MARCH 1987 £1.35

Amateur RADIO

For all two-way radio enthusiasts

Teaching Morse

Receiving weather FAX

Power supply protection

On test: Icom IC275E 2m multimode and the ICμ2 2m FM hand-held transceiver

R. WITHERS COMMUNICATIONS LTD

Manufacturers, importers and suppliers of world famous communications products
584 HAGLEY ROAD WEST OLDBURY, WARLEY, BIRMINGHAM B68 0BS
021-421 8201/2/3. CELLNET 0860 323056. PRESTEL MBX 214218216 FAX 0215614074
Amateur Radio. Business Radio. Radio Telephones. Sales. Service Accessories and antenna systems.

ICOM YAESU

THE TECHNICALLY ORIENTATED RADIO COMMUNICATIONS SPECIALISTS.

A WORLD FIRST FROM RWC LTD

YAESU FRG9600/RWC MK3 HF-UHF SERIES

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

We have fitted a High performance HF Front-End made for us by AKD. The new HF section **is fitted internally** with switching circuits and a small toggle Switch on the rear apron to enable band change whereby the display changes to read actual frequency (100kHz-60MHz). The standard SO239 antenna connector has now been changed for an 'N' connector for coverage from 60-90MHz and an SO239 connector fitted for HF coverage 100kHz-60MHz. (UHF extended coverage is now standard as per our original MK2 modification up to 950MHz).

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

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

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

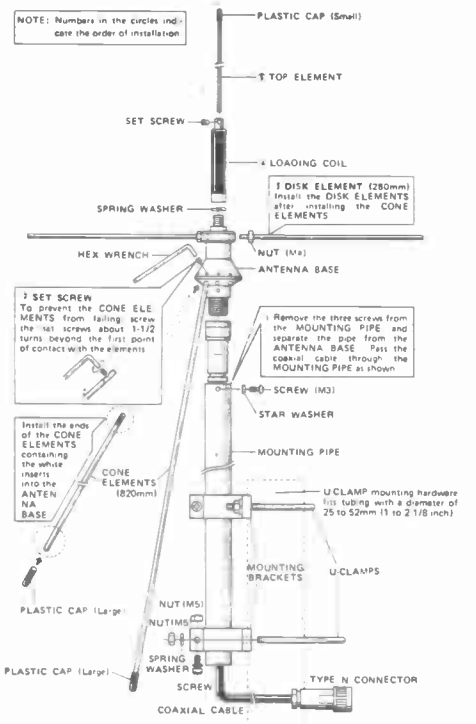
FRG9600/RWC MK3

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

Ask the hundreds of FRG9600/RWC MK2 owners how pleased they are!
FRG9600 MK2 Model 60-950MHz 'N' connector @ £519.00 + £5.00 carriage. (Modified unit only).
FRG9600 MK3 Model 100kHz-950MHz 'N' connector and SO239 for HF @ £625.00 + £5.00 carriage. (Modified unit only).
RWC Exclusive Base Station Complete HF-UHF Package FRG9600 MK3 Model, Icom AH7000 ant, G5RV HF multiband, PA4C ac-13V dc adaptor, inclusive carriage UK £725.00.

ICOM AH-7000

SUPER WIDEBAND OMNIDIRECTIONAL ANTENNA



SPECIFICATIONS

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

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

YAESU/RWC FRG9600 Options.

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

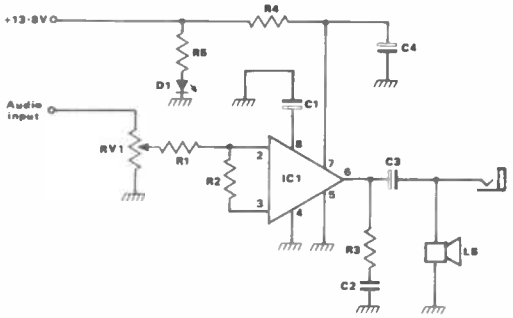
EXPORT & TRADE ENQUIRIES INVITED.

PLEASE ASK FOR COLOUR BROCHURE & SPECIFICATIONS.

Tel: 021 421 8201 (24hr answerphone)
Telex: 334303 G TXAGWM

Access BARCLAYCARD VISA AMERICAN EXPRESS DINERS CLUB INTERNATIONAL RWC Credit Card Fast Mail Order

Amateur RADIO



SERVICES

Editor: Anita Ley
Assistant Editor: Jane Berry
Advertisement Manager: Marian Vidler
Advertisement Executive: Karen Turner
Subscriptions: 01-760 0409
Accounts: Clare Brinkman
Publisher: Peter Williams
On sale: Last Thursday of the month preceding cover date
Next issue: Cover date April 1987 on sale 26 March 1987
Published by: Amateur Radio Magazines, Sovereign House, Brentwood, Essex CM14 4SE, England (0277) 219876
Printed: In England
ISSN: 0264-2557
News Trade Sales by: Argus Press Sales & Distribution Ltd, 12-18 Paul Street, London EC2A 4JS. 01-247 8233

Front cover: Icom IC275E 2m multimode. Photo by Jay Moss-Powell G6XCIB

P.M. COMPONENTS LTD

PHONE 0474 60521

Access

(SELECTRON HOUSE, SPRINGHEAD ENTERPRISE PARK GRAVESEND, KENT DA11 8HD

TELEX 966371 TOS PM

INTEGRATED CIRCUITS

AN134	2.00	MC1351P	1.50	TA7120P	1.65	TBA720A	2.45	TDA2581	2.95		
AN214Q	2.50	MC1357	2.35	TA7129P	2.50	TBA750Q	2.65	TDA2582	2.95		
AN239	2.50	MC1358	1.58	TA7130P	1.50	TBA800	0.99	TDA2593	2.95		
AN240P	2.50	MC14518CP		TA7137P	1.00	TBA810AS	1.65	TDA2600	2.50		
AN264	2.50	7.50		TA7176AP	2.95	TBA810P	1.65	TDA2610	2.50		
AN612	2.15	MC1495	3.00	TA7193P	3.95	TBA820M	0.75	TDA2611A	1.95		
AN362L	2.50	MC1496	1.25	TA7203	2.95	TBA820Q	1.45	TDA2640	3.50		
AN7140	2.50	MC145106P		TA7204P	2.15	TBA890	2.50	TDA2680A	2.75		
AN7145	3.50		7.95	TA7205AP	1.15	TBA920	1.65	TDA2690	2.45		
AN7145M	3.95	MC1723	0.50	TA7222AP	1.80	TBA950/2X		TDA3310	2.95		
AN7150	2.95	MC3357	2.75	TA7227P	4.25		2.35	TDA4600	2.50		
BA521	2.35	MC3401L	2.50	TA7310P	1.80	TBA990	1.49	TDA9503	3.15		
CA1352E	1.75	ML231B	1.75	TA7313AP	2.95	TBA990Q	1.49	TDA3560	3.95		
CA3086	0.48	ML232B	2.50	TA7314P	2.95	TCA270	1.50	TEA1009	1.38		
CA3123E	1.95	MSM5807	8.75	TA7137P	1.00	TCA270SQ		UPC566H	2.95		
CA314OT	1.15	PLL02A	5.75	TA7314P	2.95		1.50	UPC575C2			
ETT6016	2.50	SAA500A	3.50	TA7321P	2.25	TCA650	2.50		2.75		
HA1339A	2.95	SAA1025	7.25	TA7609P	3.95	TCA800	2.95	UPC1025H			
HA1366W	2.75	SAS560S	1.75	TA7611AP	2.95	TCA830S	1.95		1.95		
HA1377	3.50	SAS570S	1.75	TAA310A	3.50	TCA900	2.50	UPC1028H			
HA1156W	1.80	SAS580	2.85	TAA320A	3.50	TCA940	1.65		1.95		
HA1551	2.95	SA/SB/T/U		TAA350A	1.95	TDA440	2.20	UPC1032H			
LA1230	1.95		1.00	TAA570	1.95	TDA1001	2.95		1.80		
LA4102	2.95	SL901B	7.95	TAA661B	1.95	TDA1002A	2.95	UPC1156H			
LA4140	2.95	SL917B	6.65	TAA700	1.70	TDA1003A	3.95		2.75		
LA4031P	1.95	SL1310	1.80	TBA120AS/B/-C	1.00	TDA1006A	2.50	UPC1158H			
LA4420	1.95	SL1327	1.10	TBA395	1.50	TDA1010	2.15		0.75		
LA4430	2.50	SL1327Q	1.10	TBA396	0.75	TDA1035	2.50	UPC1167C2			
LA4400	4.15	SN76003N	3.95	TBA440N	2.55	TDA1037	1.95		1.95		
LA4422	2.50	SN76013N	3.95	TBA480Q	1.25	TDA1044	2.15	UPC1181H			
LA4461	3.95	SN76023N	3.95	TBA510	2.50	TDA1170	1.95		1.25		
LC7120	3.25	SN76033N	3.95	TBA510Q	2.50	TDA1190	2.15	UPC1182H			
LC7130	3.50	SN76110N	0.89	TBA520	1.10	TDA1270Q	3.95		2.95		
LC7131	3.50	SN76115N	1.25	TBA520Q	1.10	TDA1327	1.70	UPC1185H			
LC7137	3.50	SN76131N	1.30	TBA530	1.10	TDA2002	1.95		3.95		
LM1011	3.15	SN76226DN		TBA530Q	1.10	TDA2003	2.95	UPC1191V	1.50		
LM324N	0.48		2.95	TBA540	1.25	TDA2010	1.95	UPC1350C			
LM380N8	1.50	SN76227N	1.65	TBA540Q	1.35	TDA2020	2.95		2.95		
LM380N8	1.75	SN76533N	1.65	TBA550Q	1.95	TDA2030	2.80	UPC1353C			
LM383T	2.95	SN76544N	2.65	TBA560C	1.45	TDA2140	3.95		2.45		
LM390N	3.50	SN76650N	1.15	TBA560Q	1.45	TDA2151	1.95	UPC1365C			
M51513L	2.30	SN76660N	0.90	TBA570	1.00	TDA2160	2.50		3.95		
M5155L	2.95	STK014	7.95	TBA651R	2.50	TDA2521	3.25	UPC2002H			
M51521L	1.80	STK015	5.95	TBA720A	2.45	TDA2522	1.95		1.95		
MB3712	2.00	STK025	11.95	TBA750Q	2.65	TDA2523	2.95	555	0.35		
MB3756	2.50	STK043	9.50	TBA800	0.89	TDA2524	1.95	556	0.50		
MC1307P	1.00	STK078	11.95			TDA2530	1.95	723	0.50		
MC1310P	1.95	STK415	7.95			TDA2532	1.95	741	0.35		
MC1327	1.70	STK433	5.95			TDA2540	1.95	747	0.50		
MC1327Q	0.95	STK435	7.95			TDA2541	2.15	748	0.35		
MC1349P	1.20					TDA2560	2.15	7808	0.60		
MC1350P	0.95					TDA2571	2.95	7805	0.65		
								7812	0.65		
								7815	0.65		

SEMICONDUCTORS

AAY12	0.25	BC182	0.10	BD238	0.40	BFX68	0.25	TIP32C	0.42		
AC126	0.45	BC182LB	0.10	BD242	0.65	BFY50	0.21	TIP33C	0.95		
AC127	0.20	BC183	0.10	BD246	0.75	BFY51	0.21	TIP34B	0.95		
AC128	0.28	BC183L	0.09	BD376	0.32	BFY52	0.25	TIP41A	0.45		
AC128K	0.32	BC184LB	0.09	BD410	0.65	BFY90	0.77	TIP41C	0.45		
AC141	0.28	BC204	0.10	BD434	0.65	BLY48	1.75	TIP42C	0.47		
AC141K	0.34	BC207B	0.13	BD437	0.75	BR100	0.26	TIP47	0.65		
AC142K	0.45	BC208B	0.13	BD438	0.75	BR101	0.49	TIP120	0.60		
AC176	0.22	BC212	0.09	BD520	0.65	BR103	0.55	TIP125	0.65		
AC176K	0.31	BC212L	0.09	BD538	0.65	BR303	0.95	TIP142	1.75		
AC187	0.25	BC212LA	0.09	BD597	0.95	BRC4443	1.15	TIP146	2.75		
AC187K	0.28	BC213	0.09	BD701	1.25	BRY39	0.45	TIP161	2.95		
AC188	0.25	BC213L	0.09	BD702	1.25	BT100A/02	0.85	TIP2955	0.80		
AC188K	0.37	BC214	0.09	BD707	0.90	BT106	1.49	TIP3055	0.55		
AD142	0.79	BC214C	0.09	BDX32	1.50	BT116	1.20	TIS91	0.20		
AD143	0.82	BC214L	0.09	BF115	0.35	BT119	3.15	TV106/2	1.50		
AD149	0.70	BC237B	0.09	BF119	0.65	BT120	1.65	ZRF0112	16.50		
AD161	0.39	BC238	0.09	BF127	0.39	BU105	1.95	2N1100	6.50		
AD162	0.39	BC239	0.12	BF154	0.20	BU108	1.69	2N1308	1.35		
AD161/2	0.90	BC251A	0.12	BF158	0.22	BU124	1.25	2N1711	0.30		
AF106	0.50	BC252A	0.15	BF160	0.27	BU125	1.25	2N2219	0.28		
AF114	1.95	BC258	0.25	BF167	0.27	BU126	1.60	2N2905	0.40		
AF121	0.60	BC258A	0.39	BF173	0.22	BU204	1.55	2N3053	0.40		
AF124	0.65	BC284	0.30	BF177	0.38	BU205	1.30	2N3054	0.59		
AF125	0.35	BC300	0.30	BF178	0.28	BU208	1.39	2N3055	0.52		
AF126	0.32	BC301	0.30	BF179	0.34	BU208A	1.52	2N3702	0.12		
AF127	0.65	BC303	0.26	BF180	0.29	BU208D	1.85	2N3703	0.12		
AF139	0.40	BC307B	0.09	BF181	0.29	BU326	1.20	2N3704	0.12		
AF150	0.60	BC327	0.10	BF182	0.29	BU326S	1.50	2N3705	0.20		
AF178	1.95	BC328	0.10	BF183	0.29	BU407	1.24	2N3706	0.12		
AF239	0.42	BC337	0.10	BF184	0.28	BU500	2.25	2N3708	0.12		
AU106	4.50	BC338	0.09	BF185	0.28	BU508A	1.95	2N3733	9.50		
AU107	3.50	BC347A	0.13	BF194	0.11	BU526	1.90	2N3773	2.75		
AU110	3.50	BC461	0.35	BF195	0.11	BU807	2.25	2N3792	1.35		
AY102	2.95	BC478	0.20	BF196	0.11	BUY20	2.15	2N4280	3.50		
BC107A	0.11	BC527	0.20	BF197	0.11	BUY69B	1.70	2N4427	1.95		
BC107B	0.11	BC547	0.10	BF198	0.10	MJ3000	1.98	2N4444	1.15		
BC108	0.10	BC548	0.10	BF199	0.14	MJE340	0.40	2N5294	0.42		
BC108A	0.11	BC549A	0.10	BF200	0.40	MJE350		2N5296	0.48		
BC108B	0.12	BC550	0.14	BF241	0.15	MJE520	0.48	2N5298	0.60		
BC109	0.10	BC557	0.08	BF245	0.30	MJE2955		2N5485	0.45		
BC109B	0.12	BC557B	0.08	BF257	0.28	MPSA13	0.29	2N5496	0.95		
BC109C	0.12	BC558	0.10	BF258	0.28	MPSA92	0.30	2SA329	0.95		
BC114A	0.09	BC639/10	0.30	BF259	0.25	MRF237	4.95	2SA715	0.60		
BC116A	0.15	BCY33A	1.60	BF271	0.26	MRF450A		2SC495	0.80		
BC117	0.19	BD115	0.30	BF273	0.18		13.95	2SC496	0.80		
BC119	0.24	BD124P	0.59	BF336	0.34	MRF453	17.50	2SC931D	0.95		
BC125	0.25	BD131	0.42	BF337	0.29	MRF454	26.50	2SC1096	0.80		
BC139	0.20	BD132	0.42	BF338	0.32	MRF455	17.50	2SC1106	2.50		
BC140	0.31	BD133	0.40	BF355	0.37	MRF475	13.50	2SC1172Y	2.20		
BC141	0.25	BD135	0.30	BF362	0.36	MRF477	14.95	2SC1173	1.15		
BC142	0.21	BD136	0.30	BF363	0.65	OC16W	1.98	2SC1307	1.75		
BC143	0.24	BD137	0.32	BF371	0.28	OC23	1.50	2SC1364	0.50		
BC147A	0.12	BD138	0.30	BF394	0.19	OC29	2.25	2SC1449	0.50		
BC147B	0.12	BD139	0.32	BF422	0.32	OC36	2.25	2SC1678	1.25		
BC148A	0.09	BD140	0.30	BF423	0.28	OC42	0.75	2SC1945	3.75		
BC148B	0.09	BD144	1.10	BF457	0.32	OC44	0.75	2SC1953	0.95		
BC149	0.09	BD150C	0.29	BF458	0.36	OC45	0.55	2SC1957	0.80		
BC153	0.30	BD159	0.65	BF467	0.65	OC70	0.45	2SC1969	1.95		
BC157	0.12	BD160	1.50	BF595	0.23	OC71	0.55	2SC2028	1.15		
BC158	0.09	BD166	0.95	BF597	0.25	OC75	0.55	2SC2029	1.95		
BC159	0.09	BD179	0.72	BFR39	0.23	OC81	0.50	2SC2078	1.45		
BC161	0.28	BD182	0.70	BFR40	0.23	OC16W	2.50	2SC2091	0.85		
BC170B	0.15	BD201	0.83	BFR81	0.25	R2008B	1.45	2SC2098	2.95		
BC171	0.09	BD202	0.65	BFR88	0.30	R2010B	1.45	2SC2166	1.95		
BC171A	0.10	BD203	0.75	BFR90	1.50	R2322	0.55	2SC2314	0.80		
BC171B	0.10	BD204	0.70	BFR91	1.75	R2323	0.55	2SC2371	0.36		
BC172	0.10	BD222	0.45	BFT42	0.35	R2540	2.45	2SC931D	0.95		
BC172B	0.10	BD223	0.50	BFT43	0.35	RCA16334	0.80	1SD234	0.50		
BC172C	0.10	BD225	0.45	BFW61	0.50	RCA16335	0.80	2SD325E	1.65		
BC173B	0.10	BD232	0.35	BFW92	0.55	320600	0.95	3N211	2.95		
BC174	0.09	BD233	0.35	BFX29	0.30	SKE5F	1.45	3SK88	0.95		
BC174A	0.09	BD234	0.35	BFX84	0.26	TIP29	0.40				
BC177	0.15	BD236	0.40	BFX85	0.32	TIP29C	0.42				
BC178	0.15	BD237	0.40	BFX86	0.30	TIP30C	0.43				
						TIP31C	0.65				

NEW BRANDED CATHODE RAY TUBES – Please allow additional £3 per tube for carriage

A1865/20	65.00	D14-173GR	58.00	M19-103W	58.00	M50-120GV	58.00
AW36 11	25.00	D14-181GH/98	58.00	M23-110GH	58.00	M50-120LC	58.00
CME822W	19.00	D14-181GJ	58.00	M23-112GM	58.00	S6AB	45.00
CME822GH	25.00	D14-181GM	53.00	M23-112GV	58.00	SE4/D-P7	45.00
CME1428GH	45.00	D14-181GM50	59.00	M23-112GW	58.00	SE42BP31AL	55.00
CME1428W	39.00	D14-182GH	59.00	M23-112KA	58.00	SE42BP31	55.00
CME1523W	39.00	D14-200BE	59.00	M23-112LD	58.00	SE5Fp31	55.00
CME1431GH	39.00	D14-200GA/50	58.00	M24-120GM	59.00	T937	65.00
CME1431W	39.00	D14-200GM	75.00	M24-120LC	59.00	T948N	65.00
CME202GH	45.00	D14-210GH	75.00	M24-120WAR	59.00	T948H	65.00
CME2024W	45.00	D14-270GH/50	75.00	M24-121GH	58.00	V4150LC	55.00
CME2325W	45.00	D14-310W	110.00	M28-12GH	58.00	V5004GR	59.00
CME3128W	45.00	D14-320GH/82	85.00	M28-13LC	49.00	V5004LD	59.00
CME3132GH	45.00	D14-340GH-KM	45.00	M28-13LG	49.00	V6001GH	65.00
CME3155W	45.00	D14-340KA	45.00	M28-13GR	49.00	V6007DP31	59.00
CRE1400	25.00	D16-100GH	65.00	M28-131GR	58.00	V6008GH	59.00
CV1450	35.00	D16-100GH/65	69.00	M28-133GH	58.00	V6034WA	59.00
CV1526	19.00	D16-100GH/67	65.00	M31-101GH	58.00	V604CLA	59.00
CV2185	15.00	D16-100GH/79	69.00	M31-182GR	58.00	V6048J	49.00
CV2191	19.00	D16-100GH97	65.00	M31-182GV	63.00	V6052GR	65.00
CV2193	15.00	D18-160GH	69.00	M31-184W	58.00	V6064BP31	55.00
CV5119	85.00	D21-10GH	65.00	M31-184GH	58.00	V6064CLA	55.00
CV5320	85.00	DB7 36	35.00	M31-184P31	58.00	V6069GH	55.00
CVX389	55.00	DB7 36	55.00	M31-186W	69.00	V6070P31	49.00
D9-110GH	39.50	DG7 5	55.00	M31-190GH	58.00	V7016A	65.00
D10-210GH	45.00	DG7 32	45.00	M31-190GR	58.00	V7030	59.00
D10-210GH68B	65.00	DH3 91	55.00	M31-190LA	58.00	V7031GH	59.00
D10-230GH	35.00	DH7 91	45.00	M31-191GV	58.00	V7031/67A	59.00
D10-230GM	35.00	DP7 5	35.00	M31-220W	59.00	V7035A	49.00
D10/293GY/90	55.00	DP7 6	35.00	M31-270GY	65.00	V7037GH	45.00
D13-30GH	49.50	DN13 78	35.00	M31-271P31	65.00	V8004GR	65.00
D13-47GH/26	69.00	F16-101GM	75.00	M31-271GW	65.00	V8006GH	65.00
D13-47GM	55.00	F16-101LD	75.00	M36-141W	75.00	V8010A	65.00
D13-51GL/26	85.00	F21-130GR	75.00	M36-170LG	75.00	2BP1	13.50
D13-51GM/26	85.00	F21-130LC	75.00	M38-103GR	65.00	3BP1	11.50
D13-450GH/01	55.00	F31-10GM	75.00	M38-120W	65.00	3DP1	11.50
D13-471GH/26	55.00	F31-10GR	75.00	M38-120WA	65.00	4EP1	30.00
D13-610GH	59.00	F31-10LC	75.00	M38-121GHR	65.00	3H/QBM	55.00
D13-611GH	59.00	F31-10LD	75.00	M38-121LA	65.00	3WP1	18.50
D13-611GM	59.00	F31-12LD	75.00	M38-122GW	65.00	5BP1	9.00
D13-630GH	59.00	F31-13GR	75.00	M38-140LA	65.00	5BMP1	30.00
D14-150GH	75.00	F31-13LD	75.00	M38-142LA	65.00	5BMP1FF	30.00
D14-150GM	75.00	F31-13LG	75.00	M38-341P31	65.00	5BHP31	30.00
D14-172GH/84	59.00	F41-123LC	185.00	M38-344P39	65.00	5CP1	10.00
D14-172GR	55.00	F41-141LG	185.00	M40-120W	59.00	6EP7/S	39.00
D14-172GV	55.00	F41-142LC	185.00	M43-12LG/01	65.00	13BP1	13.50
D14-173GH	55.00	M7-120W	19.00	M44-120LC	65.00	13BP4	17.50
D14-173GM	53.00	M14-100GM	45.00	M50-120GH	65.00	17DWP4	25.00
		M14 100LC	45.00	M50-120GR	65.00	32J/1085	69.00
		M17-151GVR	175.00			1273	39.00
		M17-151GR	175.00			1564	39.00
						1844	45.00
						55451GM	75.00
						9442E1	80.00
						9547GM	75.00
						95449	75.00
						7709631	79.50

VIDEO SPARES

HEADS

3HSS £29.50

Suitable for Ferguson 3V00 3V01 3V06 3V16 3V22 3V23 3V24 3V29 3V30 3V31 8903 and many JVC Akai Nordmende Telefunken

4HSS £32.95

Suitable for National Panasonic NV333 340 2000 3000 7000 7200 7500 8170 8400 8600 8610F 8620 Blaupunkt RTV 100E 200 202 211 222 322 RTX100 200 224

PS3S £39.50

Suitable for Sony C5 C6 C7 8000 8080 Toshiba V5470 V8600 V8700

SONY £39.50

Sony DSR-10R BETA £35.00
Suitable for SLC5 SLC6 SLC7

SANYO £41.50

Sanyo VIC 9300/9500 ..... £45.00
Sanyo VIC 5300/5000 ..... £45.00

VIDEO BELT KITS

Akai VS 9300/9500/9800	£3.75
Ferguson 3V 16	£4.50
JVC HR 3330/3600	£4.50
JVC HR 3360/3660	£4.50
Panasonic NV 300	£4.00
Panasonic NV 2000B	£3.75
Panasonic NV 3000B	£3.75
Panasonic NV 7000	£3.50
Panasonic NV 8600B/8610B/V011	£3.75
Sanyo VTC 5500	£3.75
Sanyo VTC 9300	£3.75
Sanyo VTL 9300P	£3.90
Sharp VC 6300	£3.75
Sharp VC 7300	£3.75
Sharp VC 8300	£3.75
Sharp VC 9300	£3.75
Sony SL 3000B	£3.75
Sony SL 8000/8080	£4.50
Sony SL C7/J7	£4.00
Toshiba V7540	£4.50

TAPE HEADS

Mono Head	2.50
Auto Reverse	3.95
Stereo Head	3.50

ELECTRO-OPTICAL

9877M	22.00
P4231BAM	18.00
XP1002	29.00
XP1117M	24.00
XP42040	36.00
9524H	26.00

DIODES

AA119	0.08	BY210-800	0.33	1N23B	2.95
BA115	0.13	BY223	0.90	1N23C	2.95
BA145	0.16	BY298-400	0.22	1N23ER	2.95
BA148	0.17	BY299-800	0.22	1N23WE	2.95
BA154	0.06	BYX10	0.20	IN4001	0.04
BA156	0.15	BYX36-150R	0.20	IN4003	0.04
BA157	0.30	BYX38-600R	0.60	IN4004	0.06
BAX13	0.04	BYX55-600	0.30	IN4005	0.05
BAX16	0.12	BYX71-600	1.75	IN4007	0.06
BB105B	0.30	BZX61	0.15	IN4148	0.02
BT151	0.79	BZY88	0.10	IN4448	0.10
BY126	0.10	BZY95C30	0.35	IN5401	0.12
BY127	0.11	CS4B	4.50	IN5402	0.14
BY133	0.15	CS10B	8.45	IN5403	0.12
BY164	0.45	OA47	0.09	IN5406	0.13
BY176	1.20	OA90	0.05	IN5407	0.16
BY179	0.63	OA91	0.10	IN5408	0.16
BY182	0.55	OA95	0.06	ITT44	0.04
BY184	0.35	OA202	0.10	ITT923	0.18
BY199	0.40	1N21DR	5.00	ITT2002	0.10
BY206	0.14				
BY208-800	0.33				

BASES

B4	3.95
B5D	5.50
B7G	0.25
B7GSKTD	0.25
B8G	1.50
B8H	0.70
B9A	0.35
B9ASKTD	0.60
B9G	0.75
B10B	0.20
B13B	0.50
B14A	3.00
Octal	0.35
SK406	35.00
SK410	25.00
SK610	35.00
UX5	1.75
UX7	1.75
Valve Cans	
B7 & B9	0.35
Anode caps	0.50
QQV06-40 socket	
Socket for 813	8.50

WIREWOUND RESISTORS

4 Watt 2R4-10K	0.20
7 Watt R47-22K	0.20
11 Watt 1R5-15K	0.25
17 Watt 1R-15K	0.30

ZENER DIODES BZX61 0.15

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

THERMISTORS

VA1040	0.23
VA1056S	0.23
VA1104	0.70
VAT8650	0.46
VA1097	0.25

BZY88 0.07

2V7 3V 3V3 3V6 3V9 4V3
4V7 5V1 5V6 6V2 6V8
7V5 8V2 9V1 10V 11V
12V 13V 15V 18V 20V
24V 27V 30V

BATTERIES

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

LINE OUTPUT TRANSFORMERS

DECCA 100	7.95
DECCA 1700 MONO	9.95
DECCA 1730	8.95
DECCA 2230	8.25
GEC 2040	8.95
GRUNDIG 1500	15.45
GRUNDIG 5010-6010 2222 5011-6011	13.45
ITT CVC20	8.20
ITT CVC30	8.25
PHILIPS G8	8.50
PHILIPS G9	8.99
PHILIPS G11	13.39
PYE 725	10.95
RBM T20A	12.40
TANDBERG 90	11.15
TELEFUNKEN 711A	11.15
THORN 1590	9.50
THORN 8000	23.50
THORN 9000	9.95
THORN 9800	22.40
THORN MAINS TRANSFORMER 3000/3500	9.70

EHT MULTIPLIERS

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

REPLACEMENT ELECTROLYTIC CAPACITORS

DECCA 30 (400-400/350V)	2.85
DECCA 80 100 (400/350V)	2.99
DECCA 1700 (200-200-400-350V)	3.58
GEC 2110 (600-300V)	2.25
ITT CVC20 (220/400V)	1.80
PHILIPS G8 (600/300V)	2.25
PHILIPS G9 (2200 63V)	1.19
PHILIPS G11 (470/250V)	2.35

POTENTIOMETERS

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

SPARES & AIDS

HEAT SINK COMPOUND	1.00
FREEZE IT	0.95
SOLDA MOP	0.64
SWITCH CLEANER	0.85
WD40	1.75
PUSH PUSH MAINS SWITCH (DECCA, GEC, RANK, THORN ETC)	1.02
PYE I/F GAIN MODULE	6.99
ANODE CAP (27KV)	0.60

PUSH BUTTON UNITS

DECCA ITT CVC20 6 WAY	7.95
ITT CVC5 7 WAY	10.19
PHILIPS G8 (550) 6 WAY	14.49

VARICAP TUNERS

ELC1043/05 MULLARD	8.95
ELC1043/06 MULLARD	8.65
U321	8.28
U322	8.28
U324	8.28

20MM ANTI SURGE FUSES

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

20MM QUICK BLOW FUSES

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

★ SPECIAL ★

PHILIPS GEIGER MULLER TUBE ZP1320 **39.50**

P.M. COMPONENTS LTD

SELECTRON HOUSE
SPRINGHEAD ENTERPRISE PARK, SPRINGHEAD ROAD
GRAVESEND, KENT DA11 8HD

PHONE
0474 60521
3 LINES

VISA

TELEX
966371
TOS PM

A SELECTION FROM OUR STOCK OF BRANDED VALVES

A1714	24.80
A1998	11.50
A2087	11.50
A2134	14.95
A2293	6.50
A2426	35.00
A2599	37.60
A2792	27.50
A2900	11.50
A3042	24.00
A3283	24.00
AC/THI	4.00
ACT22	69.75
AC/S2 PEN	8.50
AH221	39.00
AH238	39.00
AL60	6.00
AN1	14.00
ARP12	0.70
ARP34	1.25
ARP35	2.00
AZ11	4.50
BL63	2.00
BS450	67.00
BS810	55.00
BS814	55.00
CIK	27.50
C3JA	20.00
C6A	20.00
C1112G	70.00
C1108	65.00
C1134	32.00
C1148A	115.00
C1150/1	135.00
C1534	32.00
CCA	2.80
CC3L	0.90
CL33	2.00
CV Nos Prices on request	
D3a	29.50
D63	1.20
DA41	22.50
DA42	17.50
DA90	4.50
DA100	125.00
DAF91	0.45
DAF91	0.70
DAF96	1.00
DC70	1.75
DC90	1.20
DCX4-1000	12.00
DCX4-5000	25.00
DET16	28.50
DET18	28.50
DET23	35.00
DET24	39.00
DET25	22.00
DF91	1.00
DF92	0.60
DF96	0.65
DF97	1.00
DH63	1.20
DH77	0.90
DH79	0.56
DH149	2.00
DK91	0.90
DK92	1.20
DL35	2.50
DL63	1.00
DL70	2.50
DL73	2.50
DL91	1.50
DL92	0.95
DL93	1.10
DL94	2.50
DL96	2.50
DLS10	13.50
DLS16	10.00
DM70	1.95
DM160	2.75
DY51	1.50
DY86/87	0.65
DY802	0.72
E80CF	11.00
E80F	18.50
E80L	25.00
E81CC	3.15
E81L	12.00
E82CC	3.50
E83CC	3.50
E83F	5.50
E86C	9.50
E88C	7.95
E88CC	3.50
E88CC Siemens Special	6.95
E90CC	7.95
E90F	7.95
E91H	4.50
E92CC	3.95
E99F	6.99
E130L	18.50
E180CC	9.50
E182CC	9.00
E180F	6.50
E186F	8.50
E188CC	7.50
E280F	19.50
E283CC	10.00
E288CC	13.50
E55L	42.00
E810F	25.00
E1148	1.00
E1524	6.95
EA50	1.00
EA76	1.95
EA79	1.95
EAA91	0.60
EABC80	0.70
EAC91	2.50
EAF42	1.20
EAF801	2.00
EB34	1.50
EB41	3.95
EB91	0.85
EBC33	2.50
EBC41	1.95
EBC81	1.50
EBC90	0.90

EBC91	0.90
EB91	0.60
EBF80	0.65
EBF83	0.65
EBF85	0.95
EBF89	0.70
EBF93	0.95
EBL1	2.50
EBL21	2.00
EC52	0.75
EC70	1.75
EC80	9.50
EC81	7.95
EC86	1.00
EC88	1.00
EC90	1.10
EC91	5.50
EC92	1.95
EC93	1.50
EC95	7.00
EC97	1.10
EC157	475.00
EC8010	12.00
ECC32	3.50
ECC33	3.50
ECC35	3.50
ECC81	1.15
ECC81 Special quality	1.95
ECC82	0.65
ECC82 Mullard	1.50
ECC82 Philips	1.95
ECC83 Siemans	2.50
ECC83	
ECC83 Philips	1.95
ECC83 Siemans	2.50
ECC83 Tungsram	1.50
ECC84	0.50
ECC85	0.75
ECC86	2.75
ECC88	0.95
ECC91	2.00
ECC180	0.72
ECC189	1.95
ECC801S	3.50
ECC803S	4.95
ECC804	0.60
ECC2000	12.00
ECF80	1.15
ECF82	1.15
ECF86	2.25
ECF200	1.85
ECF202	1.85
ECF801	0.85
ECF805	2.50
ECF806	10.25
ECH3	2.50
ECH4	3.00
ECH35	3.50
ECH42	1.50
ECH81	1.00
ECH83	1.00
ECH84	1.00
ECH2000	1.50
ECL80	0.60
ECL82	0.79
ECL81	0.55
ECL83	2.50
ECL84	0.74
ECL85	0.69
ECL86	0.80
ECL805	0.69
EF22	2.50
EF37A	2.50
EF39	1.50
EF40	4.50
EF41	3.50
EF42	3.50
EF50	2.50
EF55	4.95
EF70	1.20
EF71	1.50
EF72	1.20
EF73	1.00
EF80	0.55
EF83	3.95
EF85	0.50
EF86	2.25
EF86 Mullard	4.50
EF89	1.50
EF91	1.95
EF92	2.15
EF93	0.95
EF94	0.95
EF95	1.95
EF97	0.90
EF98	0.90
EF183	0.65
EF184	0.65
EF730	1.80
EF731	3.50
EF732	3.50
EF800	11.00
EF805S	13.50
EF812	0.65
EFL200	1.50
EH90	0.72
EK90	9.95
EL32	0.95
EL33	6.00
EL34	2.25
EL34 Mullard/Phillips	4.50
EL36	1.95
EL37	9.00
EL38	4.75
EL41	3.50
EL42	2.00
EL81	6.95
EL82	0.58
EL83	5.95
EL84	0.95
EL85	4.50
EL86	1.28
EL90	2.15
EL91	6.00

EL95	1.75
EL153	12.15
EL183E	3.50
EL183P	3.50
EL500	1.40
EL504	1.40
EL509	5.25
EL519	6.95
EL802	3.65
EL821	8.50
EL822	12.95
EM1	9.00
EM4	9.00
EM80	0.70
EM81	0.70
EM84	1.65
EM85	3.95
EM87	2.50
EN32	16.50
EN91	1.95
EN92	4.50
ESU150	14.95
ESU872	25.00
EY51	0.80
EY81	2.35
EY83	1.50
EY84	5.95
EY86/87	0.50
EY88	0.55
EY91	5.50
EY500A	1.50
EY802	0.70
EZ35	0.75
EZ40	2.75
EZ41	2.15
EZ80	0.75
EZ81	0.75
EZ90	1.50
F6064	2.95
FW4/800	2.95
G55/1K	9.00
G180 2M	6.95
G232 Mullard	3.95
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
GT1C S/S	13.00
GTE175M	8.00
GTR150W	1.00
GU20	35.00
GXU1	13.50
GXU3	24.00
GXU50SS	14.50
GY501	1.50
GY802	1.50
GZ30	1.50
GZ31	1.50
GZ32	1.50
GZ33	4.50
GZ34	2.15
GZ37	4.50
HAA91	1.00
HABC80	0.90
HBC90	0.75
HBC91	0.80
HF93	0.75
HF94	1.50
HK90	1.06
HL2K	4.95
HL23DD	4.00
HL90	0.70
HL92	1.50
H133/DD	3.50
HR2	4.00
HY90	1.00
HVR2	3.00
K3118	86.00
KR6/3	45.00
KT8C	7.00
KT33C	3.50
KT36	2.00
KT44	4.00
KT45	4.00
KT61	6.00
KT63	2.00
KT66/CV1075 special yellow ssss pot	19.50
KT66 USA	9.95
KT77 Gold Lion	10.95
KT81	7.00
KT88 USA	10.95
KT88 Gold Lion	18.95
KTW61	2.50
KTW62	2.50
KTW63	2.00
KTZ63	2.50
L102/2K	6.95
L120/2K	12.00
LB7-20	95.00
LS9B	6.95
M502A	60.00
M537A	60.00
M5143	155.00
M8079	6.00
M8082	7.50
M8083	3.25
M8091	7.50
M8096	3.00
M8098	5.50
M8099	5.00
M8100	5.50
M8136	7.00
M8137	7.95
M8161	6.50
M8162	5.50

M8163	5.50
M8190	4.50
M8195	6.50
M8196	6.50
M8204	5.50
M8223	4.50
M8224	2.00
M8225	3.50
ME1401	29.50
ME1402	29.50
ME1501	14.00
MH4	3.50
MHLD6	4.00
ML4	4.50
MS4B	5.50
MU14	3.50
N37	12.50
N78	9.85
OA2	0.85
QA2WA	2.50
OA3	2.50
OB2	0.85
OB2WA	2.50
OC2	2.50
OC3	1.50
OD3	1.70
OM4	1.00
OM5B	3.00
QM6	1.75
QRP43	2.50
QRP50	3.95
P61	2.50
P41	2.50
PABC80	0.50
PC86	0.75
PC88	0.75
PC92	3.50
PC97	1.10
PC800	1.10
PC900	1.25
PCC84	0.40
PCC85	0.54
PCC88	0.70
PCC89	0.70
PCC189	0.70
PCC805	0.70
PCC806	0.80
PCE82	0.80
PCF80	0.65
PCF82	0.60
PCF84	0.65
PCF86	1.20
PCF87	0.40
PCF200	1.80
PCF201	1.80
PCF800	0.40
PCF801	1.35
PCF802	0.60
PCF805	1.25
PCF806	1.00
PCF808	1.25
PCH200	1.50
PCL82	0.85
PCL83	2.50
PCL84	0.75
PCL85	0.80
PCL86	0.85
PCL800	0.80
PCL805	0.90
PD500	3.50
PD510	3.65
PEN25	2.00
PEN40DD	2.50
PEN45	3.00
PEN45DD	3.00
PEN46	2.00
PEO5-25	39.50
PEO5-40N	42.50
PFL200	0.95
PL21	2.50
PL36	1.75
PL36	1.50
PL81	0.72
PL81A	0.72
PL82	0.60
PL83	0.52
PL84	0.78
PL88	1.00
PL95	1.75
PL302	1.00
PL345	12.50
PL500	0.95
PL500	1.10
PL504	1.15
PL508	1.75
PL509	4.85
PL519	4.95
PL802T	3.50
PL820	2.95
PL5557	29.50
PL5727	2.50
PY32	0.60
PY33	0.50
PY81	0.70
PY82	0.70
PY83	0.70
PY88	0.66
PY500A	1.95
PY800	0.79
PY801	0.79
QB3-300	54.95
QB5-1750	139.50
QBL5-3500	495.00
QEQ3-10	4.95
QE08-200	£145.00
QF40	65.00
QP25	1.00
QQEQ2/5	19.50
QQEQ3-12	7.95
QQEQ3-20	35.00
QQEO6/40	45.00
QQVO2-6	19.50
QQVO3-10 Mullard	15.00
QQV03-10	5.50

QQVO3-20A	25.00
QQVO3-20B	32.00
QQVO6-40A	27.50
QQVQ7-50	63.50
QQZQ3-20	42.50
QS75 20	1.50
QS75 40	3.00
QS92 1D	6.00
QS95/10	4.85
QS108 45	4.00
QS150/15	6.95
QS150/30	1.15
QS150/45	7.00
QS1200	3.95
QS1202	3.95
QS1203	4.15
QS1205	3.95
QS1206	3.95
QS1206	1.05
QS1207	0.90
QS1208	0.90
QS1209	3.15
QS1210	1.50
QS1211	1.50
QS1212	3.20
QS1213	5.00
QS1215	2.10
QS1218	5.00
QU37	9.50
QU37	11.50
QVO3-12	4.95
QVO5-25	1.75
QVO6-20	29.50
QV2-250C	45.00
QVO8-100	145.00
QY3-125	65.00
QY4-250	70.00
QY4-400	76.00
R10	4.00
R16	12.00
R17	1.50
R18	2.50
R19	2.50
R20	1.20
R1169	55.00
RG1 125	4.95
RG1-240A	14.50
RG3-250A	3.50
RG3-1250A	35.00
RK2K25	62.50
RK-20A	12.00
RL16	1.50
RPL16	12.00
RPY13	2.50
RPY43	2.50
RPY82	2.50
RR3-250	15.00
RR3-1250	35.00
RS613	45.00
RS685	54.95
RS688	52.15
S6F17	5.95
S6F33	29.95
S11E12	38.00
S30/2K	12.00
S104/1K	10.00
S109/1K	15.00
S130	5.95
S130/P	5.95
SC1/800	5.00
SC1/1100	6.00
SC1/1200	5.00
SC1 1300	6.00
SC1 2000	9.00
SD6000M	45.00
SP4B	4.95
SP41	5.00
SP42	3,00
SS501	35.00
ST11	1.50
STV280/40	11.95
STV280/80	19.95
SU42	4.95
TB2 5/300	85.00
TB2-300	45.00
TB3 2000	395.00
TBL-2-300	275.00
TBL2-500	395.00
TD03 10E	40.00
TD03 10	35.00
TD03 10D	40.00
TD03 10F	40.00
TD1-100A	25.00
TD3-12	4.00
TP25	1.50
TSP4	7.00
TT11	1.50
TT21	45.00
TT22	45.00
TT100	57.00
TTR-31MR	65.00
TY2-125A	85.00
TY4-400	86.00
TY8-600W	365.00
TYS2/250	375.00
U18-20	2.75
U19	11.95
U24	2.00
U25	0.90
U26	0.90
U37	9.00
U41	6.95
U50	2.00
U82	3.00

