MARCH 1990 £2.95

Amateur RADIO

For all two-way radio enthusiasts

A User Review:
The KW 2000B SSB Transceiver

Modifications:
The NRD 525 Receiver

Chain Home:
The Battle of Britain Radar

Supporting All Mode SSTV:
The RX-8 and GX-2 Software Packages

Morse Report

WITH THE GRAND OPENING OF OUR NEW AMATEUR SHOP

RAYCOM ANNOUNCES NEW DIRECT PHONE NUMBERS

SALES HOTLINE 021 552 0073 and HELP LINE 021 552 0051 (73's and 51's)

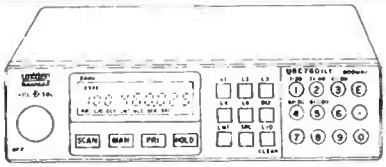
JUPITER II

Save money when you buy this top-of-the range scanner. 100 memories, coverage from 25-550/ 800-1300 MHz, priority channel monitor, channel lock-out delay and auto AM/FM switching go to make a great package and we add further value still.

Choose either a ***free*** broadband mag-mount or a ***free*** mast-mount SkyScan scanner antenna worth £14.95 **and a free** cigar adapter kit when you order your Jupiter II (and £20 off RRP!)

£299.00 .. save £39.90

760 XLT



With coverage from 66 to 956 Mhz (with gaps), 100 memories, fast search, high sensitivity (0.3 mV) and 2 watt of audio this compact mobile scanner is ideal for beginner and enthusiast alike! Raycom adds £20 worth of free antenna, and base power supply *and* drops the price to bring a blistering scanner package to our customers. Call now for an information leaflet!

£239.99 .. save £30.00.

ICOM IC-R7000

An unbeatable offer from Raycom - £30 off the retail price and a *free* Bearcat handy scanner covering 29-512MHz (with some gaps) worth £99.95 - a total saving of an incredible £129.95! Can't believe it? Send SAE for an information leaflet and offer details. Raycom Credit Card is available - just £96 deposit and £36 per month!

£959.00 .. save £130.00

ICOM IC-3210

ICOM's popular dual bander, 25 watts on both bands, great looking and readable display, full duplex capability, 40 memories and input monitor for instant repeater check. All you need add is an antenna and we have taken care of that.

Regular retail prices:

IC-3210	£499.00
Broadband mag-mount antenna	£14.95
Total regular price	*£513.95*
Raycom package price	***£479.00***

SAVE £35!

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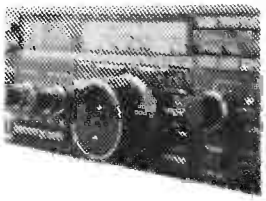
ICOM IC-725



ICOM's latest addition to the family, the 725 gives a full 100 watts of multi-mode power and is the second rig to use the DDS (Direct Digital Synthesizer) system. 10 Hz steps for smooth tuning, all mode squelch, 26 memories, and many other features make the 725 the starter rig for those who want more than a starter rig - it's unbeatable value - just look!

Regular retail prices:

IC-725	£759.00
FM TX/RX (AM RX) board	£40.00
20 Amp PSU	£129.99
G5RV ½-sized antenna	£14.95
Fist mic	£21.00
Total regular price	*£964.94*
Raycom package price	***£849.00***

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YAESU FT-747GX

HF all mode 100W transceiver, 0.1-30MHz, with the exclusive ***Raycom*** mod improving receiver dynamic range by 15-20 dB. Turns a good receiver into a *great* receiver. Ideal as a base and particularly suited for mobile/marine use with it's light weight and click-stop dial. Save money with the ***RAYCOM STARTER PACK*** - it's unbeatable value - just look!

Regular retail prices:

FT-747GX	£659.00
Raycom RX mod	£59.00
20 Amp PSU	£129.99
G5RV ½-sized antenna	£14.95
Fist mic	£21.00
Total regular price	*£883.94*
Raycom package price	***£749.00***

SAVE £135!

Raycom Credit Card is available on this pack, just £77 deposit and monthly payments of just £28! *Why wait, send for written details now!*

YAESU FT-470

Yaesu's new dual bander is ex-stock at last and packed with features - dual display, dual band monitor, 4 VFO's and 42 memories, power saver, auto power off, CTCSS, DTMF autodial and a wide range of options - SAE for information sheet.

Regular retail prices:

FT-470	£389.00
FNB-10 nicad 7.2v, 600mAH	£34.50
Wall charger	£17.71
Soft carry case	£10.58
Broadband mag-mount antenna	£14.95
Total regular price	*£466.74*
Raycom package price	***£425.00***

SAVE £42!

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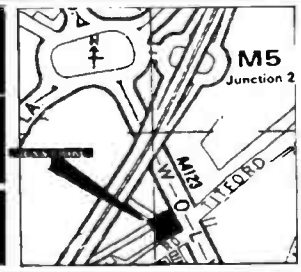

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WE STOCK ICOM, YAESU, BEARCAT, MFJ, BUTTERNUT, CUSHCRAFT, AEA, TONNA, NAVICO, TEN-TEC AND WELZ AMONG MANY OTHERS. SEND SAE FOR FULL LIST.

TEL 021-552-0073

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AC126	0.45	BC107A	0.11	BC204	0.25	BD124P	0.59	BD520	0.65	BF271	0.28	BFY51	0.32	GET111	2.50	R2009	2.50	TIP142	1.75	2SC495	0.80
AC127	0.20	BC107B	0.11	BC207B	0.25	BD131	0.42	BD534	0.45	BF271	0.26	BFY90	0.77	GEX542	9.50	R2010B	1.45	TIP146	2.75	2SC496	0.80
AC128	0.28	BC108	0.10	BC208B	0.20	BD132	0.42	BD535	0.45	BF273	0.18	BLY48	1.75	MJ3000	1.98	R2322	0.58	TIP161	2.95	2SC784	0.75
AC128K	0.32	BC108B	0.12	BC212	0.09	BD133	0.50	BD575	0.95	BF335	0.35	BR100	0.45	MJE340	0.40	R323	0.66	TIP2955	0.80	2SC785	0.75
AC141	0.28	BC109	0.10	BC212L	0.09	BD135	0.30	BD587	0.95	BF336	0.34	BR101	0.49	MJE350	0.75	R2540	2.48	TIP3055	0.55	2SC789	0.55
AC141K	0.34	BC109B	0.12	BC213	0.09	BD136	0.30	BD588	0.95	BF337	0.29	BR103	0.55	MJE520	0.48	RCA16029	0.85	TIS91	0.20	2SC931D	0.95
AC142K	0.45	BC114A	0.09	BC213L	0.09	BD137	0.32	BD698	1.50	BF338	0.32	BR303	0.95	MJE2955	0.95	RCA16039	0.85	TV106	1.50	2SC937	1.95
AC176K	0.31	BC115	0.55	BC214	0.09	BD138	0.30	BD701	1.25	BF355	0.37	BRC4443	1.15	MPSA13	0.29	RCA161B1	0.85	TV106/2	1.50	2SC1034	4.50
AC187	0.25	BC116A	0.50	BC214C	0.09	BD139	0.32	BD702	1.25	BF362	0.38	BRY39	0.45	MPSA92	0.30	RCA16334	0.90	ZRF0112	16.50	2SC1096	0.80
AC187K	0.28	BC117	0.19	BC214L	0.09	BD140	0.30	BD707	0.90	BF363	0.65	BSW64	0.95	MRF237	4.95	RCA16335	0.85	2N1308	1.35	2SC1106	2.50
AC188	0.25	BC119	0.24	BC237B	0.15	BD144	1.10	BDX32	1.50	BF371	0.25	BSX60	1.25	MRF450A	15.95	RCA16572	0.85	2N1711	0.30	2SC1124	0.95
AC188K	0.37	BC125	0.25	BC238	0.15	BD150C	0.29	BDX53B	1.65	BF394	0.19	BT100A/02	0.85	MRF453	17.50	S2060D	0.95	2N2219	0.28	2SC1162	0.95
ACY17	1.15	BC140	0.31	BC239	0.15	BD159	0.65	BF115	0.35	BF422	0.32	BT106	1.49	MRF454	26.50	SKE5F	1.45	2N2626	0.55	2SC1172Y	2.20
AD142	2.50	BC141	0.25	BC251A	0.15	BD160	1.50	BF119	0.65	BF423	0.25	BT116	1.20	MRF455	17.50	T6021V	0.45	2N2905	0.40	2SC1173	1.15
AD149	1.50	BC142	0.21	BC252A	0.15	BO166	0.50	BF127	0.39	BF457	0.32	BT119	3.15	MRF475	2.95	T6027V	0.45	2N3053	0.40	2SC1306	1.75
AD161	0.50	BC143	0.24	BC258	0.25	BO179	0.72	BF154	0.20	BF458	0.36	BT120	1.65	MRF477	14.95	T6029V	0.45	2N3054	0.59	2SC1364	0.50
AD162	0.50	BC147B	0.12	BC258A	0.39	BD182	0.70	BF158	0.22	BF467	0.68	BU105	1.95	MRF479	5.50	T6036V	0.55	2N3055	0.52	2SC1413A	2.50
AF106	0.50	BC148A	0.09	BC284	0.30	BD201	0.50	BF160	0.27	BF493	0.35	NU108	1.69	OC16W	2.50	T9002V	0.55	2N3702	0.12	2SC1449	0.50
AF114	2.50	BC149	0.09	BC300	0.30	BD202	0.50	BF173	0.22	Bf4995	0.23	BU124	1.25	OC23	9.50	T9011V	0.75	2N3703	0.12	2SC1628	0.75
AF115	1.95	BC153	0.30	BC301	0.30	BD203	0.50	BF177	0.38	Bf4997	0.25	BU125	1.25	OC25	1.50	T9015V	2.15	2N3704	0.12	2SC1678	1.50
AF116	2.50	BC157	0.12	BC303	0.26	BD204	0.70	BF178	0.26	BFR39	0.23	BU126	1.60	OC26	1.50	T9034V	2.15	2N3705	0.20	2SC1945	3.75
AF117	2.50	BC159	0.09	BC307B	0.09	BD222	0.46	BF179	0.34	BFR40	0.23	BU204	1.55	OC28	5.50	T9038V	3.95	2N3706	0.12	2SC1953	0.95
AF118	3.50	BC161	0.55	BC327	0.10	BD223	0.59	BF180	0.29	BFR81	0.25	BU205	1.30	OC29	4.50	THY15/80	2.25	2N3708	0.12	2SC1957	0.80
AF121	0.60	BC170B	0.15	BC328	0.10	BD225	0.48	BF181	0.29	BFR88	0.30	BU208	0.95	OC32	5.50	THY15/85	2.25	2N3733	9.50	2SC1969	2.95
AF124	0.65	BC171	0.09	BC337	0.10	BD232	0.35	BF182	0.29	BFR90	1.50	BU208A	1.15	OC42	1.50	TIP29	0.40	2N3773	2.75	2SC19B5	1.50
AF125	0.65	BC172B	0.10	BC338	0.09	BD233	0.35	BF183	0.29	BFR91	1.75	BU208D	1.35	OC44	1.25	TIP29C	0.42	2N3792	1.35	2SC2028	1.15
AF126	0.45	BC173B	0.10	BC347A	0.13	BD236	0.49	BF184	0.35	BFT42	0.35	BU326	1.20	OC45	1.00	TIP30C	0.43	2N4280	3.50	2SC2029	1.95
AF127	0.65	BC174	0.09	BC461	0.35	BD237	0.40	BF185	0.28	BFT43	0.35	BU326S	1.50	OC70	1.00	TIP31C	0.55	2N4427	1.95	2SC2078	1.45
AF139	0.40	BC177	0.15	BC478	0.20	BD242	0.65	BF195	0.11	BFW10	0.55	BU407	1.24	OC71	0.75	TIP32C	0.42	2N4444	1.15	2SC2091	0.85
AF150	0.60	BC178	0.15	BC527	0.20	BD246	0.75	BF197	0.11	BFW11	0.75	BU408	1.50	OC72	2.50	TIP33C	0.95	2N5294	0.42	2SC2098	2.95
AF178	1.95	BC182	0.10	BC547	0.10	BD376	0.32	BF198	0.16	BFW16A	1.15	BU426A	0.75	OC75	1.50	TIP34B	0.95	2N5296	0.48	2SC2166	1.95
AF239	0.42	BC182LB	0.10	BC548	0.10	BD379	0.45	BF199	0.14	BFW61	0.60	BU500	2.25	OC81	1.00	TIP41A	0.45	2N5298	0.60	2SC2314	0.80
ASY27	0.85	BC183	0.10	BC549A	0.10	BD410	0.65	BF240	0.20	BFW92	0.85	BU508A	1.95	OC84	1.50	TIP41C	0.45	2N5496	0.95	2SC2371	0.36
ASY77	1.50	BC183L	0.09	BC550	0.14	BD434	0.65	BF241	0.15	BFX29	0.30	BU526	1.90	OC139	12.50	TIP42C	0.47	2N5641	16.50	2SC931D	0.95
				BC557	0.08	BD436	0.60	BF245	0.30	BFXB4	0.26	BU807	2.25	OC171	4.50	TIP47	0.65	2N5643	16.50	2SK19	0.55
				BC558	0.10	BD437	0.60	BF256LC	0.35	BFX85	0.32	BUY20	2.15	OC200	4.50	TIP48	0.65	2SA329	0.95	2SK33	0.55
				BC639/1D	0.30	BD438	0.75	BF257	0.28	BFX86	0.25			OC201	5.50	TIP50	0.65			3SK88	0.48
				BCY33A	19.50	BD510	0.95			BFY18	1.35			OC205	10.00	TIP120	0.60				

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AN240P	2.80	CA3123E	1.95	LA4430	2.50	MC1352P	1.00	SN7414	1.50	STK0039	7.95	TAA550B	0.95	TBA750	1.95	TDA1044	2.15	TDA2640	3.50	UPC1360	2.95
AN247	2.50	CA3130E	1.95	LA4461	3.95	MC1357	2.35	SN7421	0.85	TA7061AP	1.50	TAA570	1.95	TBA750Q	2.65	TDA1170	1.95	TDA2655	4.50	UPC1365C	3.95
AN260	2.95	CA3140S	2.50	LC7120	3.25	MC1358	1.58	SN76110N	0.89	TA7072	2.65	TAA621	3.95	TBA800	0.69	TDA1180	2.15	TDA2680A	2.75	UPC2002H	1.95
AN262	1.95	CA3140T	1.15	LC7130	3.50	MC1496	1.75	SN76115N	1.25	TA7073	3.50	TAA6320S	2.95	TBA810AS	1.65	TDA1270Q	3.95	TDA2690	2.45	UPO2114LC	2.50
AN264	2.50	ETT6016	2.50	LC7131	5.50	MC1723	0.50	SN76131N	1.30	TA7108P	1.50	TAA661B	1.95	TBA810P	1.65	TDA1327	1.70	TDA3310	2.95	555	0.35
AN271	3.50	HA1137W	1.95	LC7137	5.50	MC3357	2.75	SN76226DN	2.95	TA7120P	1.65	TAA700	1.70	TBA820M	0.75	TDA2002	0.95	TDA3510	3.50	556	0.60
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AN303	3.50	HA1306	1.50	LM324N	0.45	MSM5807	8.75	SN76228N	2.95	TA7130P	1.50	TBA120AS/B/C	1.00	TBA890	4.50	TDA2010	1.95	TDA4050	2.95	741	0.35
AN313	2.95	HA1322	1.95	LM380N	1.50	SAA500A	3.50	SN76533N	1.65	TA7137P	1.00	SA/SB/T/U		TBA920	1.65	TDA2020	2.95	TDA4600	2.50	747	0.50
AN315	2.95	HA1339A	2.95	LM380N8	2.95	SAA1025	7.25	SN76650N	1.15	TA7146P	1.50	TBA395	1.50	TBA950/2X	1.50	TDA2030	2.80	TDA9503	3.15	748	0.35
AN316	3.95	HA1366W	2.75	LM383T	2.95	SAA1251	4.95	SN76660N	0.90	TA7176AP	2.95	TBA396	0.75	TBA990	1.49	TDA2040	3.95	TEA1009	1.35	7808	0.50
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AN342	2.95	HA1551	2.95	LM1011	3.15	SAA5020	5.75	STK014	7.95	TA7204P	2.15	TBA480Q	1.95	TCA270	2.50	TDA2051	1.95	UPC566H	2.95	7812	0.50
AN362L	2.50	LA1201	0.95	M5155L	2.95	SAB3210	3.50	STK015	5.95	TA7205AP	1.15	TBA510	2.50	TCA270SQ	2.50	TDA2101	1.95	UPC575C2	1.50	7815	0.50
AN612	2.15	LA1230	1.95	M51513L	2.30	SAS560S	1.75	STK018	7.95	TA7208	1.95	TBA510Q	1.10	TCA650	2.50	TDA2140	3.95	UPC1001H	1.95		
AN6362	3.95	LA3201	0.95	M51521L	1.50	SAS570S	1.75	STK025	11.95	TA7222AP	1.80	TBA520	1.10	TCA760	2.50	TDA2150	2.50	UPC1020H	2.95		
AN7140	3.50	LA4101	0.95	MB3705	1.50	SAS580	2.85	STK032	7.95	TA7227P	4.25	TBA530	1.10	TCA800	6.95	TDA2160	2.50	UPC1024H	1.50		
AN7145	3.50			MB3712	2.00			STK078	11.95	TA7228P	1.95	TBA530Q	1.10	TCA830S	1.95	TDA2524	1.95	UPC1025H	1.95		
								STK085	8.95	TA7310P	1.80	TBA540	2.50	TCA900	2.50	TDA2530	1.95	UPC1028H	1.95		
								STK415	7.95	TA7314P	2.95	TBA540Q	2.50	TCA940	1.65	TDA2532	1.95	UPC1032H	0.95		
								STK435	7.95	TA7321P	2.25			TDA440	2.20	TDA2540	1.95	UPC1158H	0.75		
																TDA2541	2.15	UPC1167C2	1.95		
																TDA2560	1.15				
																TDA2576	4.50				

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Ferg 3V22 HR3360	2.75
Ferg 3V23 HR7700	0.95
Ferg 3V29 HR7200	1.50
Ferg 3V31 HR7650	1.50
Ferg 3V35-36 HRD120	1.25
Ferg 42-43-44-45	1.25
Fisher 710-716-722	1.50
Hitachi VT11-33	1.25
Hitachi VT5000	2.25
Hitachi VT8000	0.95
Hitachi VT9300	0.95
Panasonic NV300-333-366	2.25
Panasonic NV370-430	2.50
Panasonic NV777	1.75
Panasonic NV2000	2.15
Panasonic NV7000	1.85
Panasonic NV8600	2.95
Sanyo 11-13-1500	1.50
Sanyo VTC5000	0.75
Sanyo VTC5300-5350	1.50
Sanyo VTC5500	2.95
Sanyo VTC9300	3.50
Sharp 9300-9500	1.75
Sharp 8300	2.95
Sharp 7300	2.95
Sony SLC5-7	2.75
Sony 6C	2.25
Sony SLC9	3.25
Sony SL8000	3.25
Toshiba 9600	1.25

20% Discount on 10 or more mixed belt kits

VIDEO HEADS

3HSSH	25.50
3HSSHA	25.50
3HSSHB	25.50
3HSSN	18.95
3HSSSF	35.00
3HSSSP	27.50
3HSSUIN	25.99
3HSSU2N	37.50
3HSSU3N	36.00
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PS38S	24.50
PS38SF	36.00
PS38T	30.00
PS482S	29.95
PSB3S	45.00

10% Discount on Five Mixed Heads

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Decca 30	6.35
Decca 80	6.95
Decca 100	6.95
Decca 120	6.95
Decca 1730	6.35
GEC 2040	5.45
GEC 2110	6.95
ITT CVC1-9	6.35
ITT CVC20/25/30	6.35
ITT CVC45	6.95
Philips G8 (550)	6.95
Philips G9	6.00
Pye 697	6.50
Pye 713 4 lead	8.50
Pye 713 5 lead	8.50
Pye 731/25	8.50
Rank A774	6.35
Rank AB23	6.95
Rank T20A	6.95
Siemens TVK76/1	6.95
Siemens Europa	7.50
Thorn 1500	6.45
Thorn 1600	5.46
Thorn 3500	7.95
Thorn 8000	6.95
Thorn 8500	7.15
Thorn 9000	8.50
Thorn 9600	8.50
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TV13 Stick	1.25
TV18 Stick	1.10
TV20 Stick	1.40
PYE 713 4 LEAD	8.50
PYE 713 5 LEAD	8.50
PYE 731/25	8.50
RANK A774	6.35
RANK A823	6.95
RANK T20A	6.95
SIEMENS TVK76/1	6.95
SIEMENS EUROPA	7.50
THORN 1500	5.45
THORN 1600	5.45
THORN 3500	7.95
THORN 8000	6.95
THORN 8500	7.15
THORN 9000	8.50
THORN 9600	8.50
TV11 STICK	0.90
TV13 STICK	1.25
TV18 STICK	1.10
TV20 STICK	1.40

FUSES — SPECIAL OFFEER 100 PER TYPE

2MM Q/QB (@ 0.06 each £4.50
100MA 200MA 250MA 500MA
1Amp 1.25Amp 1.5Amp
1.6Amp
2Amp 2.5Amp 3.15Amp 4Amp

20MM A/S (@ 0.15 each £11.50
100MA 150MA 160MA 250MA
500MA 800MA 1.25Amp
2Amp 3.15Amp 5Amp

1.25 inch Q/B (@ 0.06 each £4.00
250MA 500MA 750MA 1Amp
1.5Amp 2Amp 3Amp 7Amp
10Amp

1.25 inch A/S (@ 0.15 each £10.00
50MA 60MA 100MA 150MA
250MA 500MA 750MA 1.5Amp
3Amp 4Amp 5Amp

We have recently attended a special in house selection facility and can offer the following service to trade only:

