OCTOBER 1989 £2.55

Amateur RADIO

For all two-way radio enthusiasts

Introducing a New Column:
The Software File

Construction:
A Simple FET Tester

A User Review:
The Icom IC-725 HF All Band Transceiver

YOU GET MORE AT RAYCOM!

BEARCAT 200XLT

Save money when you buy this top-of-the range scanner. 200 memories, coverage from 66-956 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 Bearcat (and £30 off RRP!)

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COBRA SR-925

With coverage from 29-512MHz (with gaps), 16 memory channels, 2-speed search, high sensitivity (0.3 mV) and 1 watt of audio this scanner is ideal for beginner and enthusiast alike! Raycom adds £30 worth of free antenna, cable, plugs and sockets *and* drops the price to bring a blistering scanner package to our customers. Call now for an information leaflet!

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ICOM IC-R7000

An unbeatable offer from Raycom - £30 off the retail price and a *free* Bearcat handy scanner covering 29-512MHz (with 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!

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ICOM IC-3210

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Regular retail prices:

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

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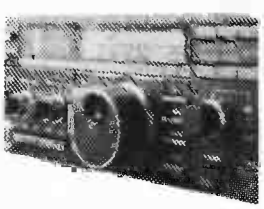
ICOM IC-725



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***

SAVE £116!

Raycom Credit Card is available on this pack, just £85 deposit and monthly payments of just £32! *Why wait, send for written details now!*

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:

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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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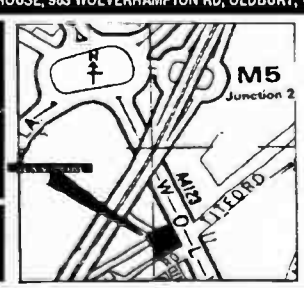