U191	0.70
U192	1.00
U193	0.65
U251	1.00
U801	0.75
UABC80	0.65
UAF42	1.00
UBF80	0.60
UBC41	2.25
UBC81	1.50
UBF89	1.00
UBL21	1.75
UC92	1.20
UCC84	0.70
UCC85	0.60
UCF80	1.00
UCH21	1.20
UCH41	2.50
UCH42	2.50
UCH81	1.00
UCL82	1.75
UCL83	2.50
UF85	1.20
UF41	1.15
UF42	1.15
UF80	0.80
UF89	2.00
UL84	1.50
UL41	5.50
UL44	3.50
UL84	0.85
UU5	3.50
UU7	8.00
UU8	9.00
UY41	3.50
UY85	0.70
V235A/1K	250.00
V240C/2K	225.00
V241C/1K	195.00
V246A/2K	315.00
V339	3.50
VLS631	10.95
VP133	2.00
VR75/30	3.00
VR101	2.00
VR105/30	1.50
VR150/30	1.15
VT52	2.50
VU29	4.50
VU39	1.50
W77	5.00
W729	1.00
W739	1.50
X24	1.00
X66 X65	4.95
X76M	1.95
XC24	1.50
XC25	0.50
XFW47	1.50
XFW50	1.50
XG5-500	22.50
XL1-5V	1.50
XL628FT	7.50
XNP12	2.50
XR1-1600A	49.50
XR1-3200A	79.50
XR1-6400A	115.00
ZM1020	6.00
Y65	6.95
Y503	25.00
Y602	12.00
Y4070	130.00
YD1100	75.00
YJ1060	265.00
YL1000	9.50
YL1020	42.50
YL1030	59.50
YL1060	95.00
YL1070	195.00
YL1071	195.00
YL1290	59.50
Z77	1.20
Z303C	9.00
Z359	9.00
Z505S	15.00
Z520M	4.00
Z521M	8.00
Z700U	3.00
Z749	0.60
Z759	19.95
Z800U	3.00
Z803U	18.95
Z900T	9.50
ZA1000	12.50
ZA1001	1.50
ZA1002	1.50
ZC1040	8.00
ZM1005	8.00
ZM1020	8.95
ZM1021	8.00
ZM1023	7.95
ZM1041	14.00
ZM1082	9.00
ZM1084	10.00
ZM1177	9.00
ZM1202	55.00
ZM1263	4.00
ZM1612	3.00
1A3	4.50
1AC6	1.20
1B3GT	1.95
1B22	10.00
IB27	55.00
1B35A	45.00
1C5GT	2.50
1FD1	2.50
1G3GT	2.50
1K3GT	2.50
1N1	4.50
1N2	4.50
1P28	25.00
1N5GT	2.50
1P28	25.00
1S2	0.55
1S5	0.70
1T4	1.00
1U5	1.00
1X2B	1.40
1Z2	8.95
2AS15A	11.50
2B22	69.50

2C39A	32.50
2C39BA	39.50
2C40	37.00
2C42	29.50
2C51	0.75
2CY5	1.50
2B7	1.50
2D21	1.95
2D21W	2.50
2E22GY	45.00
2E26	7.95
2J42	93.00
2K25	35.00
2K25 Ray	75.00
2K26	95.00
2K29	250.00
2K56	250.00
3A108A	9.00
3A/107B	12.00
3A/109B	11.00
3A/110B	12.00
3A/141K	11.50
3A/147J	7.50
3A/167M	10.00
3A2	3.95
3A3A	3.95
3A4	1.10
3AL5	0.95
3AT2	3.35
3AU6	0.65
3B2	3.00
3B4	7.00
3B7	4.50
3B24	10.00
3B26	24.00
3B28	12.00
3BZ6	1.50
3C4	2.50
3C45	24.00
3CB6	1.50
3CN3A	2.50
3CS6	0.95
3CY5	1.50
3CX3	2.50
3D6	4.50
3D21A	29.50
3E22	49.50
3EH7	1.95
3EJ7	1.95
3W4GT	2.50
4B32	35.00
4B551B	115.00
4BQ7A	1.75
4BZ6	1.95
4-65A	59.00
4-125A	72.50
4-250A	79.50
4-400A	87.50
4C27	25.00
4C28	25.00
4CB6	1.95
4CX250B	49.00
4CX250B EIMAC	£59.50
4CX250BM	75.00
4CX250K EIMAC	95.00
4CX350A	95.00
4CX350F	79.50
4CX1500B	398.50
4GS7	2.25
4GV7	2.25
4JC6A	2.95
4J52	75.00
4KT6	1.50
4X150A	35.00
5A/102D	9.50
5A152M	9.00
5A163K	10.00
5A170K	6.25
5A-206K	10.00
5A-180M	9.00
4AM8	4.15
5AM8	2.15
5AN8	1.20
5AR4	2.00
5AU4	1.50
5B.110M	10.00
5B-254M	14.50
5B-255M	19.50
5B255M	19.50
5B/256M	15.00
5B-257M	15.00
5B-258M	14.50
5C22	125.00
5R4GB	5.50
5R4GY	4.95
5T4	5.95
5U4G	2.95
5U4GB	3.50
5V4G	1.50
5Y3GT	1.95
5Z4GT	1.50
6/30L2	0.70
6A/203K	9.00
6A7	4.95
6A8G	1.50
6AC7	2.00
6AF4A	2.50
6AG5	1.50
6AG7	1.95
6AH6	2.50
6AJ4	2.00
6AJ7	2.00
6AK5	1.95

6AK6	2.50
6AL5	0.60
6AM4	3.25
6AM5	6.00
6AM6	1.95
6AN5	4.50
6AN8A	3.50
6AQ5	2.15
6AQ8	0.85
6AR5	5.95
6AR8	3.95
6AS5	1.50
6AS6	2.50
6AS7G	4.50
6AT6	0.75
6AT8	1.75
6AU4	2.00
6AU6	0.95
6AV6	0.75
6AW8A	2.50
6AZ8	4.50
6B7	2.80
6B8G	1.50
6BA6	0.95
6BA7	4.50
6BA8A	3.50
6BC8	1.00
6BE6	0.95
6BG6G	3.00
6BH6	1.95
6BH8	1.50
6BJ6	1.50
6BK4	4.00
6BK7A	1.95
6BL8	1.15
6BM8	0.58
6BN4	1.65
6BN6	1.65
6BN7	4.50
6BN8	3.95
6BQ5	0.75
6BQ7A	0.72
6BL7GTA	3.95
6BL8	1.15
6BR5	0.70
6BR7	4.95
6BR8	2.15
6BR8A	2.15
6BS7	5.50
6BW4	1.50
6BW6	5.35
6BW7	1.50
6BW8	4.00
6BX6	0.48
6BX7GT	3.50
6BZ6	2.50
6BZ7	2.95
6C4	1.25
6C5	1.95
6C6	2.50
6C8G	1.50
6C11	2.50
6C18	2.50
6CA4	4.95
6CA7	3.50
6CB5	3.95
6CB6	1.95
6CD6GA	4.50
6CF6	1.50
6CG7	2.25
6CH6	6.95
6CL3	3.95
6CL6	3.25
6CL8A	2.00
6CM5	1.60
6CM7	2.95
6CS6	0.75
6CS7	0.95
6CW4	6.50
6CY5	1.00
6CY7	2.95
6D6	2.50
6DC6	2.95
6DJ8	0.95
6DK6	1.50
6DQ5	5.95
6DQ6B	2.50
6DW4	2.15
6EA4	4.95
6EA7	2.50
6EA8	2.50
6EB8	1.75
6EM5	2.50
6EM7	2.50
6EU7	£1.95
6EU8	1.75
6EV7	2.95
6EW7	4.50
6EW6	1.50
6F1	2.00
6F5	4.95
6F7	5.50
6F6G	2.00
6F12	1.50
6F13	3.00
6F14	1.00
6F17	2.75
6F21	2.50
6F23	0.60
6F24	1.25
6F25	1.25
6F28	1.25
6F32	1.25
6F33	17.00
6FH8	12.50
6G6G	5.50
6GH8A	0.80

6GK5	1.50
6GK6	1.95
6GM8	0.95
6GS7	2.15
6GV7	2.50
6GW8	0.80
6H1	9.50
6H3N	2.50
6H6	1.95
6H6GT	1.95
6HB7	0.95
6HF5	5.50
6HF8	2.50
6HS6	4.95
6HS8	1.95
6HZ6	2.65
6J4	2.15
6J4WA	3.15
6J5	2.50
6J6	2.05
6JB6A	3.95
6JE6C	6.50
6JM6	3.95
6JS6C	6.50
6JU8	2.50
6J7	2.50
6K7G	2.00
6K8Y/G	3.00
6KD6	6.50
6KM8	2.50
6KT8	2.95
6KZ8	1.95
6L1	2.50
6L19	3.95
6L6GC	2.95
6L6GC(GE)	4.95
6L6GT	1.95
6LD20	1.15
6LF6	7.50
6LJ8	2.50
6LQ6	6.50
6L15	3.15
6MJ6	4.95
6N[illegible]	2.50
6N7GT	2.50
6P15	1.50
6P25	4.00
6P26	4.00
6P28	2.00
6Q7	1.75
6Q7GT	1.20
6R7G	3.15
6S4A	1.50
6SA7GT	1.35
6SC7	1.50
6SG7	2.50
6SH7	1.35
6SJ7GT	1.35
6SK7	1.35
6SK7GT	1.35
6SL7GT	0.85
6SN7GT	1.35
6SQ7	1.35
6SS7	1.95
6U4GT	1.75
6U8	1.15
6U8A	1.50
6V6GT	1.50
6X2N	1.00
6X4	1.50
6X5GT	1.00
6X5GTY	1.00
6X8A	2.25
7A6	4.50
7A7	2.00
7AD7	1.75
7AU7	1.50
7B6	3.50
7B7	2.50
7C6	2.50
7E7	2.50
7J7	5.50
7V7	4.15
7Y4	2.50
8B10	2.50
8BQ5	1.95
8D8	2.50
8EQ7	1.95
8298A	8.50
85A8	1.50
10D2	1.25
10DE7	2.50
10F1	0.75
10GK6	1.95
10P14	2.50
10P18	0.70
10LD12	0.65
11E3	55.00
12A6	3.95
12AD6	1.50
12AG8	1.50
12AL5	1.00
12AT6	1.25
12AT7	1.15
12AT7WA	2.50
12AU6	1.95
12AU7	0.65
12AV6	1.95
12AX4GT	1.00
12AX7	0.65
12AX7WA	2.50
12AY7	3.95
12AZ7A	1.95
12B4A	4.50
12BA6	1.50
12BE6	1.95

12BH7A	2.50
12BL6	1.75
12BY7A	2.75
12CA5	1.95
12CX6	1.20
12DQ6B	3.50
12DW4A	3.50
12DW7	2.50
12E1	17.95
12E14	38.00
12GN7	4.50
12HG7A	4.50
12J7GT	3.50
12K5	1.95
12K7GT	1.50
12K8	1.95
12SA7GT	1.95
12SG7	4.75
12SH7	1.95
12SK7	1.95
12SJ7	1.50
12SN7GT	1.85
12SQ7GT	1.95
13D3	3.20
13D7	3.20
13D7	2.50
13D9	3.20
13DR7	2.95
13EI	145.00
13EM7	3.50
14S7	1.95
7BR3	3.95
17EW8	0.95
17DW4	2.50
17DW4A	2.95
17JZ8	4.50
18D3	6.00
19AQ5	3.50
19AU4GT	2.50
19G3	17.00
19H5	33.50
19Q6	9.00
20A2	10.50
30D1	0.70
20LF6	3.50
20L1	0.95
20P1	0.55
20P3	0.60
20P4	1.95
20P5	1.15
21JZ6	3.15
21LU8	3.75
24B1	39.50
24B9	39.50
25L6GT	1.75
25BQ6	1.75
29C1	19.50
29KQ6	6.50
30C17	0.40
30C18	1.48
30F5	0.95
30FL1	1.00
30FL2	1.35
30FL12	0.95
30FL13	1.10
30FL14	1.25
30L1	0.45
30L15	0.60
30L17	0.80
30P4MR	1.00
30P12	1.00
30P18	0.60
30P19	1.00
30PL1	2.50
30PL13	0.60
30PL14	1.75
31JS6A	5.50
33A/158M	19.50
35A5	4.50
35L8GT	2.00
35W4	0.70
35Z3	1.85
38HE7	4.50
40KD6	5.50
42	6.95
47	6.00
50A5	1.50
50C5	0.95
50CD6G	1.15
50EH5	1.50
52KU	2.00
53CG	15.00
60B5	1.00
60JY6	2.96
61SPT	4.50
75B1	3.50
75C1	2.50
83	8.50
83AI	9.00
84	3.00
85A1	6.50
85A2	1.95
90AV	15.00
92AG	19.50
92AV	15.00
95A1	6.50
108C1	1.50
150B2	6.50
150C2	2.50
150C4	2.15
185T	1.50
274A	15.00
307	5.00
328A	15.00
388A	17.50

404A	10.95
425A5	8.00
431U	4.50
572B	55.00
5636	1.50
6146A	7.50
6158	3.20
6386	14.50
6883B	9.95
6973	5.95
705A	8.00
706A	8.00
715C	45.00
725A	275.00
7527	89.50
7703	395.00
803	14.95
805	39.00
807	1.95
810	85.00
811A	15.00
813	23.50
829B	14.50
832A	14.50
833A	95.00
866A	6.50
872A	20.00
873	60.00
884	5.50
927	15.00
930	9.95
931A	17.50
954	1.00
958A	1.00
1299A	0.60
1619	2.50
1625	3.00
1626	3.00
1927	25.00
2050	5.50
2050W	6.95
3545	4.00
4313C	4.00
4328D	9.00
5642	9.50
5651	2.50
5654	1.95
5663	1.95
5670	3.25
5672	4.50
5687	4.50
5692	3.50
5696	4.50
5704	3.50
5718	6.15
5725	2.50
5726	2.50
5727	2.50
5749	2.50
5750	1.85
5751	2.95
5763	4.95
5814A	3.25
5829WA	6.50
5840	3.50
5842	11.00
5847	10.95
5879	5.00
5886	13.95
5894	39.50
5899	4.50
5963	2.00
5965	2.25
6005	1.85
6012	16.00
6021	3.65
6057	3.75
6058	3.95
6060	2.25
6062	4.50
6063	2.00
6064	2.95
6067	7.00
6072	4.20
6080	7.95
6132	10.00
6146B	9.50
6688	6.50
6887	9.50
6080	7.95
6080WA	9.50
6096	5.50
6132	10.00
6136	2.50
6146B	9.95
6157	2.50
6201	6.45
6211	2.50
6267	2.25
6550A GE	10.95
6550RCA	15.00
6350	3.50
6688	6.50
6870	11.50
6887	9.50
6873	4.50
7189	3.50
7199	6.15
7239	17.50
7247	4.95
7360	13.50
7527	85.00
7586	15.00
7591A	4.95
7868	4.95

★ SPECIAL OFFERS ★

MONO AMPLIFIER £1.00
Approx 2 watt output mono amplifier uses the popular TBA820M IC power 9-12VDC

AM TUNER £1.00
Complete compact AM tuner with built in ferrite rod aerial requires only external connections to 9VDC power supply and amplifier

9V POWER SUPPLY £1.00
Plugs directly into 2 pin socket

ALL THREE £2.50 + VAT

★ SPECIAL OFFER ★
PCB BOARD ASSEMBLIES

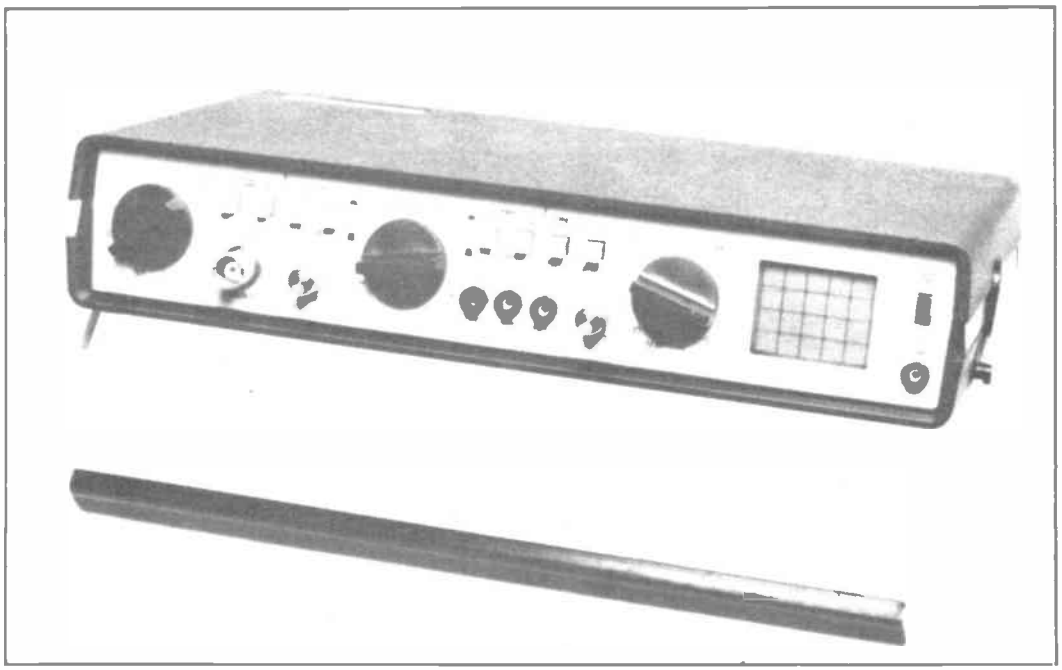
Open Mon-Thurs 9.00am-5.30pm
Fri. 9.00am-5.00pm
• 24 HOUR ANSWERPHONE SERVICE •

ACCESS & BARCLAYCARD PHONE ORDERS WELCOME

UK ORDERS P&P £1.00
PLEASE ADD 15% VAT
Export order welcome carriage at cost
Please send your enquiries for special quotations for large quantity

CALLERS WELCOME

STRAIGHT & LEVEL



PORTABLE OSCILLOSCOPE

Electronic Brokers has introduced the Thandar SC110A battery operated, portable oscilloscope, which has a bandwidth of dc to 10MHz and a sensitivity of 10mV/div to 50V/div in 12 ranges.

Ease of use and battery powering enable this instrument to be effectively employed in service applications where conventional mains powered instruments cannot be used.

The SC110A can be mains or battery operated and has a typical power consumption of 350mW, with bright line auto and economy triggering modes for ease of use and battery conservation.

The instrument has a 32 x 26mm screen with a blue-white phosphor display and five horizontal and four vertical graticule divisions. External adjustments include intensity, focus, and trace rotate. Timebase sweep times are 0.1μS/div to 0.5S/div in 21 ranges, and the calibration accuracy is ±3% for 0.2μS div to 0.5S/div ranges, with ±10% for 0.1μS/div.

Coupling is switchable dc, ac, TV frame or TV line. The input impedance is 1MΩ in parallel with 47pF, with maximum input being 350V dc and peak ac provided the dc component does not exceed 250V.

A range of optional accessories are available inclading an ac adaptor, carrying case, rechargeable battery units, probes and bench instrument racks.

For further information contact: *Electronic Brokers Ltd, 140-146 Camden Street, London NW1 9PB. Tel: 01-267 7070*

MORE MODS

After many months of research and development R Withers Communications Ltd have announced their latest HF modification for the Yaesu FRG9600. Now included is LF/HF/VHF and UHF coverage from 100kHz to 950MHz, improved S-meter and a typical receiver sensitivity of >2μVpd HF, >1μV 60-950MHz, 12dB sinad.

In addition a high performance HF front end has been fitted, manufactured by AKD. This section is fitted internally with switching circuits and a small toggle switch on the rear. The latter enables band change, whereby the display changes to read actual frequency (100kHz-60MHz). The standard SO239 antenna connector has now been changed for an N-connector for coverage from 60-950MHz and an SO239 connector fitted for HF coverage, 100kHz-60MHz (UHF extended coverage is now standard as per RWC's original Mk2 modification up to 950MHz).

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

RWC now offer the new FRG9600 in two versions. Option 1 is the FRG9600 Mk2, series 2, 60-950MHz N-connector, available for £519.00 plus £5.00 carriage, or the company will modify a standard unit for £40.00 inc VAT and return insured carriage.

Option 2 is the FRG9600 Mk3 100kHz-950MHz HF switchable, actual frequency readout (no external units) N-connector for V-UHF and SO239, fitted for HF at £599.50 plus £5.00 carriage. RWC will modify an existing unit for £129.50 inc return carriage, which will have the 950MHz

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

extended coverage fitted at the same time (existing Mk2 owners can have this HF mod fitted for £99.00 inc return carriage.

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

MOBILE MICROPHONE

Few can doubt the foolishness of driving along in a vehicle with one hand on the steering wheel and the other clutching a microphone. The popularity of cellular radio has resulted in new clauses within the Highway Code forbidding hand-held microphone operation whilst on the move.

For some months Waters and Stanton have been experimenting with various microphones in an effort to find one that was neither attached to the driver's body nor an obstruction to his vision. As a result the company are pleased to introduce the Adonis FX-8.

This microphone has the unique feature of being able to be mounted several feet away from the operator on the dashboard or sun visor. The unit comprises a highly directional microphone unit fitted with back to back electret capsules. The unit comes with all the necessary hardware to be mounted on the dash or sun visor. Unlike normal noise cancelling microphones, the output of each capsule is fed into separate amplifiers that are driven back to back and only the difference signal, ie the operator's voice, is fed to the transceiver.

The ambient noise level is virtually eliminated. A control box with up/down buttons that fits to the gear stick completes the line-up and has an output level control to match the transceiver. The only extra needed is a suitable microphone plug for the transceiver in use.

Extensive tests have been carried out in a somewhat noisy seven year old Range Rover with the microphone at least 3ft from the operator. The background noise was found to be extremely low and the received signal sounded similar to that from a conventional fist microphone. In a quieter vehicle the noise is all but absent! The freedom from flying leads attached to one's body combined with 'hands free' operation should make this microphone an attractive proposition for the mobile operator who wants to stay on the right side of the law. The microphone is priced at £69.95.

For further information contact: *Waters and Stanton, 18-20 Main Road, Hockley, Essex SS5 4QS. Tel: (0702) 206835.*

KIT CAT

Greenweld Electronic Components have announced the availability of their new catalogue, *Kit-Cat*, which is free on request.

It offers an extensive range of electronic kits catering for all abilities, from the novice to the professional. Kits include amplifiers, pre-amps, transmitters, receivers, power supplies, panel meters, timers, doorbells, running lights, sound to light units, dimmers and computer interfaces.

The catalogues can be obtained by contacting: *Greenweld Electronic Components, 443 Millbrook Road, Southampton SO1 0HX. Tel: (0703) 772501.*

INDICATORS

A broad range of Sedeco indicator lights and accessories, covering panel mounting LEDs, neons, bulbs and holders, is now available from Watts International Components of Bognor.

A comprehensive catalogue covers all the available options. Standard and high brightness LED indicators can be supplied, with or without built-in resistor protection. The same protection option applies to the neon range. Low voltage dc as well as mains neons are covered. Built-in incandescent and bulb-holding indicators are included. Bulb-holding sockets, with or without lenses, are also featured. Many physical shapes and sizes of panel mounting bodies in a choice of colours can be supplied.

The indicators are suitable for all panel display applications. The choice of round, square, clip-fixing or backnut fixing gives great flexibility to design engineers.

Voltage ranges for LEDs cover 6V, 8V, 12V and 24V. Neon ranges are 110/220V ac, and 6V, 12V and 24V dc. Built-in incandescent range is 6V, 12V and 24V. Bulb range is 6.3V, 8V, 12V, 18V and 24V.

For further information please contact: *Watts International, Components Ltd, Suite 6, Wyvern House, Bognor Regis, West Sussex. Tel: (0243) 860404.*

SHOCKPROOF MULTIMETER

New from ITT instruments is the MX112, an analogue multimeter fittef with a rubber shock-absorbing surround, which makes it ideally suited to field-service use and ham(!) fisted amateurs.

The MX112 is designed for ease of use, with only two input sockets provided for all functions and ranges, and full protection on all ranges, including the 10A current range.

In addition to the rubber shock absorber, the MX112 incorporates a shockproof movement. The panoramic dial is backed by a parallax correction mirror, and a colour-coded range indicator is used wih a patented slide switch to provide easy, unambiguous readings of functions and range scales.

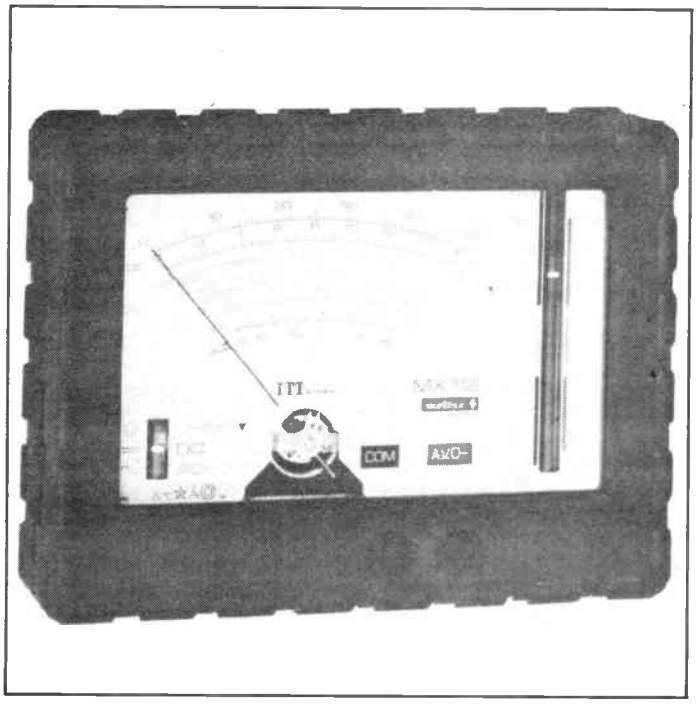
The instrument offers eight multimeter functions on 42 ranges, capacitance and decibel measurements and a dwell-meter function for measuremets on car engines.

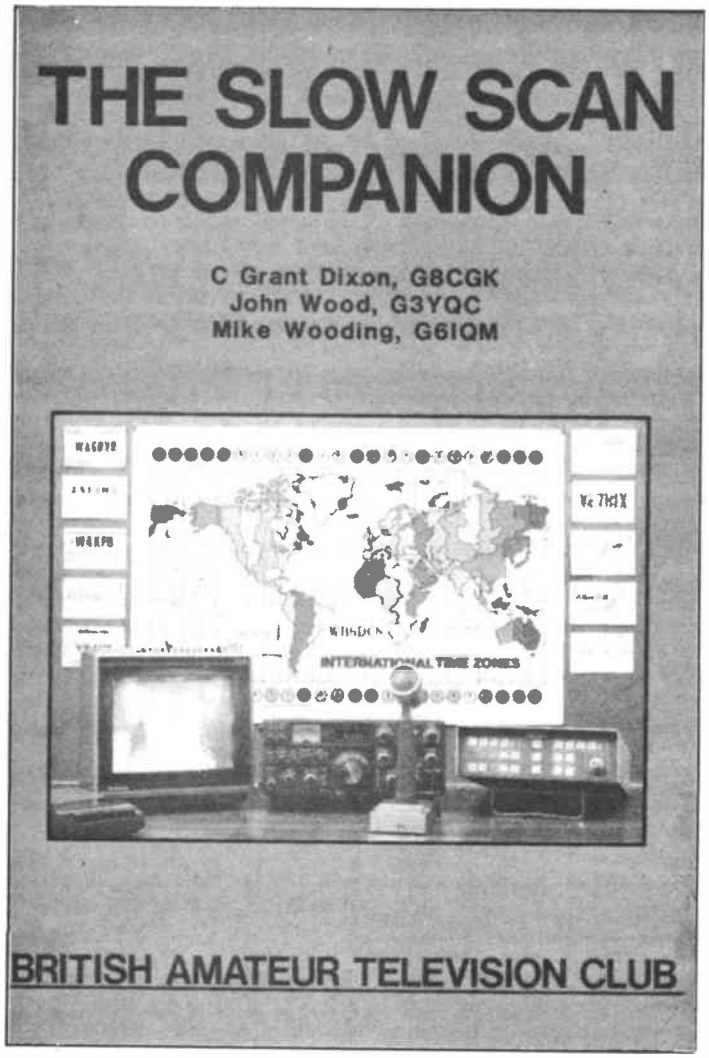
ac and dc voltages of up to 1600V can be measured, while the current facility provides measurements from 50μA to 10A.

Resistance ranges go up to 2Mohms. The instrument's sensitivity is 20,000 ohms per volt on ac ranges and dc accuracy is ±2% of full-scale deflection; the corresponding figure for ac being ±3%.

All ranges are protected up to 220V, and the instrument is designed to meet the IEC414 safety standard.

For further information contact: *ITT Instruments, 346 Edinburgh Avenue, Slough, Berkshire SL1 4TU.*





SLOW-SCAN

The BATC have announced the launch of their latest book, *The Slow-Scan Companion*, which includes many well tried and tested circuits and designs for those with an experimental nature and a preference for home construction.

The authors of the book – Grant Dixon G8CGK, Mike Wooding G6IQM and John Wood (The Editor of the British Amateur and Television Club publications) – recognised that there is no other publication of this nature currently in print, nor has there been for some years now.

Consequently, they have attempted to ensure that this volume is up to date and reflects modern trends and equipment in the world of slow scan television.

Also included in the book are descriptions of commercial equipment, both past and present, and a large section dealing with computing in SSTV. Standards and operating techniques have been included for the newcomer.

The book costs £3.50 including postage and is available from: *BATC Publications, 14 Lilac Avenue, Leicester LE5 1FN.*

STRAIGHT AND LEVELL

The Levell portable ac microvoltmeter type TM3B has many useful features, such as wide frequency range with variable bandwidth, high sensitivity and low noise level.

The TM3B has ranges from 15μV to 500V and −100dB to +50dB, with an input impedance of 10Mohm in parallel with <20pF on ranges above 50mV.

The meter has a 127mm scale length with mirror. Maximum bandwidth is 1Hz to 3MHz, but this may be reduced to 1Hz to 350Hz, 10Hz to 10kHz or 10Hz to 100kHz by use of the pass-band switch. An amplifier output is provided with gain variable up to 80dB. The TM3B is powered by a PP9 battery with a life of 1000 hours or from ac mains using an optional power unit.

It is housed in a robust steel case with dimensions 180 × 260 × 140mm and weighs 2.8kg.

For further information please contact: *Levell Electronics Ltd, Moxon Street, Barnet, Herts EN5 5SD. Tel: 01-449 5028.*

NEW TELEPHONE NUMBER

South Midlands Communications Ltd, one of the UK's leading suppliers of radio communications systems and satellite TV receiver systems, have new telephone and FAX numbers. From 1st March the new numbers will be: Tel: (0703) 255111; FAX: (0703) 263507; and Telex 477351 SMCOMM G.

Their postal address for written enquiries is: *South Midlands Communications Ltd, SM House, School Close, Chandlers Ford Industrial Estate, Eastleigh, Hants.*

I/O SYSTEM FOR IBM PCs

Users of IBM PCs and other popular RS232 interfaced computers can now utilise a versatile and economically priced expansion system to collect and generate digital and analogue inputs and outputs.

The system, available from Electronic and Computer Workshop Ltd (ECW), is based on a series of multi-slot motherboards that accept standard I/O function cards. An intelligent RS232 interfaced version, the K2612, compatible with IBM PCs, has been added to the range, allowing many more users to interface their machines to the outside world.

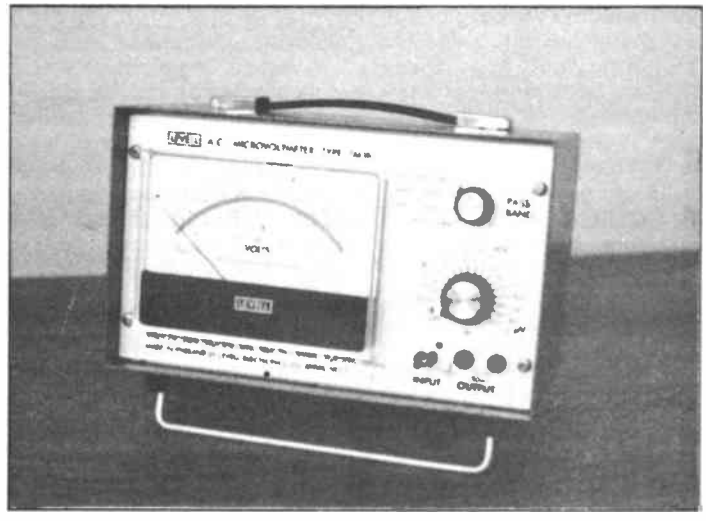
The system is a fully expandable method of connecting a wide range of analogue and digital signals to a computer for data acquisition and control of many types of electrical circuit. The plug-in series now includes an eight-channel analogue input multiplexer, A/D and D/A conversion, Centronics printer port, eight-channel logic input, real-time clock and a general-purpose output card with a choice of relay and triac outputs.

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

ANALOG TO DIGITAL

Model PC26 from Amplicon Liveline Limited is a low cost, 16 channel, 12 bit adc card for the IBM PC or equivalent computer. Supplied complete with sampling software and user manual, the analog inputs may be sampled at up to 200 times per second using Basic, 2,000 per second using turbo Pascal, or from one per hour to 30,000 per second using an additional software package, PC28A.

Input voltages may be unipolar or bi-polar, and the conversion technique is successive approximation with 35 microseconds conversion time. The PC26 is suitable for use with any compatible colour graphics card enabling data to be easily displayed and assimilated. The PC26 is economically priced at £193. For further information please contact: *Amplicon Liveline, Centenary Industrial Estate, Brighton, East Sussex BN2 4AW. Tel: (0273) 570220.*



CLUB NEWS

Border award

Following the success of the award for operators/SWLs which began on 1st January 1986, the Oswestry and District Amateur Radio Club have introduced another award for the 10m-160m bands, based on the county of Shropshire and border counties using 144MHz and above.

This time the border falls between England and Wales and the award is based on the counties of Clwyd, Powys, Gwent, Cheshire, Shropshire, Hereford/Worcester and Gloucestershire.

In order to qualify for the award, entrants in the UK must work/hear either a club member, the club callsign G4TTO or any special event station organised by the club, in addition to 10 stations in each county. Entrants outside the UK need only work 5 stations in each county.

Claims for the award must include a list of log entries (certified correct by two other operators/SWLs) giving date, callsign, frequency, mode and county for each station worked/heard, together with £1.75 or 10 IRCs.

Claims should be sent to: Tony, Awards Manager, PO Box 6, Oswestry, Shropshire SY11 1ZZ. Further details of both awards are available by sending an SAE to: J B Goldsmith, Ivydene, Four Crosses, Llanymynech, Powys SY22 6PS.

BARTG awards

The British Amateur Radio Teleprinter Group sponsors several RTTY awards including:

- The Quarter Century Award, (QCA) issued for having worked or heard amateur radio stations in at least twenty-five counties.
- The Century Award, issued for having worked or heard one hundred stations on the VHF bands, fifty stations on the UHF bands and ten stations on the SHF bands.
- The Members Award, issued for having worked or heard at least twenty-five different BARTG members on any band.

Further details on each award are available from the Awards manager, Ted Double G8CDW, 89 Linden Gardens, Enfield, Middlesex EW1 4DX.

A new book entitled *RTTY Awards* written by G8CDW is also to become available from the British Amateur Teleprinter Group.

Printed in A5 size and containing some eighty pages, the book describes about sixty different international RTTY awards and includes a comprehensive prefix and zone list.

Enquiries about price and availability should be directed to Mr Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT.

BRES 144MHz award

This year's Barking Radio and Electronics Society 144MHz contest takes place on 29th March from 13.00 to 17.00GMT.

Sections include: high power – full legal limit; low power – 20 watts PEP SSB output or equivalent in other modes; and SWL. There are no restrictions as to the number of operators at each station, which may be fixed, portable or mobile.

The contest exchange should consist of the normal RST report, and the usual three digit serial number (starting at 001). In addition, the county in which the station is located should also be sent.

Each completed contact will score 1 point, but contacts with G3XBF or G8XBF score ten points. The final score is the total contact points multiplied by the number of counties. Each country worked outside the UK counts as an additional county.

Unmarked duplicates will be deducted at double the claimed score. More than five unmarked duplicates will result in disqualification.

All entries should be on RSGB VHF log sheets or similar, and the column headings should be time, station worked, RST/serial number sent, RST/serial number received and county received. A separate check list of counties worked should also be included.

Entries should be sent to BRS31976, 32 Wellington Road, Rayleigh, Essex SS6 8EZ, and must be postmarked not later than 13th April 1987.

Awards will be made to the winner and runner-up in each section and also to the leading Essex station in each section. The decision of the committee of the Barking Radio and Electronics Society will be final.

Entrants attention is pointed towards rules 15 to 21 of the 1987 RSGB general rules, which should be used as a guide to the operation of all competing stations.

Southgate action

The Southgate Amateur Radio Club meets at the Holy Trinity Church Hall (upper), Green Lanes, Winchmore Hill, London N21, for 7.45pm.

On the agenda for March they have a talk entitled 'Building the P W Halford HF Transceiver' on Thursday the 12th and an informal meeting on the 26th. All visitors are welcome.

For further information on the club or its activities contact: D C Elson G4YLL, 200 Churchgate Road, Cheshunt, Hertfordshire EN8 9EL.

G3RR

The Rolls Royce Amateur Radio Club run regular Morse classes every Monday night and shack nights every 2nd and 3rd Wednesday, both starting at 7.30pm sharp.

In addition they are holding a members' construction contest on 4th March and an interclub games night on 1st April. Both activities start at 8.00pm.

Meetings are held in the Rolls Royce Sports and Social Club, and further information is available from the Hon Sec, L Logan G4ILG, 19 Fenton Avenue, Barnoldswich, Colne, Lancashire BB8 6HB.

Antherstone ARC

The Antherstone Amateur Radio Club meet on the second and fourth Mondays of each month for 7.30pm at the Physics Laboratory, Antherstone Upper School, Long Street, Antherstone.

Scheduled for meetings in March are a lecture on 'NiCads – Uses and Abuses' by G6YQU and G4IWA on the 9th, and an 'Informal' at The Bull in Witherley at 8.00pm on the 23rd.

In April they also have a talk by officers of the DTI/RIS if anyone has some awkward questions they wish to pose to the gentlemen 'in the know'.

Prospective new members are welcome at all meetings, and licensed amateurs invited to join in the club net held on 144.625 F3E (±QRM) at 8.00pm on the Mondays when meetings are not scheduled.

An information sheet about the club is available on receipt of a 9 x 4 inch SAE from: Roy Fuller G6YQU, 25 Thurlmere Avenue, Nuneaton, Warks CV11 6HT. Tel: Nuneaton 370600.

Keighley ARS

The Keighley Amateur Radio Society meet for 8.00pm at the Victoria Hotel, Cavendish Street, Keighley.

On Tuesday 10th March they are gathering for an informal meeting, but on Tuesday 31st they have a talk entitled 'Jordan' by JY9WR. In addition, everyone is collecting their 'spontaneous rally buys' and taking them along to the junk sale on 14th April, no doubt to purchase another load of 'looks useful but probably won't be'!

Further details on membership and activities can be obtained from the club secretary, Kathryn Conlon, of 76 Deanwood Crescent, Allerton, Bradford, West Yorkshire BD15 9BL.

ISWL

The International Short Wave League have had a bit of a reshuffle, and their club headquarters is now at 10 Clyde Crescent, Wharton, Winsford, Cheshire CW7 3LA.

In addition, the Awards manager is now Clifford A Tooke G1516, who can be reached at 46 Richmond Avenue, Rayleigh, Essex SS6 7RH.

Wimbledon activity

All WDARS meetings are held on the second and last Fridays of each month at 7.30pm in the St Andrew's Church Hall, Herbert Road, Wimbledon, London SW19.

In March they are exploring amateur radio outside the members' usual activities, with a lecture on 'Aircraft Radio Aids' by Mike McCarthy G0AWQ on the 13th, and a talk on 'INMARSAT Maritime Communications' by Chris Witmarsh G0FDZ on the 27th.

Enquiries concerning WDARS' activities and membership should be referred to the hon secretary, George Cripps G3DWW, 115

Bushey Road, Raynes Park, London SW20 8DG. Tel: 01-540 2180.

EHN news

The Edgware and District Radio Society have appointed a new secretary. Information on the club and its activities are now available from Ian Cope G4IOZ at 30 Drovers Way, Hatfield, Herts.

Meetings are held at 8.00pm on the second and fourth Thursdays of each month, in the Watling Community Centre, 145 Orange Hill Road, Burnt Oak, Edgware. The Club also runs a club net on 1978MHz every Monday night at 10.00pm, and slow Morse transmissions on 1978MHz (A1A/J3E) at 9.30pm on Mondays (4-14wpm) and 7.30pm on the first and third Thursdays in the month (8-18wpm).

Components fair

On Sunday 5th April, from 11am to 4.30pm, the Pontefract and District ARS are holding their Components Fair for radio and electronics enthusiasts. The event is taking place at the Carleton Community Centre, Carleton, Nr Pontefract, just off the A1 at Darrington.

All the usual attractions will be there, including trade stands, a licensed bar and a bookstall. Talk-in will be on S22.

For further information contact Colin Mills, telephone (0977) 43101.

Mid Lanark open day

The Mid Lanark Amateur Radio Society is holding an open day on 14th June at the Wrangholm Hall, Community Centre, Jerviston Street, New Stevenson, Motherwell ML1 4UQ.

It is hoped that a large variety of attractions will be in attendance, including satellite operation, RTTY, HF operation, DXing and QRP, in addition to the usual trade stands, junk stall and car boot sale.

Further details are available from the club secretary, David Williams GM1SSA, of 32/34 Carfin Street, New Stevenson, Motherwell ML1 4JL. Tel: Holytown 732403.

Highland games?

Following yet another highly successful event in 1986, radio amateurs in the Scottish Borders will again be acting as hosts to the 4th Anglo-Scottish Rally in Kelso's Tait Hall on Sunday 3rd May from 11am to 5pm. The organising club will be Kelso Amateur Radio Society as in past years.

There will be the usual 'talk-in' on S22, traders' stalls, club stalls, hot and cold snacks, bar, raffles, Morse tests etc.

Entrance will be £1.00. Juniors and accompanying YLs and XYLs are most welcome and will be admitted free of charge. There is something to do for everyone. Why not spend the bank holiday weekend in the Borders?

For further information, contact Andre Saunders GM3VLB, the organising secretary. Tel: (0573) 24664 any evening.

Junk sale rally

The Cambridgeshire Repeater Group Junk Sale Rally Extravaganza(!) will take place on Sunday 5th April 1987, at PRCS (Pye Telecom) canteen, St Andrew's Road, Chesterton, Cambridge. Commencing at 10.30am, it is an all day event featuring trade stands as well as the very popular 'monster' junk sale auction. There will also be a 'nearly new' bring-and-buy stall. Talk-in will be available on S22 and RB14 (GB3PY) by G5PI.

Further details are available from G8XMS, QTHR. Tel: (022) 023 3362.

White Rose Rally

The White Rose Rally will be held at 11.00am on Sunday 22nd March at the University of Leeds refectory. Admission will be by programme or 60p at the door. There will be 50 trade stands, 'talk-in' on S22 by special event station GB2WRR and a demonstration station.

Details are available from Mike G0EGM. Tel: (0532) 676368 evenings. OAPs and disabled admitted from 10.30am.

Verulam meets

The Verulam Amateur Radio Club meets at the RAF Association Headquarters, New Kent Road (off Marlborough Road), St Albans on the second and fourth Tuesdays of each month.

On Tuesday 14th April there will be an 'activity evening' and on Tuesday 28th April our very own Angus McKenzie G3OSS will give a talk entitled 'Amateur rigs of the year'.

Visitors are welcome to all club meetings, details of which are available from the honable secretary, Bob Heath G3UJV, 26 Lancaster Avenue, Hadley Wood, Barnet, Herts EN4 0EX. Tel: 01-449 4352.

'87 Sarcon

This year, the Scottish National Amateur Radio Convention will be held in Europe's largest leisure centre. The organisers have also broken the tradition of holding the convention on a Saturday in favour of Sunday September 13th, to cater for hams who have to work a six day week.

The choice of venue, the Magnum Leisure Centre in Irvine, Ayrshire was taken to make Sarcon '87 a day out for the whole family.

The Magnum Leisure Centre has two swimming pools and also twin flumes – the first giant water slides to be opened in Scotland. There is a skating rink, indoor bowling greens, bar and catering facilities and a theatre for the lectures.

The Magnum is situated in a vast beach park with boating facilities, river and sea fishing.

The organisers are also hoping to try something different with the bring and buy sale. Items over a specific value will go to a separate stand in the main hall where they can be viewed properly and safely.

Talk-in for the convention is being organised by Raynet and will probably be on the AY or CS repeater and one 2 metre channel.

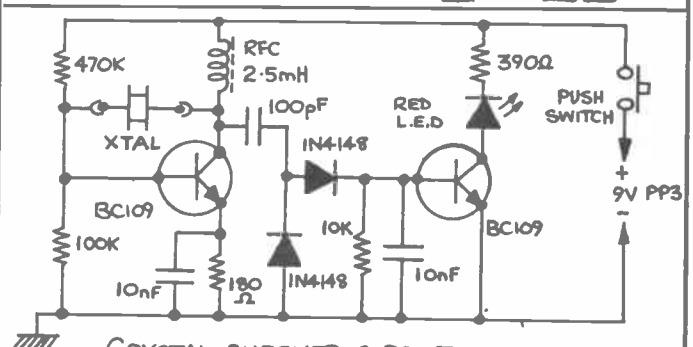
Provision on 70cms is also on the cards.

