondered how it would be possible to illustrate the performance of a notch filter, and so I had a good think and evolved a useful new method for plotting out the notch response without opening the set. The method is very similar to that used for the selectivity measurements, as it again involves the use of a 1kHz offset carrier to produce a 1kHz audio beat to hold the AGC line down, especially when the AGC cannot be switched off. We then swept the tracking generator from a 500Hz offset to 2.5kHz offset. On the plot you can see the shape of the complete notch with its depth and width shown. This should be compared with the M2 (wide SSB) filter response. The null of about

34dB is thus a good one, but the width is perhaps slightly over wide, although some people prefer it this way.

The audio amplifier delivered just over 2W into 8 ohms for 10% distortion, but this increased only to 2.85W into 4 ohms. This revealed that the audio amplifier was not quite beefy enough to feed low impedance speakers, so you may need quite an efficient external speaker if you want plenty of volume for listening to music on short wave.

A closer look at intercept point

The main RF input intercept points were taken at 28.55MHz. The basic figure of +10.75dBm was degraded when one or both of the interfering tones were within 20kHz of the tuned carrier frequency. The worst figure, at 5/10kHz, was −31dBm, which is far from ideal and due to an overwide first IF roofing filter. It is better, though, than some of the Icom receivers which had grossly excessive first IF gain, but more recently Icom have improved on this performance. It seems that Trio have incorporated slightly too much gain in front of the SSB filter, and they do need to have a further look at RF and IF gain distribution.

Intercept point measurements at 3.6MHz gave an improved point at +14dBm, but at 1.9MHz the figure was inferior at +8dBm, probably due to the characteristics of the bandpass filter switching diodes, or the pin diode front end attenuator at low frequencies. Don't forget, however, that you can improve the intercept point dramatically by careful use of the stepped attenuator. You are highly unlikely to have any front end intermodulation problems at LF unless you are unbearably close to extremely strong medium wave transmitters, as I am. My trapped dipole, without matching, puts in a signal of around 0dBm on Capital Radio at 1.548MHz, and I feel it is running excessive ERP.

VHF converter tests

I was most surprised to find that the RF sensitivity of the VHF converter was so very good, showing the noise figure to be around 1.5dB. This is at least as good as any receiver front end that I have yet tested, which is combined with a relatively good RF input intercept point of −11.7dBm.

This figure is typical of many recent VHF transceivers, although it is a long way short of the superb performance given by muTek front ends. It is, however, nearly 20dB better than the rigs such as the FT290, and 8dB better than the performance of the original Microwave Modules 144MHz transverter. The excellent sensitivity was maintained from 123 to 174MHz, although it was 10dB inferior below 123MHz. The total received frequency error on 144MHz was a mere 160Hz showing that the local oscillator frequency in the converter was also very accurate.

Conclusions

This is quite clearly a very good receiver, but its cost is only 25% below that of a complete TS440S transceiver, the R5000 without options costing £895 including VAT. This means a total cost of £1250 including VAT if you include all the filters, the VHF converter and the speech frequency readout. I therefore cannot help but feel that this rig is rather overpriced. However, if you want a good receiver you will have to pay this sort of money, and I most certainly recommend the R5000 highly, both for amateur radio and short wave listening. Next month I will be looking at the new Lowe Electronics HF125 receiver, designed by John Thorpe and made in the UK, which is much less expensive and which seems to be performing quite well in subjective listening tests.

Very many thanks to Fiona for helping me in taking all the measurements and plots, and to Lowe Electronics for not only loaning the review sample, but for discussing all the technical results in great detail.

The Trio R5000 Laboratory Test Results

RF sensitivity (12dB sinad) SSB M2 filter			
28.55MHz		−123dBm	
21.2MHz		−123dBm	
14.2MHz		−124dBm	
7.05MHz		−122dBm	
3.6MHz		−120.5dBm	
1.9MHz		−120.5dBm	
1.1MHz		−105dBm	
250kHz		−113dBm	
VHF converter			
118MHz		−117dBm	
128MHz		−127.5dBm	
138, 144, 148, 158, 168MHz		−127dBm	
173MHz		−126dBm	
RF sensitivity (12dB sinad)			
FM 29.6MHz		−118dBm	
VHF 144.95MHz		−122dBm	
improved to 16dB sinad when retuned by 2kHz			
Effective RF input intercept point 28.55MHz			
5/10kHz		−31dBm	
10/20kHz		−14dBm	
20/40kHz		−9.5dBm	
100/200kHz		+11dBm	
200/400kHz		+11dBm	
RF intercept point for 100/200kHz spacings			
1.9MHz		+8dBm	
3.6MHz		+14dBm	
Reciprocal mixing performance ratio of disturbing carrier/noise floor M1 filter			
5kHz		72dB	
10kHz		83dB	
20kHz		86dB	
50kHz		98dB	
100kHz		106dB	
200kHz		112dB (at 28.55MHz)	
S meter	28MHz SSB	144MHz SSB	29.6MHz FM
S1	−101dBm	−106dBm	−104dBm
S3	−97dBm	−102dBm	−100dBm
S5	−93dBm	−99dBm	−96dBm
S7	−87dBm	−94dBm	−92dBm
S9	−79dBm	−86dBm	−85dBm
S9	−79dBm	−71dBm	−67dBm
S9+40	−54dBm	−63dBm	−61dBm
S9+60	−34dBm	−51dBm	−45dBm
Selectivities			
CW/SSB/AM see plots			
FM ±12.5kHz		10.5dB average	
±25kHz		76.5dB average	
Notch filter depth 34dB, see plot for shape			
Audio distortion and power output			
FM 3kHz deviation 1kHz		mod 1%	
5kHz		1.1%	
AM distortion at −50dBm RF, 1kHz mod 80%		0.85%	
RF at −28dBm		10%	
SSB/CW product detector distortion		<0.7%	
Power output at 1kHz/10% THD 8 ohms		2.1W	
4 ohms		2.85W	
Frequency accuracy 14.2MHz		within 20Hz	
Frequency drift after warm up		1Hz in over 3 hours	
Frequency accuracy 144MHz		−160Hz	
FM capture ratio		5.5dB	
Dimensions including projections W × H × D		270 × 107 × 307mm	
Weight		5.6kg	

ICOM IC48E

70cm FM mobile transceiver

This deceptively simple looking little rig gives a quality and power output performance which belie its size, as it can give a full 25W output over the whole 432MHz band, and yet is one of the smallest higher power mobiles that I have seen. It is very similar to the IC28E, reviewed last year, and is a very good companion for it. It measures 140 (W) × 50 (H) × 171mm (D) including projections, and weighs 1.2kg.

The antenna connection is on a flying N type socket with its cable going through the back panel, another flying lead with special socket being supplied for the nominal 13V dc connection. A very long 13V extension lead is also supplied, with fuses in both positive and negative lines. A mobile mounting bracket and an HM15 microphone with PTT, up and down buttons and a toneburst button complement the package.

Facilities

The IC48E can deliver either 5 or 25W on Tx, depending upon the position of the power switching on the front panel, and the VFO knob clicks round in 12.5 or 25kHz steps, selection being made from the front panel. Since the rig is microprocessor operated, many other facilities are provided at the touch of one or more buttons, and these include: simplex/duplex + or – shift; access to any of 21 memories, including frequency and shift; memory to VFO; scanning of various types; and the programming of any repeater shift likely to be used.

The audio gain control doubles as the power on/off switch when it is pushed in, and the squelch control also has a double function – when it is pushed in it enables Rx monitoring of the normal transmit frequency, ie reverse repeater. When the button is released, it restores normal operation. A 'call' button provides immediate access to the frequency inserted into memory 21, and when the button is pressed again, or when you press the VFO/memory button, you return the rig to the status that it had before you pressed the 'call' button.

The VFO/memory function control is on a rocker type switch, as is the MHz up/down switch. This retains the kHz setting when switching MHz, even when you go from the top to the bottom of the band in one push, which is very convenient. The same rocker can be used to switch memories up and down when in the memory mode, or if you prefer, you can click round the memories using the VFO knob, or the up and down buttons on the mic.

A 'set' button is used for selecting a programming mode on the microprocessor when you want to change functions, such as the amount of repeater shift, and finally there is a tone squelch button used in combination with subsonic tone squelch calling which is an optional additional circuit board.

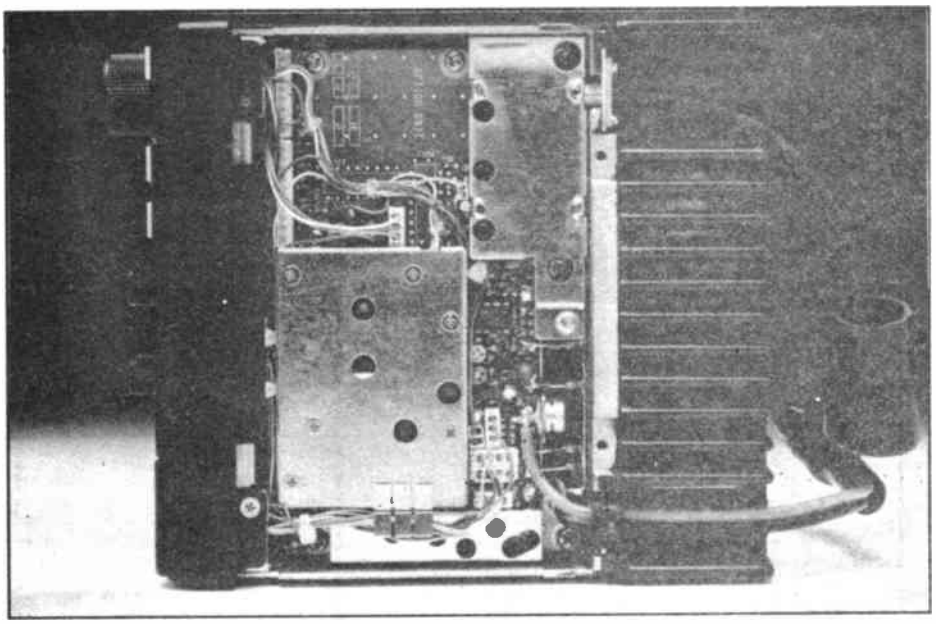
On the back panel there is a 3.5mm extension speaker jack socket accompanying the large heatsink. The latter is just about adequate to prevent the rig becoming too hot, although it did get very warm on long overs when running high power, and you might have to be careful about the positioning in the car to provide very good ventilation, which receives comment in the instruction manual.

The front panel display has a rather natty automatic dimmer mechanism, so that it should always be bright enough to be easily read in any ambient lighting condition, as it brightens up in the dark and dims in broad daylight. The frequency display is black on a clear green background, the display also showing all the status functions. The S meter is rather crude and only S1, 5 and 9 positions are actually labelled, although the other odd numbers do register. The indications come up in pairs incidentally, and only two level increases are displayed over S9.

The front panel mic socket is a standard Icom eight pin type. The internal speaker is mounted underneath and there is no bail stand for use on a table, so you will have to use either an extension speaker, or something to prop up the front when you use it as a base station. There is an internal lithium back-up battery to hold all the memories etc, when the rig is taken away from its 13V supply.

Subjective trials

When I first tried the rig out, I was somewhat baffled because the repeater shift had been set by Icom at 7.6MHz. I did not appreciate that one had to reset the programmable shift mode for 1.6MHz, and I spent a considerable time trying to reset the fixed shift. The instruction book was somewhat vague about this, but Fiona and I eventually tumbled to the solution, and it was comparatively simple once we knew how to reprogram the



correct shift. All the functions worked very well, and I found the rig very easy to use, a lot less confusing than some of the earlier Icom rigs. Although many of the buttons have second functions, these are well chosen, and all the main functions are prime ones.

The received audio quality was excellent, and there seemed plenty of volume available from the internal speaker, despite its small size, and indeed into an external one, especially if the latter was 4 ohms. RF sensitivity was very good, and my masthead pre-amp did not give as much improvement as usual, proving the set itself to be good. 25kHz selectivity was excellent, and no front end intermodulation or blocking problems were noted. The S meter is easy to see, but the range, unfortunately, is far too small.

Transmit quality was well liked on the band, the response being reasonably smooth and the sound quite punchy. The rig became fairly hot on a long over, but the heatsink seemed to dissipate the heat fairly well considering that there isn't an internal cooling fan.

The IC48E is very well presented and internal construction is excellent. I very much appreciate the recent trend in placing the antenna socket on the end of a short flying lead, for this makes installation much easier in the car. However, the extension loudspeaker socket is very deeply recessed in the heatsink framework, and you may find a plug slightly awkward to insert, and you will have to pull on the lead to unplug it.

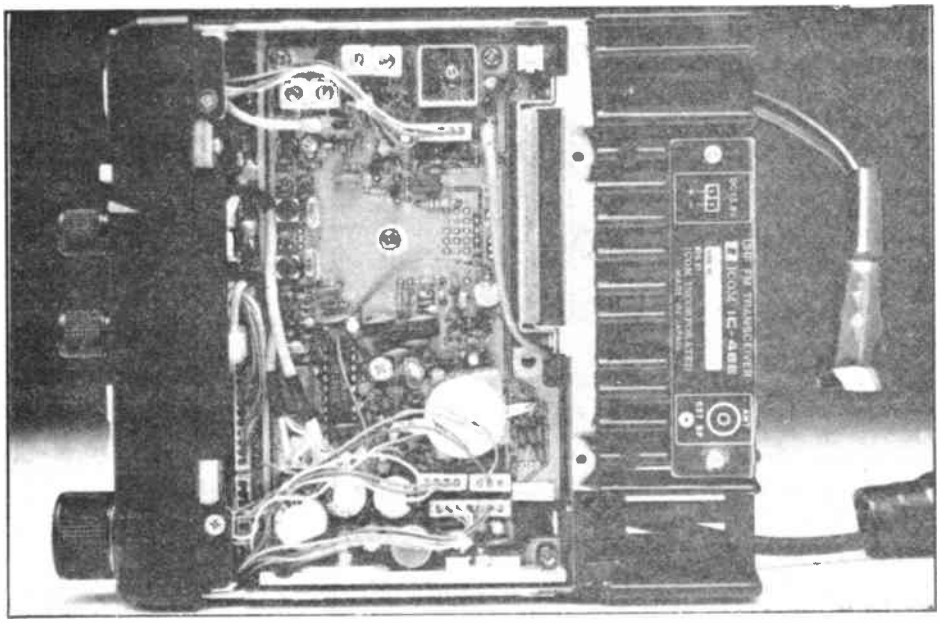
Laboratory tests

The front end sensitivity was found to be extremely good, and better than most of its competition. The rig was particularly sensitive around 436MHz, but right across the whole band good figures were maintained. The RFIM performance was good enough for normal operation, but the input intercept point was quite a way short of what I would regard as a really good figure. However, this should not be a problem on the band at the moment as signal strengths are quite a lot weaker than they are on the 144MHz band. Reciprocal mixing did not seem to be a problem as the local oscillator seemed quite quiet off channel, although I did not take any measurements. The IF selectivity was extremely good for 25kHz channelling and the passband was very symmetrical. The receiver was virtually perfectly on frequency, as there was only the most minute improvement in sensitivity when the generator was retuned slightly.

The S meter operated over an extremely small range, a signal of just below 1μV registering S1, and only a 7dB increase required for a reading of S9! The two divisions above S9 required RF increases of only 2dB and 1dB, and so I suggest that the S meter only gives an indication of the presence of a fairly strong signal! The capture ratio measured out at just over 4dB, showing good discrimination between two signals of differing strength on the same frequency. The limiting threshold was substantially below the sinad sensitivity level, so all received signals should give a compatible audio output level. This helps one to read weak signals. Quieting was very good on weak signals.

The audio distortion on a strong carrier was somewhat lower than average, which resulted in very clean reproduction of good quality transmissions. I was quite surprised that the rig gave 2.8W output for 10% distortion into an 8 ohm external load, with an increase to 4.5W into 4 ohms, showing that a 4 ohm speaker in the car should give a lot of acoustic output before distortion sets in. This should be quite useful when you are in a noisy traffic jam with the windows open on a hot summer's day.

The Rx frequency response measurements showed a gentle roll-off below 500Hz, becoming extremely steep below 200Hz. HF rolled off fairly gently above 2kHz and more rapidly above 3.2kHz; a reasonable compromise for the band, especially for mobile operation.



Transmit section tests

A maximum output power of 26W was noted at 433.2MHz with 13.8V dc supplied to the rig. With the supply reduced to 13.1V, output power varied from 25W at the low end of the band to around 22W at the very top end. In the low power position the power was typically 5W, which held steady across the band.

The RF frequency accuracy was excellent, and no drift problems were noted. Maximum speech deviation when provoked under extreme conditions was well controlled, and was only slightly higher than normal peak deviation, which had been set very accurately. The mic gain was adjusted for optimum deviation at around 2 or 3 inches from the mouth. The toneburst deviation was correct and its frequency was spot on.

Background noise was at a reasonably low level, and no synthesizer whine problems were noted. The repeater shift accuracy was within 10Hz and there were no RF harmonic problems. The maximum

current drawn on Tx was 5.8A, which is quite high for the output power given, although on low power the rig drew 2.4A. On Rx the current consumption was 0.34A, so don't leave the rig on over a weekend, otherwise you will be stumped on the Monday morning!

Conclusions

It should be noted that Icom have unfortunately dropped the speech read-out facility which they had introduced in earlier models, so this will not only be awkward for blind operators, but many mobile operators do rather like to keep their eyes on the road and press a button for frequency readout. I personally liked using this rig very much, and it is far easier to use than some of the earlier models as it was far better ergonomically designed. Its small size combined with high power makes it attractive, and the price is not grossly excessive at £449, including VAT, although it will still make a large hole in your pocket! I strongly recommend the rig and I do hope that many readers will try 70cms FM, as it is a most enjoyable band with plenty of repeaters around, and not congested in the way that 2m has become in the cities.

Many thanks to my wife, Fiona, for operating the computer testing program, and for all the help she has given in assisting me with the measurements, and in writing the review. I would also like to thank Thanet Electronics for loaning the review sample.

Icom IC48E Labatory Test Results

Receiver Tests	
RF sensitivity	
12dB sinad ref 3kHz deviation	average −124.5dBm (0.13μV)
	best −125dBm
RF input intercept point	−16.5dBm
Selectivity ±25kHz	−68dB average
±50kHz	−73dB
Capture radio	4.3dB
S meter S1	−109dBm
S5	−105dBm
S9	−102dBm
two higher levels indicated at	−100dBm and −99dBm
Audio distortion at 1kHz deviation	1.3%
3kHz deviation	2%
5kHz deviation	2.4%
Max output power for 10% THD	
8 ohms	2.8W
4 ohms	4.5W
3dB limiting threshold	−128dBm
Rx accuracy	well within 1kHz
Transmitter Tests	
Max Tx output power at 13.8V	26W
Tx power at 13.1V hi/lo	
430.2MHz	25/5W
433.2MHz	23.5/4.8W
436.2MHz	22/5W
439.975MHz	22/5W
Toneburst frequency	1750.1kHz
Toneburst deviation	4.2kHz
Max speech deviation	5.6kHz
Typical speech deviation	4.8kHz
Tx frequency error	+180Hz
Max repeater shift error	
Input/output	10Hz

An idea for the holidays

Visit the National Wireless Museum

Holiday time comes round very quickly, and it will not be long before many of us will be off again to all parts of the globe. One very popular place in Britain is the Isle of Wight. The reason for its popularity is clear: in spite of its size there is plenty to see and do without having to travel very far. Places such as Alum Bay and the Needles, Cowes and Blackgang Chine are just a few of the well known attractions.

There are some interesting places on the Isle of Wight for the radio amateur to visit. Firstly, there is the Marconi Monument at Alum Bay. This was set up to commemorate the tests which Marconi performed around the turn of the century to investigate the propagation of radio waves. Then there is a more interesting attraction: the National Wireless Museum.

This is conveniently located at Arreton Manor near Newport, which is easily found as it lies just off the A3056 and is well signposted. The manor is well maintained and lies in some very pleasant grounds. It is of great interest in itself, with parts of the building dating back to the 14th century and earlier. Apart from the manor there are several displays, including kitchen bygones, toys from the past, fabric, lace and fashion, a folk museum, antique armaments and English homes through the ages. So, whilst the rest of the family is happily looking around these displays, you can visit the Wireless Museum with a clear conscience.

The museum

The museum is located in one of the outbuildings, but quite near to the main house. The room holding the museum is packed with old and interesting wireless equipment of all shapes and sizes and of all descriptions. The atmosphere is one of years gone by, when valves reigned supreme and wirelesses gave off the gentle odour of dust on hot glass; the days of the BBC Home Service.

The array of different types of equipment is impressive. It ranges from early crystal sets to valve wirelesses, and from domestic radios to amateur and service communications equipment.

There are numerous broadcast receivers of all descriptions. These date back to some of the very early crystal sets. On one of these I saw a note explaining that the set had to be used with headphones unless it was very near the transmitter, when a loudspeaker could be used. Some of the spares to go with these sets were also on display, including some 'new' or at least unused crystals, and some cat's whiskers.

Moving forward in time, there are some early bright emitter valve sets and a selection of horn loudspeakers, as well as some early moving coil types. Then there are a number of pre-war valve superhets. These are all later than about 1933, which was about the time the superhet became popular in Europe. This was brought about because of the increasing number of strong broadcast stations which were transmitting. It was also at about this time that radios started to take on the form of an accepted piece of everyday household furniture. The examples on show are smaller than the earlier multivalve TRF sets, and they have fewer controls and clear illuminated dials, designed so that anyone could use them.

In addition to the broadcast equipment there is some ex-service equipment. This includes an example of the famous R1155 receiver and T1154 transmitter. These would bring back memories not only to people who used them during World War II, but also to the countless thousands of people who must have owned and modified them since.

Amateur radio is also widely covered. There are examples of pre-war experimental transmitters, receivers, Morse keys and other components. Complementing the equipment is a display of some old QSL cards, some of which date back to the early 1920s, when callsign prefixes were not used. Then, to show what some of the equipment looked like when it was in use, there are some old photographs of some early amateur stations. Again, some of these date back to the beginning of the 1920s.

In spite of all the broadcast and amateur equipment the centre piece of the museum must be the 1930 all mechanical 'Televisor' which was made by John Logie Baird, the inventor of the first working television system. This television is one of only a very few remaining which were built to receive the first television broadcasts in the world from the BBC at Alexandra Palace in London. It is in excellent condition as it has been renovated, but it does serve to show the shortcomings of the Baird system with its large revolving disc and small thirty line screen.

Conclusion

The National Wireless Museum is well worth a visit if you are on the Isle of Wight. However, for those who are not it is worth noting that the museum is now part of the Communications and Electronics Museum Trust. This was established in 1984 so that the work of the National Wireless Museum and other collections can be expanded and improved.

by Ian Poole G3YWX

COUNTERMEASURES

PART ONE

BRIAN KENDAL

In past years I have described the German beams (1984), the RAF wartime navigational aids (1985), and the story of British radar (1986) in *Amateur Radio*. In each of these articles I mentioned that, often within a relatively short time, and in one case before the equipment actually became operational, countermeasures were devised which rendered them impotent.

A full account of the countermeasures employed by both sides in the conflict would fill many books, consequently, within the confines of the pages of *Amateur Radio* there is only room for a brief account of the most important methods employed.

The Meacons

The most basic radio aid to navigation is the non-directional beacon. This is a simple transmitter which radiates a carrier wave on a frequency between 200 and 500kHz, modulated at regular intervals by an identification signal.

By taking bearings on several of these beacons, it is possible for the navigator to determine his position with a reasonable degree of accuracy. Alternatively, by steering a course such that the bearings remain 'on the nose' of the aircraft or ship, it is possible to 'home' onto a single beacon.

Such beacons have been in use since the earliest days of radio, remain in use to this day and, in many parts of the world, are the only available ground based aid.

In the early days of World War II, such beacons were used by both the RAF and the Luftwaffe, and it was realised that if some means of interference were possible, it would seriously complicate the task of the enemy navigators, even to the point where the aircrew lost all sense of location and perhaps even crashed.

The first requirement in jamming these beacons was, therefore, to devise a system whereby the aircraft would not realise that interference was taking place. This was achieved by August 1940 in a most elegant manner.

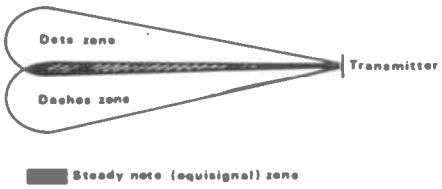
A series of receiving stations equipped with directional aerials were installed around the south and east coasts of England and tuned to the enemy beacons.

The modulation of the received signals was then passed down GPO telephone lines in order to modulate jamming transmitters located some considerable distance inland. When received by an aircraft over the United Kingdom, the jamming signal completely overcame the original beacon, but, as the modulation was derived from the incoming beacon, was indistinguishable from the genuine item.