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AC126	0.45	BC107A	0.11	BC204	0.25	BD124P	0.59	BD520	0.65	BF271	0.28	BFY51	0.32	GET111	2.50	R2009	2.50	TIO142	1.75	2SC495	0.80
AC127	0.20	BC107B	0.11	BC207B	0.25	BD131	0.42	BD534	0.45	BF271	0.26	BFY90	0.77	GEX542	9.50	R2010B	1.45	TIP146	2.75	2SC496	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	2SC9310	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	BC252A	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	BC258A	0.39	BD166	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	BC284	0.30	BD179	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	BC300	0.30	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	BC301	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	BC303	0.26	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	BC307B	0.09	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	BC327	0.10	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	BC328	0.10	BD222	0.46	BF179	0.34	BFR40	0.23	BU204	1.55	OC28	5.50	T903BV	3.95	2N3706	0.12	2SC1953	0.95
AF118	3.50	BC161	0.55	BC337	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	BC338	0.09	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	BC347A	0.13	BD232	0.35	BF182	0.29	BFR90	1.50	BU208A	1.15	OC42	1.50	TIP29	0.40	2N3773	2.75	2SC1985	1.50
AF125	0.65	BC172B	0.10	BC461	0.35	BD233	0.35	BF183	0.29	BFR91	1.75	BU208D	1.35	OC44	1.25	TIP29C	0.42	2N3792	1.35	2SC202B	1.15
AF126	0.45	BC173B	0.10	BC478	0.20	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	BC527	0.20	BD237	0.40	BF185	0.28	BFT43	0.35	BU326S	1.50	OC70	1.00	TIP31C	0.55	2N4427	1.95	2SC207B	1.45
AF139	0.40	BC177	0.15	BC547	0.10	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	BC548	0.10	BD246	0.75	BF197	0.11	BFW11	0.75	BU408	1.50	OC72	2.50	TIP33C	0.95	2N5294	0.42	2SC2098	2.95
AF17B	1.95	BC179	0.10	BC549A	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	BC182	0.10	BC550	0.14	BD379	0.45	BF199	0.14	BFW61	0.60	BU500	2.25	OCB1	1.00	TIP41A	0.45	2N529B	0.60	2SC2314	0.80
ASY27	0.85	BC182L	0.10	BC557	0.08	BD410	0.65	BF240	0.20	BFW92	0.85	BU508A	1.95	OCB4	1.50	TIP41C	0.45	2N5496	0.95	2SC2371	0.36
ASY77	1.50	BC183	0.10	BC558	0.10	BD434	0.65	BF241	0.15	BFX29	0.30	BU526	1.90	OC139	12.50	TIP42C	0.47	2N5641	16.50	2SC931D	0.95
		BC183L	0.09	BC639/10	0.30	BD436	0.60	BF245	0.30	BFX84	0.26	BU807	2.25	OC171	4.50	TIP47	0.65	2N5643	16.50	2SK19	0.55
				BCY33A	19.50	BD437	0.60	BF256LC	0.35	BFX85	0.32	BUY20	2.15	OC200	4.50	TIP48	0.65	2SA329	0.95	2SK33	0.55
						BD438	0.75	BF257	0.28	BFX86	0.25			OC201	5.50	TIP50	0.65			3SK88	0.48
						BD510	0.95			BFY1B	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	CA3130M	2.50	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	0.89	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	TAA630S	2.95	TBA810AS	1.65	TDA1270Q	3.95	TDA2690	2.45	UPD2114LC	2.50
AN264	2.50	ETT6016	2.50	LC7131	5.50	MC1723	0.50	SN76131N	1.30	TA7108P	1.50	TAA661B	1.95	TBA810P	1.65	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	MC14106P	2.95	SN76228N	2.95	TA7130P	1.50	TBA120AS/B/C		TBA890	2.50	TDA2010	1.95	TDA4050	2.95	741	0.35
AN313	2.95	HA1322	1.95	LM380N	1.50	MC14518CP	7.50	SN76533N	1.65	TA7137P	1.00		1.00	TBA920	1.65	TDA2020	2.95	TDA4600	2.50	747	0.50
AN315	2.95	HA1339A	2.95	LM380NB	2.95	MC14528BCP	1.50	SN76650N	1.15	TA7146P	1.50	SA/SB/T/U		TBA950/2X	1.50	TDA2030	2.80	TDA9503	3.15	748	0.35
AN316	3.95	HA1366W	2.75	LM3B3T	2.95	MC14538BCP	1.50	SN76660N	0.90	TA7176AP	2.95	TBA395	1.50	TBA990	1.49	TDA2140	3.95	TEA1009	1.35	7808	0.50
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AN362L	2.50	LA1201	0.95	M5155L	2.95	MC14585BCP	1.50	STK015	5.95	TA7205AP	1.15	TBA480Q	1.95	TCA270SQ	2.50	TDA2160	2.50	UPC575C2	1.50	7815	0.50
AN612	2.15	LA1230	1.95	M5151L	2.30	MC3401L	2.50	STK01B	7.95	TA7208	1.95	TBA510	2.50	TCA650	2.50	TDA2524	1.95	UPC1001H	1.95		
AN6362	3.95	LA3201	0.95	M5152L	1.50	MC14106P	2.95	STKD25	11.95	TA7222AP	1.80	TBA510Q	2.50	TCA760	2.50	TDA2530	1.95	UPC1020H	2.95		
AN7140	3.50	LA4101	0.95	MB3705	1.50	MC14518CP	7.50	STK032	7.95	TA7227P	4.25	TBA520	1.10	TCA800	6.95	TDA2532	1.95	UPC1024H	1.50		
AN7145	3.50			MB3712	2.00	MC14528BCP	1.50	STK07B	11.95	TA7228P	1.95	TBA520Q	1.10	TCA830S	1.95	TDA2540	1.95	UPC1025H	1.95		
						MC14538BCP	1.50	STK085	8.95	TA7310P	1.80	TBA530	1.10	TCA900	2.50	TDA2541	2.15	UPC102BH	1.95		
						MC14553BCP	2.95	STK415	7.95	TA7314P	2.95	TBA530Q	1.10	TCA940	1.65	TDA2560	1.15	UPC1032H	0.95		
						MC14584BCP	1.50	STK435	7.95	TA7321P	2.25	TBA540	1.25	TDA440	2.20	TDA2576	4.50	UPC1158H	0.75		
						MC14585BCP	1.50					TBA540Q	1.35					UPC1167C2	1.95		

