JUNE 1989 £1.95

Amateur RADIO

For all two-way radio enthusiasts

A User Review: Samson's ETM-1C and ETM-5C Electronic Keyers

Working Long-Distance: Medium Wave DXing

Construction: The DTR3 QRP 80m Transceiver Kit

FOR THE BEST IN AMATEUR RADIO - SAVE MONEY AND CALL US NOW FOR OUR UNBEATABLE EXCLUSIVE PACKAGE DEALS

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100W, 1.8-30MHz Ham band TX, GCRX, 32 mems, Internal ATU & PSU, DFM mixer, 105db dynamic range
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100W, 1.8-30MHz Ham band TX, GCRX, 32 mems, SSB/CW/AM/FM/RTTY, 12v operation, 40 wpm OSK keyer
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ICOM IC-735

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IC-735 ..... ~~£979.00~~

ICOM IC-725

RIG OF THE MONTH! 100W, 1.8-30MHz Ham band TX, GCRX, SSB/CW, AM/FM option, DDS system - package deal available!
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ICOM R7000

25-1000MHz + 1.025-2GHz, keypad entry, 99 mems, AM/FM/SSB, comprehensive scanning system - package deal available!
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ICOM IC-R71E

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IC-R71E ..... ~~£855.00~~

ICOM IC-3210E

Dual band mobile, 144-146MHz and 430-440MHz. 20 double memories, 25/5W on both bands, duplex capability
IC-3210E ..... ~~£499.00~~

ICOM IC-32E

Dual band HT, 144-146MHz and 430-440MHz. 20 mems, 5W on 2 and 70, duplex capacity, keypad entry
IC-32E ..... ~~£399.00~~

YAESU FT-23R/FT-73R

Yaesu's classic compact HT's, 144-146MHz or 430-440MHz, 10 mems, 5W on 2/70, 0.25uV for 12db SINAD, many options
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Dual band HT, 144-146MHz and 430-440MHz. 10 mems, 5W on 2/70, cross band capability, CAT I/F, PSS power system
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FRG-8800

General coverage receiver, 0.15-30MHz all mode, 118-174MHz option, 12 mems, CAT system, keypad entry, 0.4uV sensitivity
FRG-8800 ..... ~~£649.00~~

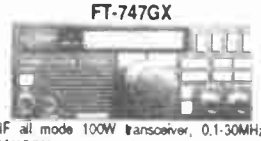
FT-767GX

HF/VHF/UHF all mode 100W transceiver, 0.1-30MHz ham band TX, GCRX, 50/144/432 MHz option, built in ATU, digital SWR & power meter
FT-767GX ..... ~~£1599.00~~

FT-736R

VHF/UHF all-mode transceiver, 144-146MHz and 430-440MHz (50MHz and 1.2GHz options), 115 mems, 60 watts, TV option
FT-736R ..... ~~£1359.00~~

FT-747GX



HF all mode 100W transceiver, 0.1-30MHz, RAYCOM starter pack with our MKII RX improvement mod, free 20A PSU. *UNBEATABLE!*
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TEN-TEC PARAGON ..... ~~£1839.00~~

NAVICO AMR1000/S

VHF 25W mobile, 144-146 MHz, 12.5/25 KHz steps, IARU channels, R0-R7, S8-S20, auto repeater shift/tone burst, digital S-meter
NAVICO AMR1000/S from £247.25

CHALLENGER BJ200

AM/FM scanning receiver, 26-520 MHz (with gaps) includes civil and most military bands, 16 mems, with free RAYCOM air band antenna
CHALLENGER BJ200 ..... ~~£229.00~~

CTE 1600

VHF HT, (same as IC-2E), 144-148 MHz, 2.5W RF, nicad charger, complete with free 2m mag-mount antenna, while stocks last
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FT-4700RH dual band 50/40W	~~£678.00~~

ICOM

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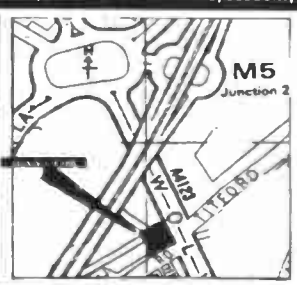

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AC141K	0.34	BC109	0.10	BC213	0.09	BD136	0.30	BD588	0.95	BF337	0.29	BR103	0.55	MJE520	0.48	RCA16029	0.85	TIS91	0.20	2SC931D	0.95
AC142K	0.45	BC109B	0.12	BC213L	0.09	BD137	0.32	BD698	1.50	BF338	0.32	BR303	0.95	MJE2955	0.95	RCA16039	0.85	TV106	1.50	2SC937	1.95
AC176	0.22	BC114A	0.09	BC214	0.09	BD138	0.30	BD701	1.25	BF355	0.37	BRC4443	1.15	MPSA13	0.29	RCA16181	0.85	TV106/2	1.50	2SC1034	4.50
AC176K	0.31	BC115	0.55	BC214C	0.09	BD139	0.32	BD702	1.25	BF362	0.38	BRY39	0.45	MPSA92	0.30	RCA16334	0.90	ZRF0112	16.50	2SC1096	0.80
AC187	0.25	BC116A	0.50	BC214L	0.09	BD140	0.30	BD707	0.90	BF363	0.65	BSW64	0.95	MRF237	4.95	RCA16335	0.85	2N1100	6.50	2SC1106	2.50
AC187K	0.28	BC117	0.19	BC237B	0.15	BD144	1.10	BDX32	1.50	BF371	0.25	BSX60	1.25	MRF450A	15.95	RCA16572	0.85	2N1308	1.35	2SC1124	0.95
AC188	0.25	BC119	0.24	BC238	0.15	BD150C	0.29	BDX53B	1.65	BF394	0.19	BT100A/02	0.85	MRF453	17.50	S2060D	0.95	2N1711	0.30	2SC1162	0.95
AC188K	0.37	BC125	0.25	BC239	0.15	BD159	0.65	BF115	0.35	BF422	0.32	BT106	1.49	MRF454	26.50	SKE5F	1.45	2N2219	0.28	2SC1172Y	2.20
ACY17	1.15	BC140	0.31	BC251A	0.15	BD160	1.50	BF119	0.65	BF423	0.25	BT116	1.20	MRF455	17.50	T6021V	0.45	2N2626	0.55	2SC1173	1.15
AD142	2.50	BC141	0.25	BC252A	0.15	BD166	0.50	BF127	0.39	BF457	0.32	BT119	3.15	MRF475	2.95	T6027V	0.45	2N2905	0.40	2SC1306	1.75
AD149	1.50	BC142	0.21	BC258	0.25	BD179	0.72	BF154	0.20	BF458	0.36	BT120	1.65	MRF477	14.95	T6029V	0.45	2N3053	0.40	2SC1364	0.50
AD161	0.50	BC143	0.24	BC258A	0.39	BD182	0.70	BF158	0.22	BF467	0.68	BU105	1.95	MRF479	5.50	T6036V	0.55	2N3054	0.59	2SC1413A	2.50
AD162	0.50	BC147B	0.12	BC284	0.30	BD201	0.50	BF160	0.27	BF493	0.35	NU108	1.69	OC16W	2.50	T9002V	0.55	2N3055	0.52	2SC1449	0.50
AF106	0.50	BC148A	0.09	BC300	0.30	BD202	0.50	BF173	0.22	Bf4995	0.23	BU124	1.25	OC23	9.50	T9011V	0.75	2N3702	0.12	2SC1628	0.75
AF114	2.50	BC149	0.09	BC301	0.30	BD203	0.50	BF177	0.38	Bf4997	0.25	BU125	1.25	OC25	1.50	T9015V	2.15	2N3703	0.12	2SC1678	1.50
AF115	1.95	BC153	0.30	BC303	0.26	BD204	0.70	BF178	0.26	BFR39	0.23	BU126	1.60	OC26	1.50	T9034V	2.15	2N3704	0.12	2SC1945	3.75
AF116	2.50	BC157	0.12	BC307B	0.09	BD222	0.46	BF179	0.34	BFR40	0.23	BU204	1.55	OC28	5.50	T9038V	3.95	2N3705	0.20	2SC1953	0.95
AF117	2.50	BC159	0.09	BC327	0.10	BD223	0.59	BF180	0.29	BFR81	0.25	BU205	1.30	OC29	4.50	THY1S/80	2.25	2N3706	0.12	2SC1957	0.80
AF118	3.50	BC161	0.55	BC328	0.10	BD225	0.48	BF181	0.29	BFR88	0.30	BU208	0.95	OC32	5.50	THY1S/85	2.25	2N3708	0.12	2SC1969	2.95
AF121	0.60	BC170B	0.15	BC337	0.10	BD232	0.35	BF182	0.29	BFR90	1.50	BU208A	1.15	OC42	1.50	TIP29	0.40	2N3733	9.50	2SC1985	1.50
AF124	0.65	BC171	0.09	BC338	0.09	BD233	0.35	BF183	0.29	BFR91	1.75	BU208D	1.35	OC44	1.25	TIP29C	0.42	2N3773	2.75	2SC2028	1.15
AF125	0.65	BC172B	0.10	BC347A	0.13	BD236	0.49	BF184	0.35	BFT42	0.35	BU326	1.20	OC45	1.00	TIP30C	0.43	2N3792	1.35	2SC2029	1.95
AF126	0.45	BC173B	0.10	BC461	0.35	BD237	0.40	BF185	0.28	BFT43	0.35	BU326S	1.50	OC70	1.00	TIP31C	0.55	2N4280	3.50	2SC2078	1.45
AF127	0.65	BC174	0.09	BC478	0.20	BD242	0.65	BF195	0.11	BFW10	0.55	BU407	1.24	OC71	0.75	TIP32C	0.42	2N4427	1.95	2SC2091	0.85
AF139	0.40	BC177	0.15	BC527	0.20	BD246	0.75	BF197	0.11	BFW11	0.75	BU408	1.50	OC72	2.50	TIP33C	0.95	2N4444	1.15	2SC2098	2.95
AF150	0.60	BC178	0.15	BC547	0.10	BD376	0.32	BF198	0.16	BFW16A	1.15	BU426A	0.75	OC75	1.50	TIP34B	0.95	2N5294	0.42	2SC2166	1.95
AF178	1.95	BC182	0.10	BC548	0.10	BD379	0.45	BF199	0.14	BFW61	0.60	BU500	2.25	OC81	1.00	TIP41A	0.45	2N5296	0.48	2SC2314	0.80
AF239	0.42	BC182LB	0.10	BC549A	0.10	BD410	0.65	BF200	0.40	BFW92	0.85	BU508A	1.95	OC84	1.50	TIP41C	0.45	2N5298	0.60	2SC2371	0.36
ASY27	0.85	BC183	0.10	BC550	0.14	BD434	0.65	BF240	0.20	BFX29	0.30	BU526	1.90	OC139	12.50	TIP42C	0.47	2N5485	0.45	2SC931D	0.95
ASY77	1.50	BC183L	0.09	BC557	0.08	BD436	0.60	BF241	0.15	BFX84	0.26	BU807	2.25	OC171	4.50	TIP47	0.65	2N5496	0.95	2SK19	0.55
				BC558	0.10	BD437	0.60	BF245	0.30	BFX85	0.32	BUY20	2.15	OC200	4.50	TIP48	0.65	2N5641	16.50	2SK33	0.55
				BC639/1D	0.30	BD438	0.75	BF256C	0.35	BFX86	0.25			OC201	5.50	TIP50	0.65	2N5643	16.50	3SK88	0.95
				BCY33A	19.50	BD510	0.95	BF257	0.28	BFY18	1.35			OC205	10.00	TIP120	0.60	2SA329	0.95		

Integrated Circuits

AN103	2.50	AN7145M	3.95	LA4102	1.50	MB3756	2.50	SAS590	2.75	STK437	7.95	TA7609P	3.95	TBA550Q	1.95	TDA1001	2.95	TDA2581	2.95	UPC1181H	1.25
AN124	2.50	AN7150	2.95	LA4140	2.95	MC1307P	1.00	SL901B	7.95	STK439	7.95	TA7611AP	2.95	TBA560C	1.45	TDA1003A	3.95	TDA2582	2.95	UPC1182H	1.50
AN214	2.50	AN7151	2.50	LA4031P	1.95	MC1310P	1.95	SL917B	6.65	STK461	11.50	TA7629	2.50	TBA560Q	1.45	TDA1006A	2.50	TDA2593	2.95	UPC1185H	3.95
AN214Q	2.50	BA521	1.50	LA4400	3.50	MC1327	1.70	SL1310	1.80	STK463	11.50	TAA310A	3.50	TBA570	1.00	TDA1010	2.15	TDA2600	6.50	UPC1191V	1.50
AN236	1.95	CA1352E	1.75	LA4420	3.50	MC1327Q	0.95	SL1327	1.10	STK0015	7.95	TAA320A	3.50	TBA651R	2.50	TDA1005	2.25	TDA2610	2.50	UPC1350C	2.95
AN239	2.50	CA3086	0.46	LA4422	1.50	MC1351P	1.75	SL1327Q	1.10	STK0029	7.95	TAA350A	1.95	TBA673	1.95	TDA1035	2.50	TDA2611A	1.95	UPC1353C	2.45
AN240P	2.80	CA3123E	1.95	LA4430	2.50	MC1352P	1.00	SN7414	1.50	STK0039	7.95	TAA550B	0.95	TBA750	1.95	TDA1037	1.95	TDA2640	3.50	UPC1360	2.95
AN247	2.50	CA3130M	2.50	LA4461	3.95	MC1357	2.35	SN7421	0.85	TA7061AP	1.50	TAA570	1.95	TBA750Q	2.65	TDA1044	2.15	TDA2650	4.50	UPC1365C	3.95
AN260	2.95	CA3140S	2.50	LC7120	3.25	MC1358	1.58	SN76110N	0.89	TA7072	2.65	TAA621	3.95	TBA800	0.89	TDA1170	1.95	TDA2680A	2.75	UPC2002H	1.95
AN262	1.95	CA3140T	1.15	LC7130	3.50	MC1496	1.75	SN76115N	1.25	TA7073	3.50	TAA630S	2.95	TBA810AS	1.65	TDA1180	2.15	TDA2690	2.45	UPD2114LC	2.50
AN264	2.50	ETT6016	2.50	LC7131	5.50	MC1723	0.50	SN76131N	1.30	TA7108P	1.50	TAA661B	1.95	TBA810P	1.65	TDA1270Q	3.95	TDA3310	2.95	555	0.35
AN271	3.50	HA1137W	1.95	LC7137	5.50	MC3357	2.75	SN76226DN	2.95	TA7120P	1.65	TAA700	1.70	TBA820M	0.75	TDA1327	1.70	TDA3510	3.50	556	0.60
AN301	2.95	HA1156W	1.50	LM323K	4.95	MC3401L	2.50	SN76227N	1.05	TA7129P	2.50	TAA930	3.95	TBA820Q	1.45	TDA2002	0.95	TDA3560	3.95	723	0.50
AN303	3.50	HA1306	1.50	LM324N	0.45	MC14106P	2.95	SN76228N	2.95	TA7130P	1.50	TBA120AS/B/C		TBA890	2.50	TDA2003	1.95	TDA4050	2.95	741	0.35
AN313	2.95	HA1322	1.95	LM380N	1.50	MC14518CP	7.50	SN76533N	1.65	TA7137P	1.00		1.00	TBA920	1.65	TDA2010	1.95	TDA4600	2.50	747	0.50
AN315	2.95	HA1339A	2.95	LM380N8	2.95	ML231B	1.75	SN76650N	1.15	TA7146P	1.50	SA/SB/T/U		TBA950/2X	1.50	TDA2020	2.95	TDA9503	3.15	748	0.35
AN316	3.95	HA1366W	2.75	LM383T	2.95	ML232B	2.50	SN76660N	0.90	TA7176AP	2.95	TBA395	1.50	TBA990	1.49	TDA2030	2.80	TEA1009	1.35	7808	0.50
AN331	3.95	HA1406	1.95	LM390N	3.50	ML239	2.95	STK011	7.95	TA7193P	3.95	TBA396	0.75	TBA990Q	1.49	TDA2140	3.95	UPC41C	3.50	7805	0.50
AN342	2.95	HA1551	2.95	LM1D11	3.15	MSM5807	8.75	STK014	7.95	TA7203	2.95	TBA440N	2.55	TCA270	2.50	TDA2150	2.50	UPC566H	2.95	7812	0.50
AN362L	2.50	LA1201	0.95	M5155L	2.95	SAA500A	3.50	STK015	5.95	TA7204P	2.15	TBA480Q	1.95	TCA270Q	2.50	TDA2151	1.95	UPC575C2	1.50	7815	0.50
AN612	2.15	LA1230	1.95	M51513L	2.30	SAA1025	7.25	STK018	7.95	TA7205AP	1.15	TBA510	2.50	TCA650	2.50	TDA2160	2.50	UPC1001H	1.95		
AN6362	3.95	LA3201	0.95	M51521L	1.50	SAA1251	4.95	STKD25	11.95	TA7208	1.95	TBA510Q	2.50	TCA760	2.50	TDA2524	1.95	UPC1020H	2.95		
AN7140	3.50	LA4101	0.95	MB37D5	1.50	SAA5010	5.35	STK032	7.95	TA7222AP	1.80	TBA520	1.10	TCA800	6.95	TDA2530	1.95	UPC1024H	1.50		
AN7145	3.50			MB3712	2.00	SAA5020	5.75	STK078	11.95	TA7227P	4.25	TBA520Q	1.10	TCA830S	1.95	TDA2532	1.95	UPC1025H	1.95		
						SAB321D	3.50	STK085	8.95	TA722BP	1.95	TBA530	1.10	TCA900	2.50	TDA2540	1.95	UPC1D28H	1.95		
						SAS560S	1.75	STK415	7.95	TA7310P	1.80	TBA530Q	1.10	TCA940	1.65	TDA2541	2.15	UPC1032H	0.95		
						SAS570S	1.75	STK435	7.95	TA7314P	2.95	TBA540	1.25	TDA440	2.20	TDA2560	1.15	UPC1158H	0.75		
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EY86/87	0.65
EY88	0.95
EY91	5.50
EY500A	1.95
EY802	0.70
EZ35	1.00
EZ40	3.50
EZ41	3.50
EZ80	0.75
EZ81	0.75
EZ90	1.50
FW4-800	4.50
G55/1K	9.00
G180/2M	6.95
G240/2D	9.00
GC10B	17.50
GC10D	17.50
GC10/4B	17.50
GC10/4E	17.50
GC12/4B	17.50
GD86W	6.00
GDT120M	5.00
GN4	6.00
GN10	15.00
GR10G	4.00
GS10C	16.50
GS10H	12.00
GS12D	12.00
GT1C	14.00
GU20	35.00
GU50	17.50
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.50
GY802	1.50
GZ32	2.50
GZ33	4.50
GZ34	2.50
GZ37	4.50
HBC90	1.95
HL41	3.50
HL90	3.50
KT8C	7.00
KT33C	3.50
KT36	2.95
KT44	5.95
KT45	5.95
KT61	5.00
KT63	2.00
KT66 USA	11.95
KT66 GEC	25.00
KT66 TEONEX	5.00
KT67	9.00
KT77 GEC	11.95
KT81	7.00
KT88 USA	12.95
KT88 Selectron	15.00
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
LB7-20	95.00
LS9B	6.95
M508	195.00
M5143	155.00
M5199	295.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	7.95
M8161	6.50
M8162	5.50
M8163	5.50
M8190	4.50
M8195	6.50
M8196	5.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.95
ME1400	3.50
ME1401	29.50
ME1402	29.50
MHLD6	4.00
MP25	195.00
MS4B	5.50
MU14	3.50
N37	12.50
N78	9.85
OA2	1.50
OA2WA	2.50
OA3	2.50
OB2	1.50
OB2WA	2.50
OC3	2.50
OD3	2.50
OM4	2.50
OM5B	3.00
OM6	1.75
ORP43	2.50
ORP50	3.95
P61	2.50
P41	2.50
PABC80	0.95
PC86	0.75
PC88	0.75
PC97	1.10
PC900	1.25
PCC84	0.40
PCC85	0.55
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	1.25
PCF200	1.80
PCF201	1.80
PCF801	1.35
PCF802	0.85
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
PCL805	0.90
PD500	5.95
PE1-100	69.00
PEN25	2.00
PEN40D	3.00
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PFL200	0.95
PL36	1.75
PL38	1.50
PL81	1.25
PL82	0.60
PL83	0.52
PL84	0.78
PL500	1.25
PL504	1.25
PL508	1.50
PL509	4.85
PL519	4.95
PL802	6.00
PL802T	3.50
PL820	2.95
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.65
PY500A	1.95
PY800	0.85
PY801	0.85
QB3-300	72.00
QB3-1750	139.00
QB5-3500	595.00
QQE02-5	19.50
QQE03-12	7.95
QQE03-20	35.00
QQE06-40	45.00
QQV02-6	19.50
QQV03-10	5.50
QQV03-10 MULLARD	15.00
QQV03-20	25.00
QQV06-40A	27.50
QQV06-40A MULLARD	39.50
QQV07-50	55.00
QQZ03-20	42.50
QQZ06-40	45.00
QS75/20	1.50
QS95/10	4.85
QS108/45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/40	7.00
QS1205	3.95
QS1213	5.00
QU37	9.50
QV03-12	6.50
QV05-25	2.50
QV06-20	29.50
QV08-100B	145.00
QY3-125	85.00
QY4-250	85.00
QY4-400	95.00
R10	4.00
R18	2.50
RG1-240A	14.50
RG3-250A	6.50
RG3-1250A	35.00
RR3-250	15.00
RR3-1250	35.00
S11E12	38.00
S104-2K	10.00
SC1/1300	6.00
SP61	3.50
STV280/40	11.95
TB2-5/300	95.00
TB2-300	195.00
TB3-750	115.00
TB3-2000	450.00
TBL2-300	395.00
TBL2-500	495.00
TD03-10/D/E/F	35.00
TT15	45.00
TT21	45.00
TT22	39.50
TT100	69.00
TY2-125A	85.00
TY4-400	85.00
TY7-6000A	600.00
TY8-600W	365.00
U19	9.50
U26	0.90
U35	3.50
U37	9.00
U41	6.95
U50	2.00
U82	3.00
U191	0.70
U192	1.00
U193	1.00
U251	2.50
U801	3.50
UABC80	1.00
UAF42	1.95
UBC41	3.95
UBC81	1.50
UBF80	0.95
UBF89	1.00
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	2.50
UCH41	2.50
UCH42	3.95
UCH81	1.00
UCL82	1.75
UCL83	2.50
UF41	2.25
UF42	2.25
UF80	1.75
UF85	1.20
UF89	2.00
UL41	10.00
UL44	3.50
UL84	1.50
UL85	0.85
UU5	3.50
UU6	6.00
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V238A/1K	295.00
V246A/1K	250.00
V246A/2K	315.00
V241C/1K	195.00
V453	12.00
VLS631	10.95
VP48	9.50
VP41	4.95
VR101	2.50
VR105/30	2.50
VR150/30	2.50
VU39	2.50
W21	4.50
W61	4.50
W77	5.00
W81M	4.50
W739	1.50
X24	4.50
X41	4.50
X66/X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG1-2500	75.00
XL628FT	7.50
XNP12	2.50
XR1/1600A	49.50
XR1/3200A	79.50
XR1-6400A	149.50
Y65	6.95
YD1100	75.00
YJ1060	265.00
YL1020	42.50
YL1060	195.00
YL1070	195.00
YL1071	195.00
YL1290	65.00
Z77	1.20
Z300T	6.00
Z302C	12.00
Z359	9.00
Z520M	4.00
Z700U	9.50
Z759	19.85
Z803U	18.95
ZA1000	12.50
ZA1001	1.50
ZM1001	12.00
ZM1005	8.00
ZM1020	6.00
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1175	6.50
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
1A3	4.50
1AE4	3.50
1AX2	3.50
1B22	10.00
1B27	55.00
1B3GT	1.95
1B35A	45.00
1B63A	75.00
1K3	2.50
1N5GT	2.50
1P28	25.00
1R5	1.50
1S5	1.50
1T4	1.50
1U4	1.75
1U5	1.50
1X2B	2.50
2A3	16.50
2AS15A	11.50
2B7	4.50
2B22	69.50
2C36	70.00
3C39A	32.50
2C39BA	39.50
2C40	37.00
2C42	29.50
2C43	60.00
2C51	2.50
2CY5	1.50
2D21	2.25
2D21W	3.15
2E22	49.00
2E26	7.95
2J55	295.00
2K25	49.50
2K26	95.00
2K29	250.00
2K48	140.00
2K56	250.00
2X2A	5.00
3A/107B	12.00
3A/108A	9.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/146J	7.50
3A/147J	7.50
3A/167M	10.00
3A3A	3.95
3A4	1.50
3A5	4.50
3AT2	3.35
3B22	25.00
3B26	24.00
3B28	15.00
3BZ6	1.50
3C45	39.50
3CX3000A7	650.00
3CY5	1.50
3D21A	29.50
3E22	49.50
3E29	39.50
3EJ7	1.95
3H	0.40
3J 170E	1450.00
3L	0.40
3Q4	2.50
4-65A	75.00
4-250A	85.50
4-400C	87.50
4-1000A	425.00
4B32	35.00
4BQ7A	1.75
4BZ6	1.95
4C28	25.00
4C35	145.00
4CS250R	285.00
4XC125C EIMAC	150.00
4CX250B	45.00
4CX250BM	65.00
4CX250K EIMAC	115.00
4CX250R AMPEREX	125.00
4CX350A	100.00
4CX1000A	425.00
4CX1500B	475.00
4CX5000A	1000.00
4D21/4-125A	85.00
4D32	125.00
4E27A	125.00
4GS7	2.25
4GV7	2.25
4J6A	2.95
4KT6	1.50
4TB5P	150.00
4X150A	35.00
4X150D	55.00
4X500A	350.00
5A/102D	9.50
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-180M	9.00
5A-206K	10.00
5B-110M	10.00
5B-254M	14.50
5B-255M	14.50
5B-256M	15.00
5B-257M	15.00
5B258M	14.50
5C22	125.00
5CL8A	2.50
5J180E	1950.00
5JL8	2.95
5R4GB	5.50
5R4GY	4.95
5R4WGY	5.95
5T4	5.95
5T8A	1.95
5U4G	4.50
5U4GB	4.50
5V4G	2.50
5W4	4.95
5X4	4.95
5Y3GT	2.50
5Z3	4.50
5Z4G	2.50
6/30L2	0.70
6A/203K	9.00
6A7	4.95
6A8	2.50
6AB7	4.50
6AC7WA	2.00
6AG5	2.50
6AG7	2.50
6AH6	3.50
6AJ4	3.50
6AJ7	2.00
6AK5	1.95
6AK6	2.50
6AL5	0.85
6AM4	3.25
6AM5	6.00
6AM6	1.95
6AN5	4.50
6AN8A	4.50
6AQ5	1.75
6AQ8	1.50
6AR5	8.95
6AS5	1.50
6AS6	2.50
6AS7G	4.50
6AT6	1.95
6AT8	1.75
6AU4GT	2.95
6AU5GT	4.50
6AU6	0.95
6AV6	1.95
6AW8A	3.50
6AX4GT	1.95
6AY3B	1.95
6AZ8	4.50
6B8G	2.50
6B10	1.95
6BA6	1.50
6BA7	4.50
6BA8A	3.50
6BC8	1.50
6BR3	2.95
6BE6	1.50
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.50
6BK4	6.50
6BL6	85.00
6BL8	1.15
6BM6	115.00
6BN6	1.65
6BN8	3.95
6BQ5	1.35
6BQ7A	1.50
6BR7	4.95
6BS7	5.50
6BW6	5.35
6BW7	1.50
6BZ6	2.50
6BZ7	2.95
6C4	1.95
6C5	2.50
6C6	3.50
6C8G	2.50
6C9	4.95
6CA4	4.95
6CA7	3.50
6CB5	3.95
6BC6	2.35
6CD6GA	4.50
6CF6	1.95
6CG7	4.50
6CH6	6.95
6CL6	3.25
6CL8A	2.95
6CM7	2.95
6CS6	0.75
6CS7	0.95
6CW4	8.00
6CX8	3.95
6DC6	2.35
6DJ8	1.35
6DJ8 SPECIAL	3.50
6DK6	1.50
6DQ5	8.50
6DQ6B	2.50
6DT6A	1.50
6DW4B	3.50
6E5	3.95
6EA7	2.50
6EA8	2.50
6EB8	3.50
6EJ7	0.85
6EM5	2.50
6EM7	2.50
6EU8	1.75
6EV7	2.95
6EW6	1.50
6F1	2.00
6F5	5.50
6F7	5.50
6F13	3.00
6F14	1.00
6F17	2.75
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	10.50
6FH5	8.50
6FH8	15.00
6FL2	4.50
6FQ7	4.50
6GE5	3.95
6GH8A	2.50
6GJ7	0.85
6GK6	3.95
6GM6	2.65
6GS7	21.5
6GV8	0.95
6GW8	2.50
6GY5	4.95
6GY6	2.50
6H1	9.50
6H6GT	2.50
6HB7	1.95
6HF8	3.50
6HM5	2.50
6HQ5	3.50
6HS6	4.95
6HS8	2.95
6HZ6	3.50
6J4	2.15
6J5GT	2.50
6J6	2.00
6J7	4.15
6J7G	4.15
6JB6A	9.50
6JE6C	9.50
6JM6	9.50
6JU8A	2.50
6JS6C	9.50
6K7G	2.00
6K8G	3.00
6KD6	9.50
6KG6A	6.95
6L1	2.50
6L6GC	3.50
6L6GC USA	9.50
6L6GT	3.50
6L7	3.50
6L15	3.15
6L19	3.95
6LJ8	2.50
6LD20	1.15
6LF6	11.50
6LQ6	9.50
6P28	2.00
6Q7GT	1.50
6R7	3.15
6RHH8	10.00
6S4A	1.95
6SA7	1.95
6SC7	1.95
6SH7	1.95
6SJ7GT	1.95
6SK7	1.95
6SL7GT	1.95
6SN7GT	1.95
6SQ7GT	1.50
6SS7	1.95
6T8	1.50
6U6GT	3.50
6U7G	3.50
6U8A	1.50
6V6G	1.25
6V6GT	1.95
6W4GT	1.95
6Y6G	3.95
6X2N	1.00
6X4	1.50
6X5GT	1.00
6X8A	2.25
7A6	4.50
7AU7	1.50
7B6	3.50
7B7	2.50
7D8	4.50
7J7	5.50
7K7	7.50
7L	1.50
7Q7	4.50
7Y4	2.50
8B8	2.50
8B10	2.50
8BQ5	1.95
8CW5	1.50
8EB8B	1.50
8FQ7	1.95
10D2	1.25
10DE7	2.50
10DX8	2.50
10EB8	1.95
10EW7	2.95
10F1	0.75
10GK6	1.95
10IP4	2.50
11E3	55.00
11R3	5.50
12A6	3.95
12A06	2.50
12AE6	5.50
12AH7GT	4.95
12AL5	1.00
12AT6	1.75
12AT7	1.50
12AT7WA	2.50
12AU6	1.50
12AU7	0.85
12AV6	1.95
12AV7	2.50
12AX4GTB	2.50
12AX7	0.95
12AX7WA	2.50
12AX7S	7.95
12AY7	3.95
12B4A	4.50
12BA6	2.50
12BE6	1.95
12BH7A	3.95
12BL6	1.75
12BR3	1.95
12BY7A	3.50
12CB	2.50
12CA5	1.95
12CX6	1.95
12DQ6B	3.50
12DW4A	3.50
12DZ6	3.95
12E1	19.50
12E14	38.00
12FX5	1.95
12GN7	3.95
12GH7	3.95
12J5GT	3.95
12J7GT	3.50
12JZ8	2.95
12KGT	1.50
12KBY	1.95
12KU7	1.95
12S7GT	1.50
12SA7GT	1.95
12SG7	4.75
12SK7	1.95
12SJ7	1.50
12SN7GT	1.85
12SW7	3.50
12SY7	4.50
12X4	1.95
13D7	3.20
13DE7	2.50
13DR7	2.95
13E1	145.00
13EM7	3.50
14B6	4.50
14R7	3.50
15E	5.50
16AQ3	1.95
16GY5	2.95
16H	0.40
16L	0.40
17AB	3.50
17AX4GTA	1.95
17BE3	2.50
17DW4A	2.95
17EW8	1.50
17JZ8	4.50
18D3	6.00
18GB5	3.50
19AQ5	3.50
19AU4GT	2.50
19BG6	3.50
19G3	19.50
19G6	9.00
19H4	35.00
19H5	33.50
20CV	9.50
20D1	1.50
20LF6	7.95
20L1	0.95
20P1	0.55
20P4	1.95
20P5	1.15
21JZ6	4.95
21KQ6	4.95
21LU8	3.75
24B1	39.50
24B9	39.50
25BQ6	1.75
25DQ6B	2.95
25L6GT	1.75
29C1	19.50
29KQ6	6.50
30C15	0.50
30C17	0.40
30C18	1.48
30FL2	1.35
30FL12	0.95
30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.60
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30P1	2.50
30PL13	0.60
30PL14	1.75
31JS6C	5.50
33A/158M	19.50
35A3	3.95
35A5	4.50
35C5	4.50
35L6GT	2.00
35Z3	1.95
35Z5GT	3.50
38HE7	5.95
40KD6	5.50
42	6.95
47	6.00
50A5	1.50
50B5	1.95
50C5	0.95
50CD6G	1.95
50EH5	1.50
50JY6	2.95
53KU	4.50
75B1	3.50
75C1	4.50
80	4.50
83	8.50
83A1	7.50
85A1	6.50
85A2	2.95
90AV	17.50
90C1	3.50
90CG	17.50
90CV	17.50
91AG	9.00
92AG	19.50
92AV	19.50
95A1	6.50
100E1	10.00
108C1	2.50
150B2	6.50
150C1K	9.00
150D2	2.50
150C4	2.50
185BT	1.50
211	25.00
230D	15.00
231D	15.00
250TH	150.00
307	5.00
328A	15.00
572B	59.00
705A	12.50
713A	25.00
723A/B	75.00
724A	275.00
725A	275.00
726A	75.00
801A	15.00
802	25.00
803	14.95
805	59.00
807	3.50
811	15.00
812A	35.00
813 Philips	35.00
813	27.50
829B	14.50
833A	95.00
845	59.50
866A	8.50
872A	20.00
873	60.00
954	1.00
955	1.00
1849	315.00
1927	25.00
2040	25.00
2050A	5.95
2050W	6.50
4212H	250.00
4471	35.00
4687A	9.50
5544	79.50
5559	55.00
5636	5.50
5642	9.50
5643	9.50
5651	2.50
5654	1.95
5670	3.25
5672	4.50
5675	28.00
5678	7.50
5687	4.50
5696	4.50
5702	3.50
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
5751	2.95
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NEW FUNCTION GENERATOR

Global Specialties have recently introduced a 20MHz programmable function generator to complement their range of test equipment.