As a result, the 'fixes' obtained were wildly inaccurate, to the extent that on one occasion a German bomber landed on a beach on the south coast of England in the belief that he was flying over Spain!

The masking of the MF beacons was known as 'Meaconing', and the jamming transmitters as 'Meacons'.

At a later date, a further development of Meaconing was introduced with the receiving equipment tuned to the enemy aircraft transmitters. When the aircrew requested a DF bearing from a base station, their transmission was Meaconed, with the result that they were given wildly inaccurate fixes with errors of up to a hundred miles.



The Lorenz Beam

Beating the beams

Prior to the war, the German Lorenz company had developed a blind landing aid in which a beam was transmitted from the up-wind end of the runway. This radiated a modulation of dots if the aircraft was to the left of the approach path and dashes if to the right. The dots and dashes were interlocked such that, when on the correct approach path, the pilot heard a steady tone.

This aid was well known and was in use by the Luftwaffe and Lufthansa (the German State civil airline), in addition to the British airlines, the RAF and aircraft of many other countries. How effective this was is demonstrated by the fact that the Lorenz system was used for many years after the war, the last in the UK being withdrawn from service at Stanstead in 1960. Working in great secrecy, two German companies refined this technique to develop two very effective bombing systems.

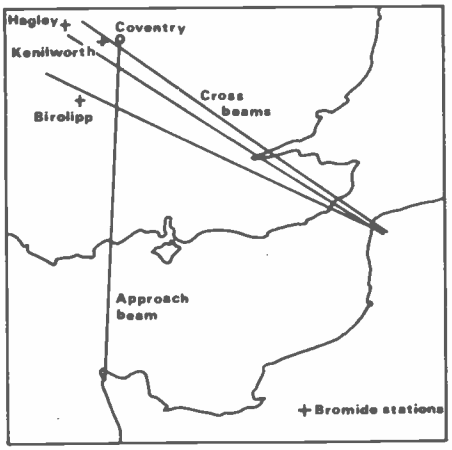
Dr Hans Plendl of Lorenz, who originally developed the system, increased the frequency of the transmission and narrowed the beam such that the equi-signal zone was less than a mile wide at 200 miles from the transmitter. In addition to this, the keying speed was far higher than normal Lorenz, this being interpreted by a meter presentation. Further transmitters radiated beams intersecting the main beam at 50, 20 and 5 kilometres from the target. A special clock was fitted to the aircraft which was started when passing through the second beam and another button was depressed on passing the third. The clock then automatically energised an electrical contact which operated the bomb release mechanism at the bomb release point. This was known as 'X-Gerat'.

The use of X-Gerat required the last twelve miles preceding the bomb release to be flown with great accuracy, and in consequence a special unit,

The nose of the Heinkez HellI photographed at St Athan 1971

Kampfgruppe 100 (ie Bomber Squadron 100) was formed, flying Heinkel He111s, which specialised in the use of the aid.

Simultaneously the Telefunken company was developing another aid which was far simpler to use, and thus did not require specially trained aircrew or, as the frequencies used were the same as those used for blind approach, special equipment. This again used refined Lorenz type beams, but in this case only two which intersected over the target. This second system was known as Knickebein.



The layout of the X-Gerat beams for the raid on Coventry on 14th Nov 1941

The Knickebein transmitters radiated a beam only ⅓ degree wide, which gave an accuracy of better than 1 mile at 180 miles distance.

Despite the fact that these systems were used in both the Polish and Norwegian campaigns, up to 1940 they had not been operated against the UK and the British authorities were ignorant of their existance. With the fall of France, Belgium and Holland, a programme of installing X-Gerat and Knickebein base transmitters was initiated along the coast facing the UK.

The first clues towards the existance of the beams had, however, already arrived, for a wad of papers had been secretly delivered by an unknown person to the British embassy in Oslo as early as November 1939. These described a number of secret German projects, including a device which enabled aircrews to measure their distance from a special ground station!

The mysterious receipt of these papers led to considerable discussion as to whether they were genuine or merely a very clever German Intelligence 'plant'.

The next clue came in March 1940 when a Heinkel of KGr26 crashed in England. On routine examination a scrap of paper was found which referred to 'Knickebein from 0600hr on 315 degrees'.

About the same time, a prisoner under interrogation admitted that Knickebein 'was something like X-Gerat' and that over London the beam would be no more than a kilometre wide.

Two months later another Heinkel from KGr26 was shot down and again a reference to Knickebein was found in a crewman's diary.

Putting two and two together, it was considered that Knickebein must be some form of radio beam. Furthermore, a bearing of 315 degrees from north Germany, mentioned in the first recovered note, would lead to Scapa Flow where KGr26 had been operating.

As a consequence of these deductions, a further very careful examination of the captured He111 aircraft was made. The only unexplained anomaly found was that the Lorenz beam approach receivers were far more sensitive than were necessary for their normal task. From this it was deduced that the beams must operate on the same frequencies as the Lorenz approach. The search was now on.

Within a very short period, further evidence in the form of captured papers became available, these referring to Knickebein and giving locations near Kleve and Stollburg in Germany and, more important, frequencies of 30 and 31.5MHz. Furthermore, beams from these two locations would give an excellent 'angle of cut' over any town in the midland of England. The interesting point about this was that, at this time, the existance, form and origin of the beams had been discovered entirely by Intelligence. No British ears had ever heard them!

The evidence of the existance of the beams was presented to the Prime Minister, Winston Churchill, who, realising their importance, demanded that every effort should be made to intercept and render them ineffective.

The task was now to finally prove their existance by actually hearing them. For this task, only an Anson Mk1 aircraft, which had already been earmarked to be written-off, was available. This was fitted with a Hallicrafters S27 receiver modified for operation from 28 volt aircraft supplies and, reportedly, specially purchased from Webbs Radio of London.

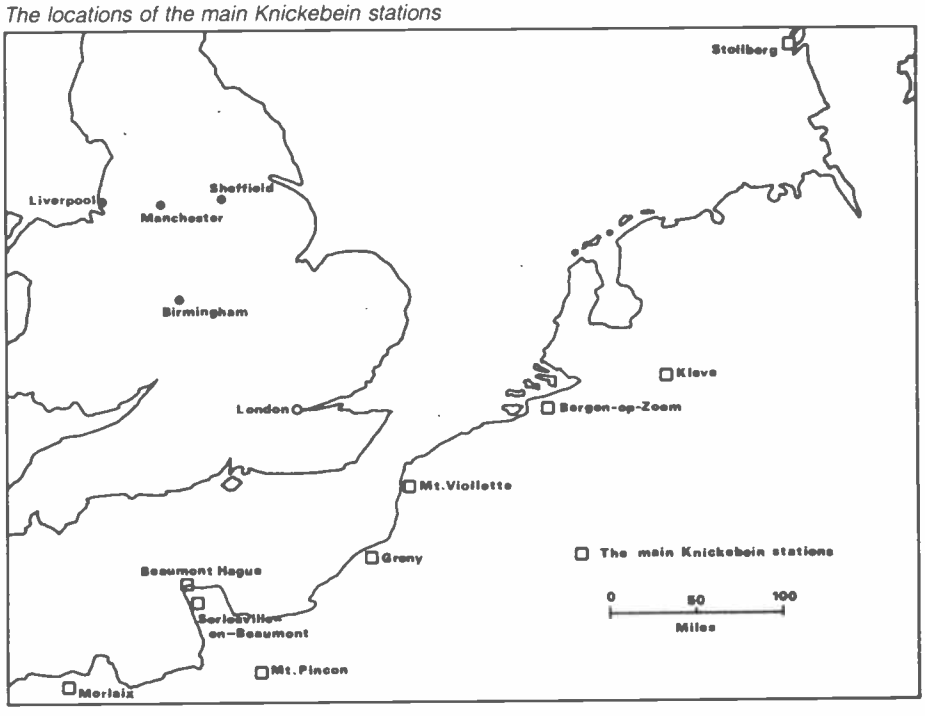
For two nights the aircraft operated from RAF Wyton, patrolling the airspace above eastern England, and heard nothing. On the third night, however, as the aircraft climbed over Spalding the Wireless Operator, Corporal Mackie, detected a series of weak dots on 31.5MHz, which soon became much stronger. As they reached the equi-signal zone, Flt Lt Bufton, the pilot, turned the aircraft along the beam and determined that its alignment was 284 degrees true, a bearing which would pass directly over the Rolls-Royce factory at Derby, the only plant manufacturing the Merlin engines which powered the Spitfire and Hurricane aircraft of Fighter Command!

Later that night they discovered a further beam on 30.0MHz. In one flight on a dark and cloudy night all the theory had been vindicated. Armed with this evidence, a special unit was quickly formed, 80 Group, under the command of Group Captain E B Addison. The original Anson was augmented by two others, and later by Armstrong Whitworth Whitley bombers, to form a very secret Countermeasures Squadron, No 109. Countermeasures were also given the codename Headache.

The next job was heroic to say the least, for the task was to carry S27 receivers, weighing over 50lbs each, to the top of the 360ft CH radar masts in an attempt to receive the beam signals at ground level. If this were possible, 109 Squadron could be alerted in order that they might carry out a further investigation and perhaps even determine the intended target.

Having discovered the beams, the problem was now how to jam them, for the RAF did not possess any high power transmitters operating on those frequencies. When all seemed hopeless, some inspired person remembered that hospital diathermy sets operated on about 30MHz. A number of these were commandeered, modified into 150 watt transmitters and located around the country. Simultaneously, a number of high power dedicated jammers were

The locations of the main Knickebein stations



constructed at TRE Worth Matravers. These radiated a series of dashes of similar characteristics to the German Knickebein beams. They were codenamed Aspirin.

The navigation technique of the German aircrew was to establish their course on the beam quite soon after take-off, fly down the beam until the cross beam was heard and then release their bombs on the target.

After the Aspirin transmitters became operational it was still quite simple to establish their course on the beam but, as the distance from the control station increased, so the Aspirin transmitters became louder, confusing the equi-signal zone with dashes and causing the inexperienced pilot to believe that he had veered to the right of the intended course. In turning to the left to correct this, he would lose the correct beam entirely and, by the time that he realised his error, if at all, it was too late to return to the correct course.

But, there still remained the X-Gerat, for by September the code breaking team at Bletchley Park had evidence that a number of new beam stations were being installed in the Calais area. Furthermore, routine electronic surveillance had discovered new enemy transmissions on 74MHz with Lorenz characteristics.

The intercept had also revealed the positions of two of these stations, given to the nearest foot. From this it was realised that such precision was unnecessary, unless the beams which they were to radiate were also of very high accuracy. Also given were details of course accuracy – an unbelievable five seconds of arc, or 12.5 feet at 100 miles!

Only one squadron were to use these beams, KGr100, who would be using a technique later employed by Bomber Command with great effect. They were to be the Pathfinders, marking the target with incendiary bombs to enable the following force to bomb visually on the fires.

It was suspected that the 74MHz transmissions which had been heard were not capable of giving the quoted accuracy, and that they formed only a course beam for initial signal acquisition purposes, with a much higher frequency beam for the high accuracy element of the system. This suspicion was unfounded, and it turned out that the fine course was generated by superimposing two 74MHz signals in a very complex way, but this was not known at that time.

In order to counter this much larger 'Headache', a stronger 'analgesic' had to be produced – 'Bromide', in the form of modified army gun-laying radar equipment.

The first large scale attack using the X-Gerat was on Coventry in November 1940, but although the KGr100 aircraft passed close to several of the Bromide transmitters, they suffered no interference. Later investigation proved that the modulation of the Bromide transmitters had been set to 1500Hz instead of 2000Hz used by X-Gerat, and the audio filters in the receivers had rejected the jamming completely.

This mistake would never have been made but for an example of Royal Navy/Army interservice rivalry a few days earlier. A Heinkel He111 of KGr100 had been 'Meaconned' and had landed below the high water mark on the beach at Bridport. This initiated an argument as to whose responsibility it was. The resulting delay before it was examined by the RAF proved fatal to Coventry. When finally examined, it was realised that the audio filter was only 50Hz wide and with a modulation error of 500Hz, the Bromide transmitters might as well have been left switched off.

By the beginning of 1941, the Bromide transmitters were beginning to have some success, but if it is thought that they were less than effective, it must be realised that the crews of KGr100 were the most experienced in the Luftwaffe, and their navigational skills were such that most would have probably found their targets with or without radio navigational aids.

Just as some success was being recorded against X-Gerat, the monitoring service began receiving navigation type signals on 40MHz. Intelligence intercepts also indicated a new installation codenamed 'Wotan' on the Cherbourg peninsular.

German codenames often gave a clue to the nature of the device, and 'Wotan' was a one-eyed god. Could this system provide both distance and directional information from a single installation? The deduction was correct even though the basic information was wrong, for it was only several years later that it was discovered that X-Gerat was codenamed Wotan 1 and the new one, Wotan 2.

This new system, called Y-Gerat, was designed, as was X-Gerat, by Dr Hans Plendl. The ground transmitter radiated a complex beam containing 180 directional signals per minute. To obtain the distance, a further signal was radiated between the directional signals. This was relayed by a transmitter within the aircraft on an adjacent frequency. On reception by the ground station, the time delay was measured and the aircraft's distance derived.

As the system had been discovered early, there was time to devise subtle means of jamming the beam.

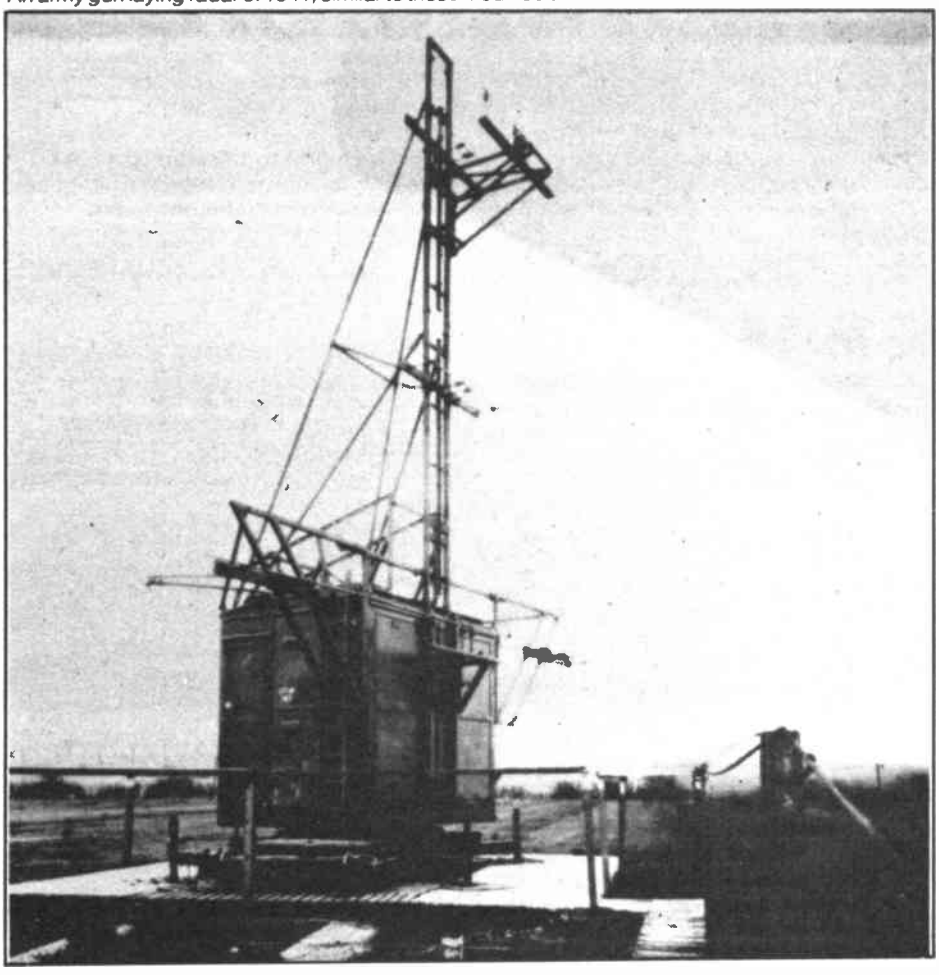
The jammers, codenamed 'Domino', utilised a receiver located at Highgate and the BBC's television transmitter at Alexandra Palace. The ranging signal from the aircraft was received at Highgate, relayed to Alexandra Palace, where it was retransmitted at high power, thus totally disrupting the ranging system.

A further Domino system was installed by mid-February and the effect of the two was that in the first two weeks of March 1941, out of 89 Y-Gerat equipped raids, only 18 received bomb release information.

The Battle of the Beams had been won.

In my next article I shall describe how the RAF counteracted the German radar and nightfighters, and even created ghost squadrons of aircraft and convoys of ships.

An army gun laying radar of 1941, similar to those modified as 'Bromide' transmitters



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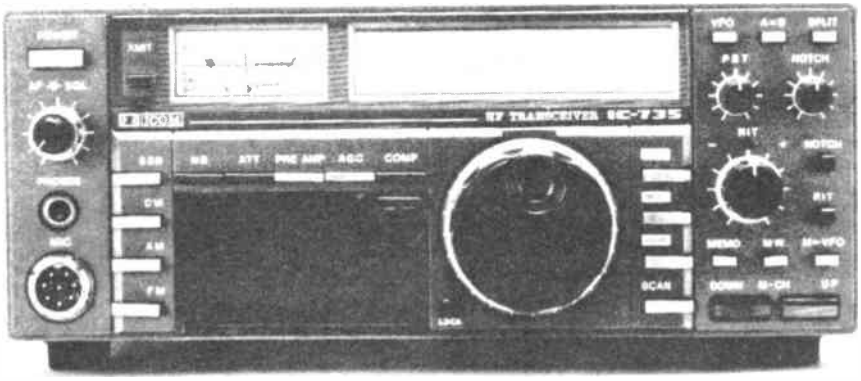

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SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Once again, despite the general conditions being adverse, our listeners have been finding the DX, and I have received some excellent reports from all over the country. If the old adage 'if you can hear them, you can work them' has any truth, then there is really no cause for complaint from licensed operators.

Mick Hudson of Canterbury, despite being in the throes of moving, has certainly been pulling in some nice stuff. During January, for instance, eighty was open for some very nice catches including JH1, KH9, W3, W8, JA4, ZL4, VE8, KC8, YN3, C6, VK2 and a few BYs popping up just to keep the mouth watering. Surprisingly though, the log for forty was not so hot, with mainly Europeans entered. Twenty was, as usual, fruitful and ZD9, TU2, ZS6, KI4, K8, ZC4, 9K2, AH6, S79, FT8 and VP8 were logged, while fifteen gave only TA2, SV5 and SV3.

Sunspot levels

According to the 'air chat' we should see a rise in sunspot levels this year, but exactly when seems to be anybody's guess (see the book review in this column). Maybe we'll notice a difference in the pattern of DX reception in the months to come.

Angie Sitton, never far from her receiver by all accounts, has been logging the nice ones from Stevenage too! Her reports included 7X2, VP8, ZC4, KC4, JB2, AH6/P2, S79, ZF6, 5U7, A71, 9L1, and 9K2/IC5 who was on an Italian island but didn't reveal which one! Turning from twenty to forty she found a similar scene to Mick, but managed to winkle out HV3, J87, 8P6 and PT7, while a trip to fifteen found ZX2u (Brazil), 9J2, YC1, VU2, PY2, OD5 and SV5. SV1 was also found on ten! Turning her attention to the CW ends of the bands as practice for her coming CW test, she logged UQ2 and HG3 on Top Band, K4, UV5 and JQ9 on forty, ZS1, YB0, 5A7 and UA9 on twenty and ZS1 on fifteen.

Gil Castle of Clifton, York, went on another tack to get his log filled and has the Vic 20 running an RX4 program via the FT101ZD to capture those funny noises we hear down the .90 end of the bands. He sent me a selection of printouts from stations he has logged on slow scan television from France, Italy, Portugal, USA, San Marino, Martinique, Bulgaria, Poland and Finland to name a few. If anyone would like to chat about his techniques or about his set-up, they can ring Gil on (0904) 37057.

Homebrew Rxs

Stan Taylor of Hartlepool, has been using his homebrew DC Rxs for 80 and 20 to good effect, and in a one hour sitting (which to Stan is a chore due to a back problem) he logged W3, KB7, W8, K9, NK8 and VE2 on eighty, while on twenty his best DX was 8P9 and VP2V; hard chasing as after TI9W came to a sticky end European QRM drowned him out every time he was passed the mike.

Martin Leonard of Dublin has only been SWL for about eighteen months, but has got in at the deep end with his FT200, homebrew ATU and half G5RV. He says that he's on the prefix chase and has over a hundred so far, mentioning A71, VK2, AK1 and KC2 in passing. He's on a radio ops' course at the moment, but hopes to take the RAE afterwards. Glutton for punishment is this lad.

Over on the awards front, it has been a busy month again with claims coming in from all quarters. First on the scene is Ian Tough, who is out in RAF Akrotiri and has had a busy time on the air with ZC4IT as pile-ups are all part of the action out there. Since he got the callsign, in September, he has worked over 2,500 stations and has over 150 countries logged.

Ian mentions the Pacific 220 net on 14220 most mornings at around 0620Z, with Jim Smith VK9NS in the chair. But, to the matter in hand. The claims were for 250 and 500 prefixes gaining the Bronze and Silver awards for two way QSOs.

Hedley Falkinderin of Malton in Yorkshire, claimed Silver for all bands, Bronze for eighty metres and Bronze for twenty metres all in one go. Not having the advantage of a computer to help him, Hedley had to search the logbook the hard way to sort them out, but seems pleased with the results.

Jane Mullany G4GIG, of Birmingham, has finally made it to the Gold spot and not only sent me her computer readout but a hand written list as well! Jane uses the Philips D2935 for all her listening and remarks that the regular listening has helped her understand propagation conditions and listening techniques.

Most of the listening was done using the built-in telescopic aerial which says an awful lot for the sensitivity of that receiver of hers! A quick glance through the loggings shows 3A2, 5B4, 5T5, 5Z4, 7S2, 8J9, 8P6, 9J2, 9Y4, BV4, C31, CU2, CX4, DU9, DX9, HH2, HK1, HV3, J28, J49, J87, T77, VK7, VP9, VU2, YZ7, ZP5 and that's just a taster!

All bands claim

Mick Hudson got in on the act too with a claim for twenty metres – Bronze, Silver and Gold all in one go. 3A2, 3D6, 5B2, 6Y5, 8R1, 9X5, C21, D44, DU7, J30, P29, TU2, ZB2, ZP5 and ZZ1 featured in a super log, and Mick now threatens me with claims for Silver awards for all five bands. I think I'll change my address!

Meanwhile, up in Market Drayton, Philip Davies has been getting into the contest arena by entering the *73s Magazine* contest. The 20 metre leg gave him WJ6 and WK6, and the 80 metre leg found NZ4, NV4, AJ3 and NM8, some of which were found by moving up into the 75 metre section. However, the 160 metre leg was the best with WB8, WB1, KE5, KM5 and UZ6. One of the best QSOs logged was that between EI8H and NT5V with good signals from both stations. The 40 metre leg perked up on 30th January with CE8, CX9, LU8, ZS4, CU2, J37 and RW3 all heard in one listening period.

Phil relates a story of a lovely YLs voice heard on 8th January around 1600 on twenty metres. Her callsign, AH6GO/2, had Philip dreaming of Hula Hula girls in grass skirts, swaying palm trees, golden sands and exotic cocktail supping at the bar. She mentioned the island where she lived – even better – then something struck him as peculiar. How come she was blasting in 5/9 plus? The bubble burst when she,tailed with 'now portable /2 in Woodstock, New York'!

Congratulations

So to the congratulations bit, where we say welcome to the licensed fraternity (to Angela Sitton, Philip Le Brun, Ray Collins, Peter Hunter and Luciano Marquardt) who have all contributed to this column over the past two years. Their time spent as listeners has now led to them all obtaining their licences. Well done.

As regular readers will know, I had the pleasure of operating GB2ILA over the weekend of 31st January/1st February. Of all the special event stations I have operated or assisted in, this one gave me the biggest kick. In support of the SWL fraternity made it a pleasant task, but the response from listeners was fantastic to say the least. Over the two days, I worked 129 stations in fifteen countries. Most contacts were made on 80m where I got stuck in terrific pile-ups. However, only 24 hours later, confirmations started coming in through the letterbox – QSL cards, postcards, written reports as well as requests for information. At the time of writing this piece, one month later, they are *still* coming in.