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Sharp 8300	2.95
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Rank A774	6.35
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B9A	0.65	OTHERS ON APPLICATION	
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BA115	0.13	BYX3B 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	CS4B	8.00
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BA313	0.75	MR512	0.65
BA318	2.95	OA47	0.15
BA32B	2.95	OA90	0.10
BA521	1.75	OA91	0.15
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BY133	0.15	IN4003	0.04
BY164	0.45	IN4004	0.05
BY176	1.20	IN4007	0.06
BY179	0.63	IN414B	0.02
BT1B2	0.55	IN444B	0.10
BY1B4	0.35	IN5401	0.12
BY1B7	0.45	IN5402	0.14
BY199	0.40	IN5403	0.12
BY206	0.14	IN5406	0.13
BY208 800	0.33	IN5407	0.16
BY210 800	0.33	IN5408	0.16
BY223	0.90	ITT44	0.10
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6SS7 1.95
6T8 1.50
6U6GT 3.50
6U7G 3.50
6U8A 1.50
6V6G 1.45
6V6GT 2.50
6W4GT 1.95
6Y6G 3.95
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30FL14 1.25
30L1 0.45
30L15 0.60
30L17 0.50
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STRAIGHT & LEVEL

ON THE COVER

On the front cover this month is the Icom IC-4SET UHF FM hand-held transceiver. This compact, go-anywhere, multi-functional hand-held measures only 49mm × 102.5mm × 35mm (WHD).

The IC-4SET includes the following functions:

- Built-in Ni-Cad batteries;
- 5W output power;
- Built-in clock with timer function;
- Easy access keyboard and tuning control;
- Forty-eight memory channels and a programmable call channel;
- Full scan, programmed scan and memory scan;
- External dc power jack;
- Tone squelch;
- Multi-function LCD display.

For further information about the IC-4SET and Icom's range, contact *Icom (UK) Ltd, Unit 9, Sea Street, Herne Bay, Kent CT6 8LD.*

MICROWAVE FETS

A new range of high power GaAs FETs for microwave applications have been introduced by NEC Electronics Ltd. Developed for satellite communications and car telephone systems, the NE345L range delivers up to 20W of output power at 2.3GHz, making it the highest power GaAs devices currently available.

Two devices, NE345L-10B and NE345L-20B, are rated for power output of 40dBm (10W) and 43dBm (20W) respectively. The range employs plated heatsink construction to minimise thermal resistance and to maximise reliability.

Housed in small hermetically sealed packages, the NE345L range is particularly suitable for use in compact equipment applications.

In addition to this, their high power, high gain characteristics allow further economies to be made by reducing the number of components required.

For further information contact *NEC Electronics (UK) Ltd, Cygnus House, Linford Wood Business Centre, Sunrise-Park Way, Linford Wood, Milton Keynes MK14 6NP. Tel: (0908) 691133.*

PANASONIC RF-B65D

Panasonic Consumer Electronics (UK) have introduced their latest compact, multi-band portable SSB receiver, the RF-B65D.

The receiver covers FM/LW/MW/SW frequencies, and the dc power source comprises 6V, UM-3×4 dry batteries for the radio and 3V, UM-3×2 dry batteries for the clock-memory. One 8cm PM dynamic speaker is included.

The system includes: a microcomputer-controlled PLL quartz synthesiser tuner; two-way direct access tuning; electronic rotary tuning; and auto-scan tuning.

The memory function consists of thirty-six preset memories, which can be retrieved instantly by pressing the appropriate memory channel key.

Other features include: LCD multi-function display; sleep and standby functions; rotary volume control; hi/lo tone selector; an AM sensitivity switch; and ac adapter.

The RF-B65D measures 198mm × 118mm × 33.5mm (WHD) and weighs 625g.

The rig retails at £179.95 and is available from Panasonic dealers nationwide.

For further information on the RF-B65D, contact *Panasonic Consumer Electronics (UK), Willoughby Road, Bracknell, Berks RG12 4FP. Tel: (0344) 862444.*

PROTOCOL ANALYSER

Thurlby Electronics Ltd have introduced the DA100, which is a low-cost protocol analyser for use on asynchronous serial data communication systems, particularly RS-232. Its diagnostic capabilities help to solve many of the common problems that occur when working with such systems.

The DA100 provides baud-rate analysis, data-word format analysis, data monitoring (ASCII or HEX), triggered data capturing and test data generation.

The DA100 connects to any standard oscilloscope via a single cable and displays thirty-two characters of alphanumeric text. Alternatively, an optional LCD dis-

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

The DA100 protocol analyser

play unit can be fitted, allowing the analyser to be used independently of an oscilloscope.