The 8020 Series consists of three instruments: the Model 8020 offers sine, triangle, square-wave and dc, plus eight log/lin sweep modes, VCO, gating and triggering modes. The Model 8021 offers the same basic features as the 8020, plus six pulse modes and two ramp modes. The Model 8022 AM function generator features external amplitude modulation.

The 8020 Series supports a frequency range from 2MHz to 20MHz, with an amplitude span of 0.1 to 15Vp-p. The pulsewidth range is 25ns to 10s and the rampwidth range is 5us to 10s. The instruments have a built-in counter loop which maintains an accuracy of better than 0.1%. They can be operated manually or via a GPIB interface.

They are housed in a metal case which minimises RFI emission and aids adaptation to ATE systems.

For further information and prices contact Global Specialties, 2nd Floor, 2-10 St Johns Street, Bedford MK42 0DH.

LOW PASS FILTERS

Cirkit Distribution have designed three lowpass filters for miniaturising audio equipment.

The THB290 is a hybrid integrated circuit-type module which includes a seventh-order lowpass filter with cut off at 14kHz. Its maximum current consumption is 15mA and its minimum attenuation is 50dB at 30kHz. The maximum distortion is no more than 0.007% at 1kHz.

The THB291 includes a seventh-order lowpass filter with cut off at 20kHz. Its maximum current consumption is also 15mA with minimum attenuation of 50dB at 40kHz. The maximum distortion is identical to the THB290.

The THB292 is also a seventh-order lowpass filter with a current consumption of 15mA and its cut off is 22kHz. The attenuation is 50dB at 40kHz, with a maximum distortion at 1kHz of 0.007%.

All three filters measure 25mm × 12mm × 6mm (WHD) and operate at temperatures from −20°C to +70°C.

For further information contact Cirkit Distribution Ltd, Park Lane, Broxbourne, Hertfordshire EN10 7NQ.

TENSION CONNECTOR

A new high tension 2mm connector is now available from Mult-Contact (UK) Ltd. It has a test voltage of 5kV and is rated at 15 amps. The recommended operating temperature range is between 70°C and −10°C.

The socket, made from brass, is machined and gold-plated and has an insulating shroud to give a breakdown voltage to VDE standards of 9.5kV.

For further information contact Multi-Contact (UK) Ltd, ICG House, Station Approach, Oldfield Lane North, Greenford, Middlesex UB6 0AL. Tel: 01-575 7070.

SIGNAL GENERATOR

The D2MAC packet test signal generator provides test patterns and signals in order to simplify installation and maintenance of direct satellite broadcast systems.

The D2MAC generates a colour pattern using standard international signals, duobinary synchronisation patterns, and facilitates external equipment synchronisation. The generator can be used for all types of functions, including test lines 311, 312, 313, 623 and 624.

Other features include MAC convergence pattern, colour bar pattern, static convergence pattern, five scale patterns, and two monochrome patterns. Non-displayable patterns, such as full field repetition of test lines 311, 312 and 313, are especially useful in circumstances involving the display of test signals on an oscilloscope.

For further information contact Schlumberger Instruments, Victoria Road, Farnborough, Hants GU14 7PW. Tel: (0252) 544433.

THE PAN 10XT

Electronic and Computer Workshop Ltd have introduced a new general-purpose multimeter which has a sensitivity of 20 ohms/VDC and 5k ohms/VAC.

The PAN 10XT measures 100mm × 1,600mm × 40mm, and offers internal circuit protection. The multimeter is housed in a shock-proof case, and is supplied with a spare fuse and instruction manual.

The multimeter's facilities include: −10 to +59dB output (in five ranges), VBF output from 7.5 to 750V and a ballistic capacity of 100mf-10mf-1mf to 100mf.

For further information contact Electronic and Computer Workshop Ltd, Unit 1, Cromwell Centre, Stepfield, Witham, Essex CM8 3TH. Tel: (0376) 517413.

CONDUCTIVE PEN

Planned Products have developed a conductive pen for applying solderable electronic traces to most surfaces, such as PCBs. The pen has many applications, including PCB fabrication and repair, electromagnetic shielding and conducting point-to-point traces.

The Circuit Works Pen, through advances in valued pen and polymer ink technology, can draw traces as narrow as 1/16in. The pen is filled with enough silver conductor to draw up to 150ft of conductive traces, and the polymer ink dries quickly at room temperature.

When not in use, the spring-loaded tip closes to prevent any accidental drying.

Solderable teminations using a 250°F cure for fifteen to twenty minutes after application are possible. Tin, lead, or silver solder can be used, but you should not exceed 350°F for more than five seconds. While hand-soldering is not recom-

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mended, wave soldering is ideal. The pen should be used with adequate ventilation.

Circuit Works Conductive Pens cost US$9.95 plus US$1.00 postage (US$2.00 overseas).

For more information contact Planned Products, 21105 Santa Cruz Highway, Brush Road, Department FREW, Los Gatos CA 95030.

DTI NEWS

Though hardly likely to keep the airwaves buzzing, the UK has recently concluded a third-party traffic agreement with Pitcairn Island. Now not many people knew that – did you?

RALLIES

The Royal Naval Amateur Radio Society Mobile Rally takes place on 11 June beside **HMS Mercury**, near Petersfield, Hampshire, starting at 10.00am.

There will be a wide variety of attractions for the family, including a flypast by a 'Swordfish' aircraft from the RN Historic Flight. A talk-in will be on 2m and 70cm.

Admission is £1.00 for adults and children are admitted free. There is free parking and refreshments will be available.

For further information contact C Harper G4UJR. Tel: (0703) 557469.

The Elvaston Castle Mobile Radio Rally will be held in Castle's Country Park on 11 June.

It is expected that over 100 stalls of radio equipment will be on view. Elvaston Castle Country Park has a lake, a nature trail, and a museum depicting life as it was at the turn of the century.

The castle is located five miles south-east of Derby on the B5010. For further information contact John Robson. Tel: (0332) 767944.

CLUB NEWS

The Wimbledon and District Amateur Radio Society meets on the second and last Friday of every month at St Andrews Church Hall, Herbert Road, London SW19.

Their program for June is:

9 June: Microwaves, by Ian Lamb G8KQW and Dennis Stanton G8CUX.

30 June: HF Antennas and Feeder Systems, by Louis Varney G5RV.

For further information contact Nick Lawlor G6AJY. Tel: 01-330 2703.

The Welwyn-Hatfield Amateur Radio Club meets on the first Monday of every month at the Lemsford Village Hall, Brocket Road, Welwyn Garden City.

3-4 June: HF Field Day, at Hill Farm, Ayot, St Lawrence.

19 June: VHF Field Day preparation.

For further information contact Roger Curtis G0CYC. Tel: (0707) 324958.

The Dunstable Downs Radio Club meets every Friday at Chews House, 77 High Street South, Dunstable, Bedfordshire.

For further details contact Tony Kelsey-Stead G0COQ. Tel: (0582) 508259.

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2SA564	£0.10	2SC1213	£0.13	2SC2092	£1.41	3SK48	£2.36	BD245	£0.84
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2SA966	£0.26	2SC1675	£0.14	2SC2320	£0.10	BC142	£0.19	MRF238	£13.64
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2SA1015	£0.11	2SC1909	£0.92	2SC2630	£12.90	BC212	£0.04	MRF454	£22.94
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2SC496	£0.36	2SC1947	£4.29	2SD313	£0.58	BC639	£0.12	TIP30C	£0.39
2SC536	£0.10	2SC1957	£0.66	2SD325	£0.43	BC640	£0.13	TIP31C	£0.27
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2SC828	£0.09	2SC1972	£6.25	2SD637	£0.71	BD139	£0.22	TIP120	£0.36
2SC900	£0.27	2SC1973	£0.51	2SD880	£0.41	BD140	£0.25		
2SC930	£0.17	2SC2002	£0.25	2SK192	£0.23	BD201	£0.33		

BOOKS

Screwdrivers Guide to CB £6
PLL Data Book £6
Cybernet Service Manual £3
Uniden Service Manual £3

Active Filter Boards

A 10.695MHz active filter specifically designed for the HAM International and NATO 2000 type CBs. This board significantly reduces image reception and cross modulation without affecting sensitivity. £6.95

Crystal Filter

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7812	£0.39	HA1392	£2.84	LC7131	£3.21	TA7061	£0.76	TDA1020	£2.28
7815	£0.37	HA1394	£2.73	LC7132	£2.89	TA7120	£0.48	TDA1510	£3.09
7818	£0.89	HA1397	£2.55	LC7137	£2.77	TA7130	£0.53	TDA1512	£3.13
AN240	£1.25	HA1398	£2.46	LM324	£0.45	TA7204	£0.90	TDA2002	£0.74
AN6551	£0.73	LA1230	£1.19	LM386	£1.18	TA7205	£0.91	TDA2004	£1.81
AN7131	£1.27	LA4102	£0.84	M51102	£1.88	TA7217	£1.22	TDA2005	£1.46
AN7140	£1.88	LA4112	£0.94	M51513	£1.86	TA7222	£1.22	TDA2020	£1.81
AN7176	£2.96	LA4140	£0.58	M51515	£1.94	TA7227	£2.06	TDA2030	£1.38
BA402	£0.89	LA4201	£1.19	M51517	£1.84	TA7240	£2.00	TDA2611	£0.79
BA521	£1.56	LA4220	£1.41	MB3712	£0.99	TA7241	£1.96	UPC1028	£0.96
BA656	£1.19	LA4250	£2.22	MB3730	£2.06	TA7270	£1.93	UPC1032	£0.73
CD4001	£0.28	LA4400	£2.89	MB3756	£1.94	TA7271	£1.93	UPC1156	£2.06
CD4008	£0.89	LA4420	£1.32	MB8719	£4.13	TA7274	£1.96	UPC1181	£0.91
CD4011	£0.11	LA4422	£1.13	MC1723	£0.48	TA7310	£0.66	UPC1181	£1.84
CD4049	£0.28	LA4440	£1.89	MC3367	£2.11	TA75902	£0.99	UPC1185	£1.81
CD4066	£0.34	LA4445	£1.96	MC3359	£2.33	TBA800	£1.38	UPC1186	£0.71
CD4069	£0.18	LA4460	£1.71	MM5610BN	£3.99	TBA810P	£0.49	UPC1230	£1.89
HA13001	£3.16	LA4461	£1.71	NE567	£0.53	TC9106	£4.44	UPD858	£1.68
HA1366W	£1.33	LB1405	£0.97	PLL02	£7.89	TC9109	£4.34	UPD2816	£0.34

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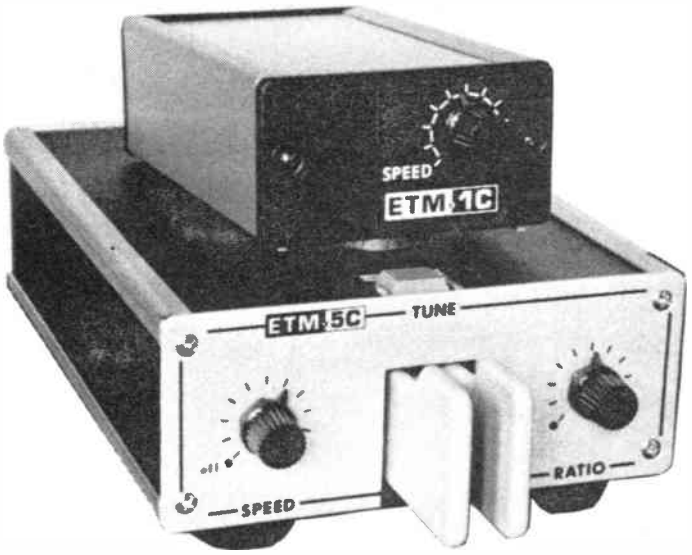


If you have just passed your Morse test and are intending to keep up with the art of sending CW, then to start with most people are content to use a conventional straight key. As you spend more time on the bands and your speed increases, your thoughts may turn towards an electronic method of generating Morse characters. Using electronics to produce perfectly spaced and timed Morse has become popular over the last ten years, but electronic keyers, usually known as 'el-bugs' have been around for a lot longer than that.

It is said that OZ7BO did much to popularise electronic keyers in Europe and these quickly caught on taking the arm-ache out of sending CW. One of the earliest designs appeared in **Technical Topics** and was made by ZL2AMW. This circuit only used two transistors but worked well for such a simple design. More complex units used up to twenty transistors and designers started to use computer techniques. These designs gave very good results but were complex in their construction owing to the many discrete components needed to get them up and running. With the introduction of modern integrated circuits the design and construction of these keyers moved on in leaps and bounds. We have now got to the stage of having a complete electronic keyer on a single chip in the form of the 8044 produced by Curtis Electro Devices Inc of California, USA.

Today there are many electronic keyers on the market and these vary in price, complexity and quality of construction. Some are units that stand alone, having the Morse generator, memories and paddles built into a single box. The less sophisticated keyers simply produce well-timed and spaced dots and dashes and require the user to plug in an external set of paddles.

This review deals with the Samson range of electronic keyers which has been available for some time and is beginning to become very popular with CW operators all over the world.

Good reputation

Samson electronic keyers are produced in West Germany by a firm managed by Herr H Samson DJ2BW. They have been producing keyers for over twenty years and their products have a world-wide reputation for quality, efficiency and reliability. The quality of their products is such that they have been chosen by many government departments, shipping lines and coastal stations. Their keyers have just been chosen by one of the major communications manufacturers for their new range of communications equipment.

Spacemark Ltd of Altrincham, Cheshire, were the UK agents for Samson for many years, but ceased to handle their products when the owner retired about three years ago. They are now distributed by Frank Watts G5BM, who can supply these keyers from stock along with a British-made twin paddle Morse key kit. This takes about one hour to build, but you can buy it ready assembled for a small extra charge.

Samson produce three types of keyer and we shall be looking at the ETM-1C and ETM-5C in detail. Unfortunately the ETM-8C memory keyer was not available for review but a brief description of this unit will be given.

Samson ETM-1C description

The ETM-1C C-MOS electronic keyer is the most basic of the Samson range. It is housed in an aluminium box with black front and back panels and is 36 × 65 × 108mm in size. The front panel contains a single control which adjusts the keying speed, and this can be set between eight and fifty words per minute. The keyer features dot and dash memories, iambic mode for squeeze keying, self-completing dots and dashes and a built-in side tone generator, but this is only suitable for connecting to headphones.

Dot and dash memories are a very important feature of an electronic keyer, their job being to autonomically insert dots and dashes in the correct places, thus enabling you to squeeze characters such as C, Q, Y, L, F, R, AR, KA and SK with a minimum of hand movement on the paddles. Samson have included a useful slide switch on the circuit board to disable the dot and dash memories.

The output from the keyer should be able to drive most modern rigs, and the positive keying transistor is quoted at +65V at 50mA maximum. Grid block keying is also available and this is rated at −300V at 20mA maximum. The unit will run from 4 to 8V dc with an idling current of 1 microamp (1μA) and a keying current of 14mA. Because of the low idling current there is no need for an on/off switch. Removing the covers reveals a double-sided plated through PCB, and quite clearly this is of the highest standard. C-MOS circuitry is used throughout and all the chips are mounted in very high quality IC sockets for ease of servicing. There are six ICs and five transistors (see the circuit diagram in **Fig 1**). Towards the front of the board and to one side of the speed control is the switch for disabling the dot and dash memories. The unit arrived with the memories enabled and this is how most people would use the keyer.

The power supply connection is made via a 3.5mm jack socket on the back panel, and because there is no internal battery box the batteries have to be placed on the outside. I found this most annoying as it spoilt the neat and compact appearance of the keyer. Frank Watts suggests that if four penlight cells are taped together into a flat pack, these can be fitted inside the case. Of course, it will be necessary to solder and wire the cells together to form the correct working voltage. If you use alkaline cells they should last well over twelve months even though there is no on/off switch.

Since C-MOS circuitry is used throughout and the maximum supply voltage quoted is 8V, I see no reason why a 9V PP3 battery cannot be placed inside the unit as it looks as if there is just about enough room. Although I didn't try it out on the keyer tested, I would certainly do so if I was to purchase the ETM-1C.

The output to the transceiver and paddles etc, is made via a seven-way push-on edge connector and both leads can be fed through two holes on the back panel. I found this both convenient and easy to wire.

Wiring and using the ETM-1C

The first job is to supply voltage to the keyer, so you will have to purchase a battery box that will hold four 1.5V cells. These can be purchased from Maplin Electronics (stock number HF29G). The keyer comes supplied with a 3.5mm power plug and a push-on edge connec-

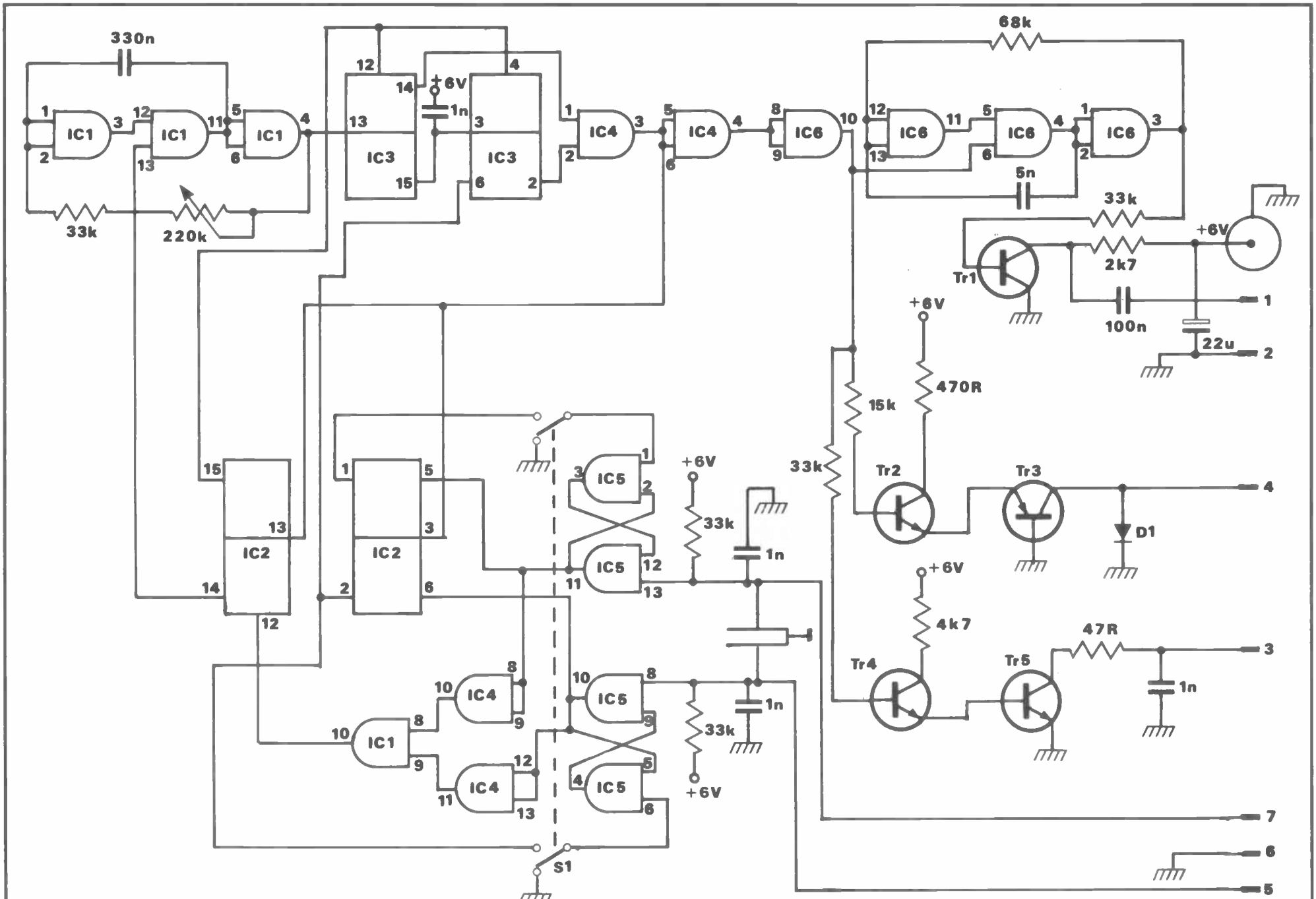


Fig 1: *Circuit diagram of the ETM-1C*

tor, but you will have to purchase a suitable plug for your transceiver's keying line. These are usually mono ¼in jack plugs, but some rigs use 3.5mm mono plugs so check your handbook first.

All connections to and from the keyer must be made with good quality screened cable; this is to reduce the chance of RF pick-up on any of the cables which could upset the operation of the unit. For power supply connections I used a PP3 battery clip which I pushed on to a battery pack, the whole thing then plugs into the power socket on the back of the keyer via the 3.5mm plug.

Next we must make the connections to the edge connector and these are shown below:

1 Sidetone output (headphones only)
2 Common connection (ground)
3 Positive keying (most common used)
4 Grid block keying
5 Dot terminal of paddle (left side)
6 Common paddle connector
7 Dash terminal of paddle (right side)

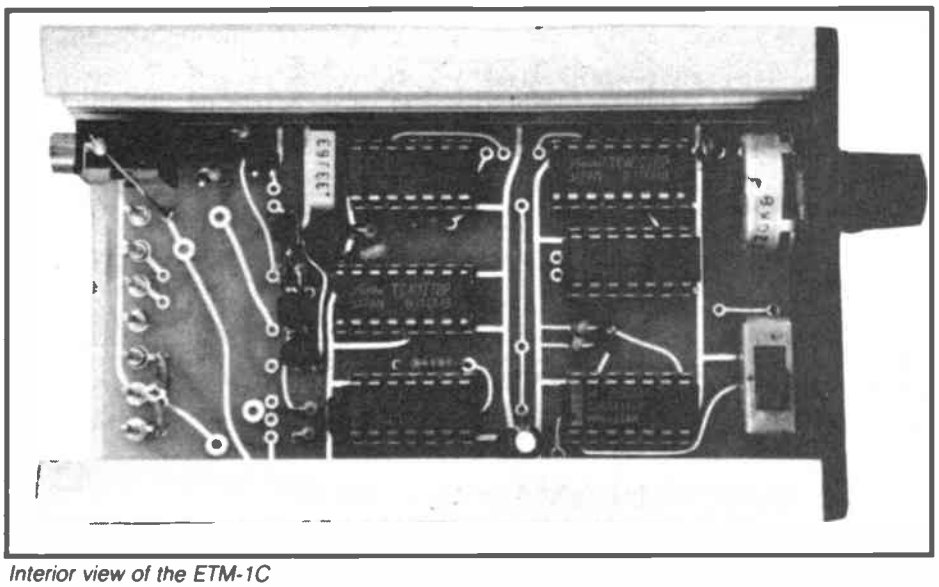
I found it a little inconvenient to have to make connections to the rig and paddles on the same connector. This makes it difficult to use the paddles with another keyer or at a different location without having first to do an unsoldering job. I overcame this problem by plugging the paddles into an in-line connector. I think it would have been a much better idea to have a separate socket on the keyer for the paddles, but maybe its small size prohibited this.

A set of Bencher paddles was wired to the appropriate pins on the edge connector, and because I was using a Kenwood TS-440S I wired the keying line to pin 3 and the screen to pin 2. The open terminal voltage of the TS-440S' keying line is approximately 5.5V dc, and this can easily be handled by the keying transistor of the ETM-1C. I plugged in the appropriate connections, switched the rig to CW and started keying. The keyer unit worked extremely well and there was no problem in producing clear and perfectly timed CW. The speed control could be adjusted from a slow, steady rate right up to a very fast, 'machine gun' sounding speed, which, I confess, is far too fast for me so I settled for about 16wpm.

I had a number of QSOs and the unit was a pleasure to use. The iambic mode worked very well and I was able to squeeze characters effortlessly which added to the pleasure of the CW contact. There were no operating problems and no signs of RF pick-up on the leads which usually shows up as permanent key down or odd characters being sent. The speed control was very smooth and overall the keyer worked well.

Samson ETM-5C description

The ETM-5C is housed in an extremely smart-looking, scratch-proof aluminium box and is finished in black textured vinyl. It measures 45 × 113 × 160mm, and comes complete with a 5 pin DIN plug and hexagon key for making adjustments to the paddles. It has all the features of the ETM-1C with the addition of a set of high quality paddles built into the cabinet. The front panel contains two controls, the first to set the speed within a range of 8-50wpm, and the second to adjust the dot to dash ratio. Mounted on the top plate is a small button marked 'tune'; pressing this will short the keying line and place your rig on air, which is useful if you wish to tune your PA stage or check your power output, SWR etc.



Interior view of the ETM-1C

Mounted in the centre of the front panel is a pair of paddles made of a hard-wearing plastic material. They are wired in the conventional way, ie, dots on the left and dashes on the right. On the back panel is a single 5 pin DIN socket which is used to take the output to the keying input of the rig. This socket also provides a sidetone output, but as with the ETM-1C this is for headphones only. Power for the unit is provided by four AA size batteries which are housed in a built-in battery holder; a much better arrangement than the ETM-1C. Again, idling current is 1μA with a maximum key down current of 20mA (relay keying) or 3mA (transistor keying).

I removed both the top and bottom plates to reveal an extremely well-constructed piece of equipment. All components including jacks, controls and paddles are mounted on one single-sided PCB, which is of the highest quality. The unit contains six C-MOS ICs, four transistors and four diodes (see **Fig 2**). All ICs are mounted in high quality IC sockets.

The housing for the paddles is fixed to the main PCB and the material used is a very heavy aluminium. It is interesting to note that the contacts are solid silver, unlike the Bencher which uses silver-coated copper contacts. The travel for the dots and dashes can be independently adjusted by the milled screws on both sides of the metal housing. I was very impressed by the quality and construction of these paddles and I found them extremely easy to use.

Wiring and using the ETM-5C

The first thing to decide before using this keyer is the type of keying output best suited to your transceiver. The unit offers either relay or transistor keying, and arrives factory wired for universal relay operation. I tried both relay and transistor keying and encountered no problems with either.

The ETM-5C is suitable for both positive and negative keying lines. For negative keying you simply reverse the connections, but when keying negative polarity rigs it is necessary to use twin conductor screened cable between the keyer output and the rig. This makes the economical transistor output suitable for use with rigs such as the TS-520S, TS-530S and TS-830S. Of course, relay keying is suitable for both positive and negative keying lines. Always refer to your handbook before wiring the keyer especially if your transceiver is all valves. The type of keying output is selected by a jumper on the PCB; for transistor keying place the jumper across pins 1 and 2.