The Cornish Award is in the form of a certificate presented by the Cornish RAC

for working/hearing Cornish stations, either resident or visiting the county of Cornwall as /A, /P, or /M at the time of the QSO. There are three classes in three groups. One point is scored for each QSO and certificates are issued for:
Europe, amateur bands 1.8 to 146MHz. Class 1, 30 points. Class 2, 20 points. Class 3, 10 points.
Amateur bands 432MHz and higher. Class 1, 9 points. Class 2, 6 points. Class 3, 3 points.
RTTY. Class 1, 20 points. Class 2, 15 points. Class 3, 10 points.
Non-Europe, amateur bands 1.8 to 146MHz. Class 1, 15 points. Class 2, 10 points. Class 3, 5 points.
SWL claims are welcome with the same scores as above.

Claims should be sent to J E Bowden G2AYQ (QTHR), or to me for verification, with a fee of 50p/$1/5 IRCs (free to handicapped or blind operators).

Due to conditions here over the past four months or so, I haven't been able to get the headphones on for my regular listening periods – and the withdrawal symptoms are telling. The broadcast bands are one of my favourite areas and I was very pleased to receive a Broadcast Award claim from David A Glow, who lives across the 'pond' in Maryland. David sent in a super list, well over the 100 required for the award, which listed some unusual stations as well as the regular 'big boys'. If anyone would like a copy of David's list, please send a stamped foolscap envelope to me at 1 Jersey Street, Hafod, Swansea SA1 2HF (Nb: ILA members will be receiving a modified list in the next Newsletter).

The name F C Judd has been seen on covers of books for a long time, and articles by him are a regular feature of radio magazines. A new book by him, *Radio Wave Propagation*, gives the reader information about ionospheric and groundwave propagation, the solar cycle and sunspots, over horizon radar, critical frequencies, and a MUF and DX guide for amateurs and listeners.

The book is full of information and has many diagrams and charts to explain points and, as a result, is easy reading, even though the subject matter is of a technical nature. Successful long distance radio reception, as has been proved by some of our readers, does not depend on having the best equipment. The ionosphere plays the most important role. Without it there wouldn't be any long distance communication by radio at all.

Good and bad days

Amateurs and listeners can have good days and bad days often not understanding the reasons. Fred Judd G2BCX explains in easy terms some of the reasons why the DX is there one minute and gone the next, and includes data and charts useful to amateur and listener alike. He draws information from authoritative sources as well as his own, not inconsiderable, experience, to put together a very readable book worthy of a place in the shack. Many pages will be well thumbed. Well worth the £8.95, by my reckoning.

Many readers use home computers to assist with their logging, or for resolving CW, RTTY, FAX and SSTV. The range of computers has increased dramatically over the past few years, reaching a boom twelve months ago when nearly every home had a computer of some type. I would like to compile a list of radio related programs and suitable computers and peripherals for publication in the column at a later date. If you can assist in any way, please drop me a line at the address mentioned earlier. Many thanks.

And finally, I'm sorry there's no feature this month, but we are still under tremendous strain here. Thank you for all those nice letters and have a good month on the air. Until next time. . .best 73s.

NO TVI TRANSMITTER

Could this be the answer to our interference problems?

The dream transmitter has arrived! A full legal limit transmitter that will not cause TVI under any circumstances. The problem of TVI has been with us since the first transmissions from Alexandra Palace before the war when the BBC, in ultimate wisdom, decided to use frequencies for the TV system which were on the third harmonic of the amateur 20m band. Immediate chaos ensued as can be imagined, and since then the search has been on to reduce the problem. These ideas have always been along the lines of minimising harmonic radiation with filters, traps and various other devices. What has never been done before is to see if there is any possibility of using the properties of the TV transmission itself to get around the problem.

New information

A recent report on some investigation into this line of thought has appeared in the pages of a rather obscure South American technical journal, *Revista de la Sociedad de los Aficionades de Radio Emisoras (Numero 67) Y de Burrologia del Pueblo de Santa Euforia del Gran Pueico*; nothing simple like *Amateur Radio* out there. The original author was Hosa B Marvello, who holds the experimental callsign IM2GUD, and I would like to thank both him and the journal for permission to republish some of the original material.

Now you see it

It has always been obvious that you could only get TVI whilst the TV Tx was on the air and, as an ultimate way out of the problem, some amateurs were forced into operating outside normal TV broadcasting hours. The fact, which has not been noticed before, is that even when a TV signal is being broadcast *it is not there all the time.* A useful comparison can be made with the projection of a film in the cinema. Although movement on the screen can be seen, it is well known that what is really being seen is a series of still pictures which are projected sequentially to give the impression of movement. So that the change of picture as a blurr on the screen is not seen, a shutter is used to cut off the light while the film is moved. During a one hour period the screen is actually only lit for 20 minutes but persistance of vision fills in the gaps.

Now you don't

How does this tie in with the TV transmission? The TV picture is actually drawn by a dot of light which is swept across the screen to form the individual lines of the picture, and each line is drawn a little lower than the previous one so as to fill the screen, the whole process taking 1/50 of a second. We now come to the bit that is useful here. Once the spot gets to the bottom of the screen it has to be sent back to the top to start the whole thing over again. This takes a short period of time, but so that the system regains stability, this flyback period is followed by a few lines which do not contain any TV picture information. They are blank lines and the TV set is adjusted in such a way that these lines are off the top of the screen.

To further ensure that the spot whizzing back up the screen is not seen, these lines are blanked out or, to put it in other words, the set is effectively switched off during this period. If it were possible to transmit only during this blacked out period then it is obvious that TVI could not be caused *under any circumstances.* It would not matter how badly overdriven or poorly adjusted the rig was, or even if the aerial passed within six inches of a neighbour's TV aerial. You cannot get TVI on a set that is, in effect, switched off.

The real magic

Is it possible to make use of this effect? What it will mean in practice is a system which will transmit audio in short bursts that are synchronised with the blackout time of the TV picture. This sounds as though it would give a lot of audio distortion, but in fact this is not the case. What is used is a form of time sampling, and this is exactly what is used to make the latest ultra hi-fi digital recordings. The result is actually superb audio quality SSB instead of the very restricted audio quality which is now produced. If more proof is required that the system will work, remember that the normal received noise blanker works by punching holes in the audio when interference is present, but you are not aware of the missing chunks of signal.

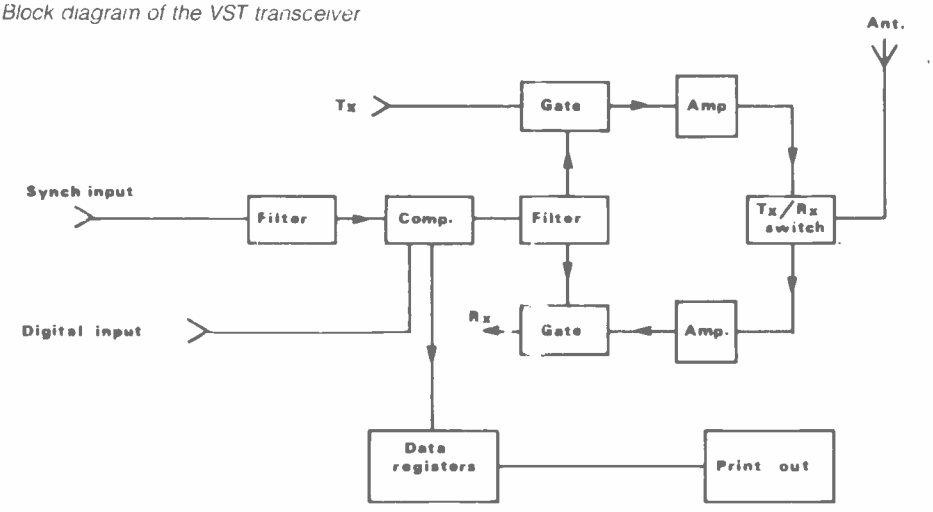
The VST system

This new system is known as Video Synchronised Transmission, or VST, and the prototype system has been built and tested running full legal power on all amateur bands up to 432MHz, with no sign of TVI at any of the many sites used. The system works in such a way as to make it usable as an add-on to any existing transmitter, and offers several other advantages which will be dealt with later.

The basic system

The block diagram in *Figure 1* shows the basic elements of the system. The first requirement is to actually get a synchronised output from your shack TV receiver. It is impossible to give precise details for this as circuitry varies from model to model. A look at the circuit diagram should make the connections clear, but if difficulty is found then your local TV repairman should be able to fit a suitable output at very low cost. It is essential that the output is via a transformer and that both ends of the secondary winding are isolated from the TV earth plane or chassis.

Block diagram of the VST transceiver



More technical

Several special circuits have had to be developed for this system and each is briefly described below; credit being given to the originator. The next stage is the sync filter, which uses the series U configuration developed by Plumber. It is essential that the sync path is kept at a constant level, and this is acheived using a compressor developed by Bromwade. The main circuit elements in this unit are two Borg resonators. After the compression circuit the control signals are once again filtered to remvove the high frequency components.

It was found that the only suitable circuit to acheive this was the well-known tandem system developed by Raleigh, and even this required transient limiting at both ends using Dunlop buffers. An input for digital signal modes is also provided and here a choice of either NCR or Gross registers may be used. A further enhancement is to use these units as developed by Sainsbury to provide a hard copy printout of the digital input.

Gate management

The fully shaped control signal is now used to switch the gate in the transmission path so as to enable transmission only in the period when the screen is blanked. It was originally thought that the pulse width would have to be reduced somewhat to allow for residual vision effects in the eye of the TV viewer. In actual fact the reverse proved to be true and the signal pulse can actually be lengthened somewhat due to illumination inertia in the coating of the TV tube. This allows longer audio sampling periods and an even higher standard of speech quality. A spin-off of this technique is that the broadcasting authorities are now examining the use of this system as a means of radically improving the quality of FM transmissions.

Additional considerations

The use of the new technique during transmission also provides other benefits. Due to the fact that the power amplifier is now only in use during very short pulses (ie the duty cycle is now extremely short), it is possible to get prodigious amounts of power from small signal devices. In a test on 80 metres it was found that it was possible to obtain peak powers of nearly 100 watts from a BC108 fitted to a good heatsink. A further advantage is that the ratings of power supply components, and especially the expensive mains transformer, can be typically reduced by a factor of 10. The short duty cycle means that there is now little need for a large heatsink, consequently making a reduction in the size and weight of the equipment possible.

Receive parameters

There are no problems in the receiver, as the transmission is completely compatible with normal circuit practices. The receiver can, however, be modified so as to give enhanced noise rejection properties. This is very simply acheived by driving the existing receiver noise blanker by the TV sync signal, so that the receiver is only switched *on* during the synchronised transmitting period. All noise received outside this period is, of course, completely blanked. Tests have shown that the Woodpecker type of signal, due to its long pulse length, is completely removed. More important is the fact that, due to the receiver only being switched on during the frame blanking periods, there is no sign of the usual timebase whistle on the lower frequency bands.

Test transmissions

This short report on the new equipment gives some idea of the tremendous potential that the system shows in several areas. It is not possible yet to give full constuctional details, but it is hoped to obtain permission from the originator to do so shortly.

Emphasis must be placed on the fact that this is an add-on unit which can be used with any transmitter and requires only a modest amount of knowledge to install. Does it really work as well as the report suggests? The proof is to actually take part in a contact and judge for yourself. Permission has been obtained to make these test transmissions on 3.75 and 7.075MHz on the hour, starting at 0900 GMT on 1st April. Please call CQ for VST test to obtain your demonstration.

50MHz What to

After the highly successful results obtained by those of us who were fortunate enough to have operated during sunspot cycle 21, either as permit holders for direct operation on 50MHz or operating crossband, we are now wondering what is in store for us, and when, as we move into cycle 22.

To regular operators the effects of sunspots and sunspot cycles are well known, with the maximum usable frequency (MUF) varying so that DX is more likely on the HF frequencies during the peak years of a sunspot cycle.

The area around 50MHz is the crossover between VHF and HF propagation, and is a band exhibiting almost all modes of propagation experienced at both VHF and HF. Further, being near the upper limits of ionospheric and the lower limits of tropospheric propagation, and at the optimum frequency for aurora and meteor scatter, it is a big attraction for amateurs with experimental inclinations.

It was most unfortunate that the original 40 experimental permits were only issued after the peak conditions of cycle 21, but the crossband successes of those of us who operated during the years 1979-82 are an indication of what is in store for the future.

Past history of sunspot cycles

Sunspot cycles are not something new – Chinese state astronomical records contain records going back over two millenia, and two researchers of the 'ancient sunspot records group', Mr Xu and Mr Jiang, have found new data based on local records which cover the 17th century. The new data shows that cycles were indeed observed, and for the latter half of the 17th century were essentially as normal as today, with cycle lengths of approximately 11 years.

Perhaps of more interest is the recent work of George Williams, a geologist working in the Flinders Range in south Australia. He has shown that lake sediments are banded very much like tree rings and fit an approximate 11 and 22 year rhythm. The data can now be traced back for 680 million years and such information reveals that banding in the past is very much like today, except that the strength has varied considerably.

Dr Robert Brecewell of Stanford University, California, looked into the lake sediment data covering the last 1337 years, and after a searching mathematical analysis, established that for the last 200 years they were precisely in step with known observations.

I am indebted to Charlie Newton G2FKZ of the RSGB Propagation Studies Committee who prepares the GB2RS propagation news and solar data for the following:

'First, all forecasts are based on past knowledge. It may come as a surprise, but it is still a fact that there is still very little hard core data on past cycles and so we are very much in the realm of guesswork. See *Figure 1*.

Facts

'We have only had good sunspot data since about 1890. Prior to that it is mainly guesswork. The next maximum is very important because it will affect all the satellites that will be launched, due to the increased heating that occurs in the outer atmosphere. If it is possible to design now for the 1990s there could be many benefits. So, this brings us to the question: When will the next maximum be and what will it be like? The honest answer is, I do not know! Most predictions at the moment give an answer around the 1990s, possibly 1991.

'In order to say what level will be reached it is most important to determine just when the minimum occurred, because that decides what it will be. At present I am not certain that the minimum has passed, and have tried to make that clear on GB2RS. The only people who say we have passed the minimum are the Meudon Laboratory, who cancelled all their predictions and substituted others, but Boulder say they have jumped the gun! We had a burst of activity last October, but since then it's been downhill again.

Sunspot predictions

'One of the more accepted statistical methods, the McNish and Lincoln method, gives a forecast based on a minimum this year (1987) and would put the next maximum in 1991 with a 'smoothed' sunspot count of 120, which fits the present bimodal pattern that has been evident since 1890 very well. All the prediction methods are very sensitive to exactly when the minimum is and what its level is, and at present we are running higher than the three previous cycles, so it looks as though we are not there yet! The spotless days are what I am watching the solar rotation for, but though they are not increasing, the rate of decrease is not enough to say we have passed the minimum yet. At present we are running level, so it's not impossible that we may have a long slow minimum like the 1954 one. If you want the solar flux 'smoothed' count, then this looks like 150 plus. Of course, the daily figures will be much higher than this on peak days, possibly twice the smoothed level. It must be understood that the only solar flux data that we can use is the Ottowa Algonquin Observatory, and they only began in 1947 so it's not a large data base.

'If we are considering transatlantic 50MHz F2 propagation then we must look at the magnetic data as well, and the 'open days' will be when this is low, so for good 50MHz DX we require high solar flux with a low geomagnetic index. They are not inseparable and one is no good without the other.

'If we talk about 'summer' 50MHz DX then we are considering electron gradients and joints between the polar and mid-latitude ionosphere. I am sure that it is *not* sporadic E. It looks as though solar cycles do not come into the picture. Zenith angles and seasonal effects seem more important.'

Guidelines to follow

From the above it will be obvious that there are certain guidelines to follow in order to achieve success on 50MHz:
(1) Listen regularly to the GB2RS forecasts each Sunday.
(2) Listen to daily WWV for magnetic and geomagnetic indices.
(3) Study the BBC TV daily weather charts for high pressure openings or 'lifts'.
(4) Listen regularly on 28MHz for openings during the early mornings to

Dates during which x band 10/6 QSOs were made to VE-W stations

	VE1AVX	OTHER VE	W1	W2	W3	W8	W9	W4	W0	W5	W7	W6	CENTRAL AMERICA	OTHER DX
1979														
OCT	3	3	3	3	3	1	-	1	-	-	-	-	1	-
NOV	27	14	14	12	2	4	2	3	-	3	1	-	4	-
DEC	22	10	7	4	1	8	5	8	3	4	1	-	6	-
TOTAL	52	27	24	19	6	13	7	12	3	7	2	-	11	-
1980														
JAN	6	4	3	5	-	1	-	-	-	-	-	-	1	-
OCT	4	1	2	2	1	-	-	2	-	-	-	-	4	-
NOV	16	10	9	3	-	6	-	5	-	1	1	3	-	-
DEC	13	3	8	3	4	2	-	1	-	-	1	-	-	-
TOTAL	39	18	22	13	5	9	-	8	-	1	2	3	5	-
1981														
JAN	10	-	6	2	-	1	-	-	-	-	-	-	-	-
OCT	5	1	6	5	1	-	-	1	-	-	-	-	3	-
NOV	18	16	12	13	12	7	5	6	6	2	-	4	14	-
DEC	14	7	14	14	12	9	6	10	9	7	8	5	4	-
TOTAL	47	24	38	34	25	17	11	17	15	9	8	9	21	-
TOTAL	138	69	84	66	36	39	18	37	18	17	12	12	37	-

expect.....

by Ken Ellis G5KW

the Far East, followed by Asia and Mediterranean areas, and later the Americas. These indicate a possible rise of MUF to 50MHz. When you get that hunch that there is DX about, even though the band seems dead, put out a CQ DX call to the west and SW as I used to do, and you may be surprised, as I was, when it produces results!

(5) Monitor the DX calling frequency 50.100 ± 1 or 2kHz. Please *do not* leave your auto keyer on this frequency for long periods though.

(6) Using a VHF TV set monitor channels 2, 3 and 4 during summer months for European and DX TV stations, a good guide to sporadic E openings.

DX openings on 50MHz during 1986

Although we are at the sunspot minimum, when little DX is expected, there were some surprising openings last year and these should be repeated again.

The FY7THF beacon (50.038) was heard in many parts of the UK on May 30th and 31st; June 2nd, 4th, 5th, 6th and 7th; and July 4th and 9th. There were also openings to North America or Canada on July 9th, 12th, 17th, 19th and 21st. It is possible that other unrecorded openings also occurred. I would appreciate reports of stations heard/worked either direct or crossband. It is most important that we pass on as much information as possible to the licencing authorities, and in this connection the RSGB VHF Committee is organising a 50MHz reporting club co-ordinated by Ray Cracknell. I am a member and will pass on all reports received at my present QTH. I am also hoping to include your reports in future monthly 50MHz articles.

Limitation of activities

The club must confine its activities to technical matters involving propagation and techniques and to sponsorship of genuine experiments. It must not usurp the normal functions of existing magazines and news sheets, contest committees or the functions of any other committees of the RSGB, but will be at liberty to make its findings known to a wider audience through facilities offered by magazines and co-operation with other clubs and committees.

During the peak of sunspot cycle 18, 1946/47, the writer was operating as MD5KW in the Suez Canal zone of Egypt and conducted extensive propagation tests with the late G6DH, G5BY and other pioneer operaters on 50MHz. These were fully reported at the time and reprinted last June/July in articles in *Short Wave Magazine*.

The highest MUF occurs north and south of the equator in the 20 degree latitudes, with a progressive drop as we get further north or south. On this basis, stations in the region of 20-30 degrees should, during sunspot maximum years, be ideally situated for contacts in the order of 50MHz, especially over 2500 mile paths running parallel to the equator. In the 50-60 degree latitudes we get a downward gradient drop of 0.8MHz per degree. This advantage to stations in the south is most noticeable during fringe conditions when the MUF hovers around 50MHz. This was most noticeable to me when operating from the Isles of Scilly and Land's End as the band was open to me, but not to stations further north. On November 13th 1981 I had an unusual experience, as G3WBQ reported:

'It was fascinating to hear G5KW on the Isles of Scilly giving S9 reports an hour or so after all signals had faded out at my QTH.'

Unexpected openings

During the afternoon I had had crossband QSOs with the usual east coast stations. As it got dark a temperature inversion took place with intense ducting, the band reopened and I had crossband QSOs with K0GUV, N6AJ, K6MYC, K9JWV, WA6PEV, VE3LNX, W9JMS, KB2YJ and, finally, K0GUV again. The 50MHz signals finally faded out at 1800Z.

In more recent times, one of the most outstanding events was on June 30th 1984, when between 2230 and 0100Z the following morning GJ3YHU worked 47 North American stations in eight US and one Canadian province on 50MHz. The only other station hearing the DX this side was G3PBV in Devon, who heard some of the stations very weakly – QTH Newton Abbot. Many of the stations were only using ten watts to a dipole, so our low power restriction does *not* mean DX is impossible if conditions are favourable.

In one of Ray Cracknell's letters to me he says:

'On 19th July (1986) I had a private opening to W4HK at 1300UT. It lasted for 30 mins and was quite widespread judging from the strong back-scatter from GB3SIX and NHQ, but there were no other takers at this, or the other side! Presumably nobody thought there could be an opening at that time of day. On 20th W1 came through at 2000UT. Again, I thought I had a private opening, but after working WA1OUB the poor chap was inundated, several other Ws appeared and the opening lasted again for about 30 minutes.'

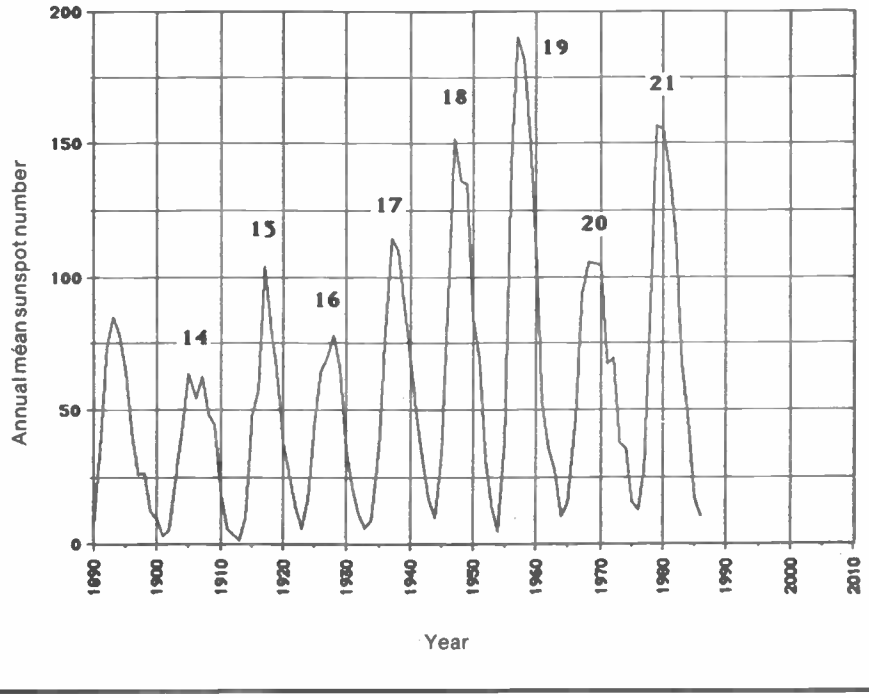
Following my successful visits to the Isles of Scilly and Land's End during cycle 21, I hope to 'go west' again for about six weeks from the middle of June this year. I am only in the planning stage at present, but hope to have some interesting news for this column when I get settled down there.

Next month

Next month's article will deal with transequatorial propagation (TEP) and the possibility of WAC on 50MHz.

All reports and correspondence should be sent to *Ken Ellis, 29 Stanbrook Road, Northfleet, Kent DA11 0JW.*

Fig 1 *Graph showing sunspot cycles for the twentieth century*



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NEW! PAC-COMM TNC-220 £149 KIT £169 ASSEMBLED

The TNC-220 is a newly designed successor the TNC-200 and other TNC-2" 'clones' giving more features at lower cost. It uses a single-chip modem that is software switchable between two radio ports, conveniently supporting both VHF and HF packet operation. Each of the TNC-220 radio ports may be configurated with jumpers for 300 or 1200 baulds. Switching between ports is entirely done in software and no cable changing, no switch setting and no returning is required. Both ports have provision for an active bandpass filter to optimize HF operation, one filter is standard. An optional tuning indicator inside the cabinet. A standard modem disconnect header is provided to allow the use of accessory highspeed or satellite modems.