Special Selection of pre-matched valves for low microphony etc. £1.00 per valve

Supply and fitting of pre-load damping rings £1.00 per ring

Special selection and matching of power valves £1.00 per valve

Valve Hardware List

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B4 CHASSIS	2.50
B5 CHASSIS	2.50
B5 FLOATING	2.50
B7 CHASSIS	1.75
B7A CHASSIS	8.50
B7G PCB	0.65
B7G PCB CERAMIC	0.95
B7G CHASSIS	0.65
B7G CHASSIS SHOCKPROOF	0.65
B7G SKIRTED CHASSIS	0.65
B7G SKIRTED PCB	0.95
B7G SKIRTED PTFE CHASSIS	0.95
B8A CHASSIS	0.85
B8G CHASSIS	0.85
B8H CHRT	0.45
B9A PCB	0.45
B9A OCB THIN	0.95
B9A CHASSIS	0.95
B9A CHASSIS SHOCKPROOF	0.50
B9A SKIRTED CHASSIS	1.25
B9A SKIRTED CHASSIS CERAMIC PINCH	0.65

PLUGS

OCTAL	0.85
B7G	0.35
B9A	0.65

CANS

B7G	0.35
B9A	0.65
B9A SKIRTED PCB	1.25
B9A CERAMIC	0.95
B9A CERAMIC CHASSIS	2.50
B7G CHASSIS	0.50
B7G CHASSIS	0.50
B7G CHASSIS	1.95
OCTAL VINTAGE CHASSIS	0.35
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OCTAL PCB	0.95
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OTHER TYPES AVAILABLE	

EX-EQUIPMENT

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BOX 50B MILITARY SOCKET	10.00
ASSORTED LAMPS	5.00

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BA115	0.13	BYX38 600R	0.60
BA145	0.16	BYX55 600	0.30
BA148	0.17	BYX71 600	1.75
BA154	0.06	BZX61	0.15
BA156	0.15	BZX88	0.10
BA157	0.30	BZY95C30	0.35
BA244	0.75	CS1B	8.00
BA316	0.75	CS10B	18.50
BA317	0.75	MR510	0.65
BA318	2.95	MR512	0.65
BA378	2.95	OA47	0.15
BA527	1.75	OA90	0.10
BAV21	0.30	OA91	0.15
BAW62	0.19	OA95	0.10
BAX13	0.04	OA202	0.40
BAX16	0.12	IN21DR	5.00
BB105B	0.30	IN23B	2.95
BT151	0.79	IN23C	4.95
BY126	0.10	IN23ER	4.95
BY127	0.11	IN23WE	2.95
BY133	0.15	IN4001	0.04
BY164	0.45	IN4003	0.04
BY176	1.20	IN4004	0.05
BY179	0.63	IN4007	0.06
BY182	0.55	IN414B	0.02
BY184	0.35	IN4448	0.10
BY187	0.45	IN5401	0.12
BY199	0.40	IN5402	0.14
BY206	0.14	IN5403	0.12
BY208 800	0.33	IN5406	0.13
BY210 800	0.33	IN5407	0.16
BY223	0.90	IN5408	0.16
BY298 400	0.22	IT44	0.10
BY299 800	0.22	IT923	0.15
BYX10	0.50	IT2002	0.10
BYX25 600	1.25		

ZENER DIODES

BZX61 Series	0.15	BZY88 Series	0.20

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M24-121GH	55.00
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M31-62GV	45.00
M31-84W	55.00
M31-90GR	45.00
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PCF84 0.65
PCF86 1.20
PCF87 1.25
PCF200 1.80
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PCF805 1.25
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PL83 0.52
PL84 0.78
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UBF80 0.95
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UBL21 2.95
UC92 2.50
UCC84 0.70
UCC85 1.00
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6C5 2.50

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STRAIGHT & LEVEL

ON THE COVER

On the cover this month is the Icom IC-R1 all band receiver, the latest addition to Icom's range of amateur radio equipment.

The IC-R1 is the same size as the IC-2SET and is, therefore, slim and compact. It has 100 memory channels which include a mode function for each channel. The selectable channel steps are: 0.5/1/5/9/10/12.5/15/20/25/30/-50kHz.

The IC-R1 features multi-scan functions which include: program scan; memory scan; auto memory write scan; memory mode scan; and priority scan from the VFO to full scan memory.

Other features include a built-in clock with timer/auto power off functions; five power save functions; memory masking; a monitor that checks for weak signals; AM/FM; a built-in 'S' meter which shows the input signal strength; and an external dc power supply with charging capability.

The IC-R1 costs £399.00 including VAT.

For further information contact *Icom (UK) Limited, Sea Street, Herne Bay, Kent CT6 8LD.*

M100 PREAMPLIFIER

Nevada Communications Limited have introduced the JIM M100 low noise wideband GaAs FET preamplifier for receiver or transceiver use.

The M100 covers 24 to 2150MHz, and three switchable bandpass filters ensure best possible performance. Automatic transceiver relay switching is also included.

The M100 can also be used via BNC connectors with hand-held rigs, oscilloscopes, spectrum analysers and similar test equipment. The M100 costs £79.95 including VAT.

For further information contact *Nevada Communications Limited, 189 London Road, North End, Portsmouth, Hampshire PO2 9AE. Tel: (0705) 662145.*

CELSICLOCK

Cobonic Limited have introduced the CelsiClock, an irreversible temperature recording clock label, which measures and permanently records the maximum temperatures on any surface.

This is a simple and convenient method of permanently recording temperature maxima levels on surfaces which are inaccessible by standard methods due to rotation, vibration, high voltage, or danger.

CelsiClock covers the range from +40C to 260°C in eight separate labels, and each label is divided into five temperature sequences.

The temperature-sensitive circular spots change colour permanently, from white to black, when their individual specified temperature rating is exceeded for less than a second.

For further information contact *Cobonic Limited, 32 Ludlow Road, Guildford, Surrey GU2 5NW. Tel: (0483) 505260.*

CLUB NEWS

The Northern Amateur Radio Societies Association will hold its annual amateur radio, electronics and computing exhibition on 18 March 1990 at the Norbreck Castle Hotel, Blackpool.

120 traders attended the same venue last year which attracted over 5,000 visitors, making it the largest single day amateur radio rally in the country. NARSA aim to improve on these figures still further this year.

For further information contact *Peter Denton G6CGF. Tel: 051-630 5790.*

The fourth Derby and District Amateur Radio Society 2m Contest takes place on Sunday 11 March between 1300hrs and 1700hrs GMT.

Any mode of operation is permitted, but the bandplan must be observed. Fixed and portable entries are permitted.

There will be two sections: full legal power limit and low power output. Entrants must specify whether they are single or multi-ops.

A list of the rules and an entry form are available upon receipt of an sae.

For further information contact *the secretary, Derby and District Amateur Radio Society, 119 Green Lane, Derby DE1 1RZ.*

The Tiverton Radio Club will hold the Mid-Devon Rally on 18 March 1990 at the Pannier market, Tiverton, Devon.

There is free parking and refreshments will be available all day. There will be a talk-in on S22. Doors open at 10.00am.

For further information write to *G4TSW (Mid-Devon Rally), PO Box 3, Tiverton, Devon EX16 6RS.*

Pontefract and District Amateur Radio Society will hold their eleventh Components Fair on 25 March 1990 at the Carleton Community Centre, Pontefract, from 11.00am to 4.30pm.

There will be a talk-in on S22 and attractions include a bookstall, bring and buy and a licensed bar etc. Admission is free.

For further information contact *B Atkinson. Tel: (0977) 704067.*

The Wythall Radio Club will hold their fifth annual Radio Rally on 18 March 1990 at Wythall Park, Silver Street, Wythall, Worcestershire, from 11.00am.

There will be the usual trade stands as well as a flea market, large bring and buy sale and a talk-in on S22.

For further information contact *Chris Pettitt. Tel: 021-430 7267.*

The Dover (YMCA) Amateur Radio Club QRP Convention takes place on 25 March 1990 at the Dover YMCA, Dover, from 10.30am to 4.30pm.

For further information contact *G0BPS. Tel: (0303) 276171.*

CHAIN HOME: BATTLE OF BRITAIN RADAR Part One

by Brian Kendal G3GDU

For military aviation buffs, this year will celebrate the fiftieth anniversary of one of the most significant battles of World War Two – the Battle of Britain.

In this, over a period of a few months, a relatively small number of Royal Air Force fighter aircraft succeeded in defeating a vastly superior Luftwaffe with the result that the attack was discontinued and, more importantly, any hope of invading the British Isles abandoned.

The conflict between Royal Air Force Fighter Command and the Luftwaffe took place in the skies over southern England during August and September 1940. The battle progressed with mounting losses on both sides, culminating on 15 September when the British Government announced that no less than 186 enemy aircraft had been shot down by the Royal Air Force. Post war investigation proved that this figure was highly inflated but, nevertheless, the German losses of aircraft, and even more important, trained and experienced crews, far exceeded replacements and were sufficient to make continuation of the battle impossible.

Despite propaganda to the contrary, there was little to choose between the quality of the aircraft used by either side, however, there were several aspects of the conflict where the defending RAF aircraft had considerable advantages. For example, in an attack on London, the Messerschmitt ME109 'Emil' fighter aircraft accompanying the enemy bombers had insufficient range to spend more than ten minutes over the target area and, consequently, if engaged in combat, had to break off quickly if a return to base were to be possible.

Similarly, when their bomber losses were beginning to mount, the Luftwaffe High Command ordered that their fighter aircraft keep close formation with the bombers, thus robbing them of the vital advantage of height at the beginning of any combat.

However, the most significant advantage that the RAF possessed was that provided by the Chain Home early warning radar system which ensured that each enemy attack could be located, assessed and met by freshly refuelled and re-armed aircraft.

Radar, however, was not unique to Great Britain, for at the outbreak of hostilities a year earlier, no less than eight countries were developing such systems, although only two, the United Kingdom and Germany, had reached the stage where they could be considered operational. Of these, the German equipment was far more technically advanced, but the British advantage lay in the fact that, unlike the German system where each installation operated as an independent unit, the plots from all the British radar stations over a wide area were relayed to a central point, where the relevance of each threat could be assessed and a suitable response initiated.

The beginnings of radar

The proverbial man in the street generally considers that radar is a relatively recent innovation and in practical terms this is certainly true. However, the principle of detection by the reception of reflected radio waves has been known since the latter part of the 19th century, for Edison is reported to have suggested such a system for preventing collision at sea.

The first recorded patent for such a system was taken out by the German engineer Christian Hulsmeyer, who developed his 'Telemobiloscope' in 1903. This warned of the approach of ships by sounding a bell and was reputed to be effective up to ranges of a thousand yards or so. Unfortunately, after the original patent nothing more seems to have been heard of the device.

The next significant mention of the possibilities of a radar system was by Marconi who, in a speech accepting the Medal of Honour from the American Institute of Radio Engineers in 1922, commented on having observed the reflection of radio waves by metallic objects and speculated that the phenomenon could be used for the detection of ships at sea.

In succeeding years, this phenomenon was also noticed by many other workers including A Hoyt Taylor and Leo Clifford at the United States Naval Research Laboratory at Anacostia DC. Several years later, Englund, Crawford and Munford, who were working on UHF at the Bell Telephone Laboratory at Holmdel, New Jersey, noticed that aircraft could be detected even when beyond visual distance. Another worker in the field, Pat Hyland of the US Naval Research Laboratory at Bolling Field, Washington, made identical observations and, as a result, made a proposal for equipment which could be constructed for the detection of both aircraft and ships. This did not find favour with the Navy Department and was dropped.

Meanwhile, back in the United Kingdom, Professor Appleton had demonstrated pulse techniques while making measurements of the height of the reflecting ionospheric layers, displaying the measurement directly on a cathode ray oscillograph.

Thus, by 1930 all the elements for a radar system were present, for the phenomenon of reflection of radio waves was well known to the scientific community while the necessary pulse and ranging techniques had been developed during ionospheric research. It therefore only required the elements to be brought together for a practical radar system to be developed.

In January 1931, W A S Butement and P E Pollard of the Signals Experimental Establishment at Woolwich made a proposal for a system for the detection of ships. They suggested that if a pulse of RF energy were radiated in a highly directive beam to impinge on the target, with the echoes being received in the interval between the pulses, the range of the target could be determined by the delay of the returned echo and the bearing from the position of the aerial.

Butement and Pollard carried out a number of experiments and even succeeded in receiving returns from short distances.

Details of the scheme were passed on to the War Office and the Admiralty, but neither were sufficiently interested to either support the work or even inform the Air Ministry.

The strategic situation

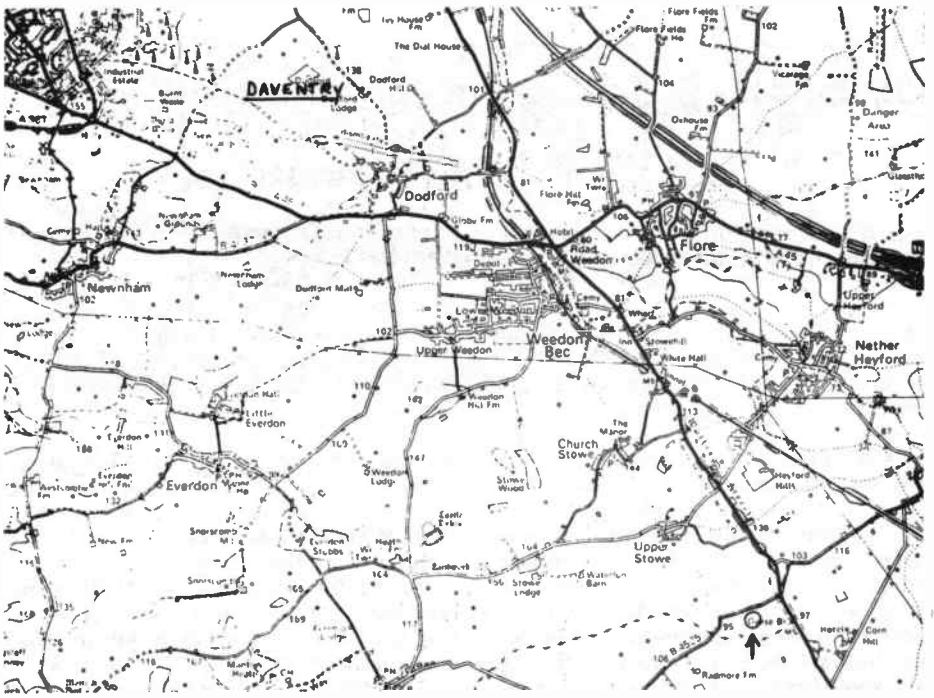
In the early 1930s Great Britain was wide open to air attack. In the First World War, some twelve years previously, the country had suffered initially from raids by Zeppelins and later bomber aircraft had been developed which could raid coastal targets and even reach London.

In the intervening period, however, aviation development had been rapid. Lindberg had crossed the Atlantic and long-distance air routes were becoming commonplace. Aircraft speeds were increasing, with Schneider Trophy race aircraft capable of speeds in the region of 400mph. The load carrying capacity of aircraft was also considerably greater than in the WW1 period.

The overall result of this was that, in any future war, the country would have to be defended against an opponent equipped with fast bomber aircraft, each carrying a substantial bomb load and flying at high altitudes. Of particular concern was the threat presented by the rapidly expanding German Air Force – the Luftwaffe.

The ability of a bomber force as an instrument of offence had been recognised originally by Marshal of the Royal Air Force Viscount Trenchard during the latter part of the First World War and then, perhaps conveniently, forgotten until 10 November 1932, when Stanley Baldwin uttered the ominous but, at that time, accurate warning that 'The bomber will always get through'.

The basis of this warning rested on a combination of geography and the ever increasing speed of bomber aircraft compared with that of the defending fighters.



A map showing the location of the BBC Daventry transmitting station and the mobile laboratory (arrow lower right)

Intercepting the enemy

There is no part of the United Kingdom which is more than seventy miles from the sea and many of the potential targets were far less. Thus an enemy aircraft could commence its attack within twenty minutes to half an hour of crossing the British coastline. Assuming that the enemy aircraft could be detected immediately at that time, the defending fighter squadrons had realistically fifteen minutes to scramble, climb to the bomber's height, locate and intercept if the target were to be defended.

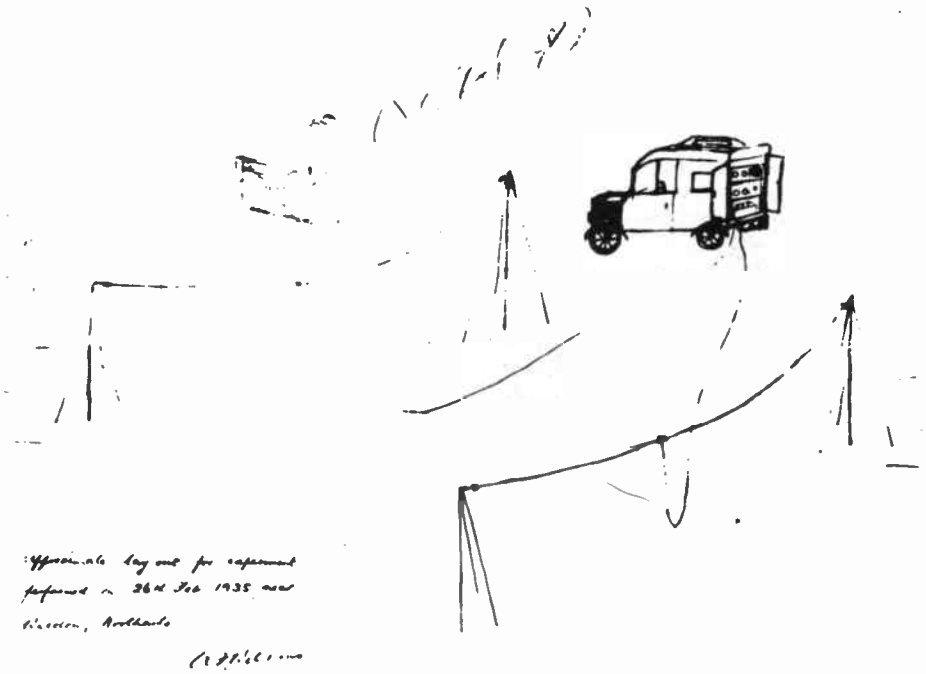
As the first five minutes were occupied getting airborne (it is little different today), ten minutes was a hopelessly inadequate time to climb to perhaps 20,000ft, and then locate and destroy the enemy.

Even if this were practical within the timescale, it was essential that the enemy aircraft should be detected on approaching the coastline and their subsequent course accurately plotted.

To this end three systems were then in use: standing patrols of aircraft along allotted stretches of coastline; a large 200ft long by 25ft high concrete acoustic mirror feeding a system of sensitive microphones on Romney Marshes, and a system of regional observers. The last one later became the Royal Observer Corps, maintaining a vigil from predetermined observation points and reporting the estimated course and height of any observed aircraft to a central point.

All these methods were ineffective; the first owing to the reluctance of successive British governments to provide the necessary finance for sufficient numbers of aircraft and pilots; the concrete mirror because its maximum range, even under perfect conditions, was only fifteen miles, the bearings were inaccurate and the system could supply neither height nor range indication, and the observer corps failed owing to its inability to give advance warning of a raid until the hostile bombers had actually crossed the coast.

This sketch, by Arnold Wilkins in 1984, shows the site layout for the mobile team during the Daventry Experiment



The extent of this problem was effectively illustrated by the summer air exercises of 1934 during which London and Coventry were selected as targets for night attacks.

The post exercise analysis showed that only two in five of the bombers were intercepted and, on the last night of the exercise, roughly half had reached their target. Baldwin's dictum was apparently vindicated and Winston Churchill summed up the situation, describing London as 'The greatest target in the world. A kind of tremendous fat cow tied up to attract the beasts of prey.' As far as air attack was concerned, Great Britain was virtually defenceless.

Death rays

It was, however, H E Wimperis, Director of Scientific Research at the Air Ministry, who inadvertently took the vital action which resulted in the development of an effective early warning system.

Over the ten years during which he had been Director, he had heard of many proposals for 'death-rays' but none had been substantiated, even when a reward of £1,000 was offered for a successful

CHAIN HOME: BATTLE OF BRITAIN RADAR

A Handley Page 'Heyford' bomber flown by Sqdn Ldr Blucke in the Daventry Experiment

demonstration. In January 1935, however, he decided to resolve the problem once and for all. He telephoned Robert Watson-Watt of the National Physical Laboratory's Radio Research Station at Slough, asking him to visit the Air Ministry and advise on the practicability of proposals for the so-called 'death-rays' in terms of causing structural damage or functional derangement to enemy aircraft or their crews.

On his return to Slough, Watson-Watt asked his assistant, Arnold Wilkins, to calculate how much power it would be necessary to radiate from a radio transmitter in order to raise the temperature of eight pints of water from 95 to 105° at a distance of five kilometres and a height of one kilometre.

From the figures supplied, Wilkins realised that the quantity of water specified approximated to the amount of blood in a man's body and the upper temperature corresponded to fever temperature. From this, Wilkins accurately surmised that a death-ray was wanted. The result of his calculation showed that the power required was fantastically large and it was obvious that such a device could not be produced with current technology.

When informed of the result, Watson-Watt was not surprised and only commented 'Well, I wonder what we can do to help them.'

Radio wave reflection

Wilkins was aware of the phenomenon of the reflection of radio waves by metallic objects and brought this to Watson-Watt's notice.

Watson-Watt then asked Arnold Wilkins to calculate the radiated power necessary to produce a detectable signal reflected from an aircraft at a given range.

In addressing this problem, Wilkins made the basic assumptions that an aircraft would have the approximate re-radiation properties of a halfwave aerial and that the aircraft would measure about twenty-five metres horizontally and three and a half metres vertically.

From these assumptions he calculated that aircraft could be detected by radio techniques – a result that Watson-Watt relayed to Wimperis in time for the first meeting of the new Committee for the Scientific Survey of Air Defence which was to take place on 28 January 1935.

The terms of reference of this committee were set by Wimperis and were 'to consider how far recent advances in scientific and technical knowledge can be used to strengthen the present methods of defence against hostile aircraft'.

The members were: Sir Henry Tizard in the chair; H E Wimperis representing the Air Ministry; Professor A V Hill, FRS, of University College and Professor P M S Blackett, FRS, of Birkbeck College, Cambridge, as independent members; with A P Rowe acting as secretary.