There is ample and secure car parking around the Magnum and the railway station is only a few minutes walk away.

Further information about Sarcon '87 can be obtained from Bob Low GM0ECU QTHR. Tel: (0563) 35738, evenings.

If your club has an event that needs publicity, send details to the Editor at the address on the contents page, to be included in Club News.

ANDY TIPPS by Deejay



CRYSTAL CHECKER CIRCUIT.

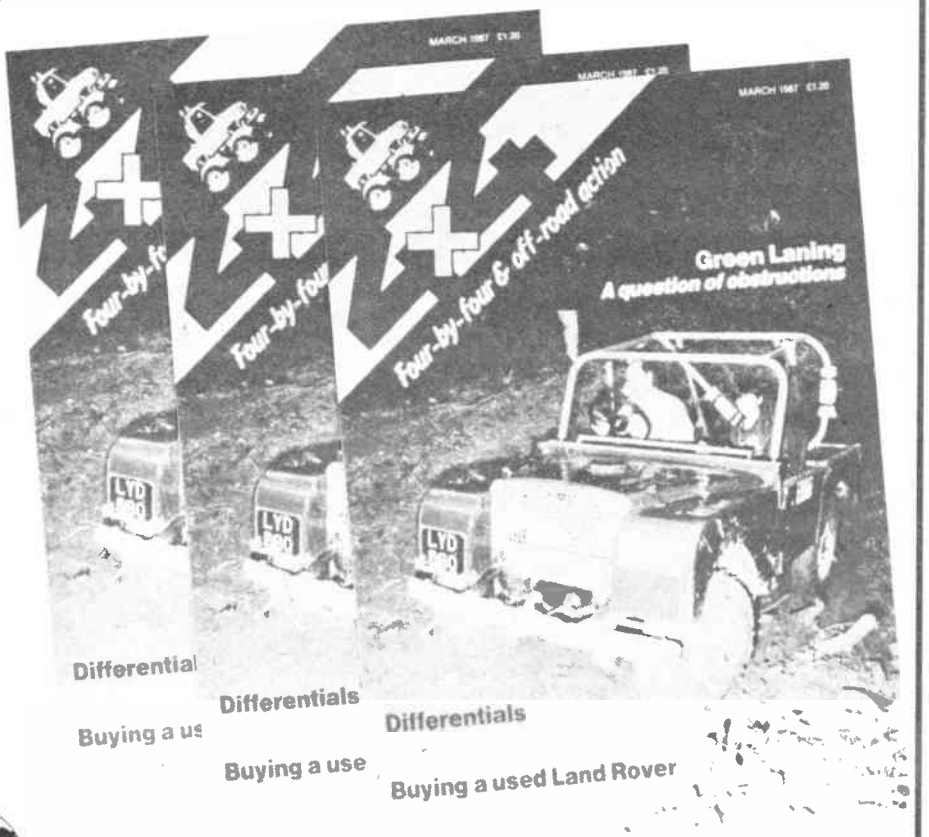
ANDY SAYS:-

"THIS IS A USEFUL GADGET TO CARRY AROUND WHEN VISITING RADIO RALLIES — A POCKET CRYSTAL CHECKER. PLUG IN A CRYSTAL, PRESS THE SWITCH, AND IF THE CRYSTAL OSCILLATES THE L.E.D. WILL LIGHT."

Bored with a humdrum existence? Tired with a tedious life?

Fancy straying from the straight and narrow or even crossing to the wrong side of the tracks? Yes, we thought as much . . .
So what's the solution? Where's the sparkling new package to break the dreary mould? Why it's here! . . .
4x4 Magazine!

4x4 has all that's best in off-road and four-wheel-drive action. Lacking only a mushroom cloud in terms of spectacle, it's guaranteed to excite and entertain, but beware! . . . This magazine contains explicit material which some readers, especially those of a frail disposition, may find disturbing. You have been warned!



Place a regular order with your newsagent or take out a subscription

ON SALE AT YOUR NEWSAGENTS 2nd THURSDAY EVERY MONTH

4x4 SUBSCRIPTION ORDER FORM

TO: Subscription Department · 4x4 · 1 Clarendon Road · Croydon · Surrey · CR0 3SJ

PLEASE SUPPLY: (tick box) for 12 issues, all rates include P & P

Inland	World-Surface	Europe-Air	World-Air
£17.70 ☐	£19.80 ☐	£25.10 ☐	£32.75 ☐

Cheques should be made payable to 4x4 Magazines. Overseas payment by International Money Order or credit card.

PAYMENT ENCLOSED: £ —

CREDIT CARD PAYMENT ☐ ☐ ☐ Signature .....

Expiry Date ☐☐ / ☐☐

☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

NAME ..... ADDRESS .....

..... Postcode AR03

DX DIARY

News for HF operators compiled by Don Field G3XTT

As I write this month's column the Peter 1st Island expedition is still in full swing using the callsigns 3Y1EE and 3Y2GV. This is the first new country to have been added to the DXCC list for many years, especailly if ZC4 (British Sovereign Bases) is discounted, given that that one was back-dated. As a result, every DXer on the Honour Roll had, perhaps for the first time in many years, to take out his rig, dust it off, and pile into the fray. Otherwise he would lose his coveted spot and fall down a notch.

Frustration

The result was pandemonium on the bands for the first couple of days of the expedition, with many operators becoming more and more frustrated. LA1EE and LA2GV, the two DXpedition operators, had to resort to various ploys to cut down or spread out the stations calling in order to be able to distinguish individual callsigns from the melee. This led to cries of favouritism being shown to various clubs or countries. For those with patience, though, by the fourth and fifth days of the operation most of the needy had made their contacts, and the 3Y stations could often be heard calling CQ with very few takers.

In actual fact the operators had been very careful to try to avoid any cries of favouritism. The major sponsor of their DXpedition was the Northern California DX Club, which had promised $10,000 up front, with more to come on the condition that no priority be extended to any group, nation, club or individual. This was, incidentally, the largest financial commitment ever to be made by the NCDXF.

By the 28th January the two operators had made 10,000 contacts and were hoping to increase this to nearer 20,000 by the time they were due to leave on 2nd February. Operations commenced late on the 23rd of January. UK stations had been able to work them on 15, 20 and 40 metres, and they had also been worked in Europe on 80. If you missed out, part of the blame must fall on those amateurs who insisted on working the expedition time and again. One G amateur was heard to make at least five contacts on 20 metres SSB. Quite why this should be necessary defeats me.

Freezing conditions

Peter 1st Island is located just off Antarctica in the Amundsen Sea, to the south west of the tip of South America. When the expedition (which, as I said last month, was a mapping and research as well as an amateur radio expedition) landed or the island the temperature was −2°C, with winds up to gale force. The two amateurs lived in and operated from igloo-shaped tents, and sat in pools of water as their feet melted the ice beneath them.

The thick ice covering the island also gave them problems with the ground system for the stations, and this prevented them from doing as much LF operating as they had hoped. Their actual operating site was on a glacier 75 metres above sea level.

Back in Norway a team of amateurs has been organised to deal with the QSLs, with the aim of getting them printed and sent out as quickly as possible when the photographs and logs are back in Norway.

The QSL manager is LA6VM, Erling Wiig, Jacob Fayes V6, N-0287 Oslo 2, Norway. The group say they prefer dollar bills to IRCs for return postage, as the former are easier to exchange.

Seychelles

The S79LJ operation by Ian G4LJF, netted 5,100 contacts in a two week operation. Ian operated from Bird Island, some 80 miles from Mahe, which is just two miles in circumference. The island was bought by the present owner as a coconut plantation in 1969, but there are now 25 tourist bungalows there (while Ian was there, John Taylor of the Duran Duran pop group was in the next bungalow). In the breeding season (May/June) some three million birds add to the islands' population.

Ian operated from the Seychelles with his TS430, an LA1000 linear and a Butternut vertical antenna with suitable radials. He was able to work UK stations on all bands except 10 metres, which opened only to southern Europe and to Africa. His 160 metre log makes particularly interesting reading, the nine lucky stations being G13OQR, G3SZA, W4MGN, 4X4NJ, F6BKI, LA5UF, 8Q7CH, OH2VY and VE1ZZ.

Where are the Gs?

Ian comments on the lack of G callsigns in his log. He also comments that, in his view, the worst operators he encountered were the ZS stations, who all seemed to want to tell him their name, QTH, the age of their grandmother, etc. In contrast, the Europeans, Americans and Japanese kept the exchanges short and sweet, which is what expedition operators usually want. Incidentally, while in the Seychelles Ian was able to have dinner with S79WHW, S79CW and the Colvins (W6KG and W6QL) who were operating from Mahe at the time as S79KG.

Around the bands

As if 3Y and S7 were not enough, January brought a host of DX on to the bands. From my own point of view Top Band proved the most interesting. KL7Y and KL7H operated from Endicott Island off the north cost of Alaska and were workable both mid-evening and before dawn. They were also putting good signals into the UK on 80 metres, despite running only 100 watts. The secret seems to be that they were operating from north of the auroral zone, thus halving the attenuation between themselves and Europe in comparison to other KL7 stations.

Other DX worked in the UK on Top Band included 7P8BE and 3B9CJ, and the UK's leading Top Band DXer now has an astounding 198 countries worked on the band, and is only short of zone 26 for the Worked All Zones award. This latter is particularly relevant

given that *CQ Magazine* have now introduced a 160 metre variant of their popular Worked All Zones award (see later in this column). The basic certificate is for confirming 30 zones, and there are then endorsements for 35, 36, 37, 38, 39 and the full 40.

While on the subject of Top Band, ON4UN is reported to have worked some 70 countries, 32 states and 11 zones (including KH6CC) in his first four days of operation on the band. And SP3BQD tells me that he has worked 96 countries on the band since last September.

DXCC

With regard to DXCC, this year sees the Golden Jubilee of the DXCC awards programme, and a special award is available for working 100 countries during 1987. An official application form is available by sending a large self-addressed envelope to ARRL HQ (no return postage is required). No QSLs are required for the award. W6GO worked the necessary 100 countries in the first three days of 1987 and, not surprisingly, the first 25 applicants for the award were all US amateurs.

Contests

The major contest in March is the CQ WPX SSB Contest, run over the last full weekend of the month which, unfortunately, clashes this year with the RSGB NEC Convention. A number of special operations have been notified for the contest, including the use of the H20 prefix by 4X6II from Cyprus from 20th to 31st March, a possible PY0F operation by PY5EG, and FO0SSJ from Bora Bora by K8JRK and others from 26th March to 6th April.

I mentioned the Bermuda contest last month, so the only other one to mention is the SP-DX Contest on the first full weekend of April (4/5th April); an opportunity to work Polish stations. This year it is a CW event (it alternates from year to year).

Other news

From Monaco, 3A7A will be aired on 27th March to celebrate the National Day of Childhood, and 3A7E and 3A7F will be operational during major contests this year. Another unusual prefix is FV7NDX. This callsign has been obtained by the French bulletin *Les Nouvelles DX* for use in major contests, and by expeditions to French offshore islands.

Israeli changes

While on the subject of prefixes, *DX News Sheet* reports that Israeli prefixes are being changed to reflect the class of licence. Callsigns in the 4Z9AAA-ZZZ series will be allocated to novices, 4X1 callsigns to class A operators (all privileges plus 1500 watts output), and existing prefixes to class B callsigns (all frequencies, but restricted to 150 watts output).

Bill KH4BPL/KH3 will remain on Johnston Island for another eleven months. W2WSE should be active as VP2MDB from Montserrat until 4th April.

Islands on the Air enthusiasts should look for F6DYK/GRO and F6FCV/GRO from Groix Island from 3rd to 7th March. Recently the IOTA LF net has moved to 3737kHz each Friday from 2030GMT, 40 metre propagation having been unsuitable on Saturdays and Sundays, on 14260kHz from 1300GMT.

Chiltern DX Club

There have been various attempts over the years to found a UK DX Club, all of which seem to have floundered for a variety of reasons. The Chiltern DX Club, which has existed for some time to cater for DXers in the Thames Valley, has extended its scope in the last couple of years and is now looking to recruit new members throughout the UK.

As the Editor of its bi-monthly newsletter, I have a vested interest in promoting the club, but I genuinely believe that UK DXers need a strong special interest club to serve as a clearing house for news, to support DXpeditions, especially UK-based, to lobby for DXers' interests with the RSGB, etc, to organise social gatherings, including hospitality to visiting DXers, and so on. Basic requirements for membership of the CDXC are: 1) DXCC worked and confirmed; 2) be proposed by a current member; 3) serve a probationary period of 6 months. Further details may be obtained from the club secretary G2DMR, or from yours truly.

Worked All Zones

After DXCC, probably the most sought after award on the HF bands is the Worked All Zones award programme, sponsored by the American *CQ Magazine* (of CQ Contests fame). *The DX Bulletin*, an American publication, recently carried a potted history of the WAZ award. From this it transpires that the idea goes back even earlier than the DXCC award.

Because it had proved so difficult in the 1930s to reach an agreement on what constituted a country (it still is!), a suggestion appeared in the November 1934 issue of a magazine called *R/9* for dividing the world up into 'zones' based on a geometrical rather than a political division of the globe. There was no suggestion at the time that certificates should be awarded, but *Radio* magazine, into which *R/9* was merged in 1935, started publishing a regular listing of contenders for working all zones. The first station to manage this (at that time) very difficult feat was ON4AU, followed in June 1937 by G2ZQ.

The WAZ Award itself did not appear until after the war, and now exists in a number of forms, including mixed, CW, phone and SSB, as well as the 160 metre version I mentioned earlier in this column, and the prestigious 5 band WAZ introduced in 1979 (the first of which was won by yet another Belgian amateur, this time ON4UN who took just five months to work the necessary 200 zones and one month more to amass the QSLs). Even after seven years, the only UK holders to date of the 5BWAZ award in its full 200 zone form are G3MCS and G3TJW, although C8GIQ is also known to have the necessary QSLs at the time of writing. The custodian of the WAZ awards is Leo Haijsman W4KA, 1044 Southeast 43rd St, Cape Coral, FL 33904. USA.

My address is:
105 Shiplake Bottom,
Peppard Common, Henley,
Oxon RG9 5HJ.

ANGUS McKENZIE TESTS

ICOM IC275E 144MHz base station

The best 2m multimode yet

It has struck me that since I started writing for this magazine in late 1982 manufacturers have continuously leap-frogged over each other, and the best rig for any particular band at any particular time can often rotate between the three main manufacturers. Now that muTek are no longer making amateur gear, I have been very concerned that there hasn't been a fully satisfactory rig available for 2m, judging by the most critical standards, and the best compromise up to now, in the absence of the muTek transverter, has probably been the Trio TS711E.

There were a number of features on this rig's predecessor, the IC271E, which I was not happy with. I did not like the audio, either on transmit or receive, and I noted a very bad IF filter leakage problem which severely affected the rig when it was being used under contest conditions. Very strong signals even ±12kHz from the received channel tended to squeak their way through to the product detector. The sensitivity was only average, and it was virtually essential to put in a muTek front end if you wanted good sensitivity.

Icom's big leap

The new IC275E gives all the usual Icom facilities, but they have obviously studied the market carefully and taken note of reviews and user complaints, for the new design is so much better in very many areas. Modes included are FM, USB, LSB, CW (with optional 500Hz crystal filter available), and data. Tuning steps are 10Hz and 1kHz on SSB/CW, and 5kHz and 1kHz on FM. There are 99 memories which store frequency, mode and any repeater offset information. The rig is rated to give a nominal 25W output, but this can be decreased by up to 10dB using an RF power mini pot on the front panel.

The usual Icom serial data interface is provided on the back panel, which allows the rig to be driven from an external computer. The data button on the front panel also enables an extremely rapid Tx/Rx changeover with only a few mS delay, which is excellent for use with AMTOR and Packet radio, the tones themselves being audio in/out and using the LSB function.

As well as the normal two VFOs with split and equalising buttons, the 99 memories are accessed with a rotary click switch and simple memory write and recall buttons. Additional buttons also allow you to insert a memory frequency into either of the VFOs. You can lock frequency and there is an RIT facility which can be switched in, out and cleared, the RIT variation being up to ± 9.9kHz. A notch filter is provided, which is rather unusual for a monoband rig, but in addition there is also a passband tuning control which has a centre indent to establish a normal passband position.

You can program in your own favourite calling channel and mode, which can be recalled instantly by simply pressing a call button. I set this for 144.300MHz and USB, and pressing the call button immediately returned me to the calling channel. However, I then found that I could not VFO off it. It did not take too long to realise that I could achieve this if I first pressed M to VFO, followed by the VFO button.

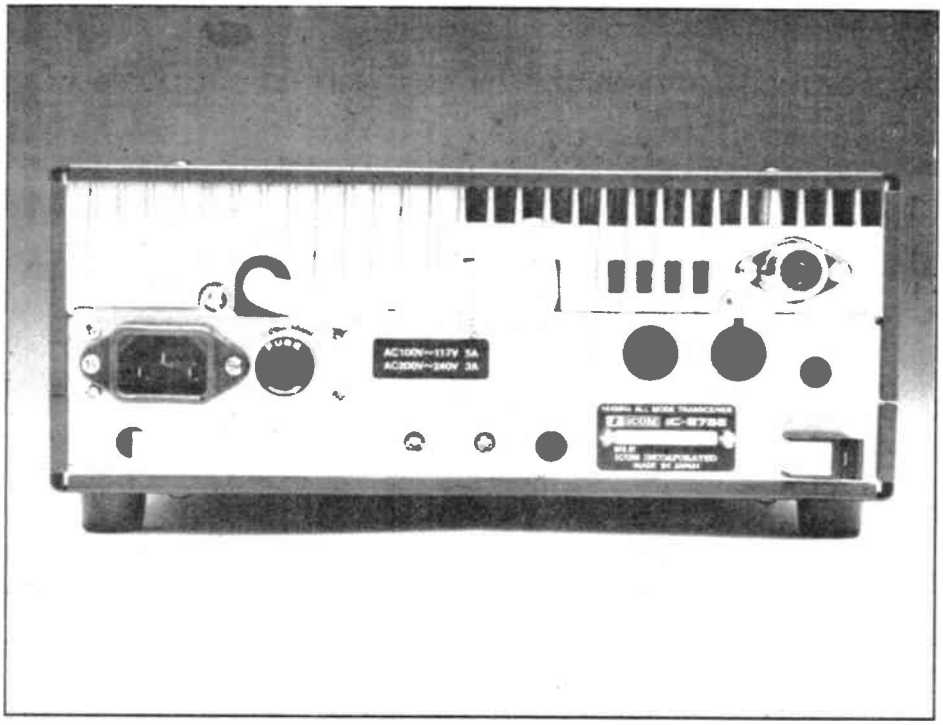
Control layout

The control layout on the left side of the front panel is quite different from previous Icom VHF rigs. In addition to the mode buttons, there are many extra ones, as follows: audio speech processor in/out; masthead pre-amp on/off; AGC fast/slow; noise blanker on/off; tone squelch on/off and setting controls; 1750 toneburst spring loaded; simplex/duplex ± selection; and reverse repeater monitor.

A row of tiny rotary pots is located at the bottom of the panel, each of which can be pushed in and out so that they can be semi-recessed when not in use. These provide: variations of RF power level; RF gain on Rx; CW delay for semi break-in keying; audio treble tone control; and mic gain (operating on all modes). Along the same row as these pots are buttons for Tx/Rx, a meter switch (power out on Tx and S meter or centre metre on Rx) and a speech frequency readout button for use with an optional speech board, which was not available at the time of review. The audio gain control is concentrically mounted with the squelch control, which operates on all modes.

The tuning knob rotates very freely, and includes a finger hole. On SSB and CW it rotates at around 9kHz per revolution on average, but this did not seem to speed up with rapid rotation, although the manual inferred that it should. Having discussed the matter with Thanet, tuning should have been around 2.5kHz per revolution speeding up to 10kHz, but some form of fault on the review sample retained the 10kHz per revolution, even at slow tuning speeds, although 10Hz steps were still available. When the 1kHz step rate is selected the tuning is at approximately 100kHz per revolution. On FM the tuning rate is of course much faster in the normal rate position.

The digital readout has a soft orange illumination, which is easy to read and gives seven digits with 100Hz resolution. The display also gives basic status indications, including the memory channel number, VFO details and various other functions that are in operation.



Also on the front panel is an eight pin standard Icom mic socket, and the normal quarter inch headphone jack. A bail stand pulls out under the front lifting it up quite conveniently, and the speaker is in the top lid towards the front. There is no carrying handle, which could be slightly inconvenient.

The rear panel

The rig can work off 240V ac mains (IEC mains socket provided), or 13.8V dc. A mains PSU is built in, and its dc output contains the usual Icom power connector, which plugs back into the dc socket when in use. The equipment also contains a mains fuse.

The antenna socket is a normal SO239, and a 3.5mm jack is provided for feeding an external loudspeaker. There is a spring loaded earth terminal on the rear, and a serial data socket for interconnecting with a computer interface.

A socket marked AQS is provided to work with an optional extra, called the Amateur Quinmatic System, which is not yet available. This will provide Icom's version of digital coded squelch, but I have yet to ascertain whether it will be totally compatible with the Trio system.

On the left of the back panel at the bottom are some further facilities. These include a key jack, a three position switch selecting break-in, semi break-in keying and off, speech compressor level pot, mix tone control, and an additional meter switch with three positions, selecting normal power output on Tx, or SWR set and read SWR. I believe that this is the first time that an SWR meter has been incorporated on a VHF rig, and this will be most useful for checking out an installation quickly. Another pre-set pot adjusts the CW sidetone level.

Although there is a large heatsink across the top of the rear panel, I did notice that the rig became very warm indeed on a long FM transmission, and I was surprised to find that there was no fan operating.

Accessory socket

This socket has eight pins providing the following connections: pin 1, NC; pin 2, ground; pin 3, send (in parallel with PTT line, and thus providing external PTT or the changeover of an external high impedance PTT line on a linear): pin 4, external modulation input; pin 5, audio output at fixed level from detector stage; pin 6, squelch ground when open; pin 7, 13.8V dc; and pin 8, ALC input.

The PTT on pin 3 is most confusingly detailed in the instruction book, and the importers state that it is not suitable for use with linears giving quite a high short circuit current or a high voltage when open. This means that it might be unwise to attempt to use some of the Microwave Modules models with the rig, unless you add an external transistorised relay switch to separate the linear PTT line from the rig's one.

Ergonomics

I generally liked the feel of the tuning mechanism, and operation of the VFOs and memory functions was quite simple and most effective. The provision of a call frequency will be a great asset. FM channelling is 5kHz with the normal position of the step button, and this is completely inappropriate in the UK, although the VFO tuning speed was just about right.

You could only achieve 12.5kHz channels with a 500Hz error on FM, or by going to SSB and dialling the correct channel and then returning to FM again. However, if you then move the VFO, you lose the offset. If you want to use 12.5kHz channelling you can easily store all the FM channels in the memories, as there are plenty of them. The memories will hold a repeater shift, and this is an advantage. A button labelled 'check' allows you to listen on input, but does not permit you to transmit on output, so it is not a true reverse repeater facility, which can be a snag.

The row of mini pots along the bottom of the front panel might be found slightly awkward to use, but I rather like the way in which you can push them into the chassis if you are not likely to be using them; one further push and they pop out again for readjustment. I suppose they allow the rig to be that much more compact, but I cannot tell how long they will last without requiring replacement through old age or breakage.

All the other controls worked very easily, but it might have been an advantage if room could have been found on the front panel for the CW break-in switch, which you might want to use fairly regularly. The rig does not have any VOX control for SSB, but I do not consider this a disadvantage as very few people seem to use it on 144MHz.

I much preferred using this rig to its predecessor, the IC271E, but there are many points about the Trio TS711E's ergonomics which I prefer. In particular I preferred the latter's clutch mechanism which provided smooth tuning on SSB/CW, with 12.5kHz stepping on FM, and the fact that it could both store repreaters with shifts in memory and store auto toneburst.

The remote data interfacing is compatible with that of other Icom rigs, so you could use one interface switched through to various Icom rigs if you wanted. Interfacing with Packet and AMTOR data is very simple, and may prove to be a strong point in this rig's favour.

Subjective tests

I very much liked the receiver on all modes, although I did not have the narrow CW filter fitted to the review sample which would be particularly useful. The rig was extremely sensitive, and is only matched by rigs with muTek front ends, and the Trio TR751E. The AGC characteristics seemed far better than on any earlier Icom rig, and AGC slow allowed strong signals to be heard without the pumping that one associates with the earlier models.

I did not note any traces of RF intermodulation distortion in the front end, and the intercept point is certainly good enough for normal use, although it is bettered by a muTek transverter combined with an excellent HF transceiver, such as the IC735. There was no 'huffing and puffing' around very strong CW signals, so there did not seem to be any reciprocal mixing problems, neither were there any annoying spurii. I preferred the tone control fully clockwise for SSB and FM, but if you do like a more mellow sound, then its treble control does seem to be better designed than usual.

The SSB selectivity was superb, about the best I have heard yet on an Icom rig,

for the top had just about the optimum bandwidth as a compromise between DX and local reception, whilst the skirts were very steep. There was no trace of any leakage problem that I had noted on the IC271 and 471 models, and the audio quality was quite good on the internal speaker, and even better on an external one. The S meter had inadequate dynamic range, and Icom need to have a look at this.

The FM selectivity was excellent for 25kHz channelling, but you will need to put in an F filter rather than an E if you are regularly going to use 12.5kHz channels. Such filters are available, and I strongly recommend them incidentally.

The pre-amp switch puts 13V on the inner of the SO239 antenna socket on Rx, and can thus power a masthead pre-amp. The pre-amp is disabled, however, if you select break-in keying on CW, or data, as masthead relays would not change over rapidly enough. It is rather useful that this is an automatic feature, which thus saves any possibility of trouble if you are as absent minded as I am!

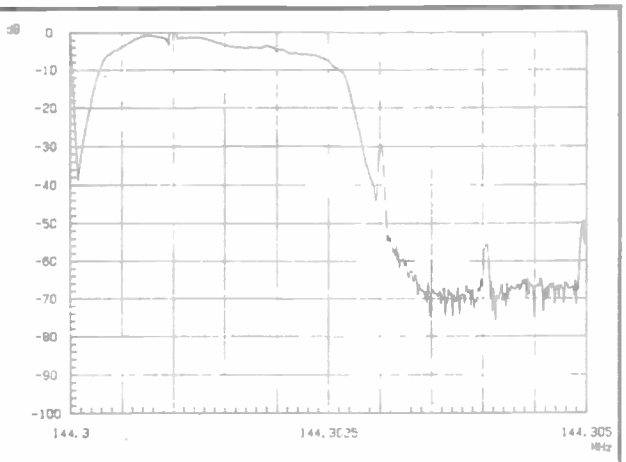
I had a number of QSOs on FM and SSB, and the reports on quality were always favourable. However, when I was using the rig at maximum power with just a moderate degree of compression, I was informed by one station who was receiving me very strongly that there was just a little more spreading than he might have expected. When the power was reduced considerably, the spreading improved a lot.

The speech quality, however, was always good, especially without compression, and the compressor did pack quite a useful punch to the signal whilst not distorting it too much. It is useful to have the mic tone control adjustment available, and this could help the rig to cope with a wide range of voices. I was very happy with the action of the passband tuning control, but the notch filter did not have a particularly deep null, although it was useful.

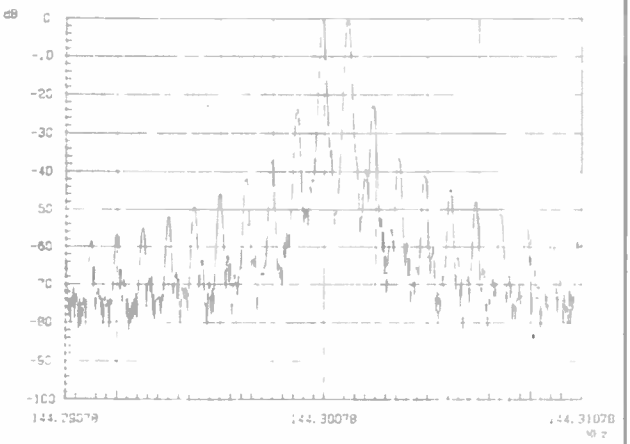
The receiver circuitry

Transmit/receive switching of the antenna is achieved with pin diodes, and this is clearly responsible for the very rapid changeover time that is available. The receive signal passes through helical filters to the first stage, a 3SK121 GaAsFET. This is a fairly expensive example and is configured to give a good intercept point, which is more than can be said for several of the 'cheapo' GaAsFETs. The first mixer uses balanced J FETs, with the first IF at 10.75MHz.

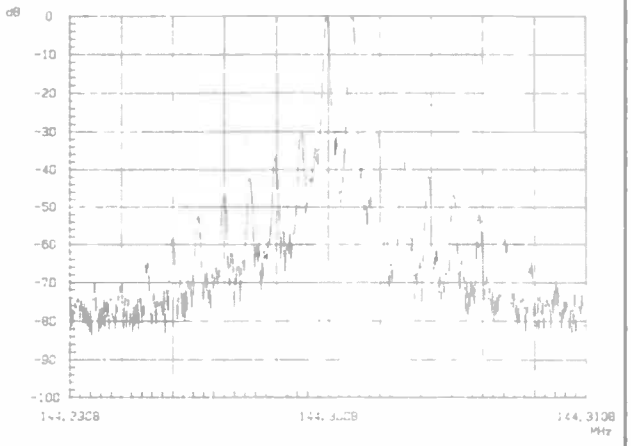
This IF feeds directly into two four-pole 15kHz bandwidth crystal filters (FL28), which are just about ideal for an optimum compromise between FM and SSB operation. The noise blanking circuitry then follows, and then a 3SK74 FET IF amplifier which feeds either an FM mixer (type MC3357 IC) and CFW 455E filter and 455kHz IF strip limiter and discriminator, or the SSB (FL31) or CW narrow filter (unspecified as yet). The notch filter immediately precedes the



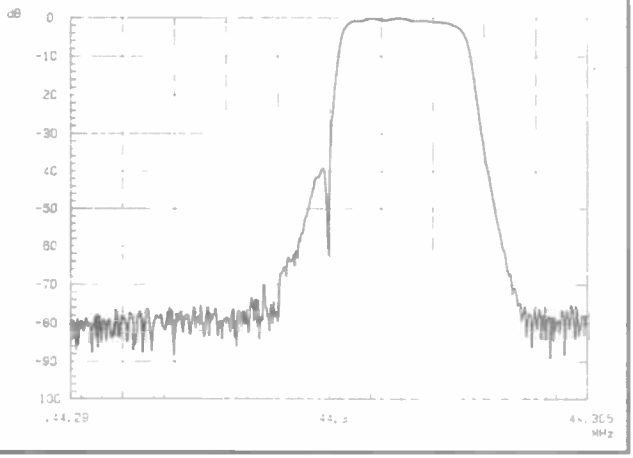
Icom IC275E Rx RF/AF response IF filter passband/AF response. AGC on slow. Resolution bandwidth 30Hz 500Hz per division



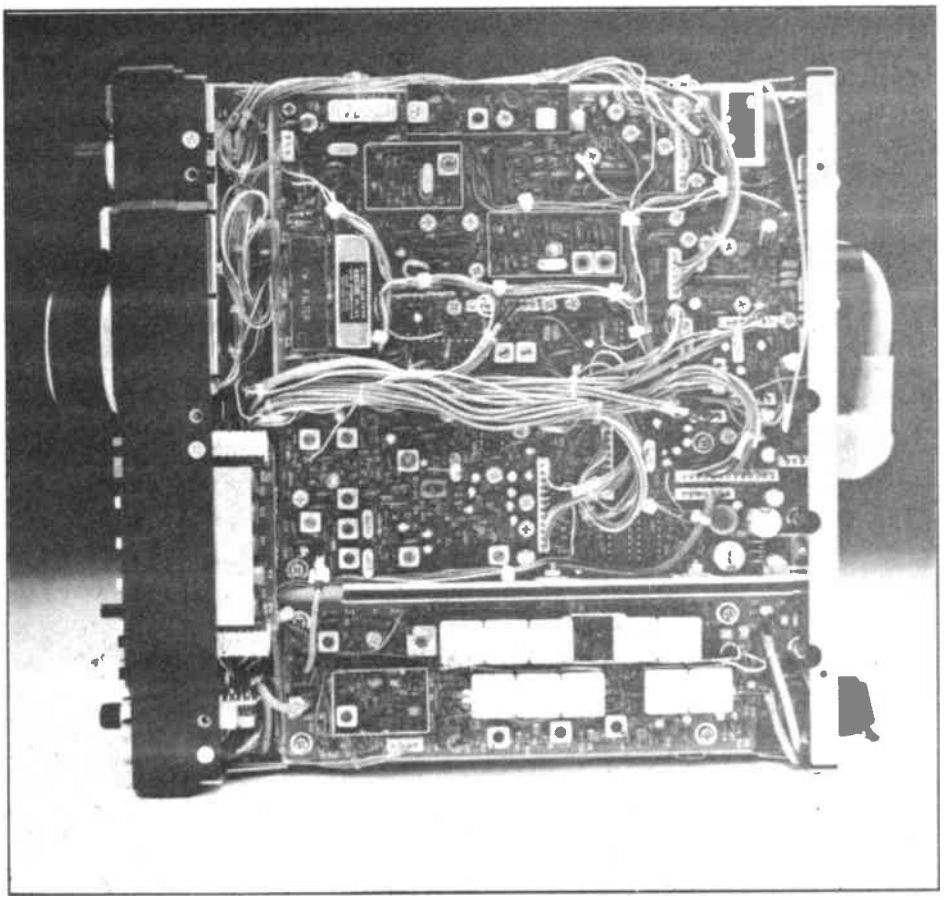
IC275E USB two-tones 28W into ALC 700Hz/1 7kHz Resolution bandwidth 100Hz. 2kHz per division



IC275E USB two-tones 6W PEP 700Hz/1 7kHz tones Resolution bandwidth 100Hz. 2kHz per division



Icom IC275E Tx AF/RF response 3W IF passband showing filter shape Resolution bandwidth 100Hz. 1kHz per division



second mixer, a PC1037 double balanced IO, which mixes the signal down to the second IF at 455kHz. An FL65 2.4kHz ceramic ladder filter then follows, and after amplification the signal passes through to the product detector and audio stages.

AGC is not applied to the front end and there is no RF feedback around the pre-amp. It is interesting that all the first IF filters are crystal types, thus explaining the excellent selectivity found. The passband tuning operates with the second mixer's local oscillator frequency working against the product detector injection frequency.

Laboratory tests

The excellent subjective sensitivity of the front end on SSB was confirmed in the lab, and a brief calculation based on the SSB bandwidth and the sinad measurements shows the receiver to have a noise figure of just over 2dB, which is very good indeed and virtually identical to the performance of muTek front ends with earlier models. The RF input intercept and intermodulation also measured very well, being only a few dB inferior to muTek. It should certainly be good enough for almost everyone, and the rig would be very suitable for contest operators. The reciprocal mixing performance is excellent, and is indeed better than many HF rigs. The local oscillator noise at just 5kHz off frequency is good, but what is particularly amazing is that it goes on falling rapidly to achieve an incredible figure of −123dB at +200kHz, a measurement which was stretching my test equipment to the limit!

The FM sinad sensitivity was also very good, nearly 3dB better than most FM rigs, and it would have been better still with a narrower selectivity on FM. FM selectivity was ideal for 25kHz channelling, but was nowhere near good enough for 12.5kHz, and you would need to order an F filter for the best compromise between selectivity and received quality. The SSB selectivity was initially checked by my normal computer method, and proved to be excellent; far better than on the IC271. In fact it was so good that reciprocal mixing slightly affected measurements at −60dB and lower. Using an audio method the selectivity was subjectively even better, so we plotted out the complete selectivity curve using my new method; the results being shown in *Figure 1*.

The blocking performance was very good and Icom have obviously paid close attention not only to gain distribution, but to the design of the roofing filters used at the first IF. I was pleased to see this filter placed immediately after the front end mixer.

AGC characteristics

The AGC characteristics were well optimised and the slow speed was certainly slow enough to avoid gain pumping on SSB, despite the fact that there was plenty of IF gain in the system. AGC operated well in holding levels down and the AGC threshold was at a very low level, which is useful on SSB when on VHF. I was not too happy with the S meter which only gave a range of 18dB between S1 and 9, higher levels also being quite a long way out. The S meter was also fairly poor on FM.

The product detector distortion was adequate but not particularly good, and the audio amplifier gave just over 2W into 8 ohms, with a very useful increase to 3.6W into 4 ohms for 10% distortion.

Reproduced frequency response on FM from a 750μS pre-emphasised signal shows quite a steep LF roll-off starting at around 300Hz, but HF did not attenuate rapidly enough above 3kHz. This is partly due to the wide filter, but also to the lack of any steep audio filtering in the audio amplifier. The 5kHz response at −8.5dB, ref 1kHz, should have been much further down, and this extended response made the measured sensitivity on FM appear worse than it was subjectively. I took all figures with the tone control flat out, but I did find that the control lopped off treble rather more smoothly than usual, so you can get a steeper roll-off at HF if you want.

The FM capture ratio measured well and the limiting threshold was several dB below the sensitivity point, and thus is very good. The FM discriminator distortion was just a little high other than at low deviations, but in practice good transmitted audio did reproduce well on this rig; SSB also sounding clear and a lot better than on earlier models.

The receiver frequency accuracy was extremely good on SSB, being only 10Hz out, FM is also accurate on Rx. The notch filter did not give a particularly good notch, but the PBT was most useful in allowing the passband to be set where you wanted it.

Transmitter tests

The maximum transmitted power output on FM was around 22W across the band, but this could be reduced down to 2.75W by rotating the power control to minimum. On CW and single tone SSB we achieved similar levels, but two-tone SSB gave at least 28W PEP, and at one time we noted around 30W. I had a long think about this and it seems that the ALC line detects the RMS value of the output signal rather than the peak, so you may note a little more PEP than you might expect, although the human voice does not normally produce two tones of equal amplitude, other than very much in passing! *Figure 2* shows the performance of the rig on SSB with two-tones when the PA is driven into ALC.

The IM products are not as low as I would like and the high order ones are not quite as good as those of some earlier models. At 6W PEP *(Figure 3)* you will see that the products are generally quite a lot better, so there is either insufficient local oscillator injection in the last mixer, or not quite enough standing current in the PA or its driver stage. I would like to see Icom make an improvement in this area, which should be better.

Harmonic outputs were at or below the noise floor of the analyser where I looked for spurii, none being visible

above the noise floor, which is excellent.

The AF/RF response plot *(Figure 4)* shows the excellent selectivity of the IF filter, and the good carrier rejection, although you can see very slight alternate sideband breakthrough, which is not really of much consequence. Audio distortion levels measured well provided a careful watch was kept on input levels to the mic input. You might therefore find that some amplified mics could over drive the mic amplifier circuitry and produce distortion, so watch out for this.

The maximum FM deviation on speech was a little excessive at 6kHz and typical speech reached 5.2kHz, although the toneburst deviation was well controlled. The toneburst frequency was only slightly low, and well within RSGB tolerances.

The transmitted signal to noise ratio seemed quite adequate at best, and I noted that the mic gain did not have to be readjusted between SSB and FM, a problem that I noted with earlier models. Increasing the mic gain did bring noise up, however. The audio processor gave a useful increase in punch, but it would be wise not to use too much processing.

Break-in keying worked well, but I could not try the rig out as I would have liked on CW because of the absence of the CW filter, which should be available soon. Whilst the frequency accuracy on SSB was good, we noted just a very slight error of just under 300Hz on FM, which is of no real concern.

I checked the SWR of two of my antennas and the SWR set, and read positions of the meter switch on the back panel were accurate and easy to use with the power control on the front.

Conclusions

This rig's main competitor is the Trio TS711E and I have compared them both over a period of a week or two. I have tried to disregard my familiarity with the Trio rig, and so based on technical performance I have no hesitation in recommending the Icom, as it is far more sensitive on SSB and is more suitable for DX and contest working. However, although the ergonomics of the Icom are basically well designed, I prefer using the Trio because of its superb tuning action, combined with continuous rotation or very light click steps at the touch of a button. The Trio has an adequate number of memories (40), and also includes the DCS system for no extra charge, but a CW narrow filter cannot be fitted, which is a serious drawback for DX and contest use.

If you are after superb technical performance, then I suggest that the Icom rig wins, and I expect that they will be producing a high power version. I wish the Trio had better sensitivity on SSB, for this is the main area of criticism that I have of it, now that Trio in their later TR751E show that they can achieve superb sensitivity in the same league as the new Icom.

I strongly recommend the Icom, but it is very expensive at £1039 including VAT, and you will have to pay extra for the narrow CW filter and speech readout. These had not been priced at the time of writing, but Icom accessories are quite expensive, although I should add that Icom's CW filters are superb. I have enjoyed using this excellent rig, and it is far ahead of the 271E, which it replaces. If you do buy one, I suggest that you increase the ALC action by reducing maximum power quite a lot, for this should make your signal that much cleaner. The transmitted audio quality on SSB seems a lot better than its predecessors, and I think that the IC275E will become the top prestige 144MHz multimode.

Very many thanks to Thanet Electronics for the loan of the review sample, and for the most helpful discussions about the circuitry and performance on the telephone. I would also like to thank my wife Fiona for helping most ably with all the measurements.

Icom IC275E Laboratory Test Results

Receiver Tests

Sensitivity for 12dB sinad SSB		−127dBm (0.1μV)
FM		−124.5dBm (0.13μV)
RF input intercept point		−4dBm
Reciprocal mixing ratio noise floor to level required for 3dB increase in noise		
	5kHz	82dB
	10kHz	91dB
	20kHz	101dB
	50kHz	111dB
	100kHz	117dB
	200KHz	123dB
SSB selectivity (computer method)		
	3dB	2.2kHz
	6dB	2.4kHz
	40dB	3.1kHz
	60dB	4.5kHz (inc noise)
SSB selectivity, audio method		
	80dB	3.3kHz
(see selectivity plot for additional info)		
FM selectivity		
	12.5kHz	+7dB average
	25kHz	+75dB average
S Meter SSB		
	S1	−113dBm
	S3	−108dBm
	S5	−105dBm
	S7	−101dBm
	S9	−95dBm
	S9+20	−86dBm
	S9+40	−78dBm
	S9+60	−56dBm
	(FM 3dM more sensitive)	
AGC threshold		below −120dBm
FM limiting threshold		−129dBm
FM capture ratio		4dB
FM quieting at 12dB sinad point		15dB
SSB product detector distortion		2.5% with 1kHz beat note
FM distortion at 3kHz deviation of 1kHz mod		3.8%
Audio output power for 10% THD		
	8 ohms	2.2W
	4 hms	3.6W

Transmitter Tests

Maximum Tx power FM/CW		22W
Maximum SSB power		22W Single tone 30W PEP two-tone
SSB carrier rejection		62dB
Alternate sideband rejection		worst case 39dB
FM max speech deviation		6kHz
Typical speech peaks		5.2kHz
Toneburst deviation		4kHz
Toneburst frequency		1748Hz
FM signal to noise ratio ref 3kHz deviation		48dB
FM Tx response ref 1kHz, into 750μS de-demphasis		
	100Hz	−16dB
	200Hz	−7.5dB
	300Hz	−3.5dB
	500Hz	−1dB
	2.5kHz	−0.7dB
	3kHz	−1.5dB
	4kHz	−5dB
	5kHz	−11.4dB
FM Tx frequency accuracy		−270Hz
Dimensions, inc projections (W/H/D)		244×108×295mm
Weight		6.2kg

ICOM IC micro 2

144MHz hand-held transceiver

Hard on the heels of the launch of the Yaesu FT23, reviewed last month, is the new Icom µ2, a very small 144MHz FM handie-talkie. It operates in 12.5kHz channels over the band 144 to 146MHz, and includes plus and minus repeater shifts with simplex, switched with a three-way selector on the back. Just above this selector is a two-way high-low power switch. On the top of the rig is a BNC socket for the short rubber duck (111mm long) supplied with the rig. On the top panel is a miniature volume control with on/off switch, an absolutely tiny squelch control, and miniature lever switches which are spring loaded for changing memories up and down and for changing frequency in 1MHz, 100kHz and 12.5kHz steps. Each of these can be pushed or pulled lightly from a centre position to change a step.

Facilities

On the right is a toneburst button for the European version. An extremely small push button to the right of the volume control is used when one wants to listen on repeater input. A digital frequency display is also provided, which can be lit up by pressing a small button on the left side cheek below a normal PTT lever, if required. This illumination is very even, and remains on for about five seconds after you have pressed the button, after which it automatically turns off to save the batteries, although it does stay on longer if you are changing channel. Incidentally, the readout can be seen without illumination if there is ample ambient light around. A crude S meter is also provided, with indications for S1, 5 and 9.