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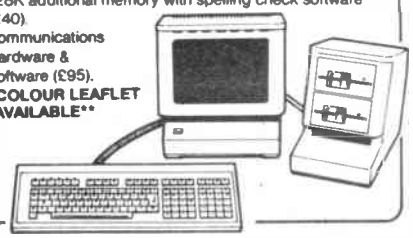

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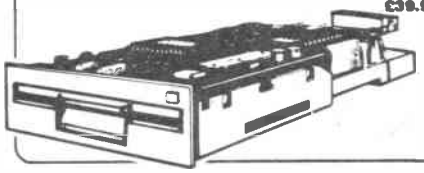

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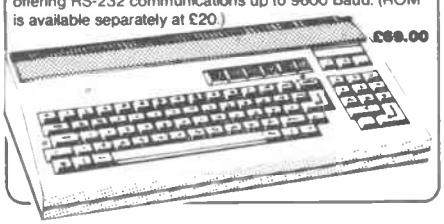

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Pirates of the Air

by Angus Fairfax-Lucy

Threats, plots, intrigue and danger – not life on the amateur bands, surely, but all part of the lot of the radio pirates. Perhaps the real story of British pirate radio began in a Soho pub where two men met, one named Allan Crawford, and the other Ronan O'Rahilly. Mr O'Rahilly had become aware of an apparent monopoly of the big record labels on music air time on many radio stations. Mr Crawford was a director of a music publishing company and the owner of a record company. Together, an idea supported by experience in the industry grew in their minds. The idea of British pirate radio was born, and although it was not to be the first pirate radio station on air, it was to be the start of an era.

By the time that Radio Caroline came on air, there were two other European pirate stations already in existance: Radio Syd and Radio Veronica, the latter netting over £900,000 a year from advertising revenue. Thus, it must be added that perhaps the first real British pirate station was conceived solely for reasons of monopoloy-breaking. Radio Caroline was fitted out with two ten kilowatt transmitters, their antenna being just under 170 feet high.

It was now early 1964, and final preparations were being effected for a first transmission in March. During the following months Radio Caroline was to have a following of around a million listeners – the era of British pirate radio had certainly begun. Just a couple of months after Radio Caroline had made her debut, another similar venture was launched with star backing, Radio Atlanta. It was the rivalry of these two that was to herald stranger events yet.

In May 1964 a strange addition to the pirate radio bandwagon joined the race. This was Radio Sutch, organised (if it could be called that) by the infamous Lord Sutch. They broadcast from the Thames Estuary, playing entire albums at a time without introduction. Little known tracks were interrupted with words like 'if any boat is coming this way, we're running out of bread . . . '.

The race had now really begun in earnest, with the introduction of Radio Invicta in June of 1964. Internal wrangling ensued over this station, and two of its original partners were expelled. Mystery and intrigue surrounded the death of one of these partners, and the drowning of two of the staff when their supply ship sank . . . In this same year Wedgwood Benn took over responsibility for the Post Office, and serious questions about allegations of interference by pirate stations surfaced with some regularity.

In April the following year, a new pirate station called Radex announced that it planned to broadcast pirate TV programmes on channel 6, using the 405 line system. The frequency they planned to use was specifically allocated for scientific research, and it takes little imagination to see the controversy that surrounded the planned venture. Fortunately, or unfortunately, depending on your point of view, backing for the idea of pirate TV failed to materialise.

September 1965 dawned with the introduction of a, then, new approach to pirate radio programming. Radio 390 came on the air, with a 'middle of the road' format. It was broadcasting on around 60 kilowatts of power, and therefore had a considerable coverage area.

By this time, conservative ratings for pirate radio as a whole were put at around ten million people, and because of the political sensitivity of the whole issue, with the feelings of ten million people at stake, the Labour party began to stall on the whole issue. In the January of 1966, Mr P G Walker lost in Leyton; what was thought to be a safe seat for Labour. One of the possible reasons for such an occurrence was put down to Labour's original resistance to the idea of pirate radio.

By this time perhaps the whole idea of pirate radio was beginning to get a little out of hand, with the transmissions of a station off the Essex coast, Tower Radio. One of their slogans was 'Get a fix on 236' and, not surprisingly, accusations of links with drug smuggling surfaced fast. The station's further notoriety was enhanced by its test transmissions of a television signal. Some while later it was evacuated and blown up by the Ministry of Defence.

So, by then, just two short years after the first real British pirate station came on air, the pirate broadcasters had gained a lot of experience, a huge collective audience, and not an inconsiderable amount of power and prestige. However, danger was still 'in the air' as was demonstrated by the sad demise of a New Zealand pirate station, Radio Hauraki.

In January 1968 the station's ship, the *MV Tiri*, drifted aground. Thousands of listeners heard the last live broadcast of the station. The station closed down with a grinding crunch, and the DJ saying 'the rocks are within swimming distance . . . I love you Mum and Dad . . . ' With that, the station was no more, but fortunately the crew were all rescued safely. The boat was a write-off.

Back in England an assorted collection of some twenty pirate stations were still broadcasting to a large British audience, but their luck was not to last forever. On June 19th Radio City was boarded and silenced, and its owner was murdered on the mainland. The Radio City affair had put a new light on pirate radio, and its golden age was slowly drawing to a close. Government pressure ensured that broadcasters on board Radio Caroline had to leave the ship, or face having their British citizenship taken away form them. In August 1967, Radio Scotland closed down, and the whole industry of pirate radio was being characterised by unemployed broadcasters and rusting ships. Tony Blackburn, Kenny Everet, John Peel and Ed Stewart all found refuge in the BBC, and Radio Caroline, the firt big British pirate station, was one of the last to go with its closure in 1968.

Radio Laser's ship The Communicator

Caroline Radio's ship the 'Ross Revenge'

Radio North Sea International was also facing a bleak future indeed after being jammed by the Ministry of Defence after its alledged links with the Communist world. Even if the popularity of pirate radio with the general public remained undiminished, its popularity with radio amateurs cannot have been too good after several examples of pirate ship to shore communications using amateur HF frequencies.

So what has happened to the pirate stations now? Although Radio Caroline and Radio Laser have both been back on the air recently, the main emphasis seems to be on the small scale operation now. Transmissions tend to be between 88 and 108MHz, and the RF power is seldom more than about ten watts at the most. Since last year a station run by a group called the HBA (Hackney Broadcasting Authority) have been broadcasting programmes on such diverse topics as Latin-American culture, and a link-up by telephone with a community radio station in Illinois USA. Another example of the genre is a station called Turkish Community Radio, which has been campaigning for legal ethnic radio for the past five years. There is also a Community Radio Association which represents the interests of many different types of pirate stations to the government.

Birmingham and London are the two main focal points of pirate activity today. Since last year a pirate TV station called Network 21 has been broadcasting with great success in London, claiming around 50,000 viewers, and run by about twenty independent film makers. Last year it had some criticism from the BBC TV program 'Did You See?', although it would be hard to give Network 21 better publicity if anyone tried. They are already getting fund raising, etc organised in preparation for the inevitable fines and confiscation of equipment.

One of the more well known pirate stations is Birmingham's black music station, PCRL. A good indication of the strength of commitment and feeling behind the station is reflected in the fact that, although the station has been raided four times in the past few years, it has only taken them a week at the most to become fully operational again.

The reason for the station's existence is that they feel the conventional local radio stations do not and cannot provide the sort of music and broadcasting they want, due to the local radio stations' commitment to providing a service to a much wider audience. Therefore, there is a real need for a local pirate station provided by and broadcast for the ethnic community. They play a lot of music related to the black community and give new bands some valuable air time, which otherwise they might have little chance of gaining on the existing local station network.

The station, by nature of its somewhat precarious legal position, has to be as compact and undetectable as possible. The whole idea has been largely successful with its target audience, claiming some support from a white audience as well. It appears to be well run, and would enhance rather than detract from the local stations run by the BBC and IBA. Although, unfortunately, the wheels of government have paused as far as the legalisation of anything resembling community radio is concerned, the audience is ready and waiting. The medium can work, and the show will go on.

PROJECT BOOK

NiCAD CHARGER

The first in our 'all things constructional' series

by Martyn Williams

This is the first of a new series which will be very wide ranging. It will cover ideas for building gear, actual constructional information and explanations of some of those technical points which you may not have clearly understood. We welcome your ideas as to what you would like to see described or discussed in this column.

Why 'The project book'? All good lab engineers and technicians have a project book in which they keep details of work in progress, future ideas and useful bits of information. That is just what this new series is intended to be.

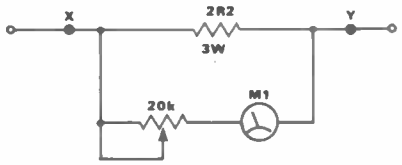
Charge and supply

This month we make a start with a simple power supply and NiCad charger which even the newest recruit to the hobby should be able to construct with little difficulty. NiCads require a constant current supply for charging and if you are really mean you can get away with putting a 50 ohm resistor in series with the NiCads. Connect up to a variable voltage power supply and then adjust the supply voltage until the desired charging current is obtained.

Regulation

A better way is to press a 7805 constant voltage regulator into service using the circuit in *Figure 1*. Here we are using a constant voltage regulator to provide a constant current into a varying load. How? Instead of connecting the earth lead of the regulator to the negative line, it is taken to the output end of the resistor and by doing this the regulator forces a five volt drop across the resistor, irrespective of the current drawn by the load. All we have to do now is to arrange the value of the resistor to get a five volt drop across it at the charging current and we are in business.

Fig 1 *Basis of constant current generation*



The maths

The value of the resistor can be found from Ohms law (R=V/I). In our case V is going to be 5 volts (the regulator *not* the battery voltage), so if we require a charging current of 0.5 amps the resistor is 5 ÷ 0.5 or 10 ohms. The wattage required is (V×I) 5 × 0.5 or 2.5 watts. This unit could be built into a small die-cast box and used in the same manner as the resistor system already described, but a better way is to build it as a complete unit as shown in *Figure 2*.

This uses a small transformer and bridge rectifier to drive the regulator, and a selection of resistors to provide different charge rates. There is also a series diode to prevent discharge of the batteries if they are left connected when the charger is switched off. A second regulator is provided to give a stabilised 12 volts at up to 1 amp.

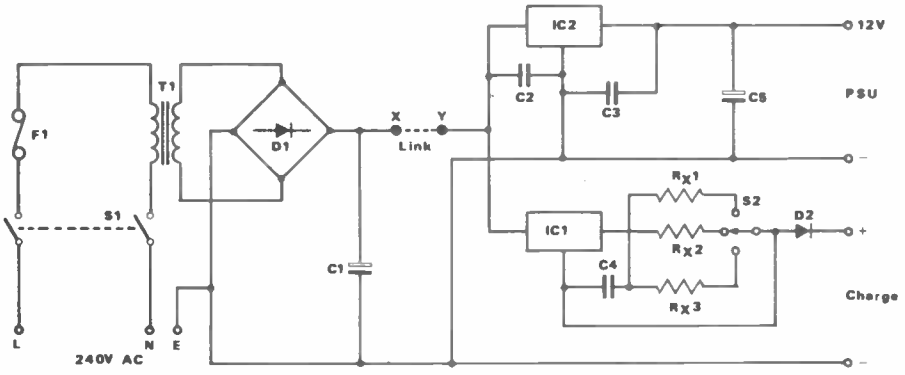
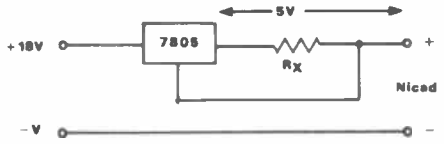


Fig 2 *Complete circuit diagram*

Meter tricks

If the link between points X and Y is broken a meter can be inserted to read the current drawn by both the 12V line and the charger. The easy way to do this is to simply fit a 1 amp meter, but there is a neat trick which will allow you to use any cheap meter from 100 microamps up to about 5 miliamps instead. The trick is to put a low value resistor between X and Y and then measure the voltage dropped across it, which is proportional to the current drawn. The circuit is shown in *Figure 3*. To calibrate the meter set Rm to maximum resistance and set the charger to the 500mA position. Short circuit the charger output leads and adjust Rm to give a half scale reading. Both the charger and PSU sections are short circuit proof.

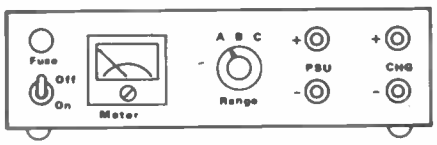
Fig 3 *Metering circuit*



The mechanics

All the components should be fitted into a die-cast box in such a way that the top is used as a baseplate. Four small plastic feet will stop it scratching the table. The regulators should be mounted to the box using insulator kits and the other components may be mounted on a piece of tagboard or suspended 'point to point' between the other components. Two pairs of terminals are used and remember to keep the positive ones well clear of any metal work or earth lines.

Fig 4 *Panel layout*



COMPONENTS

Rx 1 to Rx 4 (see below)

Battery	Charge	Rx
PP3	9mA	560R ¼W
AAA	20mA	270R ¼W
AA	70mA	68R ½W
C	250mA	22R 2W
D	500mA	10R 3W

C1	1000μF 25V dc
C2, C3, C4	.01 disc ceramic
IC1	7805
IC2	7812
D1	bridge rectifier
T1	18 volts at 1 amp
S1	double pole toggle
S2	1 pole 3 way rotary
F1	1 amp fuse
D2	1N4001 diode

FSA METER

A field strength and absorption meter by J Brown

This meter is a useful device for anyone interested in radio, be it CB or amateur radio. It can be used for checking transmitter frequency, checking multiplier stages in VHF/UHF transmitters and even RF signal tracing. With changes in the tuned circuit, models can be made for other frequencies.

When two similar circuits are placed near to each other, mutual coupling occurs and one absorbs energy from the other, or resonates in sympathy with it, ie the circuits drain or take energy from each other.

This unit works on this theory: the tuned circuit in this unit is made 'variable' so that the frequency can be read as it draws from the source. Likewise, if the unit is placed in close proximity to a high power source, by fitting a telescopic aerial in the input socket, the RF energy can be seen on the meter scale.

If AM is used the meter will read when it is near the source, as it will for FM (as the carrier is always present), but in the case of SSB the meter will follow the peaks of energy, whether they be speech or carrier.

The energy from the source is fed to the unit via a link coil which is wound on the primary of the inductance in the unit and tuned by the variable capacitor. By this method it is possible to cover quite a range of frequencies. The RF from the coil capacitor is fed to a diode and decoupled, producing a small dc voltage at the diode positive end (the RF being rectified). This is then passed to a small transistor amplifier, which in turn drives the meter and shows a reading relative to the RF source. Remember, this is not a measurement, but for comparison purposes only.

The photographs show the construction arrangement used by the author, the front view showing the tuning pointer, the sensitivity control (which is also the on/off switch) and the meter. The socket at the top is the input to the link coil and the only contact with 'the outside world'.

Construction

First the case is prepared by drilling holes to take the various parts, ie the socket, the sensitivity control, the tuning capacitor and the meter. After de-burring the holes, the case can now be laid aside and the 'electronics' board started. First the board is cut to make it a good fit in the case so it slides into the slots.

The board is a plain piece of PCB with the copper removed. The holes are drilled for the double sided Veropins that hold the components in place. This is shown in *Figure 1* and *Figure 2* shows the components fitted and wired up.

Wind L1 with six turns of 20swg enamelled wire, fix with adhesive and allow to harden. Then wind two turns on top of this at the bottom of the coil. Twist the end near the coil carefully and complete the windings again with adhesive. The coil can be stuck to the electronics board using superglue.

The components can now be mounted in the case for a 'dry run' to allow the unit to be calibrated. The most important thing at this stage is to set the tuning knob in a position that will be correct after the final construction to ensure that the calibration will hold good.

In the author's case, the unit was tuned from just under 25MHz to just over 45MHz, which was an added bonus as it was originally made for 27MHz use.

The leads on the link coil should be left about 2in long, cleaned and tinned. The leads to the capacitor should be about the same length, whilst the senstivity potentiometer and power leads are made using flexible wire to allow the wire to be folded away inside the case when the unit is finished.

When preparing the case, allow for the unusual layout and make sure the battery fits inside easily – it can be a bit awkward.

Testing

When the unit is connected up and switched on a deflection is registered on the meter. The leads may have to be reversed here to allow for the polarity of the meter. Adjusting the sensitivity control allows the pointer to be moved about. The unit is now ready to be calibrated.

Calibration

The best way to calibrate the unit is to use a signal generator which covers the range required for the unit. A lead is connected from the signal generator output to the input socket of the unit and both are switched on, with the output from the signal generator initially kept low. Check if the meter is reading with adjustments of the senstivity control.

Setting the tuning capacitor to maximum (all vanes meshed) the unit is now tuned for a meter reading. If the reading is too high, adjust the sensitivity control or the signal generator output. Likewise, if it is not high enough, increase the controls.

Tuning the signal generator through the range which the unit is expected to cover, a maximum reading should be obtained on the meter at one frequency. This is the lowest frequency that can be covered by the unit. Now tune the capacitor so that no vanes are meshed and repeat the procedure to determine the highest frequency the unit will react to.

Having determined the range, the unit can now be calibrated. It is best to start from the low frequency end. Close the

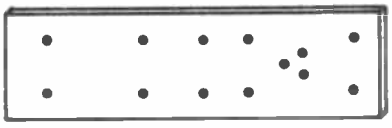


Fig 1 *PCB showing Veropin positions*

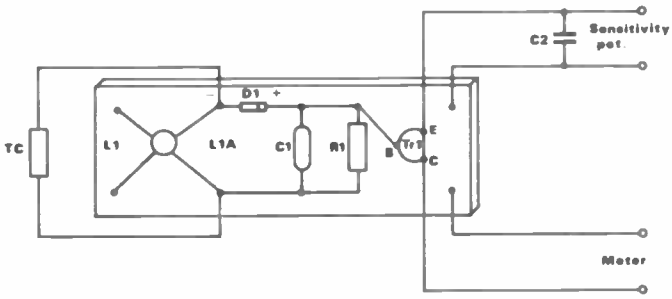
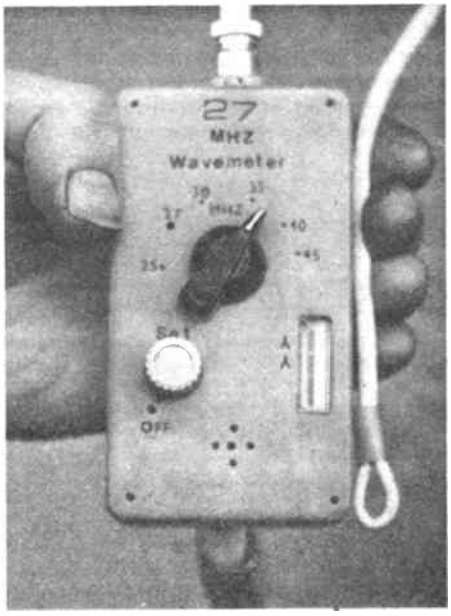
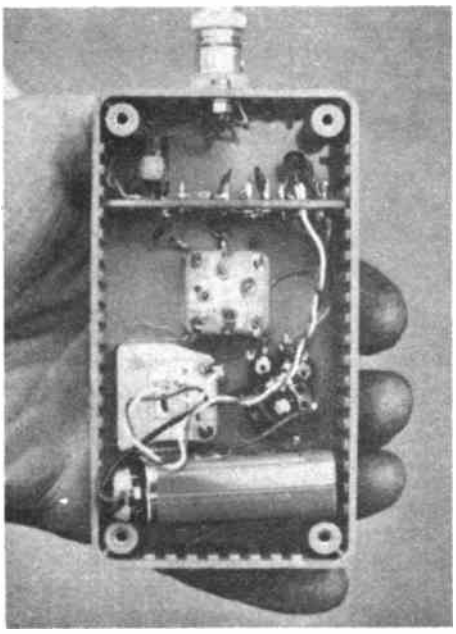


Fig 2 *Components fitted and wired up to PCB*





capacitor (all vanes meshed) and find the frequency by tuning the signal generator and then mark the position on the case front. Now go a little further up the band, say by 2MHz, and again tune both the signal generator and the unit for the maximum reading on the meter and mark the position again. Continue this until the scale is completed, and then strip the unit out and use Letraset or Meconorma dry print transfers to complete the marking.

The *off* position of the sensitivity control should also be marked, and the author also used a small LED to indicate 'power on', but this is just an added feature.

After the marking has been done, give the cover a coat of lacquer to ensure that the markings will be protected, even against hard use. Leave to dry completely and then rebuild the unit for the final time. It is possible to do all the above work with the unit in place, but it is easier to strip it completely down first, and then rebuild it.

Final thoughts

To *raise* the frequency range covered by the unit, try some of the following:

- Make the tuning capacitor smaller.
- Push the link coil turns apart.
- Use less turns on the coil.
- Use a brass or aluminium core.

To *lower* the frequency range, do the reverse:

- Use a larger capacity condenser.
- Push the turns closer together.
- Use more turns.

By using the above it is possible to alter the frequency range covered by the unit. The author had thought of using plug-in coils, but this would have made the dial calibration too complicated and messy.

Figure 3 shows the simple circuit. All parts are easily obtained; the tuning capacitor was from a scrap radio and was approximately 150pF; the other parts were new.

In use

After rebuilding and assembling in the case for the final time, check that all is correct and then fit the tuning knob. Here the signal generator is needed as an accurate source of energy. Set it to the lowest frequency marking, fit the knob and tighten the screw that keeps it in place.

Make up a lead with a Belling Lee co-ax plug on one end of a piece of co-ax cable, and on the other end fit a loop made from conductor to shielding wire. Insulate the loop end thoroughly.

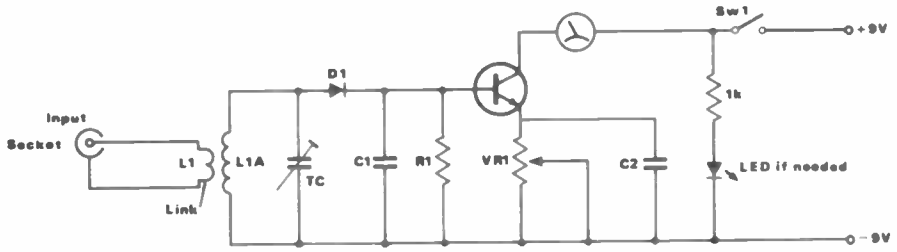
If the loop is placed near any RF source within the range of the unit, the meter will show a larger deflection when tuned in sympathy with the source, ie some of the energy from the source is being absorbed via the link. The size of the meter deflection depends on the setting of the sensitivity control. If the loop is placed with care inside a transmitter, the state of multiplier stages can be checked. It can also be used to search for RF at almost any frequency without being tuned, as complete swamp will make the meter read something, again dependent on the sensitivity control.

FSA meter use

To use as a field strength meter, a short piece of wire can be placed in the input socket and twisted around the feeders. Tune the transmitter up and the meter may show if there is a lot of harmonic content. For example, on 2 meters one could have some multiplier content that will cause interference.

Always remember that AM will show up as a continuous meter reading, while SSB will appear on peaks of speech or when the carrier is inserted during tune up.

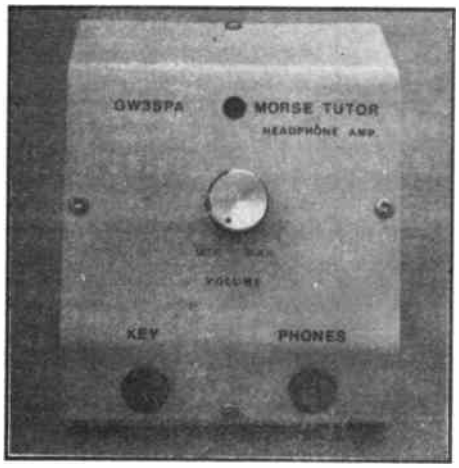
Fig 3 *Circuit diagram of the field strength and absorption meter*



COMPONENTS

Suitable case
PCB made up as shown
20swg wire for windings
Battery and lead
Belling Lee socket
Coil former ⅜in diameter
1 meter
D1 IN4148
Tc 150pF variable
C1 ·001μF
C2 ·1μF
R1 120kΩ
VR1 5kΩ pot with on/off switch
Odd wire and 13 Veropins

TEACHING MORSE



Headphone amplifier

If you should decide that you do not require the services of an internal loudspeaker, an audio headphone amplifier can be constructed using the circuitry shown in *Figure 14*. An 8 pin 741 operational amplifier, LM741, is used to drive a pair of complementary transistors, Tr1 and Tr2. Negative feedback is taken from the output of the amplifier and is fed back to the inverting input of the 741 operational amplifier. With this circuit configuration, it was possible to use a wide variety of different npn/pnp combinations without seriously distorting the output waveform.

Using a BCY72 and a ZTX108B, sufficient audio output was available to drive both high and low impedance headphones. Again VR1 provides the student with his or her own personal volume control; the component layout being shown in *Figure 15*.

As a loudspeaker will not be required, the instrument case housing the headphone amplifier can be made narrower and still retain the same sized side panels as used for the other boxes; the case being reduced in width from 160mm down to 120mm. *Figure 16* gives details of the metal work required for the front panel together with the location and size of holes, *Figure 17* giving the dimensions and location of holes for the back and floor panels. Again the front panel was signwritten using rub on transfers.