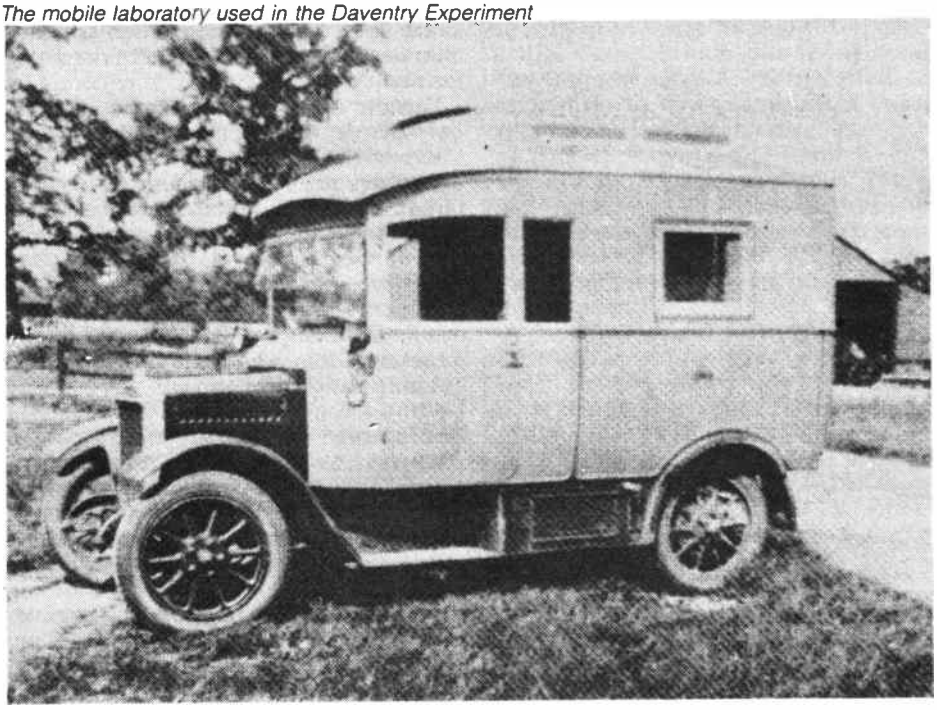
The first meeting of the committee was in Room 724 of the Air Ministry at 11.00am on the morning of 28 January 1935. Several topics were discussed including Watson-Watt's reply to Wimperis's 'death-ray' question. In association with this, he stated that a more detailed memorandum would soon be available.

Watson-Watt duly produced a paper on *Detection and Location of Aircraft by Radio Methods* which was discussed over lunch at the Athenaeum on 14 February by Tizard, Wimperis, Watson-Watt and Sir Christopher Bullock.

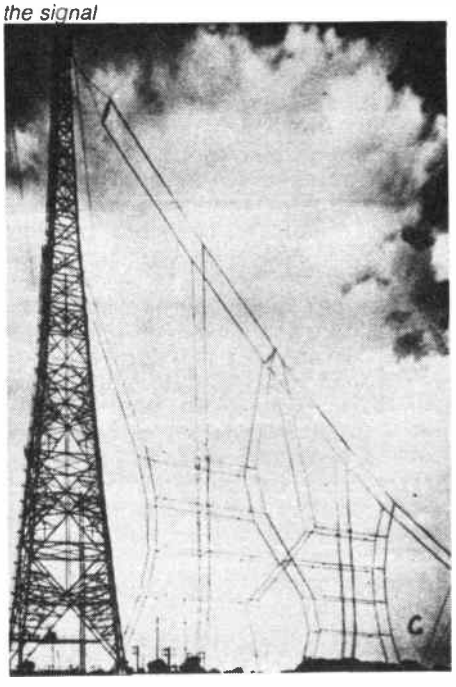
Wimperis was so impressed with what he had read that the following day he approached Air Vice Marshal Sir Hugh Dowding with the proposal that £10,000 be spent on investigating this new method of detection.

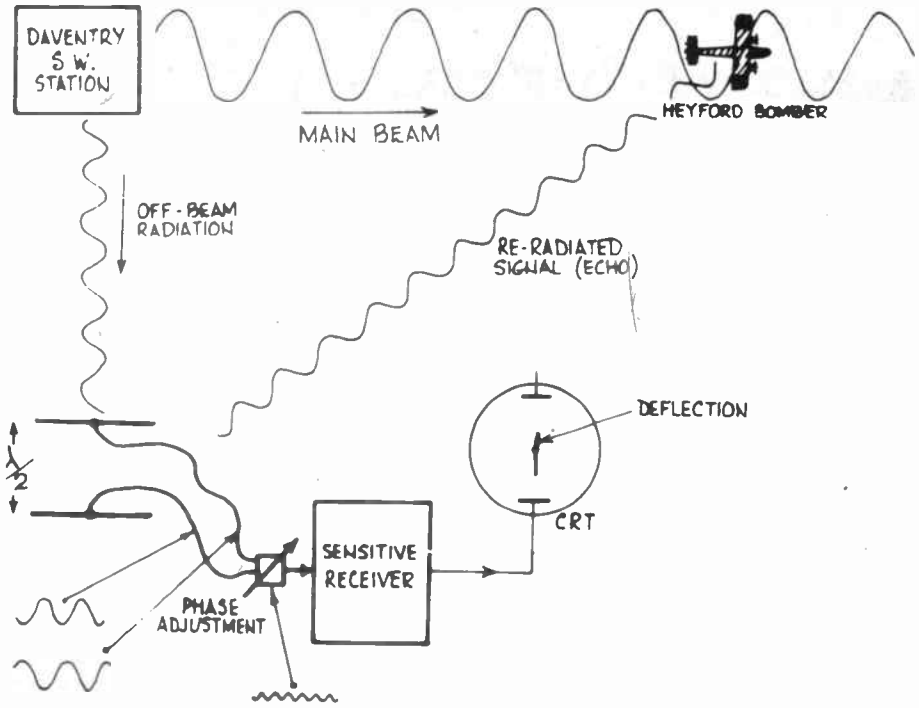
At first Dowding suggested prelimin-

The mobile laboratory used in the Daventry Experiment



The Daventry transmitting station which radiated the signal





The phasing diagram for the Daventry Experiment

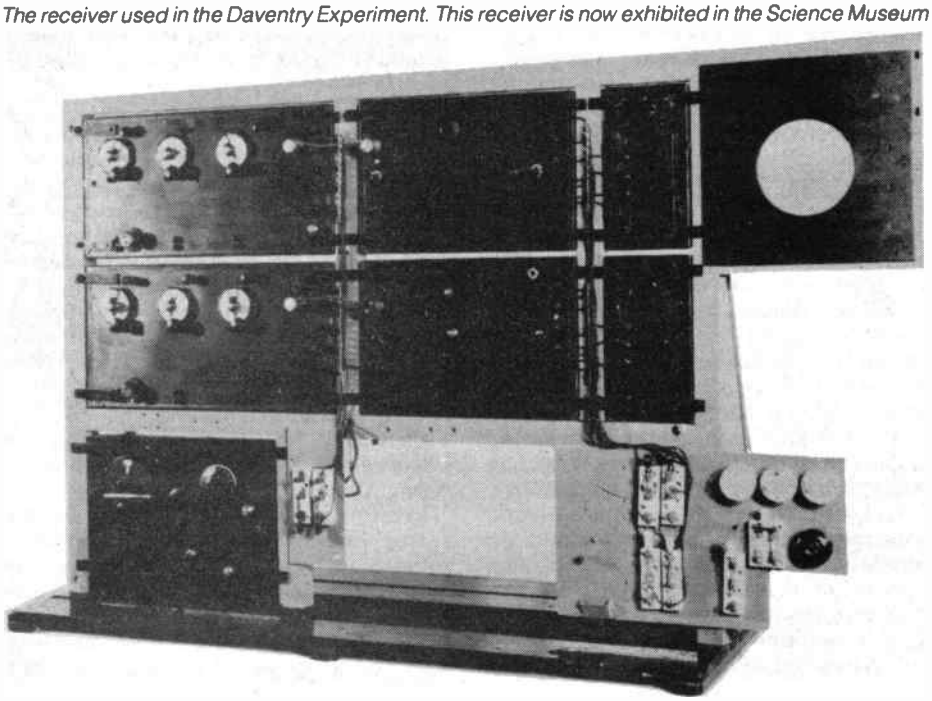
ary tests at Slough and this and various other possibilities were discussed at the next committee meeting which took place on 21 February. As a result, a test was arranged to take place near the BBC Daventry transmitting station a few days later on the 26th of the month. This later became known as the Daventry Experiment.

The Daventry Experiment

On 25 February 1935, Arnold Wilkins and his driver, Dyer, took a small Morris Commercial van, euphemistically called the Mobile Laboratory, from Slough Research Station to a field near Weedon Bec some eight miles from the BBC short wave transmitting station at Daventry. This radiated a power of 10kW on a wavelength of 49m. The beam was approximately 30° wide and inclined at an angle of 10°.

The plan was to fly a Handley Page 'Heyford' heavy bomber up and down the beam radiated by the BBC station and, using the radiated power as an 'illuminator', measure the power reflected by the aircraft structure.

The receiver used in the Daventry Experiment. This receiver is now exhibited in the Science Museum



Clearly the direct radiation from the transmitter would swamp any echoes received by Wilkins' equipment had not precautions been taken. These were extremely simple but highly effective.

Wilkins erected two halfwave horizontal dipoles, one behind the other at a distance of about half of a wavelength facing the transmitter. The feeder from each dipole was connected to the receiver via a phase-shifter. The output from the receiver was then connected to the 'Y' plates of a cathode ray oscilloscope. The phase shifter was first adjusted to cancel the direct signal from the transmitter and then 'off-tuned' to give a slight residual deflection for reference and to provide continuous monitoring of the incoming transmission.

On the morning of 26 February, the Heyford bomber, piloted by Squadron Leader R S Blucke, Flight Commander of the Wireless and Electrical Flight at Farnborough, took off and, navigating by dead reckoning, flew a course between the transmitting and observing stations. On the ground the cathode ray oscilloscope was being observed by Watson-Watt, Wilkins, and A P Rowe in the dual capacity of secretary of the committee and official Air Ministry observer.

The results were immediate and conclusive, the Heyford returning measurable signals at ranges of eight miles or more, confirming the optimistic forecasts of Watson-Watt and Wilkins. The former was so impressed by the results that he is reported to have remarked 'Great Britain has once more become an island!'

This demonstration, which has since been hailed as one of the most convincing ever staged, took place within a timescale which would be inconceivable today.

Arnold Wilkins and Dyer left the Slough Research Station in the mobile laboratory at midday on 25 February, reaching their destination during the afternoon. They then set up the equipment and had tested it by late evening.

The following morning Watson-Watt and Rowe arrived, watched the demonstration and returned to London on the same afternoon, while Wilkins and Dyer dismantled the equipment and returned to Slough.

When the success of the Daventry Experiment was communicated to Dowding he was delighted. He told Wimperis that he could have all the money he wanted, within reason, to develop the system, with £10,000 being allocated immediately.

Next month we will follow the development of Britain's first radar and ground-controlled interception system to the point where it played a decisive role in winning the Battle of Britain.

The World of D | A | T | A

BY DON FIELD G3XTT

First, news of a couple of delays. The Microsat satellite launch was delayed yet again relative to the information I put in this column last month, but hopefully will have taken place by the time you read this.

Secondly, the improvements to the Amateur Licence, scheduled for January, were delayed owing to staff shortages at the DTI. This affected the arrangements whereby the RSGB will be able to issue Notices of Variation for the 70MHz and 430MHz bands. Let's hope this is sorted out soon.

Operating

The HF RTTY frequencies were busy in January with the Bouvet Island expedition and the ARRL RTTY Round-up. I worked 3Y5B and ZS8MI on 15m just a few minutes apart on the Saturday of the contest, which was exciting to say the least!

Acrimony

I see that there is still acrimony about packet frequency allocations on the HF bands, especially on 20m. The ARRL licensed a number of mailboxes to operate above 14.1MHz, and IARU Region III has endorsed the use of frequencies above 14.1MHz for packet operation. Region I (Europe and Africa) has opposed this, though the RSGB has taken a pragmatic view and supported a few mailbox allocations above 14.1MHz on an experimental basis in order to allow intercontinental forwarding of mail. There is an IARU Region I conference due to take place next month in Barcelona, so it will be interesting to see if the official line changes.

Although I have yet to see it, there is an ARRL petition to the FCC recommending that packet operation be moved back below 14.1MHz. If so, this is an interesting about-face on their part. In practice, unless radical improvements are made to HF packet equipment and procedures, I do not think HF packet will survive the next sunspot minimum when HF traffic is impossible on 10 and 15m, and 20m once again carries most of the activity. What we need is some sort of hybrid of AMTOR and packet with the best features of each.

VHF packet network debate

Meanwhile, the debate about the effectiveness of the VHF packet network continues apace, with lots of messages generated recently about network delays and congestion on the one hand, and in support of the various volunteers who make the network possible on the other. This is the key, of course. The network is run on a voluntary basis, and we can't insist on a node being set up where there is a gap in geographical coverage or being closed down where there are already too many nodes. G3CDK, who prompted much of the debate, draws several interesting conclusions:

1. MBX/BBS could be better run by local groups rather than individuals. This would provide better back-up in the event of equipment failures, would allow the sharing of expenses, and by mutual support would enable the duties of the SYSOP to be shared rather than fall on one individual.
2. Some users would be more than delighted to contribute in time, equipment or money to a local BBS. At present, in many areas, there are no facilities for this to happen.
3. Granting variations of licence should be carefully considered, taking into account geographical considerations, the estimated number of users, and a better attempt should be made to spread the use of conflicting frequencies (though the RSGB Packet Working Group are understandably reluctant to set themselves up as judge and jury as to who should be allowed to operate a BBS in a given area and who shouldn't).
4. Nodes should be regularised in a similar manner to BBS/MBX, and attempts made to allow these only where they are needed (the comment in (3) applies equally here).
5. A re-examination of the forwarding system should be undertaken; it may be possible to make better use of 1296MHz.
6. To avoid 'black holes' in the network, financial and other support could be considered for those areas in the link path which are difficult to activate and maintain. Some kind of central users' fund is one idea which may be possible.
7. The bandplan should confine simplex packet to frequencies not designated as BBS/MBX channels, or Nodes/Forwarding channels.

The underlying theme of these recommendations appears to be that we should work collectively to improve the network, rather than let individuals do what they think best.

I suspect the main reason that packet BBSs have developed differently to, say, VHF voice repeaters, is mainly the cost. While a local club can sustain the cost of putting a voice repeater on the air relatively easily, a BBS is a different matter. Even in this day and age a personal computer, preferably with hard discs, does not come cheap. There is also the issue that a BBS needs much more operator attention than a voice repeater, which can often be left for months on end happily doing its job. Perhaps what we are looking for is the development of a fairly cheap, totally self-contained BBS, consisting of a TNC plus microprocessor and memory, all in one box. Imminent development in memory technology may well make this feasible and free all the PCs for other purposes. In theory, it could be done now by buying a cheap PC motherboard plus hard-card memory and packaging these with one of the readily available TNC kits. Has anybody tried it?

Network facilities

Do you operate a network facility for which you would like to get publicity? I know of two amateurs in my part of the world who have conference-bridge facilities (allowing several connected packet stations to have a round-table contact) and bemoan the fact that no one uses them. Others have built up specialist databases or collections of software, again only to find that they are rarely used. I'm sure there must be other similar situations around the country. Please pass on details, including the basic user instructions, and I will publish them in this column.

In terms of the way the network is used, I was heartened to see the interest generated by Mike G8AMG's series of bulletins entitled '8086 Assembler Tutorial'. To see the network used for educational purposes, rather than as a soapbox for gripes about the RSGB and

others, made a refreshing change. Let's hope more packet users follow Mike's excellent example.

Contests

While talking about operating aspects of datacomms, don't forget that the BARTG-sponsored spring contests are almost upon us. The VHF/UHF RTTY Contest will take place from 1800hrs on 14 April until 1200hrs on the 15th (which must include a four hour rest period). The contest is for the 144, 432 and 1296MHz bands and all contacts must be direct two-way. The organisers are conscious of falling support for the VHF/UHF events and are looking for an alternative format for the autumn contest in the hope of encouraging greater participation. If you have any views write to: the BARTG Contests Manager, John Barber, 32 Wellbrook Street, Tiverton, Devon EX16 5JW.

The HF Contest is scheduled from 0200hrs on 17 March until 0200hrs on 19 March, though operation is limited to thirty hours and each rest period must be of at least three hours' duration. The contest covers the 3.5, 7, 14, 21 and 28MHz bands.

I will provide photocopies of the rules in return for an sae. Both contests offer an excellent opportunity to improve your RTTY totals for the various operating awards available from BARTG and others.

BBS software

New releases of BBS software seem to appear on an almost daily basis. AA4RE has recently updated his program to allow multiple connects, with the difference that his system does not require multi-tasking software, such as DesqView, but is totally self-contained. A number of new commands are also included. What's more, AA4RE continues to look for ways in which his software can be improved. One proposal he has put forward is a possible enhancement to the Send command to allow optional information, such as Expiry date of message or Reply Requested.

We certainly need these kind of enhancements and plenty more besides. I just hope that those who write BBS software ensure consistency between their various packages, so that the end users actually gain, rather than suffer from confusion. Incidentally, I gather that some of the software on the Continent is quite sophisticated, allowing the user, for example, to choose which language he would like the prompts to be in. Do any World of Data readers have experience of using the packet network overseas?

The USA

A recent issue of Gateway, the ARRL packet radio newsletter, contains some statistics on the size of the US packet network. There are now 1,686 mailboxes in operation and 1,584 digipeaters. Not surprisingly California has the highest statistics of each, 169 and 146 respectively.

The California network proved particularly valuable following the San Francisco earthquake. The network worked well while handling large amounts of health and welfare traffic, though a number of valuable lessons were learned for the future.

One of the major benefits of packet was the way in which its networking facilities allowed traffic to be rerouted as necessary to avoid congestion, though this required quite a lot of manual intervention. It also became clear that voice still had a major part to play for 'tactical' communications. The main lesson was that it helps to plan ahead for emergency situations. This also means informing everyone of what is likely to be expected of them and training them in disciplined operating procedures, such as standard message formats. Speed and clarity may not be too important in our normal day to day packet operations, but in an emergency situation they are crucial.

R5 AF filter

I have received a press release from BARTG stating that they can now supply a PCB for the G3ISD audio filter, which was described in BARTG's **Datacom** magazine and is based on an article which appeared in **QST** back in April 1986. The filter allows you to tailor the audio response of your receiver to optimise it for reception of data transmissions, such as RTTY and AMTOR which, given the relatively poor filters in many TNCs (in fairness, they are designed primarily for VHF rather than HF operation) is a valuable facility to have. The PCB is available from: G3ISD, 147 Borden Lane, Sittingbourne, Kent ME10 1BY and costs £5.25 including postage and packing.

BARTG also market a number of other useful items, including an RTTY programme for the IBM PC and clones, which costs £9.95.

One of their best-known products is the Versaterm, a terminal unit for RTTY/AMTOR/CW, which will run with any computer and costs £50.95 as a kit, or £63.93 ready-built. For further information about this and the RTTY software contact Peter Adams G6LZB, 464 Whippendell Road, Watford, Herts WD1 7PT.

As you can see, if you want to get started on RTTY or AMTOR and are not bothered about packet, then you can do so very cheaply indeed.

Finally, the mention of RTTY software reminds me that I am on the lookout for any software which might interest HF-minded amateurs, to show at the RSGB HF Convention in September. I would be interested to hear from readers about packages which they can recommend for logging, contesting, RTTY, antenna design, etc. Ideally I am looking for packages which run under MSDOS, but want to cast the net as widely as possible.

The April 1990 ***Amateur Radio*** will be on sale 29 March 1990

SECOND-HAND

by HUGH ALLISON G3XSE

A problem solved

Coaxial power plugs are normally the sort of thing you find on the bottom of rigs, running the rig from an external source of 12V or whatever. Actually, the socket is on the bottom of the rig, the plug is on the power lead. I've had stacks of rigs come in with the changeover bit of the socket not working. This invariably leads to the rig running on external power but dead on internal batteries.

It's really galling to take the socket out and get it working by applying a light pressure on the moving arm, only to find that when you let go, the sodding thing goes open circuit. Although Tandy sells a spare socket that can get you out of a lot of trouble, I'd milked the local store dry and couldn't get one to repair a mate's FT209. In order to make a repair, the moving arm needs to be held back and the tip bent forwards. I tried using a spare plug in the socket to do this but just ended up with a broken plug – they ain't too strong. I had almost given up in despair when I had a brilliant idea – for once!

If a suitable size of threaded spacer (0.2in, roughly 6BA) is plugged into the socket (**Fig 1**), the arm will be securely held in place while you bend it. The use of the spacer is great 'cos if you stuff a screw into the socket you can use it as a fine end stop to accurately guide the screw into position. Works every time. Incidentally, ensure that the Ni-Cads are out or disconnected before you stuff spacer up power sockets.

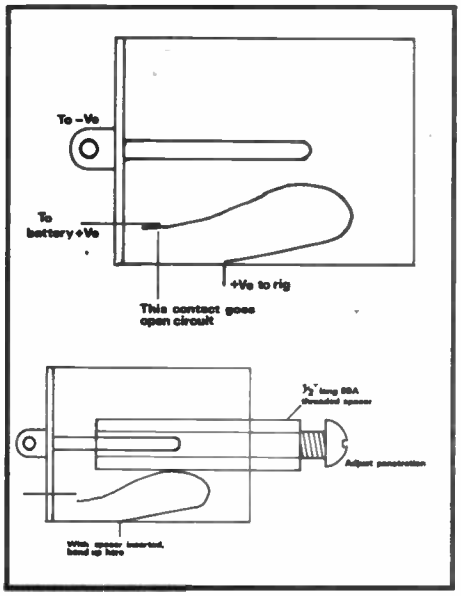


Fig 1

Rechargeable battery packs

A friend of mine does not look well. The well used battery pack for his IC2E (OK, more than well used, thrashed to death) is no more, and he has just found out the price of a new one. He decided that I am going to repair it; I have no choice in the matter.