In addition to being able to analyse transmission formats and monitor data, it can also be used to generate test data for checking the operation of printers and terminals when no transmitting device is available, or when the operation of the transmitting device is suspect.

This protocol analyser is powered from an internal PP3-size disposable battery.

A low power 'standby' mode enables the analyser to retain its set-up information for up to five months using a standard alkaline battery. Alternatively, a rechargeable battery may be used, or it may be powered from a standard 12V mains adapter.

For further information contact *Thurlby Electronics Ltd, Burrel Road, St Ives, Huntingdon, Cambridgeshire PE17 4LE. Tel: (0480) 63570.*

RECTIFIER MODULES

International Rectifier's range of HEX-pak power MOSFET rectifier modules has been extended to include 600V and 800V devices. These provide current ratings from 12A to 50A according to type, with power ratings of 500W or 625W.

Power handling capability is optimised by employing four and six-chip construction to achieve on resistances ($R_{DS(ON)}$) as low as 0.1 ohms.

The range is housed in isolated base T0-240AA modules and features both single-HEXFET and half-bridge configurations.

For further information contact *International Rectifier, Hurst Green, Oxted, Surrey RH8 9BB. Tel: (0883) 713215.*

BBC WORLD SHOP

A full range of information about the world of broadcasting, particularly international broadcasting, is now available from the BBC World Shop.

BBC World was opened in 1982 as a focal point for visitors world-wide. It is an ideal source of information about the World Service, the BBC in general, and for those who require detailed programme information.

There is a large selection of BBC books, videos, records, tapes, short wave radios and a variety of BBC World Service merchandise such as travel wallets, keyrings and tie pins.

Currently attracting more than 45,000 people a year, BBC World has become one of the BBC's most successful retail ventures.

After overheads, all income is ploughed back into World Service programmes.

You can visit the BBC World Shop at the Strand, London WC2

RSGB CONVENTION

The RSGB National HF Convention takes place on 1 October 1989 at the Belfry Hotel, Milton Common, Oxford.

The programme includes lectures on 'HF Yagis', by John Devoldere ON4UN, author of **LF DXing**; and 'Are Our Rigs Good Enough?' The speaker will be Peter Chadwick G3R2P.

The DTI will announce this year's winner of the Young Amateur of the Year Award.

Other attractions include: RSGB bookstall; Worked all Britain Stand; 1.8MHz get-together; DX Quiz; car boot sale (free admittance); and an advice booth for constructors.

There will also be a short programme of DX slides on the Saturday evening including: Marquesas and Austral Islands, by F6EXV; Cocos Keeling DXpedition, by G4JVG; and Rivella Gigedo Expedition, by XF4L.

Light lunches and snacks will be available at the hotel for a modest charge. Admission costs £3.50 per person and the doors open from 0930 hrs.

For further information contact *the RSGB, or Don Field G3XTT, QTHR. Tel: (0734) 724192.*

QSL CARDS

Thought Factory, based in Leicester, offers QSLers the opportunity to have their QSL cards printed from £44.00 for a 250 print run (minimum).

They offer full colour on one side and printed details of the station on the reverse side. Cards of all sizes are catered for.

For further details contact *Thought Factory, 40-42 Hastings Road, Industrial Development, Leicester LE5 0HL. Tel: (0533) 765302.*

APPEAL

The Banstead Group of the Macular Disease Society, which helps people with this degenerative eye disorder, is appealing for someone to build a small public speaker unit.

If you live in the Banstead area, and would be interested in building a trial unit contact *the Hon Secretary, Mrs I Dendy, 46 Sutton Lane, Banstead, Surrey SM7 3RB. Tel: (0737) 355733.*

CLUB NEWS

The Verulam Amateur Radio Club in St Albans, will hold its annual 'Great Erg Race' – an inter-club construction competition – on Tuesday 24 October at 1950 hrs.

The VARC meets at the RAF Association's HQ, New Kent Road, St Albans, on the second and fourth Tuesday of each month.

For further information contact *G3PMF QTHR.*

The Wimbledon and District Amateur Radio Society will hold two meetings in October: 13 October, AGM and 27 October, surplus equipment sale.

All WDARS meetings take place on the second and last Friday of each month at St Andrews Church Hall, Herbert Road, London SW19. Doors open at 1950hrs.