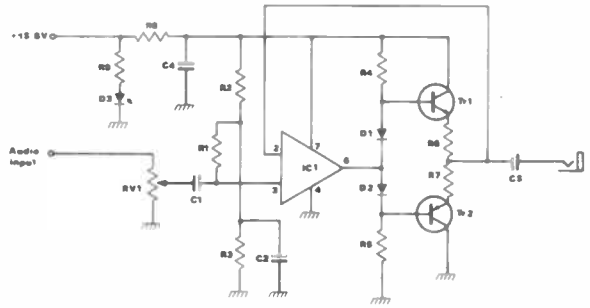
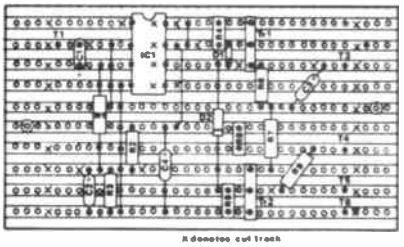


Fig 14 *Circuit diagram of headphone amplifier*

HEADPHONE AMP COMPONENTS

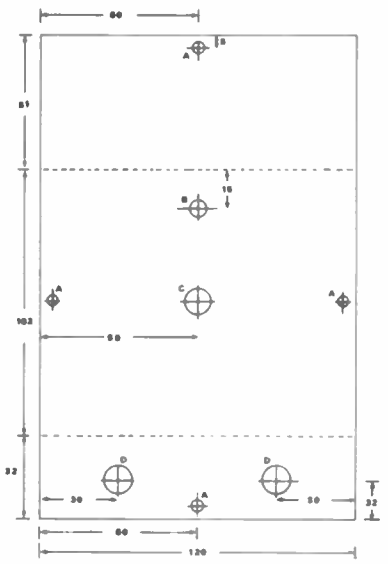
R1	47k ¼W	C1	1μF
R2,R3	10k ¼W	C2	10μF
R4,R5	4.7k ¼W	C3	1000μF
R6,R7	3.9Ω ¼W	C4	2200μF
R8	100k ¼W	D1,D2	BY206
R9	2.2k ¼W	D3	Red LED
IC1	LM741	Tr1	ZTX108B
		Tr2	BCY72

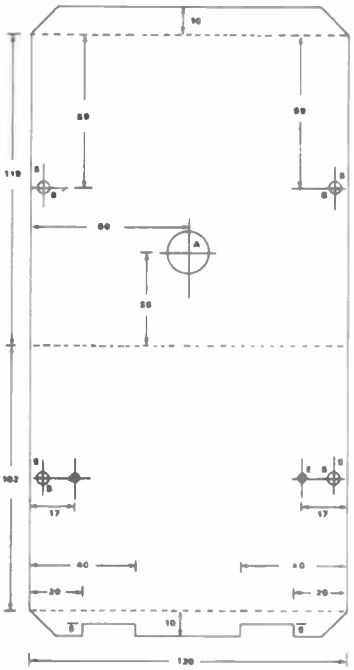


◀ ***Fig 15*** *Component layout*

▼ ***Fig 16*** *Front panel dimentions of the headphone amplifier (left)*

▼ ***Fig 17*** *Back and bottom panel dimentions of the case*





Power supply

The design of the regulated power supply was based on the components available in the junk box, in addition to the two Oldham Carefree 6 volt, 15 ampere hour batteries which were purchased from the Longleat Mobile Rally for £1.00 each, with the intention of using them as part of a float charged supply. For the batteries to be float charged it is required that the terminal voltage of each battery must be between 6.75 to 6.90 volts. It was also assumed that the regulated supply wouldn't be required to deliver more than about 2.5 amps at 13.8 volts. The full circuit

Roger Alban GW3SPA concludes this series with the construction of a headphone amplifier and a power supply unit to complete the amateur radio clubs' Morse teaching apparatus

diagram of the power supply is shown in *Figure 18.*

The mains transformer, T1, started out in life being a 50VA transformer designed to drive a 12 volt bulb continuously. The open circuit secondary voltage was measured and found to be 13.4 volts, which would be insufficient to drive a voltage regulator circuit designed to provide 13.8 volts on load. Therefore, an additional 35 turns of 22swg copper wire were added to the existing secondary winding to increase the open circuit secondary voltage to 21.2 volts.

The rectifier D1 was also purchased at the Longleat Mobile Rally for 25p. The bridge diode is believed to be a Texis 1B20K20, capable of handling a PIV of 200 volts and a forward current of 20 amps? As the power supply is intended to deliver a maximum current of 2.5 amps, the size of the reservoir capacitors must be at least 3000μF × 2.5 amps, which equals 7500μF rated at about 25 volts. Three capacitors were found in the junk box: a 4700μF, a 2200μF and a 1000μF, which were joined in parallel.

The reference voltage for the regulator was taken from a 6.4 volt Zener diode, which is compared with the voltage that appears across VR1 and forms part of a voltage dividing chain placed across the regulated output of the supply. The two voltages are compared by transistor Tr3, which is a ZTX108B, whose collector is connected to the base of Tr1, a BFY50 transistor. The collector current of Tr3 influences the base current of Tr1, which in turn controls the base current of Tr2, a TIP3055 transistor which is used as the pass transistor.

The voltage regulator circuit is prevented from oscillating by C5, a 1000pF ceramic capacitor. Diode D2 is used to prevent the floating battery from being discharged through part of the voltage regulator circuitry when the unit is disconnected from the mains supply. The main advantage of this particular circuit is that components from the junk box can be used, which will help lower the cost of building the power supply. The components were mounted on Veroboard and

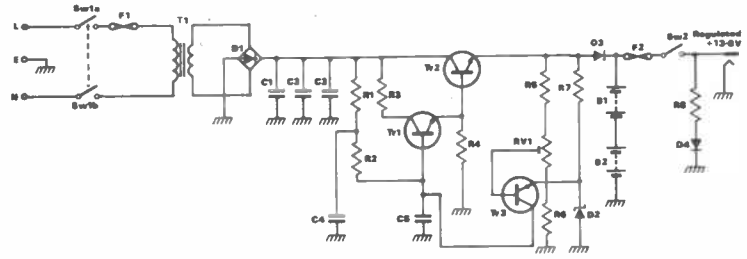


Fig 18 *Circuit diagram of the power supply*

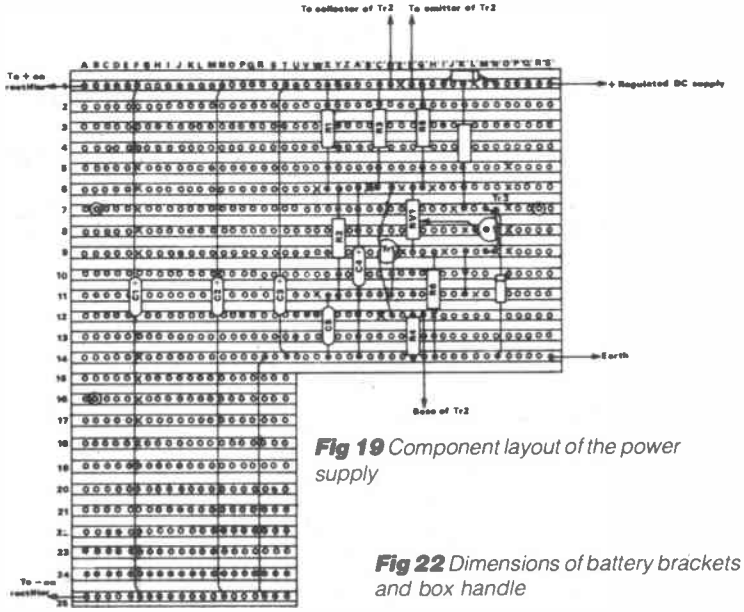
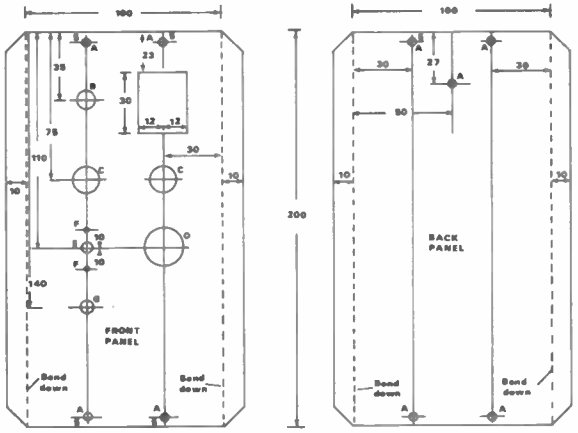


Fig 19 *Component layout of the power supply*



Hole diameters: A-4mm, B-12mm, C-16mm, D-20mm, E-6mm, F-3mm, G-6.5mm

Fig 21 *Front and back panel dimensions of the power supply box*

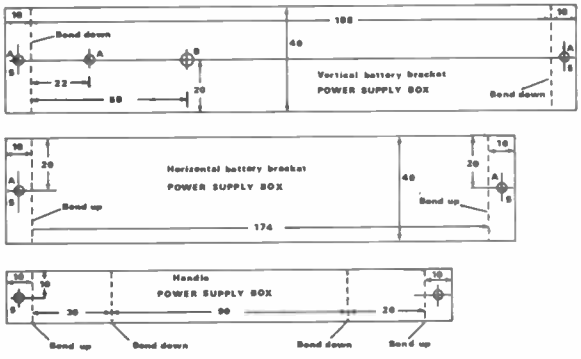
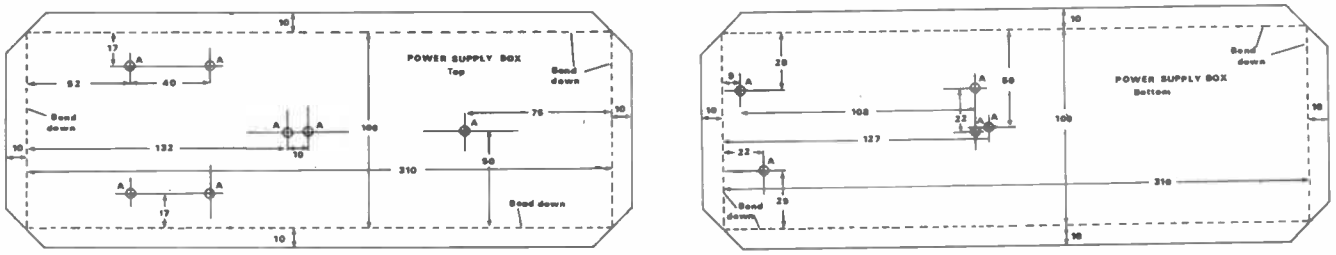


Fig 22 *Dimensions of battery brackets and box handle*

Fig 20 *Top and bottom panel dimensions of the power supply box*



the component layout is shown in *Figure 19*. The vast majority of the area on the Veroboard was taken up by the three reservoir capacitors. Consequently, the size of the Veroboard could be substantially reduced if stand alone capacitors are used.

The size of the power supply case was governed by the size and shape of the two Carefree batteries. The case was constructed out of six separate pieces of aluminium. The details of the dimensions for the top and bottom panels are shown in *Figure 20*, and the details of the front and back panels are shown in *Figure 21*. The front panel contains a miniature three pin mains socket, together with a panel mounted mains fuse and neon illuminated mains on/off switch. The dc output from the regulated supply is fed to a panel mounted fuse holder, an on/off switch, and a miniature in line battery socket.

An LED indicator has been located below the dc output socket to provide an indication of when the supply is feeding the output socket. The top, bottom, back and front panels are bolted together using 3mm nuts and bolts, and the two batteries are secured into position using two brackets bolted together using 3mm nuts and bolts. A handle was also constructed out of the aluminium sheet and bolted to the top panel using 4mm nuts and bolts.

Details of the dimensions of the two battery brackets and the handle are given in *Figure 22*. The Veroboard was bolted to the bottom of the box using 3mm nuts and bolts, with large nuts used to keep the Veroboard away from the floor of the box. The TIP3055 pass transistor was bolted to the floor of the box using a transistor mounting kit. The box will provide an adequate heatsink for the pass transistor. Do not forget to provide an earth connection between the power supply case and the earth terminal on the mains supply socket. The negative side of the regulated supply should also be earthed to the case of the power supply.

The two side panels are also constructed out of aluminium and the dimensions are given in *Figure 23*. Four stick-on rubber feet were attached to the bottom of the power supply case to prevent the case from scratching surfaces. These stick-on rubber feet were also attached to the bottoms of all the other instrument cases used in the project.

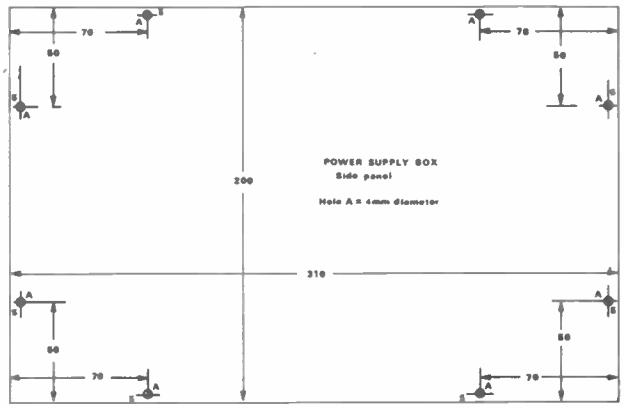


Fig 23 *Side panel dimensions for the power supply box*

When the time has arrived to test the power supply, do not connect the two batteries to the regulated supply: connect a voltmeter across the output of the regulated supply and switch on. Adjust VR1 to obtain a voltage reading of 13.8 volts, connect an ammeter between the regulated supply and the positive terminal of the two batteries connected in series, and the current reading will give you a fair idea of the condition of the two batteries. Adjust VR1 to obtain a reading of approximately 100mA and leave the batteries to charge for about 24 hours. At the end of the charge period, readjust VR1 to reduce the charging current to about 5mA. The terminal voltage of the two batteries connected in series should now give a reading of 13.8 volts.

The voltage regulator has now been adjusted to keep the two batteries in a condition of float charge. With the mains supply disconnected the two side panels can be attached to the case using short self-tapping screws. If at any time the power supply is used without a mains supply connected, always remember to connect the power supply to the mains supply and recharge the batteries at a later date.

Conclusions

The Morse tutor equipment has been in service for a few months, and the comments received from students have been very favourable. It has proved to be reliable and flexible enough to meet the requirements of the students and their own personal headphones and Morse keys. The adaptor boxes have also proved to be useful and on no occasion, as yet, has a student not been able to connect his or her headphones or key into the Morse tutor.

The intention of this series was to encourage radio clubs to provide Morse tuition for their members. I can only hope that any club members who have read this article and who have been inspired to have a go and learn Morse will badger their committee members into taking positive action.

I wish you all the best with your Morse practice, and look forward to working you on the HF bands – on the key of course! HPE CUAGN 73 GUD DX GB DE GW3SPA VA.

POWER SUPPLY COMPONENTS

R1	1.5k ¼W	Tr1	BFY50
R2,R8	2.2k ¼W	Tr2	TIP3055
R3	1Ω ¼W	Tr3	ZTX108B
R4	1k ¼W	D1	IB20K20
R5,R6	220k ¼W	D2	6.4V Zener
R7	1.2k ¼W	D3	MR752
C1	4700μF	D4	Red LED
C2	2200μF	T1	See text
C3	1000μF	F1	14A
C4	2.2μF	F2	3A
C5	1000pF	B1,B2	See text

News and comment from Glen Ross G8MWR

Repeater operating

Some operators have commented recently on the apparent lack of understanding, and not only amongst newcomers, as to just how a repeater operates. A classic one a few days ago was a station in Rochester operating through the Leicester repeater GB3CF, and saying that because lift conditions were only minimal then he must be using more than one repeater to, as he put it, 'make the trip'. Now, if you stop to think about it for a moment, this is just not possible because all the repeater inputs are centred around 145.1MHz and the outputs are centred around 145.6MHz. It should be obvious, therefore, that no repeater can hear the output of another one and retransmit it to yet another repeater.

The exception

There are nearly always exceptions to every rule and in this case it is in the method of operation of the new Packet repeaters. On these units the input and output are on the same frequency, and more than one unit uses the same frequency. This is a deliberate ploy to enable the 'handing on' of Packets to distant destinations. The basic truth remains that with a 600kHz spacing between input and output of the repeaters, you cannot talk through to cover a greater distance. What you may well do, particularly if you are well sited or use a lot of power, is to get into more than one repeater on the same frequency.

Try this one

As an example of this, it is perfectly possible for a station in, say, Cheltenham to get into the Wells repeater (GB3WR, Wurzle Radio) to the South West, and at the same time also get into Leicester (GB3CF, Charlie Fox) located to the North East, and sharing the same input frequency of 145MHz. What often occurs is that, because one repeater is stronger than the other at your location, you do not realise that it is happening. You also do not hear the desperate cries of the operators on the weaker repeater politely asking you to reduce your power or else go away. Or, in the gentlemanly wording of the Army, 'words to that effect'.

Repeater reports

Two more points were recently raised in the newsletter of the West Devon repeater group. One is about those operators who will insist on giving signal reports through the box. One operator reported as giving his first contact 5 and 9 and the next 4 and 3. Now, unless he had moved a long way in a short time, the strength of the repeater would not have changed significantly, so what had happened? Your guess is as good as mine on this one. Really, the only report you can give on a repeater is to tell the other operator that he is fully quieting, noisy or whatever into the box.

Pse ur QSL OM

The second point raised was the sending of QSL cards for contacts via a repeater. This is a commonly heard thing, usually prefaced by some remark like 'This is my first contact into Holland. Please QSL'. The thing to bear in mind in these circumstances is that you have not made a contact into Holland; the repeater has. All you have done is talked to the repeater in just the same way as when you talk to your mate when out mobile. The West Devon comment on this activity can hardly be bettered, and I quote: 'It is like claiming a medal for running a marathon when you really went on the bus'.

QSL bureau

Following on from the above, we come to the general subject of QSLing and the fact that many operators seem to think that you have to be a member of the RSGB to make use of the QSL bureau facilities. This is not the case; you do not need to be a member and you do not even have to hold a licence to enable you to receive incoming cards. You do need to be a member to use the outgoing 'acilities, but this is only fair as there are obviously postal costs and so on to take into consideration and it is unrealistic to expect to get something for nothing.

If you want to make use of the incoming facility, you will need to supply some self addressed and stamped envelopes to the person who will handle your incoming cards. The size to use are commonly known as 'pass book' and, once equipped with these, it is just as easy to put cards in the envelope as to consign them to the waste bin.

One important thing to remember is to write your callsign clearly in large letters in the top right hand corner of the envelopes. More information and a list of the bureau staff is available from the (deep breath) Membership Services Dept, Radio Society of Great Britain, Lambda House, Cranborne Rd, Potters Bar, Middx EN6 3JW.

The gateway

As I mentioned a month or so back, plans were afoot to extend the Packet radio front by tying it into the satellite systems. This has now gone a stage further, with the granting on January 30th of the go ahead for UoSAT 2 to be tied into the Packet radio network as a gateway for messages to the USA, Canada and the Falkland Isles. It must be emphasised that, for the time being, these are the only countries which may be addressed by UK operators.

The actual go ahead consisted of a variation to the licence of the Packet repeater GB3UP. So how do you get your Packet posted? All messages which are intended for the USA must be sent to the callsign of the nearest mailbox to the station you wish to communicate with for onward transmission to the recipient. The package will then enter the UK system routed to GB3UP for transmission through UoSAT 2.

Incoming

Messages coming from the States have to be routed through the nearest UoSAT ground station, and these are located at Washington, Los Angeles and Dallas. There is also a possibility of traffic for Australia being authorised in the future, although this would require the arranging of a third party traffic agreement with that country. It would appear that we may be seeing the start of a lot of international diplomatic activity soon to arrange this facility with as many countries as possible.

Contest diary

The start of the year's activities is now well upon us and those of you who enjoy the warfare of this type of activity may like to note the following dates in your diary. The 432MHz CW Contest is taking place on 5th April. The following weekend could keep you very busy with no less than three events scheduled. The first is a two day event on the 11/12th taking place on 70 and 144MHz plus the BARTAG VHF/UHF event. The same weekend also sees the start of the mountaineering season with the first of the 10GHz cumulative series. Looking into the start of May we have a contest that should just about please everyone, no matter what your favourite band may be, because it sees activity on all bands from 432MHz to 24000MHz.

Free space

Earlier in this piece I said words to the effect that you don't get something for nothing, but it seems that we might just be able to achieve that with the launch of a new European satellite, the Olympus.

This one is planned to go up sometime in 1988 and will carry four systems. One of them will be a unit to check propagation at 12, 20 and 30GHz and another unit will be a communications package running on 20 to 30GHz. The third one is a direct broadcasting system, but the fourth unit is of much more interest to the amateur world because it will be running between 12 and 14GHz and will be an 'open access' system.

This has been arranged by an agreement between ESA and the EUTELSAT organisation, and means that anyone who wishes to use the communications package may do so.

Out of bounds

Fine you say, but there is just one snag; we are not allowed to operate on those frequencies. The good news is that it has been suggested that if our licencing authorities can be persuaded to co-operate, radio amateurs could get the go ahead to operate outside normal bands to make use of the facilities.

It is going to need a lot of international pressure to get the facility, and if you are interested please write to Serge Raes, Universite de Liege Telecommunications, Institute Montifiore B28, Sart Tilman, B 4000 Liege. He needs all the support for this idea that he can get and do not forget it sets a new precedent that may be useful in later years when we need to stretch the rules to accomplish something else.

While on the satellite front, do not forget that Oscar 10 is back in business and doing well. It is now starting to find its latitude of apogee coming into the Northern hemisphere, and some nice DX is possible. Remember to keep your power down to the minimum you can get away with. Alligators are not a protected species!

Lack of space

I still get letters bemoaning the lack of space on 144MHz FM. The simple answer is, as I have said before, use 12.5kHz steps. I know that the filters in your rig are not really intended for this type of operation, and why our Japanese friends build rigs with 12.5kHz step capability and then fit the 'E' type filter, which is somewhat too wide for the application, I will never know. Provided you do not try to operate half a channel away from your local repeater it sure does help. Just to see how we are fixed for space, I have done a channel check. 24 are set aside for repeaters, beacons and calling frequencies, and 16 can be used with some restriction, which leaves only 13 as really usable. This is based on 25kHz spacing and proves just how little space we really have on the band. You can always move to 70cm, but 12.5kHz steps come an awful lot cheaper. Try it out, and I think you will have less problems than you may have expected.

Sign off

The replies about novice licences have been many and interesting. It has taken some time to sort it all out, but I hope next month to give you a report. There is still time to get your ideas, with your reasons for them, to me in time for them to be included. The address is, as always, 81 Ringwood Highway, Coventry; or use Prestel on 203616941.

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

Judging by the feedback I get from readers' letters, some of the most popular tips I write concern bodges. I came across a really good one a month or so back which I have now used with a good deal of success.

IC bodges

The problem concerns dead integrated circuits (ICs). Obviously, the best cure is a brand new full spec replacement. This may not be available in some cases, perhaps due to obsolescence, or may only be available in 10 offs at horrendous prices (or maybe available in one offs at horrendous prices!). Whatever the problem, imagine you are stuck with a known dead chip. Up to now I've always considered ICs to be irreparable, but recently I was moaning about the disgusting £25 I had been quoted for replacing an ancient 500 bit memory chip, when a colleague suggested baking it.

Initially I thought he was off his rocker, but apparently what happens is that the seal of ICs is often less than perfect, especially on cheap plastic packaged variants. Over a period of time moisture builds up inside the chip until there is enough to cause trouble. By baking it for 24 hours it is sometimes possible to drive the moisture back out and thus restore the chip to working order. The temperature of the 'bake' depends on the IC in question. Normal run-of-the-mill ICs are probably good to 50°C. I suggest you check the maximum temperature specification in the appropriate handbook.

The household electric oven *may* be good enough to hold a resonably low temperature for 24 hours, but it should be checked with a thermometer beforehand. Alternatively, you might be lucky enough to get access to an industrial chamber as used for life-testing at elevated temperatures. Apart from the cost of the electricity to power the oven, you have nothing to lose and, judging from my success to date, everything to gain. The degree of success seems dependant on how the IC failed. If it had been erratic for a while and finally gave up working then the success rate seems high. A sudden unexpected failure does not seem to respond. Having only just been told of the above, I cannot yet vouch for the long term reliability of 'repaired' ICs. I've given the ones I've had success with (the aforementioned memory chip, a synthesizer chip and a processor) a coating of varnish in a probably forlorn attempt to prevent a re-occurance.

Getting the parts

One of the first things a newly interested potential amateur will build is a receiver of some sort. A recent interesting letter from a newcomer to the hobby was most typical. He had decided to build a communications receiver described in a fifteen year old magazine and, surprise, was having difficulty buying the bits. Having taught myself in a similar fashion, I could sympathise with his predicament, especially his reference to trying to build it on a restricted budget.