Reluctantly, I open it up. It is sort of hairy inside: long thin needles, like crystal growths, abound. The earth wire has corroded between the top metal plate and the charging socket within the battery pack. Carefully I check the cells, they are totally exhausted, ie, they contain no charge. A good way to clean off the hairy growth is with a good scrubbing in water. Since the battery pack contains electronic gubbins (now also hairy), it isn't a good idea to slosh water about if the batteries are charged.

Scrubbing out a battery pack under a tap with a toothbrush is best not performed in front of its owner if you can arrange it, but I made an exception in this case (a thorough drying out with a hair-dryer afterwards is a must). The corroded wire was replaced and it accepted a charge.

After a couple of cycles of charge/discharge over a few days, the now delighted owner reported that the cells were holding 90% of their original capacity and was well pleased. I offered to replace the cells – so-called 'telephone packs' for cordless phones often contain the right size and can be picked up quite cheaply new and unused, often for under £2.00 – but my friend didn't want to bother and therefore we left it at that.

My receiver . . .

I get the odd letter occasionally saying, 'I've bought/been given/inherited this Nagombi receiver and would like to write to the manufacturer. I would also like to know which aerial is the best for this receiver.'

Well, super. For a start, twenty years ago many firms were banging out four valve short wave receivers that were little more than tarted up domestic medium wave radios. The name on the front panel was probably only the model number and no clue can be gathered from that as to the maker's true identity, or the manufacturer has long since gone out of business. Sometimes the name was exclusive to one outlet. One manufacturer used to advertise the fact that if you bought over 1,000 receivers they would brand-name 'em what you liked. Nagombi may well have vanished.

Second point. Why do you want to write to the makers anyway? If you want a handbook, a better bet is to advertise in the Free Classified Ads in this magazine. Quite honestly, with a lot of sets, the handbook says little more than turn it on and twiddle the knobs. Any self-respecting amateur normally plugs an item straight in to play with it and only reads the handbook years later in a moment of boredom.

Perhaps you need a circuit? Again, try a wanted advert, or there are specialist circuit suppliers about; look in the back of this and other magazines for advertisers.

Looking at it another way, let's say you flogged someone a second-hand car twenty years ago. The car has gone through several owners since then. If the present owner came back to you for help, especially help that would cost you time and/or money, how helpful do you think you would be? Now reconsider the attitude of a firm that made a receiver twenty years ago . . .

Aerials

Turning to the other point which these letters raise, regarding aerials, the best reply is the old standard, as high and as long as possible.

If you can get the bugger up out in the open, all the better. Otherwise the loft or round the room will have to do, even though this will increase interference from TVs, lighting circuits and thermostats etc.

Once you have played with your receiver and gash wire antenna for a while, you may well find that a particular band holds mega fascination for you. A special aerial for that band may then be considered; there are plenty of 'wire aerial' books about.

One final point. Many people graduate into short wave and/or amateur radio via CB. If you have your CB aerial up, *for receiving only* you will do no harm trying it on any band you like. **Never** transmit up an aerial cut for another frequency.

I've got the flu, honest

– Er, well. I went to a rally and bought this FT708R. I was not well, brain a bit addled and not thinking straight. Even in the flu-ridden state I was in, at £15.00 the FT708R had to be a bargain. (It is a hand-held with keyboard entry, 70cm, synthesised FM wonderbox.)

When I get home I put it on the bench. Not going is it? At that price I've no right to expect it to be. Trouble is, my eyes don't focus; really can't work out what's happening – should be in bed really. Run round with a 'scope probe. It's got this crystal, which isn't oscillating, connected to an IC.

Well, I think. No point having a crystal that isn't oscillating is there? Not

oscillating on receive, transmit, nor repeater (plus or minus). One end of crystal rail, other earthy. Rebias earthy end with 100k resistor to high end. It oscillates. Rig doesn't run but could well be faulty. My scrambled brain thinks, order a new IC.

I phone this lady up, ever so good she is. I do my best to describe the rig, its trouble and IC. 'Two quid,' she says. I give my card number and wait a few days. Plop – a small parcel is delivered by the postman. It's the ordered IC. I remove old one. Fit new one. Rotten rig still doesn't work.

My brain, now recovered, notices that the rig has a dial facility. If you transmit and hit the dial buttons the aforementioned crystal does oscillate (bleeding battery saver circuits). Who's wasted £2.00 then?

Now I notice the corroded track and replace it with bare tin copper wire. The rig works much better after that. When I'm not well I shouldn't repair rigs should I?

Thermal fuses

These little things are either bullet-shaped or look like a small square-cased capacitor. They are often in series with the mains input to your gubbins, though sometimes the sods are hiding *inside* mains transformers. If your eyesight is pin sharp you can read the sub micron writing on them, something like '0.5A, 127°.' I'm sure you don't need me to tell you that the thing is going to go permanently open circuit if half an amp, or more, goes through them, or if the ambient around them exceeds 127°C.

In your domestic junk, heated hair rollers, travelling irons etc, you might find the fuse behind the heating element to permanently shut the unit off if it overheats.

In amateur gear (and computers) they very often lurk below the mains transformer, if the transformer is PCB mounted, or they are within the transformer. The latter is usually the case with battery chargers, mains adapters, PSUs etc. Obviously, the clue is that the mains winding appears open circuit. Now look carefully at the windings. The mains one is often covered with tape. A bump, usually on the other side of the transformer from the leadout tags, may well be hiding the fuse. Cut into it carefully, removing a layer of tape at a time, until you reach it. I bet it's open circuit.

The good news is that replacements, for some currents only, are available at some Tandy stores. If you have no luck try the equipment manufacturer/agent. Sometimes you can get involved in an interesting row, 'cos they don't even know it's in there either.

Please, no linking the bugger out. It's gone, probably for a reason. I know it may be difficult to obtain a replacement and the temptation is to carry out a quick bodge, but don't. The new replacement should be carefully fitted and insulated as with the original. If you don't know what you're doing don't replace thermal fuses, 'cos we are talking real mains and you shouldn't be in there anyway.

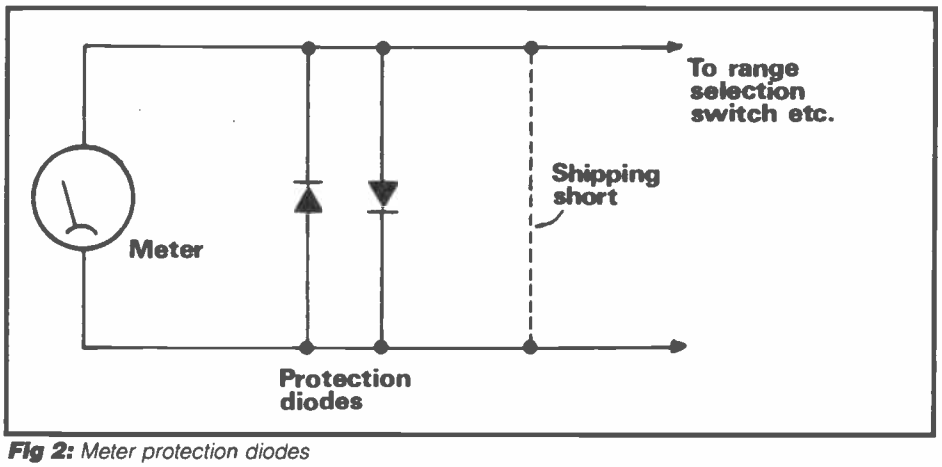


Fig 2: *Meter protection diodes*

B, not 8, you fool

Recently, I had a transceiver in for repair. Loads of volts heading towards its transistor but bugger all coming out, so I heave it off the board. It's got C1068 stamped in it. Obviously a 2SC1068; in one goes, it's working, well nearly, but it isn't really setting up right. After a quarter of an hour I give in.

Circuits out. I resume my investigation and turn the board over to look at the component side. Little warning bells go. The three rat holes where the component leadouts go through are marked CGA. Must be a thyristor or triac, I think to myself. I look at circuit diagram, sure is, grotty print though.

Why did the one in it have a transistor number on it? A closer look reveals C106B, not C1068. I think I'll take up carpentry . . .

Multimeter 'protection' circuits

Many low cost multimeters have either one or two diodes across the meter movement, often back to back (**Fig 2**). They are your meter protection diodes.

The idea of the game is that diodes do nothing till there's 0.7V across them, then they turn on and conduct. Now your average multimeter meter movement is trying to bash holes in its case with 0.7V across it (we are talking of you masochistically putting, say, 1kV across the thing when it's switched to the 250V full scale deflection range). The diodes 'save' the movement from damage, owing to them taking the excessive overload. Occasionally a specially made multimeter, back to back, diode is used. It's black, has ¼in diameter and has the appropriate symbol on it.

If you get really enthusiastic with your overload – 10A with it on the 100µA range works well – or the ubiquitous bugger-any-meter-movement test of mains up it whilst on ohms (we've all done it!), then the diodes have so many volts across them they turn their toes up. If it's your lucky day the diodes might go dead short, if it isn't they go open circuit amazingly quickly, followed by the meter movement. The cure is to cut out the diode, see if the multimeter now works, then replace the diode. Diodes are so cheap it really does seem worth replacing them. A 4148, or whatever, will do.

One final point about meter movements. Very often the meter movement and diode are shorted out with 1in of wire before they're shipped to the UK. The short acts as a meter damp. They are supposed to be removed in the shop prior to sale. Occasionally they aren't. I was quite pleased with a quantity I picked up, brand new and boxed, but sold as not working, which all had the damping strap in place. 25p each was definitely a reasonable price.

Toshiba TC9122P

This is a well used chip, especially in hand-held synthesised boxes – 2m and 70cm. You find 'em hanging on the end of the thumb-wheel switches which do the channel charge. The problem is that the input pins on the chip start to go high by themselves, ie, without the help of the thumb-wheel outputs. What should be a 0 becomes a 1 for no good reason.

Failure modes of ICs are erratic at the best of times, so don't take this as gospel. Quite often your wonderbox has only two channels, the one that corresponds to all the 0's address – often 140 or 430MHz, that comes up when selected, but change any address, ie, dial in 141 or 140.01MHz and it's gone (or trying to go) to the all 1's frequency. A 'scope on the TC9122P input pins will show them all going up the moment you move off the all 0 address.

Sometimes they all jam up while a few others go high, but there are no hard and fast rules.

The only cure, I'm afraid, is a new chip. I've seen them sell from £7.00 plus 50p carriage and VAT, to £10.00 plus £3.00 carriage and VAT, each.

A USER REVIEW

THE KW 2000B SSB RECEIVER (TRANSCEIVER)

by Ken Michaelson G3RDG

Having recently sat in the driver's seat of a very large and impressive receiver, namely the Racal RA 117E, which was about thirty years old, I thought it would be interesting to see how a transceiver from the same period performed. To this end I obtained a KW Electronics 2000B SSB transceiver, complete with its own power supply and loudspeaker in a separate matching case.

Controls on the front panel

The front panel of the transceiver is painted in dark battleship grey with white lettering. The centre of the front panel contains the dial window, the dial being calibrated in kHz from 000 to 200. Below this is a precision dual speed tuning assembly which facilitates fast-dial movement to the desired band segment, and a smooth low speed drive for positive vernier tuning to the exact frequency selected.

To the right-hand side of the front panel are, from top to bottom: PRE-SELECTOR, PA TUNE, EXT/INT/VOX, IRT/OFF/ITT/IRTT, BAND switch and 'PHONES socket. The left-hand side comprises: AF GAIN, IRT TUNE ±, METER, RF GAIN, MIC socket and MODE switch, which also controls the POWER on/off. There are two controls under the tuning knob, from left to right: MIC GAIN and PA LOAD. Two extra controls are located to the left and right of the tuning window, these are: CAL ON (a red push button) and CAL SET (a rotary control).

On the rear of the transceiver are five preset potentiometers, from left to right: VOX SENS, ANTI VOX, DELAY, 'S' METER SENS and 'S' METER ZERO. Below these are an SO239 antenna socket, an octal socket and a polarised Paignton plug which accepts the female Paignton socket from the separate power supply/loudspeaker unit.

The octal socket, in addition to allowing for the connection of a Morse key, is also used for an extension loudspeaker, an external control for operating the TRANSMIT/RECEIVE switch and the KW 110 Q multiplier, if required.

The case of the transceiver has a lift-up top and is made of perforated aluminium mesh, finished in light grey with rounded edges. The front rim of the case is finished in a lighter shade of grey.

Mains power supply

The ac mains power supply is housed in a separate cabinet which also contains the loudspeaker.

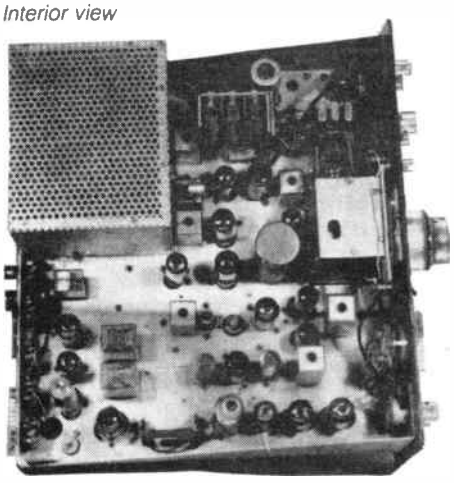
The rear of this unit accommodates the ac mains selector panels and a slide-switch, which gives high and low power. Also at the rear of this unit are: a female Paignton socket, mains lead, preset pot (to adjust the standing current on the PA valves) and three fuses, a 3A mains, an HT 750mA and EHT 750mA antisurge.

Technical advances

The specifications of the KW 2000B illustrate the technical advances which have been made in the last two decades. First of all, a general-coverage facility has been included in the receiver section. This has certainly made listening more interesting, although the KW 2000B, tunable from 7.0 to 7.2MHz and 21.3 to 21.5MHz, will cover some commercial broadcast frequencies. Twenty years ago, there was no thought of receiving FM so no provision was made for it. The latest budget transceiver from Icom, the IC-725, is a totally solid-state rig, and this fact completely alters the situation. Both receiver sections are double-conversion superheterodynes, but the KW 2000B has a much lower set of IF frequencies, the first IF being 3MHz and the second 455kHz, whereas with the IC-725 they are 70MHz and 9MHz.

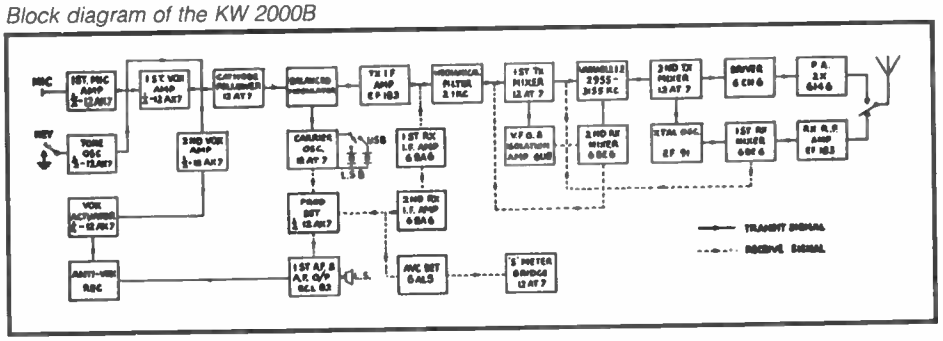
Twenty years ago, a high impedance mic such as KW's with its input impedance of 50k ohms was the state of the art, nowadays, all rigs have a low impedance of 600 ohms.

Interior view



Front view

Block diagram of the KW 2000B



The KW 2000B is not as selective as a modern rig, having a mechanical filter which gives a nominal 2.4kHz at 6dB and better than 5dB at 60dB. The selectivity angle for the reception of CW using the KW 2000B can be increased with the use of a KW 110 Q multiplier, which can be added to any receiver or transceiver having a final IF of 455kHz.

Band selection

Band selection takes a little time to become familiar with, owing to the 200kHz coverage on each bandswitch setting. The 80m band is split into two sections, 3.5-3.7MHz and 3.7-3.9MHz, as are the 14MHz and 21MHz bands. The 28MHz band is split into three segments. Modern rigs offer complete coverage of any one band but as this is not the case with this rig, I had to memorise which frequency and channel I was supposed to be on.

I like the two-speed tuning knob and, dare I say it, prefer it to the present-day knobs which give a variable tuning rate according to their rate of rotation. There are twenty-three valves in all so it takes about thirty minutes for the rig to warm up and become stable.

Using the rig

Operating the rig is a straightforward matter but, of course, there are more controls to move than in a modern rig. For example, the PRE-SELECTOR control (to receive and transmit) has to be used properly, otherwise the rig will suddenly lose all its gain.

The first step is to tune the PA into a 50 ohm dummy load. The owner's manual gives the settings for the PA load control for the various amateur bands.

When the function switch is turned to the third position of TUNE, the rig is on transmit and the TONE OSCILLATOR is switched on. This gives a 1500Hz note through the speaker; the volume of which is controlled by the AF GAIN control. I increased the mic gain until 50mA was indicated on the meter and adjusted the PRE-SELECTOR for maximum cathode current, then I increased the mic gain until an off resonance current of 130mA was found. I then started the tune and dip sequence until, in resonance, a current of 120mA was flowing into the dummy load.

I switched over to the external antenna, a shortened version of an 80m dipole, and used it in conjunction with an AEA AT-300 antenna tuner which gave a 1:1 SWR reading using my antenna on 80m. The same procedure was used to tune in other amateur bands.

Making contact

A number of QSOs were completed, mostly on 80m, with reports of excellent speech quality. Other contacts were made on 7, 14 and 21MHz which were up to the standard of the 80m contacts, but I found the slow return of the AGC a problem. Modern transceivers have a control to alter either the AGC speed or turn it off, but this facility is not included in the KW 2000B, consequently QSOs were more awkward than they need have been.

Conclusion

I enjoyed using the KW 2000B SSB transceiver and am of the opinion that its design was well ahead of its time. It even compares well with its American contemporaries, such as those made by Collins, Hammarlund, Hallicrafters and Heathkit. The KW 2000B is often available for sale in the amateur radio press and is certainly a welcome addition to the shack.

Specifications of the KW 2000B Transceiver

General	
Mode	Single sideband suppressed carrier (J3E), CW (A1A)
Bands covered	1.8-2.0, 3.5-3.7, 3.7-3.9, 7.0-7.2, 14.0-14.2, 14.2-14.4, 21.0-21.2, 21.3-21.5, 28.0-28.2, 28.4-28.6, 28.6-28.8MHz
Ambient temperature range	−10°C to +40°C
VFO stability	With constant input voltage to PSU better than 200Hz after warm-up period of thirty minutes
IRT and ITT	±6kHz from VFO setting
Power requirements	Fixed station 200-250V 45-65Hz Mobile station 12.6V dc nominal
Power consumption	Fixed station approximately 320W on transmit Mobile 10A on receive; 10/28A on transmit
Dimensions	
Transceiver	6.25in × 13.875in × 13.25in (WHD)
Ac power unit	6.25in × 7.75in × 13in (WHD)
12V dc power unit	5.25in × 4.75in × 8in (WHD)
Weight	
Transceiver	18lb approximately
Ac power unit	24lb approximately
12V dc power unit	6.5lb approximately
Receiver	
Reception modes	(1) SSB (either sideband selectable) (2) AM (exalted carrier either sideband) (3) CW
Input impedance	52 ohms
Sensitivity	Better than 1µV for 500mW output
Signal/noise ratio	Better than 20dB signal plus noise-to-noise ratio at 1µV input
Output impedance	3 ohms
Selectivity	Nominal 2.4kHz at 6dB, better than 5kHz at 60dB
AF output	1.5W
Spurious	Less than 1µV equivalent antenna signal
Transmitter	
Emission	SSB (either sideband selectable) CW (break-in keying)
Type of service	SSB continuous CW 50% duty cycle
Carrier suppression	50dB down relative to maximum output
Unwanted sideband	45dB down relative to maximum output
Mic input	High impedance
Audio response	300-2600Hz ±6dB
Output impedance	20-300 ohms approximately on all bands
Plate input power	180W PEP on SSB 150W on CW
Keying	Break in
Second harmonic	40dB down from output signal
Third order distortion	30dB down from output signal

DX DIARY

News for HF operators compiled by Don Field G3XTT

I write this towards the end of January, and after the successful end of the 3Y5X operation from Bouvet Island. Whether you are a serious DXer or only a casual user of the HF bands, you cannot have gone on the bands during early January without becoming aware of the intense interest and excitement engendered by this operation.

Unfortunately, as always with a major expedition like this, there was a down side, with deliberate jamming and interference, US amateurs operating out of band and so on. However, the 3Y5X signal was generally so loud that the interference wasn't a problem and, once the operation had been under way for a few days, they were relatively easy to work. Even their top band signals were good copy, albeit at 3.00am.

The pile-ups were quite large, right up to the end of the operation, but I do know that a number of the UK QRP operators were able to get through running just 3W. The UK 'big guns' were able to make it on five or six bands, and on CW, SSB and RTTY. In all, 3Y5X netted between 46,000 and 47,000 contacts.

The operation must have been a real adventure for all the 3Y5X operators, and I hope we will have the chance of meeting one or more of them at the HF Convention later in the year and hearing about their experiences at first hand.

QSL cards will not appear until April. When you send off your cards to LA6VM, do give some thought to enclosing a contribution towards the very high costs of the expedition. Indeed, at the time of writing there is a possibility that the journey back to Uruguay may take longer than expected owing to high winds and rough seas, and the boat is costing $5,000 for every additional day at sea!

As I said last month, the US expedition to Bouvet Island was cancelled at short notice, ostensibly because the ship they had hoped to charter was no longer available. There is a possibility that the expedition may take place next year but, if so, it may well have an alternative destination such as the South Sandwich Islands which, in amateur radio terms, now rate as being considerably more rare than Bouvet.

There was quite a lot of activity from Vietnam over the Christmas/New Year period. A Japanese team showed up as XV2A, closely followed by another Japanese group signing 3W5JA. In addition, there are now two permanent stations in Vietnam, 3W3AA which is a club station, and 3W3RR, Remi, who operates from Ho Chi Minh City.

The Colvins

Iris and Lloyd Colvin have been busy again. As I write this they are active from Bahrein as A92QL, having made almost 14,000 contacts with 161 countries in their three-week operation from Burkino Faso as XT2KG. They have now travelled in 208 countries, and managed to operate from over half of them, in an amateur radio career extending back to 1929. Well done to both of them, and may their expeditions continue for many years to come!