Also on the left side cheek is a bar on which you can attach a wrist strap, and a frequency lock slide switch which disables all the memory and frequency switches on the top panel. On the right cheek at the top are miniature jack sockets for an external microphone and speaker. Icom can supply an HM9 loudspeaker mic compatible with these sockets, costing £21.85 including VAT. Sliding onto the bottom of the rig is the BP-22 NiCad battery pack which is supplied with the rig. The battery includes a mini charging light, which is rather useful. The charging hole is on the side of the battery, which can therefore be charged in situ. A small mains charger unit is supplied with the rig. Dimensions including battery are 61(w) x 148(h) x33mm(d) including projections, and the weight is 340g. The rig, complete with rubber duck, charger and NiCads costs £159.00 including VAT.

Optional accessories

Various optional accessories will be available, including other NiCad battery packs, eg a high capacity 12V model which should allow the rig to give around 4W output, and also a 13V plug-on adaptor allowing the rig to work off an external dc supply. An adaptor should also be forthcoming to permit the large range of batteries supplied for the IC-02E etc, to be used with the µ2. A fast charger should also be available shortly.

The memories

When using this rig it is more helpful to think of the ten memories as ten separate VFOs, each of which can be accessed in rotation using the mini memory level. When you access any one of these, you can change frequency from the memory using the other levers. Thus, there is no necessity to write or read memories, as the rig is also able to store the frequency last used in each one of the separate VFOs. These frequencies are also stored when the rig is switched off, or even when the NiCad battery is unplugged, as there is an internal lithium back-up battery.

This concept is very interesting, for it is both an advantage and a disadvantage. I would personally prefer to see an additional small button which would allow the memories to be fixed as such, or as VFOs. Inadvertent pushing of one of the levers can of course lose you a frequency, and you might not have noted it in the first place. This makes the rig rather awkward for a blind user.

Subjective tests

On transmit I obtained many reports of good Tx quality. Deviation seemed full but not excessive, and the optimum speech distance from the built-in mic was around 10cm. If I spoke around 25cm back, deviation was clearly reduced to around a half, which is just about right for a hand-held. This might not be appropriate for use in a very noisy cattle truck, however, but would be just about correct for an average well maintained car!

All the controls were very easy to use except for the squelch, which was so small that I found it necessary to press a finger on the top of it, and then attempt to rotate it. Even the mini reverse repeater button was easy to use, though small, and I much preferred the channel change levers to either the rotatable channel selector of the Yaesu FT23, or the thumb wheels on earlier rigs such as the Icom IC2E. However, it will be very much a personal choice between up and down levers, buttons, and click step rotaries.

The received audio quality was remarkably clear and the response was quite flat. As would be expected, the LF response on the internal speaker is very curtailed, but this does in fact lead to superb intelligibility. The rig seemed quite sensitive even on its mini rubber duck, thus showing that these new shortened antennas are surprisingly efficient. The rig felt quite light in the hand, although the Trio TH21E is some 60g lighter, which is mainly due to it being quite a lot shorter, although just about as deep and wide.

When connected to an external dual band Trio vertical antenna, the reception quality was excellent, and I did not note any serious problems caused by strong out of band signals. I also did not note any strong locals on at the time though, and some IM products could be troublesome if there were very strong locals about.

Although the instruction book is gen-

erally very helpful, we did note an error concerning the numerical identifications of the volume control and reverse repeater button. This shows just a little carelessness, which is somewhat surprising for Icom.

Laboratory tests

The Rx sensitivity measured well, and was even across the whole band. The rig was very marginally more sensitive 900Hz off channel, showing some very slight misalignment. The front end intermodulation performance did not measure too well, and although it would be satisfactory as a hand-held, and even as a mobile (insufficient audio volume though), there could well be some problems if the rig was used with a large home station antenna with strong locals on the band.

The selectivity was slightly uneven between the two skirts, but is adequate for 25kHz spacing, Thanet explaining that the rig as it stands now was primarily developed for the wider spacing, but at least capable of being used for 12.5kHz channelling. 25kHz selectivity was quite good, but not excellent.

The S meter was very poor for we noted only around 6dB difference between the minimum reading and S9! We found the meter difficult to read anyway, and it is perhaps a little too crude. Discriminator and audio amplifier distortion was a little on the high side, but acceptable in the context of a hand-held. The rig gave a rather limited level into an external 8 ohm speaker, and we noted that it was even more limited into 4 ohms, which is therefore not recommended.

The limiting threshold was virtually at the noise level, showing excellent limiting of all signals. The reproduced frequency response into an external load was very appropriate for a hand-held, low frequencies being attenuated very rapidly indeed below 400Hz whilst high frequencies were quite well attenuated, 5kHz being −12dB ref 1kHz from a pre-emphasised signal. It was fascinating to see that the response was very flat from 500Hz to 2.5Hz, and this together with the relatively good quality internal speaker, contributed to the good intelligibility.

The capture ratio was adequate, but some other rigs are better. One rather odd measurement was that of quieting, and this was particularly good showing that the rig would detect a very weak carrier indeed, but modulation from such a weak carrier would be considerably distorted. If you judge sensitivity by the quieting performance, rather than the sinad one, then the sensitivity is actually very good indeed.

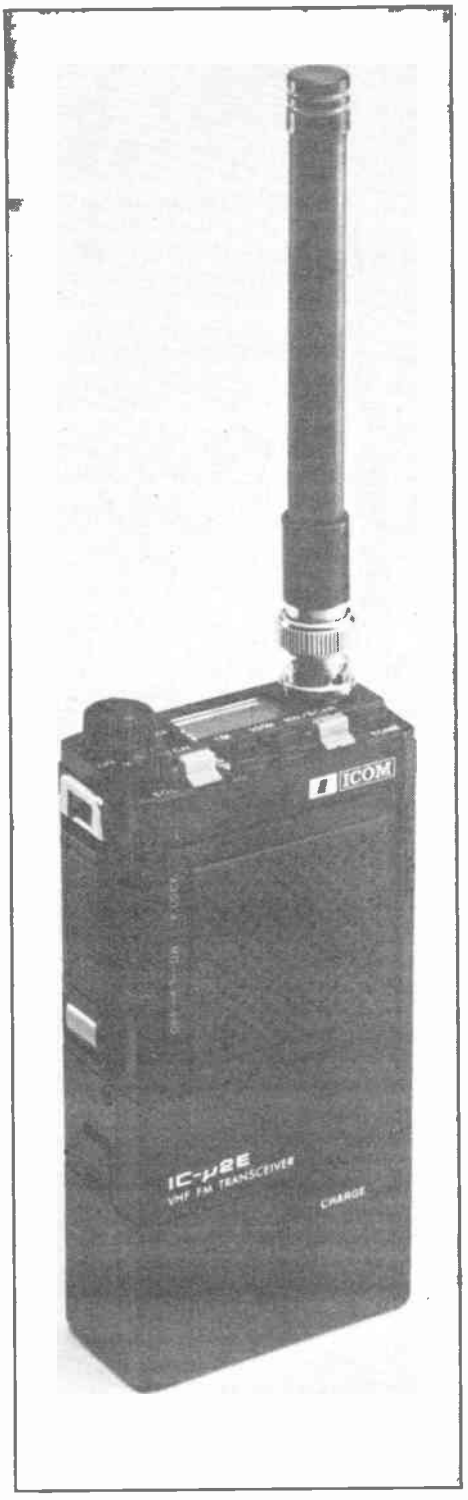
The transmitter section

The typical power output at all frequencies on the band was just over 2W, reducing to 450mW on the low power setting. However, more power is available when using a higher voltage NiCad, or an external dc source . The maximum speech deviation noted was only marginally over the 5kHz nominal maximum for 25kHz chanelling. However, typical speech peaked just below 5kHz deviation, the toneburst measuing 4.05kHz deviation. The toneburst was precisely on frequency and frequency accuracy was excellent, being never more than 90Hz high; the repeater shift was even more accurate. We had a look for second and third harmonics at RF, and they were both below the −65dB noise level of the HP spectrum analyser.

Conclusions

I very much liked this little hand-held, which is greatly preferable to, and much smaller than the original IC2E. Its other main competitors are the Yaesu FT23 and Trio TH21 models. I would not like to recommend a best buy out of these, as they each have their own particular attributes. In terms of size and weight, the Icom gives optimum facilities for its size, and the poor RF input intercept point will probably not be of concern if you are using it as a hand-held. I only wish that Icom had fitted a narrower filter, such as an F type, which would have made it far more suitable for 12.5kHz channelling. The ergonomics are good, but highly unusual, and I feel like shouting 'hurrah' for the exclusion of the dreaded thumb wheels with their annoying 10kHz channelling as found on the original IC2E and some Yaesu and Trio models. A most versatile little walkie talkie that can be modified fairly easily to receive over a much wider frequency range if required.

Many thanks to Thanet for the loan of the review sample and to Fiona, my XYL, for sharing all the work.



Icom IC micro 2 Laboratory Measurements

Receiver Tests		
RF sensitivity 12dB sinad ref 3kHz deviation		−122dBm
RF input intercept point		−36.5dBm
Selectivity	±12.5kHz	+6/+13dB
	±25kHz	+57/+60dB
Capture ratio		5dB
Audio distoration at 3kHz deviation		4.7%
Maximum audio output power for 10% THD	8 ohms	0.34W
	4 ohms	0.21W
3dB limiting threshold		−127dBm
Quieting at 12dB sinad point		18dB
Transmitter Tests		
Maximum Tx output power from BP22 NiCad		2.2W average
Low power output		450mW
Toneburst frequency		1750.0Hz
Maximum possible speech deivation		5.2kHz
Typical speech peak deviation at 10cm		4.8kHz
Toneburst deviation		4.05kHz
Tx carrier frequency accuracy		within 90Hz

CO-AX SWITCHES

The Daiwa CS201G and the Welz CH20N

For many purposes a manual coaxial switch is needed rather than a relay, especially as a relay can be less reliable and is far more expensive for the same quality in operation. Some years ago I purchased some co-ax switches both with N types and SO239s, made by Naga Sawa, and despite very great care in use, these have developed bad intermittencies, and the loss at UHF has become intolerable.

Daiwa CS201G

Last year I came across two most interesting co-ax switches, the first made by Daiwa, model CS201G being marketed by Lowe Electronics. The switch is supplied in a die casting and has one N socket at one end and two at the other. The actual switch itself is a lever type rotary having a very positive action, and the internal construction is excellent.

A short circuit is applied to the N type socket which is unswitched. It is specified to operate from dc to 1.3GHz, and the loss is claimed to be below 0.2dB across its range. I measured the loss at 400MHz to be 0.18dB, but I cannot make loss measurements of sufficient accuracy at 1.3GHz, although I suspect that it might be just worse than 0.2dB. The switch is rated at 2.5kW PEP and 1kH continuous power in a 50 ohm circuit, whilst the SWR is claimed to be better than 1.2:1, even at 1.3GHz. The isolation between sockets is claimed to be better than 60dB, but measurements at 400MHz showed it to be nearer 50dB at worst, even this figure being felt good though for its price of £21.90 including VAT.

The switch base includes feet and mounting holes allowing it to be screwed onto a bench or shelf.

Lowe Electronics point out that they have seen some 'look alikes' being marketed in the UK, which I am told are far less well made, apparently coming from Taiwan rather than Japan.

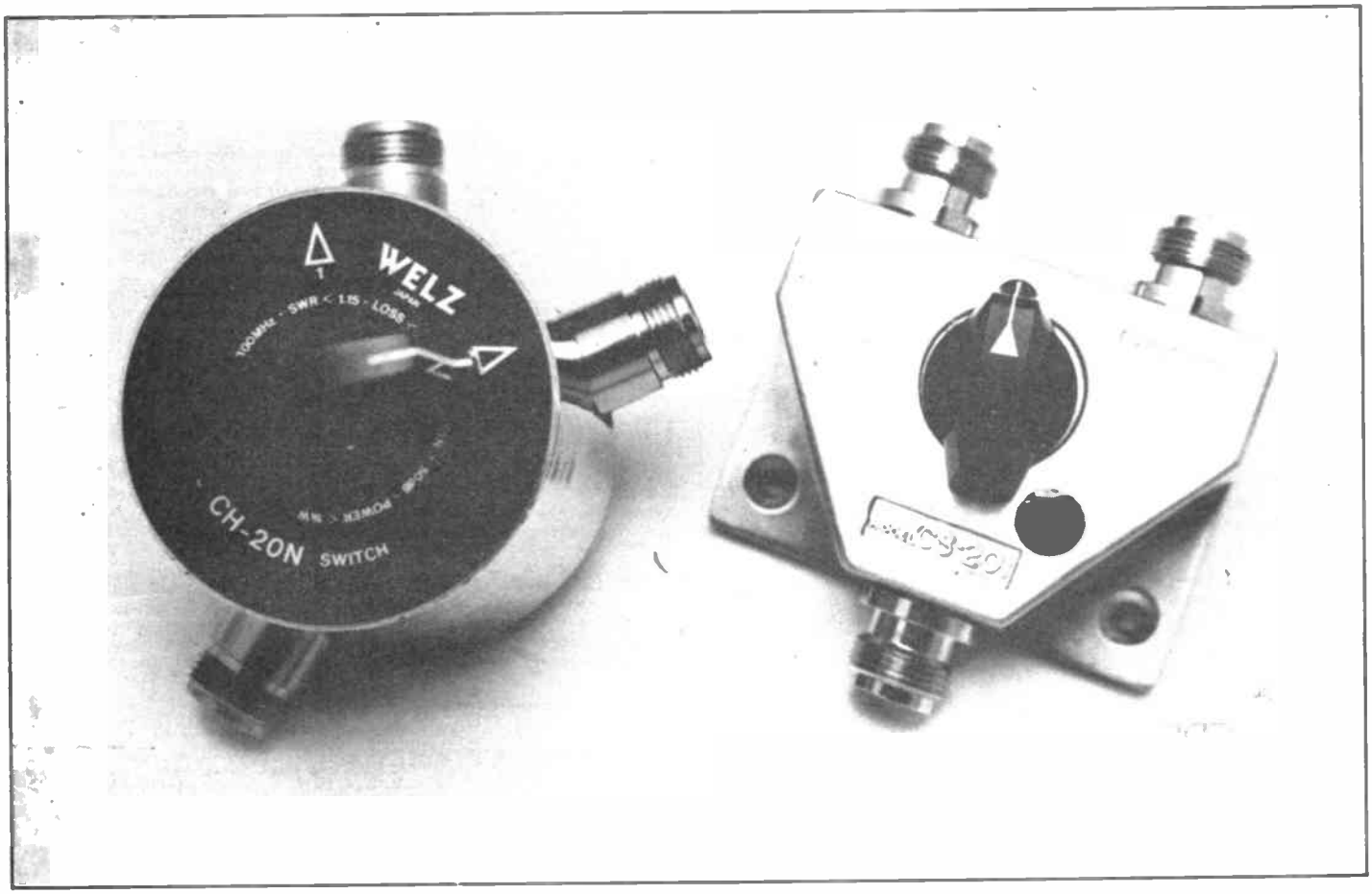
Welz CH20N

The Welz switch is also a two way changeover, but the unswitched socket is not earthed. This switch is superbly designed and constructed, and has about the lowest loss I have ever measured on a co-ax switch at UHF, the loss from dc to 400MHz being less than 0.03dB! Port isolation at 400MHz is 66dB, despite the lack of a short, and at lower frequencies it is even better, which is quite astonishing. The specification is 70dB below 200MHz, less than 60dB up to 500MHz, and less than 50dB up to 1.3GHz. The specified loss up to 1.3GHz is less than 0.1dB, and I have no doubt that the specification would be met. The switch has good plated contacts, and the rotary lever knob again works very smoothly indeed with a very positive action, although the grub screw did not tighten up quite enough on its spindle. The switch is rated to take up to 1kW power through it on a 50 ohm circuit. VSWR is quoted as being better than 1.1:1 up to 500MHz, and better 1.15:1 up to 1.3GHz, which is quite amazing.

Availability

The Welz switch is also available from RS Components, but is actually marketed and imported by Waters and Stanton at a price of £49 including VAT.

The Welz switch is available with SO239 sockets, with reduced specifications at £29, and the Daiwa switch is also available either with SO239s or in a four-way switch with BNCs. The latter unfortunately has BNC sockets located far too close to each other, and I have had the greatest difficulty in using it, but perhaps you have smaller fingers! The two N type switches are highly recommended, and seem to be very much more robust than many other types that seem to lurk around.



AVAILABLE APRIL

4th EDITION OF

U.K. LISTENERS CONFIDENTIAL FREQUENCY LIST

LARGER, SMARTLY BOUND with semi-stiff cover.

Completely revised:- Now includes even more information on MILITARY, CIVIL, AIR, MARITIME, PRESS BULLETINS, RTTY etc.

£5.95 +p·p 75p

4 PUBLICATIONS YOU SHOULDN'T BE WITHOUT!

UK LISTENERS CONFIDENTIAL FREQUENCY LIST LATEST EDITION

This publication has now sold well over 2500 copies since it was advertised only a few months ago. Now the recent updated version is selling even better. No self respecting listener should be without a copy. If you enjoy exploring the short wave bands then this publication will add to your enjoyment. It covers the hf spectrum from 2 to 30 mHz and gives details of transmissions outside the amateur bands. Specially designed for the UK and European listener it sets out in a very easy way a comprehensive list of hundreds of interesting transmissions that will keep you occupied for days on end! Only a fraction of the cost of other similar publications it contains details of Marine, Air, Military, Embassy, Press and News agencies. Many listings have time schedules included together with comprehensive RTTY details. It tells you the frequencies used by civil and military aircraft whilst flying the Atlantic, when and where to pick up the press bulletins, long distance marine traffic etc and much more. Send today for your copy of this worthwhile publication.

£5.95 p&p 75p

THE COMPLETE UHF-VHF FREQUENCY GUIDE 26-2000 mHz

Many listeners have asked for a guide to th wide VHF/UHF spectrum and to meet this request we have recently published this frequency manual. It covers the range 26 to 2000 mHz and has been specially prepared for the UK listener. Anybody who has used a scanning receiver will know that the wide frequency range involved means that it is difficult to know exactly where to listen. This guide takes all the guessing out of monitoring. It lists all the services throughout the spectrum together with both simplex and duplex frequency splits. If you've spent your hard earned money on a scanning receiver or are considering buying one you'll find that this publication contains a wealth of information that has previously remained un-published!

£4.95 p&p 40p

NEW 4th EDITION VHF-UHF AIRBAND FREQUENCY LIST

This frequency manual is without doubt the most comprehensive list of VHF/UHF aircraft listings available in the UK. Of vital importance to the airband enthusiast or indeed any keen VHF/UHF listener it sets out in a very easy to follow manner full details of a whole host of stations. Every known UK airfield quencies, etc. Included are Civil, RAF, USAF, MOD, Naval fields on both VHF and UHF bands. There are also air to air frequencies, the Red Arrows frequency, and much more. Send today for your copy and find out just how much you have been missing!

£5.95 p&p 50p

HF OCEANIC AIRBAND RADIO SUPPLEMENT NEW SECOND ADD.

Prepared in response to many requests for more information about the air traffic on the hf bands this little guide sets out to explain to the beginner how the hf band works in relation to air traffic. It contains full details of the world aircraft frequency bands in the range 2 to 23 mHz together with control frequencies and those commonly used for Oceanic control. Also included are many VOLMET frequencies, the Search and Rescue frequencies used by RAF helicopters and Nimrods, the Hf RT network, London Company frequencis, European control centres etc. An ideal companion for the hf airband listener. Send today for your copy.

£2.95 p&p 35p

WATERS & STANTON ELECTRONICS

18-20 MAIN ROAD, HOCKLEY, ESSEX – 12 NORTH STREET, HORNCHURCH, ESSEX.
MAIL ORDER TO: 18-20 MAIN ROAD, HOCKLEY, ESSEX TEL: (0702) 206835

VISA Access

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Quite regularly I am asked by newcomers to listening why they hear amateurs exchanging reports like 'You are five-nine-zero-one-four QSL my five-nine-zero-two-five.' These amateurs are taking part in contests, which occur all the year round and usually take place over weekends. They can be of any duration, from an hour or so to a week, or even spread over a year at specific intervals or specific bands at different times.

The variety of combinations of time, frequency, mode, and so on, are seemingly endless, but the organisers of contests still manage to think up more ways of making the game even more complicated. The 'scoring' methods alone range from quaint to faintly bizarre! Let's look at the rules of a typical contest that would interest the listener as well as the licensed amateur.

The Golden Anniversary Commonwealth Contest

Transmitting Section

■ The general rules for RSGB HF contests, as published in the January 1987 issue of *Radio Communication*, will apply.

■ Date and Time: From 1200GMT on Saturday 14th March 1987 to 1200GMT on Sunday 15th March 1987.

■ Sections: Single operator entries only from members of the RSGB resident in the UK and radio amateurs licensed to operate within the British Commonwealth or British mandated territories. Entries from GB, aeronautical mobile or maritime mobile stations will not be accepted. Entries may be single band or multi-band. Single band entries should show contacts on one band only. Details of contacts on other bands should be enclosed separately for checking purposes. Multi-band entries will not be accepted for single band awards.

■ Band and mode; A1A only in the 3.5, 7, 14, 21 and 28MHz bands. In accordance with IARU recommendations, contestants are requested to operate within the lower 30kHz of each band except when contacting novice stations that operate above 21,100kHz and 28,100kHz.

■ Exchange: Contacts may be made with any station using a British Commonwealth callsign, except those within the entrant's own call area. UK stations may not work each other for points. A contact exchange consists of RST and three figure serial number commencing with 001 and increasing by one for each successive contact throughout the contest. Serial numbers when sent from non competing stations must be recorded.

■ Scoring: Each completed contact will score five points. In addition, a bonus of 20 points may be claimed for the first three contacts with a Commonwealth area on each band (a list of the call areas is available from me on request). All British Isles prefixes (G, GB, GD, GI, GJ, GM, GU and GW) will count as one call area, except for the special event stations. GB5CC, which will be active throughout the contest, will count as a separate call area for all contestants, including those in the UK.

■ Documentation: Separate log sheets (HFC1) for each band must include GMT, callsign of station worked, RST/serial number sent, RST/serial number received and points claimed. Separate band totals should be added together and the total claimed score entered on the cover sheet. It is important that logs are carefully checked for duplicate contacts. Unmarked duplicate contacts, for which points have been claimed, will be penalised ten times the number of points claimed, and logs containing in excess of *five* will be disqualified. Your entry should include a signed declaration stating that the rules and spirit of the contest and the terms of your licence were observed.

■ Name and address for entries: Entries should be addressed to HF Contests Committee, A Gray G4DJX, PO Box 73, Lichfield, Staffs WS13 6UJ, England. In the event of any dispute, the ruling of the council of the RSGB shall be final.

■ Date for entries: Adjudication of this contest will commence on Monday 13th April 1987. Any entry received after this date may be excluded from the contest. Overseas stations are therefore advised to forward their logs by airmail.

■ Awards: To the winner, the Senior Rose Bowl; to the runner up, the Junior Rose Bowl; and the Col Thomas Rose Bowl Certificate of merit will be awarded to (a) first, second and third placings in home and overseas multiband placings, (b) the leading home and overseas single band entires on each band and (c) the leading station in each call area. To celebrate the golden anniversary of the contest, four special trophies will be awarded to: (a) the leading UK entrant; (b) the leading non UK entrant; (c) the leading UK SWL; and (d) the transmitting station which, in the view of the RSGB, has contributed most to the contest since its beginning.

Receiving Section

■ Rules are as for the transmitting section except as detailed below.

■ Eligibility: Only the entrant may operate the station for the duration of the contest. Holders of transmitting licences covering the frequencies below 30MHz are not eligible to take part.

■ Scoring: To count for points, a station outside the entrant's own call area must be heard in a contest contact. CQ or test calls will not count for points. A station may be logged only once on each band for the purpose of scoring. When both stations in contact are heard they should be logged separately and points claimed for both entries provided that they are outside the entrant's call area. Each completed log entry will score five points. In addition, a bonus of twenty points may be claimed for the first three stations heard in each British Commonwealth call area on each band. All British Isles prefixes will count as one call area. A separate log is required for each band. Logs should show date, time/GMT, callsign of station heard, RST/serial number sent by the station callsign of the station worked and the points claimed.

■ Awards: The BERU Receiving Rose Bowl to the winner. Certificates of merit to the leading entrant in each continent.

Getting it right

As complicated as these rules may seem, they are not, as you may be inclined to think, concocted to confuse the entrant (or keep the printer in business), but to make the conditions of the contest perfectly clear to the entrants. These particular rules are (bar any typographical errors!) exactly as published by the RSGB and are pretty standard. The scoring system is relatively simple, the main problem with contest rules being that they're not always the same.

When you start reading small print you find things called 'multipliers', which mean that every time you change frequency or contact another area, or for any one of a number of reasons, you multiply your current score by an agreed number so that, instead of scoring 500 points for 500 contacts, your final score can be anything from 501 (rare) to 427,903 (or thereabouts). The point I am trying to raise is that you should always read rules *carefully* before *and* after you've tallied your scores.

Working conditions

Well, what are your working conditions? Are you sitting on a stool in a chilly shack, ball pen ready to run out, receiver not quite up to scratch and

the old bent wire still draped over the fence? This may seem extreme but it does happen!

Setting up your station before a contest is of utmost importance. The shack should be warm and comfortable (but not so warm that you'll doze off during the session), and your receiver should be checked for any possible faults, especially in the tuning accuracy. Your aerials should be the best you can afford or have room to put up, which doesn't necessarily mean you have to have a big beam. Many contests have been won with simple wire aerials, but you must be able to get the best from what you've got and this usually means either accurately cut dipoles for the frequencies you'll use, or a good multiband aerial and very good antenna tuning unit (ATU).

Your preparations should include seemingly obvious things like readily sharpened pencils, an eraser, a supply of drinks (to choice, contests can be nerve straining!) and a note to the XYL that you are not accepting visitors, phone calls or visits for the next hour/day/month! Of course, you took her out for a meal last night, didn't you?

The day of the contest has arrived and you are poised, pencil ready, headphones on, logbook primed with date and first frequency (special sheets may be needed so check the rules), and any check sheets/maps you may need are all to hand. So who forgot to set the clock then?

Not interested

If you are not really into the contest scene, there is still a good reason why the listener should take an interest in them. It may be a bit selfish, but you can make use of contests to check your own station out. Contestants will be operating from all corners of the globe so you can check if your aerial picks up in all directions, which areas you hear most at the time of day/month/year, which frequencies are most active at the time, and from which areas.

It's a good idea to have a map of the world handy (great circle type is best) to plot the areas being received. This way you can compare conditions from any other contests you've logged.

Incidentally, in the example contact given at the start of this piece, the references were: (five - nine) the reception report of readability excellent at strength nine on the station meter; (zero-one-four) CQ zone code of Western Europe; and (zero-two-five) the Japanese zone. These zone codes, and others like them, are often used in contests.

In point of fact, the reception reports given are often unreliable and frequently 'five - nine' is sent as a matter of course rather than a statement of fact.

Awards de Belgique

An interesting letter this month comes from Lamberte J Derenette of Koksijde. Lamberte publishes the *Belgian Awards Directory*, which is a comprehensive list of the awards available from there. It costs 3 dollars or 15 IRCs. From the same source comes the news that the Dutch are to issue an award to licensed amateurs for receiving listeners' reports! The awards are for having received reports from 100 listeners . . . and responded to them by QSL card. Details of the award and lists are available from Lamberte at Strandlaan 47, B-8460 Koksijde, Belgium.

The *Amateur Radio* Prefix Awards continue to be in popular demand, with new names coming into the lists each month. The latest is Scott Marshall ORS84223, in West Berlin, who claimed the Bronze award for 250 prefixes heard, including AA4, A71, CP7, C30, HR1, HV1, J28, LY4, VS5, VU2, XE1, YB5, YT3, ZC4, 5N6, 7S2 and 9Y4. The next step will be a bit harder, Scott, but I'm sure you'll make it.

Now here's a man destined for great things: Malcolm Element G0EBD sent in his lists for the Silver award . . . hand-written by his XYL! A92, AA4, C31, CX5, HH7, J37, KH9, LU9, PS7, TK0 V85, VP9, YB5, ZZ5 and many others filled the log very nicely. Seems the computer threw a wobbly, hence the XYL's efforts. Scott asks if I'll send the lists back as he can't bear the thought of her doing the midnight oil bit again (probably kept him awake!).

Colin Tait of Lisburn, Co Antrim, got in his first 250 including CP6, FF2, HV1, IS0, J28, SU1, TK5, XE1, YT3, ZC4, 8P6 for his Bronze award. Colin is going for the UBA Contest this year, so it may be a while before he can rejoin the hunt for the next batch. Good luck, Colin.

Stephen Nixon BRS87799 of Shildon put aside the bottles of Theakston's Old Peculiar to hazily put together his list for the Silver award. Probably drowning his sorrows after the RAE and chasing the rally cars in the Lombard et al! Stephen's method of listing reveals that his catching of prefixes comes in fits and starts, with fourteen logged on twenty metres around midday on 25th October, but only a couple of choice ones in YP2 and YP9 around midnight on the 15th, whereas around midnight on December 22nd found T10, 7S7, 9H3 and 9K2 on eighty.

Howard Done of Barry finally made it to the Gold and Premier awards, just getting them in before 1986 drew to a close. Howard notes some incredible reception on eighty at night and early morning in the past few months. The logs certainly make interesting reading, with things like YB0, VO1, JA6 and H31RB/MM popping up in between the natter nets on eighty. Now he's done the rounds on prefix hunting, Howard has installed a Spectrum computer and RX4 program and is chasing the coded stuff for excitement.

Going international

Darrell Jacobs, of Grasse in France, has now claimed his Bronze award for 80m SSB and echoes Howard Done's comments regarding eighty. His log included J37, C30, TA1, ZL7, VK5, JA5, YV7, YA1, ZP8, TI5,TR8, 5X5, XX9 (Macao) and ZL5 (Antarctica) amongst a fascinating list. Darrell is also heading for the UBA contest, so I look forward to the reports of that event with interest.

Talking about the UBA reminds me that Tony Black-

Darrell Jacobs ILA152 listening in for the prefixes for his Amateur Radio prefix awards

burn managed to squeeze 122, 330 points from 205 countries heard in 1986. The greedy chap also topped the RSGB SSB Contest list this year! He's obviously worked hard for the success that he's had, but these results can only make it all the harder in 1987.

Jamboree 1986

Before announcing the results of the White Fang Fellowship Awards, I must mention that I had the pleasure of meeting members of the Radio Scouting group at Wembley this year and gained the support of their leaders for the scheme. As you may know, JOTA is intended as a means of enabling Scouts to greet each other using radio and many amateurs give their time, and often loan their equipment, to this end. The aim of the WFF Jamboree Award is to encourage the participation of listeners and junior Scouts and Cubs to take an active part in the JOTA, thereby introducing many of them to the world of amateur radio. The awards are presented for logging Scout stations only, and the small fee of 50p is donated to a charity.

So, to the results. It is my great pleasure to present the award for the best log to Tony Blackburn RS87156, with a score of 435 points. Second place goes to Chris Gibbs RS47426 with 262 points, and third place was very close with Stan Porter ORS45092 with 210 points and Pete Oliver RS85097 with 209 points. Both will get a trophy.

There were 63 entrants this year, many of which were first attempts by young Scouts. Entry fees and donations received amounted to £43.50, which I have presented to 'Children in Need' on your behalf. Thank you all for your support. I look forward to JOTA 1987!

Well, we're coming to the end of the winter season, albeit slowly, and weather conditions should improve. This should give us a chance to look at the neglected wires that we've been using for the past six months or so, and tend to the little things that go unnoticed, like solder joints, corroded wire wrapping, frayed leads and corroded coaxial screening. The latter is the most easily overlooked and it only takes a tiny crack in the plastic outer, or a loose connector, to allow damp air to penetrate into the co-ax and start the fast deterioration of the copper mesh.

Transmitting amateurs soon notice problems like this because of the sudden or gradual loss in output power and changes in the metered standing wave ratio. The listener has no such guide except, perhaps, a slight fall-off in reception, which may easily go unnoticed, especially during changing conditions where a fault could quite easily be taken as a change in propagation.

Even the simple end-fed random wire can suffer from corrosion, particularly in areas where there is salt water in the air. Solder joints where feeders meet dipoles can also become brittle and detached, giving intermittent contact.

Traps or coils in vertical or horizontal aerials or trapped dipoles are not by any means immune; however well they are made water still seems to get in some way or other. The casing of a trap probably expands or contracts at a greater or lesser rate than the epoxy or other filling during extremes of temperature, allowing moisture to enter and deterioration to take place.

A local amateur friend who took over an HF5 trapped vertical that had 'done the rounds' found that dismantling and thorough cleaning brought the aerial back to something like its original performance, after many had proclaimed it as 'deaf' or 'duff'.

Get active

So, out with the screwdrivers, soldering irons, emery cloth and so on, and check those aerials before you lose any more DX.

Well, that's it for this month. Keep listening and let me have your reports on conditions from your location... and good luck in the contest.

CAVITY WAVEMETERS & CAVITY FILTERS

If you operate on 144 MHz or above then the Cavity Wavemeter is for you. It covers 144 MHz to over 2500 MHz. A short version covering 430 MHz to over 2500 MHz is also available for the UHF operator.

Other types of Cavities are available i.e. BAND PASS & NOTCH FILTERS as used in most Repeater Stations.

10 GHz Wavemeter Kits also produced.

SAE brings you more information. Write to:

PAUL SERGENT
G4ONF,
6 GURNEY CLOSE, COSTESSEY NORWICH
TELE. (0603) 747782

L F HANNEY

77 Lower Bristol Road, Bath, Avon
TEL: 0225 24811

Your electronic component specialist for Avon, Wilts & Somerset

Closed Thursdays

K T ELECTRONICS

The first Radio Amateur equipment manufacturers in the Republic of Ireland – presents

AMPLIFIER LIST

MHA 186 UHF Broad Band Masterhead Amplifier 27dBd Gain ..... **IR£17.50**
UVA 186A UHF/VHF Masterhead Amplifier Channel 38-69 27dB Gain ..... **IR£19.25**
LA 186 UHF Line Amplifier 30dB ..... **IR£22.60**
MA 2137 Grouped UHF Masterhead Amplifier CH 21-37 27dB Gain ..... **IR£18.00**
MA 3869 Grouped UHF Masterhead Amplifier CH 38-69 27dB Gain ..... **IR£18.00**

POWER SUPPLY LIST

PS 286 12v-60mA Power supplies with 1 output ..... **IR£8.00**
PS 386 12v-80mA Power supplies with 2 output ..... **IR£12.55**
PS 486 12v-180mA Power supplies with 2 output ..... **IR£14.00**
PS 886 15v-80mA Power supplies with 2 output ..... **IR£12.55**
PS 986 15v-180mA Power supplies with 2 output ..... **IR£14.00**

All power supplies are short protected and stabilised

All items are RF-shielded, and all Masthead amplifiers are water protected.
Also in our range – TV low noise Masthead amps and power supplies.

FOR FURTHER INFORMATION AND CATALOGUE CONTACT:

U.K. Agents required

K T ELECTRONICS
Attn: Tina Keil – E19FW, Newbawn, Rathdrum
Co Wicklow. Tel: 0404 46521
From England: 010-353 40446521

BELLE VUE RADIO AND ELECTRONICS EXHIBITION

NARSA

by the Northern Amateur Radio Societies Association

in the

CENTRAL HALL
BELLE VUE – MANCHESTER

25th Year **on** 25th Year

SUNDAY 15th MARCH 1987
Doors open at 11am

The North's Premier Amateur Radio & Electronics Event

FEATURES

★ Inter-Club Quiz
★ Bring & Buy Stall
★ RSGB Book Stall
★ Grand Raffle
★ Amateur Computer Stands
★ Club Stands
★ Restaurant & Bar
★ Play Area for Children
★ Attractions for Ladies

★ RSGB Morse Tests

Traders include

A R E Communications, Arrow Electronics, J Birkett, Brial Services, Display Electronics, Chester Electronics, The Computer Junk Shop, Greens Telecom, Harwood Trading, Heatherlite Mobile Mics, R A Kent, Linkbrook Ltd, M & B Radio, M G R Services, Marco Trading, Minicost Trading, New Cross Radio, P L M Communications, Practical Wireless, Quartslab, R S G B, Royd Electronics, S G S Electronics, Sandpipe Communications, Scarab Systems, W H Westlake, Witec Ltd, T W Wraith

BELLE VUE HAS AMPLE CAR PARKS
RADIO TALK-IN ON S22 and SU8
ADMISSION £1 (OAP's 50p, under 14's free) BY RAFFLE TICKET AND EXHIBITION PLAN

ENTER AT REAR OF BELLE VUE – From Redgate Lane – OFF Hyde Road A57

Amateur Radio smart blue binders, each holding up to 12 issues keeping them in prime condition

BINDERS!

Only £4.75 Inc p&p

Overseas readers please add 30p
Please allow 28 days for delivery

Send your orders to

Edwardschild Ltd, 28 Shenfield Cres
Brentwood, Essex CM15 8BN

RADIO AMATEUR LICENCE

Start training now – No previous knowledge required. Study for 3-6 months. Post Coupon now for free brochure – without obligation:

Radio & Telecommunications Correspondence School, 12 Moor View Drive, Teignmouth, Devon. Tel: 06267 – 79398.

(AR.3)

NAME .....

ADDRESS .....

..... POST CODE .....

PSU protection

by C J Hatch G3ISD

Several years ago I became interested in the subject of low voltage regulated power supplies, at a time when there appeared to be very little practical design information available to us as amateurs. As a consequence, and following a period of head scratching and experimenting, I wrote a long and comprehensive article (1) on the subject in an attempt to improve on the 'use a fairly large heatsink' school of thought which appeared to be emerging.

After a period of inactivity I recently took a closer look at the question of improvement to the overcurrent and overvoltage protection arrangements. First of all, it is assumed for the purpose of this article that the reader will be familiar with the general principles of PSU design. Further assumptions are that the voltage regulator used is the 723 with its current limiting facility, and that the aptly named 'crowbar' is used as a protection against overvoltage. Although of no particular significance, it is noted that in general it is the PSU that needs to be protected against overcurrent, and the connected load against overvoltage.

Overcurrent protection

Initially we shall consider overcurrent protection, which acts by limiting the current to a chosen value, usually just above full load. This is based on the fact that by applying a voltage of approximately 0.66 volts to pins 2 and 3 of the 723, its output voltage, and thus that of the PSU, reduces to zero. This control voltage is most conveniently derived from the voltage drop across one of the pass transistor load sharing emitter resistors, by arranging that 0.66 volts is produced at the chosen value of limited current.

That would seem to settle the matter, but unfortunately merely to limit the current is not enough. This is because under the condition of current limiting up to the whole output of the transformer could be dissipated in the pass transistor/heatsink combination, depending on the degree of overload up to full short circuit. This could lead to rapid overheating and possible destruction of one or more of the pass transistors unless the PSU is quickly disconnected from the mains. Means to achieve this will be considered after looking at overvoltage protection.

Overvoltage protection

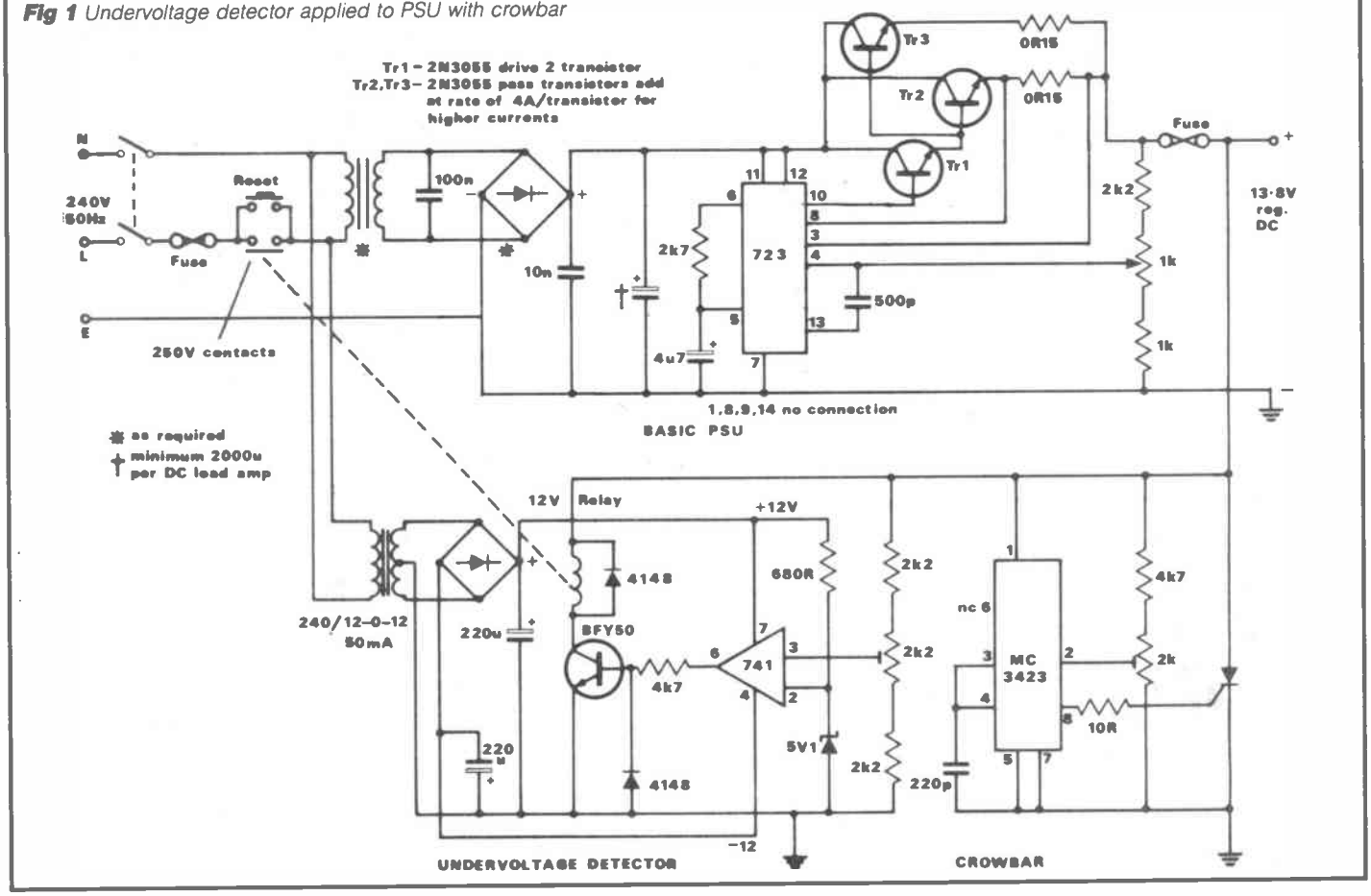
Why is it needed? Fairly obviously, a short-circuited pass transistor or a faulty 723 could result in up to 25 or 30 volts being applied to a transceiver designed for a maximum of about 15 volts (13.8+10%), with calamitous consequences. I think there is no doubt that the greatest peace of mind is to be derived from the knowledge that any overvoltage would be dealt with by promptly applying a full short-circuit to the PSU output terminals immediately it occurs. This is done by detecting the overvoltage using suitable circuitry, and then firing a thyristor (the 'crowbar') connected directly across the output terminals of the PSU, thus blowing a fuse immediately upstream of the crowbar.

Obviously, the current limit cannot be counted on to operate, since it would most likely have been a failure somewhere in the voltage regulator system which led to the operation of the crowbar in the first place.

There are also, in my opinion, two fallacies concerning crowbars. Firstly, the connection of the crowbar upstream of the pass transistors to avoid damage to the latter from the short circuit current is misconceived, if as above, it was regulator failure which initiated the crowbar operation.

Similarly misconceived is the suggestion that crowbar current is limited by a series resistor to protect the thyristor. Such current limitation would delay fuse operation, which is obviously undesir-

Fig 1 *Undervoltage detector applied to PSU with crowbar*



able, and in any case, a damaged thyristor invariably short circuits, thus failing safe. It must be borne in mind that the primary object is to prevent damage to an expensive transceiver, if necessary at the expense of PSU components, the cost of replacement of which would be no more than a few pounds. It is a case of keeping things in perspective! However, let's take a look at what I think is a worthwhile refinement to the PSU protective systems.

Automatic mains disconnection

The interesting thing to note is that both current limit and crowbar operation result in reduced or zero output voltage. This fact can be used to operate a relay connected between the transformer primary and the mains, and a suitable circuit is shown in *Figure 1*. This uses a 741 op amp as a comparator, supplied from an auxiliary 12 volt supply with its inverting input held at a constant 5.1 volts, and its non-inverting input sampling the PSU output voltage and set at a slightly higher value than the inverting input. Under these normal conditions the output of the 741 is positive, the BFY50 is turned on, and the relay is closed. If the output voltage of the PSU fails for any reason, as described above, the output of the 741 goes negative, the BFY50 is turned off and the relay is de-energised, thus disconnecting the PSU from the mains. Note that it is necessary to push the reset button to power-up the PSU when first switching on. This mode of operation ensures that the system fails safe in that the PSU is automatically switched off in the event of mains failure.