The method I used to build quite a lot of receivers of various sorts in my early days, was to buy up (at club junk sales, rallies etc) great heaps of old, non-working transistor radios. Portables, from cheap and nasty six transistor squawk boxes to sophisticated all-banders, car radios and radio cassettes etc, were all eagerly bought up, provided they were under 10p a throw. I would then have a go at repairing them, even though I had no idea what I was doing. After all, you can learn almost as much from a failure as a success.

No luck

When, invariably, I couldn't repair it, I'd mark up on a scrap of paper what *did* seem to work in it, for instance audio stage OK, IF duff, local oscillator OK. Even this may seem daunting to a complete beginner, but it isn't really. Hold the blade of a screwdriver and touch it on the centre pin of the volume control, with the set turned on and volume up full. Got a buzz in the speaker? Then the audio stage is OK (*don't* do this on anything but a battery powered transistor radio to avoid shocks).

Now get a known working set that covers roughly the same wavebands, such as medium wave. Tune the good set to the high-frequency end (200 meters, ie the 'Luxemburg' end), then tune the duff set to about the middle of its coverage and place both receivers as close together as possible. If you can find a blank carrier on the good set that moves when you tune the duff one, then the local oscillator is probably OK. Incidentally, you have now checked out four transistors, three in the audio stage and one in the local oscillator, of a six transistor set using nothing very special. Easy huh? The checking of the local oscillator might best be practiced with two working sets beforehand to get an idea of what you are looking for. Car radio and other external aerial sets can be checked out by joining aerial sockets between good and bad sets.

The point of the above is that you are building up a collection of known, probably working parts. Then, if you see a design for a short wave receiver that you fancy building, you know that you have a working audio stage in an old radio, so pick out one that resembles the published design as near as possible. Say a push-pull stage with two transformers is required, then sort out one that is similar and you have half built your set before you start!

It's advisable to pick one using pnp or npn transistors as per your chosen published design, and also to avoid 'weirdo' radios such as 3 volt powered ones. npn radios will have the positive of the battery going to the centre tap of the output stage transformer, pnp the negative. Once I became an expert at the technique, I would 'build on' from an old receiver chassis, but to start with I would take the appropriate working stage to bits and then re-build it more or less as per the published design.

As well as audio stages, old radios are an excellent source of IF transformers or, indeed, whole IF sections – 455/470KHz in AM sets and 10.7 from FM ones. Note that FM radio discriminators are not too handy as a two meter receiver discriminator as they are set up for a wider deviation, but that is also easily solved (nick it out of an old CB set!). One listener was interested in building an add-on BFO unit and was contemplating buying all the bits, the total cost being £5 due to a minimum order charge from the firm involved. He was quite pleased when I showed him how to build one out of an old radio for free.

Think about it. For a simple AM short wave radio you have the IF detector and audio already built, so you have only to build the RF stage, mixer and local oscillator (with the addition of a better IF filter perhaps) and you are there.

Getting on the air, cheap

I mentioned above one typical letter from a reader. Another common letter that arrives on average twice a month is the 'I've just passed my RAE and Morse test, I'm unemployed and I want to get on the HF bands and I've only got £50/£100/£150 to spend'.

In this column I try to cover second-hand rigs in depth when I have an example to hand, but here is a quick run through some HF rigs frequently seen for sale in a 'what you can expect to get for your money' order.

£50 Here you are probably talking about making a station out of a separate transmitter and receiver. Transmitter first, about the only SSB Tx you can expect for, say, half your money, is the KW Viceroy. It's cheap because it's big. Well, would I lie to you? Enormous *and* heavy. Dependant on power supply, a good one is stable and clean. You might just be lucky and pick up a Sphynx for SSB which are good and cheap, but rare and do not cover all bands. Otherwise its CW only folks, such as the Heathkit stuff, DX40Us etc. The Starflite I mentioned a few months back is worth looking out for, and there are often a lot of the KW CW only transmitters, Valients, etc available at a reasonable price (£20 and £25), though be prepared to knock-up a power supply. Remember too that some of the rigs in this price range may well be crystal-controlled. For a receiver, either ex-war department stuff (HROs and the like) or 1950/1960/1971 receivers such as Laffeyetes (tatty, otherwise they would be more expensive), Eddystones, maybe a Trio 9R59DS or perhaps a Heathkit RA1 are all that are available. Whatever it is, it will probably be all valve.

To summarise, it is possible to cobble together an HF station, SSB just about, for £50, provided you are prepared to accept separates and their attendant netting problems, and don't mind your newly acquired shack taking over the best part of an average sized, strong table. You will learn a lot from equipment in this category, mainly stuff you might not have wished to learn! One oddball in this price range is the often seen Heathkit single bander, about £40/£50. You are obviously restricted to one band SSB, and normally no CW, but it gives a reasonable amount of power and maybe a mobile power supply chucked in. Worth considering! You will always get your money back if you tire of it.

£100 There are some real bargains here. The early Yaesu 400 and 500 series rigs are smashing value for money. I've picked up several in the £85 to £120 range in the last year, and good they are too! The Yaesu 500 series often have low (or no) emmission PA valves (the result of a lifetime's thrashing no doubt) which could set you back a bit to replace, but at least they are available.

Both they and the early Trio 500 series (ie all except TS520 and 530s) suffer valve warm-up drift (5KHz during the first hour is typical, then very little thereafter), but these are minor troubles considering you now have a 'real', more or less, full power HF SSB/CW station for about a tenth of the price of the big boys' new rigs. The Trio 500 series, at about £95 to £110, are capable of being long-serving faithful friends. Witness that several clubs still use them in the station despite being able to replace them.

In this category there are also the Yaesu separates, the FR50 and FT50, mainly Bs. The FT50 is beginning to earn itself a reputation as a mains transformer eater (not too difficult to replace if you are prepared to adapt something to hand to fit in; new exact replacements are hard to find). Don't buy an FR50 (the receiver) and hope to buy the FT50 to match later on, as most of the FT50s are now happily married up to a mate, and single FT50s are a rarity these days.

£150 Here we are talking about KW2000s, most variants, give or take £25. An advantage here is that mobile PSUs are sometimes available as well as base station PSUs if /M activity appeals. The manufacturer is still there and I have heard favourable comments about spares back-up. Remember, though, that new spares for mid-60s rigs come at 1980s prices! One other rig at about this price is the FT200. I suppose the model number makes the seller ask £200, but after a while they come down a bit! It is possible to get an FT200 without PSU for £125/135, though it might be a touch dog-eared.

To summarise, for £50 you are scratching about with separates, £100 gets you an excellent value valve transceiver with old Yaesu boxes (plus early 500 Trio), and with £150 you are not much better off facility – or receiver – wise.

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■ PRO20A pocket scanner (recently been overhauled by Tandy) fitted with four 156.0MHz marine crystals and five spare 2 metre crystals: Comes with telescopic and rubber duck antennas, NiCads and 6 volt charger, £50. Tel: (0674) 76503, ask for Tom

■ Yaesu FT101ZD MKIII FM, very good condition, mic and fan, all boxed, move forces sale, £500 ono. Richard. Tel: (0703) 860931, Flat 40

■ Datong D70 Morse Tutor, 3 to 37 wpm, letters, numbers, or mixed. Morse key socket, ear phone socket. Set of three Morse records, 2 12in, 1 7in. One low cost Morse key. £40 cash. Tel: Southend (0702) 348746

■ Cine camera Super 8, colour sound, 50ft-200ft film. Willing to swap for either 100W amplifier for 2 metre band SSB or HF receiver. J T Walker, 13 Walton Road, Aldridge, Nr Walsall, Staffordshire WS9 8HN. Tel: 57609

■ Radio controlled aircraft. Robbe Proggo trainer/sports. New Enya 35 (6cc) engine. Futuba 4 channel radio with 4 servos, ready to fly. Value around £270, exchange for 2m portable or mobile WHY? G4XTA Paul Godolphin. Tel: (09313) 359

■ Yaesu FT707, vgc, with mic, manual, £345 or exchange for Trio 430S or FT757GX with cash adj. Tel: (0203) 346819

■ Old 78 rpm records, most in as new cond, dance bands, vocal, sold in lots of 100 for £25.00. May sell in smaller lots if required. Rigonda Bolshoi chassis (Russian stereo gram, short-waves, FM, AM, etc) for spares, offers. HMV portable 16in B/W TV for spares/repairs, £8.00. Conv CB 10 FM, tested, works well, good audio, £25.00. Rosedale Childs cord organ, £10.00. Tel: Tamworth (0827) 58004 ask for Stan

■ 200 watt mobile linear, 3-5amp power pack, 6amp power pack, Melos DE1 echo box, K40 mobile ant, K40 mic, CP27 5/8 wave, Commtel 444 base ant, 7ft Firestik, SWR meter. NATO 2000 USB, LSB, AM, FM, CW, 26 megs to 28 megs, boxed, mint, offers. Will sell above items separate. All CB items (27MHz). Tel: Steve, Halifax (0422) 823320, after 5.00pm weekdays

■ Yaesu receiver FRG7000, boxed instruction manual, mint condition, £225. SEM transmatch with Ezitune switch, instructions, mint condition, £75. Buyer collects. Graeme G0GRM. Tel: (0926) 21948 Leamington Spa

■ Marine band receiver, 16 channels, four scan auto manual. Small, compact, mains and 12V, original packing, notes, circuit, mint. Air sea rescue shipping, £80. Buyer collects. Tel: Deal (0304) 363687

■ FT101ZD plus SP901 (ex-speaker), FF501 (filter) mint condition, £550 ovno. Ham Int Multimode II, pro conversion onto 10 metres, vgc, £100 ovno. Dave G4WLH QTHR. Tel: Portsmouth (0705) 255802

■ Unwanted Xmas gift, mobile transceiver, MX7E 2-way 27MHz FM CB radio hand-held or cigarette lighter plug with retractable magnetic car antenna built-in, battery rechargeable, socket with charger, 11 months remaining warranty, £65. Tel: (0463) 232500

■ Exchange Canon zoom and macro lens, FD50-135mm, 1:3.5 with case, in mint condition, for FT290R in good working order. Tel: (06902) 693 Betws-y-Coed, N Wales

■ Limpet magnetic mount, fitted with lazer magnets for extra strength and low loss 5mm coax, ideal for radio amateur or CB, new, never been used, £20 post paid. Heavy duty power supplies, input 180-260V, output 54V at 300 watts, £20 each. British made in strong metal box. Buyer collects as too heavy to send by post. Tel: (0704) 892088, afternoons or evenings, ask for Mike

■ Realsitic PRO2021 programmable scanner, 200 memory channels, covers 68-88, 136-174, 380-512MHz, mint condition, boxed complete with Archer allband scanner antenna, 60-600MHz, plus 40ft 50Ω co-ax, bargain at £175 the lot. Tel: (0925) 821414 after 6pm

■ Rank Xerox 400 FAX Tx/Rx, in gwo with manual and box of paper, £50. G3RPD (not QTHR). Tel: (0285) 713366 office hours

■ Trio 530S, as new, filter fitted, mike, operating manual and service manual, boxed, £500 or part exchange plus £100 for FT57GX, Trio 430S, or any full coverage transceiver. Tel: 01-348 3336

■ Ham International Multimode 2, easily converted to 10m, AM/FM/USB/LSB, £90 ono. Superstar 1604 digiscan, £25. Veltrex video game, plus 3 games boxed, mint, £100. Coleco video game, plus games and Atari module, boxed mint, £95 ono. Memotech ZX81 RS232 IF, £10. Memotech ZX81 hires graphics IF, £70. Call Mike (evenings). Tel: (04023) 45969, Essex area

■ muTek GFBA144E 2 metre pre-amp, 3dB gain <0.9dB NF, inc sequencer controller, little used, buyer collects or pays postage, £150. muTek LBPF144U, 144-148MHz bandpass filter, not used, £22. Buyer collects or pays postage. Call Mike (evenings). Tel: (04023) 45969 Essex area

■ B41 LF Rx CW SSB adaptor cables, manuals, will split. £40 ono. G4CCW. Tel: 01-651 1410

■ Trio R820 amateur bands receiver, mint condition, £350. John Cox, 100 Gwendoline Street, Treherbert, Rhondda, Mid Glamorgan, South Wales CF42 5BW. Tel: 774053

■ Datong very low frequency converter, £15. Wanted: Datong active antenna, indoor model. Tel: (0272) 879873

■ Polaroid Polavision instant movie outfit c/w zoom lens, movie camera replay monitor, in new condition, original makers box, offers or swap FRG7 Rx. Consider any radio gear, HF if possible, WHY? Tel: 01-906 4206

■ Microwave Modules RTTY converter MM2000, £50. Icom IC25E 25 watt two metre FM, 144MHz, scan mic HM10, mounting bracket, £150. Sony Air Seven scanner, £170. Five band stereo equaliser, £25. Sanyo VTC5150 Beta video recorder £100. Maxcom 7E hand-held, 27MHz FM, legal, NiCads, charger, case, mag mount, £35, or px Icom R7000 plus cash. Mr Barnes, 31C Anerley Park, Penge SE20 8NF, near Crystal Palace

■ Acorn Electron, plus 3, plus 1, turbo-driver (slogger), cassette recorder, 16K SWR (ACP), ROM adaptor (one socket), over 20 discs containing games, utilities etc, ROMS, including view, viewsheet, GxR, games including Elite, Repton (1-3), Jet Set Willy, Fist etc. Books: *Advanced User Guide, Basic ROM User Guide, Creative Assembler* and many more. All leads, vgc, £250 ono. Please ring after 6pm. Peter Beck, 8 Lyndale Grove, Acton, Wrexham LL12 8DQ. Tel: Wrexham (0978) 365609

■ Ham International Concorde II, ideal for 10m conversion, £100. Bremi linear, BRL200, recently serviced, £50. CTE mod 767, 80W, used twice only, £40. Rick. Tel: Cheltenham (0242) 526138

■ Trio 9130 multimode with Adonis 503 mic and mobile mount, mint, unused, £380 ono. BNOS 25A PWR supply, mint, £120 ono. Yaesu FT209R h/held with NiCads, case, battery pack, etc, £250 ono. Sony C7 with Betastack access, 14 hours recording, good cond, £200 ono, or will split. G6JFK. Tel: (0604) 491627

■ Daiwa 2065 linear, VHF amp, 10W min, 50W with GaAsFET pre-amp, £85. Icom IC02E with 2 NiCads, charger, case, spkr mike, box and man, £250. J Beam 2m para beam, vgc, varnished £35. HQ1 mini beam for 6 to 20m, offers. Wanted: good amateur gear, WHY? Martyn Bolt, 112 Leeds Road, Mirfield, West Yorkshire WF14 0JE. Tel: (0924) 495916

■ Eddystone EA12, superb condition, amateur bands only receiver, £160 ono. Datong FLZ, filter fine for SSB, CW, £40 ono. Wanted HW8/HW7 CW Tx. Terence Wood G4MIZ, St Anthony's Cottage, 143 Station Road, Burgess Hill, W Sussex RH15 9ED. Tel: 41567

■ Jaybeam TB3, £199. Datong ANF, £50. xCB half wave vertical, OK for 10m, £10. Trio TR2200 FM 2m, S20-19-17-16-14-WL, no mike, tatty but works, offers. Jim G0BGY QTHR. Tel: 01-942 7094

■ Brother M1109 dot matrix printer, with NLQ mode, RS232 and Centronics interfaces, boxed, as new, with manual and tractor feed, 5 months old, £180 ono. Tektronix T932A oscilloscope, 35MHz dual trace, with manual, £180 ono. Tektronix 1A2 plug-in unit in vgc, £50 ono. Tandy model 102 Lapheld computer, in mint condition, £200 ono. Tel: 01-471 0669, ask for Danny, after 6pm

■ Yaesu FRG7 receiver, 0-30MHz, plus SSB filter and all manuals, new condition, little used, £120 ono. Mr Richardson, 7 Grange Road, Thornaby, Cleveland TS17 6LT

■ Valves! Don't pay silly prices. All brand new and boxed. I may have the one you want. Write: Nev Kirk G3JDK, 54 Allendale Road, Rotherham, S65 3BY and enclose stamped addressed envelope. Also for sale, Colour Genie computer with RTTY and CW software, plus interface. Cost £169 – yours in new condition with full info for only £60. Tel: Rotheram 541606

■ Yaesu FT901DM, good condition, 11m and 45m bands fitted, but easily converted back to 10m and 40m amateur bands. Complete with handbook and parts list, buyer collects, £550 ono. Dave, Sittingbourne, Kent. Tel: (0795) 23427 evenings

■ RAE course by British National Electronics, full 20 books to get you to the standard for B class licence. The best course available for first class results – it got me my licence! Offers near £20 considered. Howard G1WQZ. Tel: (0394) 460 474

■ TS830S HF transceiver, with or without filters. Tel: Terry G4OXD (0462) 35248, after 6pm

■ Speech for the Spectrum 48K. No hardware needed. Program on cassette for only £3.95. HG Jones G0GQW, 120 Kingfisher Way, Upton, Wirral L49 4PS

■ Racal RA17T general coverage Rx, 0-30MHz, Good cond, £100. Ideal for SWL. KW Viceroy Tx and KW PSU with Katsumi EKM12 sidetone CW osc and T/R relay, £70. G4WPP QTHR. Tel: Liskeard 43900

■ Trio TR9000 2m multimode mobile, plus BNOS 6 amp power supply, £350. Also Trio TS700S 2m multimode base station, £475. Both boxed with all books and super condition. Would take receiver in part exchange, FRG7700 or sim. Tel: (0482) 643231 (Tony) Hull

■ President, 120 channel, AM, U/LSB, £25. Midland, 40 channel, AM, £8. 13.8V power pack, £9. Modulator ariel on mag mount, £12. Half breed on mag mount, £8. Or all for £55. Changing to 10 metres. Tel: (09363) 4810 Alsager, Cheshire, late evenings

■ Two books: *How To Pass The Radio Amateurs Examination* by George Benbow, and *Towards The Radio Amateurs Examination* by John Bowyer. Both for £3. Instructions and manual for Racal RA17L, £3. Tel: (0203) 491245

■ For sale or exchange: All my guitar equipment for amateur radio gear. Worth over £600, will split for good exchange. Guitar amps, speakers, effects, mics. Also old radio gear wanted, any old junk I can fiddle with. Collection can be arranged. Tel: Dave G1KEQ (04536) 78477

■ Shack clearout: DG732 CRT with screen, £14. VCR139A, £4. Klystron with magnet, offers. Lots of units, panel meters, components, process timers etc. Send large SAE plus 36p stamps for lists. Meek, 92 Stopples Lane, Hordle, Lymington, Hants SO41 0JA. Tel: New Milton 610669

■ Yaesu FT980, keyer, filters, £950. FC757AT, ATU, coupling lead for FT980, £225. SP980 ext spkr for FT980, £60. All leads, manuals and boxes. Excellent

condition, £1200 the lot! Tel: (0386) 832233

■ Sony ICF2001 receiver 150kHz-30MHz, AM, SSB, 76-108MHz FM. Scan, direct entry, memories etc, little use, £145. C Hughes, 6 Woodpecker Close, Sundorne Meadows, Shrewsbury SY1 4UB. Tel: (0743) 241194 after 7.00pm.

■ Pye F27 hi-band Tx/Rx base stations, £30. Also remote control unit with mike, etc, £10. Pye F9 hi-band base station, with PC1 control unit and mike, £90. Westminster 30W mobiles with all controls, £35ea. Hi-gain base antenna, £20. All above in good working order. For conversion to 2 metres. Six channel sets available. Walker, 23 Forest Hill, Yeovil, Somerset BA20 2PF. Tel: (0935) 25225

■ SWL Global ATU 1000, hardly used, boxed with data, £20. Telescan scanning antenna, 30-600MHz, compact, indoor/outdoor, £12. Carriage extra. Mr N Porter, 23 Calder Crt, Britannia Rd, Surbiton, Surrey KT5 8TS. Tel: 01-390 2650

■ Free aerial for 70cm, 19 element Tonna, if you purchase my MM432/50 70cm linear, 10W in 50W out. New unused, £100 G3MEW, 24 Ascot Rd, Cupnor, Portsmouth. Tel: (0705) 820315

■ Novex 12/500MG video monitor. 250Vac 50Hz 35W, with composite video input. Designers for data display applications. Contrast, brightness, v hold, h hold controls. £50 ono cash sale. Buyer collects. C Cutter, 127 Avon Road, Chelmsford, Essex CM1 2LA. Tel: (0245) 356531

■ Multimode transceiver SX1, 10-11 meter, scanning pre-amp, linear, digital readout, £280 cash only. Portable radio mains/battery, new and boxed, £20. Akai portable radio, mains/battery, £15. Fan heater 2kW, £8. Safety heater, £12. Elstree Hatfonsit. Tel: 01-207-0706/2326

■ FT790R NiCads, chgr, manual, £250. FT290R, FP80A PSU, FL2010 linear, £335. SMC MS8400 scanner, boxed, £125. FT708R hand-held 70cms, 2 NiCad packs, spkr mic, charger, manual, £175. Eddystone 840C gen cov Rx, £60. R1155 Rx with PSU, £45. Wood and Douglas ATV Tx, 10 watts, £50. G-Comm 12 amp PSU, £40. Bohsei FM amp, 70 watt, 7-10W drive, £30. Mobile mount for 290R/790R, £20. J B Coates, 24 Chapel Rd, Pawlett, Somerset TA6 4SH. Tel: (0278) 685206

■ FDK700E 2m FM mobile rig, 0-25W o/set, tone, mobile bracket, h/book, 5 ele, Yagi, AEC SWR-50 SWR power meter, CO85 ant matcher, £175 ono. Will split or P/ex with cash for Yaesu FC102 and FTV102DM. Ring evenings. Brian G1UWV, New Milton, Hants. Tel: (0425) 615860

■ Racal RA17, £200 ono, or will exchange. Mr P Spencer, 39 Fen Road, Heighington, Nr Lincoln, LN4 1JL. Tel: 792640

■ ST5MC RTTY TU, as new, £100. Also GW4WRD RTTY program on tape, for BBC-B. Also, technical software, Tx-3 RTTY, CW, ASCII Tx. Program on tape for BBC-B. Both tapes very little use. £25 for the two. Eddie, Tel: (0544) 267140 after 7pm

■ 1930s speaker, 18in balanced armature type, made in USA, £18. G4FFO. Tel: Cambridge (0223) 860150

■ T1154, for sale or exch for useful ham gear. G4POE QTHR. Tel: Leek 381308

■ Solartron PSU, 6.3V 0-500V, as new. Boxed VCR97 tube. Wavemeter W1117. R1155 Jay switch, type 115 PSU for R1155/54 generators. Control box MN26. TU6B tuner, may exchange for TU10B. R1355, mains conversion, with RF26. Mint RA1B. Wanted: BC348 with or without Dynamotor if front panel is all right. 52 Bramble Lane, Mansfield, Notts

■ Blast – for the Spectrum 48K basic to machine code compiler, plus much more. Cost £24.95 new will accept £10. Also Speech for Spectrum 48K, no hardware needed, program on cassette for only £3.95. Howard Jones, G0GQW, 120 Kingfisher Way, Upton Wirral L49 4PS

■ Sommerkamp FT277ZD, Also FC902 ATU, £475 the pair. Tel: (0302) 866515 after 2.30pm

■ Realistic DX400 receiver, perfect condition and working order, £85. Also Kenwood R600 receiver, perfect working order, and Global ATU, LF switch dicky, but works perfect. Exchange for Sony ICF2001D or Bearcat DX1000 or WHY? Mr T Goodhall, 9 Gregg Hall Crescent, Lincoln LN6 8AQ. Tel: Lincoln 41223

■ Standard CMB8 mobile mounting bracket to suit C58 m/mode, mint condition used only six weeks, c/w all fittings and instructions in box and manual, £22 ono. Ian G0GRI. Tel: (0380) 830383 (Wilts) after 6pm

■ BBC B computer, dual double sided 40/80 track, disc drives with built-in power supply unit. 16K sideways RAM. Approx 100 discs software. 2 joysticks, £350 ono. Mick. Tel: Medway 722193

■ Tono Theta 350 communications computer (dedicated RTTY/ASCII/CW terminal). RTTY 45-300 baud, auto CW 170/425/850Hz shift. UHF and composite output, printer interface, perfect, £120. Tel: (0284) 704152 (Bury St Edmunds) after 5.30pm and weekends

■ Icom R71E, absolutely mint condition, very little used, possibly no more than 20hrs use, any trial, £650, no offers. Yaesu ATU FRT7700, £30, plus postage. Tel: 01-281 2493 (London) anytime