If you are not using the sidetone output then there are only two connections to make on the 5 pin DIN, and these are to the transceiver's keying line. You should always use good quality screened cable when making the connections to and from the keyer, and double check your solder joints.

Full wiring for the DIN is shown below:

1 Sidetone output (headphones only)
2 Common connection (ground)
3 No connection
4 Common connection (ground)
5 Keying output (relay or transistor)

Once the unit is wired and connected to your rig, practise with the paddles and see if the tension and spacing are to your liking. The spring tension is adjusted with the screw on one of the paddles; an Allan key is provided with the keyer for this purpose. I found that very little adjustment was needed to either the tension or spacing.

If you key the unit and adjust the dot to dash ratio control at the same time, you will hear that the dots are emphasised. For more effect on the ratio control, slide the switch behind the ratio control pot on the PCB over to the negative position.

I used the ETM-5C a number of times on the air and had many QSOs. The paddles were easy to handle and were comparable to my Bencher. I encoun-

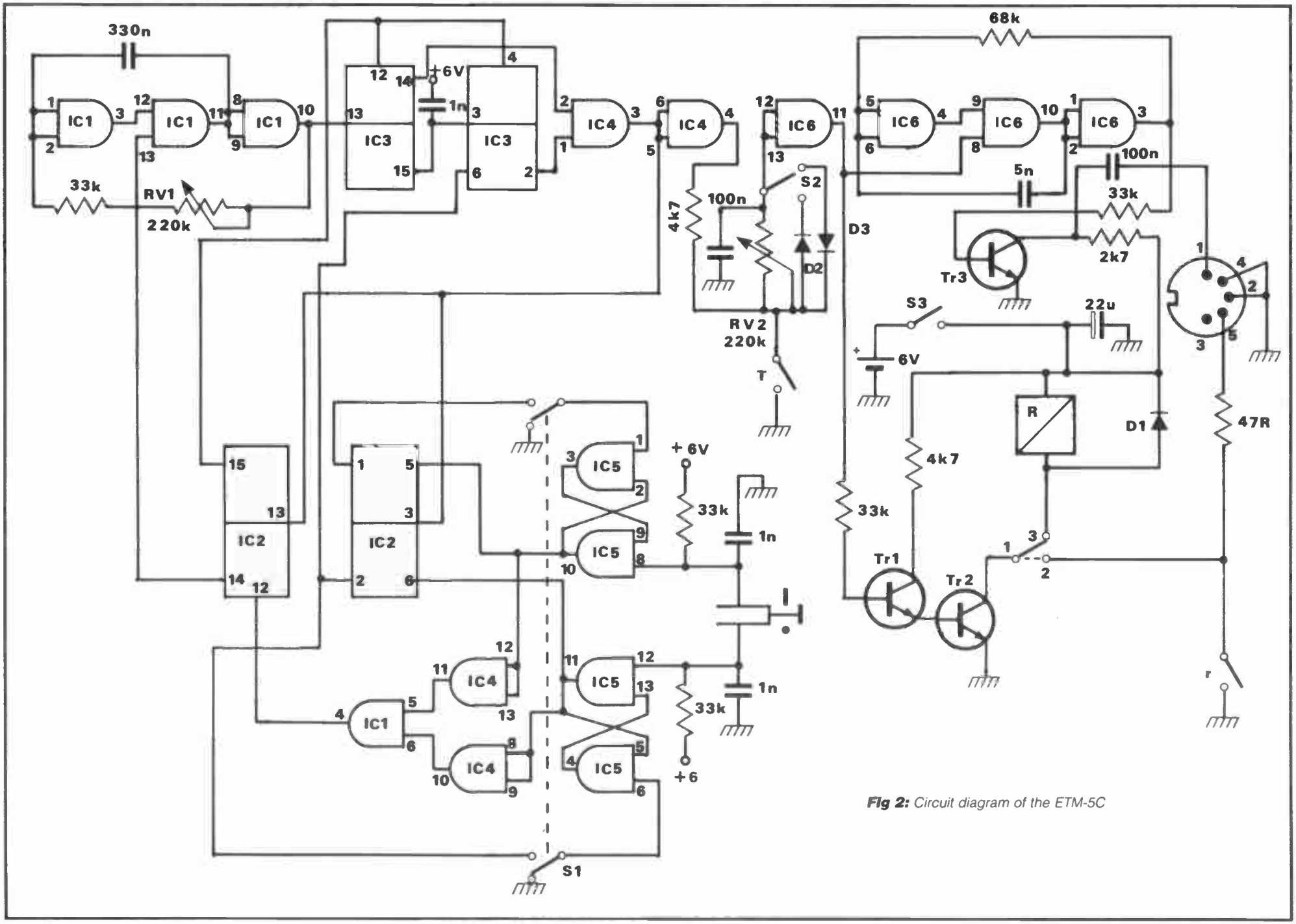
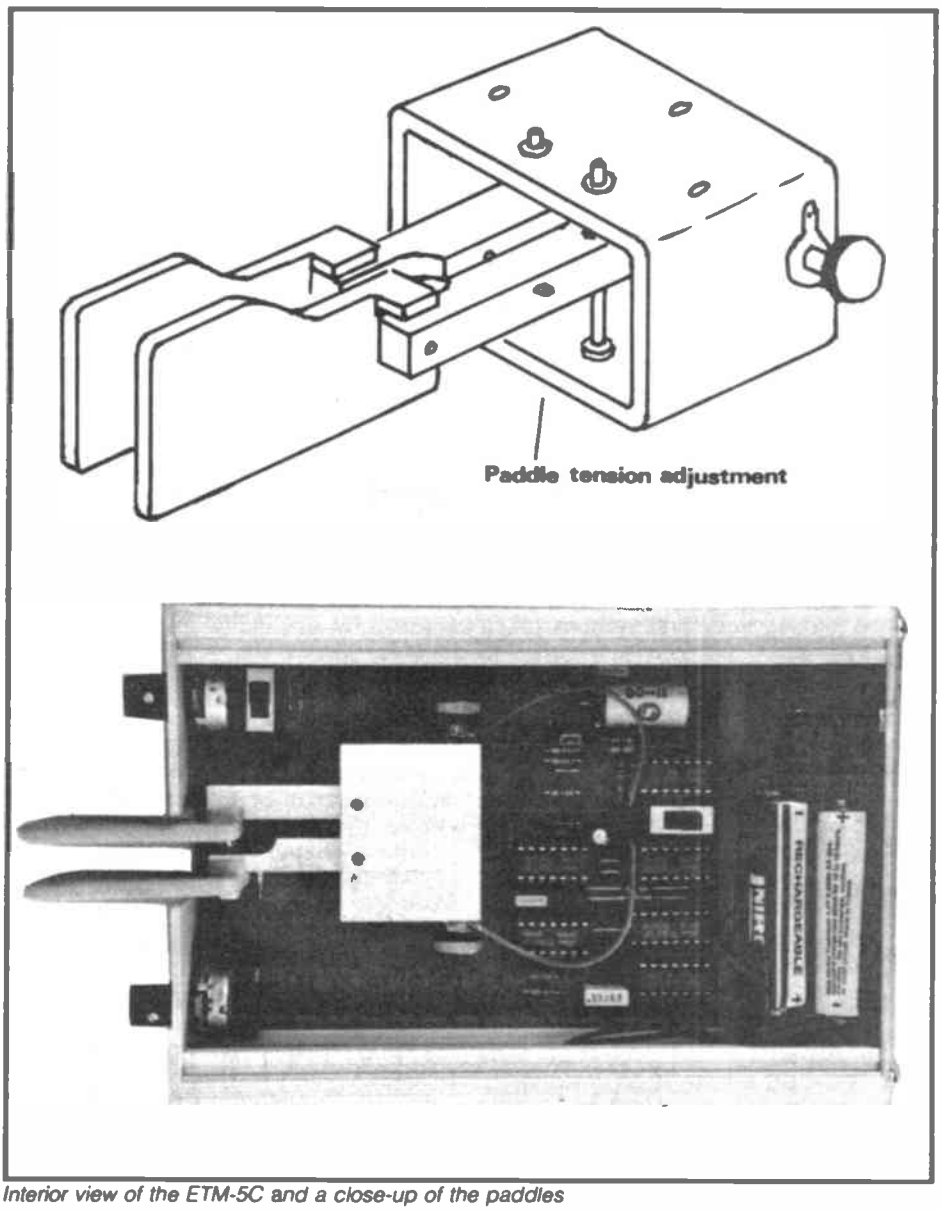


Fig 2: *Circuit diagram of the ETM-5C*



Interior view of the ETM-5C and a close-up of the paddles

tered no problems using the unit, and like the ETM-1C it produced excellent CW with very nice rounded characters. Of course, do not expect to be able to use paddles straight away as it requires practice to produce good sounding Morse. It is a pity that an extra socket isn't provided on the back panel to plug in a second set of paddles. Apart from this slight limitation, I found the Samson ETM-5C an excellent product.

Samson ETM-8C memory keyer

Samson also produce a memory keyer in the form of the ETM-8C. Unfortunately this was not available for review, so only a brief description will be given. The ETM-8C has a similar front panel and general features to the ETM-5C, the only difference being the addition of eight switchable memories. Apart from the two front panel controls for setting the keying speed, dot to dash ratio and the built-in paddles, the ETM-8C has eight high quality push-button switches on top of the case. To one side of these switches are three small slide switches, one of which controls the dot/dash memory. The other two affect the characteristics of the memories.

The unit contains fourteen C-MOS ICs, one C-MOS RAM chip and three transistors. All components including the paddles are mounted on a single double-sided PCB and all ICs are plugged into high quality sockets. The C-MOS RAM has a capacity of 4096 bits and is organised into eight 512 bit locations, each able to hold about fifty Morse characters. The memories can be programmed and played back as often as you like, and all data is retained when the keyer is not in use. Seven memories can be recalled from the keypad and the eighth may be operated by an external switch for remote control.

The keyer can be set in 'repeat' mode where up to fifty characters are repeated in an endless loop with an automatic delay between each call. This means that one memory can be programmed to call CQ or perhaps CQ contest with a pause after each call to listen for any replies. The rest of the memories can be programmed with other data such as name, QTH, rig information etc, and each can then be played in turn. Memory recall operation is indicated by an LED. The ETM-8C can also be used for meteor scatter operation with a working speed of 200wpm. This speed can be achieved by changing the value of one resistor.

Power consumption is very low and when on stand-by it only draws 1μA from the four AA size batteries. Key down is approximately 20mA for relay keying and 3mA for transistor keying, with an additional 6mA during memory operation. Frank Watts informs me that his original alkaline batteries are still going strong after more than three years of daily operation, including a number of CW contests. The size of the unit is 45 × 113 × 160mm and weighs 800g (without batteries).

Value for money

There is no doubt that commercial keyers do not come cheaply. A recent price list shows that anything between £50.00 and about £235.00 can be spent and in some cases that does not include the paddles. The Samson ETM-1C at £34.00 (plus £1.25 p&p and insurance) is the least expensive of the range, but you will have to buy a set of paddles to get it up and running. A set of Bencher paddles will cost around £67.00, bringing the total cost to £101.00. However, if you purchase the twin paddle kit sold by G5BM the cost drops to £72.00. These paddles are certainly excellent value for money.

On the other hand, you may consider purchasing a keyer with the paddle already built in. Again, checking a recent price list the cheapest I could find was £134.00, making the ETM-5C very good value for money at £85.00 (plus £2.50 p&p and insurance). If you are purchasing an electronic keyer for the first time and you do not already own a set of paddles, then I would look no further than the ETM-5C. This unit is everything you will ever need in an electronic keyer (apart from memories); it has an excellent set of paddles and a superb keyer unit, all housed in a single box. It is a beautiful piece of equipment and is highly recommended.

The next step up is a memory keyer, and although I did not review this model I see no reason why it should not reach the high standards set by the other two models in the range. The cheapest memory keyer I found was £95.00, but this needed a set of paddles; the ETM-8C includes memories and paddles and sells for a very reasonable £139.00 (plus £2.50 p&p and insurance).

Special versions of the ETM-5C and ETM-8C are available with a heavy-duty changeover relay. These are for use with the older types of marine transmitters and separate receivers and give the facility of receiver muting when transmitting, the relay rating being 500V at a maximum current of 1.5A. These models are the ETM-5CS and ETM-8CS. For more information and prices contact Frank Watts.

The Samson range of keyers is available from Frank H Watts G5BM, Woodland View, Birches Lane, Newent, Gloucestershire GL18 1DN. If you are writing for more information then please enclose an SAE for a reply.

I would like to take this opportunity to thank Frank Watts for all his help and for the loan of the two keyers for this review.

The World of D | A | T | A

BY DON FIELD G3XTT

This month I promised to cover some of the basics of packet operation. After all, once you have accumulated all the gear which I have described over the last couple of months you will want to get started, and yet the process is not entirely self-evident.

Making the connections

The first job is to connect all the equipment together as described, all being well, in the manual that comes with your TNC. The connections to the radio should be simple enough. One connection goes to the microphone input. This carries the audio tone to modulate the transmitter, and the PTT line to control the transmit/receive switching. The second connection will normally be to the external speaker connection, to take received audio to the TNC. In some cases your radio will have alternative inputs and outputs for phone-patch or even specifically for data which you can use. These are advantageous in that you don't have to disconnect the TNC leads and reconnect the microphone every time you stop using packet and go back to using the radio for phone operation. Take care to use shielded leads to avoid RF pick-up. If the worst comes to the worst, you may need to decouple the leads with ferrite beads.

The computer connection will normally be via an RS232 lead. Although RS232 is supposedly a 'standard', like most standards it is anything but, so if you have problems in this area it is worth checking the individual pin connections in detail. Many TNCs are supplied with a suitable RS232 lead.

Probably the only other connection needed to your TNC will be for power. Make sure you are using a power supply which is up to the job.

Connecting up the hardware is the easy bit! Now you need to set up the computer, the TNC and the radio to function correctly. At the computer you will need to set the terminal baud rate, parity, stop bits and word length to whatever is required by the TNC. How you set these will depend on the terminal program (for example, PROCOMM or YAPP) that you are using.

As far as the TNC itself is concerned, there are lots of parameters that you can change to optimise its operation, but at this stage the best thing is to leave most of them alone and rely on the default options which will probably be suitable to get you started. However, there are a few things which you will want to do before making your first venture on to the airwaves.

Firstly, you *must* use the **MYCALL** command to tell the TNC your callsign. This is the one crucial step. Beyond it, you might want to set up a beacon function, which will enable your TNC to send out a 'broadcast' packet (ie, not addressed to any specific station) at intervals which you can predetermine. This lets other users know that your station is active, and can contain a short message such as 'G3XTT, QTH Henley, Digipeater Active'. However, such beacon messages should be used sparingly. In the early days of packet radio they were useful as a way for people to know who was around. Nowadays they just clutter up already busy channels.

Another message you can program is that which will be sent to anyone who connects to your TNC. Another option you may want to exercise is whether to have your digipeater facility on or off (all TNCs can act as digipeaters, which means other users can use your station as a packet repeater without affecting your own activities in any way).

It is probably best not to alter any other parameters at this stage. The ones you are most likely to want to alter if you experience difficulties are the **TXDELAY** and **AXDELAY**. TXDELAY is important because it determines the time between when the PTT line is closed and a packet is sent. Too short and the Tx/Rx relay in your rig won't have operated and the packet will be corrupted. Too long and you are taking up valuable time on the channel putting out a carrier with no information. AXDELAY adds to the TXDELAY and may be needed if the distant receiver has slow squelch release and is therefore missing the beginning of packets.

Another parameter to watch is **RETRY**, the number of retries your TNC will attempt before disconnecting. Set this too high and you will end up causing lots of congestion. Too low on an already busy channel and you will keep getting cut off because inevitably under such circumstances a lot of your transmissions will 'collide' with others and fail to get through. The default is ten.

Finally, let me mention **PACLEN**, the number of bytes of data that can be sent in one packet. The default is 128, but it is safest to amend this to eighty. The reason for this is that most displays are eighty characters wide and, in some instances, those characters beyond the eightieth can be lost rather than being displayed on the following line.

As far as the various other TNC parameters are concerned, leave these until later. All of them fall into one of three categories. First there are the Terminal Parameters, dealing with the link between the TNC and the computer. You may need to alter these if you have problems with the link in terms of speed, duplication of characters on the screen, unwanted carriage returns, etc. Then there are the Radio Parameters, telling the TNC about the radio and the network to which it is connected. These include TXDELAY and AXDELAY. Finally there are the Operational Parameters which allow you to configure the TNC to suit your own operating preferences. These include RETRY, DIGIPEAT (ON/OFF) and many more.

The radio

Having set up the computer and TNC we come to the radio. The main thing here is to ensure that the receive and transmit levels are suitable so that you don't overmodulate the transmitter and so that you have enough but not too much receive audio for the TNC. The TNC manual should give you advice on getting these settings right.

Having gone through all these steps the big moment has come! Tune your radio to a suitable packet frequency and see what you can copy. The frequency on VHF that is used most is 144.650MHz, and this is where you will find all the currently licensed 2m bulletin boards. Because this channel is highly congested with bulletin board traffic (and also much of the networked traffic via NET/ROM, etc), users are encouraged to use 144.675 or 144.625 for direct QSOs, and you will find an increasing amount of activity on these frequencies. Tune to one of these channels and monitor what is going on.

This is where I need to mention one invaluable TNC feature which I didn't cover above, the MONITOR command. Depending on the TNC this is either a toggle command (ON/OFF) or it allows

you several different options ranging from displaying packets sent to you, to displaying various specified categories of packets, right through to displaying everything that is carried on the channel. By monitoring activity you will be able to tell whether your system is working correctly (at least in the receive mode), as well as seeing who is active in your area and which bulletin boards (mailboxes) are within range.

Before responding to the urge to connect to a bulletin board, I would recommend trying out a direct QSO, preferably by prior arrangement with a local who has some experience of packet and can help you out if problems arise. Another possibility, if you see from monitoring the channel that someone close has his digipeater active, is to connect to yourself via the digipeater. Yes, this really is possible with packet where it would be a nonsense in the context of phone operation.

Modes of operation

I should say at this point that a TNC has two main modes of operation, Command Mode and Converse Mode. There is a third, Transparent Mode, often used for sending computer programs which may include character combinations which would affect the operation of the TNC when in Converse Mode.

When you first switch it on the TNC will be in Command Mode and will prompt you with **cmd:** (unless you are using a specialist terminal driver such as PC PAKRATT which hides all of this from you and allows you to use the function keys on the PC to issue commands directly). To connect to my station you would type **C G3XTT** followed by a carriage return. Once the connection had been made, the TNC would automatically go into Converse Mode, and from then on anything you typed would appear on my screen, and vice versa. If you were, say, G9ZZZ, and wanted to connect to yourself via my digipeater, you would issue the command **C G9ZZZ VIA G3XTT**, again followed as always by a carriage return. The TNC will forward helpful information to the screen as the contact progresses. For example, if you failed to connect to my station you would get one or other of the following displays:

***retry count exceeded**
***DISCONNECTED**

or:

***G3XTT busy**
***DISCONNECTED**

However, if all was well you would get the message:

***CONNECTED to G3XTT**

At the end of the contact one of the participants will need to issue a disconnect command. To do this you need to get back into Command Mode which is normally done by typing <CTRL-C>. The cmd: prompt should reappear. You can then issue the command **D G3XTT** and the following message will appear on your screen:

***DISCONNECTED**

When you are in QSO on packet the normal convention of passing transmission back and forth is unnecessary. In effect, packet gives you duplex operation. However, depending on the terminal software you are using, what you type may be mixed up on the screen with the incoming text from the other station. The convention, in this case, is that when you are ready for the other station to type something, you end what you have been typing with >>>.

Incidentally, as of version 1.1.4 of the TNC2 software, a TNC2 or full clone has 115 commands in all, but you won't need to learn them all. Some you will have used in setting up the TNC in the first place and may never need again. For example, when you set up MYCALL, you would have done so by typing **MYCALL G9ZZZ** or just **MY G9ZZZ** (most commands can be abbreviated) at the cmd: prompt.

Having convinced yourself that everything is working well, you will undoubtedly want to announce yourself to your local mailbox system, possibly leaving a message for all users on that mailbox that you are now active on packet, so that they can start to leave messages there for you. UK mailbox (BBS) systems have GB7 callsigns and most are based on software written by W0RLI or WA7MBL. Those that are not still operate in very much the same way.

Joe Kasser· G3ZCZ described BBS operation in ***Amateur Radio*** in the June and July issues last year, so I won't go into much detail here. To connect to a BBS is just the same as connecting to any other station, but you will then be prompted by the BBS with a menu of commands which allows you to (L)ist the messages on the mailbox, to (R)ead messages, to (S)end messages, and much more. The (H)elp command may well turn out to be the most useful the first time you log on.

One nice feature of BBS is that the first time you log on you will be asked to enter your name and, subsequently, you will always get a personal greeting. You will also be told if you have personal mail waiting for you. As well as carrying the plethora of mail traffic which circulates around the country, many BBSs hold a selection of other interesting information and computer programs which you can (D)ownload after asking to see (W)hat is there.

The letters in brackets refer to the commands that you would enter. There are other BBS commands that I haven't mentioned here, but they will become obvious as you get to know your local BBS. The SYSOP (System Operator) will also be happy to help you. These folk put a lot of time and effort into running their mailboxes, so they want you to get the most out of using the system.

News

Dick G7BHG sent me a message via packet to say that he uses a homebrew TNC and would welcome information in this column about homebrew equipment for the data modes. I would be happy to pass on tips in these pages from other readers who have 'rolled their own', though I suspect that with the rapidly falling prices of commercial TNCs, most packeteers are using an off-the-shelf product of some sort.

Talking about off-the-shelf products, in addition to the various TNCs I have listed in the last couple of months the Digital Radio Systems PO*Packet Adaptor has recently been getting a very good press in the USA. The PCPA plugs into an extension slot in an IBM PC (or clone) and provides two packet radio channels (or ports) that operate independently.

With the Type 1 PCPA, one port includes a 1200 baud modem for VHF while the second has an RS232 output to which an external modem can be connected. With the Type 2, each port has a 1200 baud modem. Software to drive the PCPA comes on disc, which makes it easy to add future upgrades. Various versions are already available, including one which uses the newly developed WA8DED command set.

I have seen AMDAT advertising these DRSI PC* Packet Adaptors and no doubt other UK suppliers will follow. Incidentally, I noted in one US publication that one benefit of the DRSI product is that, by running two of them in one PC, four frequencies can be supported from a single network node.

I mentioned the WA8DED software above. WA8DED started out believing that, while the normal TNC2 command set is designed to be meaningful to human users, it is not ideal for interpretation by a computer! His amended command set includes a 'host mode' (similar to that already found on some proprietary TNCs such as the PK232) which allows the computer to have full control of the TNC (helpful in automatic operation such as a mailbox). The host mode ensures that the computer can track what the TNC is doing at all times, which makes it easier for the computer to control TNC-to-host communication.

The WA8DED software will be made available through the Tucson Amateur Packet Radio (TAPR) group in the USA and will no doubt find its way to the UK in due course.

The ROSE (RATS Open Systems Environment) X25 networking software has now been released and can be obtained in the UK by downloading file ROSE.ZIP from 01-547 1479.

Now to a different subject. The satellite people have recently been getting upset, and rightly so, at finding packet activity on 145.825MHz, which falls inside the satellite sub-band. There is no reason for this. I mentioned earlier those frequencies on 2m which are used for packet activity and, with the exception of 144.650, they are relatively underused so there should be no compelling reason to operate elsewhere in the band.

Finally, on the hi-tech front, G1NTX reports considerable success in using high bit rate telephony modems to send data at 9600bps over a standard FM channel. The potential savings in transmission time (resulting in reduced channel congestion) are considerable. G3RUH 9600bps modems are also now available ready-assembled from AMDAT.

That's about it for this time. Please send any news on amateur datacomms via the editorial office, direct to my callbook address, or via GB7WOK.

PROJECT BOOK

by Martin Williams

One request that comes in fairly regularly is for a computer program that will calculate world-wide distances from Maidenhead locators. These programs have been around for years, but each new generation of amateur seems to have difficulty in finding them. Perhaps this is because many of these locators are 'machine specific' for such things as Oric and Dragon computers, which are no longer readily available.

Portability

The program shown in the Table is specifically for the Amstrad and other IBM clones, although it is easily rewritten to suit other machines. To get this portability, programming techniques were used which will make many so-called professional programmers feel rather poorly. Some machines already have PI as a reserved variable, in which case line thirty can be omitted. The program assumes a display of eighty character-width with twenty-five lines of text. The 'LOCATE' statement (x,y) indicates the line and position where something will be printed. Do not forget to put your own locator in upper case (into line 110). The routine starting at line 380 can be used in many other programs. It simply takes your input (UC$), in whatever case you entered it and sends it back in upper case.

The Program

```
10  cls:rem For IBM or Amstrad clones
20  locate 10,18
30  print "Calculates distances from Maidenhead locators."
40  PI=3.14159
50  P=PI/180
60  A=4000.9
70  F=(a*10)/(2*PI)
80  locate 12,25:Print "Use your own locator..Y / N..?.."
90  a$=inkey$: if a$= " " then 80
100 if a$= "N" or a$= "n" then 140
110 if a$= "Y" or a$= "y" then 120 else 80
120 e$= "?????":locate 12,59:Print E$;goto 150
130 rem: Enter your own locator in upper case in line 120
140 locate 12,25:input "Enter the first locator.....?..";e$
150 uc$=e$:gosub 380:f$=uc$
160 gosub 290
170 le=lf:be=bf
180 locate 14,25:input "Enter the distant locator...?..";f$
190 uc$=f$:gosub 380:f$=uc$:gosub 290
200 ga=lf-le
210 b=bf-be
220 n=sin(be)*sin(bf)+cos(be)*cos(bf)*cos(ga)
230 dx=int((-atn(n/sqr(1-n*n))+pi/2)*f+.5)
240 locate 16,25:print "The distance is "dx" Kms".
250 locate 19,25:Print "Enter R to rerun or E to end."
260 locate 19,56:a$=inkey$
270 if a$= "R" or a$= "r" then run
280 if a$= "E" or a$= "e" then 450
290 For n=1 to 6
300 t$(n)=mid$(f$,n,1)
310 next n
320 lf=(asc(t$(1))-65)*20-180+val(t$(3))*2+(asc(t$(5))-65)/12+1.24
330 bf=(asc(t$(2))-65)*10-90+val(t$(4))+(asc(t$(6))-65)/24+1/48
340 lf=lf*p
350 bf=bf*p
360 return
370 rem
380 rem: UPPER CASE CONVERSION ROUTINE.
390 for x=1 to len(uc$)
400 if asc(mid$(uc$,x,1))<97 then 430
410 cd=asc(mid$(uc$,x,1))-32
420 uc$=left$(uc$,x-1)+chr$(cd)=mid$(ucs,x+1,255)
430 next x
440 return
450 end
```

SECOND-HAND

by HUGH ALLISON G3XSE

Morse Reader MBA RC

I really don't know why I bought one of these. Perhaps because it was cheap. They normally sell for £65.00 and when I was offered it for £50.00 . . . well, I'm a sucker for a bargain. Although I've never been turned on by RTTY, which this machine also does, I was most interested in firing up the Morse reader facility.

Does it work? Yes, very well. Much better at decoding than any 'computer plus program' that I have. There is one extra unexpected little bonus as well; RF-wise it's very quiet. I suppose being designed to work next to the rig in a shack, the designers actually bothered to suppress it properly. Apart from one dirty great splurge at 1850kHz, + or − 10kHz, nothing. If you've ever run a ZX81 up in the shack you will appreciate how 'quiet' this machine is.

Now I'm probably your average class A Morse reader. I can write down CW up to about 30wpm and read it in my head up to 40wpm, depending on hangover, sending fist, QRM, etc. Well, for some strange reason I was reading the handbook blurb (a first!) and it said something along the lines of 'an experienced CW operator will soon find that watching the display and reading the Morse in his head will result in an increase in his reading speed'. It's right too. The box can be set up to indicate the speed of the Morse it is reading, and after only twenty minutes I'd gone from 40 to 45wpm. Morse readers are not only for those who cannot read Morse!

BFOs . . . again

It's not often I row with a reader. He wrote in asking what IF his receiver was, since he wished to build a BFO for it. I was happy to oblige, but asked him why he wanted to build one when there was already one built in. He wrote back to say there wasn't. Now I'd used an example of his receiver with its mating CW transmitter ten years ago and was sure it did have one, but he was adamant. At the excellent 'held on a Saturday' Rainham rally (how do they get so many traders to sell such bargains?) in comes a trader with one of these receivers under his arm. Sure enough, no BFO on/off switch. I was wrong. I turn it over. On the *back* panel is a small switch marked 'code on'. It's the BFO switch. I was right! What a stupid place to put a switch . . .

Eddystone 770U

These things usually change hands for between £50.00 and £70.00, depending on condition. Hence I was very attracted to a really pristine example for £25.00 at the Rainham rally. The seller was honest and told me that the drive cord had snapped. A gentle wiggle of the tuning control and I knew what was really wrong. If the pointer tries to move in both directions then it isn't the drive cord, it's the glass over the tuning display pushing against the pointer mechanism. It only has to go back a fraction, almost an unnoticeable amount, to cause chaos. Four small clips hold the glass, and if whacked the glass moves back in the clips about an eighth of an inch and jams everything up.

Now, these receivers, and many like them from the Eddystone stable, are substantially built. Getting into the glass clips involves much mechanical disassembly. It's roughly akin to moving the Blackpool Tower a foot to the right. The first example I repaired took me four hours. Now I can do it in half an hour with the assistance of a friend.

Note, and note well. Never, ever, stand any Eddystone on its back because the speaker terminals will snap. Right. Cover off, knobs off, handles off. Sounds easy, huh? Now the hard bit. There are two TV type Belling Lee sockets on the front panel, and you can't undo them 'cos the heads of the screws are under a decorative trim. It's not easy to unsolder the coax to them either, hence your assistant. He or she holds the front panel, still attached by two coax cables, while you work on the glass and eventually swing the whole front assembly out. Incidentally, the clips that secure the glass should have little rubber buffers on them. If they have rotted through, an eighth of an inch of sleeving will do as a replacement for each one.

Time to put it back together. Lots of bits, aren't there? I prefer to do everything up finger tight then, when certain of a good fit, do it all up with pliers and screwdrivers, etc.

One final point. The 'waveband' that you have it switched to is indicated by green lights. These are not LEDs but real bulbs behind plastic. They are a standard size but, helpfully, not marked. They are 6V.

Scopes . . . again

In a blinding flash of stupidity I bought an old but transistorised non-working oscillosope in a car boot sale at a rally. Well, a fiver seemed fair and it was light enough for the wife to carry back for me.