For further information contact *Nick Lawlor G6AJY, 115 Bridgewood Road, Worcester Park, Surrey KT4 8XS. Tel: 01-330 2703.*

The Dunstable Downs Radio Club will hold an RAE open evening on 29 October.

For further information contact *Tony Kelsey-Stead G0COQ, 44 Shelley Road, Luton LU4 0JA. Tel: (0582) 508259.*

The Bedord and District Amateur Radio Club is organising a special event

station on 14 October 1989 at Cardington Airfield to celebrate the sixtieth anniversary of the ill-fated R101 airship.

For further information, write to: *Richard Smith G120J, 1 Perring Close, Sharnbrook, Bedford MK44 1JE.*

The Conventry Amateur Radio Society programme of events for October includes:

6 October AGM; 13 October night on the air and Morse tuition; 20 October, preparation for JOTA, and night on the air and Morse tuition.

The CARS meets every Friday at 2000hrs at: Baden Powell House, 121 St Nicholas Street, Radford, Coventry.

For further information contact *Jonathan Ward G4HHT, 3 Shirley Road, Walsgrave, Coventry CV2 2EL. Tel: (0203) 610408.*

The Wirral Amateur Radio Society programme of events for October includes:

4 October, AGM; and 18 October, equipment sale.

The WARS meets on the first and third Wednesday of each month at 1945hrs at: Ivy Farm, Arrowe Park Road, Birkenhead L49 5LW.

The Stevenage and District Amateur Radio Society will be running an RAE course from 6 November at: the Ridgemond Training Centre, Telford Avenue, Stevenage.

From the beginning of October, club activities will be held at: the Ground Floor Lecture Room, D Block, Ridgemond Training Centre.

For further information contact *Pete Daly GOGTE, 48 Lincoln Road, Stevenage, Herts SG1 4PJ. Tel: (0438) 724991.*

ADDENDUM

In the July issue of ***Amateur Radio***, we published 'A Trapped Dipole for the DX Bands', by David Taylor G4EBT.

An error appeared on page forty-one, second column, second line down. It should read 'Are 55mm in diameter', *not* 15mm.

THE ICOM IC-725

HF ALL BAND TRANSCEIVER

A USER REVIEW

by Ken Michaelson G3RDG

In these days of ever increasing prices, it is refreshing to review a transceiver which, in money terms, costs much less than similar types of equipment. The new IC-725 transceiver provides all the facilities an amateur needs, without any of the unnecessary frills which would hardly ever be used in operation.

Advanced features

The IC-725 has a number of advanced features, such as a Direct Digital Synthesiser (DDS) with three selectable tuning rates in 10, 20 or 50Hz steps; and a 'Band Stacking Register' capability, on which I shall comment later. There are also a 10dB preamplifier, a 20dB attenuator, three scan types, a noise blanker and twenty-six memories. So, although this is Icom's 'budget' option, not much that is necessary has been omitted.

This small unit measures 241mm×94mm×239mm (WHD), and is in Icom's usual colours of battleship grey with a darker shade of grey for the front panel. A chromium-plated bail on the underside of the rig raises the front to a more convenient height, if required. The specification of the IC-725 is shown in Table 1. The circuit diagram is shown in **Fig 1**.

The IC-725 is intended as much for mobile operation as base station work. The threaded holes at either side of the case are for connecting the rig to the IC-MB5 mobile mounting bracket (available as an optional extra). I did not use the rig as a mobile, but its compact size will make it relatively simple to install in a vehicle. Another optional extra is the MB-23 carrying handle, for which separate threaded screw-holes are provided. This option, of course, is one of the choice of extras that Icom give the prospective owner, rather than include them as standard and thereby increase the total price of the rig.

There is neither VOX facility nor the Icom PBT (passband tuning) but, for the price, you can manage without them.

Controls on the front panel

The front panel of the transceiver has twenty-two microswitches, all of which have the excellent feel one expects from Icom. In addition, there are two dual-action concentric rotary controls, the phone socket (standard ¼in) and the mic socket. The tuning knob is fitted with a rubber ring round the outside, and there is also the means of adjusting the 'drag' or tension. This adjustment is, quite simply, a 'cross-headed' screw on the front panel.

To the upper-left of the front panel are the push on/push off Power and Transmit switches, followed by the 'S' .meter, which doubles as a Relative Power meter when transmitting. On the left-hand side of the meter are two LEDs: a green one lights up when receiving and a red one when transmitting. This red LED also acts as an ALC indicator so that when transmitting in the SSB mode, the LED lights up on voice peaks.