This and that

If the object was solely to ensure positive and rapid disconnection following crowbar operation, it could be achieved simply by connecting the relay coil across the PSU output. By using the 741 comparator, similar rapid disconnection will be obtained during any degree of current limit operation. Note that the 741 will change output polarity 'instantaneously' for input voltage differences of a millivolt or less, resulting in positive operation. Nevertheless, a fuse must always be included upstream of the crowbar as a back-up in case of failure of other protective features.

Incidentally, I believe there is no need for a soft-start circuit to limit the inrush current in most cases (have you ever seen one in a commercial unit?), either for the sake of the rectifier diodes or to enable a smaller primary fuse to be used. For practical purposes the peak inrush current can be assumed to be the peak transformer secondary voltage (RMS × 1.414) divided by the secondary resistance, as the discharged reservoir capacitor(s) can be regarded as a short circuit. In the case of my own 25 amp PSU, this works out at 95 amps, which seems very high until one finds that the 25 amp diodes used have a non-repetitive surge rating of 300 amps, a very wide margin.

In practice the inrush will be lower because of other neglected mains and transformer impedances, etc, and rapidly decreases as the capacitor(s) become charged, usually within the first cycle (0.02 sec). By using the auto disconnection system described above, the primary fuse can be left to do the job most suited to it, and that is to cope with transformer or supply lead short circuits.

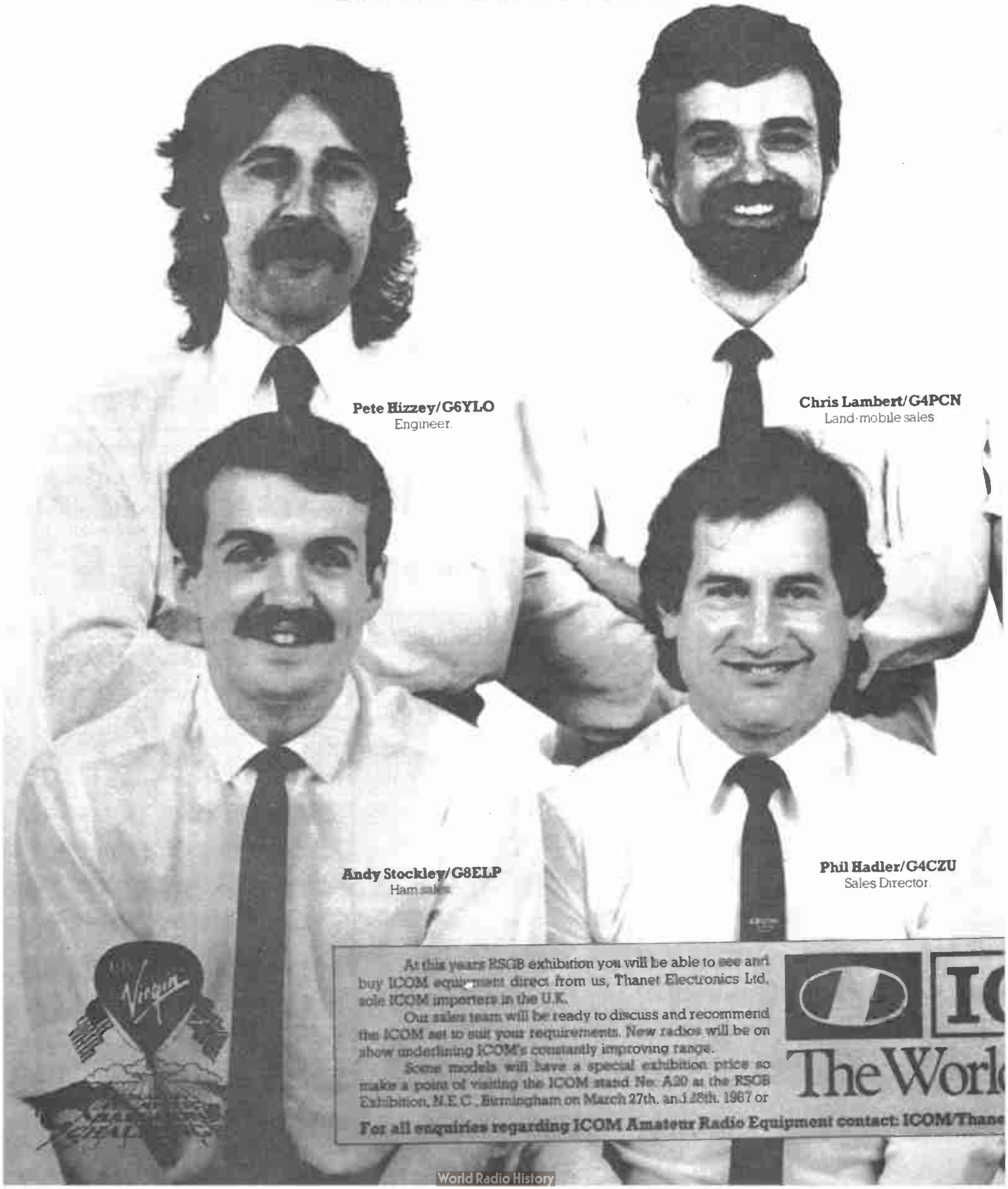
Study of fuse characteristics will reveal that, in general, any attempt to use them for any purpose other than very heavy overloads or short circuits will be doomed to failure. That is to say that they are not suitable for protection against moderate overloads, ie up to say about 200% of normal full load current. This is due both to their inverse time/current characteristic, and the very wide spread of characteristics between nominally identical fuse samples.

It has to be said that in view of its basic simplicity this is very unlikely to be an original arrangement, and in addition there will be other ways of using the fall in voltage to trigger mains disconnection. Nevertheless, this does not detract from its value as a highly desirable improvement.

References

(1) 13.8V Power Units – An Amateur's Approach. E J Hatch CEng, FIEE, G3ISD. *Radio Communication* July 1983. (See also references to the above article in *Technical Topics,* page 491, *Radio Communication* June 1984, and August 1984, page 679).

COME ON DO
& MEET T



At this years RSGB exhibition you will be able to see and buy ICOM equipment direct from us, Thanet Electronics Ltd, sole ICOM importers in the U.K.

Our sales team will be ready to discuss and recommend the ICOM set to suit your requirements. New radios will be on show underlining ICOM's constantly improving range.

Some models will have a special exhibition price so make a point of visiting the ICOM stand No. A20 at the RSGB Exhibition, N.E.C., Birmingham on March 27th. and 28th. 1987 or

For all enquiries regarding ICOM Amateur Radio Equipment contact: ICOM/Thane

IC
The World

WN TO N.E.C.
HE TEAM.

COM
d System

you may miss a bargain.

All equipment bought on our stand can be paid for with cash, cheque, Access and Barclaycard. Interest-free credit can also be arranged. This could be your chance to own the ICOM radio you have always dreamed of.

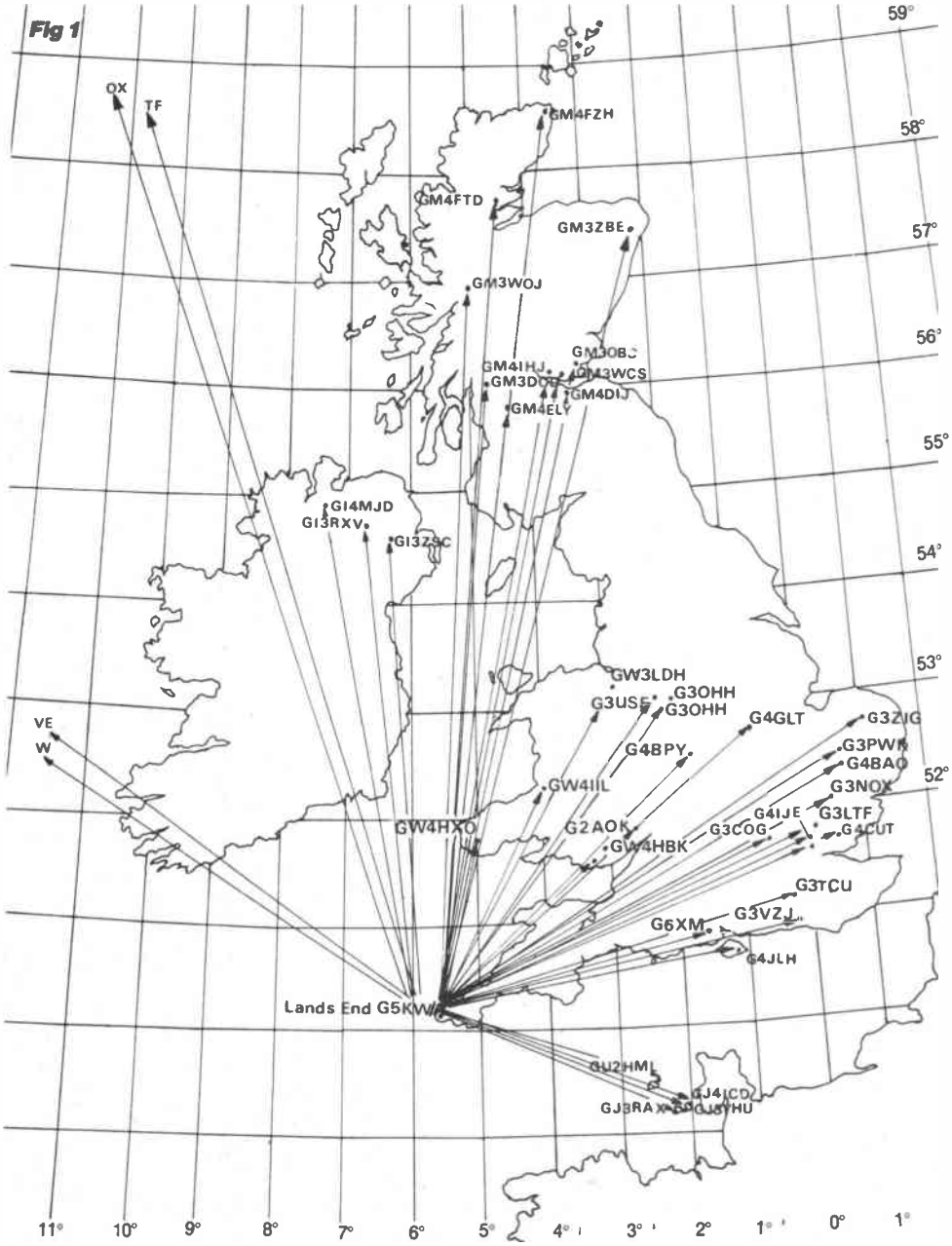
Should any items have to be sent on to you we now operate a full Datapost service giving next day delivery. Come on down to N.E.C., meet the team and see why ICOM is going up in the world.

Electronics Ltd. Dept AR, Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 363859.

50MHz What to

On 1st February last year (after many years of frustrating negotiations in the face of vigorous opposition from neighbouring countries), the RSGB negotiating team managed to persuade the DTI to allocate limited facilities for UK class A operators to operate on the 6m band on a 24 hour basis. It was agreed that the situation would be reviewed in twelve months time, and it was hoped that all or some of the stringent restrictions would be lifted or modified, and that class B operators would be allowed access to this very interesting band. Recently, some encouraging indications have been made by the RSGB about the negotiations currently taking place.

With the close-down of Band I TV in the UK as a result of the Merriman Commission report, it was hoped that full 50MHz facilities would be made available to UK amateurs. Unfortunately, there were (and still are) major problems both at home and abroad. UK TV services still use this band for programme support services, radio microphones and outside broadcast equipment. NATO armed forces on the continent and mobile users currently have access to the band, and some European countries still operate channel 2 Band I VHF TV. The criterion is that in Region 1 50MHz is *not* an amateur allotted band. At the last IARU international conference at Geneva, the late Roy Stevens G2BVN put up a strong case for Region 1, but it was defeated by three votes.



From 1979 onwards, during the peak of sunspot cycle 21, a small band of dedicated and enthusiastic amateurs operating crossband, ie receiving on 50-52MHz and transmitting on other bands – mainly 28MHz, made some historic QSOs and revived an interest in what had become a neglected part of the spectrum in this country; with the exception of a brief period during the International Geophysical Year (1957), when a few experimental permits were issued.

What is special about 50MHz?

It may be questioned why there has been so much fuss about 50MHz, and what exactly is special about it? The area around 5/6 metres is the crossover between VHF and UHF propagation, and there is a variable overlap when the main characteristics of both types of propagation are evident; sometimes for brief periods and at unpredicted times but on other occasions following a definite pattern which can be accurately forecast. This uncertainty gives it a fascination and general interest to all amateurs.

There are still a number of unknown factors affecting propagation, and those of us who have been operating on 5/6 metres for over half a century are not prepared to commit ourselves on some of the theories which have not been definitely proved.

G5KW/A on 50MHz at Lands End

When the issue of the original 40 permits was imminent, the author, who had conducted a very successful propagation study at the Isles of Scilly during the peak of sunspot cycle 21, decided to return as far west as convenient for the same purpose. Due to the expense, the Isles of Scilly were abandoned in favour of Ardensawah Farm, a few miles SE of Lands End. Some derelict farm buildings were made available, but unfortunately ac mains were not obtainable at a reasonable cost, so a small petrol driven generator and heavy duty batteries were purchased. In general the same equipment was used as that used for the propagation study at the Isles of Scilly: an Icom 551 multimode transceiver with a 100 watt linear amplifier by Microwave Modules and a Yaesu FT629B transceiver as a standby. The main aerial was a Cushcraft 6 element yagi, wide-spaced on a 34ft boom, with a claimed gain of 15dBd. Other smaller 5 element beams were used for comparison purposes.

1st February 1981

The great day we had all been awaiting arrived, but the permit for G5KW did not arrive until the 6th! A map of contacts made with the other permit holders and other stations is shown in *Figure 1*. In

expect.....

by Ken Ellis G5KW

order to analyse these results, reference is made to the following modes of propagation involved at 50MHz.

Modes of propagation on 50MHz

Extended ground wave is a term used to indicate the continuous coverage obtained beyond true ground wave, which on 50MHz, as on other VHF frequecies, is limited to line of sight. However, beyond the natural horizon the signal does not disappear but is extended by a scattering effect from hills, tall buildings and other reflecting objects in addition to reflection from the ionosphere and other layers.

From *Figure 1* it can be seen that there are no permit holders in the true ground wave area. The extended ground wave area, which when subject to certain conditions enables refractive index-contacts to be made regularly, lies in the area between 200 and 400km approximately. The factors affecting contact range are: the intermediate terrain; the antenna height and gain; and the transmitter output power.

The G5KW/A QTH was about 150ft asl, with a clear take-off in all directions. The very high ground to the north-east in Cornwall and Devon prevented any extended ground wave contacts in that direction, but along the south coast strip regular contacts were made. Along the Severn estuary, and beyond to the midlands, a good propagation path was generally possible.

Unfortunately, no permits were issued to operators in a geographical line from Anglesea to the Wash until you get to the area of a line from the Clyde to the Forth. This was most unfortunate as this area could have provided some interesting statistics on the start of the tropospheric area. However, with the general release of the band we look forward to further reports from this area.

Tropospheric propagation (Tropo)

Some interesting contacts were made at distances beyond the 400km arc to GM, GI and the eastern counties of G. These were mainly by Tropo, which will soon be recognised by regular operators.

Tests were made with different power and at different angles to compare the high gain Cushcraft yagi and the 5 element smaller yagies. It was concluded that antenna gain and power output affected extended ground wave more than Tropo or other forms of propagation.

Sporadic-E or Es

Until we get nearer to the peak of cycle 22, we must rely on Es propagation for DX working. The DX contacts shown in *Figure 1* were undoubtedly by this method, but contacts of over 2000 miles outside F layer periods present a controversial problem. 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 (see *Figure 2* by Melvin Wilson W1DEI, *QST* Dec 1970).

This idea could make another important study, but would require more operators along the intermediate path. In this connection the regular reception of the FY7THF beacon over a wide area raises another unresolved problem. A comment by VHF propagation expert Ray Cracknel G2AHU, is offered for consideration.

'I've 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 that 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*'.

Whilst conducting my propagation study in the Isles of Scilly, I had considerable experience of this with the FY7THF beacon early in the morning, before other hams in that area were active! I suggest that a form of marine ducting may have contributed to this effect. As we approach the peak of cycle 22, more operators will ensure that progress is made.

GW3MHW, a very successful and active operator on 50MHz from a mountain top QTH quotes, 'I am convinced that the multi-hop method of propagation, which is frequently stated to be the explanation of long DX and skip on the lower frequency bands, is not a satisfactory explanation for long DX on 50MHz. My observations lead me to the conclusion that much propagation on 6m takes place by a type of channelling of the waves between two closely spaced layers of strong ionisation reaching the surface of the earth where the lower layer becomes weaker'.

What to expect and when

The main objective of this article is to give guidance and advice, particularly to the newcomer to 50MHz, when DX is present during the run-up to the peak of cycle 22. With this in mind I shall quote from my own log and the logs of other successful operators during cycle 21. The contacts I made with other permit holders tell their own story! These contacts did not depend on high MUF or F2 and should be possible under the present conditions. During the Es season, May – Sept, direct and crossband DX is probable. A good indication of this is given by monitoring beacons and European TV VHF Band 1 stations. The beacons to listen for are:

ZB2VHF Gibraltar 50.035. This beacon usually starts coming in during late April, and is a very constant signal peaking S9+ at times for long periods.

OX3VHF Greenland locater IQ06PS 50.045. 20/30 watts antenna ground plane.

5B4CY Cyprus 50.499. This beacon used to be heard regularly in G when conditions were good from early mornings through the day during the sporadic E season. It is not believed to be operating at present, but reports of reception would be appreciated.

FY7THF French Guiana 50.038. This beacon is regularly received in Europe, but in G usually early in the mornings. Actual propagation mode at present has been not established.

Malta. It is hoped that a beacon will soon be operational, but there are some problems to be resolved.

South Africa. Many ZS stations switch to the auto keying mode during unattended operation of their station simulating beacon operation. This is very useful for propagation studies, but most frustrating as it is not possible to break in for a QSO.

There are a number of other beacons, but as they are not regularly received here they have not been included. Some American and other DX beacons likely to be heard here during the peak of cycle 22 will be referred to in the second part of this series.

Aurora propagation

On 8/9th February a few days after the general 24 hour release of 50MHz, one of the most extensive auroras on record was experienced. It started with a Proton-9 flare eruption on 6th February, lasting approximately 45 minutes. This event had been accurately forecast by Charlie Newton on GB2RS, so we were all geared up and waiting impatiently. During the afternoon of the 6th, there was a high solar noise and I completed an aurora QSO with GM4YPZ at 1800, followed by GM0DZN and several G's whilst beaming to the north-east. Here in Kent the aurora effect faded out around 2010, but it persisted longer further north.

The following day it started here at 1301 with an aurora QSO with GM4NFC and GM0YPZ, followed by a tropo QSO with GM4YPZ at 1500 and aurora and tropo QSOs with GM4NFC at 1522 and G13ZTL at 1524. Many more aurora QSOs took place during the afternoon, all beaming NE. There was a break during the early evening, but the aurora cloud moved to the north-west for QSOs with, amongst others, GM3ZBE, GJ3YHU, PA0XMA and LA9DL at 2358. After midnight several QSOs were made and many stations were heard calling, but the aurora effect was fading. My last QSO was with G3ZIG at 0040. Later I received a letter from 'Lefty' K1TOL, with some interesting comments.

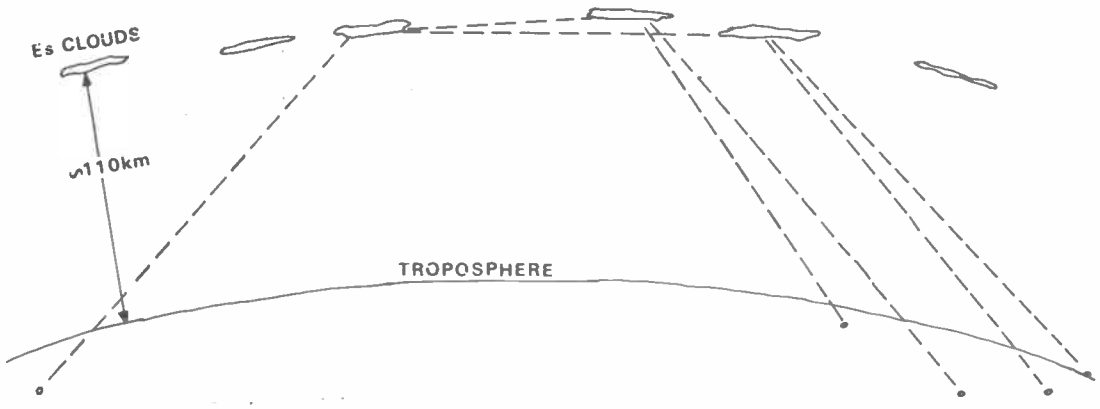


Fig 2

'Several hams on the east coast heard GB3SIX on 8th February from 2300-0110UTC. I was the first to hear it at 2300 for over 1.5 hours. The signals being aurora via 539A.

'I called CQ in the direction of G for over an hour, but had no replies. I received a letter from Olaf SM6PU, who reported hearing my CQs for about 15 minutues around 0050UTC. I also heard the GB3NHQ beacon weakly around 2345-2355. K1JRW heard a G3Z around 0030. It is very important to look west for aurora openings after the buzz dies down, and I have worked many W7/VE6/VE8 and KL7 stations on a dead band after the aurora has died down. Do not be fooled, the long haul aurora E openings always occur late at night after the aurora has died out, and have no growl or flutter but sound echo like, similar to F2 back scatter!'

These comments from Lefty are very instructive, as I for one was not aware of this post aurora effect, otherwise I would have stayed on a little longer. Better luck in future!

Mario K2MUB also heard the GB3SIX beacon; the aurora began there about 1500 on 8th February and was followed later by F2 to the South; FY7THF and HC2FG beacons breaking through.

According to VK5LP the aurora was operating in VK on 8/9th Fehruary, but is very rarely reported – possibly due to the fact that there is little insentive to beam south. Who will be the first from this side to have a QSO by aurora across the Atlantic? It could be you! I heard a VE3 by aurora in 1982, but could not read the complete call, so it is only a question of time and good luck.

Stations known to be active on 50MHz

The most active stations in Portugal are CT1WW and CT1LN. In Gibraltar ZB2BL is custodian of the ZB2VHF beacons, and in Norway about 25 permit holders operate on a non-interference basis. A number of other stations have been contacted, but as there status is doubtful have not been included.

There is a considerable amount of interest in crossband working in Europe using two metres and 28885 in the ten metre band. Stations worked regularly include SM6PU, DK1PZ, DL7YS, EA3ADW, CT1LN, CT1WW, LA1K, LA6QBA, I5TDJ, TF1T, OH1ZAA, LA9DL, OX3BX, OZ9QV, F0FDB and G4JCC.

The next instalment of this series will deal with F2 propagation to North, Central, and South America, world-wide DX and the possibility of 50MHz WAC.

The Liniplex® F1 — Sounds Good

Because it is the first shortwave receiver to successfully realise the full potential of shortwave broadcasting. Operating continuously synchronised to the signal, even during fading, the Liniplex sounds remarkably clear with none of the distortion and little of the fading usually associated with conventional shortwave reception. Enjoy music on shortwave in a way that has not been possible before, especially when using your Hi-Fi system.

Without any reduction in fidelity, the listener can also for the first time select upper or lower sidebands, or both, at will, to relieve adjacent channel interference. This also makes the receiver compatible with any future use of single sideband broadcasting.

Crystal controlled to avoid synthesiser noise the receiver otherwise follows a regular communications receiver design. The plug-in crystals, one for each of the nine pre-set channels, are initially all BBC frequencies best suited to your particular location. Simply switch on and select the best channel for the time of day – synchronisation is fully automatic, ie no tuning is required.

An indoor antenna is supplied but whilst ordinary transistor receivers generally gain no benefit from an external wire antenna due to overloading, the Liniplex receiver, with its excellent large signal handling capability, will on the contrary only sound even better.

The Liniplex is designed and manufactured in England and it is used extensively by the British Forces Broadcasting Service.

The Liniplex F1 is available directly or from appointed distributors from £625 (exc VAT) in the UK.

Distributors: Radio West, 3417 Purer Road, Escondido, CA92025, USA. Tel: 619 741 2891
Alltronic, Sonnenallee 95, 1000 Berlin 44, West Germany. Tel: 030 681 1095
O & C Alexander Sales (Pty) Ltd, PO Box 1713, Johannesburg, RSA. Tel: 724 9366
Philip Collins & Associates Pty, PO Box 295, Artarmon, NSW 2064, Australia. Tel: 02 412 2797

PHASE TRACK LTD, 16 Britten Rd, The Robert Cort Industrial Estate, Elgar Road, Berks, United Kingdom

PHASE TRACK

SURPLUS COMPUTER HARDWARE

ITT SCRIBE III WORD PROCESSING SYSTEM. Professional system originally selling at around £6000 without printer. Now offered with **software included** & a variety of different options available. This system is available from us **ALL BRAND NEW** at the cost of current budget systems, but with **office-quality** performance & features.

SOFTWARE INCLUDED:
- *DATABASE — allows information storage & retrieval by user-selectable criteria.
- *EDITING — including easy reformatting, global search & replace, save & move, cursor control etc.
- *AUTOMATIC LETTERWRITING — with merge, glossary file for much used phrases etc.
- *MATHS FUNCTIONS — screen maths allows addition of rows, columns & complete tables.
- *PROGRAMMABLE COMMANDS — allows format changes, accessing record block files, prompts etc.
- *HELP FILES — quicker to use than the comprehensive manual supplied.
- *BASIC COMPILER.

HARDWARE INCLUDED:
- *SCREEN/WORKSTATION — dual processor (16 bit TI 9995 & Z80H) with 128K memory, 12" green screen 25 x 80 character display with slow scrolling, QUME printer interface.
- *KEYBOARD — low-profile keyboard additionally has 43 clearly marked dedicated function keys.
- *DISC DRIVES — dual SHUGART 5¼" DSDD drives each 430K capacity formatted.

£295.00

OPTIONS:
- *10mbyte MiniScribe WINCHESTER disc drive (£195).
- *NEC Model 3500 35cps daisy wheel printer (£295).
- *NEC Model 7700 55cps daisy wheel printer (£395).
- *128K additional memory with spelling check software (£40).
- *Communications hardware & software (£95).

COLOUR LEAFLET AVAILABLE

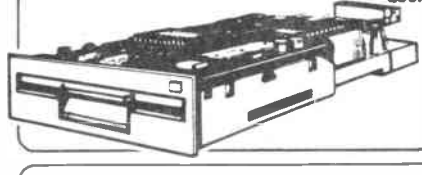
HITACHI Model 305S 3" disc drives. With SHUGART compatible interface (34 way edge connector) & suitable for **BBC** with DFS, **AMSTRAD 664/6128, TATUNG EINSTEIN** & many others. 250K (double density unformatted) per side reversible; 40 track; standard power connector for 12V & 5V; overall power consumption typically 3.7W. Supplied **BRAND NEW** with connector pin-out details etc. but uncased. Data cables only are available for AMSTRAD & BBC (£7.50) and TATUNG (£10.00).

£29.95

HITACHI Model 305D double sided 3" disc drives. As above, but double sided (500KB unformatted accessible without turning disc over). Not suitable for AMSTRAD 664/6128.

***Over 2000 Model 305 drives already sold by us**

£39.95



MATMOS PC. Available without disc drives only. 64KB Z80A based keyboard sized machine with RGB, composite video outputs & UHF modulator. Serial, parallel, cassette & peripheral bus interfaces are provided, together with a ROM port. MICROSOFT BASIC is in ROM. Office quality machine originally sold at £350 by its big-name manufacturer. **BRAND NEW.**

***Over 1000 already sold by us** **£49.00**

MATMOS TERMINAL. MATMOS PC as above but with additional plug-in menu driven terminal emulation ROM offering RS-232 communications up to 9600 Baud. (ROM is available separately at £20.)

£69.00

SAMURAI S-16 MSDOS COMPUTER SYSTEM. **8086** based true 16 bit machine with high-res green screen; 128K memory (do-it-yourself expandable to 512K); **twin DSDD 8" floppy disc drives (total 2.3MB).** CENTRONICS parallel interface; 2 x RS232 interfaces; MSDOS with full manuals. **INCLUDED** in the price are **PEACHTEXT** word processing software, PEACHCALC spreadsheet, and **PEACHTREE TELECOMMUNICATIONS. ALL BRAND NEW** with original manuals.

***Last few** **£299.00**

HITACHI MONO MONITOR. All BRAND NEW but uncased and for 12VDC. 15.625kHz-15.75kHz horizontal frequency; 50-60Hz vertical. Positive TTL video & sync. separated. 9", 12" & 14" available.

All types **£18.50**

BLEASDALE UNIX COMPUTER SYSTEM. 68000 based system with 750K memory, TEAC Model FD55 DSDD floppy disc, ATASI Model 3000 45mbyte WINCHESTER drive, MICROLINE Model 83A printer with stand and acoustic hood, KIMTRON ABM85H VDU, 8-line terminal multiplexer. With UNIX operating system & PASCAL 2.

£2500.00

ITT Model 3500 FACSIMILE machine. Very compact Group II machine allows document transmission & reception over phone line. EX DEMO.

£299.00

Please note:
**VAT & CARRIAGE must be added to all items. Carriage is £2.00 + VAT for 3" disc drives, and £10.00 + VAT for all other items.*
**A complete stock list (which includes test equipment & other items) is available on request.*

MATMOS Ltd., 1 Church Street, Cuckfield, W. Sussex RH17 5JZ. (0444) 414484/454377
COMPUTER APPRECIATION, 111 Northgate, Canterbury, Kent CT1 1BH. (0227) 470512. TELEX 966134 COMPAP

matmos & COMPUTER APPRECIATION

Meteorological Facsimile

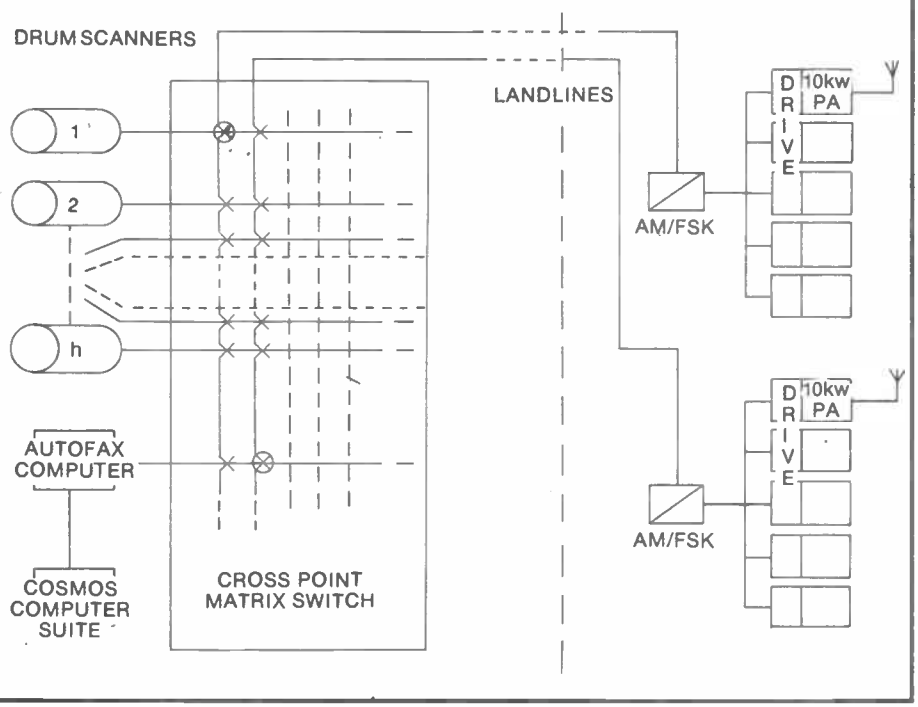
by Ken Michaelson G3RDG

Like lots of other people, I have been interested in weather forecasting since the days when the XYL with three children to manage used to treat my word as law (!) in deciding what clothes they should wear. Very often I made mistakes and we all got soaked, so I thought I would go into the science in greater detail. I tried my hand at decoding the five figure groups which are transmitted in the RTTY format from Bracknell and other stations (CCITT International Telegraph Alphabet No 2 at 50 bauds 400Hz shift), but that was too time consuming as each five figure group had to be decoded and the results written on a map of Northern Europe to get the whole weather picture. Then one day I became intrigued with the number of stations all over the HF bands which were transmitting a peculiar cyclic grating sound. Upon investigation this turned out to be *facsimile*.

Well, what is 'facsimile'? It is a method of transmitting and receiving pictures line by line. The picture to be sent is wrapped around the drum of a machine which rotates at an accurately maintained speed of 60, 90, 120 or 240 revolutions per minute. An optical scanner, which is mounted on a screw thread, picks up the black and white information from the picture as it rotates, and moves along the drum at a speed determined by the pitch of the thread, thereby covering the whole of the picture. The brightness values of the picture elements (these are called pixels), are converted into varying voltages by means of this scanner, the output of which then modulates the transmitter. An illustration of a typical machine is shown below.

The electrical values are either digital for black and white originals, such as meteorological charts or written text, or analogue for pictures such as photographs from various press agencies or satellites which require graduations in grey tones. Because I am only talking about meteorological transmissions here, the picture will either be black or white. The data is sent out by modulating an audio sub-carrier at 1900Hz. Full white will produce a shift of +400Hz and full black −400LF. This, however, is only the case on the HF bands. When receiving on the LF bands around 130/140kHz, the shift is only ±150Hz. The modulation is FSK (frequency shift keying), and the emission code is F3C.

Outline of FAX distribution signals from Bracknell



However, before all this gets under way a 'start tone' of either 300Hz or 675Hz for an IOC of 576 or 288 is sent by the transmitting station. IOC stands for Index of Co-operation and is defined by the formula M = LF/pi, where L is the length of the scanning line and F is the scanning density (or number of lines per unit length). This IOC is normally either 576 (for a minimum pixel size of 0.44mm), or 288 (for a minimum pixel size of 0.7mm), so a start tone applicable to the desired picture definition would be sent. Next a series of pulses are sent for about 30 seconds, each pulse lasting for about 0.5 seconds, before giving way to the actual picture information. The pulses allow the receiving apparatus to edge itself round so that when the picture is sent the start is at the top lefthand side of the paper.

This pulsing consists of sending alternate black and white signals with the following frequencies to indicate the speed of the drum in revolutions per minute: 1Hz for 60 lines per minute (60rpm); 1.5Hz for 90 lines per minute (90rpm); 2Hz for 120 lines per minute (120rpm); and 4Hz for 240 lines per minute (240rpm). After the picture has been sent, the process is brought to a close by the transmitting station sending a 'stop tone' of 450Hz.

In my particular case, I do not use a 'facsimile' machine. I have built a FAX decoder for the FM signals which I use with a dedicated computer (Z80), and a program on ROM which operates my Epson RX-80 F/T printer in the graphics mode, thus giving me a line by line printout of the picture coming through. The receiver was built from a circuit designed by Lionel Sear G3PPT, published in *Radio & Electronics World* magazine in January 1984, and examples of the received pictures are shown below.

You will always find that Met facsimile transmission schedules list the appropriate drum speed/IOC combination in the form 120/576, although not all transmissions use this combination. Khabarovsk Meteo in the

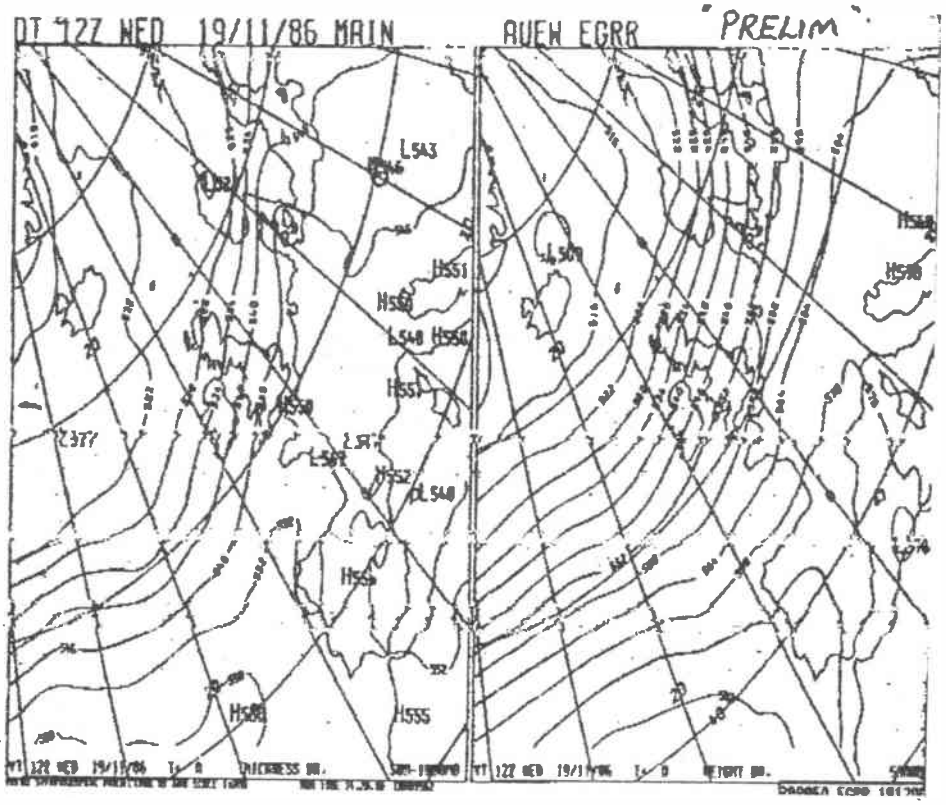
USSR uses a drum speed of 90 with an IOC of 288 and Beijing Meteo in China uses 60/288. But I would say that nine tenths of the world-wide transmissions are 120/576, and the time taken to send a complete picture using these constants is therefore 4 minutes and 48 seconds. On occasion the transmitting stations have to send a picture of greater length, one such is the iceberg chart, and in that case the line standard is only used to maintain the aspect ratio. As far as the Meteorological Office at Bracknell is concerned, the drum speed is always 120, but according to the published schedules, the IOC is about half and half between 576 and 288.

The Meteorological Office is actually part of the Ministry of Defence, and although the charts are prepared for transmission at Bracknell, they are in fact transmitted from an RAF station. There are two main groups of transmitters both of which run a power of 10kW to the antenna, and they are listed in the table with the times of operation.

CALLSIGN	TIME	FREQUENCY
GFA21	0000 - 2400	3289.5kHz
GFA22	1800 - 0600	4610kHz
GFA23	0000 - 2400	8040kHz
GFA24	0000 - 2400	11086.5kHz
GFA25	0600 - 1800	14582.5kHz
GFE25	1800 - 0600 (1 Oct - 31 Mar)	2618.5kHz
	1900 - 0500 (1 Apr - 30 Sep)	
GFE21	0000 - 2400	4782kHz
GFE22	0000 - 2400	9203kHz
GFE23	0000 - 2400	14436kHz
GFE24	0600 - 1800 (1 Oct - 31 Mar)	
	0500 - 1900 (1 Apr - 30 Sep)	

The World Meteorological Organisation – Global Telecommunications System (WMO – GTS) is one of those specialised agencies like, for example, the International Telecommunications Union (ITU), and is controlled through the United Nations Organisation (UNO). Its objective is the rapid exchange of meteorological and related information, and its Secretariat, situated in Geneva, has divided the world into six regions as follows: 1 – Africa; 2 – Asia; 3 – South America; 4 – North and Central America; 5 – Southwest Pacific; and 6 – Europe.

The transmitters operated by Bracknell are intended for specific regions, which are: Region 6 (Europe); the Northern part of Region 1 (Africa, north of 20°N); and the Western part of Region 2 (Asia as far as 60°E). With a power input of 10kW into the antennas, I have no doubt that the transmitters achieve their desired coverage. During a period of 24 hours the group of GFE callsign stations transmit 108 different weather pictures, and the GFA group transmit 54. All the weather pictures have a 'chart name' at the beginning, followed by the 'location indicator' of the originating weather station.



Above and overleaf – examples of charts received from Bracknell

The 'chart name' consists, as a rule, of four letters, the first of which indicates the data type (A for analyses, C for climatic data, F for forecasts, etc). The second letter indicates the type of data, for example: AH, upper air thickness analyses; or FI, sea ice information forecast, etc. The third and fourth letters are the geographical designators going through the alphabet. For instance: AA is Antarctic; CN is Canada; and NT is the North Atlantic area.

A practice often used by Bracknell is to insert the letters XX when no specific designator is appropriate, so that the first group would be, perhaps, FSXX.

The next four letters are called the location indicators, and all charts in Great Britain have EG as the first two letters. These are followed by a further two letters which show the actual place of origin. For example: EGRR is Bracknell; EGSS is London/Stanstead; and EGTE is Exeter.

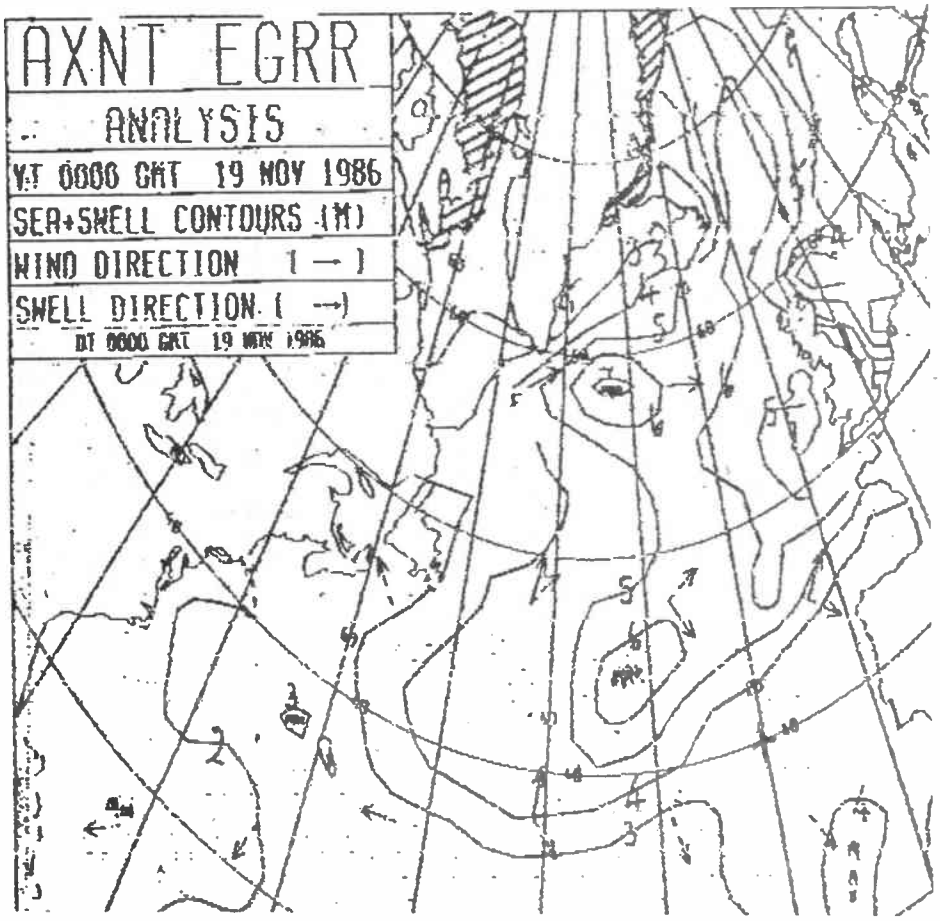
A complete list of world-wide location indicators, together with all the chart names and a great mass of other information, is available in a book called the *Air and Code Manual*, published by Klingenfuss Publications in the Federal Republic of Germany.

The main users of these transmissions are pilots of aircraft who are concerned with the transmissions from the GFE group, which give upper air temperature forecasts at varying heights superimposed on maps of clearly defined sections of the earth. The other group of users are ship captains, to whom the forecasts of ice or sea swell or wind is obviously of great help. In addition to this, the Meteorological Office is now involved in a great amount of weather forecasting for commercial purposes on behalf of various large companies whose operations can be considerably affected by weather conditions. These include the obvious ones such as the gas and electricity boards and the water authorities, but also organisations in sectors like transport, retailing, entertainment and offshore oil exploration. The organisers of sporting events are also turning to the Met Office for information.