Next day, out on the bench. Someone had 'been at it' in grand style. Busted off wires, dry joints and burnt through cableforms. As there was a distinct lack of circuit diagrams it was obvious that I had an interesting hour or two coming up. Ten minutes were spent in tidying, then volting it up. No EHT, duff transistor in inverter. As usual there's something suitable lying among the dross covering the bench top. Not only is there now a healthy whistle but a pin helpfully labelled '+90V' sets up a treat with a wiggle of the 'set HT' pot.

No dot up front. This is bad news. I've said it before and I'll say it again; the golden rule when repairing 'scopes is to get a dot. Off with the deflection connectors to the tube, still no action. The bad news is getting worse.

So, we've got volts across the tube (did I mention it's anode +1.5kV, cathode −1.5kV?), there's a red glow up the narrow end and nothing on the big end. Of course, I've got no connection details of the tube pin-outs and I've also got visions of a wasted fiver, probably no emission from the cathode, viz a worn-out tube. There is, of course, a possibility of the thing being cut off, ie, grid stuck well negative of the cathode. (This isn't an impossible situation, by the way, 'cos it's precisely what happens during flyback blanking). There's only one solution, haul the tube out and look through the glass to see which pin is going where. I'm just undoing the clamping screws when up comes an elderly engineer, enquiring what I'm doing. He suggests checking if the anode is taking current. Brilliant.

Obviously you must take care with 1.5kV; but in this case there's no problem and there's soon an AVO in there on the 1mA range. Wiggle the brilliance control and the current varies from nothing to 50μA.

Now I am well out of my depth. Volts, current, but no dot? Elderly engineer is enjoying my discomfort (oh, all right, ignorance). He obviously knows what's wrong, but it is going to cost me a cup of coffee to find out. I give in and pay up (rotten 'scope now costing me £5.05) whereupon he produces a magnet from his pocket and holds it about an inch from the middle of the tube (in its mu-metal shield) and goes round the circumference of it. Voilà, in one position there's a dot. Something within is magnetised.

In with a degaussing coil from an old colour telly and a variac, and demagnetise it all. On with deflection connectors and a healthy 'scope. I'm well pleased.

This is not the end of the story, however. It was noted by everyone present that the said 'scope would run on either 12V or mains. One engineer promptly wanted to use it to look at the electronic ignition in his car. I said, of course he could borrow it.

Unfortunately the 'scope is so old that it's positive earth. Apparently it got quite exciting when he connected it all up. No sweat when he connected 'scope to car battery (it was probably insulated by its rubber feet), but all hell broke loose when he earthed the 'scope probe . . .

TV cameras

It's the day before a fast scan TV contest. A local amateur, with whom I

have had two-way TV contacts, has run up his station to check all is well. It isn't. Absolutely nothing out of the camera except syncs. This device is probably ten years old and about the size (and weight) of a breeze block. Basically the thing is in three bits, all bolted together to make the one unit. Bottom is the camera proper, middle is the talkback unit (totally useless) and top a useful little monitor. The only action was a blank raster on the said monitor.

Lens off, in with an AVO on to the videcon connector. Nothing. The high value resistor in series with the target (2.2 mΩ in this case) was open circuit, as per the epidemic I reported a few months back. We replace it and there is video coming out. The shack monitor shows an excellent, well-defined picture, but on the built-in monitor, nothing.

A wander round the monitor with a 'scope probe shows video coming in but ending at a pin of an IC. This is obviously a sync separator and low level video amplifier chip, but, naturally, there are no circuits. There are volts on to the chip but no outputs, so the last rites are passed. My friend is not too bothered; at least the camera works, though without the monitor working it's going to be a bit inconvenient using it in the garden (when recording his kids at play). A few quick telephone calls reveal that the said chip is obsolete.

As we were putting the covers back on a strange thing happened; inspiration struck. Covers back off. Linking the video through the chip (ie bypassing it with a 1μF capacitor) produced an unlocked picture. Turning the contrast control up to full, rather than halfway where it used to sit, produced a well contrasted image. How to lock it? Well, the camera proper, the bottom bit, had an external 'sync in' socket on it. A 100pFs from there to the line oscillator in the monitor, plus 4,700pFs to the frame, locked the camera to the monitor. Sure it was a bodge, but it worked.

Incidentally, I'm often asked what these older, larger black and white cameras are worth. Quite honestly the bulk of the value can often be in the lens. One in good condition five or ten years ago was worth about £55.00. Nowadays £25.00 to £35.00 is about the mark. No lens, halve it.

Cassette player motors

This comes under the 'you know a bit about radio, so you can fix my xxxxx'. xxxxx can equal anything from hair-dryers to mainframe computers. Lately I've been plagued by dead cassette players. Home, stereo, separates for the use of. Severe lack of anything at all going round. Now comes the best clue of the lot. Give the flywheel a nudge. If it all bursts into life and seems hunky-dory, you have an open circuit armature winding. As a final check, turn it on and off about ten times. Note the number of times the thing starts up and runs of its own accord and the number of times it needs 'bump starting'.

Most cassette motors have three windings, so one open circuit winding equals 33% requirements to bump start. I've had two open circuits occasionally (equals 66% bump starts).

Rip out the motor. Take great care to note which size drive belt (rubber band to you and me) goes where. There are often three, all of different sizes. If you get stuck the big flat one is normally the flywheel drive, the longest, tape counter and the smallest, clutch. Note normally! Also make sure you know which bit of the motor pully drives which belt. You may have to remove the pully, they are simply a tight fit on to the motor shaft. Note where it 'sits'.

Now take the motor to bits. Very often there is a motor within what looks like a motor casing. This is there to reduce vibration and/or to house the electronic speed control, if fitted. The way to open it up is to bend back the lips with either a jeweller's screwdriver or a small pair of pliers.

Armature out, worry it with an AVO. Locate open circuit winding and then reflow the joints with a *hot* soldering iron for about five seconds. I'll bet it now checks out and, when reassembled, it's going to work. The problem is that the windings are wound with self-fluxing wire but are not soldered to the commutator properly.

Put it this way. A new motor is going to cost £10.00 to £15.00, and may take six weeks to arrive. A DIY repair is going to cost an hour's work. Worth a try.

TODAY'S TECHNOLOGY

by Ian Poole G3YWX

Modern technology is advancing at a tremendous rate and it is having a marked effect on everyday life. Things that were unheard of a few years ago are now commonplace. Probably the best example of this is the personal computer which is found in most offices and in many homes.

Amateur radio has also been affected in a similar way. For example, thirty years ago valve technology was in an almost unassailable position. Now valves are virtually unheard of. This change came about with the introduction of the transistor which enabled equipment to be made smaller, cheaper and more reliable. Then integrated circuits were introduced, allowing further cost reduction and miniaturisation.

The aim of this series is to outline some of these developments and show what is happening in the radio world today. Some of the ideas will be far reaching, while others will be limited to radio interests. There will also be a few suggestions for experimentation as well.

Valve comeback

Rumours are hitting the electronics industry about the possibility of the trusty valve making a comeback. Industry magazines like **Electronics and Wireless World** and **Electronics News**, have been buzzing with talk about its return.

These new valves have been made possible after a lot of development work in the USA and the United Kingdom over the past few years. As a result, it is likely that in the foreseeable future viable devices will be available.

Unlike their predecessors, these new valves are minute and can be placed on to a silicon chip. This is possible because they rely on field emitting cold cathodes with the result that heaters are no longer required.

The cathodes consist of a silicon cone sited in a 'hole' or 'valley' on a silicon substrate. The tip of the cone has a diameter of a couple of microns and is coated with metal. This greatly increases overall performance and, in particular, gives much higher current densities. The coating has until now been one of the major difficulties, but since this problem has been solved experimental devices are now in production.

The valve operates by setting up a field between the cathode and the top of the hole where the anode is located. As the device is evacuated and as a potential is applied between the cathode and anode, electrons leave the cathode and flow across to the anode. They can also be controlled in the conventional way by integrating the equivalent of grids on to the device.

The main advantage of these devices for communications purposes is their operating frequency. Minute distances coupled with electron mobility in a vacuum of about sixty times that of gallium arsenide vastly reduces transmit times. In turn this increases the higher maximum usable frequencies. This means that microwave front ends or even transmitter outputs may benefit from these integrated valves.

Another major use for these valves is in displays. Even today's CRT displays have many advantages over liquid crystal displays, since they are brighter and far more flexible to use. Now with the possibility of integrated cold cathode valve displays, the days of the liquid crystal display may be numbered!

New microwave devices

With the recent launch of Sky TV and all the other satellite broadcast channels, there are likely to be a few spin-offs which will benefit the radio amateur. In fact, new technology is developing all the time to meet the expected demand for satellite TV receivers. This should provide a source of relatively cheap microwave devices.

With this in mind, it is worth mentioning that Hitachi have recently launched four new GaAs devices. They are aimed specifically at the satellite TV market and will operate at frequencies up to 12GHz. The first device is the 2SK1229 HEMT (high electron mobility transistor), then there are two MOSFETs, the 2SK779 and 780. Finally, there is a Schottky barrier diode, the HSE11. As the satellite market is going to be fiercely competitive, it is not likely that these devices will be excessively expensive.

Loop aerials

The subject of aerials always interests radio amateurs. Generally, a large garden and very understanding neighbours are required; unfortunately most amateurs are not lucky enough to have either. This means that aerials are usually a matter for compromise and any increase in efficiency is eagerly sought.

One type of aerial which is generating a lot of interest at the moment is the loop. It is small and efficient and could be the answer to many a person's dreams.

Usually small aerials suffer from two major disadvantages. The first is their efficiency. As an aerial is made smaller its radiation resistance falls and any ohmic losses become more significant. Even when thick conductors are used the losses are large. The other drawback is the bandwidth. Again, the bandwidth falls as the physical size of an antenna is reduced. The so-called minibeams have a much smaller bandwidth than a full-sized beam for example.

The loop antenna overcomes both of these problems (see **Fig 1**). Firstly, the resistive losses are reduced simply by having a *very* low resistance loop. Thick copper tubing must be used to keep the resistance down to a few hundredths of an ohm. Fortunately the nature of the aerial means that this sort of construction can be used, whereas with verticals the loading coil introduces a lot of resistance, beams cannot be made too large or heavy and again introduce resistance and losses.

The second disadvantage is overcome by making the loop tunable. This is done by placing a variable capacitor in the loop. However, this means that some form of remote control is needed, but with today's technology it can be done without incurring too much cost.

The basic idea of the loop is that it should have a circumference of between an eighth and a quarter of a wavelength. By doing this the loop only uses the magnetic component of the electromagnetic wave. This has the two-fold effect of it being less influenced by nearby objects or sources of radiation. Accordingly, it is ideal for the town dweller with a small garden. In addition to the overall efficiency of the aerial, it can be hoisted quite high so that it will compare with a dipole in the clear.

Designs and theory for these loops are beginning to appear in amateur radio magazines and I will return to this subject in the future. Also, for anyone interested, Caplo manufacture loop aerials but in view of their construction and the necessity for remote tuning they are rather more expensive than the standard vertical or dipole. However, they could be the answer to all your aerial problems.

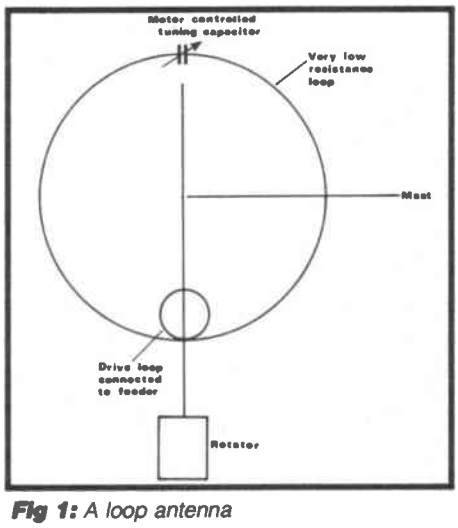


Fig 1: *A loop antenna*

THE SEM TRANZMATCH MK3

AERIAL TUNING UNIT

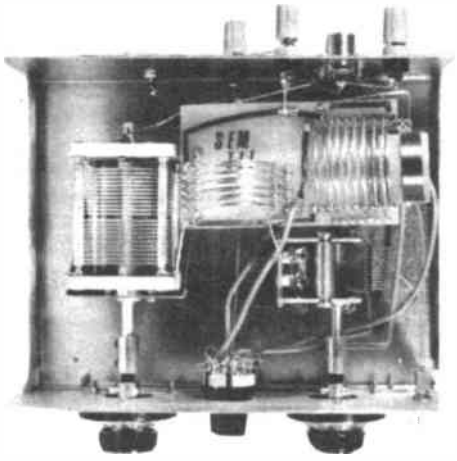
by Ken Michaelson G3RDG

The SEM Tranzmatch Mk3 is quite a small unit measuring 220mm (w) × 104mm (h) × 182mm (d) including the slight overhang at the front. The plated steel case is finished in matt black paint with an anodised aluminium front panel and black lettering. It is equipped with two slow-motion drives with figures marked from '1' to '100' over an 180° arc. In the centre of the front panel is a small knob with three positions: 'direct', 'tuner' and 'load'. The unit supplied for review did not have the optional dummy load built in, so there was a stop on the switch allowing only the direct and tuner positions. However, the unit was fitted with the SEM 'Ezitune', a form of noise bridge. The switch to control this is situated on the right-hand side of the panel. Under the centre knob is a ten-position rotary switch, which taps off the coupling coil to obtain a match.

On the rear panel, which is unpainted, are two SO239 sockets, three screw type terminals and a phono socket for the supply input to the Ezitune. None of these is labelled, and the bottom centre screw type terminal, in spite of being the earth connection, is the same colour red as the other two. All very confusing.

The interior is well-made, with good quality variable capacitors, the one for 'tune' having ceramic end-pieces. The coupling capacitor is mounted using nylon screws and nuts to insulate it from earth. The actual coils are air-spaced, being fed through a previously drilled glass fibre board, and the Ezitune unit is built on a separate PCB mounted upside down on the base by means of a centre screw.

To operate the Ezitune, the Tranzmatch has to be supplied with an external nominal 12V dc supply which will give 25mA, the centre pin of the phono plug being 12V positive. The Tranzmatch is rated to handle 1000W



maximum and has a matching range of 15 to 5000 ohms balanced or unbalanced.

In use the ATU performed as it should, but it took a little while to make it operate correctly. I found that the Ezitune would only operate on 80 and 40m with my particular set-up, which was a pity. I had to connect up an SWR meter and tune the two knobs and the tap switch manually to cover the higher frequencies. In my opinion, the tap switch does not have sufficient markings. There is one position for 160m and the other nine positions are simply marked '80-10', leaving the operator to decide where to go. In fact, to take the number of clicks clockwise on the switch from the 160m position, I found that 80m came up on the third click, 40m on the fifth, 20m and 15m on the seventh and 10m on the ninth, with the tune capacitor roughly around the 30 mark throughout. These settings were, of course, on my unusual antenna which is a sort of 80m dipole, fed with 15ft of 300 ohm ribbon from the centre and then coax to the rig. With other and possibly more conventional antennas the settings would obviously be different.

Apart from the usual coax input, the ATU will accept end-fed antennas or balanced twin feeder types. The connections for the three types are hand-drawn at the bottom of the single instruction sheet.

No circuit is provided with the Tranzmatch, so if you lost the instruction sheet it would be difficult to find out what to do. I felt that at a total cost of £174.50 (VAT and carriage included), the Tranzmatch does offer value for money, but if I bought one myself I would certainly pay the extra £9.90 to have the dummy load built in.

My thanks to Waters & Stanton Electronics, 18/20 Main Road, Hockley, Essex, tel: (0702) 206835, for the loan of the ATU for this review.

MEDIUM WAVE DXING

by Steve Whitt G8KDL

Welcome to the first edition of a new feature in ***Amateur Radio*** dealing with the world of medium wave DXing. This column is aimed at both the newcomer to this fascinating area of radio listening, and the listener with years of radio experience tucked firmly under his belt.

What is medium wave DX?

There are thousands of radio amateurs world-wide who probably started their radio careers by casually tuning the short wave broadcast bands. A surprising number who have acquired their 'ticket' still maintain an interest in intercepting non-amateur signals. In addition to this pool of skilled radio listeners, there are many other people around the world who enjoy listening to the broadcast bands in order to stay in touch with news and developments, and to learn of different cultures outside their own country.

Eventually most short wave listeners and radio amateurs using HF radio will have observed that the short wave broadcast bands are dominated by a small number of international broadcasters radiating many high-powered signals. These stations try to plan their broadcasts so that listeners world-wide can hear programmes in their native language at a convenient time of the day.

In complete contrast, the medium wave band, ie, frequencies between 526.5kHz and 1606.5kHz, is full of thousands of local stations situated the world over. Since this band is used primarily for local broadcasting, most listeners would be surprised to learn that it is possible to tune into stations on the other side of the world. Of course, this comes as no surprise to the knowledgeable radio amateur who can regularly communicate over thousands of miles using relatively low power.

Long distance DX on the medium wave band, however, is something of a challenge, particularly if one compares it with amateur top band DX. The two bands share many common factors in the way radio signals behave, but while top band signals rarely exceed a few hundred watts in power, those occupying the medium wave band frequently exceed 50kW. Indeed, there are over 700 stations around the world using power in excess of this figure; unfortunately, the majority are in Europe!

Nevertheless, the medium wave band is an enticing challenge.

Starting out

Let's take a brief look at what you need to become a medium wave DXer and how to get started. Firstly, it is important to realise that the medium wave DXer can start listening with very cheap and basic equipment; any domestic radio will tune the medium wave band, and it is quite easy to hear between fifty and 100 different stations at night using just an internal aerial. However, it is preferable to use a better-quality domestic radio or a good car radio to get started. With this equipment, stations can be heard from all over Europe and North Africa. If radio conditions are favourable and you listen at the right time, reception of some North American stations should also be possible. In this way you can work the medium wave band before committing yourself to more sophisticated (or expensive) equipment.

Alternatively, if you are a practising short wave listener or amateur radio operator, all you need to get started on the medium wave band is a change of waveband. Indeed, many short wave listeners tend to overlook the fact that their radios are able to tune the medium wave band, and that their outdoor aerials can also pick up distant medium wave signals. For the short wave listener who is tired of the megawatt propaganda stations (and their associated jammers), a fresh challenge can be found on the medium wave band.

Round the clock

It is possible to DX on the medium wave band twenty-four hours a day (provided you don't need to sleep!), but the band has two distinctly different 'personalities', according to the time of day.

During daylight hours medium wave radio signals are absorbed in the lower layers of the ionosphere and only 'ground-wave' signals propagate; these signals radiate away from the transmitter and allow reception at distances up to about 500km. Daytime is also a good time to listen to low power local radio stations in the UK, since very few distant signals are audible and interference is at a minimum.

At night the ionosphere tends to reflect, rather than absorb medium wave signals, and energy radiated upwards from a transmitter is reflected back to earth at some point far away from the transmitter.

It is quite possible for night-time signals to undergo multiple hops with alternate reflections occurring in the ionosphere and off the earth's surface. This allows reception to take place many thousands of kilometres away from a transmitter. For example, Radio Globo, in Rio de Janeiro, Brazil, is regularly heard in the UK; its signal crosses 9,500km of ocean on the way. You will, of course, notice that night-time skywave propagation fills your radio dial up with hundreds of powerful European signals, so how is it possible to hear weak DX signals?

Over the years, international broadcasting organisations have agreed a bandplan arrangement on the medium wave band, which entails all stations in an area to operate on fixed-frequency channels. This arrangement maximises the number of broadcasters who can operate and minimises the degree of interference affecting the listener. Fortunately for the DXer, international agreement is not perfect and as a result different medium wave bandplans are operated in different continents; most European, African and Asian stations use channels that are exact multiples of 9kHz, whereas channels in the Americas are assigned as multiples of 10kHz. This means that, by tuning between the European broadcasters, reception of transatlantic stations becomes possible.

The example shown in Table 1 illustrates the value of knowing a station's timetable. Although reception of WINS is technically possible when a path of darkness exists between New York and the UK, NOS is a powerful signal which will cause interference. However, NOS

Table 1

Bandplans

1008kHz	(112×9kHz)	NOS Hilversum, Holland
1010kHz	(101×10kHz)	WINS New York, USA
1017kHz	(113×9kHz)	SWF Baden Baden, Germany

signs off for the night at the unusually early time of 2100hrs or 2200hrs (GMT) and knowing this makes it possible to tune a virtually interference-free signal from WINS before midnight. If you have not heard your first American station, WINS is a pretty good bet; try anytime after 2300hrs and listen for an all news/talk station with the slogan 'Give us twenty minutes and we'll give you the world'.

DX Stations

North America	KBRW, Barrow, Alaska, on 680kHz
Central America	R Victoria, Aruba, on 960kHz
South America	ZP1 R Nacional, Asuncion, Paraguay, on 920kHz
Asia	HLAZ Cheju, Repuplic of Korea, on 1566kHz
Africa	R Bophuthatswana, Ga-Rankuwa, Bopuhthatswana, on 1098kHz
Oceania	There have been no reports for many years, but European stations are regularly heard by Australian DXers

Table 2

What will you hear?

At first you will notice the stronger local stations on the band, but after gaining experience you will hear more elusive stations. Just to whet your appetite at this stage, some of the more DX-worthy stations heard from the last couple of years are shown in Table 2.

Radio amateurs experienced in top band activity will be used to regularly operating over greater distances than is possible on the medium wave band today. For many years, during the first half of this century, world-wide medium wave reception was possible in Europe. These stations used just a few kilowatts of power and sometimes much less. In subsequent years the band has become overloaded with new high power stations operating twenty-four hours a day, effectively blocking out large chunks of the radio spectrum. Unfortunately, medium wave DXing today requires equal amounts of skill, patience and good luck!

QSL corner

Most radio amateurs are familiar with QSL cards, but there are many who will be surprised to learn that many medium wave broadcasters issue QSL cards too.

Let us suppose you have just heard Radio Fiji on your pocket transistor radio; how are you going to convince everyone that you weren't just dreaming? Wouldn't it be good to have something from the radio station, confirming that you really did hear them? Well, this is the purpose of QSL cards. A QSL card is usually a picture postcard (although it can also be a letter, a certificate, or a folder) sent to a radio listener by a radio station, confirming that reception actually took place.

To receive a QSL card from a station there are several things you need to do, but remember that you have to hear the station first, and then convince (sometimes incredulous) station staff that you really did hear their signal.

Normally a QSL card is obtained by sending a reception report to a station, giving details of reception conditions and of the programme material heard as proof of reception. Naturally, you need to state the time you were listening (date and times should be in GMT/UTC or in the station's own local time).

Historically, the QSL card originated in the days when stations relied on reports from listeners to determine their coverage area. Nowadays however, many stations use reports from professional monitoring stations for this purpose. Consequently, the QSL survives largely as a service from the station's point of view.

There is a significant difference in QSL policy between the international short wave broadcasting station, which issues QSL cards to maintain contact with and to gauge the size of its audience, and the local medium wave station that is heard outside its usual coverage area. At best, the latter will view a distant reception report with curiosity and will send out a QSL as a public relations exercise. At worst, to an under-staffed station with a limited budget, reception reports from DXers can be a waste of time. Therefore, it is vital that medium wave DXers follow some simple guidelines when sending out reception reports to stations.

Firstly, you should send a personal letter to the engineer or manager, together with a detailed report of reception conditions (was the signal strong, and was there any interference?) and programme details to prove that you really heard the station ('music and talking' is not good enough). Additionally, make a polite request – not a demand – for a QSL card or a letter confirming reception, remembering that most medium wave stations are local operations with limited budgets. It is wise to write to them in their own language (or that used in the programme) and to enclose an IRC for the return postage (IRCs are available from the post office).

This may seem like a complicated procedure but if you follow these tips, not only should you receive more QSL cards for your own collection, but you will help to maintain good relations between radio stations and the DX fraternity in general.

Forthcoming months

This month I have only been able to scrape the surface of the fascinating world of medium wave radio, and in forthcoming issues of ***Amateur Radio*** I hope to go into more detail on a wide range of topics such as receivers, propagation, aerials, expeditions and station news, as well as keeping an ear open to what listeners have been hearing.

All of your comments, ideas, queries and listeners' loggings will be most welcome; you can write to me c/o the editor. Till we meet again, why not try listening down on the medium wave band. Good DX and 73s.

DX DIARY

News for HF operators compiled by Don Field G3XTT

During April the sun didn't live up to earlier expectations, but adequate radio propagation allowed UK amateurs to participate in many major expeditions. F2CW and F6EXV worked hard as FO0EXV/M and FO0CW/M from the Marquesas Islands and /A from the Austral Islands, both of which may count as new 'countries' under the current interpretation of the DXCC rules.

A number of amateurs worked Jacky and Paul on four bands (10, 15, 20 and 40m) from each spot. Later in the month, a German group showed up from Conway Reef, an outlying part of Fiji, signing 3D2CR for what may be yet another new one. At the time of writing they are still active and have been worked in the UK on 10, 15 and 20m. However, the big operation, which I managed to squeeze in as a postscript to my April column, was the XF4L operation from Revilla Gigedo by OH2BH and others. They did a marvellous job, making some 47,943 contacts: 60% on SSB and 40% on CW. This figure also includes 405 RTTY contacts, 525 via satellite and 160 on 6m. XF4L was worked by UK amateurs on the five major HF bands. They were running at least three stations simultaneously most of the time, and all three stations were frequently heard in the UK emitting good signals.

Peter ZS8MI made a welcome appearance from Marion Island as promised, with excellent signals into the UK using the rhombic antenna belonging to the commercial radio installation on the island. However, some early CW operation turned out to be the work of a pirate station. Peter will be on Marion Island for eighteen months in all, so everybody should get a chance to work this rare one. As always, there was plenty more activity on the bands during April, so no-one should have been disappointed.

Of course, with so many potentially important DX stations on the bands during April, there were the usual troublemakers who managed to upset matters with their deliberate QRM.

Firstly, there are the self-appointed 'policemen' who jump on anyone who transmits on the same frequency as the DX station and usually cause far more QRM than the unfortunate 'offender'. Secondly, there are the 'tuner-uppers' who put a carrier on top of the DX station – either inadvertently or deliberately. Thirdly, there are those bright individuals who insist on calling the DX station on his own channel, even when he is announcing frequently that he is listening elsewhere! Then there are the 'lazy bones' who keep asking on top of the DX station about his call, his QSL information and his location, etc, rather than listening for him to announce it from time to time. And so it goes on.

Those (like myself) who stick around in the pile-up to work the DX, despite all this provocation, must be masochists I suppose, but the satisfaction of finally getting through makes it all worthwhile. Some people say it was better in the good old days; others say these problems have always been with us. From my own observations I would say that QRM has increased, but this is just a reflection of the general increase in activity on the HF bands. Twenty, or even ten years ago, a major expedition would have been pleased to make between 10,000 and 20,000 contacts. Nowadays such an expedition can easily make 40,000 contacts or more and still find that the demand – and the pile-ups – are just as big as when they started. All this seems to bring into question whether the ARRL is doing the right thing in creating more DXCC counters (countries), and in introducing single band DXCC awards for 80, 40 and 10m, all of which must increase the demand placed upon DX stations and, hence, the overall level of QRM on the bands. However, the ARRL, I am sure, would argue that they have made these moves in response to demand from the DX fraternity in the first place – a move influenced by the 'marketplace', if you like. For those of you who like to go on the HF bands for a ragchew, this must seem like the worst kind of nightmare. Indeed, this must also apply to the 'rare' expatriot station in Africa, or wherever, who just wants to talk to his friends back home. I would be happy to hear your views, though I do not have much hope of changing the ways of the world!

WARC bands

One escape from the rat race is to move to the so-called WARC bands, so I was disappointed to see that the extension of privileges to UK amateurs on 18 and 24MHz to include SSB and higher power levels has been put back, possibly to 1992. Apparently this is due to delays in moving other services off these bands. However, given that amateurs in many countries, including the USA, already have high power privileges on both CW and SSB on these bands, it is difficult to imagine that extending them to UK amateurs would add to the overall level of interference and congestion. Let's hope the DTI has second thoughts. One bright spot here is that Finnish amateurs will be allowed to operate on 18 and 24MHz from 2 July.

In terms of new countries, another possible which I mentioned last month is Banaba Island (previously known as Ocean Island) in the republic of Kiribati. Jim Smith VK9NS hoped to activate this one in early May. If you missed this, Jim is confident that a larger operation involving more operators may be possible in the near future.

African DX

Alan, active recently as TU4BR/5U7, is now in Liberia and will be there for two years. Expect plenty of activity once he gets his licence and all his equipment set up.

Steve S79MST lives in the Seychelles and has been quite active recently. G4IRG is handling the QSLs. Steve may try to operate from some of the outlying islands, such as Aldabra, some time in the future.

D44BS has returned to the Cape Verde Islands after four years in the USA and expects to be very active once again.

TZ6VV has returned to Mali and will be there for four years. He is very optimistic about getting permission to operate on 160m between 1810 and 1850kHz.

The next operation from Malyj, Vysotskij Island, in the Baltic Sea was scheduled from 22-30 May, and it was hoped to keep four stations active around the clock. Hope you caught this one. At the time of writing, the callsign is not known but presumably the 4J1 prefix will be reused.

JG1RVN plans to operate on CW and RTTY from Belau, Western Caroline Islands, sometime during June. I have no other information on this one, but both the Eastern and Western Carolines are activated quite regularly these days, especially by Japanese operators. KC6IN, a resident on the Eastern Carolines, is frequently heard on all bands.

More islands

Members of the Venezolano Radio Club are planning another expedition to an island off the coast of Venezuela. This latest expedition will take place from 19-22 July, using the YY5LB callsign, from Blanquilla Island. Previous operations by this group have always been very efficient and easy to work from the UK. Also for IOTA, SM5KI will operate from

the Gulf of Bothnia islands during June, and the French operation from Glenans Island has been rescheduled for 9-12 June (it was originally due to take place during April). DL5XAS/P will operate from the North Frisian Islands on 24 June.

Members of the French FF6KMH Club will operate from Cornwallis Island in Canada from 4-20 July; their callsign is not known.

JW7FD is due to start operations from Bear Island in June, and will be there until 1 December. Bear Island is, of course, well-known from the popular novel of the same name, and is located far away from the main islands of Svalbard (Spitzbergen) where most of the population is to be found.

A QSL card from JW5E reveals that there are 3,000 Russians living on Svalbard, plus 1,300 Norwegians and fifteen Poles.

Many DXers will remember the activity from SP2BHZ/JW a few years ago. During a seven-day operation during February this year, JW5NM (LA5NM) and JW7FD (LA7FD) made 3,500 contacts with 140 countries, while managing 147 zones towards 5BWAZ and 135 US states towards 5BWAS. Not bad going!

Kirsti VK9NL and Leila WA4ZEL will append 'JW' to their callsigns in an operation from Svalbard sometime during June. Strange place for a holiday!