Southern Sudan

The southern Sudan has been absent from the bands for some years now, mainly as a result of the volatile military situation which makes access difficult. However, John PA3CXC is confident that he will be there for two to three weeks, beginning on or around 15 March. F2CW and PA3DFT are also planning to go. The callsigns will be 6U0CW on CW and 6U0DX on SSB. The hope is to run two stations round the clock on all bands, and there may be some RTTY and packet working.

The operation is linked with a scheme to raise money for charitable projects in southern Sudan, and the hope is that amateurs who make contact will be prepared to donate at least $1.00 per QSO. The activity will be filmed by a Dutch and American TV team who are making a documentary about the aid programme.

Other DX

AH6IO is planning a trip to Palmyra Island for 11-17 March or thereabouts. The plans also call for a stop on Christmas Island (T32) on 23-24 March for the WPX contest. Let's hope he pulls this one off.

WB2DND will be in the UAE (A6) again from 22-28 March, operating as A61AD. This time he plans to be especially active on 40 and 80m CW.

DL5UF and DK1CE are due to be in the Pacific until 4 March, operating from H4 and YJ. You may still have time to catch them on the usual DX SSB frequencies and 5kHz above the band edges on CW.

Ted OD5LX wrote recently in the FOC newsletter that his antennas have been partially destroyed by some of the 400,000 shells which have rained down on Beirut over the past six months. No incoming mail has been received for some months, and electricity is only available for six hours each day. Nevertheless Ted manages to stay on the bands in a limited way, running low power.

Since 1 January USSR stations have had access to 18 and 24MHz, which seems to have led to considerably increased activity on these bands. The higher classes of licensee are allowed both CW and phone privileges, others are restricted to CW only.

Prefixes

Estonian stations have been using the pre-war ES prefix since the beginning of the year, and both Lithuanian and Latvian stations appear to be using the prefix YL. The various Russian islands all have new prefixes as well. UA1PGO on Franz Josef Island has become 4K2PGO, the other European islands appear to have taken 4K3 prefixes, while the Asian islands are using 4K4.

IOTA

Island chasers may want to look out for Barry AL7LJ, who is active from Attu Island (IOTA reference NA64) until June. Tony KL7AF, himself an island station on Kodiak Island, will handle the QSLs. Check the IOTA frequency of 14260kHz in the evenings from about 2000GMT.

By the way, dedicated island chasers may want to have a go at the DIFM Award for working French islands. The basic award requires confirmed contacts with ten of the eighty-two different islands or island groups around the French coast. Send QSLs or photocopies to the awards manager, Gilbert Jeannet FE5AI, La Croix Guillaume, F-71220, St Bonnet-de-Joux, France. The fee is seventeen IRCs or FFr50, plus the cost of return postage for the cards.

Endorsements are available for single-mode, single-band etc, and for each additional five islands worked. I can provide a full list of the eighty-two island groups with their references if required.

Contests

The results of last year's CQWW 160 Metre CW Contest show that GW3YDX was world winner, even beating all the multi-operator entrants. Well done Ron! G4BYG, G4OBK and yours truly were

world sixth, seventh and tenth respectively (outside the US and Canada), while GM3IGW was world fifth in the multi-op category. My score, together with G4OBK's, led to the Chiltern DX Club coming seventh in the Club scores table out of eighty-three club entries.

Look out this month for the Bermuda Contest on 17-18 March in which UK stations gain points by working stations in the USA, Canada and Bermuda. Total operating period must not exceed thirty-six hours, with each off-period being at least three hours in duration. Both CW and SSB contacts are allowed on the same band with a given station, provided the contacts are at least one hour apart. Feel free to write to me for full rules plus a copy of the official log sheet if you intend to take part.

The CQWW WPX SSB Contest will take place on 24-25 March and, as always, we can expect the bands to be full of unusual prefixes. Single-operator entries are restricted to thirty-six hours of operation, and contacts on the LF bands (160-40m) count double points. Again, I can help with the full rules, plus official log sheets.

The Japan International CW DX Contest is on 9-11 March, though I don't have any further details.

CQ magazine recently carried the result of a contest ethics survey. Without going into too much detail, the survey seems to show that most contesters (bear in mind this survey was conducted in the USA) bend the rules from time to time with infringements such as 'rubber clocking' at the beginning and end of contests or guessing at missed reports. However, there were very few who admitted to blatant cheating (the survey was anonymous). As with all aspects of amateur radio, of course, the only person you end up kidding is yourself. The very nature of our hobby makes verification by a third party all but impossible.

Martti OH2BH, himself a well-known contester and DXpedition operator, picked up a similar theme in an interview which appeared in the January issue of **The DX Magazine**. Martti argues that some of the top contesters and contest groups had got to the stage of 'going for a win' regardless of their personal honesty or skill. This had led to others with greater integrity giving up contesting.

Martti's solution is to encourage leading operators and groups to log on computer (quite commonplace these days) and to allow their computer log to be cross-checked with others (some have proved noticeably reluctant to do this when it has been suggested in the past).

For himself, Martti is determined to carry on contesting but, in his own words 'to establish clean and exemplary operating procedures' while taking on, and hopefully beating, the other 'big guns'.

In practice, I suspect much of this discussion is irrelevant to UK contesters. The British have always nurtured a concept of fair play in any leisure or sporting activity. However, if we are to be able to compete sensibly in international contests with entrants from around the world, then it is important that they too 'play the game'. Any comments?

DXCC

DX News Sheet reports that cards for Banaba (T33) and Conway Reef (3D2) may be submitted for DXCC credit after 1 March. There are now 323 countries on the DXCC list, which means that you need 314 confirmed to achieve Honour Roll status. The recent XW and 3Y operations will have given a number of UK amateurs (myself included) the last ones they needed to rise to this exalted position – provided, of course, that the QSL cards don't get lost in the post!

QSLing

Talking about QSLs, I receive requests from time to time to include QSL information in this column. Nowadays almost all DX stations and DXpeditions offer a direct QSL route for those who do not want to wait for the QSL bureau to do its stuff, so it would be impossible to include a comprehensive listing of QSL routes here. What I will start to do is to show addresses for the major DXpedition operations.

For others, I can usually help with information in response to a request to my home address (please include an sae). I also have lots of International Reply Coupons available at 40p each if you need these for your direct QSLing. The alternative is to send a dollar bill. These are very acceptable in many countries, though beware. Receiving currency through the post is illegal in some third world and Eastern Bloc countries and you could be putting the recipient in a very difficult position.

Congratulations

Congratulations to Laurie Margolis G3UML, who has recently achieved five-band WAZ. Laurie managed this using only wire antennas from a suburban QTH in London, demonstrating what a good operator can achieve even with limited means. All his contacts were on SSB. As a TV reporter Laurie has to spend quite a lot of time away from home, which certainly didn't help.

Incidentally, K1MEM, a good friend of mine, has recently taken over the administration of the WAZ awards programme from W4KA.

Silent Key

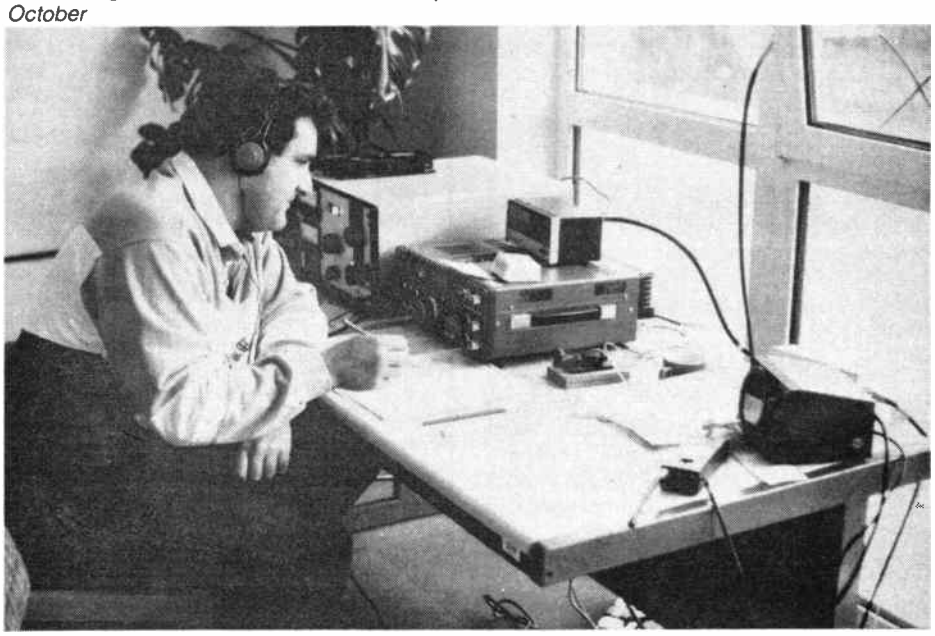
Ron Perks G4CP passed away recently. Ron was the highest placed UK amateur in the DXCC Honour Roll and remained very active on the bands right up to his death. Ron will be sorely missed by the UK DXing fraternity and by his friends in FOC (the First Class Operators Club).

Another recent Silent Key is Frank Anzalone, past DX and contests editor of **CQ** magazine.

Useful QSL addresses

A92QL via YASME: PO Box 2025, Castro Valley, CA 94546, USA.
XW8KPV via JH1AJT: Yasuo Miyazawa, POB 8-Asani, Yokohama 241, Japan.
XV2A via JA3UB: Jiro Miyoshi, Box 73, Amagasaki 660, Japan.
3W5JA via JA7JPZ: M Sato, 23 Tenzindo, Makawa, Higashitagawa, Yamagata, Japan.
3Y5X via LA6VM: E Wiig, Jacob Fayesv 6, N-0287 Oslo 2, Norway.

Laurie Margoll's G3UML, who is the latest recipient of five-band WAZ in the CQWW SSB Contest last October



TODAY'S TECHNOLOGY

by Ian Poole G3YWX

Technology should not be used just to improve the basic electrical specifications of equipment. Instead it should be used to improve the unit as a whole. Concepts such as ease of operation should be borne in mind far more than they are at the moment. Microprocessors are one example which illustrates how much more flexible things can be made, but they are usually far less user friendly. It is time for designers to take stock and assess the performance of equipment more from the user's point of view and judge how easy it is to use.

Another area where technology can be applied is in improving safety. This topic has been the centre of a lot of research and discussion. One aspect of this is the hazard of electromagnetic radiation from transmitters. But before looking at that in more detail, let's look at a couple of other topics.

More about DDS

There has been a lot of talk recently about DDS or Direct Digital Synthesis. With IC technology advancing at a tremendous rate its use has become more widespread in an increasing number of amateur transceivers, such as the Icom IC781, IC765 and the IC725.

Apart from DDS improving phase noise performance it can also result in faster scanning times. Conventional synthesisers based on the very familiar phase-locked loop shown in **Fig 1** can be relatively slow, often taking many milliseconds to change frequency. Although this may not seem very much it can be highly significant.

The reason for the slow tracking and lock times of conventional synthesisers is found in the loop filter. When loops have very small step sizes the filter must have a very low cut off point. This means that its ability to change will also be very slow.

Direct digital synthesisers do not suffer from this drawback. A change of frequency simply means reprogramming the chip. This can be done quickly and, in any case, a conventional synthesiser would have this delay on top of the loop settling time.

This improved switching time offers a number of advantages. For example, it allows high-speed scanners to scan even faster. However, this improvement will benefit only specialised professional applications. Where the amateur will benefit is in faster transmit/receive switching. As local oscillators often have to change frequency during changeover, albeit only slightly, a short delay in the oscillator settling time can increase the overall transmit/receive changeover time. This is crucial when using modes such as packet where the changeover time must be small.

Crystal technology

Crystal technology has been with us for a long time but in spite of this, it is being used more and more. The technology is also advancing, allowing smaller and better crystals to be developed all the time.

Crystals are made from quartz which is a form of silicon dioxide that has crystallised into a hexagonal structure. Although quartz occurs naturally it is not particularly common, and most of the quartz used today is manufactured.

Quartz also exhibits the piezoelectric effect. This means that when any mechanical stress is applied to it a potential difference will appear across it, and vice versa. The piezoelectric effect is used to couple the mechanical resonances of the crystal to electrical circuits; the resonances can be used as tuned circuits in receivers and oscillators.

Many substances exhibit the piezoelectric effect and will possess mechanical resonances. However, quartz is unique because of the tremendously high values of Q which can be obtained from it. Values of up to 100,000 have been quoted, but they are usually a little less. These values of Q mean that quartz crystals have a wide variety of applications. In oscillators they produce a very stable resonant circuit and enable very low phase noise figures to be obtained. In microprocessor clock oscillators they are used as the resonant element because they are cheap and reliable.

Crystals are also widely used in filters. These days most communications receivers will have a filter based on crystal technology to provide the main selectivity. These filters offer responses with a very sharp cut off, which is ideal. They are so good that LC filters cannot compare.

Crystal manufacture is an area where modern technology is paying dividends in performance and cost. The way in which the crystal is made will determine its characteristics, so careful manufacture and the use of accurately controlled processes are essential.

First of all a round blank is cut from the correct type of specially cultured quartz. This is done while taking note of the exact orientation of the crystal because this will determine many factors, like the temperature stability and mode of oscillation of the finished component.

The next stage is to lap the crystal. This has to be done very accurately, because

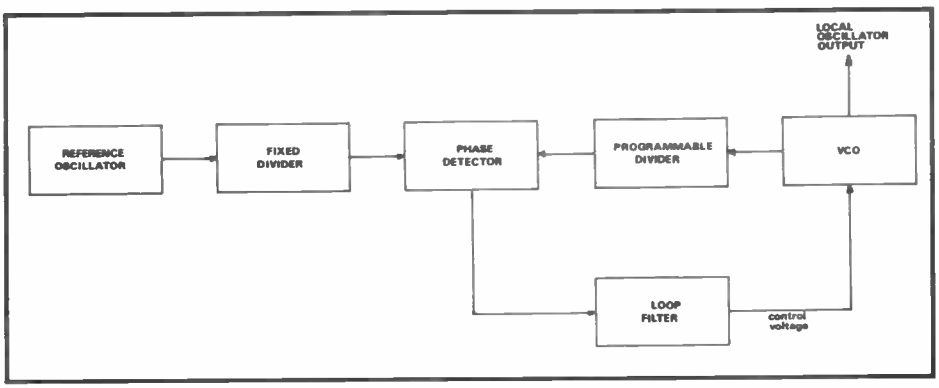
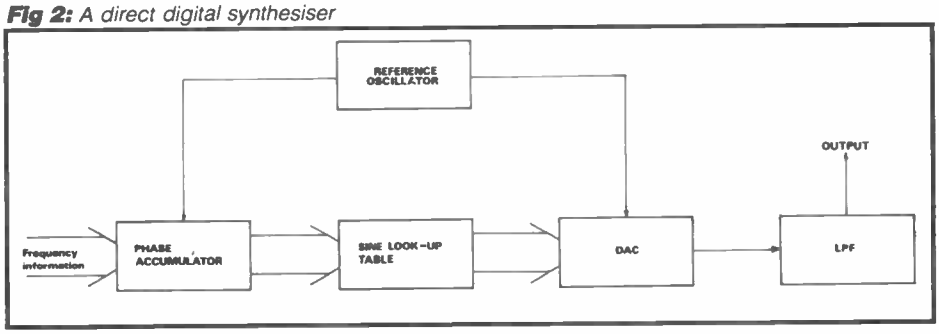


Fig 1: *A conventional single loop PLL synthesiser*

Fig 2: *A direct digital synthesiser*



the thickness will determine the crystal's frequency of oscillation. The lapping is done with a very fine paste. In spite of this the crystal surface will have too many discontinuities which will cause a lack of activity and ageing. To overcome this problem the crystal undergoes a stage of chemical etching.

The final stage is to mount the crystal. Initially, silver or gold electrodes are deposited on to each facet. Then each crystal is bonded to its mount in such a way as to minimise losses. Finally it is placed in its holder, which is either evacuated or filled with an inert gas. This reduces any chemical activity on the surface of the crystal which would cause ageing and a reduction in activity.

Using today's technology, crystals offer much lower losses, exhibit much higher Qs, and operate at much higher frequencies.

Ham health

Over the past few years there has been a number of items in amateur radio and professional electronics magazines about safe levels of RF and what RF can do. Obviously, damage is caused by local heating – a factor which is only too apparent when something comes out of a microwave oven. However, some people wonder what comparatively small levels of RF and, for that matter, electric and magnetic fields can do.

With this in mind, it was interesting to read an article in the October 1989 issue of **QST** entitled 'Is Amateur Radio Hazardous to our Health?'. In this article WC2S, who is a surgeon and cancer specialist, investigates some of the evidence available at the moment.

The article concludes that there is still a lot of controversy about the effects on health and safe power levels. However, it is wise to take sensible precautions: aerials should be kept away from houses; hand-held rigs should be kept as far away from the head as possible; and transmissions should be kept short. The best place for a mobile antenna is in the centre of a metal roof.

Finally, there was a plea for an accurate and inexpensive RF power density meter. Surely with today's technology this should be possible?

News clips

Siemens have recently announced a series of new diodes and transistors capable of giving improved performance. The BFQ82 silicon transistor has a noise figure of 1.62dB and a gain of 17dB and 16Hz. Siemens have also introduced a new zero bias Schottky diode with a capacitance of around 0.035pF. Finally, they have launched a GaAs FET, the CFY25. This device has a noise figure of less than 1.7dB and is fabricated using the latest wafer steppers to ensure high imaging accuracy.

SGS-Thompson have announced a new RF linear power transistor, the SD1492. It is designed for TV transmitter applications, but could be used in amateur service and it can deliver 150W of RF at 860MHz. Its features include gold metallisation and an integral input impedance matching network to optimise the bandwidth.

Piezo resonators are seen more often these days. They are cheaper than the equivalent quartz resonations and can be used where the requirements are less exacting.

Finally, Pedoka have extended their range of resonators to include some standard frequencies between 2.45 and 6MHz.

The April 1990 *Amateur Radio* will be on sale 29 March 1990

ICOM

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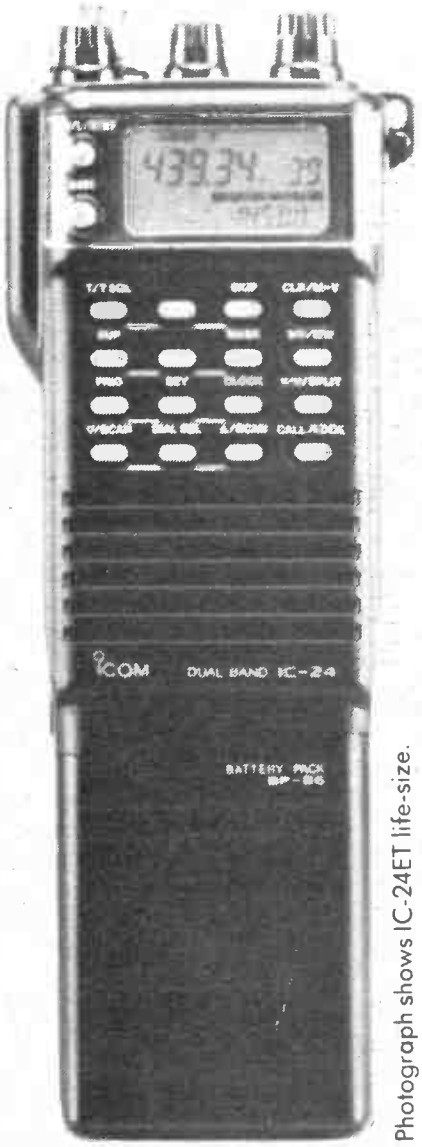

Photograph shows IC-24ET life-size.

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HS-51	Headset
MB-30	Mounting bracket
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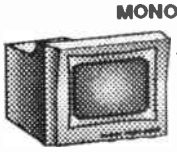

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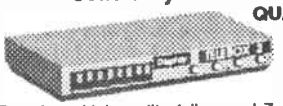

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THE RX-8 AND GX-2 SOFTWARE PACKAGES

by Mike Wooding G6IQM

In this review I shall be looking at two software packages for the BBC B and Master computers, available from Technical Software. Both packages are of particular interest to ATVers as they support all mode SSTV.

RX-8 multimode receive package

The RX-8 software package is a multimode receive only system. As the name suggests there are eight modes supported, these are: AMTOR/SITOR (ARQ and FEC), ASCII, fax, x Morse, packet radio, RTTY, SSTV and UoSAT 1 and 2.

The package comes complete with an EPROM, user manual, test cassette and an interface with connecting leads. The package is well presented and is capable of the manufacturer's performance specifications.

The user manual

The user manual is well produced, not one of those photocopied efforts but professionally printed. The opening section gives an introduction and a basic explanation of the two-tone system used to send information via various modes. However, it is only a very basic introduction to the subject and further information may be required to fully understand the technicalities of the various modes.

The next section explains how to call up the program and describes the various command keys which are common to all modes. Also given are detailed instructions for using the screen display, keyboard, text store, printers and disc/tape storage mediums.

The user manual also describes how to instal the EPROM into the computer and connect the interface between the radio and computer. There is also a fault-finding page if you encounter any problems in getting the system running correctly.

The remainder of the user manual deals with the various modes and how to operate their software. Advice is also given concerning the type of receiver and aerial required, what to do about computer noise, and where on the bands are found the various types of transmission.

Connecting the equipment

Once the EPROM has been fitted and the computer reassembled, the interface must be connected to the user port on the BBC using the ribbon cable supplied. This **must** be carried out with the computer switched **off** at the mains.

The interface is housed in a cream plastic case measuring 15.5 × 9 × 4cm. The front panel comprises a bank of three push-button switches (ON/OFF, FILTER ON and NARROW) and an LED bar-graph display. At the rear of the case are the interconnection sockets.

The unit is connected to the receiver using the 6-pin DIN to 3.5mm jack lead supplied with the package. If your receiver does not have a 3.5mm external speaker socket, than an adapter for the usual 0.25in headphone socket can be obtained easily. Alternatively, Technical Software will supply the correct plugs for fitting to the cables when you order the equipment.