The LCD display area is immediately above the tuning knob. It shows sixteen different pieces of information – not all at once, of course – and includes: Mode, RIT, Split, Memory channel with the word MEMO above it, and which VFO is in use at the time. The LCD display shows the figures and letters in black against an orange background, and is one of the clearest displays I have seen in a long time.

To the right of the display are six microswitches, four of which have dual operations. The top three are: VFO, SPLIT and UP, and the lower three MEMO, MW, (Memory Write) and DOWN. The second facilities of the four, brought into operation by pressing the FUNCTION key, are on the top row: P SCAN and A=Band, and on the lower row: M SCAN and M to VFO. In the middle between UP and DOWN is M-CH.

Having entered the Memory mode by pressing MEMO, the twenty-six memory channels can be searched by pressing either UP or DOWN. The channels are displayed sequentially, either up or down. No bother turning switches, just a pressure on either key. This arrangement is one of the simplest methods of memory selection yet.

Working in sequence

The lower two-thirds of the front panel contains the rest of the controls; the centre area being taken up by the tuning knob. On the left there are three keys labelled from top to bottom: SSB, CW/N and AM/FM. Pressing these keys gives the desired mode, and they work sequentially. That is to say, SSB on the first press gives LSB and the second press gives USB. The next pressure goes back to LSB, and so on. CW/N gives CW or CW/N (with the optional FL-100 or FL-101 installed). The review unit had neither filter in position, so I was unable to try CW/N. The bottom key operates AM/FM in the same manner: one press gives AM and the next gives FM. Since the optional UI-7 module (AM transmit and FM receive/transmit) was not included, I was unable to test the AM transmit or FM mode.

On the right-hand side of the tuning control are four keys labelled from top to bottom: kHz, MHz, BAND and LOCK (FM TONE is written underneath). They are all of the push on/push off type. Pressing the kHz key sets the tuning rate in 1kHz

The front view of the IC-725 transceiver

Specifications of the Icom IC-725

Frequency coverage	
Receive	500kHz to 30MHz
Transmit	1.80000 to 1.99999MHz 3.40000 to 4.09999MHz 6.90000 to 7.49999MHz 9.90000 to 10.49999MHz 13.90000 to 14.49999MHz 17.90000 to 18.49999MHz 20.90000 to 21.49999MHz 24.40000 to 25.09999MHz 27.90000 to 30.00000MHz
Modes	
SSB (A3J), CW (A1), AM (A3), FM (F3)	
(UI-7 AM FM unit required for AM transmit and FM transmit/receive)	
Number of memory channels	Twenty-six
Antenna impedance	50 ohms unbalanced
Usable temperature range	−10°C to +60°C (+14°F to +140°F)
Frequency stability	Less than ±200Hz up to one hour after power is turned on Less than ±30Hz after one hour at +25°C (+77°F) Less than ±350Hz at 0°C to +50°C (+32°F to +122°F)
Power supply requirements	13.8V dc ±15% negative ground
Current drain (at 13.8V dc)	Receive (squelched) 1.2 amp Maximum audio output 1.5 amp Transmit 20 amp
Dimensions	241mm × 94mm × 239mm (WHD)
Weight	4.6kg
Transmitter	
Output power	
SSB, CW, FM	10 to 100W continuously adjustable
AM	10 to 40W continuously adjustable
Spurious emissions	More than 50dB below peak output power
Carrier suppression	More than 40dB below peak output power
Unwanted sideband	More than 50dB down with 1kHz AF input
Receiver	
Receive system	
SSB, CW, AM	Double conversion superheterodyne
FM	Triple conversion superheterodyne
Intermediate frequencies	1st SSB 70.4515MHz CW 70.4506MHz AM, FM 75.4500MHz 2nd SSB 9.0115MHz CW 9.0106MHz AM, FM 9.0100MHz 3rd FM 455kHz
Sensitivity (preamplifier ON)	
(1.8 to 30MHz) SSB, CW	Less than 0.15μV for 10dB S/N
AM	Less than 2.0μV for 10dB S/N
(28 to 30MHz) FM	Less than 0.5μV for 12dB SINAD
FM squelch sensitivity	Less than 0.3μV (preamplifier ON)
Selectivity	
SSB,CW	More than 2.3kHz at −6dB Less than 4kHz at −60dB
AM	More than 6kHz at −6dB Less than 20kHz at −40dB
FM	More than 15kHz at −6dB Less than 30kHz at −50dB
Spurious response rejection	More than 70dB
Audio output impedance	8 ohms
Audio output power	More than 2.6W at 10% distortion with an 8 ohm load
RIT variable range	More than ±1kHz

Table 1

steps and is shown by a little arrow appearing in the display area over the kHz digit. The same thing happens if the MHz key is operated, except that the tuning rate is changed by 1MHz steps, with the little arrow appearing above the MHz digit.