Not one for IOTA, but certainly for the WAB enthusiasts and others, the Stroud Amateur Radio Society will activate Steepholm Island in the Severn estuary on 6, 10, 40 and 80m between 27 and 29 May.

Some holiday!

Just in case you thought that DXpeditions, other than to remote reefs, were rather like holidays, here is a salutary tale.

During the recent KP2A/KP5 operation from Desecheo Island (a wildlife sanctuary near Puerto Rico), the operators were surprised to see a helicopter land nearby. They were even more surprised when the occupants disembarked and pointed their guns at the DXpeditioners! Apparently, the new arrivals were Puerto Rican police who had mistaken the hams for drug traffickers! Fortunately, the confusion was resolved before any damage was done, but the CW from KP2A/KP5 was reported to be a little shaky for a few hours afterwards!

Contests

June is a relatively quiet month as far as contests are concerned, though the hardy ones among you will no doubt join your local club for the Field Day activities on 3-4 June. The World-wide South America Contest, a CW event, will be held on 10-11 June (twenty-four hours from 1500GMT on the Saturday). On 17-18 June you can work Japanese and other Asian stations in the All Asia SSB Contest, a forty-eight hour job. The contest exchange is the signal report plus your age; YL operators can substitute '00' rather than reveal their age! Finally, the RSGB 1.8MHz CW Contest is on 24-25 June. This contest is always a challenge because of the inevitable summer static which masks the signals.

Insurance QSOs

A topic which has been featured in some of the DX press recently is duplicate or 'insurance' QSOs. Following the Rotuma DXpedition (3D2XX), W6SZN analysed the logs and was horrified at what he found. On 10m CW the duplicate rate was 12.4%. One so-called DXer worked 3D2XX eleven times on that band and mode. 'How', asks W6SZN, 'can DXpeditions avoid this'?

There will always be those who are unhappy about whether they are in the log – maybe some QRM came up at the crucial moment – and feel obliged to try a second time; though eleven contacts are extreme to say the least! Every duplicate contact you make deprives someone else of what may well be a new QSO. The ideal is probably that your insurance contact should be on another band or mode. Of course, you cannot always rely on having propagation on another band or receiving the DX station on another mode (and, of course, many DX operators stick exclusively to a single mode).

Entering into the debate in DX News Sheet, G3NSY commented that many DXpeditions bring the problem on themselves by not repeating the callsign of the station they are working in full. The poor DXer feels obliged to try again, especially if the operation is from a remote spot that may not be activated again for several years.

Any comments from the DX Diary readership? From listening to recent DXpedition operations, I know that many UK amateurs are getting in on the action and, I'm glad to say, that one of the XF4L operators singled out British amateurs with special praise for their standard of operation and good behaviour in the pile-ups.

Operating techniques

It has been some years since I last commented on DX operating technique, so many newcomers to the HF bands may sometimes wonder how to obtain a rare station. Isn't it rather like looking for a needle in a haystack? Well, not necessarily. It helps to know what opportunities for DXing are available, therefore the information contained in this column can be of value. There are other sources of information, such as the RSGB's weekly DX News Sheet, the Hambank telephone hot line and 144.525MHz, which is used by HF DX operators in much of the UK to pass information in more or less the same way as 6m operators use 28.885MHz. As I mentioned last month, G4DYO, who is editor of News Sheet, is putting out regular bulletins via the packet network.

Once you know what DX is likely to be around, you will want to think about which bands offer the best propagation and at what times of the day. If you are regularly active on the bands you should have a fair idea. Otherwise look out for propagation predictions which can be obtained from various sources, or use a computer program such as Minimuf to help forecast propagation patterns.

Don't forget possible short path as well as long path openings and remember that, on the LF bands, long distance propagation peaks at our sunset and their sunrise for paths to the East, and at our sunrise and their sunset for paths to the West. Again, there are computer programs or aids such as the DX Edge which can help in determining sunrise and sunset times. Bear in mind that optimum propagation may take place at a time which, due to different time zones, could be in the middle of the night at the far end, though DXpeditions often manage to man the station(s) round the clock.

Frequencies

In terms of where to listen on the bands, DXpeditions tend to use a number of well-known frequencies. On 20m, for instance, they usually turn up on 14195kHz on SSB and on 14005 or 14025kHz on CW. On 10 and 15m the CW frequencies follow the same pattern, with SSB activity on 21195, 21295, 28495 and 28595kHz. On the LF bands 3501, 3505, 7001 and 7005 are common for CW, with 3795, 3799 and 7085 often being used for SSB.

If your background is on VHF or CB, you may be initially surprised by the fact that DXpedition operators often ask for calls on a different frequency. For example, the operator may be on 14195kHz and announce that he is listening '210 to 220'. The reason is twofold. Firstly, to keep his own frequency clear of interference so that he can be heard more easily and, secondly, to spread out the calling stations so that he can identify callsigns more easily. Always follow the directions given by the DX station, otherwise you risk causing unnecessary QRM and will, quite possibly, fail to make a contact. Most modern transceivers are capable of split-frequency operation, though older rigs may require an external VFO or a separate receiver.

Once you've got this far, the rest is up to your technique which, like any skill, improves with practice. Most experienced amateurs rate the following skills as the most important: good timing of your calls, good listening to discover the tuning pattern of the DX station, and a knack of being in the right place when the DX station first appears on the band or changes bands. All these and other similar skills are at least as important as having full legal power and a massive antenna system.

Further information

If you would like further information, look out some of my early columns or get a copy of the following books: **DX Power, Effective Techniques for Radio Amateurs** by Eugene Tilson K5RSG, published by TAB Books in conjunction with the ARRL; **Secrets of Ham Radio DXing** by Dave Ingram K4TWJ, published by TAB Books; **The Complete DXer** by Bob Locher W9KNI, published by Idiom; and **Low Band DXing** by John Devolders ON4UN, published by the ARRL. The ARRL and RSGB operating manuals are also invaluable. Happy hunting. 73 de Don G3XTT.

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THE NEW IC-2SE, SIMPLE OR MULTI-FUNCTION 144 MHz FM TRANSCEIVER

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Options

- **BA-11, Bottom Cap.** Protective cap for terminals on the base of the IC-2SE.
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BP-81	7.2V, 110mAh
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BP-83	7.2V, 600mAh
BP-84	7.2V, 1000mAh
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- **Carrying Cases.**

Carrying Case	Battery Packs, Battery Case
LC-53	BP-81
LC-55	BP-81, BP-83 or BP-86
LC-56	BP-84 or BP-85

- **MB-30, Mounting Bracket.** Mounts the IC-2SE in a vehicle or on a wall.
- **OPC-235, Mini DC Power Cable.** For use with o 13.8 V DC power supply

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The IC-2SE has 48 fully-programmable memory channels and one call channel. Each memory and call channel stores an operating frequency and other infarmation required for repeater operations.

Convenient Repeater Functions.
The IC-2SE is equipped with programmable offset frequencies for accessing repeaters. All memory channels and a call channel stare repeater infarmation far your convenience. The IC-2SE includes a newly designed 1750 Hz tone call transmit function. A 1750 Hz tone call transmits when the PTT switch is pushed twice quickly.

Power Saver for longer operating time.
The power saver ensures lower current flaw during standby conditions. Operating times are much longer than with older, more conventional transceivers.

Built-in Clock with timer functions.
The IC-2SE is equipped with an advanced 24-hour system clock with timer function. The transceiver automatically turns an when real time matches a pre-programmed time. This is perfect for scheduling QSO's. Auto power-aff timers and other settings can be made in clock mode.

Convenient Scan Functions.
The IC-2SE is equipped with VFO and memary scan.
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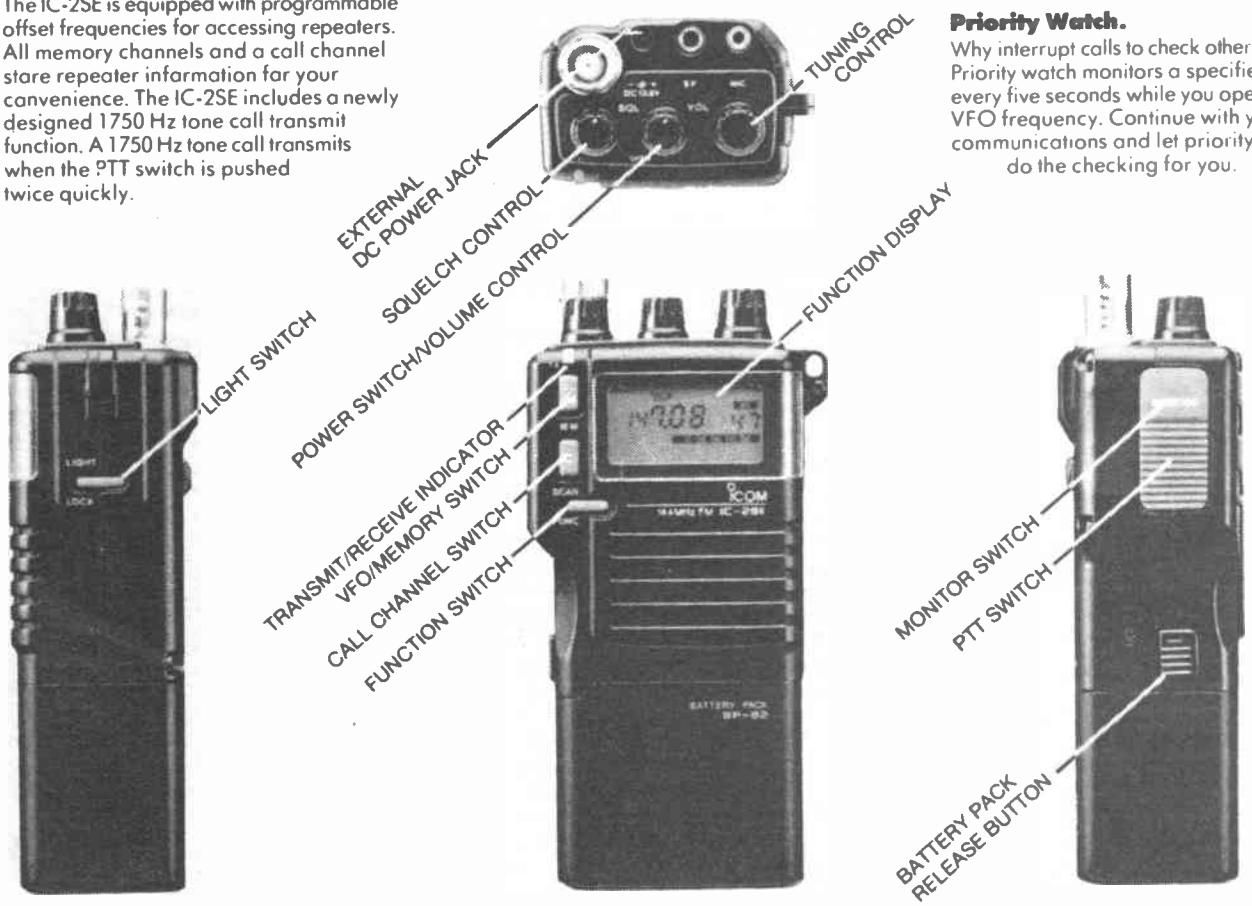
- **Memory Scan.** Memory scan repeatedly scans memory channels.

Auto Power Off Timer Function.
If you ever forget to turn the IC-2SE off, dan't worry. It will turn itself off. Power-aff time can be selected ar deactivated using multi-function mode. Preserve battery pack power for the times when you need it most.

Priority Watch.
Why interrupt calls to check other stations? Priority watch monitors a specified station every five seconds while you operate on a VFO frequency. Continue with your communications and let priority watch do the checking for you.



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THE MF10 AUDIO FILTER

by Stan White G4EGH

Having operated a modern HF transceiver while visiting another amateur, I came away thinking just how useful the IF width/shift facility was. The experience made me wonder if a similar result might be achieved by filtering at audio frequencies.

Since filtering is best done as early as possible along the signal path, I was concerned that I might not achieve very good results. However, my aim was to 'clean up' the signal; not to receive a previously unreadable S1 signal alongside an S9 +40dB signal.

Description

The MF10 audio filter is capable of six different modes. The first switch position (marked as switch position one, 'filter out of circuit') is a low pass filter with a −3dB cut off frequency of approximately 7kHz and is a seventh order filter, which means that its roll off above the cut off frequency is very steep. This filter is not adjustable by the controls provided and is 'in circuit' on all other switch positions.

Switch position two gives a wide notch. This term is misleading, since the response of the filter gradually drops to the point where there is great attenuation, then gradually rises again (see **Fig 1a**). The effect on speech is noticeable and, as a result, it is easy to tune the filter and 'notch out' any annoying whistle. In this mode only the 'tune' control has any effect.

The narrow notch is available on switch position three. Here, speech is unaffected because the filter response drops very sharply, then rises rapidly again (see **Fig 1b**). This sharp tuning makes the filter difficult to use, so the trick is to tune out the whistle via switch position two, then switch to position three and fine tune. Again, only the tune control functions in this mode.

Now for the interesting bit! Switch position four selects the bandpass filter. The tune control places the peak of the bandpass wherever you want it, but the pass bandwidth is variable using the 'Q' control. The passband is adequate for SSB speech when this control is set to minimum (see **Fig 1c**), but when the control is advanced, the width of the bandpass decreases until (when the Q is at maximum) dot merge occurs on high-speed CW (see **Fig 1d**). All of the data modes are catered for; just tune to the centre frequency, adjust the Q accordingly, and away you go!

This filter has an advantage over the CW crystal filter in my transceiver, in that it greatly attenuates off tune signals. Since these signals can still be heard in the background, the off tune replies are not lost, just retuned. Off tune replies are simply not heard with the crystal filter.

Switch position five selects the low

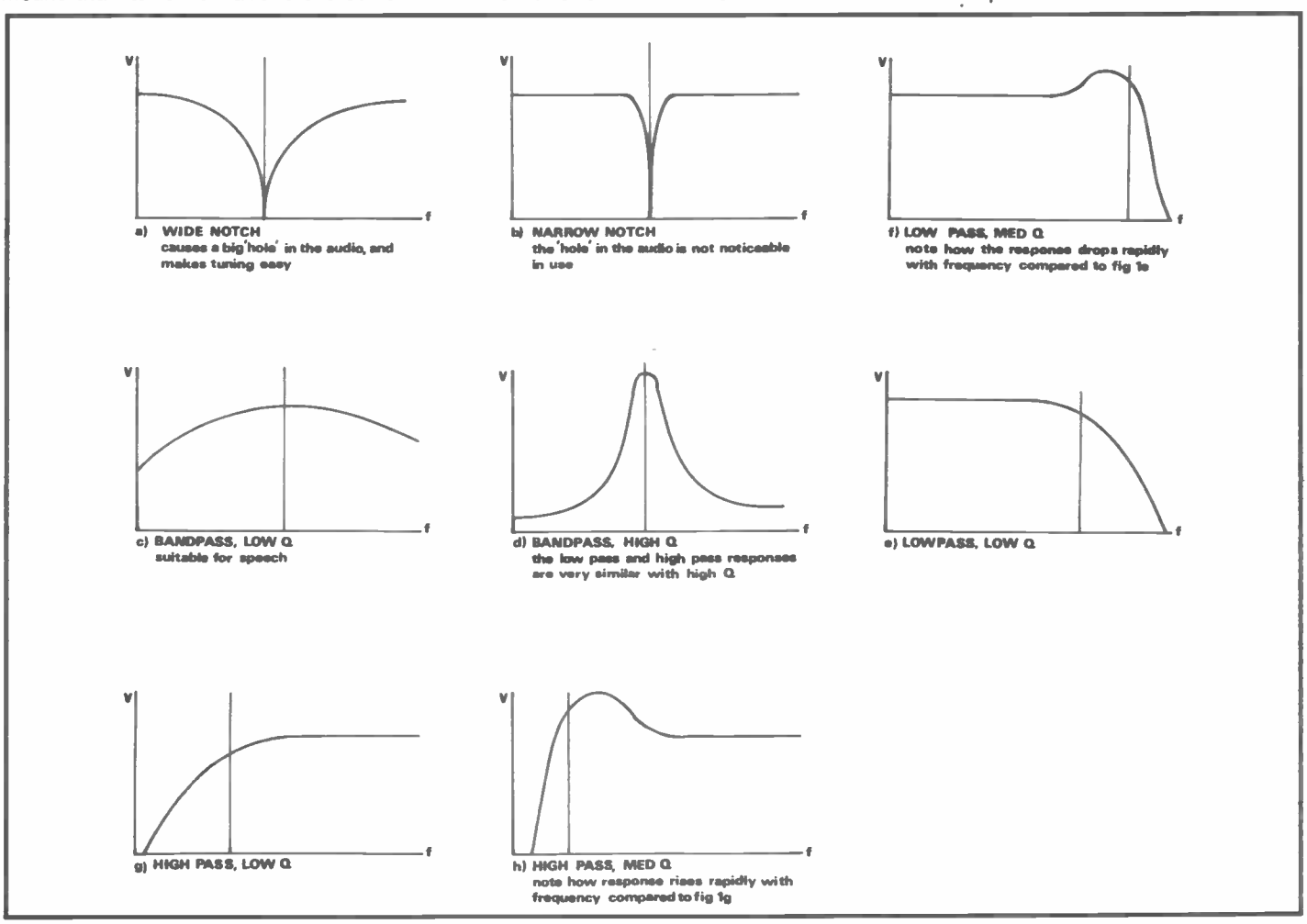


***Fig 1a** to **b:** Filter passband responses. For notch or bandpass, the centre frequency (Fo) is represented by the vertical line. For high and low pass responses, the corner frequency (Fc) is −3dB relative to the peak response and is also represented by the vertical line. It should be noted that the frequency represented by the vertical line is one-hundredth of the frequency generated by IC4*

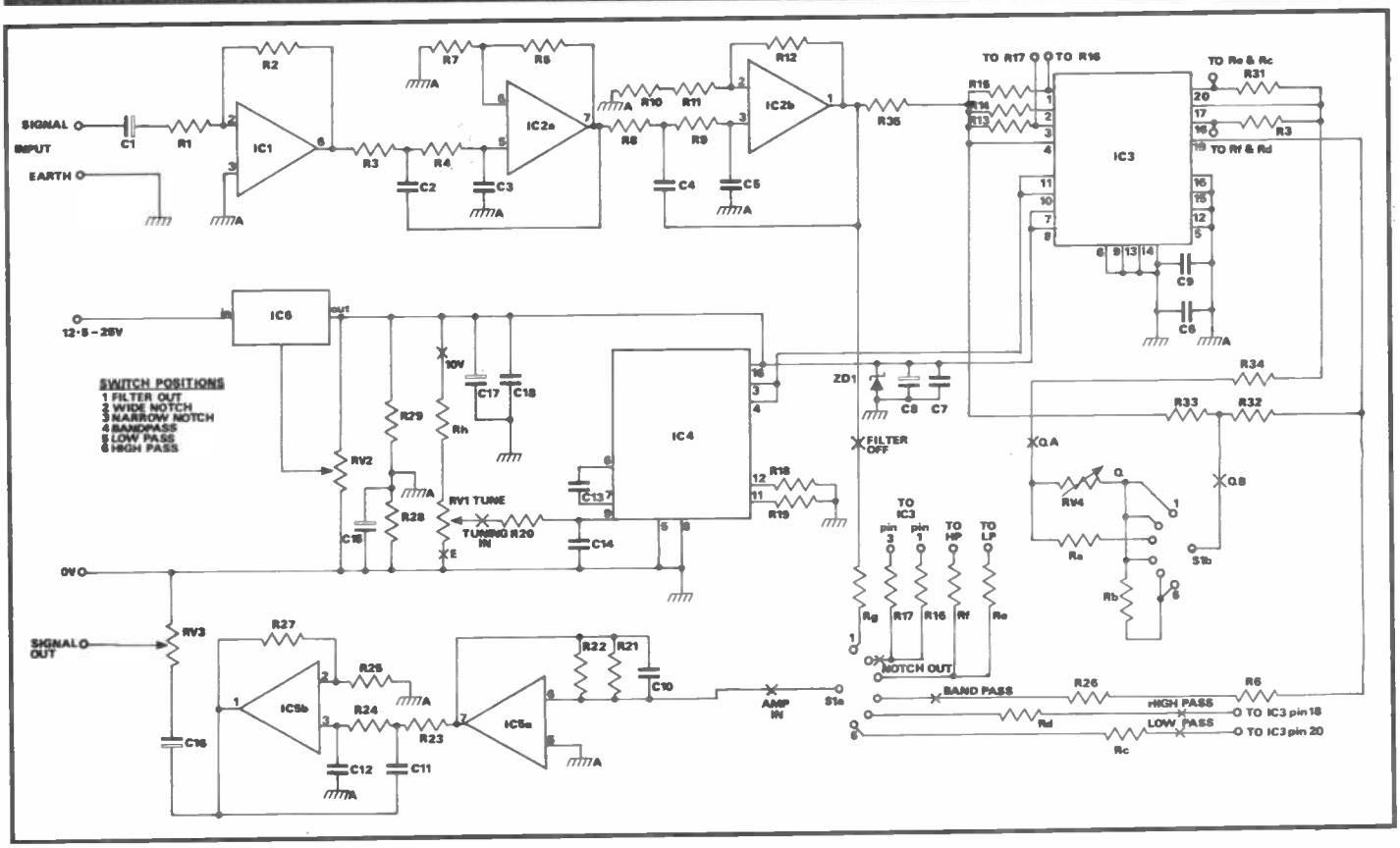


Fig 2: The circuit diagram

pass mode. The tune control sets the corner frequency and the Q control determines the shape, with low Q giving the response shown in **Fig 1e** and medium Q giving the shape shown in **Fig 1f** (notice the faster rate of roll off). High Q settings result in a response which is very similar to that shown in **Fig 1d**.

High pass mode is selected via switch position six; the response shape is shown in **Figs 1g** and **1h**, and maximum Q results in a shape similar to **Fig 1d**.

The reason for including the low and high pass facilities is that if roll off is not required on the upper *and* lower audio register, all of the filtering can be concentrated on the required side, thus giving a faster roll off.

The output of the filter is at high impedance and is not intended to drive a loudspeaker. If the filter is to be incorporated within an existing receiver, the existing audio amplifier can be used. However, if you are building an add-on box then you will have no trouble locating a circuit for a suitable amplifier, since the maximum output from the filter is more than 6V peak-to-peak.

Circuit description

The circuit diagram is shown in **Fig 2** and includes all 'on' and 'off' board components (except Ri and RV5).

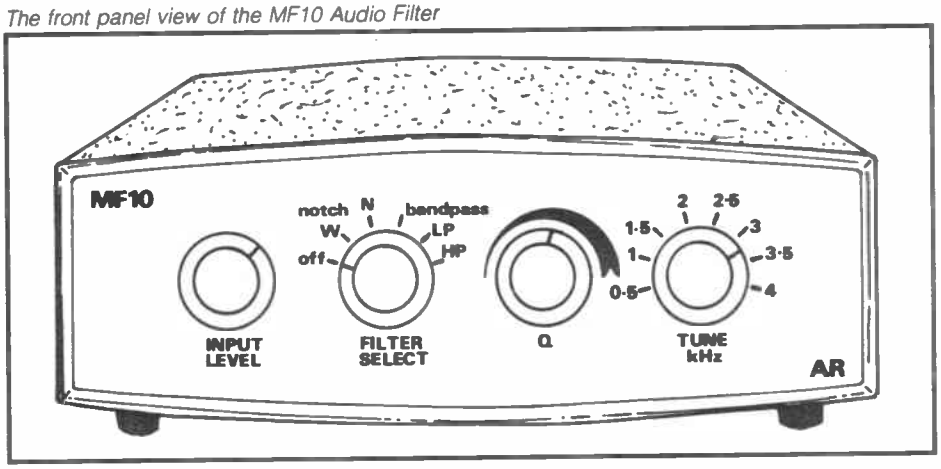
IC1 acts as a buffer amplifier with R1 and R2 and determines input impedance and overall filter gain. The output from IC1 is fed to IC2; the two halves form a low pass filter with a corner frequency (−3dB) of 7kHz. This low pass filter has two functions: it sets the upper frequency response of the filter overall and, more importantly, ensures that no supersonic frequencies reach IC3. This is important because IC3 is a switched-capacitor filter. Its frequency is set by a clock 100 times greater generated by IC4. Should a supersonic signal frequency beat with the clock frequency within IC3, sum and difference products will result and may cause an audio tone to appear at the output. This effect is known as 'aliasing' and is prevented by IC2. The input to all of the switched-capacitor filters should be band-limited in this way.

The clock generated by IC4 is a large amplitude square-wave and its frequency is set by RV1.

The various outputs appearing on IC3 are selected by S1 and passed to IC5a which, together with IC5b, forms another low pass filter and removes the small clock component appearing on the outputs of IC3. RV3 is the output level control.

The circuit operates on a supply voltage between +12 and +25V with IC6 providing a regulated +10V. The analogue ground (AG connection on **Fig 2**) derives 5V from R28 and R29. The zener diode ZD1 is included to protect the remainder of the circuit against regulator failure, since IC3 is expensive to replace and will not tolerate more than +14V. (Zener diodes always go short circuit when they 'blow up'). This simple protection will only be effective if the circuit is fused at 250mA or less (this filter consumes less than 50mA when operated under normal conditions).

The front panel view of the MF10 Audio Filter



Components

While the use of 1% resistors is recommended (they are the ones with the brown tolerance band), this may be relaxed to 5% with the exception of Re,

THE MF10 AUDIO FILTER

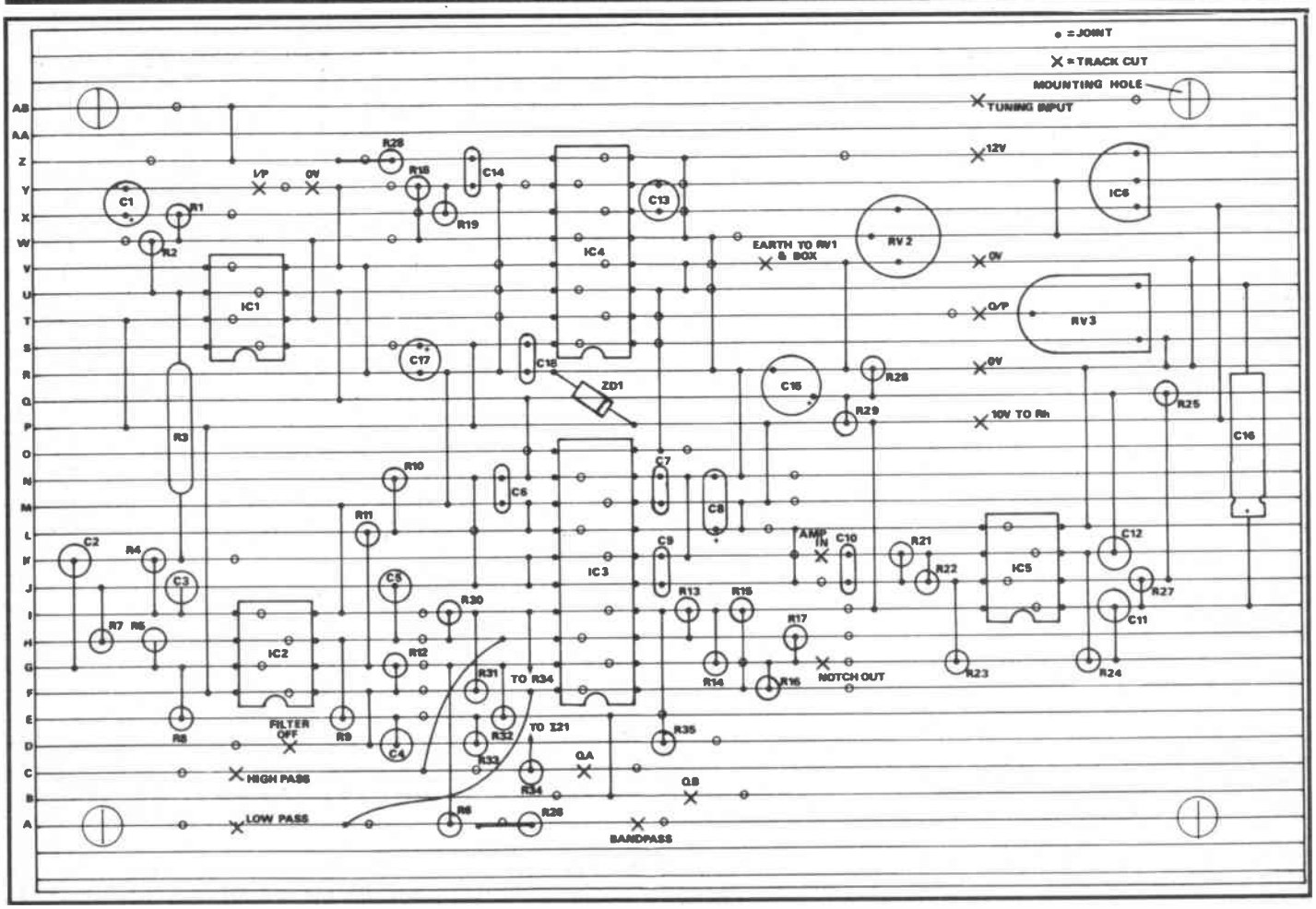


Fig 3: *The vero diagram*

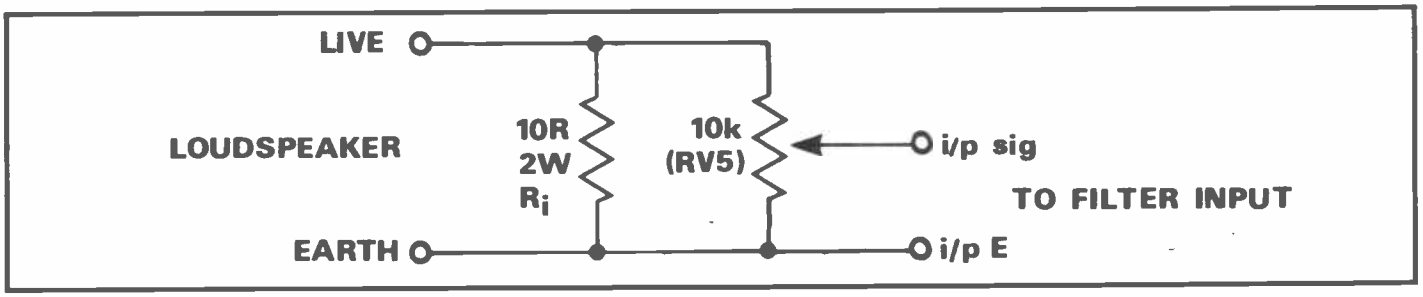


Fig 4: *The input circuit*

Rf, R16 and R17. The effect of such a change is unnoticeable to the ear, but it is quite interesting with an oscilloscope. Resistors marked * on the components list can also be relaxed to 5% without detriment. C2, C3, C4, C5, C11 and C12 are 1% types and are available from Maplin Electronic Supplies Ltd. 2% tolerance components are also acceptable.