■ Scanner users, I have photocopies of service manuals for the following: Tandy, Realistic PRO30, PRO31, PRO32 and PRO2021, Yaesu FRG9600 and combined AOR2001-2002 (UK vers) and Regency MX5000-MX7000 (USA version), £5 each plus P&P (50p). Tel: 01-743 0811

■ Cobra 148GTL DX, ideal for converting to 10m, mint condition, £100. Zetagi BV130P mains amplifier, 26-30MHz, £45. Avanti Astro plane 100, £20. Tel: Mansfield 559759

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■ CTE International Speedy, 26-30MHz, 140 watts, mains, RF amp, AM/FM/SSB, plate LOAD controls, £40 plus postage. Also Uniden Uniace 200, 40cm FM Tx, £30 plus postage. CP163-11 RF amp, AM/FM/SSB, 3-30MHz, input power 0.5W, 5W, 10W, output 20/50/100 watts, AM/FM, 40-200 SSB, pre-amp, £70 plus postage. Tel: Brian (0249) 816334 evenings or weekends

■ JIL SX400 VHF, 26-520MHz plus RF down converter, 800-1.4GHz scanner and Icom board, band Discone, £450 ono, or exchange for HF transceiver with 2m transverter and ATU. Tel: Lancing (0903) 755898 (West Sussex) after 8pm

■ VHF communications 2 metre antenna polarisation switcher unit, German quality, £38. Yaesu FT726 6 metre (50MHz) unit, £125. Tokyo Hypower 2 metre linear (perfect), 2-10W in, up to 80W out, meter/pre-amp, £75. SSB (German) 13cms, 3 pole filter (silver-plated parts), superb, £31. Parabolic (Swedish) 13cms antenna slug tuner, £20. Tel: Paul G4XHF (0293) 515201

■ Icom ICR71E superior grade general coverage receiver, 100kHz-30MHz, plus £350 extras, incl external speaker, remote control, filters, voice synthesizer, ex condition, £750 ono. Tel: (0452) 504596 evenings

■ Sony ICF2001D multiband radio. 5 year guarantee, bought August 1986, excellent condition, £250. Tel: (0452) 504596 evenings

■ Scarab systems MPTU1 RTTY terminal unit, c/w software for CBM64, £50 ono. Larkspur HF156 manpack, £25 ono. DSB2 transceiver, QRP, CW/DSB for Top Band, c/w digital display, £80 ono. Wanted: SEM Europa B or C, 144MHz or 70MHz, any condition but must be complete. G3VKM QTHR. Tel: (050 277) 622, Norfolk

■ Silent key sale: KW Atlanta, complete station, £185. Bremi 10 amp PSU, £25. Seif 4 amp PSU, £10. Heathkit spk, £4. AVO multimeter in case, £15. AVO minor, £5. 2m pre-amp, Sentinal, £1. Harvard spherical spk, £4. 500mA ac/dc converter, £7. 2m ¼W mag mount antenna, £7. Class C wavemeter, 136 to 7150kHz in three bands, very heavy, £25 collect. G3VYP (Ludlow) Tel: (056 885) 296

■ Trio R600, as new, hardly used, £250 ovno, complete with all packaging, manual and receipts, 9 months old (approx). This communications receiver has a range of 150kHz to 30MHz, plus AM/SSB/CW. Tel: Milton Keynes (0908) 564547 anytime

■ Yaesu FT901DM, in good condition, 11m and 45m bands fitted but easily converted back to full 10m and 40m bands. Comes complete with manual and parts list, prefer buyer collects, £550 ono. Dave, Sittingbourne, Kent. Tel: (0795) 23427 evenings

■ Yaesu FRG7000 general coverage receiver, 0-30MHz, has digital frequency display, clock and timer etc, with owner's manual and circuit diagram (no modifications), £200. Tel: Castleford (0977) 559675

■ Yaesu FT707 with 11 metre band, easily changed back to ten, £340. Complete with Trio MC60 base mike. I will pay for insured carriage or buyer may collect. Will take cheap 2 metre FM mobile or 20 amp PSU p/ex. May consider p/ex with FT480R, TR9000 multi, not 290. Please write in first instance to: Bob, PO Box 73, Luton, Beds LU1 5QD. All letters answered

■ Icom IC751 HF Tx gen cov all mode DXer rig, incl frequency controller, SSB wide filter, voice synth, SM8 desk mic, all in excellent working order, vgc, all you need is a 13.8V 20A PSU to hear real DX. Reason for sale: going onto VHF/UHF. Price for this super rig is £950 ono. Tel: (0734) 596485 after 8.30pm

■ 934MHz Cybernet Delta One. Crestbyte pre-amp. Base collinear two mobile antenna. All co-ax and PSU, £350 the lot. Tel: Ashford, Kent (023 373) 2601 evenings

■ Yaesu FT980, keyer, filters, £950. FC757 auto ATU, £225. SP980, £60, or £1,200 complete. Tel: (0386) 832233

■ Yaesu FT221 two metre multimode, as new, seven extra crystals, handbook, £285. Datong speech processor, £35, or swap AR88D, WHY? J M Allsop, 15 Woodland Grove, Mansfield Woodhouse, Notts NG19 8AZ. Tel: (0623) 641709

■ Trio TR9500 70cm multimode, £365. FDK multi 750XX 2m multimode, £285. Hi-mound HK707 Morse key, £10. Datong model D70 Morse Tutor, £35. Antique brass key, £20. Amtech 300 ATU, £15. Windsor model 65B all-wave signal generator, £15. AR40 rotator, £50. 70cm 17-element beam, £12. Altai KDM6 TR dip meter, £40. Mostly in mint condition, all ono. Emery, 'Pasmor', Trevowan Road, Crantock, Newquay, Cornwall TR8 5RU. Tel: Crantock 830465

WANTED

■ Exchange: Tono Theta 350 communications computer (dedicated RTTY/ASCII/CW terminal) with auto CW, 45-300 baud RTTY, 170/425/850Hz shift, UHF and composite output, printer interface, for Commodore 64 computer plus recorder. Tel: Bury St Edmunds (0284) 704152 after 5.30pm and weekends

■ B40D alignment data manual or any info. Mr Markey, 5 Hulbert Croft, Almondbury, Huddersfield HD5 8SD. Tel: (0484) 549249

■ Would appreciate loan of data or circuit for VHF receiver – RAF R1392D. Tel: (0242) 513395

■ Collins TCS12 Tx/Rx PSUs, connectors and any accessories, good price paid. Tel: Tim 01-530 5937 after 7pm

■ AR2000 or 2001, must be in first class condition with box, no time wasters please. Or MX7000 in same condition as above. Tel: (0592) 773662 after 6.30pm

FREE CLASSIFIED ADS

WANTED

■ Please Help! I am looking for a Heathkit SB600, the station speaker to match my SB301. I will pay a good price for a clean example in kit or made-up form. Jeff G6YIQ. Tel: (0707) 325447 if you can help

■ SEM Tranzmatch and Ezitune. Tel: (0623) 513758 after 6.30pm

■ Copy of circuit diagram for Realistic TRC1005 CB hand-held transceiver. Will purchase or borrow. All expenses paid. Mr H Harrison, 37 Parkside, Tanfield Lea, Stanley, Co Durham DH9 9NP

■ Super Star 360FM, or Cobra 148, or any 27MHz CB radio suitable for conversion to 28MHz. Also all band mobile linear wanted, will collect anywhere in UK. Tel: (0734) 411501

■ SSB accessory for Grundig Sattelit 1000 receiver, or details to enable one to be constructed. Mr Page, 34 Belgrave Crescent, Chichester, West Sussex PO19 2SH. Tel: 783651

■ Grundig reel to reel tape recorder, operating instructions book required or copy. Model No TK145. Ferguson reel to reel tape recorder, operating instructions book required or copy. Model No 3210. G Leigh, 31 Tewkesbury Road, Handsworth, B'ham B20 3DX

■ For swap: Regency ACT-T-720A 16 channel VHF air scanner for FRG7 or DX302 or similar comm Rx. Sorry no cash OAP. Frank Gingell, 82 Coulpark, Alness, Ross-shire.
Tel: Alness 884227

■ Good 934MHz mobile transceiver outfit. Exchange for world famous Zenith Royal 3000 AM/FM multiband SW receiver. May also consider top make h/held 40 channel CB, 2m/VHF h/held or multi-band VHF/VHF receiver h/held. Tel: Croughton 810270 week evenings

■ Yaesu 7700, digital readout, with memory, or similar, WHY? Tel: (0283) 221870

■ Have home 8 track player, AM/FM, stereo, with 100 8 track tapes, vgc. Also Magpie Autoscan 5000 CB, also vgc. Exchange 2m equipment, FC707ATU, Belcom LS102, Ham Jumbo, heavy duty rotator, Icom SP3 speaker, 934MHz equipment or WHY? Phone for a chat and a haggle. Tel: Stalham 82075, ask for Ian

■ Impetuous new licensee looking for low cost secondhand 2m FM mobile transceiver (might consider hand-held). Also antenna, accessories, etc. Can collect if necessary, up to say 100 miles. Mr Kerry Morris, 44 Leamington Road, Weymouth, Dorset DT4 0EZ. Tel: (0305) 788591 evenings, weekends

■ Circuit diagram, layout, voltage chart etc, for Cobra 148GTLDX/Super Star 360 FM MK1. PCB No 879AB, not the 010. Tel: (021) 744 8322 (Martin)

■ Tunable receiver to cover air and marine bands, 118/136MHz and around 160MHz. Please state approx range, reasonable price, age immaterial. Tel: Holbeach, Lincs 22649, after 6pm

■ HF rig. Awaiting licence and seeking cheap HF SSB/CW rig, circa TS500/510 etc KW2000 as indication of type of price able to pay. Anything wkg and 3.5MHz to 28MHz SSB and CW considered. No objection to valves or to separates (FL/FR100 etc). Top Band/WARC not essential but much appreciated. No CW only rigs pse as already have that in hand (on loan). But as plan to be very QRV, the CW mode rig with good CW Tx is most important. Also interested in very cheap converted multimode 10m only rig with CW facility. Nothing in original 11m form pse. Also looking for 2m portable, but mobile considered, and would prefer multimode or SSB/CW rig such as Totsuko. Please write (all letters replied to) with description and your price to BRS88639 Angie Sitton, 29 Hudson Road, Stevenage, Herts SG2 0ER

■ FC102 Yaesu ATU, in good condition. Tel: Southend (0702) 348746

■ 2m, 6m or pos HF. Anything considered. Your price paid or part exchange for Eddystone Rx, model no 958, solid-state. Dave Tel: (0248) 354022

■ Datong FL3 audio filter, must be in excellent condition. Also a good old fashioned up and down key in working order. Tel: (0206) 394336 (Essex)

■ Trio or Kenwood R2000 receiver, or Sony 7600D receiver or Sony AN1 active antenna. Tel: Wood Clochan 378

■ Will exchange Trio 9130 and 100 watt linear amp with pre-amp, both mint, for FT707, FT77 with FM and ATU. Both must be mint and in gwo. Other HF considered like Trio 530SP and ATU. Drae 24 amp PSU included for Trio 530SP. Also 10 ele Jaybeam ant. Tel: Terry (0506) 34235 anytime

■ Wanted, for project, Pye Pocket Phones, 2 × Rx, cond unimportant. Also one or more of the following Rxs: R1155, R208, 9R59DS, ICF2001, DX160, DR28 or 7700MKII. Again cond unimportant, working or not. Also required for project. Please write with details, prices, etc. All letters answered. M Whyte, Box 205, Edinburgh EH6 6HX

■ BRL500 linear amplifier for 26-30MHz or similar QRO amp. Good price please, can collect. Call Steve (weekends). Tel: (04023) 49987

■ Meccano, any bits, pieces, mags, etc. Any hidden in your loft? Please call Cyril (evenings). Tel: (04023) 45969, Essex area.

■ Eddystone mains PSU for EC10 Rx. Derek Sheen, G4CCW. Tel: 01-651 1410

■ FRG7 Rx or sim in gwo, swap for Polaroid Polavision instant movie outfit, cw zoom lens, movie camera replay monitor, in new condition, in original box. Would consider any deal re amateur radio gear WHY? Tel: 01-906 4206

■ General coverage receiver wanted, prefer Icom ICR70, ICR71, Yaesu, Trio, Kenwood, Sony, condition not important, non worker considered, good cash price paid. Collection arranged. P/ex VHS VCR CTV hi-fi possible. Tel: (02302) 2438 (Beds)

■ What have you in exchange for Sinclair Spectrum Plus. Also Waffa drive for same. Anything considered in radio. Mr Bourne, 72 Cornish Way, Royton, Lancs. Tel: (0706) 846815

■ Wanted for my 6 month old Philips N2999 receiver, 1.50MHz to 29.999MHz AM and SSB, and 80 to 108 VHF. Scanner ARO2001 or 2002, Realistic PRO2021, PRO2004, PRO32 hand-held or something similar. Mr S P Kelly, PO Box 8, C Town, IOM

■ Four metre transverter, two metre input, also linear for same. G0ESB. Tel: (0543) 264586 after 6pm or weekends.

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

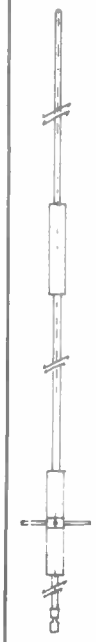
Name/Address Postcode/Telephone							

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



2 METRE COLLINEAR
UVRAL X2 5/8 over 5/8

An omni directional antenna giving low angle radiation. The ideal base station vertical. Ruggedly constructed for long life.

Technical Specification

Gain	:- 6 dB
Impedance	:- 50 Ohms
Max Power	:- 100 Watts
Length	:- 3.14 metres
SWR 144 to 146Mhz	:- Less than 1.5
Wind Loading	:- 4.6 Kgf at 100mph
Weight	:- 1.2 Kgs
Mounting Diameter	:- 25mm
Termination	:- Free 'N' Socket

Send cheque or postal order for **£29.95** plus **£2.50** postage to:

BUCKLEYS (UVRAL) LTD.,
BETA WORKS,
RANGE ROAD,
HYTHE, KENT CT21 6HG
Tel. No. (0303) 60127/60128

USED AMATEUR EQUIPMENT?
I Buy, Sell & Exchange!

SELLING? I pay the BEST POSSIBLE PRICES for your Clean Used Equipment!

BUYING? I have the BEST SELECTION of top Quality Used Equipment Available!

For the Deal You've been Looking for,Phone Dave, G4TNY

ANYTIME ON HORNCHURCH (04024) 57722 (0836) 201530 9am – 7pm Mon – Sat or Send SAE

G4TNY AMATEUR RADIO
132 Albany Road, Hornchurch, Essex RM12 4AQ

AGRIMOTORS

MERTON CB AND RADIO CENTRE
MERTON GARAGE AND POST OFFICE, MERTON.
Nr OAKHAMPTON, DEVON EX20 3DZ

OPEN 6 DAYS 9-6 LUNCH 1-2pm THURSDAY 9-1
(SUNDAYS BY APPOINTMENT)
SPECIALIST IN 934 MHz
SUPPLIERS OF ALL 27MHz AND 934 MHz EQUIPMENT
AMATEUR EQUIPMENT CATERED FOR
08053 200

MRZ
COMMUNICATIONS LTD
STOKE-ON-TRENT

DESK DC SUPPLY AND BASE FOR ICOM PORTABLES

ICOM-AMATEUR/PMR/MARINE/AIR

YAESU – AMATEUR UK AND EXPORT

TEL: (0782) 619658
ICOM 7 DAY SERVICE

LEDSCOPE

A Low Frequency Oscilloscope with High Efficiency LED Display.

Kit of Parts	£49.95
Case	£14.95
Test Probe/Lead Kit	£7.95

For Free reprint of article send SAE. All Prices include VAT. Please add £2.50 P&P.

LEFAX LTD
Unit 6, Genesis Business Centre
Redkiln Way, Horsham, West Sussex
RH13 5QH. (0403) 54135

SERVICE MANUALS

For most Makes, Models, Age of electronic equipment
Amateur Radio, Test equipment, Audio, Television, Video, Vintage, Military etc Thousands Stocked SAE enquiries.

MAURITRON TECHNICAL SERVICES
Dept AR, 8 Cherry Tree Road, Chinnor, Oxon OX9 4QY.

Amateur RADIO SMALL ADS

This method of advertising is available in multiples of a single column centimetres — (minimum 2cms). Copy can be changed every month.

RATES
per single column centimetre:
1 insertion £7.00, 3 — £6.60, 6 — £6.30, 12 — £5.60.

AMATEUR RADIO SMALL AD ORDER FORM

TO: **Amateur Radio · Sovereign House**
Brentwood · Essex CM14 4SE · England · (0277) 219876

PLEASE RESERVE.....centimetres by.....columns

FOR A PERIOD OF 1 issue.....☐ 3 issues.....☐ 6 issues.....☐ 12 issues.....☐

COPY enclosed.....☐ to follow.....☐

PAYMENT ENCLOSED: (Add 15%VAT).... £ — Cheques should be made payable to Amateur Radio. Overseas payments by International Money Order and Credit Card

CHARGE TO MY ACCOUNT.....☐ CREDIT CARD EXPIRY DATE ☐☐ / ☐☐

COMPANY .....

ADDRESS .....

SIGNATURE ..... TELEPHONE.....

.....

C P I

NEXT ISSUE OF Amateur RADIO ON SALE Thursday 30th April

HEATHERLITE PRODUCTS

MOBILE MICROPHONES
Complete with control box, mic gain control, PTT, LED on Tx.
TYPE A suits the majority of rigs
with plug, with scan buttons **£25.00**
with plug, without scan buttons **£23.00**
TYPE B with second stage amp (for some Icom rigs) **£23.00**
FOR SINGLE EARPHONE ON ANY OF ABOVE ..... add **£2.00**
TYPE SW for hand portables using jack plug connections, mic with switching box, earphone, jack plugs..... **£14.50**
MIC and COAX only – mic, coax, circuit **£7.00**
mic, coax, circuit, earphone **£9.50**
POST AND PACKING on above **£1.50**

AMPLIFIERS
HF Explorer amplifier – pair of 3-500Z valves **£950.00**
2m Explorer amplifier – 144MHz – single 4CX250B..... **£485.00**
2m Explorer amplifier – 144MHz – single 4CX350A..... **£525.00**

Carriage extra at cost

No.1 Beverley Business Centre, 1 St. Nicholas Road, Beverley, North Humberside
TEL: 0482 871762 ACCESS/VISA cards accepted

HEATHKIT U.K.

Spares and service centre.
Cedar Electronics, Unit 12, Station Drive, Bredon, Tewkesbury, Glos. Tel. 0684 73127

IAN FISHER COMMUNICATIONS OF STANHOPE

CB Works, Bondisle Way, Stanhope, Bishop Auckland Co Durham DL13 QTY
(0388) 528464

Main Distributors of 27MHz CB radios and the NEW DELTA 1 series 2 model transceiver with the latest cybernet board. Also the NEW Nevada range of 934MHz aerials to suit, also 934MHz pre-amplifiers and VSWR meters and GREENPAR BNC and 'N' type plugs.

Large stocks of coaxial cable, plugs, sockets and adaptors.
All available via mail order.

OPEN: MON-SAT 10.30am-6.00pm
RING FOR DETAILS
(0388) 528464

DW ELECTRONICS G3 XCF

Amateur Radio Supplies
71 Victoria Rd, Widnes ICOM
Tel: 051-420 2559
Open Mon-Sat 9.30-5.30 (closed all day Thurs)
We supply YAESU, ICOM, Tonna, Jaybeam, Microwave Modules, Datongs etc

PNP Communications Communications Interface

for RTTY – Morse – AMTOR

Our popular range of communication modules is now available, fully boxed and tested under the model number.

CTU 20

The CTU20R is RTTY only & costs **£62.50** whilst the CTU20RM is for morse as well and costs **£75.25**
For shortwave listeners the MF2-DX gives the option of 170Hz, 425Hz or 850Hz shift reception and costs **£56.95**

Send a large (A4) SAE for full Cat
Please add VAT at the current rate.
Access & Barclaycard (VISA) welcome.

62 Lawes Avenue, Newhaven
East Sussex BN9 9SB
Tel: (0273) 514465

JAYCEE ELECTRONICS LTD

JOHN GM30PW
20 Woodside Way, Glenrothes, Fife KY7 5DP
Tel: 0592 756962
Open: Tues-Sat 9-5
Quality secondhand equipment in stock. Full range of TRIO goodies. Jaybeam – Microwave Modules – LAR.

ACTIVE ANTENNA

Unique compact high-performance model offering truly portable operation yet performs comparable to full wave dipoles on Long, Medium and Short Wave Bands Price £49.95

NODDFA
Lower Road, Harlech, Gwynedd LL46 2UB

JAPANESE Ic's (PART OF OUR RANGE)

AN301 £3.50, AN7140 £2.20, AN7145 £1.95, AN7146 £2.20, BA532 £1.60, BA536 £2.40, HA1377 £2.20, HA1398 £2.75, HA13001 £2.95, LA4460 £1.80, LA4461 £1.80, LA4507 £4.25, LC7137 £2.75, M51515 £2.50, M51517 £2.80, MB3705 £1.80, MB3712 £1.50, MB3722 £3.50, MB3730 £2.50, MB3731 £3.50, MB3756 £2.60, MB8719 £3.85, STK461 £7.50, STK463 £8.40, TA7205AP £1.00, TA7222AP £1.30, TA7229 £3.25, TA7240 £2.95, TA7607 £2.95, TA7614 £2.75, TA7628 £2.95, TA7640 £1.75, UPC575 £1.00, UPC1001 £2.20, UPC1031 £1.95, UPC1158 95p, UPC1181 £1.10, UPC1182 £1.10, UPC1185 £2.50, UPC1188 £2.75, UPC1230 £2.50, UPC1277 £2.75, UPC1365 £3.60
ADD 60p POST AND PACKING AND THEN ADD 15% VAT TO TOTAL
T POWELL 16 PADDINGTON GREEN LONDON W2 1LQ
OPEN MON-FRI 10AM-5PM, SAT 9AM-12 NOON.
TELEPHONE: 01 723 9246
ACCESS/VISA. TELEPHONE ORDERS ACCEPTED OVER £5.00

SURPLUS/REDUNDANT ELECTRONIC COMPONENTS WANTED

I/Cs – Tuners – Transistor – Valves – Diodes etc, any quantity considered – immediate payment

ADM ELECTRONIC SUPPLIES
TEL: 0827 873311

ETESON ELECTRONICS

E•E
15B Lower Green, Poulton-le-Fylde, Blackpool
Tel: (0253) 885107
Open 9.30am - 12.30, 1.30 - 5.30 Closed Wed & Sun
Electronic Component Specialists
A wide range of electronic components, IC's, capacitors, transistors, resistors, plugs and sockets etc

RF DEVICES AT ROCK BOTTOM PRICES!

Nobody beats us!

Over 30,000 RF devices at low prices

REPLACEMENT RF TRANSISTORS

MRF454 HF/SSB 80W	£18.20
MFR450 HF/SSB 50W	£11.60
MRF238 VHF/FM 25W	£12.80
MRF475 HF/SSB 20W	£2.99
2SC1969 HF/SSB 18W	£2.50
2SC2043/1307 HF 16W	£2.00
2SC1947 VHF 3.5W	£7.60
2SC1946A VHF 32W	£14.30

REPLACEMENT RF POWER MODULES

M57704/SAU3 UHF 15W	£36.00
M57712/SAV7 VHF/FM 25W	£39.00
M57713/SAV8 VHF/SSB 15W	£39.00
M57716/SAU4 UHF/SSB 15W	£49.00
M57719 VHF/PMR 15W	£29.00
M57727 VHF/SSB 38W	£45.00
M57749/SAU11 934/FM 7W	£29.00

Send £1.00 p&p and SAE for full list
All prices inc. VAT
Many Ic's and other types in stock

RAYCOM LTD
DEPT AR 584 HAGLEY RD WEST
QUINTON BIRMINGHAM
B68 0BS
021 421 8201-3
(24hr answer phone)

D.P. HOBBS (Norwich) Ltd

13 St Benedicts Street, Norwich Tel: 615786
Open Mon-Sat 9-5.30
Closed Thurs 1.00pm
Stockists of
YAESU, FDK, ICOM, JAYBEAM
& Electronic Component Specialists

MORSE CODE PREPARATION

Cassette A 1-12 wpm for amateur
Cassette B 12-25 wpm for professional examination preparation.
Each cassette is type C90
Price of each cassette (including booklets) **£3.95.**
Morse key with separate battery (PP3) — driven solid-state oscillator and sound transducer produces clear tone for sending practice. Price of key with electronic unit **£8.95.**
Price includes postage etc. Europe only
MH ELECTRONICS (Dept AR)
12 Longshore Way Milton Portsmouth PO4 8LS

Telephone the advertising department on: 0277 219876 for details

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

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	£66.00	£62.00	£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

depth mm x width mm	ad space	colour rates exclude cost of separations: 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 87	2 Apr 87	8 Apr 87	10 Apr 87	30 Apr 87
Jun 87	30 Apr 87	6 May 87	8 May 87	28 May 87
Jul 87	28 May 87	3 Jun 87	5 Jun 87	25 Jun 87
Aug 87	2 Jul 87	8 Jul 87	10 Jul 87	30 Jul 87

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 – webb-offset.