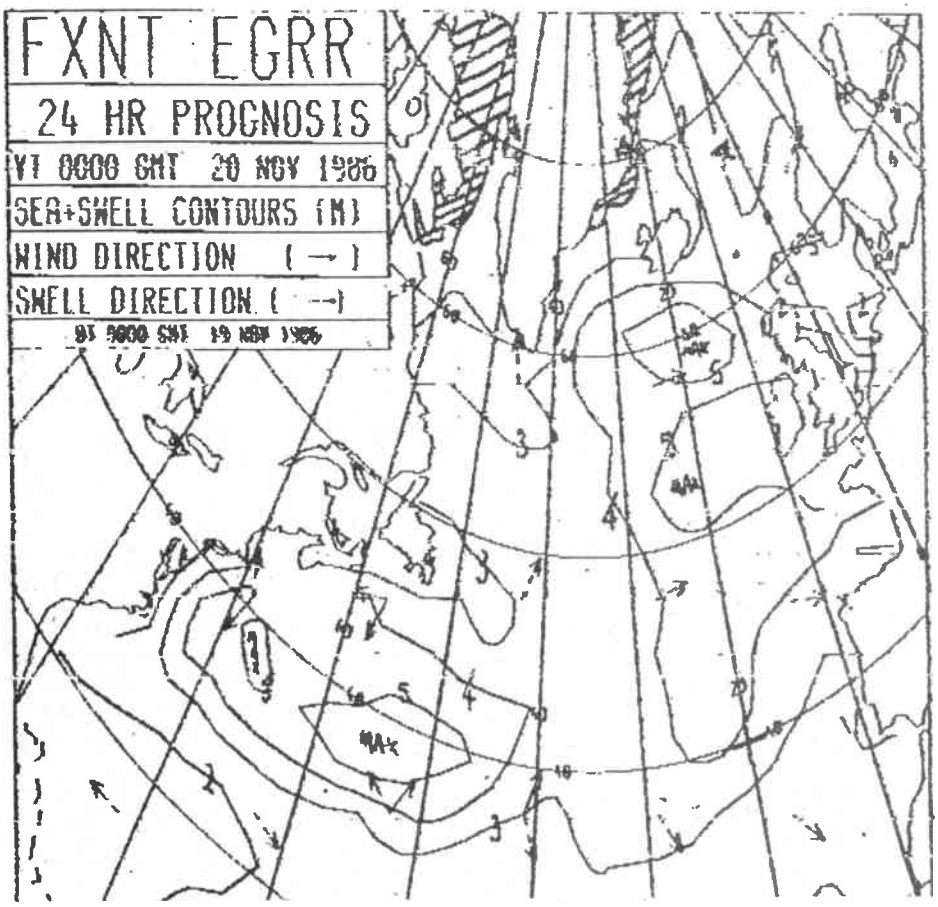
As an interesting sidelight on this, I understand that at the 1985 Wimbledon Tennis Championships, the Meteorological Office was able to give a crucial 20 minute warning of an impending thunderstorm over the area, which allowed the authorities to cover the courts in time, and prevented them from a thorough soaking. These users are connected to Bracknell by wire and usually have a FAX terminal at their head office. By observing the various forecasts, food supermarkets for instance, can decide on the quantity of, say, ice cream or salads to buy and distribute to their branches. At the other end of the scale, periods of prolonged cold weather would give them warning to have quantities of soup or any other goods needed in winter.

The information necessary to make up the charts comes from a number of different sources. There are weather ships sending their reports, aircraft flying for the sole purpose of observing weather conditions, and sonde balloons, sent up into the atmosphere at specific intervals to obtain information on temperature, moisture, air pressure etc. There are also reports given by pilots of civilian aircraft at certain times to help in the general composition of the weather pattern at any given time.

All this information is then put together, and a weather map drawn



showing the relevant particulars. This is then attached to the drum of the facsimile machine and sent out as described above. The distribution of the signals from Bracknell is carried out by radio, but initially the signal must get to the transmitting station, which is achieved as follows. There are a number of drum scanners at Bracknell (FAX machines similar to the illustration), which are loaded with the relevant charts. The output of the scanners is connected to a crosspoint matrix, so that various outputs from the drum scanners (and incidentally an AutoFAX computer which is itself connected to the Cosmos Computer suite) can be distributed to one or other or both of the two groups of transmitters.



The signal is conveyed to the transmitting site by landline and on arrival it is converted to either amplitude modulation or frequency modulation and transmitted in accordance with the listings given above. The emission codes are either A3C or F3C. As far as my reception of the facsimile signals is concerned, I have found that they have all been frequency modulation F3C.

Before concluding, there is one point that I must bring to your attention, and that is the requirement that anyone who wishes to receive these FAX broadcasts *must* be in possession of a licence to do so. This can be obtained without difficulty by making an application to the Meteorological Office (Licensing), MET Office, 17 London Road, Bracknell RG12 2SZ, giving the information listed in the table below.

LICENSING INFORMATION

1) The transmissions to be received
2) The proposed frequency or frequencies to be used for reception
3) The apparatus to be used for reception
4) The location of the apparatus
5) The purpose for taking the broadcasts (in our case it would be 'amateur interest in the weather').

If the purpose for taking the broadcasts does not involve any commercial use of the information and is solely for your own interest, then a once only fee of £5.00 is payable. In fact, having made your application to the Met Office and received permission to receive Met Office FAX broadcasts, you then send it to the Department of Trade and Industry (Amateur Radio Licensing), at Waterloo Bridge House, Waterloo Bridge Road, London SE1, who will ask you for your £5.00. In due course you will receive your licence.

If any of you have had your appetites whetted by this article and have become interested in FAX signals, I can recommend the *Guide to Facsimile Stations*, price 30DM, published by Klingenfuss Publications, Hagenloher Str 14, D-7400 Tuebingen, Fe Rep Germany. It gives world-wide meteo station particulars with frequencies, times of transmission and actually what they transmit in the way of charts at any given time. Very useful.

I have found the reception of these FAX transmissions an absorbing interest, as apart from seeing what is happening in other parts of the world, I find that it is possible to give a reasonable forecast of the weather in south-east England on the basis of the pictures received. Good listening.

Acknowledgement is made to: *Klingenfuss Publications, Hagenloher Str 14, D-7400 Tuebingen, Fe Rep Germany.*

Tony Smith G4FAI takes his bimonthly look at the world of dots and dashes

Morse tests

I haven't been overwhelmed with replies to my request for first-hand information about the arrangements for the RSGB Morse tests, and there are no disaster stories at all. Mr D S Dolling, now G0FVH, took his test at the Harlow Rally last September. He says, 'I was very nervous . . . but the examiner put me at ease, and even let me stop and compose myself mid-test'. He has nothing but praise for the RSGB in all his dealings with them to date.

When Mr J A Anderson wrote, he was awaiting his new callsign after taking the test at Horsham in early December. The tests started at 11am and his appointed time was 3pm.

He was greeted by 'a very friendly member of the RSGB who told me that about 28 candidates were taking the test, and that they were running a little behind schedule'. The subsequent 1¼ hour delay made him rather 'steamed up' by the time he got into the examination, 'no doubt', he says, 'due to my age of 70 plus!'

Uncontrollable shake

'The Morse itself was quite easy to take down, but my sending was terrible due to uncontrollable hand shake! However, the examiners were most encouraging . . . they all do a wonderful job, and were most helpful in spite of a very long day for them.'

As well as hearing from candidates, it was nice to hear from the other side. Mike Davidson G4WRU officiated at the first RSGB Morse test in East London, on 14th November.

For some reason the test was not officially announced in *RadCom*, but nevertheless eight candidates managed to find out about it. Mike reports, 'All went well, I did my utmost to put the candidates at ease, including providing them with peppermints to suck. I felt that I succeeded to a great extent in easing their nerves and at the end six walked out with smiles of relief on their faces.'

Commendable attitude

In these three reports there is a common theme – the very commendable attitude of the examiners, and their efforts to help candidates overcome their nerves. G4WRU again, 'I feel that the Morse tests run by the RSGB will be of great benefit to the amateur radio movement, given a little time for administrative hiccups to be sorted out. I am proud to be involved at this early stage'. That seems to sum it up very nicely. Thanks Mike, and congratulations to Messrs Dolling and Anderson on passing their tests. Every success to them in their new mode!

Calling XU2UU

Ray Hunting G3OC has sent me an account he wrote in *Mercury*, journal of RSARS, in July 1984, about an experience in France in 1940. He was sending important traffic back to the UK when the Germans got a fix on his frequency and jammed his signals. The UK operator gave up, and the key was taken over, Ray believes, by the Sergeant-in-Charge, who told him over the air that he was previously XU2UU.

After that, the two ops abandoned Army procedures and worked as hams, using QRQ, QRX, QSY, etc to outwit the German interference. At this distance of time Ray recalls the other operator's call as XU2UU, although he only heard it once through bad QRM. Can anyone help identify this operator, who was obviously a Royal Signals amateur operating in China pre-war?

Two names have been suggested so far, 'Blanco' White and Frank Lawson. Maybe someone has a 1938/9 *International Call Book* they could look up to see if either of these names, or the call, is to be found there? If you can help, please write to Rev R Hunting G3OC, 25 Station Road, Thurlby, Lincs PE10 0JA.

Q & Z codebook

In the last column I asked if anyone had a copy of the original Q code. What I did not know at the time was that a new codebook due to be published, with which I am associated, had a copy in it! This English language, 82 page booklet by PA0BFN and PA3ALM lists *all* Q and Z codes. It is a handy reference book for every shack, and its intention is to stimulate greater use of the codes.

Adapting codes

While today's Q code takes up 36 pages, the original 1912 version is contained on one page. QSB meant 'Is my tone bad?' or 'Is my spark bad?'; QRG was 'What (shipping) line do you belong to?'; QRZ, 'Are my signals weak?'; and QSL, 'Did you get my receipt?'. A lot of changes have taken place since 1912 and, of course, amateurs have adapted many of the codes for their own use.

The Z code is hardly known by amateurs today, although there are still some examples in the RSGB *Radio Communication Handbook*. There are 23 categories covering every type of signal, from various aspects of aviation, to meteorology, traffic generally, and 'various'. This last category includes ZUF1, 'Air raid warning'; ZUF2, 'Air raid in progress', and ZUF3, 'All clear'. I hope we won't have to use any of these particular signals, but there are certainly a number of Z codes which could be revived for amateur use with advantage.

The Q/Z booklet costs £3, post paid. Just send a cheque, payable to Morsum Magnificat, to G4FAI, 1 Tash Place, London N11 1PA.

What sunspot minimum?

For those of us (me included) who bemoan the present 'poor' conditions on the bands, let me tell you about Steve Muster G4UOL. In 1986 he had 5818 CW QSOs, averaging 112 contacts a week. Since coming on the air in September 1983, he has had 10,385 CW QSOs, and has worked 133 DXCC countries (102 confirmed), including 20 new countries last year.

His antenna is just 43ft of wire running down his garden, sloping from about 15ft to 12ft, terminating at a washing-line post. The wire runs down the post for about 5ft, and then winds round its 6in diameter for about 200 turns. He uses a TS930S and an AT230 ATU with the full 100W on 7MHz without TVI. The antenna loads up well on all bands.

'However', he says, 'on the other bands one needs to use a bit of common sense!'

Morse satisfaction

These activities demonstrate several things about Morse, not least of which is the capability of establishing radio communication in adverse conditions with a modest antenna. They also show the dedication which CW operating can produce, and the satisfaction obtainable. Such activity is not for us all, but every Morse enthusiast can find a personal level of enjoyment and achievement in this mode. G4UOL's results serve to remind us that there is still plenty of scope to widen our horizons if we ever want to.

MUST AM DIE?

The other day it occurred to me that it is a very long time since I heard an AM signal on the amateur bands. On HF, prior to 1960, this mode of operation carried the bulk of R/T traffic and for a further ten years, until the introduction of the Japanese transceivers, it also found favour on 2 metres and the other VHF bands. Why then has this mode disappeared so rapidly?

Obviously, on the crowded HF bands the improvement in transmission efficiency, the lack of heterodyne whistles between closely adjacent stations and a 50% reduction in bandwidth when using SSB proved to be an overwhelming argument for change, but on the uncluttered VHF bands such reasons were of less importance, and other causes must be sought.

Why the demise?

It is probable that the introduction of solid-state equipment had much to do with the demise of the amplitude modulation mode for, as a frequency modulation signal is of constant level, the power amplifier transistors could be safely operated close to their design limits.

Had AM been used, a far lower carrier power would have had to be selected in order to remain within transistor ratings at peak modulation. With the much wider range of transistors now available, this is of little importance, but in the late 1960s and the early 1970s, this had become a critical factor.

The AM mode has long been derided as 'Ancient Modulation', but whether this term is deserved or not must remain a matter of opinion. The fact remains that the mode is still used for all MF and HF broadcasts, VHF aeromobile air to ground communications and many other tasks.

Amplitude modulation is the most basic means of radio telephony communication and, as such, is simple both to set up and operate. In its most efficient form it requires only a CW transmitter, an audio amplifier and a transformer to match amplifier to transmitter.

It is believed by many recently licensed amateurs that AM is inferior to FM, but this may be disputed. Certainly FM has some advantages, but the converse is also true.

As FM is insensitive to signal level variation, 'mobile flutter', except at low signal levels, has largely disappeared, but the FM 'capture' effect can work to advantage or disadvantage. The same effect which ensures interference free local contacts, will also mask the station being worked if strong interference occurs. If AM is being used, sufficient signal may well be heard from the weaker station to arrange a frequency change or other measures to overcome the problem.

FM misconceptions

Many people also believe that the audio quality on FM is superior. This misconception comes from experience with FM broadcast transmissions. These, however, are wideband FM with a deviation of 75kHz. Amateur transmissions use narrowband FM and the restriction of bandwidth nullifies this advantage. On amateur wavebands there is little to choose between the audio quality of the two modes. Compared with SSB, A3 is about 9dB less effective, but, in general, is far easier to tune and more pleasant to listen to.

From the foregoing it would appear that AM has few advantages and there is little point in its retention. This is to some degree true, for the bandwidth it occupies makes it antisocial on the congested HF bands, whilst there is insufficient reason for it to displace either SSB or FM on VHF. I do suggest, however, that there is good reason for limited retention, for, even if it is not widely used, the equipment is simple to construct and adjust and is thus ideal for newcomers to home construction.

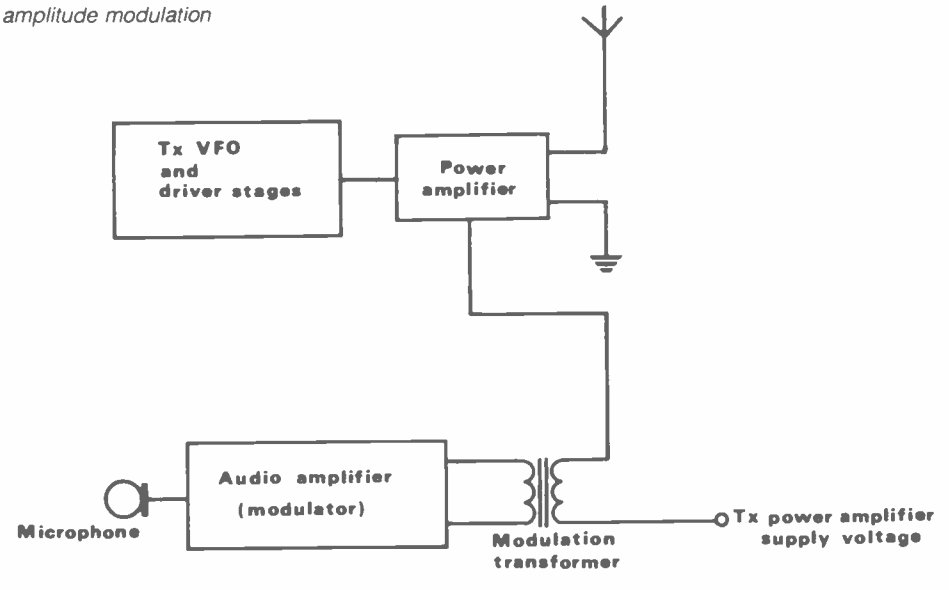
What is amplitude modulation?

Amplitude modulation is so rarely used on the amateur bands these days that there is good reason for many operators knowing little about it. Many years ago it was (erroneously) believed by many that the strength of the carrier wave varied in sympathy with the modulating audio signal. This misconception is understandable, for an output meter fitted to the circuit will show an increase when the modulation is applied, whilst an oscilloscope will clearly show the variation in signal strength through the modulation cycle.

Whilst neither indication can be disputed, they do not tell the whole story for, in fact, the action of modulation is no different to that of any other circuit in which two signals of different frequencies are mixed. If a carrier of frequency F1 is modulated by an audio signal of frequency F2, then the output will contain signals of F1, F1 + F2 and F1 - F2, the two latter combinations being referred to as the sidebands.

This can readily be observed on a spectrum analyser, but such devices are rare in amateur shacks. An alternative method is to modulate the carrier with the highest possible frequency (say 20 or

Fig 1 *Block diagram for amplitude modulation*



25kHz) and tune across the signal with a selective receiver with BFO switched on. The carrier and the two sidebands will be discerned as separate signals.

Equipment

The basic requirements for an AM transmission are a CW transmitter, an audio amplifier capable of an output of half the input power of the transmitter and a transformer for matching one to the other.

In the heyday of amateur AM operation in the 1950s, thermionic technology reigned supreme and, during that time, many alternative ideas were evolved to provide cheaper means of modulating the carrier, for modulation transformers were relatively expensive and the cost of high power valve audio amplifiers could be a heavy drain on the pocket. Today, however, 5-10 watt solid-state audio amplifiers are relatively cheap and such methods are unnecessary. The modulation transformer may still pose a problem, but for fully solid-state equipment, suitable devices may be obtained from surplus PMR equipment.

Matching

Should it be desired to match a solid-state modulator unit with a valve transmitter, it is possible that an old valve output transformer operated in reverse may prove suitable, whilst if fully thermionic equipment is desired, a suitable modulation transformer may certainly be purchased quite cheaply at the next rally or club junk sale.

A little care should be taken, however, in the selection of the transmitter output devices for, at peaks during the modulation cycle, the voltage applied to the device will rise to double the supply rail level. Whilst valve power amplifiers will usually accept this without complaint, unless the solid-state equivalent is generously rated, the result may prove disastrous.

Adjustment

The object of adjustment of an AM equipment is to provide an optimum balance between the carrier power and the applied modulation, for at one extreme the speech could be hardly audible, whilst at the other 'overmodulation' would cause distortion and splatter across the band on speech peaks. The easiest method of checking the modulation level of the transmission is by using an oscilloscope. The level of audio applied can be readily optimised by observation of the transmitted waveform.

Should no oscilloscope be available, a thermocouple RF ammeter in the aerial should show an increase of about 10% during modulation. It is also possible that the meter could show a decrease. This is known as 'decremental' or 'downward' modulation, which can usually be corrected by either reversing the connections to one winding of the modulation transformer, adjusting the RF drive level to the power amplifier or varying the power amplifier loading. With or without an oscilloscope, the final check must be the signal reports received from local stations.

Reception

As AM is in common use on the broadcast bands, this section must seem superfluous. However, if a communications receiver is in use, a few words on receiver adjustment may not be out of place. The bandwidth required for AM is in the order of 5kHz. Any less than this and the received speech will sound bassy and muffled. The equipment should therefore be adjusted for this bandwidth and the BFO switched off.

Should the receiver have been designed for SSB operation only, AM can be received by zero beating the BFO with the receiver carrier and switching to upper or lower sideband as convenient. This technique is also useful to minimise adjacent channel interference. FM only receivers cannot receive AM.

Which band?

From the foregoing it will be realised that the encouragement of AM is only appropriate to just one or two wavebands. The most obvious of these is 160 metres which, at present, carries little amateur traffic. This has always tended to be a home-brew band, for few commercial transmitters or transceivers encompass this waveband within their range.

It may be thought that aerials for 160 metres must be impossibly large, but in the past many amateurs just joined all the aerial feeders entering the shack and loaded against ground. Even with such aerial systems, the range available may well surprise many operators. In general, this should be quite comparable with that of modern 10 to 25 watt 2 metre FM transceivers without any of the problems caused by hills or other screening.

Range

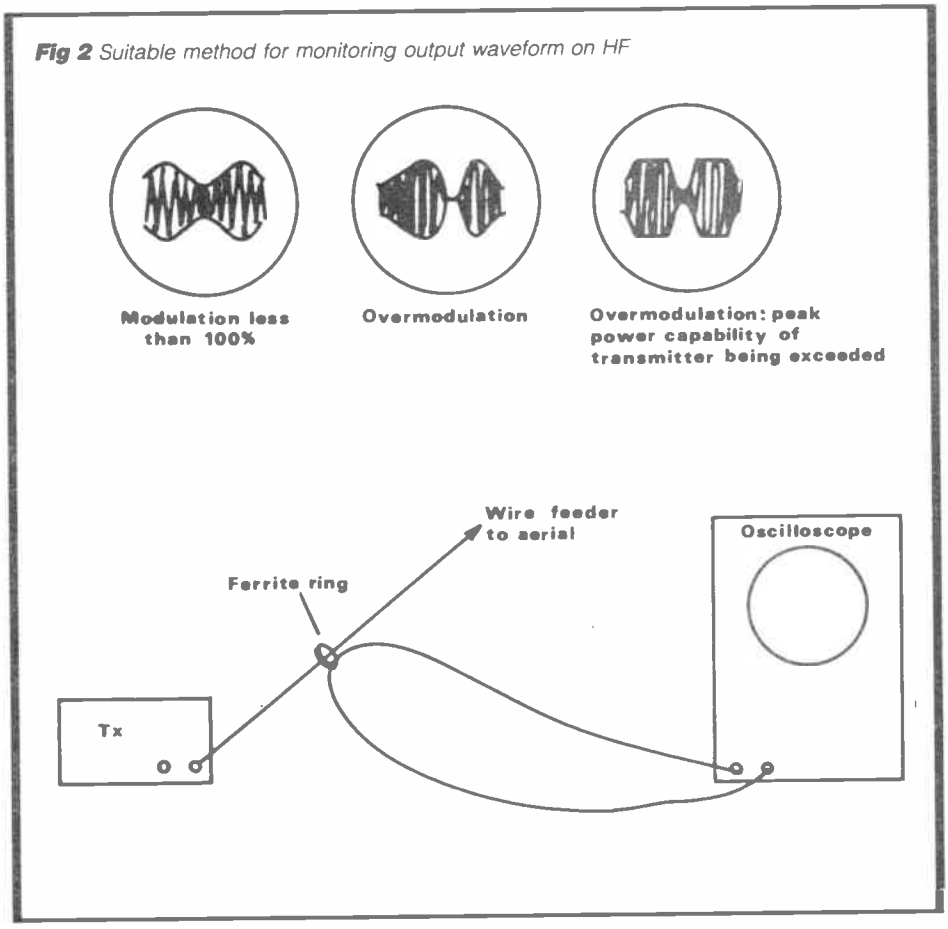
When conditions are good, even with modest aerials, considerable range is possible. In the early 1960s, the author worked every county in the United Kingdom plus a dozen or so European countries using only 100ft of aerial and without exceeding 7 watts input. Enthusiastic DXers with better aerial systems regularly work across the Atlantic and even to VK and ZL.

In mobile operation, using only an 8ft whip aerial, ranges of 10 to 25 miles were normally expected, again with no mobile flutter and few fade areas. It would therefore seem that Top Band would be an ideal band to encourage AM, for it permits the effective use of simple equipment which would make a suitable early project for newcomers to home construction.

Final thought

Having completed construction of a Top Band transmitter, you will then be in the position to volunteer to be the 'fox' in a D/F hunt, and thus have the opportunity to wreak vengeance on those who have made you suffer in the past!

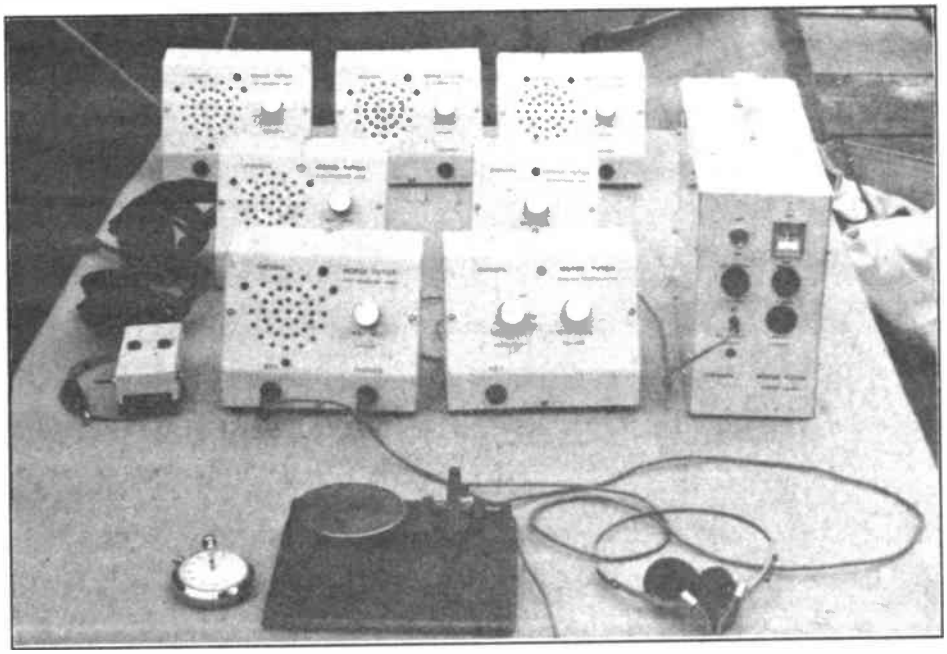
Fig 2 *Suitable method for monitoring output waveform on HF*



TEACHING MORSE

Roger Alban
GW3SPA

continues with the club Morse teaching idea with the construction of a Morse oscillator and a head end amp



A number of different designs of Morse practice oscillator have appeared from time to time. These designs range from a single transistor audio oscillator, to using a type 555 integrated circuit to produce an audio tone to feed either a loudspeaker or headphones.

My own practical experience of teaching Morse has shown that the students would prefer to be able to use their own headphones, irrespective of whether they are of the high or low impedance type. They also require to be able to adjust the sound level to meet their own personal requirements. The audio tone should preferably be sinusoidal, and the pitch should be adjustable to match the sound commonly experienced from the side tone oscillator of any HF rig.

Square wave problems

The 555 type of oscillator produces a nasty square wave, which sounds rough and has introduced unnecessary difficulties to a small number of students in the past. The single transistor oscillator approach is ideal if only one or two headphones are to be coupled to the oscillator. However, the resulting keying characteristics may sound unpleasant.

There are two main components which effect the keying characteristics: the envelope shape and frequency stability. The single keyed transistor audio oscillator is likely to sound 'chirpy' because it is being switched on and off into a varying impedance load which will effect the frequency stability.

A survey of the headphones used by students shows that the vast majority terminate the cable end of the headphone lead using a standard mono quarter inch jack plug. Therefore, it is intended to standardise with this type of plug and socket interface for headphones. However, to cater for the few who use either crocodile clips, banana plugs, 3 pole plugs, 3.5mm or 2.5mm sub miniature plugs, a general purpose converter box will be required.

Individual requirements

Each student will also require simultaneous connection of his or her straight key into the audio oscillator, if two-way Morse conversations are to be held. Again, a survey of the Morse keys used by students revealed that a general purpose plastic box containing a variety of different sockets would also be required for this.

The situation may arise where you have to use a room which does not contain any power points. It would therefore be sensible if the power supply also contained batteries which could be float charged. The capacity of the batteries should be such that they would be capable of outlasting any Morse teaching session. It was also decided that the supply should conform to a 13.8 volt dc supply and that the equipment should be designed to work at this voltage.

Block diagram

The block schematic diagram for the complete Morse tutor is shown in *Figure 1*. The master oscillator comprising a keyed audio oscillator, a buffer amplifier and six individual audio distribution amplifiers. The six head end amplifiers consist of three different designs of audio amplifier to feed either

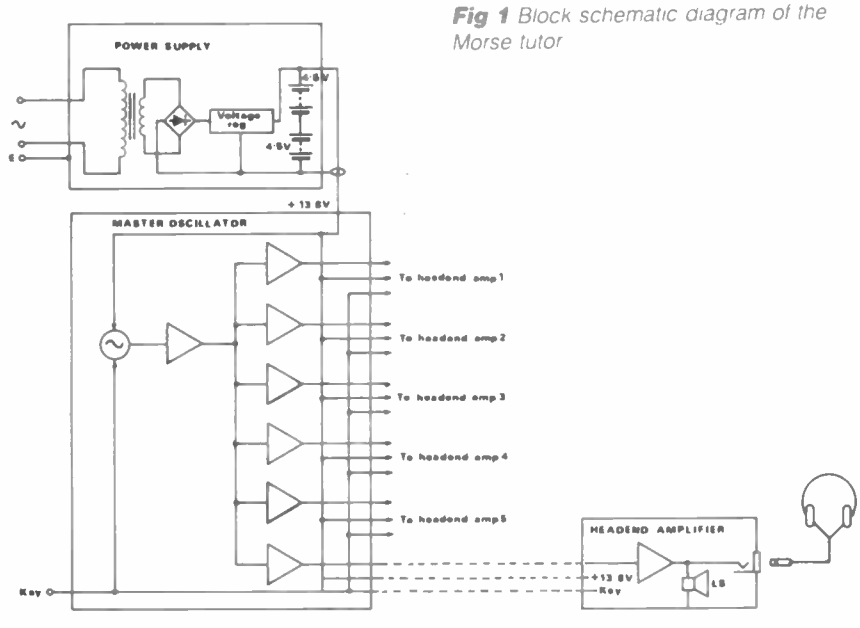


Fig 1 *Block schematic diagram of the Morse tutor*

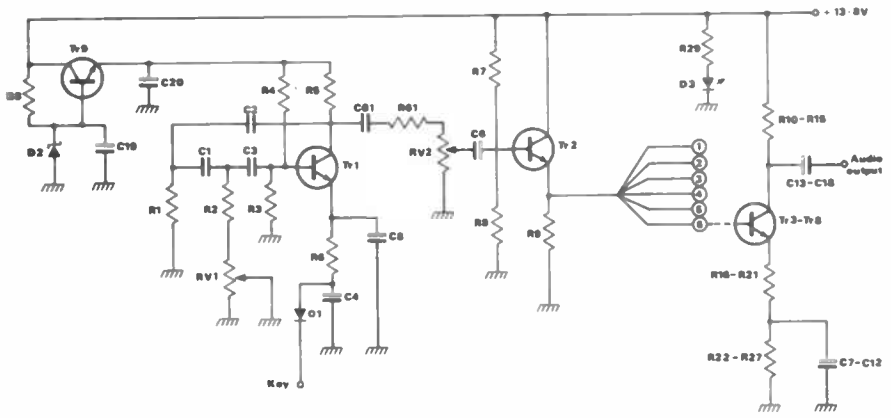


Fig 2 Full circuit diagram of master oscillator

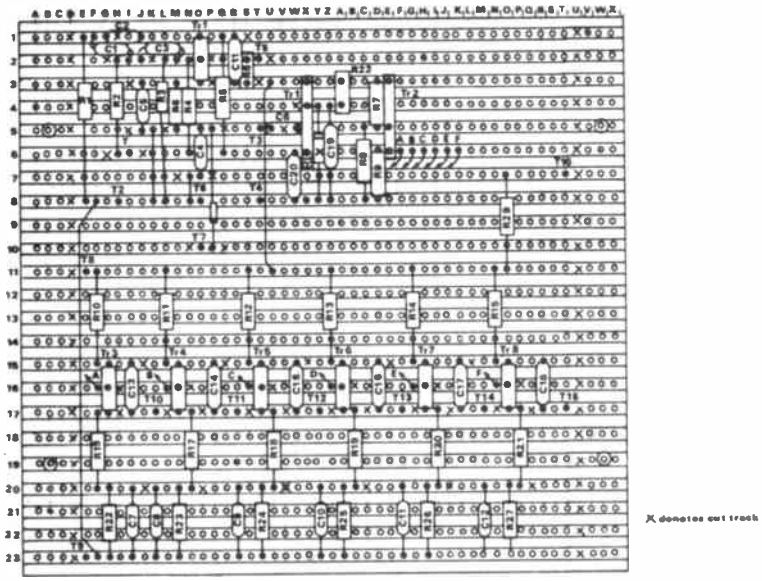
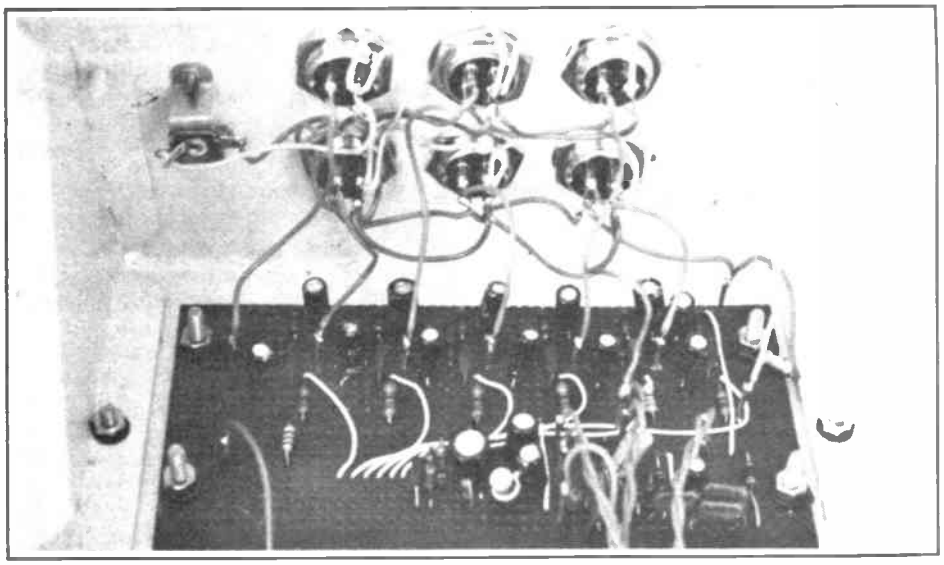


Fig 3 Component layout of master oscillator circuitry



MASTER OSCILLATOR COMPONENTS

R1, R3	4.7k ¼W	C1,C2, C3	0.022µF	Tr1, Tr2	ZTX108B
R2, R6, R28	1k ¼W	C4	3.3µF 25V	Tr3-Tr8	ZTX109B
R4	22k ¼W	C5, C7-C12	4.7µF 25V	Tr9	BC107
R5	3.9k ¼W	C6, C13-C18	1µF 25V	D1	IN270
R7, R16-R27	100k ¼W	C19	22µF 25V	D2	9.1V Zener
R29	2.2k ¼W	C20	10µF 25V	D3	Red LED
R61	47k ¼W	C61	0.01µF	VR1, VR2	10k log

small 8 ohm speakers or headphones. Four pin standard microphone plugs and sockets have been used to connect between the master oscillator and the various head end amplifiers, using four core individual screened cable. Down each cable the keyed audio, earth, key line and supply are fed to the head end amplifiers. The power supply contains the floating battery which is fed directly to the master oscillator through standard coaxial cable using miniature in-line battery connectors.

The Morse tutor

The heart of any Morse practice equipment is the audio oscillator, and it is important that the output from the oscillator is sinusoidal. If the oscillator is keyed directly, then the resulting envelope of the keyed audio should contain a fast rise and fall time, otherwise the resulting keyed audio will not be very pleasant to the human ear. The supply feeding the oscillator should be stabilised with a Zener diode to avoid any unwanted frequency drift as a result of the supply voltage varying. It is also wise to feed the audio oscillator into a buffer amplifier to improve the frequency stability when being keyed into a load. There are many different types of oscillator circuit available to choose from, ranging from the Wien bridge to the simple single transistor RC oscillator.

The circuit of the audio oscillator is shown in *Figure 2*. Transistor Tr1 forms part of an RC oscillator, whose 180 degree feedback path is derived by C2, R1, C1, R2, C3 and R3. Originally the circuit was designed to operate on a fixed frequency of approximately 680Hz, but by introducing VR1 and reducing the value of R2 from 4.7kohm to 1kohm, it was possible to vary the frequency of the oscillator from 560Hz to just over 1000Hz. I used a 10kohm log potentiometer for VR1, found in the junk box. However, the frequency control can be made to become linear if a 10kohm antilog potentiometer is used instead.

The oscillator is keyed by grounding the emitter of Tr1 via diode D1 and the key contacts. C4 and C5 provide sufficient audio decoupling to ensure the stability of the oscillator, irrespective of the length of key lead. Transistor Tr1 was taken from a scrap PCB and is a Ferranti transistor type ZTX108B, although a BC108B transistor can be substituted in its place. The supply feeding Tr1 is voltage stabilised by Tr9, a BC107.

The output of the audio oscillator is fed via the master volume control, VR2, to an emitter follower buffer amplifier stage comprising Tr2. Here again a BC108B can be substituted. The emitter of Tr2 is fed directly to a number of individual amplifiers, Tr3 to Tr8, which form a distribution amplifier. In my design six amplifiers were built, although if you should decide that you would like to increase on this number then there shouldn't be any problem as the base current of the amplifiers is very small and will have an insignificant effect on the

emitter current of Tr2. The ZTX109B transistors can be substituted by BC109B transistors.

This circuitry was constructed on Veroboard for simplicity, and the component layout is shown in *Figure 3*. The terminals connecting the wires to the various controls and sockets were constructed from small 10mm lengths of 28swg copper wire. The terminals allow the constructor to solder the various interconnecting wires after the Veroboard has been bolted into ths metal housing. Terminals T1 and T2 should be connected to VR1, the frequency control potentiometer, and terminals T6 and T7 should be connected to the Morse key, where T6 is the earth connection to the key and T7 the 'live' side of the key.

Terminals T3, T4 and T5 should be connected to VR2, the master volume control. Terminal T8 should be connected to the plus 13.8 volt supply socket, mounted on the back of the oscillator housing, while terminal T9, the Veroboard main earth, should be connected to the negative side of the supply socket and by an earthing tag to the metal case. Terminals T10 through to T15 should be connected to the 4 pin microphone sockets mounted on the back of the master oscillator case. Terminal T16 should be connected to the anode of the LED diode which has been mounted on the front panel. All the boxes used to form the Morse tutor have LED diodes mounted on the front panels to provide an indication of power.

Do it yourself cases

As suitable instrument cases were found to be expensive, the decision was taken to make the instrument cases from scrap aluminium purchased from a local sheet distributor. To make life easier, all the metal boxes were made the same size and shape, each box comprising two side plates (dimensions given in *Figure 4)*, a front panel and another sheet to form the floor and back plate.

Figure 5 gives details of the dimensions and hole sizes for the front panel of the master oscillator, but all the sides should be bent before any hole drilling takes place. This advice also applies to all the other pieces of aluminium used in this project. *Figure 6* gives details for dimensions and hole sizes for the bottom and back of the master oscillator box.

After the various panels had been marked out for cutting (I used an electric jig saw), the panels were bent to the correct shape using a large vice with angle irons to prevent the jaws of the vice from marking the aluminium. After the metal work had been completed, the aluminium was painted using an ordinary car aerosol paint. After the paint has been allowed to dry for about 24 hours, the front panel was signwritten using rub on transfers and sprayed with a protective coating manufactured by Letraset Ltd. If an antilog potentiometer is used for the frequency control, then the layout of the frequency scale will need to be altered.

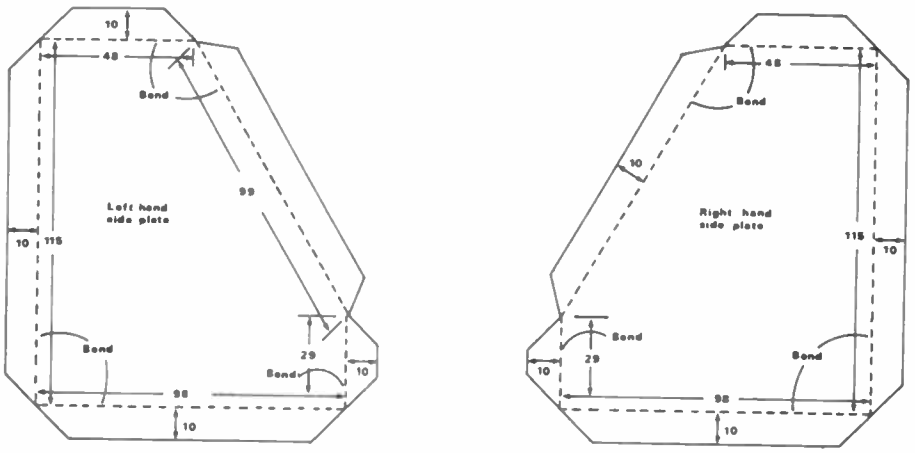


Fig 4 *Dimensions of the two side panels*

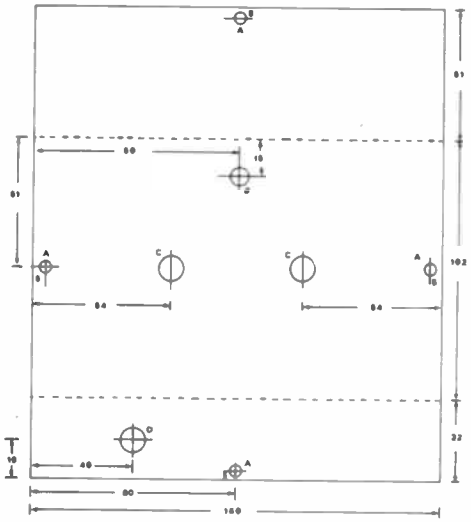


Fig 5 *Dimensions of the front panel of the master oscillator box*

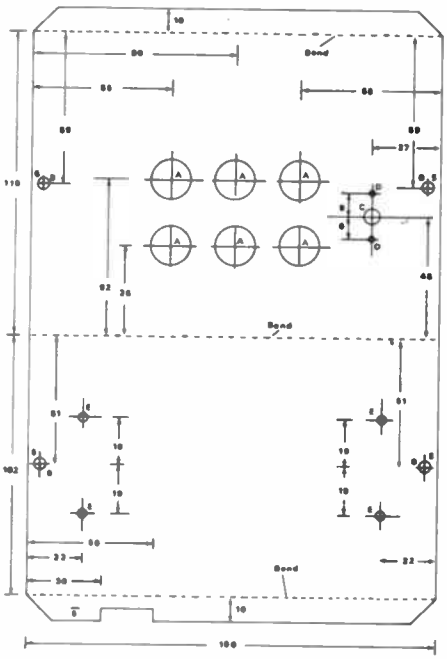


Fig 6 *Dimensions of the back and bottom panels of the master oscillator box*

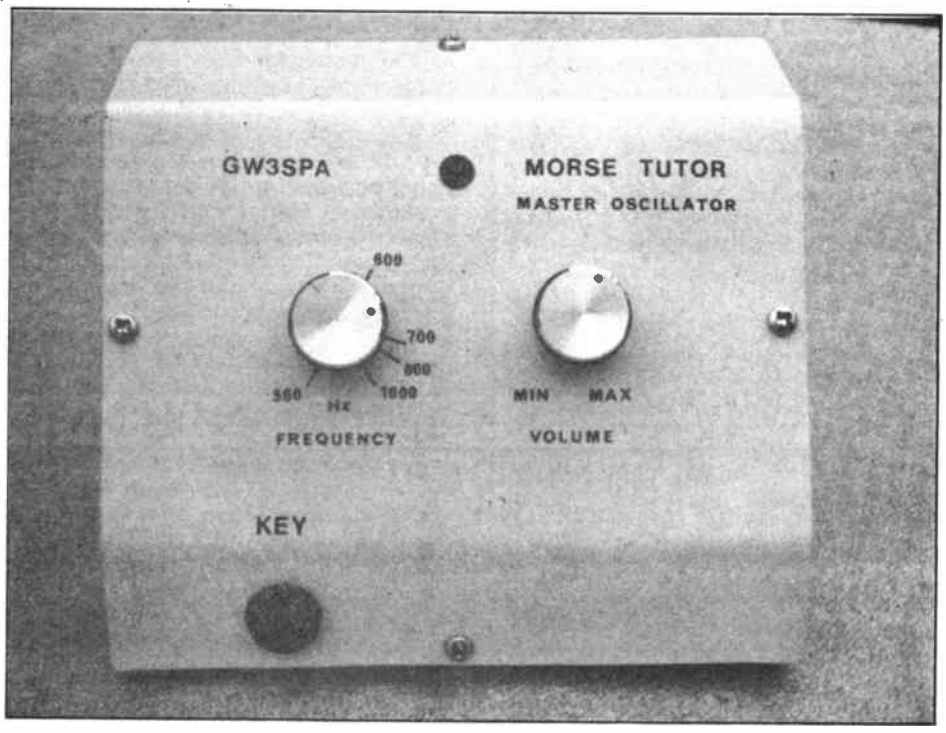


Fig 7 *Head end amplifier using 8 pin version of the LM380 IC*

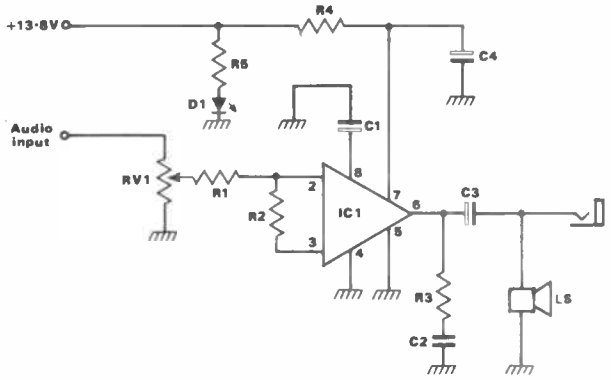


Fig 8 *Head end amplifier using 14 pin version of the LM380 IC*

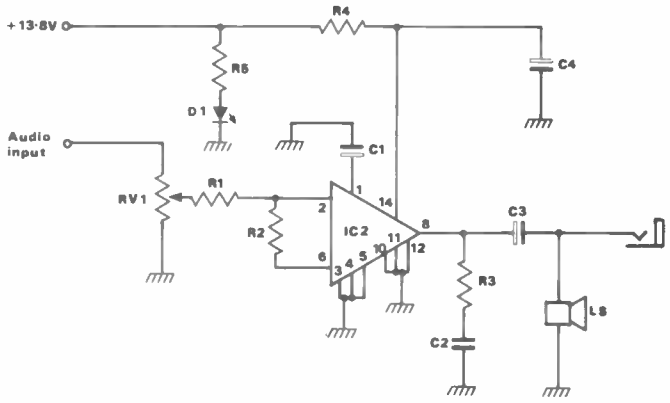


Fig 11 *Front panel dimensions for the head end amplifier*

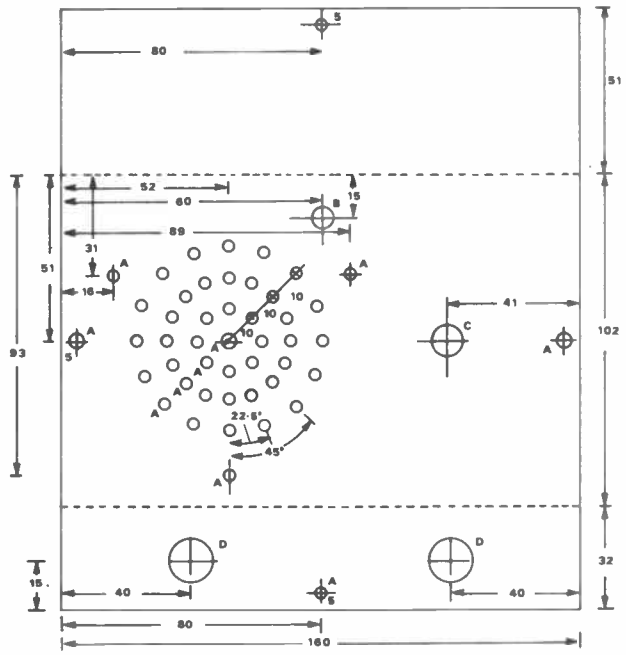


Fig 9 *Component layout for the 8 pin LM380 audio amplifier*

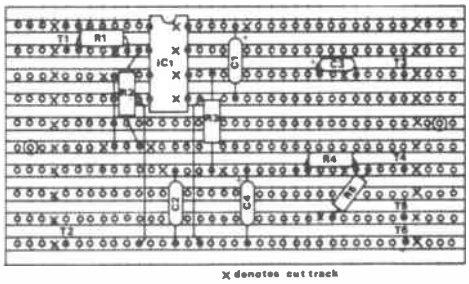


Fig 10 *Component layout for the 14 pin LM380 audio amplifier*

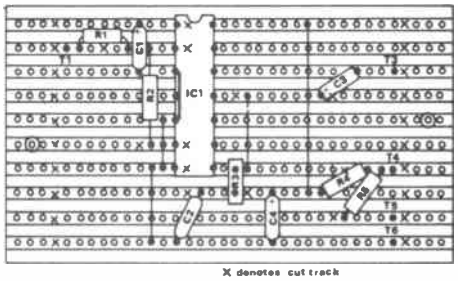
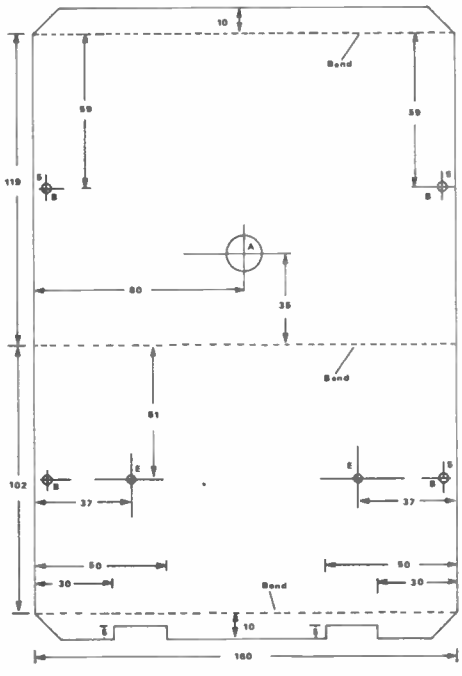


Fig 12 *Dimensions of the back and bottom panels for head end amp case*



Head end amplifier

To simplify the design of the audio power amplifiers to drive an internal 8 ohm loudspeaker or external headphones, the compact LM380 2 watt audio amplifier was selected to form the heart of the circuitry. The circuit diagram of the 8 pin version is shown in *Figure 7*, and the circuit diagram for the 14 pin version is shown in *Figure 8*. VR1 provides the student with an independent control of the volume. To avoid frequency instability of the amplifier, it was discovered that the value of R3 was critical; for the LM380 amplifier to operate satisfactorily R3 must be 2.7 ohms.