Since the harmonics of the clock frequency may radiate interference into the associated receiver, the filter should be constructed within a fully screened box made from tin plate for example. All leads from the box should be routed via soldered-in feedthrough capacitors with a minimum value of 1000pF 100V. RV1, RV4 and S1 should also be mounted inside the box. If an aluminium box is used, bolt-in feedthroughs would be a better choice. These components are not shown on the circuit diagram. Note that the negative supply lead should also be connected to the box.

Construction

If you study the vero diagram in **Fig 3** you will notice that it is essential to use the IC sockets.

As is usual with veroboard, accurate cutting of the tracks is the first task. **Fig 3** shows that each track is lettered and that each hole along the track is numbered for accuracy. Fitting the larger components first sets up reference points for the smaller components which come later. My suggested order for assembling the items to the board is: sockets for the ICs, linking wires (note the use of the two insulated wires), veropins and then the remaining components. Note: only the numbered resistors are mounted on the board.

In my unit the resistors Ra to Rh were connected between the appropriate board-mounted veropins and the switch and potentiometer tags. The size of the veroboard was chosen so that spare tracks could be mounted on either side and may be used as desired. Rb can be mounted on S1 and, if S1 and RV4 are adjacent, Ra can be mounted between them (see **Fig 2**).

If you prefer to build a 'proper' PCB, there is only one critical aspect to the layout to consider, namely the track joining IC3 pins 10 and 11 to IC4 pins 3 and 4; it should be kept as short as possible, otherwise it makes a nice antenna for the harmonics of the clock pulse!

Setting up

The filter is very easy to set up, and requires only a voltmeter for testing the equipment. Do *not* plug in any of the ICs at this stage. However, IC6 (the regulator) must be soldered on to the board.

Set RV2 midway and connect a 13.8V

power supply (fused at 250mA or less) to the filter with a 120 ohm resistor in series using the positive lead. Now set the voltage across ZD1 to 10V by adjusting RV2. Short circuit the 120 ohm resistor and carry out any final adjustments to RV2.

Check that the voltages around the circuit are as shown in the voltage chart (see Table 1). Switch off the power for a few seconds to allow the capacitors to discharge, then insert the ICs, checking that you have not put them in backwards. The filter is now complete. Finally, all you need to do is hook up an audio amplifier, provide an input signal (which may come directly from the loudspeaker leads of an existing receiver if the input circuit shown in **Fig 4** is used) and adjust RV3 to obtain the appropriate signal level from the filter to suit the audio amplifier.

Circuit changes

The filter works very well, however some constructors like tinkering, so here are a few suggestions.

The input impedance is set at 33k by R1, and the overall voltage gain is set to 4.15dB (2.6 times) by R1 and R2. Raising R1 will decrease gain and increase input impedance and vice versa. Raising R2 will increase gain and vice versa.

The overall frequency response of the filter (which is not adjustable and is set for a corner frequency of approximately 7kHz) gives a level response over the entire speech band and offers adequate protection against aliasing. The corner frequency is set by R3, R4, R8, R9, R23 and R24. Raising the value of these resistors will result in the overall response taking place at a lower frequency, whichever position of S1 is selected. This can be of great value when 'tight' low pass filter overall is required, giving great attenuation of sideband 'spitch' from adjacent channels, whilst leaving the adjustable part of the filter available for other functions (ie, notching out a carrier). Suggested values to experiment with are 39k and 47k. However, 'fidelity' may suffer on SSB if the values are too high. (The frequency is also set by R21 and R22, but these are best left alone). If the overall response of the filter is lowered in this way, it should be noted that the adjustable filter works over a range of approximately 250Hz to 3.6kHz; some of the movement of RV1 (tune) will be wasted unless Rh is also raised in value, thereby lowering the maximum frequency that the adjustable filter can be set to. For those of you with a frequency counter, measure the frequency at IC3 pin 10 and divide the result by 100. This will inform you, for example, of the amount of audio frequency that will not be passed by the filter while set in notch mode.

Table 1

Voltage Chart

IC1	pin 7 +10V, pin 3 +5V
IC2	pin 8 +10V
IC3	pins 7 and 8 +10V pins 5, 12, 15 and 16 +10V
IC4	pin 16 +10V
IC5	pin 8 +10V

All voltages measured with respect to earth using 20kΩ voltmeter

Conclusion

This versatile filter accomplished all that was asked of it, and more. It greatly enhanced the readability of the audio coming from my HF transceiver (which, of course, uses a crystal filter). I next tried an old receiver with IF which was a bit like a barn door (thus producing a lot of interference to the wanted signal). Hooking the filter to the audio output gave results that were nothing short of a miracle!

The best results will be obtained if the AF gain of the receiver is set fairly high, and the overall volume is controlled by the RF gain. Using the receiver in this way largely obviates the objection to the filter being the last in the signal chain, and is how I would recommend any receiver to be used, particularly on 7MHz, even if you do not build the filter.

PARTS LIST

Resistors

R1	33k *	R11	6k8	R21	15k	R31	68k	Rf	4k7
R2	33k *	R12	82k	R22	180k	R32	22k	Rg	22k
R3	18k *	R13	22k	R23	18k *	R33	27k	Rh	6k8 *
R4	18k *	R14	22k	R24	18k *	R34	5k6		
R5	56k	R15	22k	R25	68k	R35	27k		
R6	18k	R16	22k	R26	220R	Ra	120k		
R7	150k	R17	22k	R27	82k	Rb	18k		
R8	18k *	R18	560k*	R28	1k *	Rc	18k		
R9	18k *	R19	12k *	R29	1k *	Rd	18k		
R10	56k	R20	10k *	R30	68k	Re	4k7		

All resistors are 0.6W, 1% metal film (stocked by Maplin Electronic Supplies Ltd). Values marked: * may be relaxed to 5% without detriment. Resistors marked: * must have the same value and may be altered as described in the text. Ri is a 10R, 2W component.

RV1 10k linear	Maplin FW02C
RV2 2k miniature round trimmer	RS Components 187-517
RV3 47k miniature horizontal preset	RS Components 186-306
RV4 2M2 linear	Maplin FW09k
RV5 10k	Optional

Capacitors

C1	10μF 16V Tantalum
C2, C3, C4, C5, C11 and C12	1n2 125V 1% (B×57M)
C6, C7 and C9	4n7 100V Mylar (WW17T)
C10	2n2 100V Mylar (WW16S)
C8	22μF 25V Tantalum (WW73Q)
C13	180pF 100V miniature ceramic (W×59P)
C14	47nF 100V Mylar (WW20W)
C15	470μF 16V electrolytic (FF15R)
C16	22μF 25V electrolytic (FB30H)
C17	47μF 16V Tantalum (WW76H)
C18	10nF 100V Mylar (WW18U)

With the exception of the 1% components, the remaining capacitors are not critical (see text). All capacitors listed above are available from Maplin Electronics Ltd.

Semiconductors

IC1 TL071 (RA67X)	IC3 MF10 (QY35Q)	IC5 TL072 (RA68Y)	ZD1 BZY88C/12
IC2 TL072 (RA67Y)	IC4 4046 (QW32K)	IC6 78L05 (QL26D)	(QH16S)

Miscellaneous

Veroboard 0.1 pitch, 5.2in × 3.3in (51 holes × 32 tracks)
17 Veropins
S1 2 pole 6 way
IC sockets 3 × 8 way, 1 × 16 way, 1 × 20 way
Fuse holder and fuse (250mA or less)
Feedthrough capacitors 1,000pF (3 required: 1 for power into box, 1 for signal in, and 1 for signal out)
Suitable screened box
On/off switch (connected in series with +VE supply-lead)
Stand-off pillars for mounting the circuit board, screws, knobs and wire, etc.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Tropical bands

Over the past few months we have looked at the air, marine and HF short wave bands. However, some readers have asked about listening to the lower end of the short wave bands, on what are called the 'tropical bands'. There are good reasons for looking closer at this area of the short wave spectrum.

The tropical bands are to be found on 120, 90 and 60m; that is, between 2.300 and 5.060MHz. As you may know, tropical climates are subject to frequent thunder-storms and very high static electricity, which adds up to an unfriendly atmosphere for propagating radio waves, particularly in the medium wave spectrum. It is for this reason that the International Telecommunications Union (ITU) allocated the tropical bands segment to these areas.

The most used segment is the 60m band. Although there is a small number of European and other stations using this band for community radio, you should be able to find the Latin American stations, using a reasonable aerial and a modicum of patience.

Many stations in the major cities have now gone over to medium wave or VHF (FM) as the conditions are better than in the mountainous regions. In the mountains, due to the terrain, VHF is not feasible and, as stated, the static levels are too high for medium wave transmissions to be successful.

These 'minor' stations are important to local communities, since they are often the only means the population, who may be farmers, plantation workers or mineral miners, have of receiving news of local interest; therefore, these stations are very reliant on reasonably good reception. Also, because of the community nature of the programmes, they are broadcast in the local tongue, usually a dialect of Spanish or Portuguese. There is rarely ever any English spoken.

The stations in these outlying areas are mostly medium to low power, often measured in watts rather than kilowatts, but, with conditions as they are at the moment, there is a good chance of even quite low power stations 'making the trip' to the UK. The time to listen for them is after dark and patience is certainly the order of the day, not only to hear the stations, but also to identify them, so it means listening for a while to hear some sort of station announcement. As with all broadcast stations, it seems to take forever just to hear a clue as to who you are listening to.

Reports

So, the next problem is how do you send reports to these stations? Due to the remoteness of many of them, there is no postal service, so the mail is held in a post office box in the nearest major town. Also, mail for any particular area will only be handled by the office specified, so you *must* use the correct address.

Listeners frequently bemoan the fact that they get no response to reports, particularly from small radio stations. They fail to realise the simple fact that these stations are set up for the benefit of the local community. To be quite honest, they don't care that Fred Bloggs in Birmingham can hear them and, in fact, they probably don't even know where Birmingham is! Basically, you have to resort to appealing to the station manager or engineer. Firstly, your report should be in either Spanish or Portuguese, whichever is appropriate. It should contain full details of the reception, under what conditions you heard the programme and details of the programme itself, together with your comments. Introduce yourself and give some details about your locality, enclosing a couple of pictures of the area. Incidentally, most Latin Americans are soccer mad, so ask about their national team, perhaps even enclose a sticker from your local club. They might not know about your area but mention Manchester United or Liverpool and you're in! Ask about the station set-up, remarking how unusual and pleasant it was to hear signals from his locality. Unlike reporting to major international broadcasters, this is the time when good old-fashioned 'bullshine' can be of help!

Always include a couple of international reply coupons, as many of these little stations operate on a shoestring. The chances are, they'll nick the coupons and you'll hear nothing from them, but you do have an outside chance of getting a letter or card from some exotic region of Brazil or Peru.

Finding the addresses of these (and other) stations is made easier if you have a copy of the **World Radio and Television Handbook**, published by Billboard Publications Inc.

Radio Nederland's 'Media Network' also gives details of some of the tropical stations to be found, so tune in on Thursdays at 1150, 1450 or 1850 (various frequencies, try 5955, 9715, 9895, 11930, 11730 or 15280). Incidentally, Jonathan Marks of Radio Nederland gives examples of some Spanish and Portuguese translations in the **Guide to Broadcasting Stations** published by William Heinnemann, 10 Upper Grosvenor Street, London W1X 9PA.

All-time high

The galeforce winds at the beginning of April took their toll and more than a few listeners awoke to find their aerials looking the worse for wear. Seeing some of the havoc caused to the west coast, I'm glad we're not in the tornado belt!

Meanwhile, the bands have not been at all bad, and recent reports show a rapid climb to what looks like being an all-time high for sunspots. I just hope this also means an improvement to the weather over the past few summers (remember, the last high sunspot level coincided with a great summer).

DXing has been a pleasure for most of our listeners with most areas being logged. Even the VHF 'brigade' has had the auroras to play with! Don't mention the solar flares to some radio hams, because the wiping out of bands for hours at a time is not conducive to repeatable Anglo-Saxon language!

Awards

So, to the mailbag. The first letter comes from Peter Uhren ILA 417, of Waren, in East Germany, who mentions that he's just 'found out' that broadcast listening is 'verboten' in East Germany! Apparently, the reason is that citizens are not allowed to contact 'non-socialist' countries. Peter says, 'Our limitations become less, but still they exist'. Considering Peter has been corresponding with me quite uncensored (I won't say how I know!) for some time, and that East German hams are as lively on the bands as the Soviets, the situation must be improving, despite the authorities over there.

Mick Turner ILA 135, of London, has been using a new aerial arrangement with his FRG-8800. Apparently, a previously used inverted V was not delivering the goods, so he extended it to make a 'lazy N' configuration. Well, whatever, the results have been very encouraging with JA1, KP2, HR1, YD6, PT1, VU2, HL1, VE3, VK2, VU7 and 9M2 all coming into the net. Like I say, try anything once! Right, what's next in the alphabet?

Our old mate Stan Porter ILA 062 has left his QTH in Malawi for a nice retirement in the Algarve (lucky blighter!). His old faithful CR100/2 has been donated to a radio museum, established by John Ford 7Q-002 in Malawi.

Geoff Hughes G7DUF of London, has been using a Heathkit HW101 and a triband yagi at the 'school' recently and is eagerly awaiting his full

call after logging such niceties as 5V7, ZF1, VP8, KC1, BV2, T77, 4S7, VE8, JW5, 6Y5, FY5, VQ9, TZ6, HK4, VU7, S79, A61, 6H3, J37, CX6 on phone, plus LU9 and TG9 on RTTY.

Peter Cain ILA 297, of Newcastle-upon-Tyne, occasionally tears himself away from the amateur bands to have a bash on the airbands and his recent loggings include Honolulu on 11.384 and Sydney on 8.867.

Peter has also logged the following on 10m: TG, DU, FY, 9J, XX, HI, ZD9, 6W, KG6, KP5, VU7, HL, 7P, ZF and AH0; on 15m, HK0, 8P, TU, VP8, VK9, ZD9, Z21, TG, DU, A22, 3B8, VU7, KP5, AH9, V85 and ZD7; on 20m, HK0, 8P, 3B9, PY0, 3W, 9Q, VS6, VP2M, T30, 5W, ZD7, V44, ZL7 and VQ9; on 40m, HH, 5Z, HL, 5N, VS6, XE, HK, KP5, CE and 5T; and on 80m, A9, VP8, V3, VK3, TI, 5H1, HH and YI.

17m offered J7, PY, KH6, ZL and VK2, and 12m, HH, P29, VK4, FK, C6, 9J, V2, 3X and PZ.

The latest QSLs are 9Q5DG, VE8CB, 9X5NH, 9L1RK, TU2QQ, T53RC, FH5EF, 4S7VK, VP8BUO (80m), YJ8JS (10m), 4K0D, 9J2EZ and WY5L/KH3. Quite a respectable collection there.

On to the Broadcasting scene, Derek Taylor ILA 346, of Preston, claims one Continental (North America) award and *three* Medium Wave awards, plus the Broadcast Monitor Award.

Just look at some of his loggings (frequencies in brackets). ZAK, Antigua (1100); R Taino, Cuba (1040); R Orituko, Venezuela (1440); R del Fin, Colombia (106); OBXII R Corporaçion, Peru (1440); R Globo, Brazil (1100); R Relos (Porto Rico); R Surio, Cuba (1440); R Maneria, Chile (1060); R Caroni, Venezuela (1050); XEB, Mexico (1220); Air Nagpur, India (1566); BSKA, Saudi Arabia (1440); CBS, Taiwan (600); GRF, Greenland (570); VPL6, Trinidad (610); ZIZ, St Kitts (555), and a pile of callsigns from North American stations including WLAC (1510), CHTN (720), CKIM (1240), WHYM (1330), WENE (1430), WBT (1110), WONO (1400), CBE (1550), WQQW (1590), KOKA (1020), WTNN (670... a new station), KXEL (1540) and KFAB (1110).

This is real listening and, needless to say, gives Derek a lot of pleasure. He logs a number of stations that are new on the air so appreciate his reports and many are surprised to receive reports from so far afield, for example station WJDY was transmitting on 1.470MHz on 30 October 1988 with only 45W of power.

BARTG

The British Amateur Radio Teledata Group was founded thirty years ago as the teleprinter group. Nowadays, with computers doing most of the work and new modes being used, Teledata is more in keeping with their modern image. They have regular schedules and you can look for them around 1030, 1130 and 1230 on 80m, and 0700, 1200, 1500 and 1700 on 20m. All transmissions are at 45 baud, normal shift. They are also on 144.600 on either 45 or 50 baud from a number of stations in different areas throughout the country. Their club call is GB2ATG.

A reminder about the Radio Amateur Invalid and Blind Club which hosts 2m nets throughout the country on Sundays, and also the HF net on 80m on most days of the week. Frequencies vary, but try around 3.740 at 0930, or thereabouts.

ILA

Have you noticed that I haven't plugged the ILA recently? For those new readers, the International Listeners Association was started up nearly four years ago by some ***Amateur Radio*** readers who wanted to swap information with other like-minded individuals.

At that time, there were about a dozen people who asked me to act as a go-between. Being a nice chap I agreed, and the membership has grown ever since worldwide.

The number of awards available to listeners ranges from the fairly simple to the very difficult. There is also a quarterly newsletter, 'Just Listening', which offers tips, news and reviews as well as a number of items available to members, such as QSL cards and computer programs at cost price. Membership costs £1.50 per year.

You can become an ILA member by writing to the International Listeners Association, 1 Jersey Street, Hafod, Swansea SA1 2HF, or by seeing them at one of the rallies at Swansea, Longleat or Leicester later this year.

News and comment from Glen Ross G8MWR

Space news

It has been some time since we reported on the latest developments in the satellite scene.

Let us start with Oscar 9 which is steadily getting itself into deeper problems. This particular 'bird' has been running out of steam for some time and is gradually falling back into the earth's atmosphere at a rate of descent of about 400m per day. The huge solar flare on 9 March made matters even worse for several days when the drag factor increased substantially, but it is now back to normal.

The UoSat organisation is running a competition for contestants to estimate the date and time when the final plunge into oblivion will take place. Prizes are being offered, and your entry form should be sent to: Orbital Decay Competition, AMSAT-UK, 94 Herongate Road, Wanstead Park, London E12 5EQ. You must include your name and QTH, the receiver used, the predicted date and time, and a short description of how you arrived at your conclusion.

Method of re-entry

There is no easy way to predict the time and date of Oscar 9's destruction, but you might like to work along the lines suggested by G3AAJ in a recent copy of **RadCom**.

First make sure that your receiver is accurately calibrated. Next, monitor a pass of Oscar 9 by tuning to exactly 145.825, and check that the S meter is set to read centre-zero tuning. When you first hear the satellite, the meter will read off scale and gradually come to centre reading when the satellite is at the point of closest approach. Note the time this happens. If you then take a series of readings on subsequent passes, you can find out the exact orbit time and from that, the amount of decay. The rest is up to you. Good luck!

Beacons

Before Oscar 9 finally gives up the ghost, you may like to try monitoring the four HF band beacons that are carried on it. Because of early problems with getting the gravity gradient boom (which also acts as the HF aerial) out to its full length, these beacons have not been used previously.

All four beacons are now running, and the frequencies are 7.002, 14.002, 21.002 and 29.510MHz. The beacons carry telemetry at 12wpm CW, and some interesting propagational effects can be monitored if you are able to listen to two beacons at the same time.

Contacts in space

One of the more interesting aspects of the VHF spectrum is trying to contact astronauts in space. This usually results in uncontrolled chaos and very few contacts. The astronauts on the Soviet Mir space station have improved chances of a QSO considerably; that is, if you count '5 and 9, OM' as a contact.

News is coming in of another American radio ham in space. He will be a crew member on the Columbia space shuttle mission, which is due to fly in March 1990. The various AMSAT organisations were given the go-ahead 'in principle' on 14 March this year.

Operations

The operator concerned will be Ron WA4SIR, who will be the flight's astronomer and payload specialist for the Astro 1 system. However, when time permits, he will be using voice, video and packet communications.

The orbit of Columbia is planned to have an inclination of 28.5° and should give excellent opportunities for amateurs to make contact. Final approval depends on several other factors, so I will keep you informed as information becomes available.

Oscar 10

The Australian AMSAT ground-station has reported that signals from 0-10 have been noted with considerable FM. This indicates that the satellite is not receiving enough sunshine to keep the Ni-Cads fully charged. *All* amateurs are requested not to use the satellite until the end of May at the earliest. By that time, the satellite will be into more sunny conditions and in full use again.

Apart from the effects of the diminished battery, the various systems on board are performing well. If you can tolerate the temporary shut-downs, the experts predict that this bird will give many more years of useful service.

The mole

Your friendly spy has revealed that the fee for Morse tests, administered by the RSGB, has increased from the present £7.00 to £10.00 for all people applying after 1 April this year. This represents an increase of nearly 43% when inflation is running at about 8%. To justify the new increase the inflation rate would need to be roaring along at well over 14%.

Tardy

The other nasty point is that the press release announcing this rise did not leave the office until 22 March. Not much notice there. The RSGB claims to be in constant touch with the DTI so they must have known about the increase well before this date, and yet I remember no mention of it in **RadCom**. The RSGB is, it seems, yet again, poor on communication. And how about their concern about keeping down the cost to young people entering the hobby? On the basis of this increase, it seems likely that the cost of our licence could rise to about £17.00. The DTI has told me that this is 'not likely to happen in the near future'.

CEPT licences

The latest list of countries which participate in the new CEPT system is Austria, Belgium, West Germany, France, Liechtenstein, Luxembourg, Monaco, Netherlands, Norway, Spain, Sweden, Switzerland and Turkey.

There seems to be a belief that you can simply take your rig to these countries and start operating using your British licence, but it is not as easy as that. There are several steps you should take beforehand. First, write to the RSGB asking for their information on CEPT. Next, contact the DTI in London and ask for the Radio Amateur Information Sheet nine, plus a copy of their booklet BR68. If your licence has been recently renewed, you will have received a copy of the 1989 licence regulations. If not, ask for a new copy of your licence and the regulations.

Next steps

Information sheet nine contains the addresses of the various authorities for the countries in which you are going to travel. Write to them asking for copies of their licensing regulations, and any further information which they think would be helpful. When you travel abroad, take copies of all the information you have received from the various offices.

Operating

Now we come to the tricky part which you must be very careful to comply with. You do not gain any extra facilities over

and above your British licence when you operate abroad. You must operate within the limits set by your British licence or the local licence, whichever has the greater restriction. For instance, if you are operating in Germany, remember that you can only run 400W maximum even though the German regulations allow operators to use much higher power. Also, although your licence allows you to operate on 6m the German one does not, therefore you are not allowed to operate on 50MHz. This also operates in reverse as a German visiting the UK cannot operate on 6m even though we can.

Six metres

You may remember that I mentioned that 6m was being proposed as a DX information channel. I also mentioned that it was yet another one of our frequencies to become a club spot, and that we were being slowly squeezed out of the band by specialist interest groups. As you may imagine, it brought a lot of response from readers, mainly along the lines of 'Well, what can we do about it?'

Some of the letters from HF band operators were very interesting, with most of them being very well reasoned. I thought I would quote extensively from a letter received from G4DYO, who is editor of the RSGB HF News Sheet. He feels that the HF fraternity has a strong case. Having read it you will probably feel much happier about giving up some space to him.

Points made

G4DYO gets his facts sorted right from the start by referring to 'Your article in Ham Radio', and that the objections to the idea are made by people who are 'Not clued up on radio matters'. He goes on to say that the frequency is used 'For discussing amateur radio matters, which is more than can be said for most class B operators'. He then makes several points which I think you might find of interest. 'Get rid of class B licences, *real* amateurs are those with CW ability. The B licence is what it infers – a second-rate job. Class Bs who cannot obtain the extra requirement for a "man's ticket" should have their licence withdrawn'.

There is more

G4DYO continues with some more excellent ideas. 'Get CW novices off the air, they are just QRM machines and space-wasters. Half of them won't pass the test while they have a hole in their...'

Another good point, 'Get Raynet off 2m. CB is the ideal medium for all emergency work. I could talk down twenty Jumbo jets in the time it takes...those guys (Raynet) to pass the time of day'. He continues by strongly urging 'Remove all repeaters'. Apparently, they are full of operators who 'waste time and whinge'. A last point he makes is to 'Get VHF (men) off HF. We don't want the 6m "freaks" using up valuable space on 10m'.

So, as I understand it, he is saying, 'Get the VHF nets off our HF bands and then make way for our HF nets on the VHF bands by closing down the repeaters and rescinding the licences of all class B operators'.

I look forward to receiving the RSGB's comments on these proposals from their editor. Incidentally, G4DYO is QTHR if you want to add to the debate.

Questions

Let me finish by asking G4DYO a few questions. What is he achieving on the HF bands that has not been done fifty years ago with far simpler equipment? Has he ever tried working aurora, Sporadic-E and TEP on 50MHz? How about some moonbounce? Perhaps he has already tried full colour video on 10GHz. How about some experimental SSB on 24GHz? Has he tried troposcatter, investigated ducting, or the effects of solar flares? How about...? The list goes on.

Many other class Bs, including myself, have become involved in these activities. Oh, by the way, when I held a class A licence in 1950, I worked 110 countries on 28MHz in a single day. HF seemed so easy, so I moved to VHF, and here I stay.

Close-down

That's everything for this month. Keep all your news and comments coming to me at 81 Ringwood Highway, Coventry CV2 2GT. You can also contact me via packet at 9B7NUN. See you next month. Bye!

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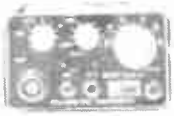

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VHF UHF Airband Guide to Commercial & Military	£5.95
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ICF SW1S	As above with full kit etc	£247.00
ICF PRO80	150kHz-225MHz SSB/FM	£297.00
ICF AIR7	108-174MHz + FM Broadcast	£227.00
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BITS TO BUILD

A CALIBRATOR CIRCUIT AND LIGHT INDICATOR

Some radio journals, this one excepted, appear to assume that, as a constructor, the radio amateur wants to spend a lot of money on components, perhaps with ready-etched PCBs and then labour for weeks to complete a complex project.

Past experience has taught me that many constructors like building little projects; the sort that only cost a pound or two and can be built in one evening with an excellent chance of working first time. They may not be in the forefront of high tech, but the two projects offered here are inexpensive, take very little time to build and will certainly work first time.

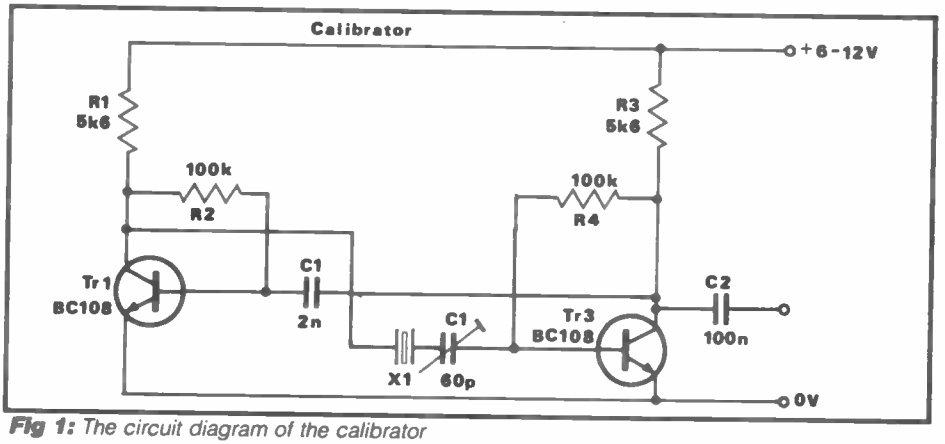


Fig 1: *The circuit diagram of the calibrator*

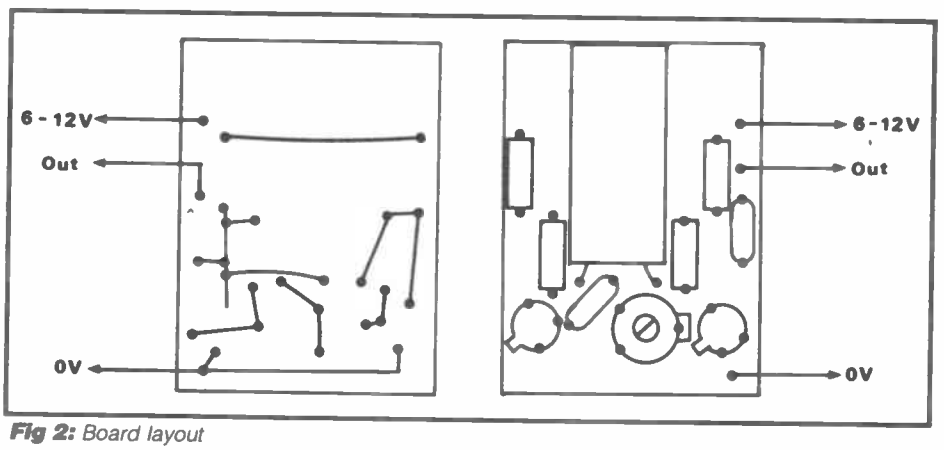
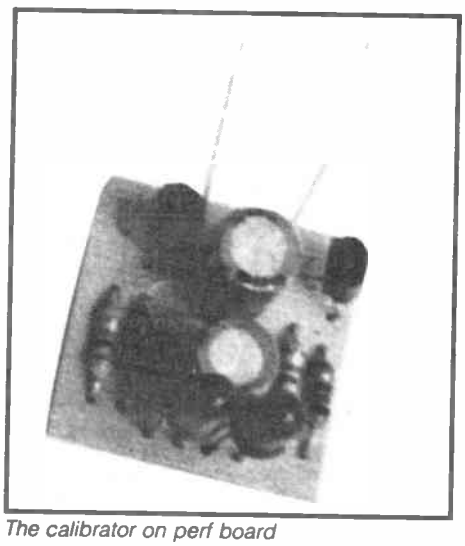


Fig 2: *Board layout*

A simple calibrator

The amateur radio literature and kit market is full of crystal calibrator circuits. These are crystal-controlled oscillators which give accurate frequency markers in a receiver. The licence regulations require everyone to have some form of independent frequency check – have a look. Few calibrator circuits can be simpler than this one.



The calibrator on perf board

The more sophisticated circuits give a range of frequency outputs; this one gives only a single output, but that is adequate for most purposes on the HF bands. The frequency is 100kHz, which is a very useful spacing for identifying frequencies on the HF amateur bands. The output can be clearly heard on a receiver up to 30MHz and in many receivers, well beyond that frequency.