The system in use

Once everything is connected switch on the computer. The usual on-screen prompt line will appear with an extra one above it announcing the presence of the RX-8 software. If you do not get this prompt message, then check to ascertain whether the EPROM has been loaded correctly.

Having obtained the correct screen message, type *RX8 (or *RX-8, it doesn't matter which) and you should get the following message: INTERFACE NOT OPERATIONAL ?? BASIC'.

Now switch on the interface and try again!

The software defaults to the RTTY receive program with a full screen display, featuring the program identification in a bar at the top and the program control bar at the bottom. The control bar indicates which mode the program is in and the various settings selected for receiving that mode. These two bars occupy only 10% of the screen, leaving the rest available for displaying incoming information.

Switching between the eight receive modes is achieved by pressing SHIFT and a single letter on the keyboard. Within each mode the various facilities available are selected by single key strokes, and thus enables the operator to quickly use the software effectively.

All modes have some form of fine-tuning indicator, either on screen or by using the LED bar-graph display in the interface. This is very helpful if you are not well versed with the nuances of the sounds of various modes when being received.

Of particular interest is the SSTV receive mode. This system is much simpler to operate than other computer-based receive packages, although the user manual gives the impression that this mode might be difficult to drive at first. However once pictures are being received, its simplicity of operation soon becomes apparent; the results obtained on the screen indicate if any parameters have been wrongly selected (these can be changed 'live'), and the results of the changes are immediately displayed on the screen. Incoming pictures can be frozen on the screen at the end of the incoming frame and then saved to disc or tape and sent to the printer for hard copy.

It would be inappropriate to list all the various facilities available, but suffice it to say that any signal found on the bands can be decoded and read without difficulty. The software will deal with just about any signal in any of the modes as efficiently as any dedicated unit for that mode.

Conclusions

The RX-8 package is easy to instal and get running. In use the results obtained are quite impressive. If you are an avid short wave listener, or want to use the RX-8 package as the receive half of a transceive unit, then I can highly recommend this system.

The RX-8 package is very cost-effective when compared with other units for receiving only one of these modes. Particularly, as an all mode colour and monochrome SSTV receive converter, its operation is faultless.

The RX-8 multimode receive system

THE RX-8 AND GX-2 SOFTWARE PACKAGES

GX-2 dual-mode transceive package

The GX-2 software package for the BBC B and Master computers is a dual mode transmit and receive system. As the name suggests there are two modes supported, SSTV and fax. The package comes complete with an EPROM, user manual and an interface with connecting leads.

The user manual

The opening section Welcome to GX-2, is followed by the installation and setting up instructions. The EPROM installation instructions are comprehensive, as are the interface connection and set-up details. The problem pages are at the end of the user manual, listing possible faults and ways to rectify them.

The next three pages of the user manual deal with the screen display, the keyboard, using a printer and saving to disc or tape. For saving and loading screens it is preferable to use a disc-based system, as individual screens take around four minutes to load or save using tape, which is impractical during a QSO. Another point raised in the user manual is that when printing what is displayed on screen, the effect on the printer ribbon is the same as when using a DTP package; that is, it may wear out rather quickly.

The next section deals with the comprehensive type-ahead facilities. The user manual states that these facilities are 'very sophisticated'. If I were comparing these facilities to some graphics packages available for the Atari ST, then I would not necessarily agree with that statement. However, as the system operates on an 8-bit BBC computer, these facilities offer a useful range of graphics' designing tools.

The type-ahead facility can be used at any time, except when receiving fax pictures on the full screen. Messages can be typed ahead and displayed on either the full screen or buffers, which are only a quarter the height of the full screen. This allows up to five messages which can be typed ahead and then selected at random. However, the user manual states that when in SSTV mode, these buffers occupy the whole screen when transmitted. Therefore, the size of text selected must be chosen while bearing in mind that it will be four times larger in the vertical plane when it is transmitted.

There is a choice of eight background colours (shades of grey in monochrome for SSTV and levels of brightness in fax) and there are eight text colours. The four selectable text sizes correspond to ×1, ×2, ×4 and ×8 normal computer text height, with three widths also available corresponding to ×3, ×6 and ×12 normal width.

The remainder of the user manual deals with the specifics of the SSTV and fax modes independently, with comprehensive instructions on the facilities available to each. Finally, a list of all the key strokes for each mode is given.

Once the software has been installed, the EPROM fitted and the computer reassembled, the interface must be connected to the user port on the BBC using the ribbon cable supplied. This **must** be carried out with the computer switched **off**.

The interface is housed in a black plastic case measuring 11 × 6 × 3cm. All the interconnection cables are permanently connected inside the box, with their ends terminated in the ribbon plug for the user port on the computer. The tinned wire ends for connection to the radio equipment have identifying labels for the transmit and receive leads.

Once all the connections have been made, switch the equipment on. If all is well the usual screen prompt will appear on the monitor screen with the GX-2 prompt line above it announcing the presence of the EPROM. Typing in *SSTV or *FAX for the required mode will result in the program being called. If the interface is not connected correctly, or not at all, then the following prompt will be displayed on the screen: INTERFACE ?? BASIC.

Check all connections and try again!

Once the selected program has been successfully called the screen will change to the receive screen for that mode.

SSTV

In SSTV mode the screen display consists of the control bar at the right-hand edge of the screen, with the rest of the screen being the picture frame area. The system defaults to eight-second 128-line mono receive and, if the receiver is switched on, will display any incoming signals as either noise or pictures, according to the type of incoming signal.

The receive mode is indicated by an 'R' in the control bar. A fine-tuning aid is shown in the top right-hand corner of the screen, but is only usable once the signal is coarse-tuned closely enough for the software to start decoding. This indicator is relatively useless if the signal is too noisy.

Changing between any of the receive modes is simply a matter of double key operation, eg, CTRL M, CTRL Q etc. A full list of these key strokes is given in the user manual. Similarly, changing scan speeds or between mono and colour receive, is just as easily done.

During receive the program can be set to a hold mode, whereby the picture being received will be frozen on the screen at the end of the present frame scan. The frozen picture can then be saved to tape or disc as required.

Robot VIS mode is fully supported, in that the program will automatically switch to the correct receive settings once the VIS signal at the start of the frame is received.

In line-sequential colour mode the software inserts the SC-1 sync pulse at the start of each red line. On receive, it detects this pulse to regain colour sync if it's lost. The GX-2 system is fully compatible with Robot and SC-1.

SSTV transmit is selected by keying CTRL T (to return to receive, key CTRL R). Immediately transmit mode is selected the system goes into standby mode and transmits a steady tone. This aid is useful for the receiving station to tune to. The control bar indicates transmit mode by displaying 'T' instead of 'R'. Pictures for transmission may be loaded from tape or disc but the use of tape as a storage medium is not recommended for 'live' work, owing to the prolonged load/save time.

Alternatively, transmit messages may be typed into the type-ahead buffers and selected for transmission. Each buffer has a colour/grey scale band at the bottom of its screen area, reminding you not to type into this area when in Robot mode because it will not be sent. In other modes this band, or whatever is typed over it, is transmitted.

The appropriate screen is selected for transmission by pressing CTRL f1 to f5

for the five type-ahead buffers, or f0 for the main screen (where pictures loaded in from storage will be). As soon as the required display is selected the screen number is prompted in the control bar and the frame is transmitted; the transmission continues until another display is selected, or when the system is put back on hold or into receive.

During transmission it is possible to change the mode between 128 and 256 lines as well as the transmit speed, but only whilst on hold. All other changes have to be initiated whilst in the receive mode.

Fax

In fax mode the system defaults to receive at 120rpm at an IOC of 288, with the screen display consisting of the control bar across the top with the rest of the screen displaying received/transmitted pictures. The various parameters available can be changed by simple dual-key strokes. There is no fine tuning indicator but once a few signals have been tuned, it is not too difficult to find the correct spot. As suggested in the user manual, tuning slowly from low to high seems to be the easiest method.

Once a picture is being received the correct IOC must be selected if the picture aspect ratio is not correct. This is done by pressing CTRL (up arrow or down arrow) until the correct ratio is achieved. There is also a facility for correctly centring the incoming picture on the screen. As in the SSTV mode the incoming picture can be frozen and saved to tape or disc.

Transmitting fax

When transmit is selected, keying CTRL T (key CTRL R to return to receive) will retain the same settings as those selected during receive. The sequence starts by sending thirty seconds of phasing signal to allow the receiving end to synchronise. The selected screen (or only the top quarter, if selected) will then be transmitted. Unlike SSTV the frame is sent only once, followed by five seconds of stop tone, after which the program returns to the receive mode. At the amateur standard IOC of 288, a whole screen takes approximately seven minutes to transmit. To stop transmitting at any time simply press the ESCAPE key.

An optional extra is the printer fax facility. This allows received fax pictures to be directly printed out. Automatic picture phasing is active in this mode but only works at 120rpm. However, as this is the most common speed used, this is not a problem.

Conclusions

The package is relatively simple to drive, and within half an hour I had the system up and running and the first slow scan pictures coming in. Unfortunately the screen shows only four out of the five buffers at any one time and, unless you have a good memory, the numerical order in which they appear is not always obvious. That aside, the SSTV system gives good results with the minimum of fiddling.

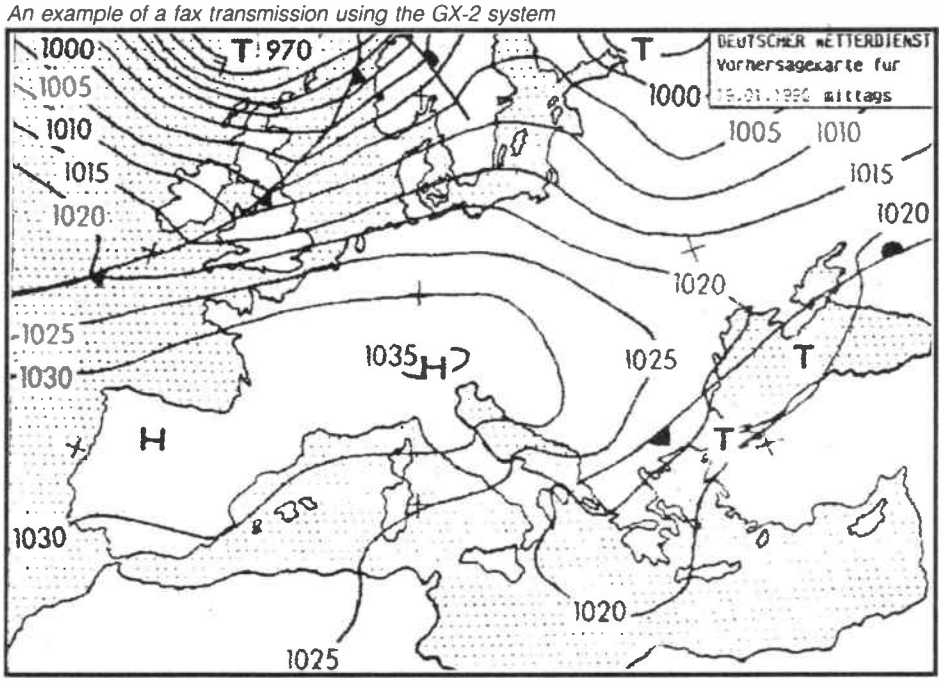
The decoded fax pictures were of reasonable quality, relative to the signal strengths received. Unfortunately, I did not have a receiver capable of receiving weather fax transmissions, but the printer fax option gives better results than the on-screen pictures.

I can certainly recommend this package for any amateur station interested in either fax or SSTV. It compares favourably with the other converters I have seen, but it is much cheaper, even if you have to consider getting a BBC computer! As far as fax is concerned, I do not know of many other systems yet available, but on its performance alone I can recommend it.

The RX-8 system costs £259.00 including VAT. The GX-2 system costs £99.00 including VAT, or £119.00 with the fax direct printing operation.

Both systems are available from: Technical Software, Fron, Upper Llandwrog, Caernarfon, Gwynedd LL54 7RF. Tel: (0286) 881886.

An example of a fax transmission using the GX-2 system



SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

It's funny how some people regard log-keeping as a chore. In fact, for some time there has been lobbying to abandon the practice. At present, it is necessary to keep a logbook of all contacts made by an amateur operator. A standard format is used by most amateurs, giving the basic details as required by the amateur radio regulations. Comments can also be made regarding contacts and station test transmissions etc. But how does this affect the listener?

Log-keeping

A logbook is a record of your activities in radio, just as a ship's log is a record of what happens during a voyage. It enables you to refer back to an incident that happened a while ago and has suddenly become of interest again. When the incident first occurred it may have held no particular significance and, were it not for the note in the logbook, would probably have been long forgotten.

Thus the logbook is a memory aid. For the listener, it is a history of one's activities in the hobby, noting changes in equipment and aerial arrangements, changes in propagation conditions and weather, details of anything unusual heard and a host of other items of interest at the time.

Primarily, however, the logbook is a record of stations, whether amateur or broadcast, air, marine or even clandestine, that have been heard during one's time in the hobby. Careful noting of the times heard and the frequencies, signal strengths and mode of transmission is standard procedure, but it is the 'comments' column that is of ultimate interest.

Looking through my own recent log entries, I see that I have been as lax as many others in simply having a name and location in the comments column, but looking back to the old days of my operating, I find much more detail, such as comments on distortion on signals, general conditions and even little personal snippets about the contact.

If I go even further back to my listening years, I find still more information like details of equipment I was using and how it performed, especially with different aerials, and details of filters I had tried including my first homebrew peak and notch filter (still got that somewhere!). In fact, I spent a pleasant hour or so going back through the old logs and it made me feel sorry that my later entries were so brief.

Log-keeping for the listener is a voluntary thing but it can be extremely interesting and, on occasion, very useful.

There's no need to invest in a pre-printed standard logbook. In fact, it is probably better to use a hard-covered feint-ruled book as you can enter more details and it will probably keep far longer than the average loose-leaf or spring-bound book. There's no real necessity for headed columns either if you put the date/time/frequency details in the margin to make entries easy to find.

Of course, it's not only for personal interest that it's useful to keep an accurate log. Supposing you are tuning the bands in an idle moment, just looking for something a bit different from the run-of-the-mill stuff. Suddenly you hear a strange callsign, like the one I logged as T/003-7. As it happened, this call was being given by a freighter out in the Atlantic and the operator was simply passing information to base.

Maritime rescues

However, it could have been a freighter in trouble, like the one logged by the late GW3AX off the Brazilian coast. In this case, Stan made detailed notes and passed the information to the authorities, as a result of which he was given an award by the country's embassy.

Consider the case of Bob Watters, a listener in St Austell, who logged details of the **Island Queen** that was listing 700 miles out in the Atlantic. His swift reactions in calling the Falmouth coastguard were instrumental in rescuing the crew of fourteen.

There have been more recent instances of assistance being given by amateur operators and listeners, not least the passing of messages to relatives of the citizens of Romania during their recent internal struggles.

These things do not happen every day and it would be rather boring to sit day after day just listening for such an event. However, it's as well to cultivate the habit of accurate and worthwhile log keeping, because you never know! By the way, I've made a New Year resolution to keep a better logbook myself . . . wonder how long it will last?

QSL cards

From log books to QSL cards, and a very interesting story from Roy Clayton G4SSH.

In May 1988, Roy had a QSO with T77T in San Marino. It wasn't a long contact because of the pile-up one expects with these rare stations, but, like everyone else, Roy wanted confirmation for his countries list.

Some time later, he received his QSL card back from the bureau, clearly stamped 'not in my log . . . return to sender'. Now, Roy was not at all happy but, as this sort of thing often happens, he shrugged off his disappointment and put the card in the file of gotaways.

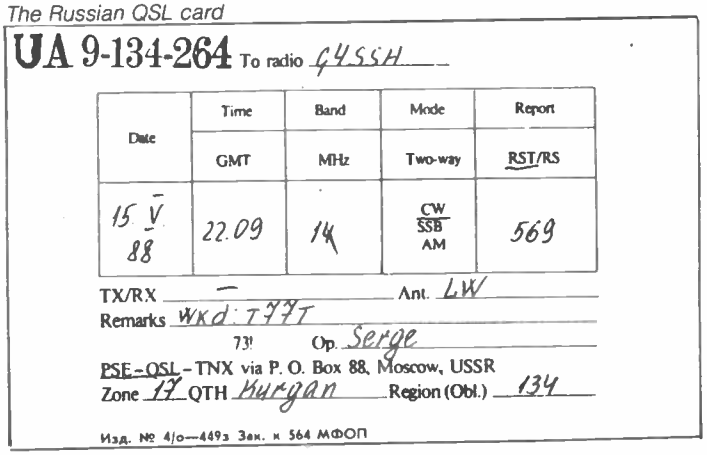
A few months passed and the incident had been forgotten when, via the bureau, Roy received a card from UA9-134-264, a listener in Kurgan, in the Soviet Union, asking for a QSL for his logging of Roy's contact with T77T! Needless to say, Roy was over the moon that a Russian listener had confirmed his contact and that he could claim the wanted card from San Marino.

It goes to show that an accurate listener report can be of real value to a licensed station.

The more information you can give about the QSO, the more useful it will be. If you can give extra details such as comparative signal reports, your station set-up, propagation conditions from his area etc, so much the better.

Like log-keeping, good reporting is important if you hope to receive QSLs from stations, especially rare ones. I remember sending an SWL report to ZL1ANZ some years ago and being delighted to receive his card in return,

The Russian QSL card



UA 9-134-264 To radio G4SSH

Date	Time GMT	Band MHz	Mode Two-way	Report RST/RS
15 V 88	22.09	14	CW / SSB / AM	569

TX/RX — Ant. LW

Remarks WKd: T77T

73! Op. Serge

PSE-QSL - TNX via P. O. Box 88, Moscow, USSR

Zone 17 QTH Kurgan Region (Obl.) 134

Изд. № 4/о—449з Зак. к 564 МФОП

together with a very nice letter thanking me for the detailed report and a complimentary copy of the ZL Call-book!

Awards

Of course, accurate logs and good reporting are the stock-in-trade for award hunters and we have more to congratulate this month.

My heartiest congratulations to John Rogers of Skelmersdale up in Yorkshire for a superb log of over 100 stations from towns supporting a lifeboat. This, on the surface, does not seem a difficult task, but since the introduction of the ILA Lifeboat Award four years ago, there have been only *three* successful applicants! Setting aside the difficulties of logging these stations, John supplied *all* the information he could obtain, including the type of lifeboat on station and the WAB square the station is in! A superb effort, well deserving of the trophy!

Contests

Now, I knew Ken Burnell was moving from Milton Keynes and I was sure he wouldn't be away from his receiver for long, but I wasn't prepared for the rather large parcel that thumped on my doorstep a couple of weeks back!

Ken RS88465 has certainly not been idle. Enclosed in the parcel were claims for Continental Awards for Asia, the Soviet Union, North America, Europe and Africa and a whopping list for the Gold Prefix Award for 1,000 prefixes. Just to give you a flavour of the Gold list, A47, AA6, AC8, AJ9, AZ4, BZ1, CP1, CT500, CW0, D44, DX8, H44, HC2, HX1, J39, LQ5, OL4, PS7, TY3, V29, XX9, YC0, YL2, ZM4, 3B8, 4J1, 4S7, 5V7, 7P8, 8R1 and 9Q5 were some of the tasty prefixes recorded.

We wish you luck in your new QTH, Ken. Well done!

Our old mate Martyn Whyte ILA 259, up there in Edinburgh, is still at it with claims for the Continental Awards for North America and USSR, but this time for 10m only! Seems that he had a spot(!) of trouble with some water recently as he's requested duplicates of some of his previous awards that got spoiled. Only too pleased to oblige, chum!

For the rest of the logging news, we turn to Peter Bowles ILA 039, of Newhaven, who, with his usual understatement, says it's been a pretty good year for DX. Still firing up the old Trio R600 and DX440 through his 25m end-fed, Pete manages to pull in plenty of good stuff and logs all the details too!

Among Peter's recent loggings are VU2RX, AP2JZB, VP5VAD, V3ITP, HZ1AB, BY4RB, BV2FA, ZD8PJ and JY5FA on 28MHz; ZP5MWM, VO2AC/P1, D44BC, 8P9EM and 7X2BK on 21MHz; and 4U1ITU and 4U1VIC have been found on 14 and 21MHz respectively at various times.

Peter has just claimed the ZC4 Award and is keeping his fingers crossed.

Bulletin board

Kevin Flood of Reading is toying with the idea of a Computer Bulletin Board service for listeners, the purpose being the exchange of information such as current DX being logged. If you are interested, drop Kevin a line c/o 1 Jersey Street, Hafod, Swansea SA1 2HF.

Slow scan TV users

Terry Howes is a graphic design student with a project in hand on art and technology. He is particularly interested in the slow scan television system and would like to contact users (transmitters) of the system to obtain information.

If you can help Terry and are in the London area, drop him a line at 13 Coleherne Road, Earl's Court, London SW10 9BS.

Close-down

Having had a very mild winter so far, it's easy to be lulled into a false sense of security. This is often the time when high winds occur and those weak spots on our aerials show themselves.

If you have a free weekend or even an odd day, why not check on those soldered joints, traps, insulators and guy lines? It may only take a few hours and could save you a lot of headaches if a bit of a blow does come!

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PROJECT BOOK

by Martin Williams

One of the problems that 'old timers' had to cope with is still with us today, despite all the technological advances that have taken place over the years. Lack of voltage stability caused drifting carriers and other problems in the 1920s and is still causing them today.

Stabilising

There are many occasions when a well stabilised line at the correct voltage is required. The obvious way to make a good start is to ensure that the main supply line is well smoothed and adequately regulated for the purpose intended. However, this is not always enough. It is frequently found that local, or on-board, regulation is also required, often because voltage swings on supply lead to a particular board due to the varying current demands of the circuitry.

Zeners

Possibly the simplest method of providing the stability is by making use of a zener diode and the simple circuit for this is shown in **Fig 1.** These are often thrown into the circuit by inexperienced constructors with little thought of the operating parameters of the device and even less about the limitations of the circuit.

The basic idea of the circuit is that if the load takes less current the voltage across the diode rises. It then takes more current and the voltage drop across the resistor increases and so the voltage is returned to the starting point.

Starting

It is obvious that you have to start with a higher voltage than the required stabilised one because there has to be a drop across the resistor or the circuit will not work. There must also be an allowance made for the current taken by the zener diode itself. In the smaller wattage examples this should be set to about 10 to 15mA. Anything less than this and you will have poor regulation.