PAYMENT
Above rates exclude VAT.
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.

£1 BAKERS DOZEN PACKS

Price per pack is £1.00.* Order 12 you may choose another free. Items marked (sh) are not new but guaranteed ok.

1. 5 – 13 amp ring main junction boxes
2. 5 – 13 amp ring main spur boxes
4. 5 – surface mounting
5. 3 – electrical switches, white flush mounting
7. 4 – in flex line switches with neons
9. 2 – mains transformers with 6V 1A secondaries
10. 2 – mains transformers with 12V ½A secondaries
11. 1 – extension speaker cabinet for 6½" speaker
13. 12 – glass reed switches
17. 2 – ultrasonic transmitters and 2 receivers with circuit
19. 2 – light dependent resistors
25. 4 – wafer switches – 6p 2 way, 4p 3 way, 2p 6 way, 2p 5 way, 1p 12 way small one hold fixing and good length ¼ spindle your choice
28. 1 – 6 digit counter mains voltage
30. 2 – Nicad battery chargers
31. 1 – key switch with key
33. 2 – aerosol cans of ICI Dry Lubricant
34. 96 – 1 metre lengths colour-coded connecting wire
39. 1 – long and medium wave tuner kit
41. 8 – rocker switch 10 amp mains SPST
45. 1 – 24 hour time switch mains operated (s.h.)
49. 10 – neon valves – make good night lights
50. 2 – 12V DC or 24V AC, 3 CO relays
51. 1 – 12V 2 CO miniature relay very sensitive
52. 1 – 12V 4 CO miniature relay
54. 10 – rows of 32 gold plated IC sockets (total 320 sockets)
55. 1 – locking mechanism with 2 keys
56. 1 – miniature uniselector with circuit for electric jigsaw puzzle
60. 5 – ferrite rods 4" × 5/16" diameter aerials
61. 4 – ferrite slab aerials with L & M wave coils
63. 1 – Mullard thyristor trigger module
66. 1 – magnetic brake – stops rotation instantly
67. 1 – low pressure 3 level switch can be mouth operated
69. 2 – 25 watt pots 8 ohm
70. 2 – 25 watt pots 1000 ohm
71. 4 – wire wound pots – 18, 33, 50 and 100 ohm your choice
77. 1 – time reminder adjustable 1-60 mins clockwork
85. 1 – mains shaded pole motor ¾" stack – ¼ shaft
89. 1 – mains motor with gear box 1 rev per 24 hours
91. 2 – mains motors with gear box 16 rpm
96. 1 – thermostat for fridge
98. 1 – motorised stud switch (s.h.)
101. 1 – 2½ hours delay switch
103. 1 – mains power supply unit – 6V DC
104. 1 – mains power supply unit – 4½V DC
107. 1 – 5" speaker size radio cabinet with handle
112. 1 – heating pad 200 watts mains
114. 1 – 1W amplifier Mullard 1172
115. 1 – wall mounting thermostat 24V
118. 1 – teak effect extension 5" speaker cabinet
120. 2 – p.c. boards with 2 amp full wave and 17 other recs
121. 4 – push push switches for table lamps etc.
122. 10 – mtrs twin screened flex white p.v.c. outer
124. 25 – clear plastic lenses 1¾ diameter
127. 4 – pilot bulb lamp metal clip on type
128. 10 – very fine drills for pcbs etc.
129. 4 – extra thin screw drivers for instruments
132. 2 – plastic boxes with windows, ideal for interrupted beam switch
134. 10 – model aircraft motor – require no on/off switch, just spin to start
137. 1 – 6½" 4 ohm 10 watt speaker
142. 10 – 4 BA spanners 1 end open, other end closed
145. 2 – 4 reed relay kits 3V coil normally open or c/o if magnets added
146. 20 – pilot bulbs 6.5V.3A Philips
154. 1 – 12V drip proof relay – ideal for car jobs
155. 3 – varicap push button tuners with knobs
169. 4 – short wave air spaced trimmers 2-30f
172. 10 – 12V 5W bulbs Philips m.e.s.
178. 3 – oblong amber indicators with lilliputs 12V
180. 6 – round amber indicators with neons 240V
181. 100 – p.v.c. grommets ⅜ hole size
182. 1 – short wave tuning condenser 50 pf with ¼" spindle
184. 1 – three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188. 1 – plastic box sloping metal front, 16 × 95mm average depth 45mm
193. 6 – 5 amp 3 pin flush sockets brown
195. 5 – B.C. lampholders brown bakelite threaded entry
196. 1 – in flex simmerstat for electric blanket soldering iron etc.
197. 2 – thermostats, spindle setting – adjustable range for ovens etc.
199. 1 – mains operated solenoid with plunger 1" travel
200. 1 – 10 digit switch pad for telephones etc.
201. 8 – computer keyboard switches with knobs, pcb or vero mounting
206. 20 – mtres 80 ohm, standard type co-ax off white
211. 1 – electric clock mains driven, always right time – not cased
216. 1 – stereo pre-amp Mullard EP9001
232. 2 – 12V solenoids, small with plunger
236. 1 – mains transformer 9V 1 amp secondary C core construction
241. 1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile
241. 2 – speakers 6" × 4" 4 ohm 5 watt made for Radiomobile
243. 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile
244. 1 – mains motor with gear-box very small, toothed output 1 rpm
245. 4 – standard size pots, ½ meg with dp switch
249. 1 – 13A switched socket on double plate with fused spur
266. 2 – mains transformers 9V ½A secondary
267. 1 – mains transformers 15V 1A secondary p.c.b. mounting
291. 1 ten turns 3 watt pot ¼ spindle 100 ohm
296. 3 car cigar lighter socket plugs
298. 2 15 amp round pin plugs brown bakelite
300. 1 mains solenoid with plunger compact type
301. 10 ceramic magnets Mullard 1" × 3/8 × 5/16
303. 1 12 pole 3 way ceramic wave charge switch
305. 1 tubular dynamic microphone with desk rest
308. 1 T.V. turret tuner (black & white T.V.)
310. 2 oven thermostats
313. 5 sub miniature micro switches
314. 1 12" 8 watt min fluorescent tube white
315. 1 6" 4 watt min fluorescent tube white
316. 1 round pin kettle plug with moulded on lead
453. 2 – 2½in. 80ohm loudspeakers
454. 2 – 2½in. 8ohm loudspeakers

FROZEN PIPES Can be avoided by winding our heating cable around them, 15 mtrs connected to mains cost only about 10p per week to run. Hundreds of other uses as it is waterproof and very flexible. Resistance 60ohms/metre. Price 28p/metre or 15m for £3.95.

CAR STARTER/CHARGER KIT

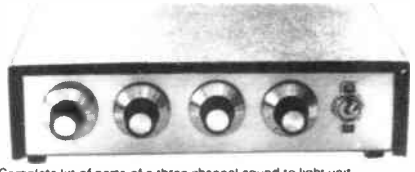
Flat Battery! Don't worry you will start your car in a few minutes with this unit – 250 watt transformer 20 amp rectifiers, case and all parts with data £17.50 post £2

Ex-Electricity Board. Guaranteed 12 months.

VENNER TIME SWITCH

Mains operated with 20 amp switch, one on and one off per 24 hrs, repeats daily automatically correcting for the lengthening or shortening day. An expensive time switch but you can have it for only £2.95 without case, metal case – £2.95, adaptor kit to convert this into a normal 24hr time switch but with the added advantage of up to 12 on/offs per 24hrs. This makes an ideal controller for the immersion heater. Price of adaptor kit is £2.30.

SOUND TO LIGHT UNIT



Complete kit of parts of a three channel sound to light unit controlling over 2000 watts of lighting. Use this at home if you wish but it is plenty rugged enough for disco work. The unit is housed in an attractive two tone metal case and has controls for each channel, and a master on/off. The audio input and output are by ¼" sockets and three panel mounting fuse holders provide thyristor protection. A four pin plug and socket facilitate ease of connecting lamps. Special price is £14.95 in kit form.

12 volt MOTOR BY SMITHS

Made for use in cars, etc. these are very powerful and easily reversible. Size 3½" long by 3" dia. They have a good length of ¼" spindle –
1/10 hp £3.45
1/8 hp £5.75. 1/6 hp £7.50

25A ELECTRICAL PROGRAMMER

Learn in your sleep. Have radio playing and kettle boiling as you wake – switch on lights to ward off intruders – have a warm house to come home to. You can do all these and more. By a famous maker with 25 amp on/off switch. A beautiful unit at £2.50

THIS MONTH'S SNIP

BENCH ISOLATION TRANSFORMER. Torroidal wound 400 watt but very compact. Has a separate 10V winding which can be added or subtracted to give fine voltage control. Normally £40, our price £10 plus £2 post, ref 10P9.

TANGENTIAL BLOWER HEATERS

We can supply:
1·2KW—quite definately the smallest tangential blow heater we have ever had, measuring approx. 6 × 6 × 4. This could be just the thing for a small bedroom or to fit under desk or table if you suffer from cold legs. In addition to normal heating functions if put into a simple enclosure this could be a pipe unfreezer (much safer than a blow lamp) possibly even a paint stripper, hair dryer or hand dryer. Price is £5, plus £1 post, ref 5P23.
2·5KW—width approx 8" (plus motor), elements made up of two 1·2kw sections, so with switch supplied you can have 2kw, 1kw or cold blow. Over heat cut-out eleminates fire risk should fan stop or air flow be impeded. Fan blades are metal. Price £5 plus £1.50 post, ref 5P62.
3KW—width approx 13" plus motor, element made up of 1kw and 2kw section, supplied with 4 section rocker switch, allowing 3kw, 2kw, 1kw and cold blow. Price £6.95 plus £2.00 post.
2KW O.I.Y. SPECIAL—if you want a really cheap tangential heater, this is your opportunity, made for 115v mains, to use it on 230v. Simply join elements in series, needs only simple on/off switch, as you will only have one heat level 2kw and no cold blow. Price £2 plus £1 post, ref 2P68
VERY LOW RUNNING COST—only a 300w element. So would cost only approx. 1½p per hour to run. Should be enough for an airing cupboard or a hot box for seed germination. Might even be enough to keep a damp corner dry. Normal construction approx. 4½" plus motor wide. Price £5 plus £1 post, ref 5P78.
500W–115V TRANSFORMER to isolate you or yours from mains to earth shock dangers. We are able to offer these transformers at less than the price of an auto transformer. Our price for the 500w mains to 115v isolation transformer is £10 plus £5 post, ref 10P8.
RESIN CURED FILLER/BUILDER/STICKER made by the famous Holts company, suitable for repairs, not only to car bodies but also to sinks and wash basins, water tanks, drain pipes and gutters, tiles, roofs, filling holes in walls and concrete, repairing cracks in gates, window frames, etc. etc. It is weather resistant and adheres well to metals, wood, concrete and some plastics. Special bargain price 2 large tubes for £1, ref 8D464.
STEPPER MOTOR. By American Phillips corporation. Step angle 7·5° Coil resistance 27 ohms. Operating volts 10–14. Size approx. 2½" dia by 1½" deep on a square mounting plate. This is in fact two bi-directional motors with P.M. rotors. Applying correct pulse causes a 7·5° step angle of spindle. Number of steps through which it rotates and a speed at which it rotates is determined by the applied impulses. Properly used this provides an ideal method of speed and position control. Brand new and unused price £5, ref 5P81
BIG GLASS FIBRE SHEETS. Virtually unbreakable, size 4' × 3' approx. Flat, approx. 1/16" thick. Intended for pcb's but ideal for roof repairs, car port, greenhouse etc. £2 each. Minimum quantity we can despatch is 10. Carriage cost £6.50 per 10. £8.50 for 15.

IONISER KIT

Refresh your home, office, shop, work room, etc with a negative ION generator. Makes you feel better and work harder – a complete mains operated kit, case included £11.95 plus £2.00 post.

TELEPHONE BITS

Master socket (has surge arrestor – ringing condenser etc) and takes B.T. plug	£3.95
Extension socket	£2.95
Dual adaptors (2 from one socket)	£3.95
Cord terminating with B.T. plug 3 metres	£2.95
Kit for converting old entry terminal box to new B.T. master socket, complete with 4 core cable, cable clips and 2 BT extension sockets	£11.50
100 mtrs 4 core telephone cable	£8.50

MINI MONO AMP on p.c.b. size 4" × 2" (app.)

Fitted volume control and a hole for a tone control should you require it. The amplifier has three transistors and we estimate the output to be 3W rms. More technical data will be included with the amp. Brand new, perfect condition, offered at the very low price of £1.15 each, or 13 for £12.00

£2 POUNDERS*

2P2 – Wall mounting thermostat, high precision with mercury switch and thermometer
2P3 – Variable and reversable 8-12v psu for model control
2P4 – 24 volt psu with separate channels for stereo made for Mullard UNILEX
2P6 – 100W mains to 115V auto-transformer with voltage tappings
2P8 – Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
2P9 – Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters
2P10 – 12 volt 5 amp mains transformer
2P12 – Disk or Tape precision motor – has balanced rotor and is reversible 230v mains operated 1500 rpm
2P14 – Mug Stop kit – when thrown emits piercing squawk
2P15 – Interrupted Beam kit for burglar alarms, counters, etc.
2P17 – 2 rev pr minute mains driven motor, ideal to operate mirror ball
2P18 – Liquid/gas shut off valve mains solenoid operated
2P19 – Disco switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
2P20 – 20 metres extension lead, 2 core – ideal most Black and Decker garden tools etc.
2P21 – 10 watt amplifier, Mullard module reference 1173
2P22 – Motor driven switch 20 secs on or off after push
2P26 – Counter resettable mains operated 3 digit
2P27 – Goodmans Speaker 6 inch round 8ohm 12 watt
2P28 – Drill Pump – always useful couples to any make portable drill
2P31 – 4 metres 98 way interconnecting wire easy to strip
2P32 – Hot Wire amp meter – 4½ round surface mounting 0–10A – old but working and definitely a bit of history
2P34 – Solenoid Air Valve mains operated
2P38 – 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc.
2P43 – Small type blower or extractor fan, motor inset so very compact, 230V
2P46 – Our famous drill control kit complete and with prepared case.
2P49 – Fire Alarm break glass switch in heavy cast case
2P51 – Stereo amplifier, 3w per channel
2P55 – Mains motor, extra powerful has 1½" stack and good length of spindle
2P62 – 1 pair Goodmans 15 ohm speakers for Unilox
2P64 – 1 five bladed fan 6½" with mains motor
2P66 – 1 2Kw tangential heater 115v easily convertible for 230V
2P67 – 1 12v–0–12v 2 amp mains transformer
2P68 – 1 15v–0–15v 2 amp mains transformer
2P69 – 1 250v–0–250v 80 mA & 86.3v 5A mains transformer + 50p post
2P70 – 1 E.M.I. tape motor two speed and reversible
2P72 – 1 115v Muffin fan 4" × 4" approx. (s.h.)
2P75 – 1 2 hour timer, plugs into 13A socket
2P82 – 9v–0–9v 2 amp mains transformer
2P84 – Modem board with press keys for telephone redialler
2P85 – 20v–0–20v ½A Mains transformer
2P88 – Sangamo 24 hr time switch 20 amp (s.h.)
2P89 – 120 min. time switch with knob
2P90 – 90 min. time switch with edgewise engraved controller
2P94 – Telephone handset for EE home telephone circuit
2P95 – 13A socket on satin chrome plate
2P97 – mains transformer 24V 2A upright mounting
2P98 – 20m 4 core telephone cable, white outer
2P99 – 500 hardened pin type staples for telephone cable
2P101 – 15V mains transformer 4A upright mounting
2P105 – capillary type thermostat for air temperature with c/o switch
2P108 – mains motor with gear box giving 110rpm
2P109 – 5" wide black adhesive pvc tape 33m, add £1 post if not collecting

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£5 POUNDERS*

5P1 12 volt submersible pump complete with a tap and switch, an ideal caravan unit.
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5P3 Silent sentinel ultra sonic transmitter and receive kit, complete.
5P6 12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall. Ex GPO but in perfect order.
5P12 Equipment cooling fan – mini snail type mains operated.
5P13 Ping pong ball blower – or for any job that requires a powerful stream of air – ex computor. Collect or add £2 post.
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5P18 –motor driven water pump as fitted to many washing machines
5P20 –2 kits, matchbox size, surveilance transmitter and FM receiver
5P23 –miniature (appr. 2½" wide) tangential blow heater, 1·2kw
5P24 – ¼hp motor, ex computer, 230V, mains operation 1450rpm. If not collect add £3 post
5P25 –special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
5P27 –cartridge player 12V, has high quality stereo amplifier
5P28 –gear pump, mains motor driven with inlet and outlet pipe connectors
5P32 –large mains operated push or pull solenoid. Heavy so add £1.50 post
5P34 –24V 5A toroidal mains transformer
5P35 –modern board from telephone auto dialler, complete with keypad and all ICs
5P37 –24 hour time switch, 2 on/offs and clockwork reserve, ex Elec. Board loading up to 50A. Add £1 post
5P41 –5" extractor fan, very quiet runner (s.h.), gntd 12 mths.
5P48 –telephone extension bell in black case, ex-GPO
5P51 –200W auto transformer 230V to 115V torroidal
5P52 –mains transformer 26V 10A upright mounting, add £2 post
5P54 –mains motor with gear box, final speed 5rpm
5P58 –Amstrad stereo tuner FM and LM and S. AM
5P60 –DC Muffin type fan 18 to 27V, only 3W
5P61 –drill pump mounted on frame, coupled to mains motor
5P62 –2 ½kw tangential blow heater, add £1.50 post if not collecting
5P73C high pressure mains operated gas or water valve with tube connection suitable soldering
5P74 8rpm 60W mains motor and gearbox with instant stop
5P79 30rpm 80 watt mains driven motor with gearbox
5P82 1 25rpm mains 60w motor with gearbox
5P84 1 delay time switch, adjust 0–20 seconds
7P1 1 instant heat solder gun—mains with renewable tip and job light
10P10 1 9" extractor fan 115V so supplied with adaptor

LIGHT CHASER KIT motor driven switch bank with connection diagram, used in connection with 4 sets of xmas lights makes a very eye catching display for home, shop or disco, only £5 ref 5P56.

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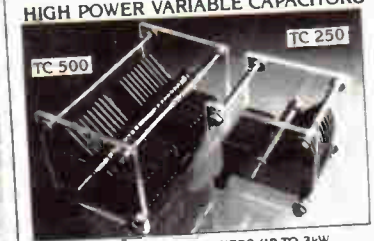
NEVADA AMATEUR PRODUCTS

HIGH QUALITY BRITISH MADE
HIGH POWER VARIABLE CAPACITORS



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TC500 £28 plus £2 p&p
CAPACITY:- 26-500 pF
VOLTAGE:- 7.8kV Max
SIZE:- 101 x 105 x 165mm
AIR GAP:- 2mm

TC250 £19.95 plus £1 p&p
CAPACITY:- 13-250 pF
VOLTAGE:- 7.8kV Max
SIZE:- 101 x 105 x 88mm
AIR GAP:- 2mm

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Each catalogue is packed full of info. and includes a £2 voucher.

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2 MTR HANDHELD

CT1600 A superbly sensitive new handheld covering 142-149MHz £179
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Each set supplied C/W re-chargeable battery pack and free mains charger unit.

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B110 144MHz 110 Watt W/Pre Amp.	£169
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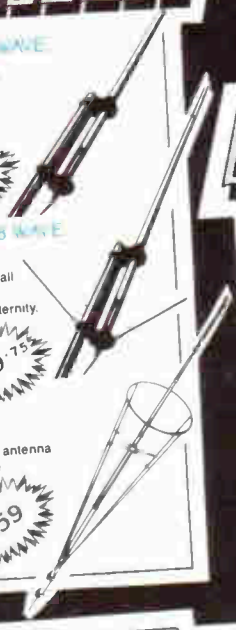
Full range of 144 MHz mobile amplifiers in stock see our Ham Catalogue.

29 MHz BASE ANTENNAS



NEVADA TC52 ½ WAVE

This top class half wave uses high grade aluminium and a low loss coil handling up to 1 KW. £19.95
WIND RESISTANCE:- 75 MPH
GAIN:- 2.5 dB
FREQ:- 28-30MHz
plus £4 p&p

NEVADA TC58 5/8 WAVE

Using high grade aluminium and a low loss coil complete with small radials this antenna is our most popular amongst the 29MHz fraternity. £29.75
POWER:- 1kW
GAIN:- 3.5 dB
FREQ:- 28-30MHz
LENGTH:- 6.6 MTRS
plus £4 p&p

SALIUT 3/4 WAVE

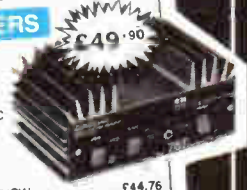
Using a unique base hoop this antenna offers exceptional ground wave coverage on 10 FM £59
POWER:- 2kW
GAIN:- 4.5 dB
FREQ:- 28-30MHz
LENGTH:- 9.1 MTRS
plus £4 p&p

RF AMPLIFIERS

All amplifiers except broadband models are tuned for 29.6MHz centre freq. Should you require a lower freq. i.e. 28.5MHz please state when ordering. Export models available for 26-30MHz.

MOBILE AMPLIFIERS

C.T.E. MOD 767 £49.90
76 Watts FM
INPUT:- 05-10 Watts
SWITCHABLE:- Class AB Class C
SUPPLY:- 13.8 Volt
REMOTE CONTROL FACILITY



C.T.E MOD 737 50W FM AM/SSB/CW	£44.76
C.T.E MOD 767 80W FM AM/SSB/CW	£49.90
C.T.E MOD 757 150W FM Broadband	£116.87
ZETAGI B35 25W FM 26-30MHz	£22.23
ZETAGI B150 70W FM 26-30MHz	£49.96
ZETAGI B300 150W FM (2-30MHz)	£136.00
NEVADA TC35 30W FM 26-30MHz	£23.75

MAINS OPERATED AMPLIFIERS

C.T.E DC9 Solid State 150W FM (Broadband)	£199..
ZETAGI B132 150W FM Solid State (Broadband)	£119.00

SCANNING RECEIVERS

C.T.E. DISCONE WIDEBAND ANTENNA £26

RECEIVE	70-700 MHz
TRANSMIT	70-500MHz
MAX POWER	500W
GAIN	3.5dB

WIDEBAND DISCONE RECEIVING ANTENNA
(3 Element) 70-500MHz

NEW BEARCAT H/HELD SCANNING RX. MODEL 100XL £229

£24.95

Receives 8 bands plus aircraft band. 16 Channels, priority keyboard lock and lighted display.
66-88 MHz 118-174 MHz 406-512 MHz

BEARCAT 175XL £209

Base receiver covers:-
66-88MHz
118-174MHz
406-512MHz
with 16 channel memory/scan

BEARCAT DX1000 COMMUNICATIONS RECEIVER £379

Direct access communications 10KHz-30MHz with 10 channel micro-processor controlled memory.

TEST EQUIPMENT

ZETAGI DL150 RF DUMMY LOAD AND POWER METER £85.19

A very accurate unit for the service dept. or discerning enthusiast.
FREQ:- 0.5MHz-500MHz
POWER:- 150 Watt Max in 3 ranges 0-3, 0-15, 0-150W.

ZETAGI 500 SWR AND POWER METER £41.46

For the enthusiast who wants the very best. A twin meter unit with push button control for either 75 OHM or 50 OHM cable.
FREQ:- 3-200MHz
POWER:- Up to 2kW

FD 1350 1.3GHz FREQUENCY COUNTER £139.53

FREQ:- 10Hz-1.35GHz
SENSITIVITY:- 43mV at 1GHz
DISPLAY:- 8 Digit
SUPPLY:- 9-12 Volt DC.

NEVADA

HIGH QUALITY BRITISH MADE 29MHz FM PRODUCTS

NEVADA TC35 DX £23.75

R.F. POWER AMP. WITH HARMONIC FILTER

INPUT:- 1-4 Watts
OUTPUT:- 25-30 Watts
SUPPLY:- 13.8V DC
FREQ.- 26-30 MHz

Can be centred on 29.6 MHz or 28.5 MHz (state which) A new top quality amp. which now features harmonic filter to reduce harmonic O/P

NEVADA TC27 RX RECEIVER PRE-AMP FOR 26-30MHz £22.34

A superior low noise pre-amplifier for 29MHz FM operation
Variable gain -6dB's to +18dB's suitable for use with transceivers up to 25 Watts output

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