The idea for this project came from my wish to add a calibrator to my old HF band receiver. I have a Drake 2B, a fine-valved receiver of the 1970s, which I use alongside various little QRP transmitter boards for casual QRPing on the bands. It might seem an ancient item but I would match it against the most expensive HF receivers available today, at least I would to about 20MHz. One of the optional extras for the Drake 2B is a crystal calibrator; there is a switch for it on the front panel. The additional calibrator board plugs into the main chassis. My example of the receiver does not have the board, so I decided to build a simple calibrator which could be mounted in the same position and controlled by the existing front panel switch.

The circuit

The circuit for the calibrator is shown in **Fig 1**. The more experienced 'circuit reader' will recognise it as a version of the multivibrator circuit. The output from each of the two transistors feeds back into the input of the other via a capacitor. It is sometimes used as a circuit for CW audio sidetone monitors. . .by those who do not mind assaulting their ears with an unpleasant tone.

This circuit application has two advantages, well, three if you count simplicity. 100kHz crystals are notoriously sluggish in wanting to oscillate; after all, it is quite a large chunk of quartz that needs to be activated at such frequencies. This circuit coaxes the largest crystal into oscillation.

The second advantage is that the multivibrator circuit produces an oscillator which is rich in harmonics; just what is required for this circuit. The receiver has to pick up the harmonics of the 100kHz oscillator every 100kHz up to at least 30MHz for the circuit to be any use for the HF bands. The output is also high enough not to have to directly connect the circuit to the receiver's own circuitry.

The circuit uses two bipolar transistors (the BC108 has been used here, but any similar type, such as the BC183 would be suitable). The outputs of each transistor (at the collector) are fed via a capacitor into the input at the base of the other transistor.

The output of TR1 uses the crystal to couple from its collector to the base of TR2. This determines the frequency of the oscillation. The series capacitor VC1 is added in series with the crystal X1. This capacitor is a trimmer which is used to finely adjust the frequency of the oscillations.

Construction

For ease of construction, I built my version of this circuit on a small piece of 'perf board'. This circuit board material has a matrix of holes 0.1in apart. It is similar to veroboard but without the copper tracks. Perf board is available from mail order suppliers or branches of the Tandy chain of stores.

The layout of the completed board is shown in **Fig 2**. Mount the components in the same way as a conventional PCB, by pushing the leads through the appropriate holes and making the connections on the back of the board. As there are no copper tracks, the interwiring of the components is done by wires. Usually the components have enough extra lead length for the excess to be used for the interconnections. In some cases, wire may have to be added to make the connections.

The layout has been designed around the HC/34 metal housing for 100kHz crystals of the type often found for sale at radio rallies. Any type of 100kHz crystal may be used, but the older 10X-type plastic-housed crystals will require more board space with appropriate movement of other components. This layout could also be used if you want to etch a PCB.

Testing

Once built, the calibrator is simple to test and use. First of all, the calibrator must be tuned to 100kHz. In the UK we have a free and highly accurate standard frequency source to check the calibrator: the Radio 4 long wave transmission on 200kHz (1,500m). At least it is there at present, although I understand that the EEC want us to move it.

To set the calibrator simply connect a few feet of wire to the calibrator output, and drape it near a radio tuned to Radio 4. The oscillator should be heard beating with the signal of Radio 4. Adjust VC1 for zero beat so that the tone of the calibrator can no longer be heard.

The calibrator, when used with a short wave receiver, can be loosely coupled to the receiver by placing a wire from its output close to the antenna input of the receiver. In order to function effectively, the calibrator requires 6 to 12V which could perhaps be taken from the receiver's power supply. In my case I decided use the heater line of the Drake 2B to power the calibrator. In fact, the calibrator 'on' switch was connected to the heater line and originally switched on a valve calibrator circuit. I added a small rectifier bridge and a smoothing capacitor to give a supply for the calibrator circuit. The circuit for this is shown in **Fig 3**. When used with a receiver, the calibrator should give useful 'pips' every 100kHz along the tuning range.

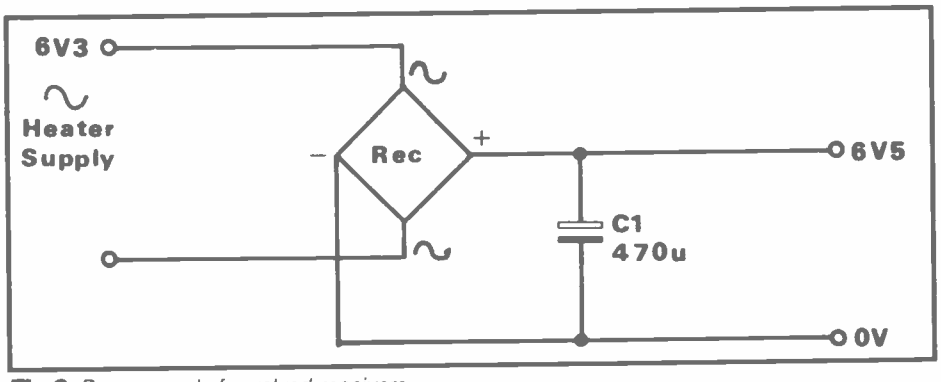


Fig 3: *Power supply for valved receivers*

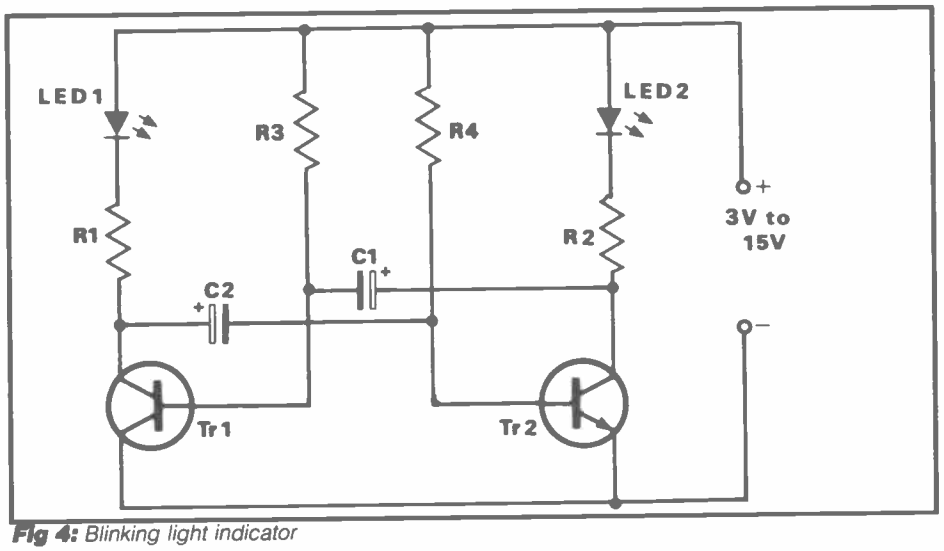
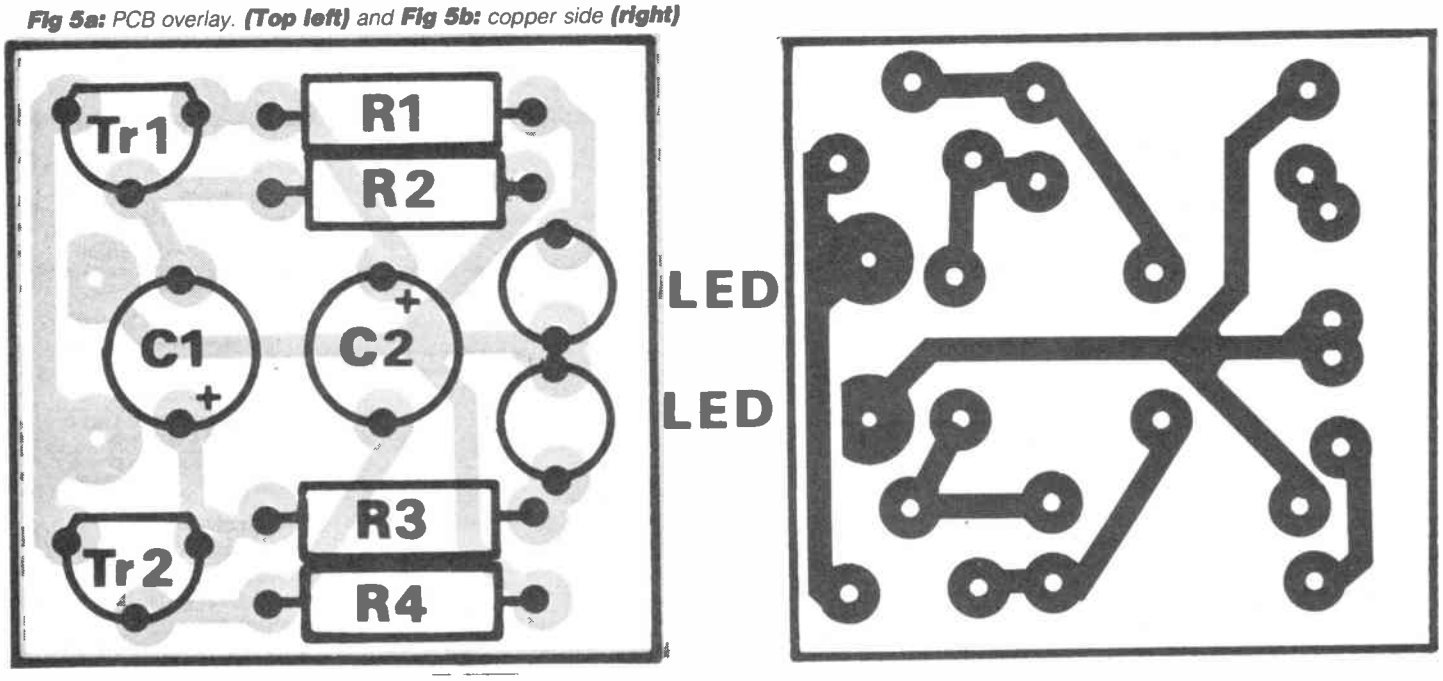


Fig 4: *Blinking light indicator*

Fig 5a: *PCB overlay.* ***(Top left)*** *and* ***Fig 5b:*** *copper side* ***(right)***



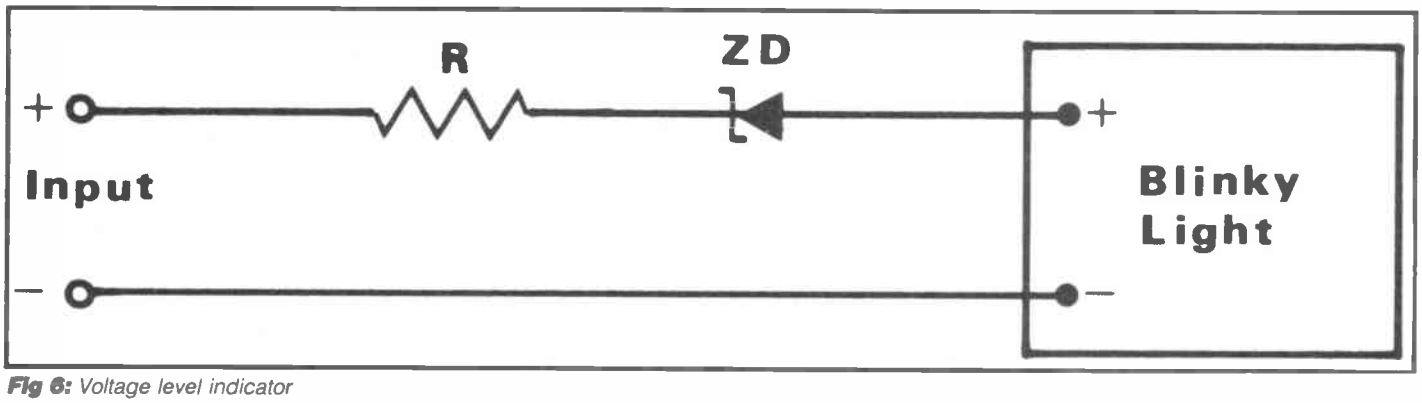


Fig 6: *Voltage level indicator*

A blinking light indicator

Fig 4 shows yet another multivibrator circuit. This time the oscillator works at a low frequency and is used to switch on two LEDs in an alternating light sequence.

In this circuit, the two transistors T1 and T2 switch each other on and off alternately as a 'flip-flop' circuit. The collector lead of each transistor contains an LED with a series resistor, R3 and R4. The circuit oscillates between T1 and T2, alternately flashing the two LEDs on and off. This is the blinking light effect.

The rate at which the LEDs switch on and off is controlled by the ratio of C1/R3 and C2/R4. You can experiment with the value of C1 and C2 to obtain the desired flashing rate. Extra LEDs can be added to the circuit by wiring them in series with LED1 and LED2. If this is done, the values of R1 and R2 will need to be lowered. They should have a suitable value to pass the required current to illuminate the LEDs.

The circuit is built up on a small PCB, the layout of which is shown in **Fig 5**. The board is only 1in square and so may be used where space is limited. As with the previous project, this circuit could be built on a small piece of perf board.

Applications

The little flashing lights are a novelty and would, for example, enhance children's toys. A model train set might be livened up with flashing light signals. Or, you could mount the LEDs at either side of a callsign or name badge with the circuit board behind the badge and a PP3 battery in a pocket.

One definite and useful application is a voltage indicator. The circuit for this is shown in **Fig 6**. By adding a zener diode (Dz) and a series-limiting resistor (R), the circuit will light when the input voltage is equal to voltage (zener) + 3V. R maintains the current to the circuit board at around 20mA. Finally, the values given here would provide an under-voltage indicator for a car battery.

These circuits will not set the electronics world alight but they are simple, cheap and useful.

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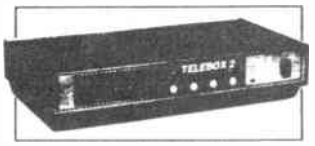

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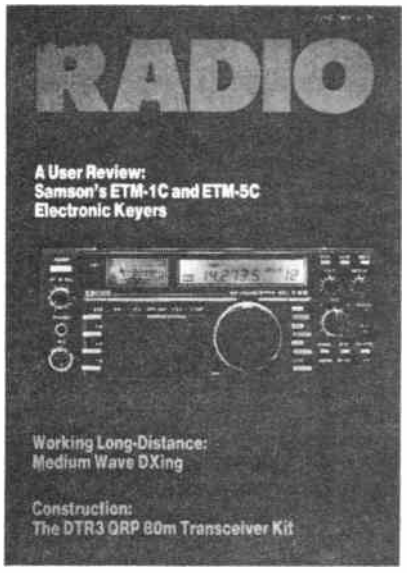

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50MHz

by Ken Ellis G5KW

All-time firsts to South America

Last month's column started with the exciting report of an all-time first QSO between the United Kingdom and Australia.

This month we have another set of all-time firsts to report between Scotland, Northern Ireland and countries in South America. This follows an all-time first two-way QSO between England and South America on 7 September 1988 at 2123hrs, when LU7DZ had several two-way QSOs with G1PAM, Plymouth, followed by eight other G stations, including G3CCH in Scunthorpe. This was a UK 6m distance record of 7,057 miles.

On 20 March LU8MBK worked twenty-six G stations, but there are no details available. On 21 April at 1717hrs, G4NDG from Tiverton, in Devon, had a QSO with CX4HS. On 29 March at 1204hrs, Geoff GJ4ICD had a QSO with LU9AEA S8/S9 for another GJ all-time first. At 1206hrs, Geoff had a QSO with LU8MBL and heard LU8YYO and LU8EKB. By 1300hrs the path had extended to Northern Ireland and Scotland.

Ted Collins G4UPS received the following extracts from the log of CX4HS.

'Between 1303hrs and 1337hrs I QSOd the following UK stations: GI8YDZ, GM4IGS, GI6GBK, GI4OPH, GM4JEJ, GM4UPL and GI4OWA.'

Between 1328hrs and 1340hrs on the same day, GM4OMT had two-way QSOs with CE3OK, CE6ABK and LU8MBL. LU9AEA and LU8MBL were both heard by G4UPS, but no other Gs reported hearing the CX or CE stations. As this was an historic opening, other reports would be appreciated for my records.

I will not theorise on the propagation modes responsible for these unusual openings, because I have no doubt that experts will study the solar and weather conditions prevailing at the time, and their results will be made available in due course.

A difference of opinion exists as to whether multi-hop or a type of waveguide effect is responsible for the greater distances covered during sunspot peaks and other abnormal conditions. The fact that signals can be heard over 2,500 miles away supports the waveguide theory. We still have a lot to learn about this subject and the similarity to HF propagation, with the skip distance increasing as the MUF rises, must be considered.

North/south path to South Africa

The spring equinox north/south and TEP path to South Africa has now ended. Due to the increased activity and interest, the opening was very successful for those who took part. Several Gs are waiting to receive confirmation QSL cards for working ten or more ZS squares to qualify for the South Africa Award. At the last count, PA0HIP had worked a total of seventeen squares. I have worked thirteen squares and several other Gs are believed to have even more to their credit.

Although some double hop openings occurred during the summer Es season, the next major openings are not expected until the autumn equinox season (August to October).

Summer Es season

We should now be in the summer Es season, because there is some evidence of isolated patches of Sporadic-Es enhancing F2 during periods of high MUF, giving long-distance propagation.

In the northern hemisphere, the Sporadic-E season is from May to July, with short-skip propagation on 50MHz of 400 to 1,300 miles or so. Multi-hop effects can extend the range to more than 2,500 miles. Es skip can take place at anytime or season, but it usually occurs mid-morning or early evening. Sporadic-E is not influenced by the changes in MUF during the solar cycle. In fact, greater Es activity has taken place during the 'quiet' part of the cycle, but high MUF will, of course, enhance Es propagation under certain conditions.

Early Es propagation

If we accept a maximum range of 2,400km for a reflection at a height of 115km, then the Iceland, Malta and Gibraltar beacons will have made a useful contribution to checking the effects of Sporadic-Es in the past and will be a useful indication of any future openings.

Fig 1 shows the reception of the Gibraltar beacon GB3VHF from 27 May to 6 June 1981, from the Scilly Isles, during the peak of cycle 21 (via Es enhanced by F2). From 31 May until the first few days of June, several people had two-way QSOs on 70MHz with the beacon keeper, Jimmy Bruzan ZB2BL.

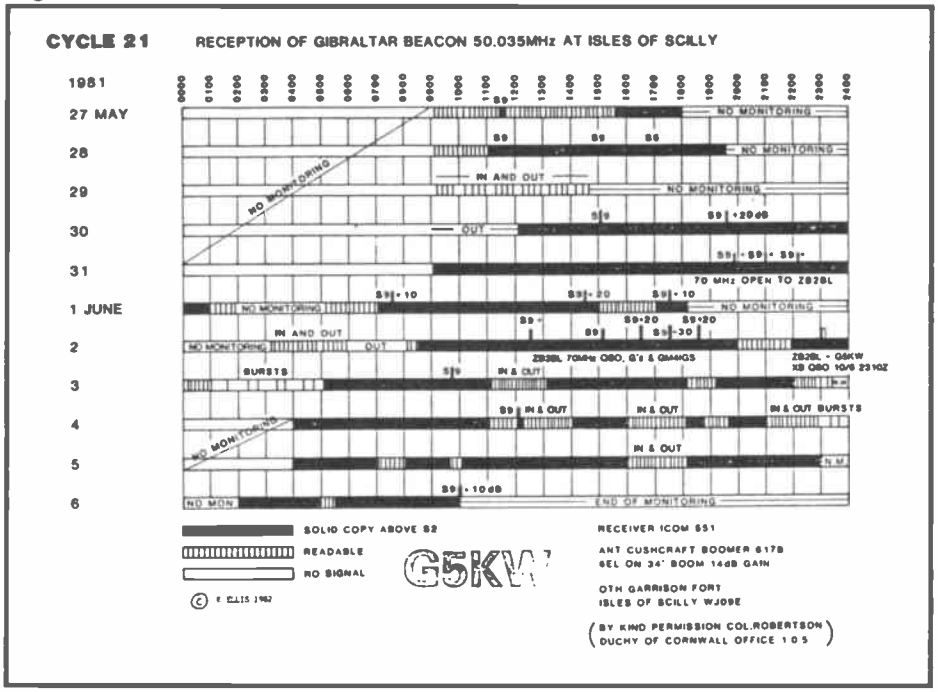
Double hop Es

Multi-hop propagation over a sea path can be more effective than over land since a calm sea is an excellent reflector, but in rough conditions a considerable 'scatter' effect will occur.

From my log, the first major Es opening in 1987 occurred on 19 June from 1830hrs to 1955hrs, when I contacted nine US stations in W1, W2, W5 and VE1YX. On 26 June I QSOd W6JKV/YVO on Avis Island. Another major opening took place on 21 July from 1940hrs to 2230hrs with VE1YX, followed by eight contacts with W1/W2, finishing with VE1YX again as the band faded out.

Last year the transatlantic path did not open for me until 6 June, although many openings occurred from other locations. My first QSO was with WD4KPD, in North Carolina, at 1525hrs. This was followed by fifteen QSOs with W1, 2, 3 and KB4CSE at 0008hrs on the 7th. The October 1987

Fig 1



RSGB newsletter, edited by G4ASR, contains a full account of these openings from 25 May to 21 July 1987.

Conclusions

G H Grayer G3NAQ, an authority on 50MHz openings, wrote a thesis dated 19 November 1987 which states: 'The majority of 50MHz openings are as a result of multi-hop Sporadic-E reflections.' However, in the March 1987 issue of ***Amateur Radio***, another authority on the subject contends: 'Opinions differ amongst the more experienced as to whether they are due to multi-hop Es or a form of ducting when Es are present at both ends of the path'.

Ray Cracknell G2AHU, an expert on propagation, writes: 'I have always been a believer in the old army frequency selection method of looking only at the first and last point of refraction from the ionosphere. If we do this we see that although the first point of encounter to the south/west is undoubtedly from Es, the last is almost certainly from F2. Whatever happens in between is a matter of *your guess is as good as mine*.'

From the mailbag

Mike G3SED, from Portsmouth, has sent in this report.

'After the large aurora of 13-14 March, 6m continued to yield daily TEP openings to central and southern Africa. On the south coast of England, peak times were between 1000hrs to 1300hrs, and on good days a further "greyline" peak occurred at around 1730hrs. Stations worked on 15 March include 9H1CG, 9H1JQ (running 200mW) and 9H1ES (running 500mW). During 18-30 March: G3GJQ/5NO, TU2MA, J52US, PZ1AP, LU9AEA, KP2A, TR8CA and forty-eight ZA QSOs.'

Mike G3JVL, also from Portsmouth, sent this report which covers 8 March to 13 April, when he had over 120 QSOs with fourteen different countries.

'On 12 March at 1657hrs, the very high solar noise continued after our sunset time up to −100dBm for a long while.

'On 13 March at 1400hrs, I witnessed the best aurora I have ever seen or heard. At 1414hrs PA0HIP was first heard at 31A. During the rest of the day and up to 0230hrs the next day, this event continued with very strong signals for most of the time. Stations in G, GD, GI, GM, GW, EI, PA, LA and SM were worked on 6m, and further crossband contacts were made with DL, HB9 and OZ.

'OH9NLO, near the Arctic circle, was heard for a long time without a QSO being made. In Portsmouth, no transatlantic signals were heard in IO9OMS. There were reports of VE1YX being heard and of him hearing the GB3SIX beacon, although he made no QSOs. The only reported QSO was made by G4GLT with a W1.

'On 18 March CT8LN was heard working CX8BE and LU3EX . They were not audible in the UK.

'On 26 March at 1137hrs, ZR5AAX worked G3SED. He was not audible, even though he was only 15km to the south of Portsmouth! This is a typical example of how localised some of these intriguing openings can be. Don't blame your rig or aerial, it's a fact of life.'

That concludes another month. See you next time. 73 de Ken Ellis, 18 Joyes Road, Folkestone, Kent CT19 6NX.

The latest reported figures on the number of countries worked

Countries Worked

GJ4ICD	43	G6ION	29
G4JCC	42	G3UKV	28
G3JVL	41	G3SYC	26
G4UPS	41	G4IGO	26
G3SED	40	G2AOK	23
G5KW	38	GM4DGT	23
G4AHN	35	G4HBA	23

BUILD AN 80m TRANSCEIVER: THE DTR3 CW TRANSCEIVER KIT

by George Dobbs G3RJV

There are many reasons for the increase in amateur radio construction in recent times. I am not sure why it has happened, but the proof is in the increasing number of kits available for the radio amateur to build. I have seen a lot of kits in the last few years and, like any field of human endeavour, they range from the good, to the bad, via the indifferent.

My attention was drawn to the Lake Electronics DTR3 CW Transceiver for a number of reasons. As secretary of the G QRP Club, I am interested in all types of QRP equipment, and this transceiver offers about 1½W on 80m; the most popular band for QRP Club members to work each other in the UK. I also know G4DVW, the designer of the transceiver, who has given many evening classes in radio construction. This transceiver originated from those classes and is the result of practical work with constructors rather than a designer sitting in an 'ivory tower'. Relying on sophisticated test equipment is no substitute for practical experience and being aware of the needs of the struggling novice.

The kit is supplied with everything except a soldering iron, solder and time to complete the project. It is designed for a novice to be able to build an amateur radio station on one band, and enjoy working stations with home-constructed equipment. The kit uses a form of modular construction which allows for stage-by-stage building to ease assembly and testing, and flexibility of use or modification.

Fig 1 shows the block diagram of the transceiver. This conventional direct conversion transceiver is of the type used by many QRP operators on 80m and other bands. The transceiver is controlled by a common VFO (variable frequency oscillator) for transmit and receive. **Fig 2** shows how the stages in the block diagram are translated into modular boards in the transceiver.

The transmitter

The signal is generated by a Colpitts VFO using a FET and two bipolar devices as a buffer amplifier/emitter follower with separate outputs to the transmit and receive circuits. The VFO is housed in its own screened aluminium box. A tuned driver stage feeds a Class C PA, which is terminated with a low pass filter to give 1.5W of RF output. The PA has simple zener diode protection, and the driver is keyed using a switching transistor.

A 'transmit/receive' switch on the front panel controls the voltages supplied to the various boards in the transceiver. A relay on the transmit board performs the antenna changeover function. This board is only energised when the switch is in the transmit position, therefore it is impossible to key the transmitter without an antenna present at the output. As the VFO is common on transmit and receive, RIT (receiver incremental tuning) offsets the VFO frequency during receive.

The receiver

The incoming signals are tuned by a two-stage input filter, which feeds the received signals into the product detector (or mixer) where they are mixed with the VFO signal. The resultant audio signal passes to an audio preamplifier, then it is amplified via an audio integrated circuit. The audio board also includes a sidetone generator to monitor the Morse on transmit.

Since most of the selectivity of a direct conversion receiver is achieved in the audio stages, audio filtering is placed between the audio preamplifier and output stages.

This passive LC filter circuit has a 6dB bandwidth of 250Hz and a peak response at 750Hz. Although the filter is too sharp to resolve SSB, the choice of a passive filter, rather than the more commonly used active filter, gives a shape factor that shuts out the unpleasant ringing generated from many audio filters. The popular LM386 output stage can drive a pair of 8 ohm headphones or a loudspeaker. The manual shows how the gain of this stage may be preset to suit by the simple selection of component values.

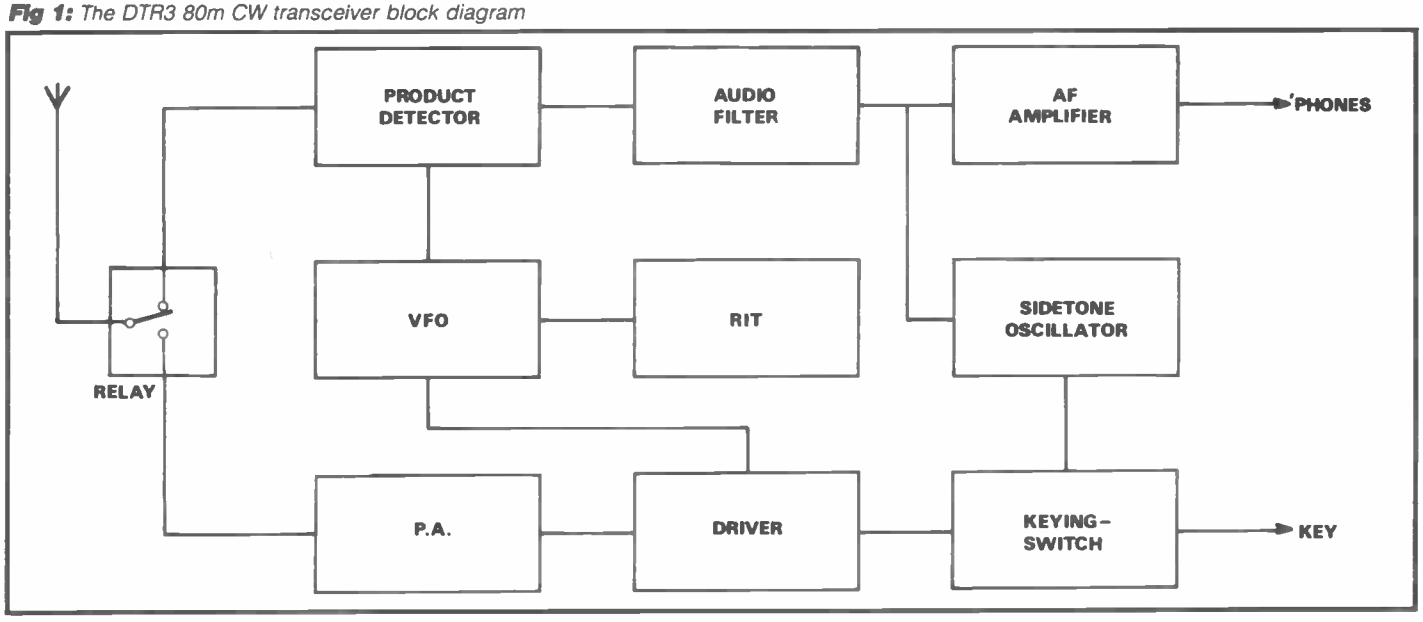
The kit

The kit comes complete with everything you need to build the receiver, from the wire to an attractive case with stick-on front panel. The components are of the highest quality, even down to the expensive Jackson Brothers variable capacitor. The circuit's modules are built on good-quality fibreglass printed circuit boards, complete with all the necessary hardware for mounting and interconnection.

The comprehensive constructor's manual contains a full textual guide to building the transceiver stage-by-stage, and is illustrated with very clear circuit and layout diagrams. The manual also includes information on identifying the components, mounting and soldering components, and a useful set of warnings about the common pitfalls of radio construction.