Again, to simplify the construction of the head end amplifiers, the components were mounted on Veroboard; *Figure 9* shows the component layout for the 8 pin version of the LM380, and *Figure 10* shows the component layout for the 14 pin version. All the LM380 ICs were mounted into holders to prevent any damage during construction.

The dimensions and hole sizes for the front panel of the head end amplifier are shown in *Figure 11*. The loudspeaker holes were drilled to fit a 65mm diameter loudspeaker. *Figure 12* gives the dimensions and hole sizes for the back and bottom panel; the side panels being fitted using self-tapping screws. The Veroboard was mounted on to the floor of the box using 3mm nuts and bolts, and raised from the floor using large nuts as spacers. When all the internal wiring had been completed the front panel was attached to the two side panels and the front panel signwritten, using rub-on transfers.

Next Month

Next month Roger Alban GW3SPA concludes his series with the construction of the headphone amp and the PSU to complete the practice set-up.

HEAD END AMP COMPONENTS

R1,R4	100k ¼W	C1	10μF
R2	10k ¼W	C2	0.1μF
R3	2.7Ω ¼W	C3	1000μF
R5	2.2k ¼W	C4	2200μF
IC1	LM380N-8	VR1	10k log
IC2	LM380N	D1	Red LED

QUARTZ CRYSTALS
SAME DAY SERVICE

Any frequency from 2MHz to 55MHz for just £9.50 (inc p+p & VAT). Orders received before 10 am are completed and posted THE SAME DAY! Just let us know; frequencies? holder sizes? circuit conditions? (i.e. series resonance or load capacitance). Cash with order or use our new credit-card hotline 0703 848961.

McKnight Crystals

McKnight Crystals
Dept Y
Amateur Radio Division
Hardley Industrial Estate, Hythe, Southampton SO4 6ZY
Telex: 47506 Fax: 0703 846532

SHORTWAVE LISTENER

SONY AN 1 – Active antenna, suitable for any Sony multiband radio ever made. Suitable other makes as well **£49.00**

We are a specialist company in shortwave and communication receivers.

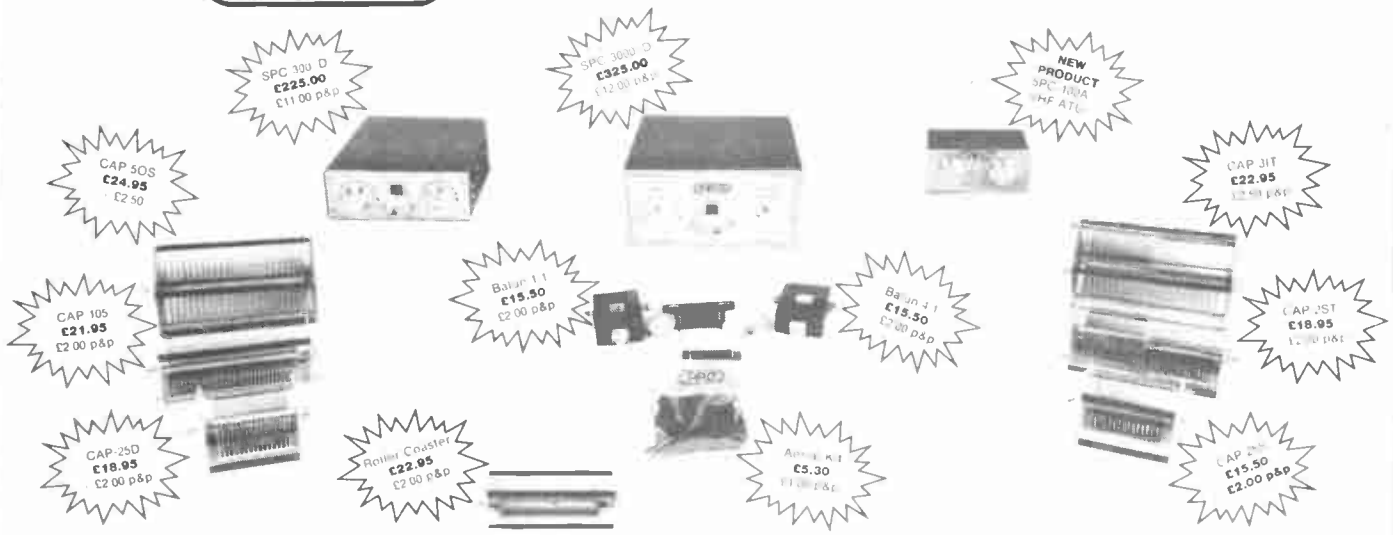
PANASONIC, GRUNDIG, SONY, PHILLIPS
Get tuned into the world with our 10 band radio for as little as..... **£39.95 + £1.50 p&p**

GOODMANS (Sangean)
Arriving shortly the fantastic new Phillips D2999 all band world radio..... **£299.00**

Fully illustrated catalogue of our range of radios VHF/UHF Scanners, air band radio £1.00 refundable against purchase. Full range of Sony accessories in stock.

JOHNSONS SHORTWAVE RADIO
43 Friar Street, Worcester.
Tel: 0905 25740
CONTRACTORS TO THE M.O.D.

CAP.CO ELECTRONICS LTD Tel. 0695 27948



By public and commercial demand and to compliment our existing range of proven HF ATU's, we are now producing 3 VHF ATU s which are —

SPC – 100A – Standard VHF ATU – 144-145MHz
SPC – 100B – Commercial high power – 80-170MHz
SPC – 100C – Very wideband ATU to match existing HF arrays on VHF – 144-145MHz

COME AND TAKE A LOOK AT NEC MARCH 1987

Stay tuned forever with a Capco ATU – once bought – never replaced

Stockists
South Midlands Comm (all branches), Amcomm/ARE, Ray Withers Comm, Reg Ward & Co, Arrow Electronics, Radio Shack Ltd and other local suppliers

MAKE-A-CAP 8Kv (2.5m spacing) and 12Kv (45mm spacing) Ready built, proven high quality capacitors, often copied, never equalled
Why compromise – buy the best, buy CAP.CO We can build to your own specification if required.

ROLLER COASTER 28 Micro Henries 1 to 30MHz

BALUNS Fully encapsulated for indoor or outdoor use

TURNS COUNTER 100 turns to take ¼" shaft

AERIAL KIT Unique G40GP clip-open wire feeder system with tee piece

For further details send SAE to: CAP·CO ELECTRONICS LTD
63 Hallcroft, Birch Green, Skelmersdale, Lancs WN8 6QB

News and comment from Glen Ross G8MWR

The good news

Oscar 10 is back at work and is now running full power again. The reset happened on 27th December and was the culmination of untold hours of work by members of the AMSAT organisation. It had been thought that the satellite was beyond hope of repair, and AMSAT themselves were saying they doubted if it could be put back into action again. The actual technical achievement of repairing a system you can't get at and that is flying around is a bit mind bending in itself; there is no way you can send a serviceman up to have a look at it.

Getting it right

The big problem area had been the batteries which supply all the power to the unit. It was thought that they might be unrecoverable due to the demands made by heavy usage, but this has proved to be not so. Due to the patch-up job, AMSAT have now got virtually no control over the orientation or configuration of the satellite, but at least it is working well with very good reports on signals coming through it. AMSAT's advice is to get on and enjoy it while you can because no one is prepared to hazard a guess as to how long the present condition can be maintained.

The burble machine

The UoSAT unit is still doing well and can be regularly heard on 145.825MHz producing its lovely burbly sound as it transmits the data. The signal from this one is so strong that it can be easily heard using a hand-held and a rubber duck. There is a proposal to tie this one in to the new Packet network, with a view to giving overseas coverage on this mode. It's a long way from the old crystal set days.

Mobile operating

There is without a doubt more mobile operating on two metres than any other band, probably due to the amount of repeaters that are available and also the fact that mobile aerials can be of a reasonable size and still give good efficiency. It is a way of life that we have experienced for many years, but it now seems that the long expected fly in the ointment is getting closer. The new edition of the Highway Code, which is expected to be available soon, contains new advice on the use of mobile radio and car telephone equipment.

Safety rules

The main points which will affect us are that you should not use a microphone or a telephone handset while the car is in motion, except in conditions of an emergency. That seems fair enough, but there is also a recommendation not to use a remote microphone, such as one fixed to the sunshield in your car, if this would remove the driver's attention from the road.

No surprise

The Department of Transport introduced this amendment only after discussion with all of the parties who they knew to be interested in the subject. This involved talking to some thirty organisations but not, by their own admission in the news broadcast of 1st February, the RSGB! Some thirty thousand members, probably up to 10,000 of them using mobile gear at some time, and the authorities did not even think it worth discussing the matter with our national society.

Bending the rules

Do not try to bend the new advice by saying that the Highway Code is not actual law. This is true, but remember that if you get involved in a charge of driving without due care and attention, the advice given by the code is taken into consideration; you are supposed to heed the advice given even if it does not carry the weight of law.

Paperchasing

Time once again to have an update on the certificate front, although the poor winter conditions have seen a certain decrease in the amount of claims received. There is nothing to equal a big lift in conditions to give the postman aching arms.

There are always exceptions to every rule and this time the one that has been bent is the one about not including contacts through satellites in your claim. Bill GM6RGN up in Shetland has submitted a claim for 144MHz Bronze, which contains nothing but contacts through the RS birds, and a special endorsement certificate has been issued to mark the achievement. However, we will still not accept mixed claims through repeaters, etc for the awards.

Linda G0AJJ from North Walsham goes for Bronze on 432MHz, with a best DX contact to OK1KEI at a distance of 1010km. Some other nice contacts listed are into LA and SM land. 144MHz Gold goes to John G4TGK from New Romney and G1UCY gets a 144MHz Bronze with a nice contact to OK1KFQ at 1072km included in his list.

There's more

G6LPS requested a 432MHz Silver award with a best DX to EA1BLA at 1066km. The award was obtained using 10 watts to a 17 ele 30 feet high, and a QTH which is only 250 feet above sea level. One thing that the 432MHz claims show is that you can work just as far on 70cm as you can on two metres.

Mike G6XRK from Harold Wood goes for a 144MHz Gold, the best DX being 9H1BT at 2000km. Mike mentions having a terrible take off to the east, and also reports working 18 YUs, YO, HG, OE, DL and OK amongst others. Patience and good conditions can certainly pay off.

From Poole comes a claim from Colin G6MXZ, who goes for 144MHz Silver and a 432MHz Bronze, and again backs up the similar range available on the bands. His best DX on 144 is 897km and on 423 the best is 862; a difference of around twenty miles. Back to the ladies and a claim from Joy GM1NTQ up in Glenrothes for a 144MHz Bronze, the best DX being to PE1FGG at 953km.

All the contacts were made using 25 watts and the aerial was a five ele Tonna mounted on her broomstick, which is stuck out of the bedroom window. I refuse to make comments about witchcraft and magic helping the contact score along!

Still they come

Dave G0CJL from Luton claims a 144MHz Gold award, with a best contact to SP3MFI. He mentions that he already has 27 awards, with another 11 only needing a few more contacts. That is an impressive collection by any standard.

From Culworth, near Oxford comes the family team of Julian and Heather; G1NOD and G6LOH. NOD goes for a 432MHz Silver, with a best DX at 1132km, and LOH gets 432MHz Silver with 815km to HB9MIN and a 1296 Bronze. The best DX on that band was with PE0MAR at 356km.

G1HYG lives at No Place in County Durham from where the call comes for a 144MHz Silver with SSB only endorsement. His best contact was with YU1MWP at a distance of 1879km. Finally, for this listing, is G1DPL from Crediton who goes for a 144MHz Silver, the best DX being to LA6HL at a distance of 1082km. Remem

ber, you do not need QSL cards for these awards; if you cheat you only cheat yourself. Full details of the awards are available by sending an SAE to the QTH shown at the end of the column.

Cumulatives

The interest shown in our recent series of constructional articles for simple 10GHz equipment was remarkable, with well over 100 sets of PCBs supplied to intending builders. Now that you have all got it built you will want an excuse to use it, and the most prolific activity takes place on the RSGB cumulative contest. This year they are scheduled for 12th April; 10th May; 21st June; 12th July; 9th August; and 13th September. The length of the contest has been extended and now runs a full 12 hours, from 0900 to 2100GMT.

For those of you who have not been out on these before, the idea is to score one point for each kilometre worked and then to take the best three days' operating scores and add them together to make your final total. This means that you do not have to go out on all the contests and so gives everyone a better chance of a good score. You can only use one site per day, but you are allowed to move a short distance, say from one side of a ridge to the other, so as to be able to clear local obstructions. If you do decide to go out you will need to be able to operate on 144.175MHz for calling and talkback purposes, an FT290 or something of the sort is more than enough to do the job.

Grounded satellite

A new proposal from the Leicester repeater group is to provide a beacon which will be for ATV use; a mode which is gaining a lot of followers on the band. The idea is that the beacon would provide signals which are to the same specification as the new Direct Broadcast Satellites (DBS), complete with intercarrier sound and all the fixings. The beacon is intended to operate in the 3cm band, which is adjacent to the DBS frequencies, and the picture provided will be a test card or possibly colour bars. It is hoped eventually to tie it in to the existing GB3GV video repeater so as to provide a high quality crossband repeater system.

Interested?

The group also says that if the new beacon generated enough interest it could be fitted with its own receiver, so making a complete 10GHz repeater. The ability to test out your new satellite TV system on a strong and reliable signal, before you go searching for the satellite, should encourage a lot more people to get involved in this new side of the hobby.

Another interest that the group has is to provide a 10GHz input to the existing 70cm repeater, so that microwave operators can adjust equipment by listening to the signal being relayed on 70cm; again a very useful provision and one that demonstrates very clearly that a repeater group can provide useful facilities beyond the usual talkboxes.

Odds and ends

Your response to the request to send in your ideas on a novice licence has brought a fantastic response. Those for and against are roughly equal, as might have been expected, and a lot of the arguments were predictable, but some of you have come up with some excellent ideas.

There is still time to get your views on the subject to me and I hope to give a breakdown of opinion and tell you some of the better ideas in next month's column. We should soon start to see a lift in the poor winter conditions, with a few contests to play with and the start of the main rally season. I shall be attending most of the rallies within reasonable driving distance of Coventry, and look forward to meeting as many of you as possible.

All your contributions and ideas should be sent to me at: 81 Ringwood Highway, Coventry CV2 2GT, or on Prestel using 203616941.

SECONDHAND EQUIPMENT GUIDE

by Hugh Allison G3XSE

ac/dc

No, I am not talking of unusual sexual practices but of 'live chassis' receivers. This type of receiver, also known as a 'universal' was quite popular up to and just after the war. The advantage, if it is an advantage, was that no mains transformer was required. You simply strung up your heaters plus a suitable resistor (the so-called 'mains dropper') in series like Christmas tree lights. That took care of your LT (low tension) problems, and HT (high tension) came via straight rectification of the mains. The hassle was that the negative,side was your chassis. Lethal. If you think about it the set would indeed run on ac or dc, provided it was of the correct voltage, and on dc if it was of the correct polarity.

Most of your early all valve 405 line TVs did the above (hence wooden or bakelite cases and plastic knobs), and quite a few of the four valve mains superhet radios of that era were the same. Fine, you may say, but what has this to do with secondhand amateur radio gear? Well maybe I was hung-over, or perhaps it was just a burst of sheer insanity, but for some now regretted reason I bought an Eddystone marine receiver S670, actually a model 659/670, at a rally. As the wife carried it off to the car for me (I spoil that woman) the ex-owner, his face wreathed in smiles, told me how pleased he was to see the back of it. 'I've had nothing but shocks from that', he moaned, 'especially since I changed the volume control'.

In the know

For those of you who do not know, the 670 is a seven valve plus selenium rectifier ac/dc receiver, operating from 1.2 to 30MHz with U series valves (100mA heater current) in a *metal* case. With one side of the mains connected to the chassis you would be right to expect some hefty insulation, and there is. Great care was taken by Eddystone over the original design, big chunks of Bakelite all over the place, making sure the owner continued to live.

To be fair, the receiver must have been a godsend to amateurs who lived in dc mains areas of the country. I was truly amazed to learn that dc mains was still the only form of electricity provided to some domestic premises in big chunks of Hull and several parts of North London, as late as 1956. I thought, in my ignorance, that such practices had disappeared before the war, so perhaps the situation of a large population of amateurs lumbered with no ac explains the popularity of the receiver, and one or two models like it.

The problem is that, over the years, people have forgotten all about the inherent dangers of ac/dc sets. You simply don't expect a chassis to be connected to the mains, and I must admit to sheer surprise when working on one on the bench and just casually clipping the scope probe earth onto a convenient 'earth' point. If you are lucky the only bang is the earth leakage circuit breaker (ELCB) tripping out. If you are unlucky, ie no ELCB, and some berk has wired up the live to chassis, there is a blinding flash, a massive bang and you have vapourised your earth clip. I know, I've done it!

In our debt

I often feel that the SSTV amateur population of the UK owe me a favour, as an aside. A reputable UK importer of amateur equipment had been offered an exclusive SSTV monitor and asked me to check it out. We are talking mid-1970s and long persistence tubes. For some inexplicable reason the HT was derived straight from the mains, so one side of the chassis *and the case* were 'live'. I was asked to check a sample over prior to bulk purchase. There is no prize for guessing why that equipment never appeared in the UK!

To return to the 670, as I said, masses of Bakelite all over the place. The trouble is that people just do not appreciate the vital significance of the insulating spacers. It's all too easy to take something to bits for, say, repair or modification, and when you put it back together you can either leave out a washer, or you disregard one since it was made of paxolin and has disintegrated in your hands.

In the particular case of the receiver I bought, the owner had replaced the volume control with one where the earth tag of the potentiometer was soldered to the metal case of the pot. The pot was bolted to the case and thus the case was live. Unsoldering the tag from its case made the thing much safer. I say safer since the receiver had no mains lead, so the previous owner had simply soldered the mains lead to the back of the mains plug on the rear of the receiver. The mains plug has two totally exposed pins that stick out of the rear of the receiver.

He had, of course, used so-called bell flex on the mains (totally un-colour coded) and, with a 50/50 chance of getting it wrong, had wired the chassis to the positive of the mains. It was amazing the guy was alive to sell it! Incidentally, I have heard of a few cases where chassis rust has bridged the insulation on the rear chassis runners. Worth a look if you've got an old one.

One final point about repairing ac/dc sets. I was repairing another 670 which had no local oscillator which worked for about a minute after switch on (I know it has to warm up. . .) and then it would stop. A'scope showed the local oscillator was dying (I was using an isolating transformer) and I suspected the valve. The trouble is that UCH42s are a bit thin on the ground these days, and I didn't want to go out and try to obtain one without checking it out first.

An older and wiser engineer asked to be left alone with it for a few minutes and soon had it going again. It cost me a pint to learn his secret. Apparently, the valve was indeed soft, as I had suspected. He had put a 75 ohm resistor across the heater of the valve, which cuts down the emission (this only works on series connected valves, obviously) thus reducing the effect of the air in it. Repairing ac/dc sets is a lost art! A real bodge!

Trio TR2400

This was a two metre FM hand-held rig, now seen more and more on the secondhand market. I've had a chat or two about them with readers at a few rallies. The 2400 was one of the first LCD readout, keyboard entry, synthesised hand-portables. Prior to the 2400 most rigs had been either printed knob readout (difficult to use) or LED display, which was a bit greedy on your limited battery capacity (remember the Palmasizer?).

The LCD was the answer; no current drain to speak of, and viewable in direct sunlight. You had repeater, reverse repeater and simplex, plus ten memories and lots of other bells and whistles. The receiver was good, quoted as a believable 0.4μV for 20dB quietening, and the Tx was a nominal 1.5 watts. There was no low power facility.

The 2400 is just a bit big by today's super-mini standards (71 × 192 × 47mm) and a bit heavy (about .75kg with batteries), but boy are they reliable. They change hands for real money, and you will probably have to shell out £115 to £125 for one secondhand, which seems a bit much compared with an AOR240 (£70'ish, fabulous receiver, and oh so light), or an IC2E at about a ton, but well worth it if it's what you want.

Pye Europas

These machines come in all flavours: high band, UHF etc, AM and FM, the most useful ones for amateur use normally being the ones that cover 2 metres or 70cm FM. They are quite sensitive, well below a microvolt receiver sensitivity, and a nominal five watts (ish) out on transmit. Price secondhand depends not only on condition, but whether it comes with mic, has got a fitted toneburst etc, and the number of channels in it. Fifteen to twenty-five sovs is probably about right for a straight-from-the-taxi example (ie not on the amateur band etc) and, say, forty-five quid tops for a brimful of crystals, all the goodies 70cm one (the two metre one a bit less, perhaps).

One point that is not well known about Europas, and that only occurs on some examples, is that the frequency (either, or both, that of transmit or receive) can vary as you put the boards down from their raised, servicing position. Your scribe learnt this the hard way with a taxi firm. The owner, who was badly sited in a hollow, could manage about a twelve mile radius using an all Europa set-up.

Taken short just before Christmas (his peak earning period) by a Europa which had manfully tried to stuff five watts up a shorted co-ax run (squashed flat by a boot lid), he asked me to repair it. I replaced the PA transistor and then gave it a general tweak, fool that I am. He was pleased to have had such a quick repair, but a bit upset at his now only five mile range on that particular set. Twice he returned it to me, and every time I checked it on the bench (boards flapped out) it worked a treat.

In desperation I decided to check it out fitted in the taxi. Both Tx and Rx were 5kHz off channel. Tweaking the crystal trimmers with the boards down and covers off solved the problem. The cure is not as easy as it sounds, by the way, since you have to go down the trimmer core with the boards closed, and this can cause a kHz or so error, so you will have to have a couple of attempts before you get it right. As I said above, a rare occurrence (perhaps 10% exhibit this tendency), but worth noting.

ECW FOR KITS, SCOPES AND AN EXTRA PAIR of HANDS!

Easy–to–build electronic kits

Complete with full instructions and applications information. Problem–solving, fault–finding service available.

* **K2622 – AM/FM radio pre–amp.** 20db signal gain, 10 to 150 MHz bandwidth. Gives greatly improved reception performance for VHF, FM or AM radio. **£12.13** per kit
* **K2554 – FM Tuner.** High performance tuner includes varicap tuning circuit, adjustable mute, AFC, AGC and outputs for tuning meter and digital frequency display. 12Vd.c. supply required. **£32.03** per kit
* **K2553 – Stereo Decoder.** Used with K2554 FM tuner, provides high quality stereo FM reception. Includes 19kHz filter. **£17.99** per kit
* **K1771 – Miniature FM Transmitter.** Ideal for local wireless transmission such as babyphones. Mic. and other inputs accepted. 100–105 MHz, 50mW output. **£9.20** per kit
* **K2637 – 2.5W Miniature Amp.** Complete unit with pre–power stages, 4 to 15Vd.c. supply. Measures just 42x32x27mm. **£9.95** per kit
* **K2623 – 3A Lab. Power Supply.** Fully stabilised and short–circuit protected PSU. 0 to 24V, switched output current. **£40.14** per kit

Oscilloscopes

A good quality, economically priced range of oscilloscopes from miniature portables up to 30MHz VDU 'scopes. The following are just three from the extensive Crotech range:

* **3031** – Compact 20MHz single trace, 9.5cm flat CRT, 2mV/division. Includes very useful component testing facility. **£238.05**
* **3132** – 20MHz dual trace 'scope. 2mV/division sensitivity. +/–12V, +5Vd.c. supplies and component tester. **£341.55**
* **3339** – 30MHz VDU 'scope dual trace, 5mV/div. 1V p–p composite video input displays up to 64 characters/line. Bright display, built in d.c. power supply and component tester. **£669.30**

Octopus

* An extra pair of hands. Work holder with four flexible arms – two with croc–clip holders, one with powerful magnetic holder and one with high quality magnifying glass. Universal desk–top fixing. **£10.29** basic kit **£13.17** super kit

Wire Cutters

* The popular Bib No9 – the professional quality wire stripper at a special discount price. (Extra discount for volume orders). **£1.50**

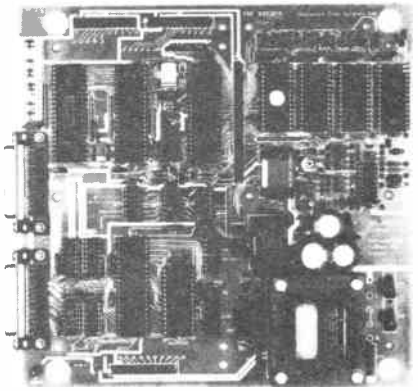
ECW Prices include VAT & Postage. For your order, please make cheques payable to **ELECTRONIC & COMPUTER WORKSHOP LTD**
171 Broomfield Road, Chelmsford, Essex CM1 1RY. Telephone (0245) 262149

The Archer Z80 SBC

The **SDS ARCHER** – The Z80 based single board computer chosen by professionals and OEM users.

★ Top quality board with 4 parallel and 2 serial ports, counter-timers, power-fail interrupt, watchdog timer, EPROM & battery backed RAM.
★ **OPTIONS:** on board power supply, smart case, ROMable BASIC, Debug Monitor, wide range of I/O & memory extension cards.

from £185 + VAT.

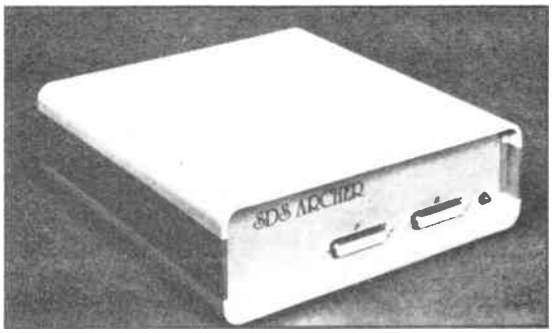


The Bowman 68000 SBC

The **SDS BOWMAN** – The 68000 based single board computer for advanced high speed applications.

★ Extended double Eurocard with 2 parallel & 2 serial ports, battery backed CMOS RAM, EPROM, 2 counter-timers, watchdog timer, powerfail interrupt, & an optional zero wait state half megabyte D-RAM.
★ Extended width versions with on board power supply and case.

from £295 + VAT.



Sherwood Data Systems Ltd

Sherwood House, The Avenue, Farnham Common, Slough SL2 3JX. Tel. 02814-5067

FREE CLASSIFIED ADS

FREE CLASSIFIED ADS CAN WORK FOR YOU

We are pleased to be able to offer you the opportunity to sell your unwanted equipment advertise your 'wants'.

Simply complete the order form at the end of these ads, feel free to use an extra sheet of paper if there is not enough space We will accept ads not on our order form.

Send to. ***Amateur Radio Classified Ads,***. Sovereign House. Brentwood. Essex. CM14 4SE.

DEADLINE AND CONDITIONS

Advertisements 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.

FOR SALE

■ FDK multi 725X, 144-148MHz, good condition, £160 ono. Reason for sale – HF mobile. Tel: 01-247 6097, daytime only please

■ VFO 30G designed for TR7200G, 144-146 continuous, including repeater shift, manual and connection cable, very good condition, £70. West. Tel: (0705) 371183

■ HRO-M receiver, excellent cond, re-valved, re-condensed, with PSU, nine coil packs, covers 50kHz to 30MHz, fine set for £125, offers. Scope, small light military type, very robust, ideal field service, vgc, £40. Scope tubes, DG7-5, 2½ inch, £18. 3AFP31, 2½ inch, £15. CV320, 1½ inch, £10. K E Franklin, 50 Abingdon Street, Burnham-on-Sea, Somerset. Tel: (0278) 784205

■ Uniden CR2021 receiver, 150kHz-30MHz, 76MHz-108MHz, FM, AM, SSB, narrow/wide filter, built-in ATU, keyboard entry, LCD readout, 14 memories, programmed scanning, mains power unit, manual, £120. Tel: (0782) 324206 after 6pm. Ask for Lew

■ New, boxed, complete and very cheap: Discone antenna, 100-500MHz, £20; 2m, 5 ele XY crossed yagi, £20; 70cms, 88 ele long yagi, 16dBd plus!, £25; 2m power splitter with cables, £20; all above boxed, new. Wanted: 4CX1000 or 4CX1500 or similar valve (I have a big x'former!). Please contact G0BPS. Tel: (0303) 76171 or QTHR

■ Yaesu FT707 HF transceiver, £350. Amtech 300 ATU, £30. KR400RC rotator, £60. Hansen SWR-3E, £10. Tel: Tisted 306 after 4pm

■ Scanner, Amstrad PCW. If you have either, then I've got some invaluable logging programs and interesting frequencies to listen in on. Also mods for Yaesu and Trio VHF, UHF hand-helds. Far too much to list here. For a full listing, please send a stamped addressed envelope to: PO Box 71, Bournemouth, Dorset BH9 1DT

■ TS520SE txcvr, immaculate condx, with hand-held mike, £350 ono. Prefer buyer collects. Trio TR2400 2mtr txcvr with charger, excellent condx, has leather case, £120 ono. Hallicrafters SX28 receiver, good condx, working, with handbook, weighs 75lb so buyer must collect, or could deliver within 50 miles, £45. Mr R M Dotchin G3WEP. Tel: Bedford 213985, after 5pm

■ Multi-cable, 12 strands 20G colour coded, PVC covered, 9/16in dia, screened, £4. Philips 3in speakers round, 80Ω, pair £2.50. Twenty 60mA 1¼in fuses, £1.50. 9 volt plastic enclosed battery box for 6-HP2, £2. Flexible shafts 10½in, 7½in M&F ends, ¼in, £2 each. Insulated base for tank whip No 10 Mk 2, ideal for vertical, £2. Circuit plus brochure on AVO all-wave oscillator valve 1946, £2. Alan G3MBL, 32 Heldhaw Road, Bury St Edmunds, Suffolk IP32 7ES. Tel: (0284) 60984

■ Sanyo VTC5150 beta video recorder, £100, vgc, good picture. Icom IC25E, 25 watt, two metre, transceiver scan mic, HM10, £150, no offers. 5 band stereo graphic equaliser, £25. Honda XBR500, year old, swap for TS940 Trio transceiver, cash difference either way, depending on cond. Wanted: Icom R7000 with AH7000 ant, cash paid. Mr Peter, 31c Anerley Park, Penge, London SE20 8NF

■ Sony ICF7600D, 2 hours use, AM/FM/SSB, complete with maintenance contract, £145. Super small UR43 relays, 12 volt up to 460MHz, £3.50 + postage. 50 ohm Dummy load, case 12 x 3in, £10. Barnes G3AOS, 14 Coalpit Lane, Langley, Macclesfield. Tel: (02605) 2287

■ Nato 2000, suitable for conversion to 10m, £110. Yaesu 7700 with memory, also ATU, £325, in box, also instruction manual. Aerial for Band I, 47-70MHz, four element, £15. Tel: (0283) 221870

■ Barlow Wadley XCR-30, Mark 2, 0-30MHz and FM receiver, £35. Also Sony ICF7600 FM/MW SSB receiver, boxed, hardly used, £35. Tel: 01-352 5379, evenings

■ TS940S (ATU), £1,550. TL922, £890. Tokyo HC2000, £260. Kenpro KP200, £110. Ex condition. M. Ohta G0CEO QTHR. Tel: 01-349 9556, after 8pm

■ IBM software packages for IBM XT, AT, JR, or IBM compatibles, both Desqview and Sidekick worktop packages, both new, still sealed, £10. Tel: (0784) 812289, after six

■ KDK2025 25W mobile FM 2m rig, good condition, £100 ono. Trio 7010 10W 2m SSB, CW rig, fitted side-tone, original packing, £90 ono. Standard 8800 mobile 10W 2m FM rig, £120 ono. DNT 10m FM rig, good condition, £45. Arthur Brooks. Tel: (0375) 678833, Essex

■ Zenith Royal 3000 Transoceanic portable radio, as new condition, complete with leather case, handbook and service manual, £110 ono. Tel: 01-393 9115, evenings. Epsom area

■ Trio TW4000A dual bander, 2m 70cms, as new in box, £325. BBC B computer with sideways ROM board, Wordwise view, Packet radio etc, all in Eprom, also d/drive, £300. Yaesu FTV707 transverter with 2 metre module, £130. Oscar dualband collinear, £25. Trio dualband mobile collinear with duplexer, £30. All as new. Tel: Irvine 217611

■ I am engaged (!!) so I must reluctantly sell the following: Yaesu FT480R, complete with PSU, desk mic, rotator, HB9CV, and co-ax. All for only £365. Hallicrafters SX140 ham band only Rx, £50. Buyers to collect. Tel: Mike G1HGD on (0926) 55158, evenings only

■ Marconi CR300/1 15kHz to 25MHz Rx, with power unit type 889, and comprehensive service, calibration and circuit manual. Rx working but needs servicing for best performance. Sensible offers to Max, every evening between 22.30 and 24.00hrs. Tel: Bedford 740318

■ Avanti POL II quad beam and skyking rotator. All complete and in gwo, £80. Postage free. Also Dragon 32 computer, boxed, leads, software etc, £70. Enquiries for more info welcome. Write to: W Matheson, 17 Keith Street, Stornoway, Isle of Lewis, Scotland PA87 2AA

■ 20 amp 19V dc unstabilised power supply, 6V, 12V-20V tappings, £20, phone after 6pm. Tel: (031) 668 3451

■ Eddystone Rx, model 670A, nice cond, £80 ono. Wanted: Kenwood SM220 monitor scope, also Pan display unit, BS8, must be in mint cond. Also Eddystone 940 Rx. 12 Norn Hill, Basingstoke, Hants RG21 2HD. Tel: Basingstoke 468649

■ Scanner: AR2001, 25MHz, 550MHz, as new, £150, no offers. Mr B Sheridan. Tel: Broadway 858878

■ Admiralty B41 receiver, 15kHz to 700kHz, £35. Also B40 receiver, 0.64-30MHz, £35, or £60 the pair. Wanted: HF tcvr, also IC2E, also I wish to buy old musical boxes or polyphons or phonographs. 200 Haslingden Old Road, Rawtenstall, Lancs BB4 8RS. Tel: (0706) 224617

■ Dragon 32 computer, with joysticks and various games and Dragon books, £40. Tel: (0544) 318743

■ Yaesu FT200 tcvr, mint condition, little used, in original boxes, handbook, key, SWR bridge, £200. Kenpro KR400RC rotator, unused. G4MH mini beam, brand new. John Harris G3XIN. Tel: 01-423 6119

■ Trio 2m and 70cm dual band mobile TW4000A, 9 months old, never mobile, lack of interest reason for sale, £325. Trio 2m TM201A slim mobile, £195. P/ex video or satellite dish. Russ Pyne, 79 Highcroft Avenue, Oadby, Leicester. Tel: (0533) 715160, if out (0860) 520589

■ Spectrum 128K comp and access, £110 ovno. Or exchange for FRG7 or sim, WHY? Write encl details to: Ross, 9 Brandy-Wells, Kingsnympton, Umberleigh, Devon EX37 9SP

■ Unused Microwave Modules MML144/100S, £103. MML28/100S, £88. Post paid. Offers, 100 metres UR67 new, 200 metres UR57 new. G3FPD QTHR. Tel: (0403) 723205

■ Yaesu FT290R, NiCads, charger, case, manual, 50 watt linear, 5/8λ mobile ant, 2mtr collinear ant. The lot, £320. Tel: (0256) 882486

■ Radio valves, 44 various ex-WD, ex-US, 1930s and 1940s. Phone for list. Tel: Slinfold 790114

■ CBM 64, cassette, basic manual, program reference manual, 2 joysticks, approx 30 games all in vgc. Wanted: FT480R, FT707, FC707, FT290R, Ham Jumbo or WHY. Ring for haggle. Tel: Stalham 82075

■ Icom IC22A, 1 and 10W 2m FM, xtalled R1-R7, S0, S20-24. Original box and fittings, good condition, £125. Dave G3XZK QTHR. Tel: High Wycombe 718213

■ Casio 'PB80 pocket computer, programs in basic, with Morse Tutor program, £15. Newbrain AD computer, slight fault, with manuals and user group newsletters, £15. Small (5in) green screen monitor, made by Burroughs, neat unit, requires 12V 0.5A, £20. Morse Tutor program for Amstrad or IBM PC, with 40 test texts, £8. J Moss G4ILO QTHR. Tel: Colchester 210878

■ Pye PF2 FM hand-held, crystals S20, S22, R5, mint condition with new battery and neat homebrew drop-in charger, 0.75W output, 1mA standby current consumption, fitted 3SK88 pre-amp, £60. Morse Tutor for Amstrad/IBM PC compatibles, train for amateur A licence and beyond, will teach punctuation, 40 test texts, make up your own. A superb program, £8 for disc and manual. J Moss G4ILO QTHR. Tel: Colchester 210878

■ Philips recording system, one desk transcribe console, LFH0086/15, c/w earset foot control, 240 mains, 2 pocket memos 0085/15, c/w cassettes, value £140. Exchange for working UHF hand-held multi channel, or ditto 2 mtrs. Eyles, 41 Bredon Grove, Poolbrook, Malvern, Worcs WR14 3TS. Tel: Malvern 62385

■ HW101, HP23A mike manuals, checked by Heath, perfect, £170. Tel: (021) 706 8752

■ Commtel PS1310S PSU, 240V ac variable, 4-12A dc, 8-15V dc protected, vgc, £60 ono. MM 2m linear 144/100W, 10W in, 13.5V dc, no pre-amp, £75 ono. Ham Broadband linear LA120, 13.5V dc, .05-30MHz switched power, low, med, high, 4W in 200W SSB, 100W FM, switched pre-amp (wants taming), vgc, £80 ono. R B Lever, 4 Hambleton View, Wigginton, York YO3 8PN. Tel: (0904) 768545, York. G8QS

■ Brother M1109 NLQ dot matrix printer, boxed as new, bought 1986, it has both RS232 and Centronics interfaces, £200 ono. Tandy model 102, as new with manual, £200 ono. Tel: 01-471 0669 after 5pm, ask for Danny

■ FT980, all filters, Curtis keyer, mint, unmarked, £900. G3AGT QTHR. Tel: (0823) 76349

■ Sony ICF2001D, PLL synthesized, portable, AM, FM, USB, LSB/CW, air, wide, narrow, sync functions, world communications receiver. The world's best portable Rx. Brand new with years guarantee, thus mint A1 condition, complete with Datong active antenna complete with pre-amp (indoor), hear Australia now! All boxed, half price, £199. Could post registered delivery (insured). Please phone evening, weekends, be quick! Tel: Graham on Bracknell 53670 (Berkshire)

■ Dragon 32 computer plus many programs, PNP Communications RTTY/CW interface (Rx only Tx possible), Sanyo data recorder, 24 bit printer and Murphy portable B&W TV, plus free small unit. All items in new condition with manuals etc. Cost £340, sell £150. Steve G4WBT, 97 Redland Drive, Kingsthorpe, Northampton NN2 8UG

■ SPC300 antenna tuning unit, handling capability 1kW, covers all the HF bands, £130 post paid. Leson DT251 base station mic, with signal modulation meter fitted, £18 ono, post paid. Micronta SWR, power, modulation 3 separate meters in one unit, covers 3-30MHz, 0-500 watts, still new and boxed, £20 post paid. BNC sockets, panel fixing, 15p each. Limmpett mag mount, fitted with Lazer magnets, 5mm low loss co-ax, £25. Tel: (0704) 892088

FREE CLASSIFIED ADS

■ For Yaesu FT101, matched pair of NEC GJS6Cs, £15. 1986 *International Listing Callbook* , £9, postage extra. Heath 0-12-U 3in lab scope with manual, £15. Airbrush type S2 retouching paint sprayer with compressor, £120, buyer collects as housebound. No phone. Jess G4GOF. JH Luxton, Bergnein, Battery Hill, Fairlight Cove, Hastings, East Sussex TN35 4AP

■ Cybernet Delta One 934 transceiver, pre-amp, Halbar 17 element beam, collinear. All in vgc. Consider exchange for HF, 70cms, or six metre transceiver. KW E-zee match tuning unit, £45. Tel: Woodstock 812278

■ Trio TS530SP, immaculate condition, still in box, emigration forces sale. First reasonable offer secures sale, not used very often, buyer collects, last piece of equipment to go. Tel: Tony (051) 260 9296

■ Commodore 64 computer, 1541 – disc drive, data recorder, PSU, handbooks leads and some disc based games. Also joystick unit. All in brand new cond, £175 ovno. Can deliver within 20 mile radius of Wolverhampton. Tel: (05435) 77360. Phil G4OHK QTHR

■ Nato 2000 AM/FM and Uniace 300 FM base. Will swap for a good 0-30MHz receiver. Also Midland 76-900 FM base and Sirtel 2003 VOX Mike. Offers or swaps. Tel: (0205) 820 111 after 7.00pm

■ Yaesu FT101ZD MKIII HF trans (new PAs), SP901 extension speaker, Sommerkamp FC902 ATU, all vgc, with boxes plus many other extras, £675 ono or swap FT101ZD for Yaesu FRG9600 scanner or AR2002. May swap for good mobile HF transmitter. Tel: Mark G4UWA Burton-on-Trent (0283) 45653

■ PBM14 2m yagi, MBM48 70cm beam, £20 each. Both unused. Also Kenwood SW100B SWR/PWR meter, 140-450MHz, £20 or swap WHY? Paul GM0DQR QTHR. Tel: (041 637) 0808 after 6pm

■ FT102 AM/FM, board fitted, FC102, ex condx, £650. Black Star freq counter, 600MHz, £80. Pocket Phone 70, xtalled RB2, RB4, SU8, spare NiCad and charger, £45. EC10 Rx Mk2, £45. Codar AT5 Tx 160/80m, c/w 12V PSU and changeover switch, £30. Spectrum 48K c/w PSU, £30. Steve G0BBZ QTHR. Tel: (0705) 472708

■ Jaybeam ZX 8 element yagis, boxed and complete with phasing harness, unused, £30. Also wanted QQVO6-40 valve for 2m linear, and any plans or circuit diagrams, for linear. Paul Moss G1UUX. Tel: Evesham 831104 after 5pm

■ Icom 271E 2 metre base station multimode, muTex front end and built-in power supply, in mint condition, cost £979 as new, £580 ono. Tel: 01-859 1688, Peter G1UWS

■ DX300 synthesized communications receiver in box, excellent condition, £105. Eddystone short wave receiver, EB31, £65. Tel: (051) 525 4528

■ Icom IC271E 25 watt multimode base station, muTek front end, 32 memories, immaculate, £700. NAG 2 mtr linear, 250 watt output, £250. Microwave Modules 70cm linear, 100 watt, £150. Tonna 70cms 19 element crossed, brand new, never assembled, £30. Ex equipment switched mode PSU, 13.8 volts, 20 amps, £40. G8WPD, Doug, QTHR. Tel: (0298) 79481

■ FT2700 dual bander, 8 months old, mint cond, £360.00. FT290R with mobile mount, soft case, new set of NiCads, £225.00. 19ele X-Y 70cm ant, new, £28.00. Howes HC280 80mtr transverter, assembled but not cased, £30.00. Mr LJ Stubbs G4DBX, The Cottage, Bradfield Green, Nr Crewe, Cheshire CW1 4RA. Tel: (0270) 71369

■ Stalker ST9FDX, suit mod to ten metres? Perfect conition, gives approx 16W out, 360 ch, AM/FM/SSB, Hi/Lo bands, plus legal 40 ch. Genuine reason for sale. £60, no offers cause I need the money (Student – you must understand now!). Tel: Swaffham 24274

■ Sony ICF2001 FM/AM/SSB receiver, keyboard entry, scanning, 6 memories, complete with manual, boxed and ac power adaptor, £85. John G6BGY. Tel: Clevedon (0272) 871039

■ Radio mags. Interested? Then read on. 100 UK assorted, incl *SWM*, *AR*, *HRT*, *PW* and *Rad-Com*. Also around 20 USA radio mags, also some callbooks. Please contact: G1WMJ. M Hudson, 71 Knight Avenue, Canterbury, Kent CT2 8PY. For a list please enclose an SAE

■ Scanner SX200, covers 27MHz CB, 28MHz, 2 metres, 70cm, airband and much more, excellent condition, use mobile or at home. Power supply, mobile adaptor, telescopic antenna all included. AM/FM, many other facilities, current new price £325, have this one for £180. Tel: Nottingham (0602) 606429

■ TET two element tri-band, HF, £120. Also MET 14 element two metre, £25, and 18 ele para beam for 70cm, £15. Tel: (0952) 57670

■ FRG7700 with 2m transverter, mint condition, try before you buy, £280 ono. Tel: Riverside 2495, after 6.30pm (Berks)

■ Wideband solid-state linear, 3-30MHz, 200W PEP, not used, mint condition, £75. Also Ham International Concorde Mark II and multimode Mark II, both ideal for 10m conversions using EPROM or own methods. Both working condition and in good condition, £60 each. Phone in evening only please. Letters answered without exception. Mr Drury G0FXQ, Corner Barn, Hockerton Road, Upton, Newark, Notts NG23 5TG. Tel: (0636) 814541

■ AMT2 RTTY, AMTOR, ASCII, CW, state of the art TV, with software on EPROM for CBM64, as new, £175 ono. Phone evenings/weekends. Tel: 01-764 6767

ADVERTISERS PLEASE NOTE

Please ensure that your telephone number (if applicable) and address are included in the appropriate section of your ad.