Example

Assume that you have a 12V supply and that you actually need 5.6V with a current capability of 20mA. The first thing to do is calculate the resistor value using Ohms Law. The total current, load plus zener is, say, 33mA and the voltage drop is 12 – 5.6 = 6.4V. The nearest standard value resistor which we can use is 220 ohms. Next we need the wattage rating for the resistor and this would be (V * I) 0.22W. In practice we would use a halfwatt rated component.

Diode rating

We also have to make sure that the diode itself is suitable. This is done by ensuring that the diode can handle all the excess current if the load should go open circuit. Again using Ohms Law, and building in a little safety factor, we would choose a 500mW device.

A point that is frequently overlooked is that a zener diode is a prolific generator of RF hash over a very wide bandwidth. Because of this it is essential that the capacitor shown in the circuit diagram is included. This should be a disc ceramic type with a value of 10nF for the HF bands and 1nF for VHF working. Make sure it is mounted as close as possible to the zener diode and that the lead lengths are kept to a minimum.

Uprating

The basic circuit can be used over a wide range of current requirements as will be obvious from the really massive diodes available at rallies.

The main problem with high current applications is the wattage rating of the series pass resistor and getting rid of the large amount of heat which is generated. If the current requirements are not too high, say 2 or 3A, then the circuit shown in **Fig 2** may be used. This is simply a series pass transistor which is capable of handling the current demand with the zener diode controlling the base voltage.

Losses

Depending on the transistor used, the output voltage is typically 600mV less than the zener voltage. The series resistor is now calculated on the basis of the standing current of the zener only. The small base to emitter current of the transistor can be ignored.

Owing to the fact that the load is no longer connected to the zener, the regulation is not as good as the basic circuit. It should also be kept in mind that a short circuit on the output line could easily blow the series pass transistor. This does at least protect the main supply from damage caused by overload.

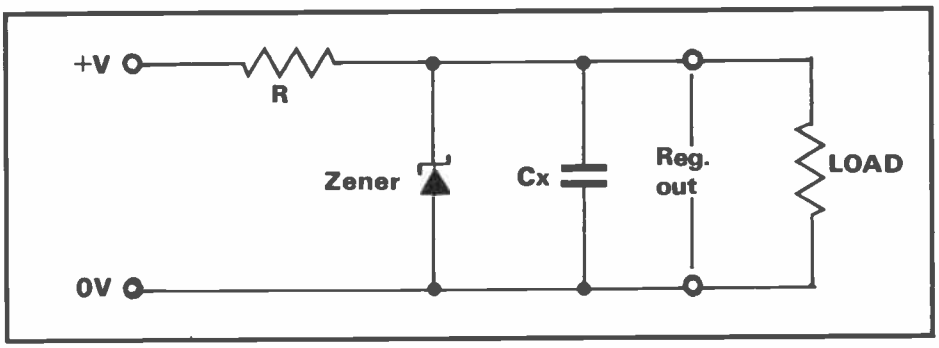
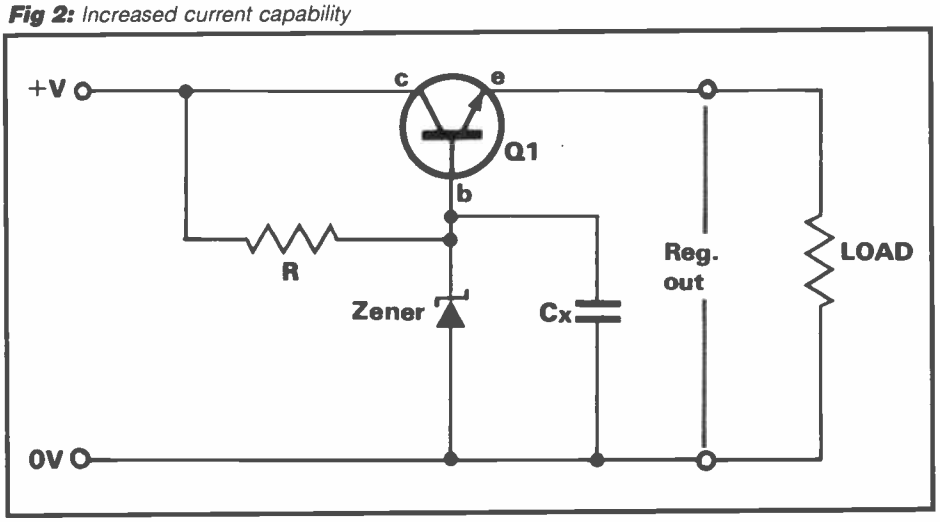


Fig 1: *Basic regulator*

Fig 2: *Increased current capability*



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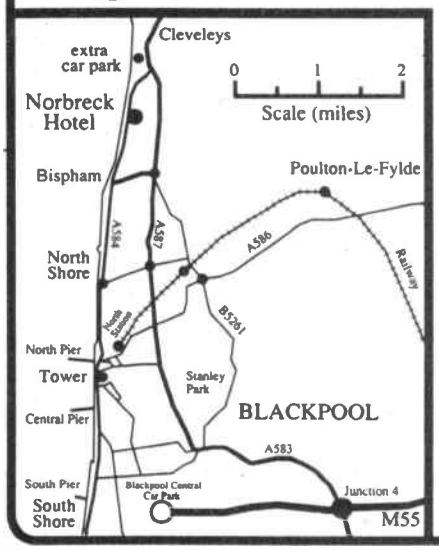

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MODIFICATIONS: THE NRD 525 RECEIVER

by Glen Ross G8MWR

A popular but, to say the least, expensive receiver which is currently available on the amateur market is the NRD 525, manufactured by the Japan Radio Corporation.

Taken generally this is a superb piece of equipment which puts most other units to shame. There is one way, though, in which this particular lily can be gilded.

Noises off

There is a problem with background audio hiss when the extension speaker is used, rather than the small internal unit. This problem only occurs whilst receiving SSB and shows itself as a high increase in background noise when the volume control is turned up to receive a weak signal. This, of course, is just the time when you need the least background noise. The problem is due to the usual injection noise in the demodulator, and it is not apparent on AM because of the high level carrier generated in the receiver from the AM signal.

The easy way

One way round the problem is simply to use the front panel tone control to cut the top response. Unfortunately, owing to the rather low turnover point the JRC engineers have chosen, this also destroys the readability of the signal by severely reducing the high frequency content.

With most receivers the way round this problem would be to find the AM audio line and put suitable filters in circuit, but this is not possible in the JRC design. What is required is a filter which has no effect at low settings of the volume control and has an increasing effect when the control is turned up.

The answer

Several different ideas were tried until a solution was eventually found. If a suitable value capacitor is wired from the slider of the volume control to earth, then when the control is at the low end the capacitor is almost short-circuited and has no effect. As the resistance of the control is increased by clockwise rotation, the effective audio cut due to the capacitor not only increases but the frequency at which it starts to operate is reduced.

Success

By trial and error it was found that a capacitor of 68nF connected as described gave a virtually constant amount of background noise at any point in the volume control sweep. This was checked by removing the aerial and tuning to a spot where no signal was present. This is not as easy as it sounds because the receiver will pick up an amazing amount of stuff just on the internal wiring.

Fitting

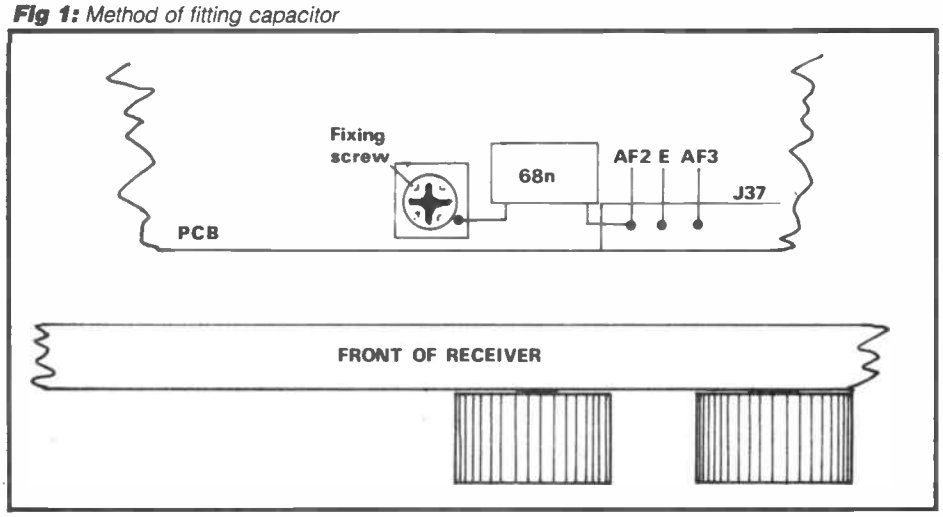
The component can be fitted very easily. First, remove the bottom cover and turn the receiver upside down with the front panel facing you. About halfway along the front edge of the board you will see a fixing screw, and just to the left there is a series of solder points on the back of a socket. One leg of the capacitor is fitted to the solder point nearest the screw and the other end is connected to the bare piece of earth plane at the PCB fixing screw (see **Fig 1**).

For those of you who like to work from the manual, the live end of the capacitor goes to the line marked AF2 on connector strip J37.

Alternatives

The 68nF capacitor proved right in my own installation, but the final result will depend on the frequency response of the extension speaker and trial and error. Several alternatives have been tried with excellent results but if you wish to experiment, a 33nF capacitor will give less reduction of hiss and a 100nF capacitor will give rather more.

Fig 1: *Method of fitting capacitor*



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

More on key collecting

In the autumn 1989 issue of **Morsum Magnificat**, Colin Waters G3TSS took a close look at the Eddystone S689 bug key. He provided useful information, including the maker's original adjustment instructions, for collectors and users owning this increasingly rare and interesting key.

A pre-production model was originally displayed at the Amateur Radio Exhibition in 1947 and the first production run was in 1948. It was the only British semi-automatic ever sold in significant numbers – and was the only bug key anywhere to actually look like a bug! From correspondence I have received it appears that a good number of these keys is still in use on the amateur bands around the world.

Interestingly, although the S689 was intended for the amateur market it was also used professionally. It was instrumental in giving a number of service operators the opportunity to send faster Morse. Bugs were banned but the S689 was used 'illegally' at night. This was discovered and then condoned when the users demonstrated the advantages of semi-automatic overhand keying for traffic handling.

No connections

Keys come in all shapes, sizes and designs but the one thing they have in common is that they are all intended to switch an electrical signalling circuit. Or is it?

To confound this assumption I have a hand key without any electrical connections at all! This is a British army 'Key, Dummy, Signallers' MkII', dated 1917, which was used for learning and practising the code. In those days telegraphists rarely heard the signal they were sending and were expected to read the code entirely from the clicking of a key or sounder.

The dummy key was provided for private practice during training, and on completion of their course trainees were expected to be able to use Morse on wireless or line transmission as well as with visual signalling, using lamp or heliograph. A slightly more demanding requirement than the amateur Morse test today!

This lovely little brass key on a mahogany base was produced for the British army from around the turn of the century until just before WW2 and is a real collector's delight. If you have a copy of the RSGB's **World at their Fingertips** you can see one of these keys, a 1902 model modified for wireless work, in the foreground of a photo of the late G2UV's experimental station of 1922.

New Argonaut

According to Fred Maia W5YI in the **W5YI Report** of 1 January, Ten-Tec will unveil their latest low-power transceiver at the ARRL national convention at Dayton this summer.

He reports: 'The five-watt Argonaut II will bring QRP into the computer age, with microprocessor-controlled frequency synthesis, dual VFOs, at least 25 memories, FM option and a 100kHz-30MHz general coverage "... world class" receiver. The $900 (target) price HF 160-10 metres unit uses a liquid-crystal display for low energy consumption, and measures approximately 9.5in w × 3.25in h × 10in d.'

According to Ten-Tec, they don't want to show a prototype at Dayton but a full production unit available for sale. They claim they have made an effort to contact all the 'top QRP gurus' for input on the design of this new transceiver.

Ten-Tec products are much used and respected by QRPers and the earlier Argonauts, especially the 515, are eagerly snapped up when advertised second-hand. It is very good news that Ten-Tec are coming back into the QRP market with a new model, especially with such a comprehensive coverage, but the price itself looks far from QRP!

Many QRPers are ardent homebrewers determined to demonstrate that they can work the world with a handful of components, usually with CW. To them a $900 rig, probably equating to something like the same figure in sterling, no matter how good it is, may seem like a Rolls-Royce does to a keen cyclist.

I'm not criticising Ten-Tec. I used to have an Argonaut 509. I've got an Argosy II now, and I'd love to have an Argonaut II. It's just that rigs in that price range in the QRP field seem very much in the luxury class.

New QRP convention

It is nice to see that the lead given by the Yeovil ARC, whose sixth QRP convention will be held in May has been followed elsewhere. The G-QRP Club held its first mini-convention at Rochdale last October, and there are plans to repeat it this year. Now there is to be a south eastern QRP convention at Dover (YMCA) Radio Club, Leybourne Road, Dover, from 10.00 to 16.00hrs on Sunday 25 March. The entry fee will be 50p.

Promised is the opportunity to chat with fellow QRPers, to buy kits and components and to listen to talks on QRP subjects. QRPers in the south east will certainly welcome the chance to attend such an event without the long journey previously necessary. Further information on this new venture is available from R A Pascoe, 3 Limes Road, Folkestone, Kent CT19 4AU.

European CW Association

As the current chairman of EUCW I often receive enquiries about the association from amateurs who, mistakenly, believe it is a CW club which they can join.

EUCW is, in fact, an association of European independent amateur radio clubs dedicated to supporting, encouraging and defending amateur CW activity. Through the association, clubs exchange ideas and information, and arrange various activities of benefit to all amateur CW operators on an international basis.

The current membership of EUCW comprises: AGCW-DL (Germany); Benelux QRP club; BTC (Belgium); FISTS; FOC; G-QRP; HCC (Spain); High Speed Club; INORC (Italy); SCAG (Scandinavia); Super High Speed Club; TOPS (in 'hibernation' at present); UFT (France); and the Very High Speed Club.

In my view, all amateur CW operators should belong to one (or more) of these clubs if only for self-protection, although between them there is a wide range of CW activity to meet most interests. Jointly the clubs represent a potent force to speak up for CW, particularly over frequency use, when faced with ever-increasing demands from the new modes which seem to be so strongly supported by national societies.

The more CW operators that EUCW represents, the more notice must be taken of it! If you don't know how to contact an appropriate club, send me an sae, QTHR, for details.

News and comment from Glen Ross G8MWR

Packet beacons

A couple of months ago, I commented about the congestion on the packet network and that a fair proportion of the problem was caused by individual stations sending out beacon signals. These signals are usually on the lines of a callsign, location, name and the fact that digipeating is set to on. Now, we have to ask who really needs this information anyway? In the early days of packet it was one method of making your presence known and of generating a few contacts.

Congestion

There are more stations on packet now than you can cope with and because of the congestion, very few simplex contacts. Most of the problem is caused by people who insist on sending this beacon information at two-minute intervals. Because this takes up air time on a single congested frequency, it simply slows everything else down. If you are one of the beacon broadcasters, ask yourself how many unexpected contacts have you made due to the beacon being on? Now give yourself an honest answer. If your beacon is transmitted, say, twenty times an hour then, unless you have five contacts an hour, you are simply making a nuisance of yourself.

Headers

A thought for the SYSOPS. You may need all the information in the header part of the message so that, if needed, you can trace it back through the system. Do we actually need to send this information to the final recipient of the message? I suggest that we do not. The recipient only wants to know that the message is from G9XYZ at GB7ZZZ. If he needs to get the full routing information, it would be readily obtainable from his local SYSOP. If these details were not sent to the final destination, much air-time and collisions would be avoided. If you think that this idea would not alleviate the problem, just have a look at the header on the RSGB news. Because of the receiver having to ask for repeats, this information has to be sent several times and yet it is of no value to the recipient.

As a further example of this wasted effort, I recently received a message from an English amateur with eighteen lines of useless header information. This was sent to ALL, so consider the thousands of repeats that must have been required before this non-information arrived at thousands of destinations. Perhaps the next SYSOPS meeting would care to think about this idea to make the system more efficient?

50MHz

Reports are arriving to the effect that the Swiss authorities have granted use of the 50MHz band to HB9 licensees from January 1990. As with most countries the facility has been granted on an experimental basis for one year. Operation is allowed only outside TV hours and the 100W ERP limit is in the full band, 50 to 52MHz. Calls to look out for include HB9DBM, HB9CRQ and HQ9QQ, although by the time you read this, there will probably be many more.

A similar experimental period has been granted to Danish stations. There are no restrictions on the use of the band as far as aerials and power are concerned, other than the normal constraints imposed by their licences for other bands.

A good Sporadic-E opening to Europe occurred on 15 January, with several Danish stations getting their first taste of DX on the band. Stations heard include OZ2DX, OZ4VV and OZ7IS – all of whom were putting good signals into the UK. There was also some activity from Sweden, with reports of SM7SCJ working into Eire using low power to a dipole aerial.

Spain

During the last couple of years there have been a lot of 50MHz contacts into Spain. It has always been the view that these contacts were illegal in that the Spanish stations did not have permission to operate on the band. EA7AG writes to clarify the position and I can do no better than to quote him:

As of mid November, 'I want to make it clear that no licence, permission or authorisation of any kind has been given to Spanish amateurs to transmit on 50MHz. All stations transmitting from Spain are pirates and that also includes stations in EA6, EA8 and EA9 in North Africa.'

There have been many people claiming they have worked these calls direct rather than crossband to 10m. It would be interesting to know if these claimed contacts have been deleted from the lists supplied by stations when claiming various DX awards. The answer is plain, if you worked a Spaniard you were working a pirate.

12.5kHz?

There has been a lot of talk over the last few years about the possibility of moving from 25 to 12.5kHz spacing, especially on 2m. The advantages are obvious: twice as many spots available to operate on. The RSGB set up a study group to look into the matter, which has concluded that since there is now less use of the band there is no need to implement the narrower spacing.

Backward

This seems to be a retrograde step. Most modern rigs are able to cope with the closer spacings except, possibly, if you try to work half a channel away from your neighbour, who is half a mile down the road. If that causes a problem the answer is obvious, move away a few steps.

The statement about reduced band occupancy is true but not unexpected. During the last two or three sunspot cycles the same effect has been observed. When there is a lot of DX around on the HF bands people tend to spend their time chasing it, rather than talking to the locals on 2m. Once conditions on the DX bands start to deteriorate, then these people will return to VHF and congestion will rear its ugly head again. The RSGB will then deliberate for three years, by which time, the DX bands will be open again. The RSGB will conclude that there is no problem, and so *ad infinitum!*

Dubus

News has arrived about a large-scale revamp of this VHF DX newsheet. Dubus has been published for nearly twenty years, but there has been some dissatisfaction with the amount of German text used in its articles lately – not surprising, as it is published in West Germany. The authors have now decided to cater for its large international market by publishing most of the magazine in English.

If you are really serious about DX operating, then contact Ken Hatton G4IZW, telephone: (0434) 220636 for details.

FUJI

The death has been announced of FUJI – or Oscar 12, as it is also known. This amateur radio satellite has been up and running for about three years, but there has been increasing difficulty in keeping it programmed to operate as originally intended. This was mainly due to radiation damage to the solar cells and the general decay of the back-up battery system. The Japanese Amateur Radio League have finally given in to the difficulties of keeping it running and closed down the satellite in November 1989. The official reason given was that it would enable the team to concentrate on a replacement satellite, which is already being built.

Jas-1-b

This is the code-name for the new satellite which was scheduled to lift off in February, although an exact date is not yet known. It will go into a solar synchronous, 99° orbit at a height of 900km. This means that the satellite will be in eclipse for about a third of each orbit and to improve on this, it is intended to give it secondary boost up to around 1,200km.

Technicalities

The power will be derived from an array of 900 dual layer GaAs solar cells. These should have a long life as they are virtually immune to the effects of radiation and temperature degradation. The total power provided will be 11W, which is nearly twice as much as that of the old satellite and should enable longer operating times in periods of eclipse. Some surfaces on the satellite will be covered with paint or thermal insulation to keep it within the optimum temperature range of 0 to +40°C.

Transponders

Two beacons are carried, the first runs 100mW on 435.795MHz and transmits plain carrier, Morse code or PSK information. The second is on 435.91MHz and runs a full 1W.

All transponder modes and frequencies are similar to those on the defunct FO-12. Probably the most frequently used one is the JA mode. This has a linear uplink between 145.9 and 146MHz with the downlink appearing between 435.9 and 435.8MHz.

Requirements

To get into this satellite it is recommended that you use about 100W ERP. The spacecraft will be tumbling in space for several months before the magnetic system on board eventually stabilises the satellite. Because of this it will be difficult to determine the best polarisation to use. All the aerials on board are circularly polarised but due to the slant angles etc, which may be assumed at any one moment, it is recommended that normal linear polarisation will be the best for starters.

More satellites

No less than six new birds were scheduled to be launched at the end of January. These will cover nearly every aspect of amateur operating including dedicated data and packet systems, plus remote imaging if you want to get into the field. The launch was originally planned for 11 January but, at the time of writing, a date around the 30th seemed more likely. All the details on these will be given as soon as possible, hopefully in next month's issue.

Awards

The winter season sees a reduction in the number of awards issued and this month we have only one claimant, G7DWK, from Coventry. He claims a Bronze and Silver award for 144MHz, with the best DX being PE1KLQ at 520km for the Bronze and SM4TW at 1,072km for the Silver. The awards are particularly welcome as Dave runs only 2W from an FT290 to a small yagi at 30ft above ground. For more information about the awards send an sae to the address below.

The final

I recently heard the following on 2m (where else!), 'Sorry my signal is noisy. I wonder if this is any better? I have switched in the noise blanker on my rig.' Where do we get them from? Please send me anything of interest to: 81 Ringwood Highway, Coventry, or contact me on packet via GB7NUN.