Cunning design

The IC-725 covers all amateur bands, and these are selected in sequence by pressing the BAND switch and rotating the tuning knob. When the key is pressed, two little arrows appear on the far left of the display and whatever happened to be tuned in at the time will be lost. Turning the knob shows the amateur bands, starting with 1.9MHz up to 29MHz and then back to 1.9MHz.

This is where the cunningly-designed band stacking facility is used. You can preprogram one station on each of the amateur bands, together with the mode, and then turn the knob to immediately recall it. What it boils down to is that you have eleven choices, which can be anywhere between 1.8MHz and 29MHz. If you choose a commercial station outside the amateur bands, then naturally you cannot transmit, but any choice within the amateur bands will allow transmission. This facility enables the operator to jump from band to band with everything all tuned up and is very convenient for switching bands during a contest, or even checking conditions on another band.

The bottom switch on this bank is labelled LOCK and deactivates the main tuning knob. It also transmits a sub-audible tone signal when in the FM mode.

The remainder of the right-hand side of the panel contains four controls: the RIT knob shifts the frequency up to ±1kHz either side of the displayed frequency and is brought into action by pressing the key on its right labelled RIT; the ANTENNA TUNER switch, when pressed, brings the optional AH-3 HF automatic antenna tuner into circuit; and finally, the FUNCTION switch alters the operation of nine different switches, as shown in Table 2.

The left-hand part of the front panel contains the phone socket and below it is the usual Icom 8-pin microphone socket for the Icom HM-12 electret condenser-type hand-held microphone supplied with the transceiver. The hand-held's UP/DOWN buttons are on the top face and a slide switch on the back switches the UP/DOWN option on or off. To the right of these are two concentric rotary controls: the left-hand one being AF GAIN and (the outer ring) SQUELCH. The right-hand control is the MIC GAIN and (the outer ring) RF POWER. Below these two knobs are four push on/push off switches, from left to right: NB, ATT, PRE and AGC. It is to the credit of Icom's designers that there are so many options