If you do not wish to have your address published, please include it but state 'not for publication'.

Any ads submitted without an address and/or telephone number will not be printed. This condition has become necessary because a small number of ads have been submitted by bogus readers, causing considerable inconvenience to the holders of the telephone numbers quoted.

■ 934MHz Cybernet Delta one, £250. PA7-E base collinear with co-ax, offers. HRA-900 masthead pre-amp, £95. Spectrum Plus computer, £45. Datacorder, £15. Games, 9 for £5. CB 27/81 base station (Harvard), £50. Antenna, £7. SWR meter, £3. Hallicrafters Sky Challenger, circa 1939, working, with extension speaker and external signal meter (not working), (120 volts) £100. Realistic DX302 comms rcvr, 0.01-30MHz, £175. Tel: 01-671 3545. 10 Doverfield Road, Brixton, London SW2 5NB

■ TH21E, TH41E trncrs, BT2, DC21, EB2, HMC1, PB21, PB21H, BC6, SC8, SMC30. AD1, etc access. Over £700 worth for sale, £400 ovno. Tel: G6ZNU (day) 01-242 1234 ext 2891, (eve) 01-886 3548

■ FT902DM line-up transceiver. YO901 multi-scope. FTV901R transverter fitted with 2 metre plus 70cm. FC902 antenna tuner. SP901 speaker. 1kW dummy load. £800 or very near offer. All in as new condition. Buyer comes tries and takes away. Mr C A Compton, 6 Common Road, Wrangle, Nr Boston, Lincs PE22 9BY. Tel: 870227 or 870915

■ Zetagi TM1000 SWR, £40, as new. Pioneer KEM4030 radio cassette, cost £170, swap for home base CB with SSB or small gen/cov Rx, Sony ICF2001 or 2001D with cash. Tel: Buxton (0298) 71834, Derbyshire, 5pm-8pm

■ Trio TS530S HF rig with narrow SSB and CW filters, matching ATU and matching speaker, £400 the lot. Also 200W dummy load and Trio low – pass filter and Adonis desk mike included in this deal. Mr R G Anderson, 36 Sycamore close, Canvey Island, Essex SS8 9JQ. Tel: Canvey Island 697906

■ Redifon QRO linear amp transmitter, own driver and exciter,1.5 through to 30MHz, variable power output, perfect working order, can be seen working only require 240V, complete with manuals and circuit diagrams, can deliver, will accept £600 or swop for HF gear, 2 metre m/mode or car or WHY? Tel: (0248) 355635 evenings

■ Trio R2000 as new and seldom used. Still under guarantee. Includes Global 1000 ATU. This is also brand new. £425 the two items. Tel: (0843) 45561

■ Tokyo Hypower 2 metre linear, 80W out, up to 10W in, as new, £75 ono. Datong SRB2 Wood Pecker blanker unit, £60 ono. Kenpro KR500 elevation rotator with control unit, as new, £90. EME (German) 1325, 25W, 13cms PA with 7289 valve (as new), £220 ono. 1500V PSU card, EHT toroidal and heater toroidal for same, £70 ono. Tel: Paul (0293) 515201

■ Air Ministry headgear, WW2 operation room type (same as old GPO telephonist type). VHF Rx, type R220, civil defence Rx. 14 B7G valves + B7G xtal, 10.890MHz. Receivers on fixed freq 70.2MHz. GPO telex/Creed printer, relay tester type 299, also tuning fork stroboscopes 125Hz/150Hz. Naffi Rx, medium wave, circa 1945, brand new 6K7/6K8/6Q7/6V6, runs on 6V (can be easily mains modified as PSU on separate chassis), all in wooden case. 250V wooden cased tester by Record (similar to Meggar), circa 1949, with leather case. WW2 (1942) Fullerphone. Headphone/microphone for WS31. CV valve lists. Headgear No10 for WS19, WS62, WSC12, etc. Grundig capacitive microphone, suits TK5 and others. Manual, AR88D (photocopy). Tony Howard. Tel: (0908) 73114

■ MMT432/28 transverter, 70cm 4CX250B amplifier, c/w built-in PSU. Serial 8056 printer for Spectrum + 128. Exchange FT780, FT790 or FT680, FT690, WHY? Tel: Martyn (03635) 471 (Devon)

■ AOR2002/2001, MX5000, MX7000, range of scanners in one large 63 page service manual with 7 A3 circuit pages with fault cure passes. Ring for copy, £20 plus 64p postage. Also other Tanoy, PRO30, PRO31, PRO32, PRO2021 Op's manual, also for PRO2004 and FRG9600. Tel: (04738) 5526

■ Icom 720A general coverage transceiver, all band with matching PS15 power supply and ICSM5 desk mic. Boxed, good condition, £650.Trio TR7730 2m FM mobile transceiver, £150. SEM Transmatch ATU, £25. Hi mound HK707 Morse key, £7. Tony G0CDH. Tel: Bristol (0272) 694757

■ Icom IC720A gen coverage HF transceiver, £675. Trio PS430S 15 amp PSU, 3 months old, £130. New Icom SM8 desk mike, £65. CapCo SPC300 1kW ATU, with Daiwa CN620A 1kW SWR meter, £188. GW1P 160 thru 10 mobile ant, £65. G0ABY, Phil Lawson, 5 Brompton Grove, Hartburn, Stockton on Tees, Cleveland TS18 5HF. Tel: (0642) 580536

WANTED

■ Yaesu XF82HSN 1.8KHz narrow SSB filter, exchange brand new Yaesu MD1B8 scanning desk microphone for MH1B8 scanning hand-held mike plus £50 ono. No phone. Jess G4GOF. JH Luxton, Bergheim, Battery Hill, Fairlight Cove, Hastings, East Sussex TN35 4AP

■ Early wireless and crystal sets wanted, particularly WWI sets or parts, early valves, horn speakers, bound volumes *Wireless World*, catalogues, pre-war television. Urgently need good HF transceiver or comm Rx. Also interested in tinplate toy trains, any condition or parts. Good cash offered. Jim Taylor G4ERU, 5 Luther Road, Winton, Bournemouth. Tel: (0202) 510400

■ Spares for AR88D receiver, also AR88D speaker and headphones and PSU for HRO receiver. J Edwards, Beeches Coach House, Burton Hill, Malmesbury, Wilts SN16 0EE

■ I require an IC2E 2 metre 144-148 hand-held in good condition, with speaker mike and in working order. I will exchange a Pye Westminster mobile W15 AM set, complete with leads and mic plus speaker. Also one Pye Bantam 3 chan port with mic and batt. All sets ex cond. Also a Harvard 40ch WT44 FM hand-held Tx/Rx Tel: 01-968 5427 West London, ask for Martin after 6pm, leave message and Tel no

■ Car radio, positive earth only, from 1959 to 1965. Must be in good condition and in working order. Good price paid. Also wanted car cassette player

FREE CLASSIFIED ADS

(not eight track) positive earth only. Mr Morrison (Les), 70 Claverhouse Drive, Edinburgh. Tel: (031) 664 0184

■ Codar 250/S ac/PU. Old Heath RA1/RG1 Rxs, any condition, for experimental projects. Radio tuners Armstrong AM44, Pye HFT111W, Eddystone 820 and Chapman S6BS. Details and price to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA

■ Look! Does that Sony reel to reel video recorder under your bench have a good head? If it's on a dead AV3420 or AV3620, then quote your price. Also require small Akai video monitor to suit Akai VT110 portable video recorder. Also want CCTU 'C' mount lens of any type. Write Nev Kirk, 54 Allendale Rd, Rotherham S65 3BY. Tel: R'ham 541606 anytime

■ Yaseu FT707 or similar with 11 metre band, nothing too expensive as resources are limited. Can view and collect in Norfolk or Suffolk. Tel: Tony (0603) 53205

■ Help! Does anyone have a circuit diagram for the Rama model 250FC. If you do I would be very grateful if you could send me a copy of it. Mr B Jenks, 10 Stoke Close, Eastham, Wirral, Merseyside L62 4DX

■ Eddystone S770R receiver, full coverage, any good make, even older models with valves. Also Yaesu FT209RH hand-held, 5 watts, good condition please. Tel: 01-272 9275, John

■ SEM Visa 3.5MHz receiver. SEM transmatch/ Ezitune with dummy Load if possible. Barnes G3AOS, 14 Coalpit Lane, Langley, Macclesfield. Tel: (02605) 2287

■ Any equipment for TV DX band one and three. Tel: (0283) 221870

■ HRO junior, HRO-M, HRO-MX, HRO-5, HRO-W HRO-5T, HRO-5RA, HRO-7T, HRO-50, HRO-60, NC-1, NC-303. HRO speakers, coil holders, PSUs, table or rack versions. Also, other National company Malden receiver, transmitters and equipment, original catalogues, manuals, literature. German and Japanese HRO copies. Tel: St Albans 39333

■ Yaesu FT726, must be mint. Tel: Irvine 217611

■ SWR/Power meter, 432MHz, 70cms band. Also AM/FM CB radio (postage paid). Mr PD Beech, 66 Newpool Road, Knypersley, Staffs ST8 6NS. Tel: (0782) 516213

■ Yaesu 757GX or Trio 430S transceivers with or without PSUs, ATUs, condition not important as buyer requires an HF Tx/Rx for mobile use only. Prices please. Tel: John (0734) 411501

■ Vic 20 computer plus access, etc, must be in vgc. Also Yaesu CPU 2500R FM 2m trans, vgc, and Trio VFO20. Tel: Weymouth (0305) 813202, G4OWY

■ Yaesu FT707 10W or 100W model, or similar Trio or Icom HF mobile. Also required, FT480 2m multimode mobile or simiar in any condition. Any operators into QRO mobile to mobile operation? If so, lets communicate! All letters answered. If out while phoning, please leave message, 73s G4ZOW. Jenkins, 6 Sandmere Close, Hemel Hempstead, Herts HP2 4RW. Tel: (0442) 68931

■ Datong audio filter FL3, must be in first class condition. Also wanted (Lowe) Katsumi message keyer, model MK-1024. Tel: (0206) 394336, Essex

■ Sharp MZ80A peripherals and software, eg I/O port MZ80AEU, disc drive MZ80FB, printer, cassette or disc software for amateur use, eg RTTY, AMTOR, contest logs, database, word processing, anything considered. Details to Chris. Tel: (021) 430 7267. G0EYO QTHR

■ Top Band (160m) Tcvr, anything considered. Must have AM and CW at least. Also wanted Kenwood T599S HF Tx, any condition. Peter G1TXI QTHR. Tel: Norwich (0603) 748338

■ Video 2000 portable video recorder, type 22VR20, made by Pye or Philips, with or without its companion 21VR20 tuner/timer. Also want circuit of American made International video corp reel to reel video tape recorder. Type IVC801 PSM, ex-Marconi lab equipment. Come on lads, surely some body can help me! How do I convert a Sony KTX1400UB Prestel RGB monitor to composite input? Nev Kirk G3JDK, 54 Allendale Road, Rotherham, Yorks S65 3BY. Tel: Roth 541606

■ 3 ele mini beam, prefer TET but may consider others. Have HQ1 to sell or p/x on 3 ele. Wanted: Yaesu 4m or 6m transverter module. Also Yaesu monitor scope to match FT902. Will swap FT102 for TS430 with FM or WHY? Martyn Bolt, 112 Leeds Rd, Mirfield, West Yorks WF14 0JE. Tel: (0924) 495916

■ Good secondhand QVO4-7, QQVO3-20a and QQVO6-40A valves. Collins mechanical filter, one for CW, one 3.1 SSB, suitable for 'S' line receivers. RSBG Bulletins for July 1954, and June and July of 1949. *T&R* for 1930 and earlier. *SWM* July and Aug 1959, Sep 1956, Jan 1948, Mar & July 1946 and any pre-war editions. Some pre-war *T&R*, & *QST* still available and also post war *CQ, QST, SWM*, Bulls to exchange or sell. Write to The Advertiser, Ty-Top, Castle Caereinion, Welshpool, Mont, POWYS

■ IC260, IC255 'E'or 'A', FTV707 Txvtr, FT707, FT107 (QRO versions only), ELH230 Alinco linear. Do you have any of the above in perfect condx? If so, please ring me. Must be in Kent, S Essex etc. Tel: Mark G4RGB (0634) 30822

■ KW204 Tx or similar Tx, plus Codar PR40 preselector. Cash waiting. Tel: Ian (0224) 636828 after 6pm

■ Pye homebase PC5, remote mike and micro headset with 3 Pye Reporter mobiles, mikes, speakers and boosters. Exchange for Ham equipment for info. Tel: (0977) 684008, Leeds

■ R1155, T1154, including parts, leads, plugs, key, manual etc, and LT power supply. Pye WS62, and BC348, need not work but prefer unmodified. Brimar valve and telelube manuals. The *Services Text Book of Radio*, vols 2, 4, 6, 7. Air Force publication AP1186. For WSC12 I require 3 way dc controlled connector for A/T unit and adaptor connector for direct use of No10 headgear. Tony Howard. Tel: Milton Keynes (0908) 73114

■ Urgently wanted, Yaesu FRG7700 Rx, also FRT7700 ATU if available. Must be mint or vgc. Carriage paid. Dave Howes, 149 Warren Wood Road, Rochester, Kent ME1 2XG. Tel: (0634) 404096

■ Codar 250/S power unit. Also Heathkit RA1 and RG1 Rxs, in any condition. Also R1132A Rx. Details/prices to Richard Marris, 35 Kingswood House, Farnham Road, Slough, Berks SL2 1DA

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

NEXT ISSUE OF Amateur RADIO ON SALE Thursday 26th March

HEATHERLITE PRODUCTS

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

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

Carriage extra at cost

75 St Catherine's Drive, Leconfield, Nth Humberside

TEL: 0401 50921 ACCESS/VISA cards accepted

IAN FISHER COMMUNICATIONS OF STANHOPE

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

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

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

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

SERVICE MANUALS

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

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

DW ELECTRONICS G3 XCF

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

USED AMATEUR EQUIPMENT?

I Buy, Sell & Exchange!
SELLING? I pay the BEST POSSIBLE PRICES for your Clean Used Equipment!BUYING? I have the BEST SELECTION of top Quality Used Equipment Available!
For the Deal You've been Looking for,Phone Dave, G4TNY ANYTIME ON HORNCHURCH (04024) 57722 or Send SAE

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

AGRIMOTORS

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

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

PNP Communications Communications Interface

for RTTY – Morse – AMTOR

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

CTU 20

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

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

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

NORTH WALES AMATEUR RADIO MART

AMATEUR RADIO – CB RADIO – MARINE RADIO – PMR
25 ABBEY STREET
RHYL
Open Monday-Saturday: 11am-5.30pm
All repairs and accessories available ex stock Mail order welcome
Tel: 0745-51579

GO MEDITERRANEAN MARITIME MOBILE

Join Roy (ZB210) and Sarah on
"COCKATOO"
53 foot motor sailer, cruising Menorca £150 per week fully inclusive. Yaesu 757 at your disposal.
Contact Liz 180 The High Street, Deal, Kent
Tel: 0304 374636

Selectronic

The UK's leading suppliers of 934MHz personal radio equipment
203 High Street
Canvey Island, Essex
Tel: 0268 691481
(Open Mon-Sat 9-5.30)
Amateur radio equipment also in stock

RF DEVICES AT ROCK BOTTOM PRICES!

Nobody beats us!

Over 30,000 RF devices at low prices

REPLACEMENT RF TRANSISTORS

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

REPLACEMENT RF POWER MODULES

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

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

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

MORSE CODE PREPARATION

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

D.P. HOBBS (Norwich) Ltd

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

Telephone the advertising department on: 0277 219876 for details

ADVERTISERS INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	1/8 page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	1/4 page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	1/2 page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	1/2 page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

Covers: Outside back cover 20% extra, inside covers 10% extra
Bleed: 10% extra [Bleed area – 307 x 220]
Facing Matter: 15% extra

DEADLINES

*Dates affected by public holidays

issue	colour & mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Apr 87	26 Feb 87	4 Mar 87	6 Mar 87	25 Mar 87
May 87	2 Apr 87	8 Apr 87	10 Apr 87	30 Apr 87
Jun 87	30 Apr 87	6 May 87	8 May 87	28 May 87
Jul 87	28 May 87	3 Jun 87	5 Jun 87	25 Jun 87

CONDITIONS & INFORMATION

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

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

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

PAYMENT
Above rates exclude VAT.
All single insertion ads are accepted on a pre-payment basis only, unless an account is held.
Accounts will be opened for series rate advertisers subject to satisfactory credit references.
Accounts are strictly net and must be settled by the publication date.
Overseas payments by International Money Order or credit card.

FOR FURTHER INFORMATION CONTACT
Amateur Radio, Sovereign House, Brentwood, Essex CM14 4SE.
(0277) 219876

Commission to approved advertising agencies is 10%

CONDITIONS
10% discount if advertising in both Amateur Radio and Radio & Electronics World.
A voucher copy will be sent to Display and Colour advertisers only.
Ads accepted subject to our standard conditions, available on request.

£1 BAKERS DOZEN PACKS

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

1. 5 – 13 amp ring main junction boxes
2. 5 – 13 amp ring main spur boxes
4. 5 – surface mounting
5. 3 – electrical switches intermediate type, will also replace 1 or 2 way switches, white flush mounting
7. 4 – in flex line switches with neons
9. 2 – mains transformers with 6V 1A secondaries
10. 2 – mains transformers with 12V ½A secondaries
11. 1 – extension speaker cabinet for 6½" speaker
13. 12 – glass reed switches
17. 2 – ultra transmitters and 2 receivers with circuit
19. 2 – light dependent resistors
25. 4 – wafer switches – 6p 2 way, 4p 3 way, 2p 6 way, 2p 5 way, 1p 12 way small one hold fixing and good length ¼ spindle your choice
28. 1 – 6 digit counter mains voltage
30. 2 – Nicad battery chargers
31. 1 – key switch with key
33. 2 – aerosol cans of ICI Dry Lubricant
34. 96 – 1 metre lengths colour-coded connecting wire
39. 1 – long and medium wave tuner kit
41. 8 – rocker switch 10 amp mains SPST
45. 1 – 24 hour time switch mains operated
49. 10 – neon valves – make good night lights
50. 2 – 12V OC or 24V AC, 3 CO relays
51. 1 – 12V 2 CO miniature relay very sensitive
52. 1 – 12V 4 CO miniature relay
53. 2 – mains operated relays 3 × 8 amp changeover (s.h.)
54. 10 – rows of 32 gold plated IC sockets (total 320 sockets)
55. 1 – locking mechanism with 2 keys
56. 1 – miniature uniselector with circuit for electric jigsaw puzzle
60. 5 – ferrite rods 4" × 5/16" diameter aerials
61. 4 – ferrite slab aerials with L & M wave coils
63. 1 – Mullard thyristor trigger module
66. 1 – magnetic brake – stops rotation instantly
67. 1 – low pressure 3 level switch can be mouth operated
69. 2 – 25 watt pots 8 ohm
70. 2 – 25 watt pots 1000 ohm
71. 4 – wire wound pots – 18, 33, 50 and 100 ohm your choice
77. 1 – time reminder adjustable 1-60 mins clockwork
85. 1 – mains shaded pole motor ¾" stack – ¼" shaft
89. 1 – mains motor with gear box 1 rev per 24 hours
91. 2 – mains motors with gear box 16 rpm
96. 1 – thermostat for fridge
98. 1 – motorised stud switch (s.h.)
101. 1 – 2½ hours delay switch
102. 1 – mains P.S.U. 9V OC
103. 1 – mains power supply unit – 6V DC
104. 1 – mains power supply unit – 4½V DC
107. 1 – 5" speaker size radio cabinet with handle
111. 2 – musical boxes (less keys)
112. 1 – heating pad 200 watts mains
114. 1 – 1W amplifier Mullard 1172
115. 1 – wall mounting thermostat 24V
118. 1 – teak effect extension 5" speaker cabinet
120. 2 – p.c. boards with 2 amp full wave and 17 other recs
121. 4 – push push switches for table lamps etc.
122. 10 – mtrs twin screened flex white p.v.c. outer
124. 25 – clear plastic lenses 1⅜ diameter
127. 4 – pilot bulb lamp metal clip on type
128. 10 – very fine drills for pcbs etc.
129. 4 – extra thin screw drivers for instruments
132. 2 – plastic boxes with windows, ideal for interrupted beam switch
134. 10 – model aircraft motor – require no on/off switch, just spin to start
136. 2 – car radio speakers 5" round 4 ohm made for Radiomobile
137. 1 – 6½" 4 ohm 10 watt speaker and 3" tweeter
142. 10 – 4 BA spanners 1 end open, other end closed
145. 2 – 4 reed relay kits 3V coil normally open or c/o if magnets added
146. 20 – pilot bulbs 6.5V.3A Philips
154. 1 – 12V drip proof relay – ideal for car jobs
155. 3 – varicap push button tuners with knobs
169. 4 – short wave air spaced trimmers 2-30f
171. 1 – shocking coil kit with data – have fun with this
172. 10 – 12V 6W bulbs Philips m.e.s.
178. 3 – oblong amber indicators with lilliputs 12V
180. 6 – round amber indicators with neons 240V
181. 100 – p.v.c. grommets ⅜ hole size
182. 1 – short wave tuning condenser 50 pf with ¼" spindle
184. 1 – three gang tuning condenser each section 500 pf with trimmers and good length ¼" spindle
188. 1 – plastic box sloping metal front, 16 × 95mm average depth 45mm
193. 6 – 5 amp 3 pin flush sockets brown
195. 5 – B.C. lampholders brown bakelite threaded entry
196. 1 – in flex simmerstat for electric blanket soldering iron etc.
197. 2 – thermostats, spindle setting – adjustable range for ovens etc.
199. 1 – mains operated solenoid with plunger 1" travel
200. 1 – 10 digit switch pad for telephones etc.
201. 8 – computer keyboard switches with knobs, pcb or vero mounting
206. 20 – mtres 80 ohm, standard type co-ax off white
211. 1 – electric clock mains driven, always right time – not cased
216. 1 – stereo pre-amp Mullard EP9001
232. 2 – 12V solenoids, small with plunger
236. 1 – mains transformer 9V 1 amp secondary C core construction
241. 1 – car door speaker (very flat) 6½" 15 ohm made for Radiomobile
241. 2 – speakers 6" × 4" 4 ohm 5 watt made for Radiomobile
243. 2 – speakers 6" × 4" 16 ohm 5 watt made for Radiomobile
244. 1 – mains motor with gear-box very small, toothed output 1 rpm
245. 4 – standard size pots, ¼ meg with dp switch
249. 1 – 13A switched socket on double plate with fused spur for water heater
266. 2 – mains transformers 9V ½A secondary split primary so ok also for 115V
267. 1 – mains transformers 15V 1A secondary p.c.b. mounting
291. 1 ten turns 3 watt pot ¼ spindle 100 ohm
296. 3 car cigar lighter socket plugs
298. 2 15 amp round pin plugs brown bakelite
300. 1 mains solenoid with plunger compact type
301. 10 ceramic magnets Mullard 1" × 3/8 × 5/16
303. 1 12 pole 3 way ceramic wave charge switch
304. 1 stereo amp 1 watt per channel
305. 1 tubular dynamic microphone with desk rest
308. 1 T.V. turret tuner (black & white T.V.)
310. 2 oven thermostats
311. 1 Clare Elliot sealed relay 12V
312. 1 pressure pad switch 24 × 18 (Trigger Mat)
313. 5 sub miniature micro switches
314. 1 12" 8 watt min fluorescent tube white
315. 1 6" 4 watt min fluorescent tube white
316. 1 round pin kettle plug with moulded on lead

MULLARD UNILEX AMPLIFIERS

We are probably the only firm in the country with these now in stock. Although only four watts per channel, these give superb reproduction. We now offer the 4 Mullard modules – i.e. Mains power unit (EP9002) Pre amp module (EP9001) and two amplifier modules (EP9000) all for £6.00 plus £2 postage. For prices of modules bought separately see TWO POUNDERS.

CAR STARTER/CHARGER KIT

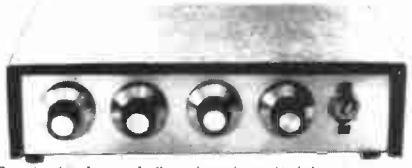
Flat Battery! Don't worry you will start your car in a few minutes with this unit – 250 watt transformer 20 amp rectifiers, case and all parts with data £16.50 or without case £15.00 post paid.

Ex-Electricity Board. Guaranteed 12 months.

VENNER TIME SWITCH

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

SOUND TO LIGHT UNIT



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

12 volt MOTOR BY SMITHS

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

25A ELECTRICAL PROGRAMMER

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

THIS MONTH'S SNIP

is a 13·5V DC power supply unit, plugs into a 13A socket and its output is OK to work 12V portable TVs, car radios etc., etc. Offered at £2 each, or 13 for £24 post paid. Our reference 2P110.

MAKING SUNBEDS?

CHOKE AND STARTER for 6' 100uva tube £2, post £1 for 1 or 50p each in quantity.
TUBE HOLDERS. Canopy type spring loaded, 4 pairs for £1, 100 pairs £20, 1,000 pairs £150, post paid.

TANGENTIAL HEATERS?

We again have very good stocks of these quiet running instant heat units. They require only a simple case, or could easily be fitted into the bottom of a kitchen unit or book case etc. At present we have stocks of 1·2kw, 2kw, 2·5kw, and 3kw. Prices are £5 each for the first 3, and £6.95 for the 3k. Add post £1.50 per heater if not collecting.
CONTROL SWITCH enabling full heat, half heat or cold blow, with connection diagram, 50p for 2kw, 75p for 3kw

FANS & BLOWERS

Woods extractors
5" £5 + £1.25 post. 6" £6 + £1.50 post
4" × 4" Muffin equipment cooling fan 115V £2.00
4" × 4" Muffin equipment cooling fan 230/240V £5.95
5" Plannair extractor £5.50
9" Extractor or blower 115V supplied with 230 to 115V adaptor £9.50 + £2 post
All above are ex computers but guaranteed 12 months
10" × 3" Tangential Blower. New. Very quiet – supplied with 230 to 115V adaptor on use two in series to give long blow £2.00 + £1.50 post or £4.00 + £2.00 post for two

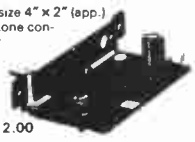
IONISER KIT

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

TELEPHONE BITS

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

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



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

J & N BULL ELECTRICAL

Dept A.R., 128 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QL

MAIL ORDER TERMS: Cash, P.O. or cheque with order. Orders under £20 add £1 service charge. Monthly account orders accepted from schools and public companies. Access & B/card orders accepted. Brighton 0273 734648. Bulk orders: write for quote.

OVER 400 GIFTS YOU CAN CHOOSE FROM

There is a total of over 400 packs in our Baker's dozen range and you become entitled to a free gift with each dozen pounds you spend on these packs. A classified list of these packs and our latest "News Letter" will be enclosed with your goods, and you will automatically receive our next news letters.

TWO POUNDERS*

2P2 – Wall mounting thermostat, high precision with mercury switch and thermometer
2P3 – Variable and reversible 8-12v psu for model control
2P4 – 24 volt psu with separate channels for stereo made for Mullard UNILEX
2P6 – 100W mains to 115V auto-transformer with voltage tappings
2P8 – Mains motor with gear box and variable speed selector. Series wound so suitable for further speed control
2P9 – Time and set switch. Boxed, glass fronted and with knobs. Controls up to 15 amps. Ideal to program electric heaters
2P10 – 12 volt 5 amp mains transformer – low volt winding on separate bobbin and easy to remove to convert to lower voltages for higher currents
2P12 – Disk or Tape precision motor – has balanced rotor and is reversible 230v mains operated 1500 rpm
2P14 – Mug Stop kit – when thrown emits piercing squawk
2P15 – Interrupted Beam kit for burglar alarms, counters, etc.
2P17 – 2 rev pr minute mains driven motor with gear box, ideal to operate mirror ball
2P18 – Liquid/gas shut off valve mains solenoid operated
2P19 – Disco switch-motor drives 6 or more 10 amp change over micro switches supplied ready for mains operation
2P20 – 20 metres extension lead, 2 core – ideal most Black and Decker garden tools etc.
2P21 – 10 watt amplifier, Mullard module reference 1173
2P22 – Motor driven switch 20 secs on or off after push
2P26 – Counter resettable mains operated 3 digit
2P27 – Goodmans Speaker 6 inch round 8ohm 12 watt
2P28 – Drill Pump – always useful couples to any make portable drill
2P31 – 4 metres 98 way interconnecting wire easy to strip
2P32 – Hot Wire amp meter – 4½ round surface mounting 0–10A – old but working and definitely a bit of history
2P34 – Solenoid Air Valve mains operated
2P35 – Battery charger kit comprising mains transformer, full wave rectifier and meter, suitable for charging 6v or 12v
2P38 – 200 R.P.M. Geared Mains Motor 1" stack quite powerful, definitely large enough to drive a rotating aerial or a tumbler for polishing stones etc.
2P43 – Small type blower or extractor fan, motor inset so very compact, 230V
2P46 – Our famous drill control kit complete and with prepared case.
2P49 – Fire Alarm break glass switch in heavy cast case
2P51 – Stereo Headphone amplifier, with pre-amp
2P55 – Mains motor, extra powerful has 1½" stack and good length of spindle
2P62 – 1 pair Goodmans 15 ohm speakers for Unilox
2P64 – 1 five bladed fan 6½" with mains motor
2P66 – 1 2Kw tangential heater 115v easily convertible for 230V
2P67 – 1 12v–0–12v 2 amp mains transformer
2P68 – 1 15v–0–15v 2 amp mains transformer
2P69 – 1 250v–0–250v 60 mA & 86 3v 5A mains transformer + 50p post
2P70 – 1 E.M.I tape motor two speed and reversible
2P72 – 1 115v Muffin fan 4" × 4" approx. (s.h.)
2P75 – 1 2 hour timer, plugs into 13A socket
2P82 – 9v–0–9v 2 amp mains transformer
2P84 – Modem board with press keys for telephone redialler
2P85 – 20v–0–20v ½A Mains transformer
2P88 – Sangamo 24 hr time switch 20 amp (s.h.)
2P89 – 120 min. time switch with knob
2P90 – 90 min. time switch with edgewise engraved controller
2P94 – Telephone handset for EE home telephone circuit
2P95 – 13A socket on satin chrome plate
2P97 – mains transformer 24V 2A upright mounting
2P98 – 20m 4 core telephone cable, white outer
2P99 – 500 hardened pin type staples for telephone cable
2P101 – 15V mains transformer 4A upright mounting
2P105 – capillary type thermostat for air temperature with c/o switch
2P107 – membrane keyboard, telephone type
2P108 – mains motor with gear box giving 110rpm
2P109 – 5" wide black adhesive pvc tape 33m, add £1 post if not collecting

£5 POUNDERS*

5P1 12 volt submersible pump complete with a tap which when brought over the basin switches on the pump and when pushed back switches off, an ideal caravan unit.
5P2. Sound to light kit complete in case suitable for up to 750 watts.
5P3 Silent sentinel ultra sonic transmitter and receive kit, complete
5P5. 250 watt isolating transformer to make your service bench safe, has voltage adj. taps, also as it has a 115V tapping it can be used to safely operate American or other 115V equipment which is often only insulated to 115V. Please add £3 postage if you can't collect as this is a heavy item.
5P6. 12V alarm bell with heavy 6" gong, suitable for outside if protected from direct rainfall. Ex GPO but in perfect order and guaranteed
5P12. Equipment cooling fan – minin snail type mains operated.
5P13. Ping pong ball blower – or for any job that requires a powerful stream of air – ex computer. Collect or add £2 post.
5P15 – Uniselector 5 pole, 25 way 50 volt coil
5P18 – motor driven water pump as fitted to many washing machines
5P20 – 2 kits, matchbox size, surveillance transmitter and FM receiver
5P23 – miniature (appr 2½" wide) tangential blow heater, 1·2kw
5P24 – ½hp motor, ex computer, 230V, mains operation 1450rpm. If not collect add £3 post
5P25 – special effects lighting switch. Up to 6 channels of lamps can be on or off for varying time periods
5P26 – Audax woofer 8" 8ohm 35 watt
5P27 – cartridge player 12V, has high quality stereo amplifier
5P28 – gear pump, mains motor driven with inlet and outlet pipe connectors
5P32 – large mains operated push or pull solenoid. Heavy so add £1.50 post
5P34 – 24V 5A toroidal mains transformer
5P35 – modem board from telephone auto dialler, complete with keypad and all ICs
5P37 – 24 hour time switch, 2 on/offs and clockwork reserve, ex Elec. Board loading up to 50A. Add £1 post
5P41 – 5" extractor fan, very quiet runner (s.h.), gntd 12 mths.
5P45 – pack of 6 cooker clock switches
5P48 – telephone extension bell in black case, ex-GPO
5P50 – box of 20 infra red quartz glass enclosed 360W heating elements
5P51 – 200W auto transformer 230V to 115V torroidal
5P52 – mains transformer 28V 10A upright mounting, add £2 post
5P54 – mains motor with gear box, final speed 5rpm
5P58 – Amstrad stereo tuner FM and LM and S. AM
5P60 – DC Muffin type fan 18 to 27V, only 3W
5P61 – drill pump mounted on frame, coupled to mains motor
5P62 – 2½kw tangential blow heater, add £1.50 post if not collecting

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

VALVE PRE AMP described in the Aug E.T.I. it's a very interesting circuit if you intend trying it, we can supply many of the parts

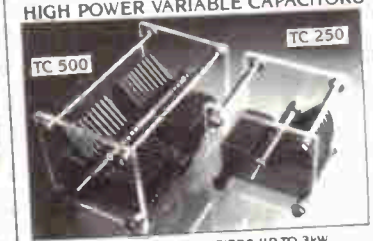
mains transformer 250–0–250 + 6·3V our ref	2P69 + £1 post
B9A valve bases 4 for £1	BD95
Double tag strips 3 lengths £2	2P100
Toggle switches dpst and 4p 4 way rotary switch	BD394
1 meg single gang pot 4 for £1	BD391
100 + 100µf 320V electrolytic 2 for £1	BD392
4µf 300V 4 for £1	BD393

TELECOMMS BUMPER CATALOGUES

CB £1
AMATEUR £1
934 MHz £1
Each catalogue is packed full of info. and includes a £2 voucher.

NEVADA AMATEUR PRODUCTS

HIGH QUALITY BRITISH MADE
HIGH POWER VARIABLE CAPACITORS



IDEAL FOR ATU's OR AMPLIFIERS UP TO 3kW

TC500
CAPACITY:- 26-500 pF
VOLTAGE:- 78kV Max
SIZE:- 101 x 105 x 165mm
AIR GAP:- 2mm
£28 plus £2 p&p

TC250
CAPACITY:- 13-250 pF
VOLTAGE:- 78kV Max
SIZE:- 101 x 105 x 88mm
AIR GAP:- 2mm
£19.95 plus £1 p&p

29 MHz BASE ANTENNAS

NEVADA TC52
This top class half wave uses high grade aluminium and a low loss coil handling up to 1 KW
WIND RESISTANCE:-75 MPH
GAIN:- 2.5 dB
FREQ:- 28-30MHz
£19.95
plus £4 p&p

NEVADA TC58
Using high grade aluminium and a low loss coil complete with small radials this antenna is our most popular amongst the 29MHz fraternity
POWER:- 1kW
GAIN:- 3.5 dB
FREQ:- 28-30MHz
LENGTH:- 6.6 MTRS
£29.75
plus £4 p&p

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

2 MTR EQUIPMENT

2 MTR HANDHELD

CT1600 A superbly sensitive new handheld covering 142-149MHz
- Repeater shift
- High/low power 1.5/0.5 Watt
- Thumbwheel selector

£179
Each set supplied C/W re-chargeable battery pack and free mains charger unit

VHF MOBILE AMP

B110 144MHz 110 Watt W/Pre Amp	£169
B42 144MHz 40 Watt	£64.66
LA05435 144MHz 45 Watt	£69.75

Full range of 144 MHz mobile amplifiers in stock see our Ham Catalogue

RF AMPLIFIERS

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

MOBILE AMPLIFIERS

C.T.E. MOD 767
£49.90
76 Watts FM
INPUT:- 0.5-10 Watts
SWITCHABLE:- Class AB Class C
SUPPLY:- 13.8 Volt
REMOTE CONTROL FACILITY

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

MAINS OPERATED AMPLIFIERS

CTE DC9 Solid State 150W FM (Broadband)	£198.11
ZETAGI B132 150W FM Solid State (Broadband)	£119.00

SCANNING RECEIVERS

C.T.E. DISCONE WIDEBAND ANTENNA £26

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

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

NEW BEARCAT H/HELD SCANNING RX. MODEL 100XL £24.95 £229
Receives 8 bands plus aircraft band. 16 Channels priority keyboard lock and lighted display
66-88 MHz 118-174 MHz 406-512 MHz

BEARCAT 175XL £209
Base receiver covers 66-88MHz 118-174MHz 406-512MHz with 16 channel memory/scan

BEARCAT DX1000
COMMUNICATIONS RECEIVER
£379
Direct access communications 10KHz-30MHz with 10 channel micro-processor controlled memory

TEST EQUIPMENT

ZETAGI DL150 £85.19
RF DUMMY LOAD AND POWER METER
A very accurate unit for the service dept. or discerning enthusiast
FREQ:- 0.5MHz-500MHz
POWER:- 150 Watt Max in 3 ranges 0-3 0-15 0-150W

ZETAGI 500 £41.46
SWR AND POWER METER
For the enthusiast who wants the very best. A twin meter unit with push button control for either 75 OHM or 50 OHM cable
FREQ:- 3-200MHz
POWER:- Up to 2kW

FD 1350 1.35GHz FREQUENCY COUNTER
FREQ:- 10Hz-1.35GHz
SENSITIVITY:- 43mV at 1GHz
DISPLAY:- 8 Digit
SUPPLY:- 9-12 Volt DC
£139.53

NEVADA

HIGH QUALITY BRITISH MADE 29MHz FM PRODUCTS

NEVADA TC35 DX £23.75
R.F POWER AMP WITH HARMONIC FILTER
INPUT - 1-4 Watts
OUTPUT - 25-30 Watts
SUPPLY - 13.8V DC
FREQ - 26-30 MHz
Can be centred on 29.6 MHz or 28.5 MHz (state which) A new top quality amp which now features harmonic filter to reduce harmonic O/P

NEVADA TC27 RX £22.36
RECEIVER PRE AMP FOR 26-30MHz
A superior low noise pre amplifier for 29MHz FM operation
Variable gain 6dB's to +18dB's suitable for use with transceivers up to 25 Watts output

TELECOMMS

HOTLINE (24 HOURS)
0705 662145
189 LONDON ROAD, PORTSMOUTH.
HANTS. PO2 9AE.
TELEX 869107 TELCOM G
USE YOUR CREDIT CARD (AMERICAN EXPRESS ACCESS OR VISA) FOR IMMEDIATE DESPATCH
TRADE ENQUIRIES WELCOME.

WORLDWIDE DISTRIBUTORS OF AMATEUR & PERSONAL RADIO EQPT.