A beginner could easily build the kit

Fig 1: *The DTR3 80m CW transceiver block diagram*



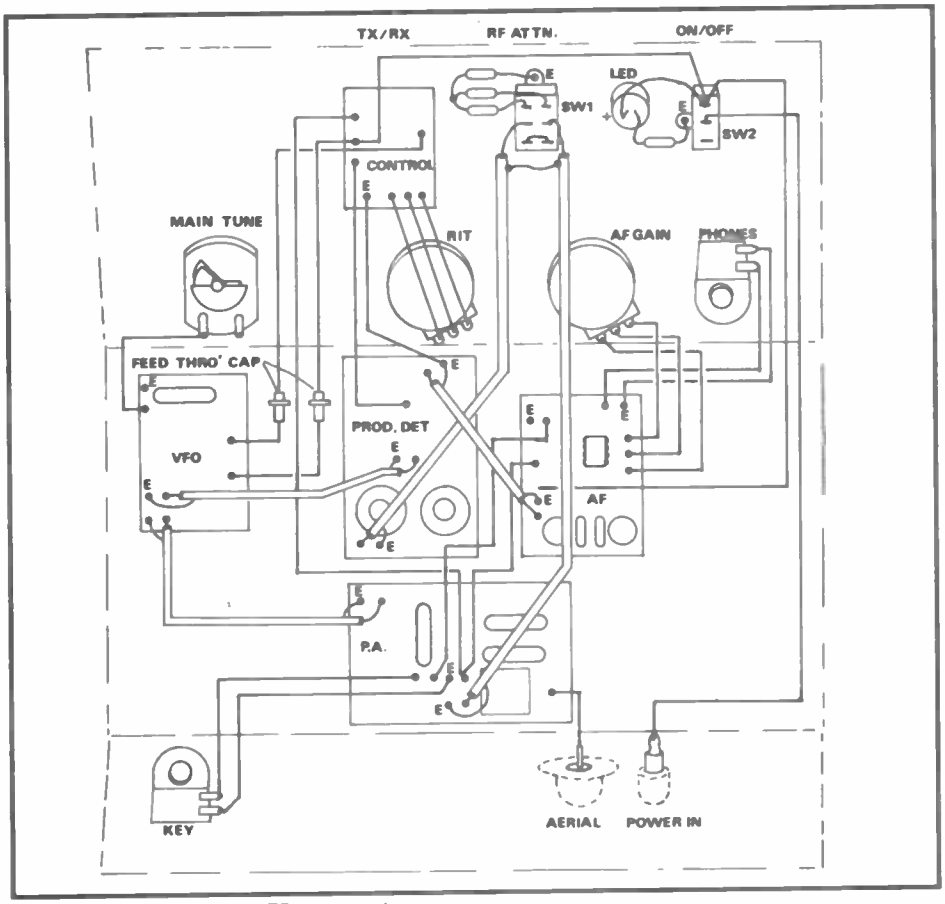


Fig 2: *The layout of the DTR3 transceiver*

Front panel view

from this manual. However, the only thing a manual cannot do is actually solder the joints, so beginners are advised to get in some soldering practice beforehand. Experience has taught me that bad soldering accounts for almost every failure in kit building.

My least favourite aspect of radio construction, putting the circuits together into a case, is clearly explained and illustrated. Instructions are also given for the precise cutting and dressing of the interconnection leads and board connections. The case is finished off with black front and rear panels with smart markings.

The manual concludes with detailed instructions on the setting up and testing of the transceiver. The only essential test equipment required are a multimeter and a calibrated receiver on the 80m band. The instructions take you through a simple stage-by-stage setting up procedure. The final page of the manual describes how to use the transceiver. Read this carefully, because it is possible to fail at QRP operation by not using the equipment correctly.

Conclusion

The DTR3 offers a simple way to operate QRP on 80m CW. The high quality kit and excellent manual make the project simple to build. Although 1½W does not seem like much power to inject on to an amateur band, my version of the DTR3 gained many reliable contacts around the UK and into Europe using a G5RV antenna. I liked the DTR3, it looks good and it works well. The circuitry is rather predictable for such a project, but this conservative approach to its design has resulted in a reliable product.

At £74.25 (plus £2.00 p&p), the kit did seem expensive at first glance. However, when you consider that many other kits require additional components and a cabinet, the expense is justified. For the money, *everything* is provided. The really wary can obtain a ready-built DTR3. Check with the manufacturer for a price.

The DTR3 is available from: Lake Electronics, 7 Middleton Close, Nuthall, Nottingham NG16 1BX. Tel: (0602) 382509.

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■ FDK ATC 720 sky (voice professional) airband monitor, 118-136 AM 720 channels, complete with charger, slightly scratched, £80.00 ono. Write to: Stuart Thompson, 13 Farrer House, Church Street, Deptford, London SE8 3DY

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■ Trio TR-9130, with mic, mounting bracket. Manual and original packing, £325.00. Hodec 12V dc 3 amp power supply £15.00, carriage extra for the above. Jaybeam C5/2m collinear, £40.00. Buyer collects. GM3AVA QTHR. Tel: (0324) 562420

■ Yaesu FRG7 communications receiver, very good condition, handbook and wiring diagram, £130.00 ono. 2m five-element Yagi, plus new rotary, with poles and vertical load, £50.00 ono. Tel: (0635) 522495 after 6pm

■ Westower, 25/FBP, two-sections, 45in wind up and tilt-over, full instructions. DX32 two element Tri-bander and six element 2m quad, £600.00. Paul QTHR. Tel: 061-973 1360

■ President Washington AM/USB/LSB, base station unit, ideal for conversion, mint condition, £60.00. Will swap for receiver/scanner. General-coverage and digital readout preferred. Tel: (0742) 478048

■ Rohde and Schwarz UHF SDR signal generator. 300 to 1000MHz. 1°V to 4V op, eight ranges, £75.00. Tel: (0945) 880893

■ Trio R1000 receiver, excellent condition, boxed, with manual, £180.00. Tel: (091) 2367395

■ Regency HX850E hand-held scanner, 75-106, 118-174, 406-495, AM/FM, twenty memories, search facility, rubber duck aerial, case and charger,

FREE CLASSIFIED ADS

£120.00. Will swap for 2m hand-held. WHY? Tel: (0657) 3305

■ Trio TM211E, digital code, squelch, £240.00. Yaesu FT-37R, two power packs, 3W and 5W output, £200.00, both as new boxed. Eddystone 77OU/2 UHF Rx, good condition with manual, £85.00. Tel: (0792) 467384

■ Sommerkamp TS788CC, excellent condition, 100W output, mainly used for receive AM/FM, USB/LSB, CW, £300.00 or £200.00 and three-element 10m beam. Tel: (0290) 24692

■ Grundig satellite 2100, 150kHz-30MHz in ten bands, plus FM, and SSB unit, manuals, £150.00. Tel: 01-570 5603

■ TS-830S, mint condition, HF rig, £695.00. Yaesu FT-747, still under warranty, with scanning mic, £520.00. Yaesu FT-560, 500W, 80-10, £190.00. Tel: (0843) 294446

■ Sony ICF-6700W, world radio FM, MW, all SW coverage, excellent condition, £160.00. Tel: (0245) 322082 evenings or weekends

■ Sell or exchange for FL-2100Z or similar HF linear, HF rig or 50MHz rig: standard C58 2m multimode portable, plus slide mount, 25W linear, two mobile brackets, Fist scan, mic, shoulder strap, three portable antennas, 30 Ni-Cads, two power leads, homebrew 2m ATU 15dB preamp, original boxes for rig, Linear owner's manual, £380.00. Also I have a Belcom LS-102L and Zetagi B300PS, 200W linear, all offers considered. Write to: J D Bolton G4XPP, 10 Bowness Road, Coniston Park Estate, Timperley, Cheshire WA15 7YA

■ Exchange: MTV 435 Tx/Rx microwave modules for Bearcat BC200XLT or any hand-held scanner with coverage up to 950MHz. Tel: 021-743 7519 between 6pm and 9.30pm

■ Ham International jumbo, mint condition, manual, boxed, will exchange for Yaesu FRG-7000, FRG-7 (with cash adjustment) or Trio 1000. Also Mapsat weather satellite decoder/receiver with software, cables, antenna, tapes, etc, including interface for CPC464, £200.00. Tel: (048 68) 29419 after 8pm

■ Strongarm 110V winch model SA5000, never used, £250.00. Yaesu FTV-107 transverter with 2m module, £150.00. Alan G1NRM. Tel: 01-534 4841 daytime, 01-959 3380 evening

■ Racal Dana 9837 frequency counter and timer, £80.00. Tel: (0784) 450947 after 6pm

■ IC-225 FM mobile, 2m, 10-12W, £12.00. Yaesu FT-708 70cm hand-held, plus case, Ni-Cad, charger, speaker and mic, £170.00. Mobile collinear and 8x8in stacked beam, £40.00. 30ft Alumast with base and rotator mounts, new, £190.00. Multimode 2m transverter, 2MHz IF, new, £80.00. Roger WHY? Tel: (0736) 754369

■ SV610 Shibaden pro reel-to-reel videotape recorder, needs servicing, ideal as amateur TV station, offers. Will swap for any mobile HF gear, HF Rx, VHF scanner – any working radio gear. WHY? Write to: G0CIG, 106 Goldbeaters Grove, Edgeware, London

■ Sony CRF-320 with manual, excellent condition, £550.00. Will exchange for Panasonic RF-9000. Tel: 061-743 1570

WANTED

■ Kenwood 5000 with VHF. Also Icom IC-7000, must be in mint condition, cash paid. Tel: 01-556 5131

■ Yaesu FT-2 or similar, must be in good working order and suitable for a beginner. Write to: Darren, 56 Broadway, Grimsby

■ Yaesu FT-767 or similar, FT-101 (any model), Alinco 2m hand-held, ALM or similar, VHF scanner Rx. Tel: (0843) 294446

■ Original handbook or manual for any of the following: Marconi Mercury; AR8576L; RA217; BRT402/400; 51J/R388; HRO50/500; R1475; BC348; R206; B46/B47/5AH; B41; TC512 Tx/Rx; B36; avo valve characteristic meter; WS62 and TR101. Include details of condition and price. Write to: K Barker, 29 St Andrews Court, Benton, Newcastle-upon-Tyne NE7 7UT

■ Instruction manual for the Panasonic DR29 (RF2900) receiver, original or photocopy. Sales brochures for transistor communications-type receivers (portable or table-top), any age and make. Non-working portable communications-type receivers, eg, Grundig, Satellit, Zenith Transoceanic and Panasonic DRs, etc), any condition. Workers considered if cheap. Brian. Tel: (0253) 866023

■ All types of military radio equipment from WW2, any condition. Also, wartime printed matter and cine film; particularly information on the type 62/62A RAF indicator (this is a radar unit, similar to a 'scope). Anything connected with the R1155 and T1154, including trailing and loop aerials, resistance units, drive boxes for loop aerials, etc. Tel: (0908) 73114, ask for A Howard

■ Yaesu NC15 PSU/quick charger for FT-209R hand-held. Tel: (0604) 414498

■ 16mm cine film, colour or monochrome, any subject, cash or some radio swaps available. Anything about WW2, radio, posters, etc, WHY? Also want RAF indicator type 62, etc. Tony. Tel: (0908) 73114 anytime

■ Icom IC-SP3 external speaker and Icom AH7000 discone, must be in excellent condition. Tel: (0206) 394336

■ Akai ¼in portable videotape recorder, in any condition. Also professional television broadcast equipment, WHY? Tel: (0253) 725499 day, (0253) 712769 evening

■ Yaesu SP102 speaker for FT-726R transceiver, must be in mint condition. Tel: (0286) 880851 after 6pm or weekends

■ AF unit for FT-707 or Sommerkamp FT-767DX, condition not important. Tel: (0296) 658115 any time

■ FRG9600, 100kHz-950MHz, or 60MHz-950MHz, must be in good condition, cash waiting. Write to: S Martin, 24 Collingwood Close, Worle, Weston-super-Mare, Avon BS22 9PQ. All letters answered

■ Large quantity of unwanted main frame computer parts, ie, printers, VDU, disc drive, graphics boards, PSU, boards, etc. Some good, some unknown, some bad! Exchange for anything military radio, including bits and parts, any condition, manuals, etc. WHY? Must be pre-1960. Also seeking 16mm cine films, any subject. A Howard. Tel: (0908) 73114 (Milton Keynes)

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

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.

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

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

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COPY enclosed.....☐ to follow.....☐

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

COMPANY .....

ADDRESS .....

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SAE for quote.
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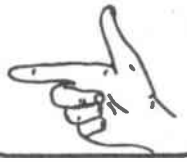

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Our kits are ideal for the Development Lab, service engineer, Repair Shop, Tech college and hobbiest alike. The components supplied in our kits are new and to full specification. They come individually packed in handy re-usable plastic tubes, all contained within a storage unit.

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Replacement tubes complete with Resistors 25p ea.

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KIT 50E12-10 12R-1MEG (60 values 10 of ea.) 600 = **£13.75**
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400mA IN4148 (200) 1Amp 4007 (50 ea.)
3 amp 5401,5408 (25 ea) Total 350 = **£12.00**
Any kit can be put together, if you or your company have a requirement for special or mixed kits we will be happy to quote. Please send sae for full component and product list. Please add 50p P&P and 15% VAT to all orders. MAIL ORDER ONLY

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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	£96.00	£92.00	£89.00	£53.00
126 x 90 or 61 x 186	¼ page	£115.00	£110.00	£106.00	£92.00
126 x 186 or 263 x 90	½ page	£226.00	£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
126 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£560.00	£530.00	£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 ad	mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
July 89	31 Mar 89	1 Jun 89	7 Jun 89	9 Jun 89	29 Jun 89
Aug 89	28 Jun 89	29 Jun 89	5 Jul 89	7 Jul 89	27 Jul 89
Sep 89	2 Aug 89	3 Aug 89	9 Aug 89	11 Aug 89	31 Aug 89
Oct 89	30 Aug 89	31 Aug 89	6 Sep 89	8 Sep 89	28 Sep 89

CONDITIONS & INFORMATION

SERIES RATES
Series rates also apply when larger or additional space to that initially booked is taken.
An ad of at least the minimum space must appear in consecutive issues to qualify for series rates.
Previous copy will automatically be repeated if no further copy is received.
A 'hold ad' is acceptable for maintaining your series rate contract. This will automatically be inserted if no further copy is received.
Display Ad and Small Ad series rate contracts are not interchangeable.

If series rate contract is cancelled, the advertiser will be liable to pay the unearned series discount already taken.

COPY
Except for County Guides copy may be changed monthly.
No additional charges for typesetting or illustrations (except for colour separations).
For illustrations just send photograph or artwork.
Colour Ad rates do not include the cost of separations. Printed – web offset.

PAYMENT
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.
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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.

No. 1 LIST BAKERS DOZEN PACKS

All packs are £1 each, if you order 12 then you are entitled to another free. Please state which one you want. Note the figure on the extreme left of the pack ref number and the next figure is the quantity of items in the pack, finally a short description.

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BD7 4 In flex switches with neon on/off lights, saves leaving things switched on.

BD9 2 6V 1A mains transformers upright mounting with fixing clamps.

BD11 1 6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.

BD13 12 30 watt reed switches, it's surprising what you can make with these—burglar alarms, secret switches, relay, etc., etc.

BD22 2 25 watt loudspeaker two unit crossovers.

BD29 1 B.O.A.C. stereo unit is wonderful breakdown value.

BD30 2 Nicad constant current chargers adapt to charge almost any nicad battery.

BD32 2 Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.

BD42 5 13A rocker switch three tags so on/off, or change over with centre off.

BD45 1 24hr time switch, ex-Electricity Board, automatically adjust for lengthening and shortening day, original cost £40 each.

BD49 10 Neon valves, with series resistor, these make good night lights.

BD56 1 Mini uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.

BD59 2 Flat solenoids—you could make your multi-tester read AC amps with this.

BD67 1 Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.

BD91 1 Mains operated motors with gearbox. Final speed 16 rpm, 2 watt rated.

BD103A 1 6V 750mA power supply, nicely cased with mains input and 6V output leads.

BD120 2 Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.

BD122 10m Twin screened flex with white pvc cover.

BD128 10 Very fine drills for pcb boards etc. Normal cost about 80p each.

BD132 2 Plastic boxes approx 3in cube with square hole through top so ideal for interrupted beam switch.

BD134 10 Motors for model aeroplanes, spin to start so needs no switch.

BD139 6 Microphone inserts—magnetic 400 ohm also act as speakers.

BD148 4 Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.

BD149 6 Safety cover for 13A sockets—prevent those inquisitive little fingers getting nasty shocks.

BD180 6 Neon indicators in panel mounting holders with lens.

BD193 6 5 amp 3 pin flush mounting sockets make a low cost disco panel.

BD196 1 in flex simmerstat—keeps your soldering iron etc. always at the ready.

BD199 1 Mains solenoid, very powerful, has 1in pull or could push if modified.

BD201 8 Keyboard switches—made for computers but have many other applications.

BD210 4 Transistors type 2N3055, probably the most useful power transistor.

BD211 1 Electric clock, mains operated, put this in a box and you need never be late.

BD221 5 12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.

BD242 2 6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.

BD252 1 Pansotat, controls output of boiling ring from simmer up boil.

BD259 50 Leads with push-on ¼in tags—a must for hook-ups—mains connections etc.

BD263 2 Cblong push switches for bell or chimes, these can mains up to 5 amps so could be foot switch if fitted into pattress.

BD268 1 Mini 1 watt amp for record player. Will also change speed of record player motor.

BD283 3 Mild steel boxes approx 3in x 3in x 1in deep—standard electrical.

BD293 50 Mixed silicon diodes.

BD305 1 Tubular dynamic mic with optional table rest.

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Generates approx. 10 times more IONS than the ETI and similar circuits. Will refresh your home, office, workroom etc. Makes you feel better and work harder—a complete mains operated kit, case included. £12.50+£2 P&P. Our ref 12P51.

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ECHO BOX Intended to make dolls and robots talk. These units record speech and other sounds then play back the sounds a few seconds after hearing it. Basically the unit consists of a FET microphone, a micro-processor and lots of ICs, transistors, etc., on a pcb, coupled to a 2in speaker. All put together in a case size approx 4½in x 2¾in x 1¾in deep. In addition to talking back undoubtedly these models could, with a few alterations, be made to perform functions in repsonse to sound frequencies. Price £5 each. Our ref 5P130.

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JOYSTICK FOR ATARI OR COMMODORE for all Atari and Commodore 64 and Vic20. New. Price £5. Order ref 5P126.

EXTRA SPECIAL OFFER. The ATARI Compendium contains computer 65XE data recorder XC12, joystick and ten games for **£62.50 plus £4 insured delivery.**

TIME AND TEMPERATURE LCD MODULE This is a 12 hour clock, a Celcius thermometer, a Fahrenheit thermometer, a too hot alarm and finally a too cold alarm. Nice size, approx 50mm x 20mm, with 12.7mm digits which clearly display the time or temperature. Requires only a 1.5V battery and a few switches. Comes complete with circuit diagram and explanation. Price £6. Our ref 6P12.

40 WATT THREE-WAY SPEAKER SYSTEM Woofer, mid-range and tweeter, all assembled in a shelf mounting case, size 180mm long x 100mm high x 140mm deep. Really beautifully made. 4ohm impedence. New and tested. £10 each. Our ref 10P64.

CAMERAS Three cameras, all by famous makers, Kodak, etc. One disc and two differnt instant cameras. All in first class condition, believed to be in perfect working order but sold as untested. You can have the three for £10 including VAT, which must be a bargain—if only for the lenses, flash gear, etc. Our ref 10P58.

1/8th HORSEPOWER 12 VOLT MOTOR. Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 5/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the ends by means of 2 nuts. A very powerful little motor which revs at 3,000 rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. price £6. Our ref 6P1, discount for quantities of 10 or more.

PHILIPS LASER

This is helium-neon and has a power rating of 1.6mW. Completely safe so long as you do not look directly into the beat when eye damage could result. Brand new, full spec, £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15. Battery operated P.S.U. now available at £15.

HAND-HELD VIDEO LAMP. Mains operated and will enable you to take professional standard videos. Made by the famous Ferguson Company, this uses a 1000w halogen lamp in a fan cooled, hand-held and hand-switched metal housing. Comes complete with optional barn-door assembly and camera bar. Obviously intended to retail at over £60, we offer these at £30 each plus £3 insured delivery. Our ref 30P3.

HIGH RESOLUTION MONITOR. 9in black and white, used Philips tube M24-306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new. **£16 plus £5 post.** Our ref 16P1.

12 VOLT BRUSHLESS FAN. Japanese made. The popular square shape (4½in x 4½in x 1¾in). The electronically run fans not only consume very little current but also they do not cause interference as the brush type motors do. Ideal for cooling computers, etc., or for a caravan. **£8 each.** Our ref 8P26.

ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has gold plated contacts and is complete with ribbon cable and edge connector. Brand new, only **£15 plus £3 postage.** Order ref 15P15.

MUSIC FROM YOUR SPECTRUM 128 We offer the Organ Master three octave keyboard, complete with leads and the interface which plugs into your 128. You can then compose, play, record, store, etc., your own music. Price £19 plus £3 special packing and postage. Order ref. 19P1.

FDD BARGAIN

3½in made by Chinon of Japan. Single sided, 80 track, Shugart compatible interface, interchangeable with most other 3½in and 5¼in drives. Completely cased with 4 pin power lead and 34 pin computer lead **£40.** Our ref 40P1.

OUR ALADDIN'S CAVE. You may be a new reader and now know that we have a shop at 12 Boundary Road, Hove, where you can go and have a browse around at our assortment of 'goodies'. Unfortunately, because of staff shortages, we cannot be open on Saturdays yet, so the hours are 9.30am to 5pm, Monday to Friday. We of course still serve callers at 250 but request that you bring a completed order form as 250 is really the mail order depot.

J & N BULL ELECTRICAL

Dept AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT

MAIL ORDER TERMS: Cash, PO or cheque with order. Orders under £20 add £1.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/card orders accepted. –minimum £5. Phone (0273) 734648 or 203500.

POPULAR ITEMS

Some of the many items described in our current list which you will receive if you request it

DOUBLE MICRODRIVES. We are pleased to advise you that the Double Microdrives which we were offering at about this time last year as being suitable for the 'QL', 'OPD' and several other computers are again available, same price as before namely £5. Our ref 5P113.

SOFTWARE FOR REMAKING. Just arrived. Large quantity of mainly games. All are on normal tape spool in cassette holders and should be suitable for wiping out and re-making into games or programmes of your own design. We offer 5 different for £2 or 100 assorted for £20. Important note: We cannot say which titles you will get nor accept orders for specified titles or 'so many, all different', etc., so only order if you can take them as they come. Order ref 5 for £2 is 2P224, 100 assorted is 20P10.

VERY USEFUL MAGNETS. Flat, about 1in long, ½in wide and ¼in thick. These are polarised on their faces which makes them ideal to operate reed switches in doors and windows or to hold papers or labels, etc., to metal cabinets, or even to keep cupboard doors firmly closed. Very powerful. 6 for £1. Our ref BD274(a).

ACORN COMPUTER DATA RECORDER REF ALF03 Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44.

FREE POWER! Can be yours if you use our solar cells—sturdily made modules with new system bubble magnifiers to concentrate the light and so eliminate the need for actual sunshine—they work just as well in bright light. Voltage input is .45—you join in series to get desired voltage—and in parallel for more amps. **Module A** gives 100mA. Price £1. Our ref. BO631. **Module C** gives 400mA. Price £2. Our ref. 2P199. **Module D** gives 700mA. Price £6. Our ref. 6P3.

SOLAR POWERED NI-CAD CHARGER 4 Ni-Cad battenes AA (HP7) charged in eight hours or two in only 4 hours. It is a complete, boxed ready to use unit. Price £6. Our ref. 6P3.

SWITCH AC LOADS WITH YOUR COMPUTER This is easy and reliable if you use our solid state relay. This has no moving parts, has high input resistance and acts as a noise barrier and provides 4kW isolation between logic terminals. The turn-on voltage is not critical, anything between 3 and 30V, internal resistance is about 1K ohm. AC loads up to 10A can be switched. Price is £2 each. Ref. 2P183.

METAL PROJECT BOX Ideal size for battery charger, power supply, etc.; sprayed grey, size 8in x 4¼in x 4in high, ends are louvred for ventilation other sides are flat and undrilled. Price £2. Order ref. 2P191.

4-CORE FLEX CABLE. Cores separately insulated and grey PVC covered overall. Each copper core size 7/0.2mm. Ideal for long telephone runs or similar applications even at mains voltage. 20 metres £2. Our ref.2P196 or 100 metres coil £8. Order ref. 8P19.

6-CORE FLEX CABLE. Description same as the 4-core above. Price 15 metres for £2. Our ref. 2P197 or 100 metres £9. Our ref. 9P1.

13A PLUGS Fins sleeved for extra safety, parcel of 5 for £2. Order ref. 2P185.

13A ADAPTERS Takes 2 13A plugs, packet of 3 for £2. Order ref. 2P187.

28V-0-28V Mains transformers 2½ amp (100 watt) loading, tapped primary, 200-245 upright mountings £4. Order ref. 4P24.

BURGLAR ALARM BELL—6" gong OK for outside use if protected from rain. 12V battery operated. Price £8. Ref. 8P2.

VERY RELIABLE CAPACITOR 4.7μ 400v not electrolytic so not polarised, potted in ali can, size 1¾ x ¾ x 1½in high. A top grade capacitor made for high class instrument work. Ideal for PCB mounting. 2 for £1. Our ref BD667.

CAPACITOR BARGAIN—axial ended, 4700μF at 25V. Jap made, normally 50p each, you get 4 for £1. Our ref. 613.

SINGLE SCREENED FLEX 7.02 copper conductors, pvc insulated then with copper screen, finally outer insulation. In fact quite normal screened flex. 10m for £1. Our ref BD668.

M.E.S. BULB HOLDERS Circular base batten type fitting. 4 for £1. Our ref BD127a.

SPRING LOADED TEST PRODS—Heavy duty, made by the famous Bulgin company, very good quality. Price 4 for £1. Ref. BO597.

3-CORE FLEX BARGAIN No. 1—Core size 5mm so ideal for long extension leads carrying up to 5 amps or short leads up to 10 amps. 15mm for £2. ref. 2P189.

3-CORE FLEX BARGAIN No. 2—Core size 1.25mm so suitable for long extension leads carrying up to 13 amps, or short leads up to 25A. 10m for £2. Ref. 2P190.

ALPHA-NUMERIC KEYBOARD—This keyboard has 73 keys giving trouble free life and no contact bounce. The keys are arranged in two groups, the main area is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13" x 4"—brand new but offered at only a fraction of its cost, namely £3, plus £1 post. Ref. 3P27.

WIRE BARGAIN—500 metres 0.7mm solid copper tinned and p.v.c. covered. Only £3 plus £1 post. Ref. 3P31—that's well under 1p per metre, and this wire is ideal for push on connections.

1/8th HORSEPOWER 12 VOLT MOTOR Made by Smiths, the body length of this is approximately 3in, the diameter 3in and the spindle 5/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6P1, discount for quantities of 10 or more.

3 VOLT MOTOR Very low current so should be very suitable for working with solar cells. £1 each. Our ref BD681.

MINI SPEAKERS to use instead of headphones with your personal stereo—simply plug in to earphone socket. Excellent sound quality, only £4 per pair. Our ref 4P34.

SEALED LEAD ACID BATTERIES Japanese made re-chargeable and maintenance-free. Leak-proof construction, so could be used in any position. Long life expectancy—usually four to five years. 12V 2.6Ah, £10 each. Our ref 10P59. 6V 1Ah, £5 each. Our ref 5P135.

INNER EAR STEREO HEADPHONES Ideal for lady listeners as they will not mess up your hair do! Come complete in a neat carrying case. Price £3. Our ref 3P56.

STEREO HEADPHONE AMPLIFIER Very sensitive. A magnetic cartridge or tape head will drive it. Has volume control and socket for stereo headphones. 3V battery operated. £1 each. Our ref BD680.

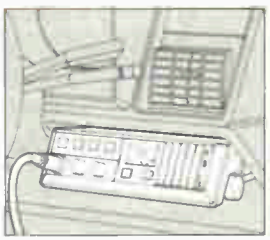
FET CAPACITOR MICROPHONE EAGLE CI.200 Output equivalent to a high class dynamic microphone while retaining the characteristics of a capacitor microphone. Price £1. Our ref BD646.

SUB-MIN TOGGLE SWITCH Body size 8mm x 4mm x 7mm SBDT with chrome dolly fixing nuts. 4 for £1. Our ref BD649.

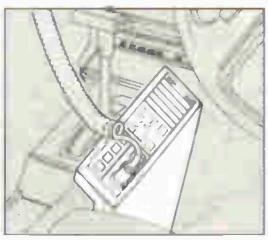
SUB-MIN PUSH SWITCH DPDT. Single hole fixing by hexagonal nut. 3 for £1. Our ref BD650.

DISPLAY 16 CHARACTER 2 LINE As used in telephone answering and similar machines. Screen size 85mm x 36mm x 9.3mm. Alpha-numeric, dot matrix module with integral CMOS micro processor. LCD display. Made by the EPSON Company, reference 16027AR. Price £10. Our ref 10P50.

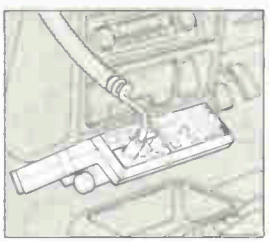
The new AMR1000/S
It checks out from every angle



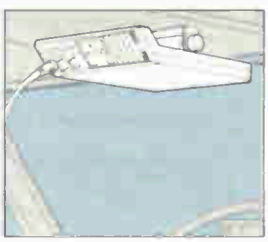
Under dash mounted (side)



Central console mounted



Under dash (central)



Roof mounted

Whichever way you look at it, the Navico AMR1000/S sets new standards in 2m mobile transceivers.

The angled, reversible control panel, together with a range of inexpensive optional mounting brackets enables installation in any vehicle, whether under or on top of the dash, either side of a central console or even from the roof.

This means the display will always face you giving total access to the controls which are spaced to allow simple, safe, mobile operation. The front mounted loudspeaker will also face you, projecting the sound toward you and not at your feet or into the dashboard.

Combine this with the most sensitive and selective receiver, an audio response tailored for today's busy band and the unique, fully automatic repeater/simplex operating facilities and you have a truly remarkable mobile radio.

There is also a choice of models to suit your exact needs. In the words of Chris Lorek of HRT about the Navico AMR1000/S "Not only does it out-perform its competition on technical grounds but it offers many very useful operating features not found on other rigs, and sells at what appears to be a very competitive price".

Check it out for yourself, prices start at just £247.25 (incl. VAT). For more details and to arrange a personal demonstration clip the coupon today.

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