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■ Exchange Mullard valve tester including manual, circuit and adaptors, lots of computer books, manuals, Fuji TV zoom camera lens. Write to: J Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS

■ Icom IC-761 transceiver, built-in power supply and auto ATU, two months old, £1,800. Also JST ATU, new, £150.00. WPO voice equaliser and speech processor, £40.00. Tel: (0277) 823434

■ Realistic DX-300, GC/Rx, Icom IC-2 VHF/FM Tx, HC-5010EC DMM, swap for FT-7 or similar Tx. Also consider swap for R2000 or similar Rx/Tx in gwo. Require 87/88 callbook. WHY? Offers. Tel: 031-669 8356

■ Russian Vega 215 eight-band comms Rx, ideal SWL set, £30.00. Philips N4450 eight-track recorder 10.5in reels with manual, £45.00. 50ft RG214 low-Ploss Tx coax (0.5in) unused, £8.00. 12V 8A linear PSU (Gresham), £8.00. Schrup 24V 1A Stab powerpack, £6.00. Large box of computer panels and other kit includes ROMs, RAMs, PSUs, Ni-Cads, stepper motors etc, £6.00. SG Brown headphones, £5.00. Pye MW/SW valve Rx minus case £5.00. Four ceramic 3.5in AE ribbed insulators, £3.00. Box of assorted new components, including instrument cases etc, £5.00. G4FZG QTHR. Tel: (0242) 580329

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■ Mutek 50MHz transverter, 144MHz IF, £200.00. Yaesu FT-790 with case, Ni-Cads etc, £250.00. Microwave Modules MMT 1296/144 1296MHz transverter, 144MHz IF, £175.00. SSB electronics, 1296MHz linear, 10W out, £90.00. BNOS 144MHz linear and preamp, 3W in 180W out, £275.00. 144MHz/432MHz diplexer, £25.00. Buyer collects or pays carriage. Tel: (0202) 665284 before 10.00pm

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driver, £200.00. Also R109 war-time Rx, collector's item, CW, service period, headphones, 6V car battery, photocopy of handbook and nineteen set variometer plus few spare valves, £100.00, buyer collects. Tel: (0287) 34397 daytime

■ Yaesu FC102 antenna matcher, 1200W, coax and wire, feeders, dual meters for SWR and PEP and hold function, excellent condition, original box, £185.00. Tel: (0920) 463564, ask for Max G3WMB

■ PRO 2004 scanner, vgc, £230.00 ovno. President Lincoln (same as Uniden 28-30), vgc, with tuning mod fitted, £245.00. CTE International transverter, 40-45m, with antenna, £70.00. Sirio 2012 antenna, used condition, £45.00. Ham Concorde 3, vgc, offers? Tel: (0298) 78268

■ Yaesu equipment service manuals for the following models: FC707, FR50B, FRG7, FRG9600, FT101, FT101ZD, FT201, FT223, FT480R and FT757II, £10.00 each. Write to: S J Austin, 8 Greenwood Avenue, Chinnor, Oxon OX9 4HN

■ R1155 with mains PSU speaker, £60.00. HRO with octal valves, mains PSU speaker, nine GC coils in wooden racks, £70.00. BC348L with built-in mains PSU, £40.00. R1155, complete and working, has audio fault, £25.00. BC348Q, complete and working, one range u/s, £20.00. Manuals for BC348, R1155, HRO, AR88LF etc, £5.00 each. Tel: (0727) 39908

■ Icom 71E in mint condition, boxed, manual, FM, board fitted by dealer, including ATU, £600.00. Buyer inspects and collects from East London. Tel: 01-556 5131

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■ Kenwood 5000 with VHF converter, must be mint. Tel: 01-556 5131

■ Drake MN2700 matcher, must be in very good condition and unmodified, fair price offer. Tel: (0920) 463564, ask for Max G3WMB

■ Denco plug-in coils, nine-pin fitting, all colours, ranges 3, 4 and 5. Tel: Barnsley (0226) 288718

■ Drake RV-7 remote VFO for Drake TR7 transceiver. Tel: (0483) 36953, ask for Stan G3XON

■ Handbooks or circuits for an HP606B signal generator and the following RF milli-voltmeters: Philips GM6014, HP411A and Farnell TM6. I will pay postage and copying costs. Tel: 01-248 3024 daytime or (0372) 62268 evenings, ask for Michael O'Beirne

■ Cobra 148 GTL DX, must be in good condition. Tel: (0283) 221870

■ General-coverage communications receiver: AR88 or Racal RA117E, if possible, but will consider others. Will travel within Scotland to audition wireless. Good price paid for concours model, however, wireless does not have to be that! Tel: (078687) 410

■ Telescopic mast or similar. Tel: 01-858 1448

■ Modern receiver, must be in good condition and in working order, eg, EA12 or EC10. Tel: (0727) 39908

■ Simple communications receiver, anything considered, eg, EC10, Codar CR70A etc. Exchange for large stock of components, ICs, modules, ham station items and PSUs etc. Tel: (0242) 580329

■ Reports and contacts for packet signals on 10m transmissions on 29.250MHz FM. Call G2DHV (QTHR) or via GB7UWS on 2m packet

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Amateur RADIO

ADVERTISING RATES & INFORMATION

DISPLAY AD RATES

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛ page	£66.00	£62.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
128 x 186 or 263 x 90	½ page	£305.00	£290.00	£275.00	£245.00
263 x 186	1 page	£590.00	£550.00	£530.00	£470.00
263 x 394	double page	£1,130.00	£1,070.00	£1,010.00	£900.00

SPECIAL POSITIONS

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

DEADLINES

*Dates affected by public holidays

issue	colour ad	mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Apr 1990	28 Feb 90	1 Mar 90	7 Mar 90	9 Mar 90	29 Mar 90
May 1990	28 Mar 90	29 Mar 90	4 Apr 90	6 Apr 90	26 Apr 90
June 1990	2 May 90	3 May 90	9 May 90	11 May 90	31 May 90
Jul 1990	30 May 90	31 May 90	6 Jun 90	8 Jun 90	28 Jun 90

CONDITIONS & INFORMATION

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

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

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

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

ADVERTISERS INDEX

BAKERS DOZEN PACKS

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

BD2	5	13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.
BD9	2	6V 1A mains transformers upright mounting with fixing clamps.
BD11	1	6½in speaker cabinet ideal for extensions, takes our speaker. Ref BD137.
BD13	12	30 watt reed switches, it's surprising what you can make with these – burglar alarms, secret switches, relay, etc, etc.
BD22	2	25 watt loudspeaker two unit crossovers.
BD29	1	BOAC stereo unit is wonderful breakdown value.
BD30	2	Nicad constant current chargers adapt to charge almost any nicad battery.
BD32	2	Humidity switches, as the air becomes damper the membrane stretches and operates a microswitch.
BD42	5	13A rocker switch three tags so on/off, or change over with centre off.
BD45	1	24hr time switch, ex-Elextricity Board, automatically adjust for lengthening and shortening day. Original cost £40 each.
BD49	10	Neon valves, with series resistor, these make good night lights.
BD56	1	Mini uniselector, one use is for an electric jigsaw puzzle, we give circuit diagram for this. One pulse into motor, moves switch through one pole.
BD67	1	Suck or blow operated pressure switch, or it can be operated by any low pressure variation such as water level in water tanks.
BD103A	1	6V 750mA power supply, nicely cased with mains input and 6V output leads.
BD120	2	Stripper boards, each contains a 400V 2A bridge rectifier and 14 other diodes and rectifiers as well as dozens of condensers, etc.
BD128	10	Very fine drills for PCB boards etc. Normal cost about 80p each.
BD132	2	Plastic boxes approx 3in cube with square hole through top, so ideal for interrupted beam switch.
BD134	10	Motors for model aeroplanes, spin to start so needs no switch.
BD139	6	Microphone Inserts – magnetic 400 ohm also act as speakers.
BD148	4	Reed relay kits, you get 16 reed switches and 4 coil sets with notes on making c/o relays and other gadgets.
BD149	6	Safety cover for 13A sockets – prevent those inquisitive little fingers getting nasty shocks.
BD180	6	Neon indicators in panel mounting holders with lens.
BD193	6	5 amp 3 pin flush mounting sockets make a low cost disco panel.
BD199	1	Mains solenoid, very powerful, has 1in pull or could push if modified.
BD201	8	Keyboard switches – made for computers but have many other applications.
BD211	1	Electric clock, mains operated, put this in a box and you need never be late.
BD221	5	12V alarms, make a noise about as loud as a car horn. Slightly soiled but OK.
BD242	2	6in x 4in speakers, 4 ohm made from Radiomobile so very good quality.
BD252	1	Panostat, controls output of boiling ring from simmer up to boil.
BD259	50	Leads with push-on ¼in tags – a must for hook-ups – mains connections etc.
BD263	2	Oblong push switches for bell or chimes, these can mains up to 5 amps so could be footswitch if fitted into pattress.
BD268	1	Mini 1 watt amp for record player. Will also change speed of record player motor.
BD283	3	Mild steel boxes approx 3in x 3in x 1in deep – standard electrical.
BD305	1	Tubular dynamic mic with optional table rest.
BD653	2	Miniature driver transformers. Ref LT44. 20k to 1k centre tapped.
BD548	2	3.5V relays each with 2 pairs changeover contacts.
BD667	2	4.7μF non-polarised block capacitors, PCB mounting.

There are over 1,000 items in our Bakers Dozen List. If you want a complete copy, please request this when ordering.

GEIGER COUNTER KIT includes PCB loudspeaker etc to build a 9v Geiger counter only £39.00 Ref 39P1

ALKALINE PP3 BATTERIES These are past their sell-by date but test OK, only 2 for £1.00 Ref BD758

1¼ FUSE HOLDERS 5 for £1.00 Ref BD752

UNCASED KEYBOARDS Brand new mounted on PCB with components only £3.00 Ref 3P27

TOASTERS 2 slice with browning control, may need slight attention onlyu £3.00 Ref 3P84

MICROWAVE CONTROL PANEL Brand new, mains operated including digital clock, relay output, good for all sorts of timer applications. Good value at £6.00 Ref 6P18

EQUIPMENT WALL MOUNT Multi adjustable metal bracket for speakes etc. 2 for £5.00 Ref 5P152

SUB-MIN TOGGLE SWITCH Body size 8mm x 4mm x 7mm SBDT with chrome dolly fixing nuts. 3 for £1. Order ref BD649.

COPPER CLAD PANEL for making PCB. Size approx 12in long x 8½in wide. Double-sided on fibreglass middle which is quite thick (about 1/16in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD683.

POWERFUL IONISER

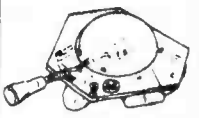
Generates approx 10 times more IONS than the ET1 and similar circuits. Will refresh your home, office, workroom etc. Makes you feel better and work harder – a complete mains operated kit, case included. **£12.50** + £2 P&P. Our ref 12P5/1.

REAL POWER AMPLIFIER for your car, it has 150 watts output. Frequency response 20Hz to 20kHz and signal to noise ratio better than 60dB. Has built-in short circuit protection and adjustable input level to suit your existing car stereo, so needs no pre-amp. Works into speakers ref 30P7 described below. A real bargain at only £57.50. Order ref 57P1.

REAL POWER CAR SPEAKERS. Stereo pair output 100W each. 4 ohm impedance and consisting of 6½in woofer, 2in mid-range and 1in tweeter. Each set in a compact purpose-built shelf mounting unit. Ideal to work with the amplifier described above. Price per pair £29.96. Order ref 30P7.

STEREO CAR SPEAKERS. Not quite so powerful – 70W per channel. 3in woofer, 2in mid-range and 1in tweeter. Again, in a super purpose-built shelf mounting unit. Price per pair £27.95. Order ref 28P1.

VIDEO TAPES. These are three hour tapes of superior quality, made under licence from the famous JVC Company. Offered at only £3 each. Our ref 3P63. Or 5 for £11. Our ref 11P3. Or for the really big user 10 for £20. Our ref 20P20.



ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the PCB. Complete kit £10. Our ref 10P81.

12in HIGH RESOLUTION MONITOR. Amber screen, beautifully cased for free standing, needs only a 12V 1.5 amp supply. Supplied with connection data for H sync, V sync & Video. Brand new in maker's cartons. Price £22.00. Free delivery. Order ref 25P10.

COMPOSITE VIDEO KIT converts composite video to H sync, V sync & sep video. Price £8.00. Ref 8p.

14in COLOUR MONITOR made by the American Display Tek Company. Uses high resolution tube made by the famous Japanese Toshiba Company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price £89 each plus £6 insured carriage. Order ref 89P/1.

BUSH RADIO MIDI SPEAKERS. Stereo pair. BASS reflex system, using a full range 4in driver of 4 ohms impedance. Mounted in very nicely made black fronted walnut finish cabinets. Cabinet size approx 8½in wide, 14in high and 3½in deep. Fitted with a good length of speaker flex and terminating with a normal audio plug. Price £5 the pair plus £1 post. Our ref 5P141.

3½in FLOPPY DRIVES. We still have two models in stock: Single-sided, 80 track, by Chinon. This is in the manufacturer's metal case with leads and IDC connectors. Price £40, reference 40P1. Also a double-sided, 80 track, by NEC. This is uncased. Price £59.50, reference 60P2. Both are brand new. Insured delivery £3 on each or both.

ATARI 65XE COMPUTER

At 64K this is most powerful and suitable for home and business. Brand new, complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 delivery.

REMOTE CONTROL FOR YOUR 65XE COMPUTER. With this outfit you can be as much as 20 feet away as you will have a joystick that can transmit and a receiver to plug into and operate your computer and TV. This is also just right if you want to use it with a big screen TV. The joystick has two fire buttons and is of a really superior quality, with four suction cups for additional control and one-handed play. Price £15 for the radio controlled pair. Our ref 15P27.

ASTEC PSU. Mains operated switch mode, so very compact. Outputs +12V 2.5A, +5V 6A, ±5V 6A, ±12V 5A. Size: 7½in long x 4¾in wide x 2¼in high. Cased ready for use. Brand new. Normal price £30+, our price only £12.95. Order ref 13P2.

VERY POWERFUL 12 VOLT MOTORS. ⅓ horsepower. Made to drive the Sinclair C5 electric car but adaptable to power a go-kart, a mower, a rail car, model railway, etc. Brand new. Price £20 plus £2 postage. Our ref 20P22.

PHILIPS LASER

This is a helium-neon and has a power rating of 2mW. Completely safe as long as you do not look directly into the beam when eye damage could result. Brand new, full spec. £35.00 plus £3 insured delivery. Mains operated power supply for this tube gives 8kV striking and 1.25kV at 5mA running. Complete kit with case £15. Complete kit with tube & power supply. £48.00.

ORGAN MASTER is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold-plated contacts and is complete with ribbon cable and edge connector. Comes complete with Spectrum 128 software. Brand new only £22.00. Ref 22P1

FULL RANGE OF COMPONENTS at very keen prices are available from our associate company SCS COMPONENTS. You may already have their catalogue, if not request one and we will send it FOC with your goods.

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

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

MINI MONO AMP on PCB, size 4in x 2in (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 AR250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT.

MAIL ORDER TERMS: Cash, PO or cheque with order. Please add £2.50 service charge. Monthly account orders accepted from schools and public companies. Access and B/Card orders accepted – minimum £5. Phone (0273) 734648 or 203500. Fax No 0273-23077

POPULAR ITEMS – MANY NEW THIS MONTH

JOYSTICKS for BBC Atari, Dragon Commodore, etc. All £5.00 each. All brand new, state which required.

TELEPHONE TYPE KEYPAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubber contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut-out and has a 10 IDC connector. Price £2.00. Ref 2P251.

SUB-MIN PUSH SWITCHES. Not much bigger than a plastic transistor but double pole PCB mounting. 3 for £1.00. Our ref BD688.

AA CELLS. Probably the most popular of the rechargeable NICAD types. 4 for £4.00. Our ref 4P44.

20 WATT 4 OHM SPEAKER. With built-in tweeter. Really well made unit which has the power and the quality for hi-fi 6½in dia. Price £5.00. Our ref 5P155, or 10 for £40.00, ref 40P7.

MINI RADIO MODULE. Only 2in square with ferrite aerial and solid dia tuner with own knob. It is superhet and operates from a PP3 battery and would drive a crystal headphone. Price £1.00. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET. The old and faithful 3 pin with screw terminals. The plug is panel mounted and the socket is cable mounted. 2 pairs for £1.00 or 4 plugs or 4 sockets for £1.00. Our ref BD715, BD715P, or BD715S.

MICROPHONE. Low cost hand-held dynamic microphone with on/off switch in handle. Lead terminates in 1 3.5mm and 1 2.5mm plug. Only £1.00. Ref BD711.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES. 140V 100 watt pair made by Hitachi. Ref 25K413 and its complement 2SJ118. Only £4.00 a pair. Our ref 4P42.
Also available in H pack Ref 2SJ99 and 2SK343 £4.00 a pair. Ref 4P51.

TIME AND TEMPERATURE LCD MODULE. A 12 hour clock, a Celsius and Fahrenheit thermometer, a too hot alarm and a too cold alarm. Approx 50 x 20mm with 12.7mm digits. Requires 1AA battery and a few switches. Comes with full data and diagram. Price £6.00. Our ref 6P12.

REMOTE TEMPERATURE PROBE FOR ABOVE £3.00. Our ref 3P60.

A REAL AIR MOVER. Circular axial fan moves 205 cubic foot per min, which is about twice as much as our standard 4½in fans. Low noise mains operated, 6½in dia, brand new. Regular price, over £30.00. Our price only £10.00. Our ref 10P71.

600 WATT AIR OR LIQUID MAINS HEATER. Small coil heater made for heating air or liquids. Will not corrode, lasts for years. Coil size 3in x 2in, mounted on a metal plate for easy fixing. 4in dia. Price £3.00. Ref 3P78 or 4 for £10.00. Our ref 10P76.

EX-EQUIPMENT SWITCHED MODE POWER SUPPLIES. Various makes and specs but generally ±5, ±12V, ideal bench supply. Only £8.00. Our ref 8P36.

ACORN DATA RECORDER. Made for the Electron or BBC computers but suitable for others. Includes mains adapter, leads and book. £12.00. Ref 12P15.

STABILIZED POWER SUPPLY KIT 1-25v 2A, contains PCB transformer and components to build a bench supply only £20.00. Ref 20P25.

PTFE COATED SILVER PLATED CABLE. 19 strands of .45mm copper, will carry up to 30A and is virtually indestructible. Available in red or black. Regular price is over £120 per reel. Our price only £20.00 for 100m reel. Ref 20P21, or 1 of each for £35.00 Ref 35P2. Makes superb speaker or aerial cable!

NEW PIR SENSORS. Infra-red movement sensors will switch up to 500W mains. UK made, 12 months manufacturer's warranty. 15-20m range, with a 0-10min timer, adjustable wall bracket. Only £20.00. Ref 20P24.

MITSUBISHI 3½in DISC DRIVES. Brand new drives, ½ height, double-sided, double density, warranted. Our price £60.00. Ref 60P5.

10 MEMORY PUSHBUTTON TELEPHONES. These are customer returns and sold such so may need slight attention. Price £6.00. Ref 6P16 or 2 for £10. Ref 10P77. BT approved.

NON-MEMORY PUSHBUTTON TELEPHONES. Same condition as above with redial £3.00. Our ref 3P79. BT approved.

DEHUMIDIFIERS. Domestic mains powered dehumidifiers, these are customer returns and sold as seen. Price £30.00. Our ref 30P9. Callers only please.

SPECTRUM SOUND BOX. Add sound to your Spectrum with this device. Just plug in. Complete with speaker, volume control and nicely boxed. A snip at only £4.00. Our ref 4P53.

BBC JOYSTICK INTERFACE. Converts a BBC joystick port to an Atari type port. Price £2.00. Our ref 2P261.

TELEPHONE EXTENSION LEAD. 5m phone extension lead with plug on one end, socket on the other. White. Price £3.00. Our ref 3P70, or 10 leads for only £19.00! Ref 19P2.

LCD DISPLAY. 4½in digits supplied with connection data £3.00. Ref 3P77, or 5 for £10, ref 10P78.

CROSSOVER NETWORK. 8 ohm 3-way for tweeter mid-range and woofer, nicely cased with connections marked. Only £2.00. Our ref 2P255, or 10 for £15.00, ref 15P32.

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BASE STATION MICROPHONE. Top quality uni-directional electret condenser mic 600r impedance sensitivity 16-18kHz – 68dB built-in chime, complete with mic stand bracket. £15.00. Ref 15P28.

MICROPHONE STAND. Very heavy chromed mic stand, magnetic base 4in high. £3.00 if ordered with above mic. Our ref 3P80.

SOLAR POWERED NICAD CHARGER. 4 Nicad AA battery charger. Charges 4 batteries in 8 hours. Price £6.00. Our ref 6P3.

MAINS SOLDERING IRON. Price £3.00. Our ref 3P65.

SOLDERING IRON STAND. Price £3.00. Our ref 3P66.

SHARP PLOTTER PRINTER. New 4 colour printer originally intended for Sharp computers but may be adaptable for other machines. Complete with pens, paper etc. Price £16.00. Our ref 16P3.

CENTRONICS CONVERSION KIT FOR ABOVE PLOTTER only £4.00. Ref 4P57.

CAR IONIZER KIT. Improve the air in your car, clears smoke and helps prevent fatigue. Case req. Price £12.00. Our ref 12P8.

NEW FM BUG KIT. New design with PCB embedded coil 9V operation. Priced at £5.00. Our ref 5P158.

NEW PANEL METERS 50UA movement with three different scales that are brought into view with a lever. Price only £3.00. Ref 3P81.

STROBE LIGHTS. Fit a standard Edison screw light fitting, 240V 40/min flash rate, available in yellow, blue, green and red. Complete with socket. Price £10 each. Ref 10P80 (state colour required).

ELECTRONIC SPEED CONTROL KIT. Suitable for controlling our powerful 12V motors. Price £17.00. Ref 17P3 (heatsink required).

EXTENSION CABLE WITH A DIFFERENCE. It is flat on one side, making it easy to fix and look tidy. 4 core, suitable for alarms, phones etc. Our price only £5.00 for 50m reel. Ref 5P153.

METAL PROJECT BOX. Ideal for battery charger, power supply etc. Sprayed grey, size 8in x 4in x 4½in. Louvred for ventilation. Price £3.00. Ref 3P75.

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