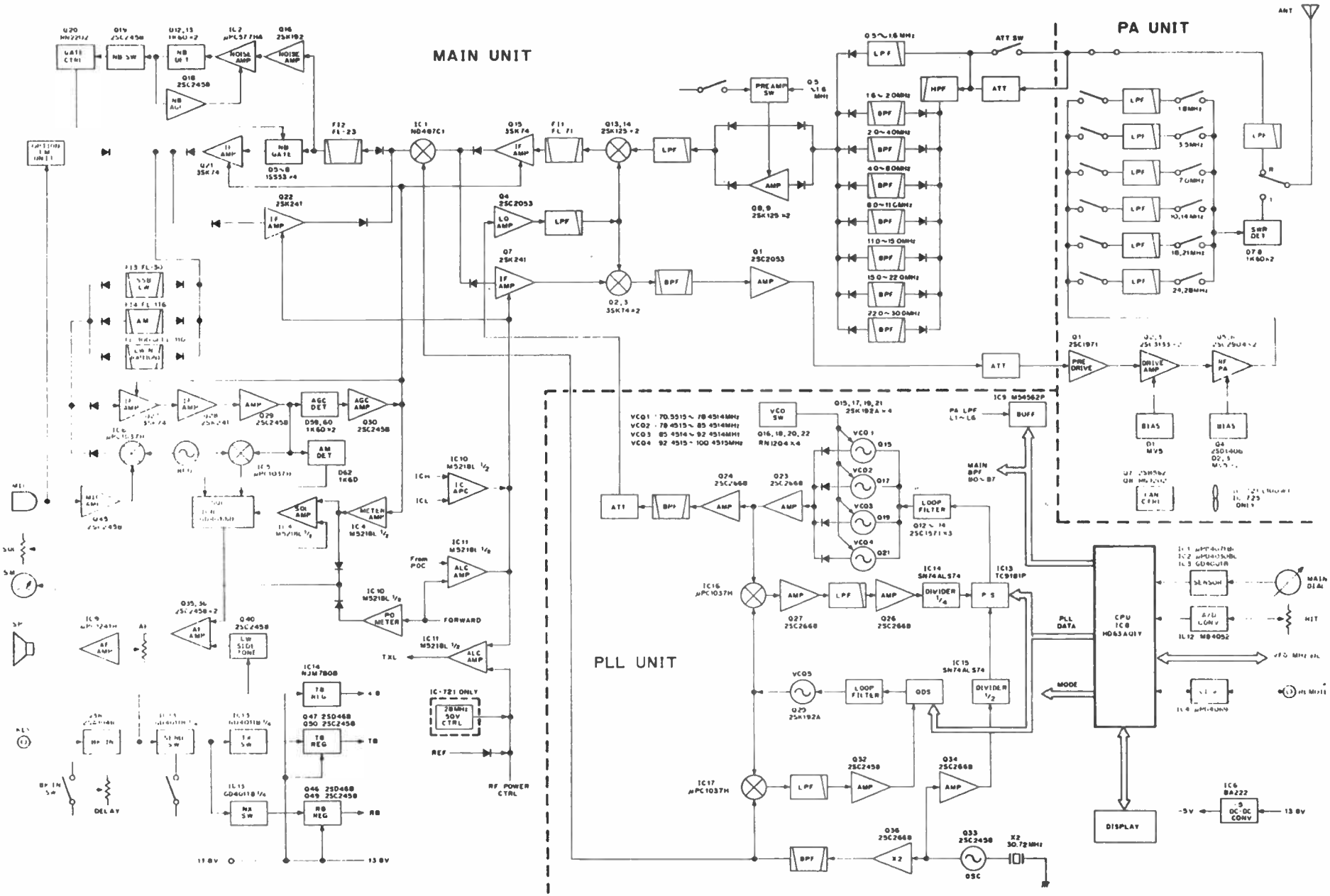


Fig 1: *The circuit diagram of the IC-725 transceiver*

Function Switch

Function +VFO	Activates programme scan
Function +SPLIT	Equalises the frequency and mode of the two VFOs
Function +MEMO	Activates the memory scan
Function +MW	Activates the 'frequency transfer function'
Function +RIT	Adds the RIT shift frequency to the displayed frequency.
Function +TUNER	Bypasses the AH-3 automatic antenna tuner
Function +kHz	Changes the tuning step
Function +BAND	Turns the 10Hz reading in the display'on or off'
Function +LOCK and MEMO	Activates the 'mode selected memory scan'

Table 2

on the front panel without giving any appearance of overcrowding.

Checking out the back

The rear panel is just as well laid out. The actual sockets are not labelled, but a plate in the centre gives all the relevant information together with the rig's serial number etc. The usual 50 ohm SO239 socket is situated up on the top right-hand side, and below this is a substantial ground connection in the form of a threaded post with a wing nut to secure the cable.

In a line along the lower edge are six sockets, a push on/push off switch and an adjustable rotary control. From left to right these are: a 3.5mm socket for an external speaker of between 4-8 ohms; the CW semi break-in on/off switch (coloured blue); the rotary control which adjusts the transmit-to-receive switching delay time for CW semi break-in operation; a standard ¼in socket for the CW key which accepts either a straight key or an electronic keyer; two DIN sockets, ACC(1) having eight pins and ACC(2) seven; and two phono sockets, the left-hand one accepts an ALC voltage, and the right-hand one is called a 'send' control socket which goes to ground when transmitting and will control an external unit.

In the centre is another 3.5mm socket, the CI-V remote-control jack, for the remote operation of the transceiver's functions using a personal computer. Next to this socket is a 4-way projecting plastic socket for the optional AH-3 HF automatic antenna tuner cable. Finally, above this is the dc power socket which accepts 13.8V dc for the rig's operation.

When the top cover is removed, the whole of the top section of the IC-725 consists of one large aluminium heat-sink, with finning extending two-thirds of the way forwards from the rear. In the front right-hand corner is the 65mm-diameter speaker which faces upwards. To my surprise the rig has fan cooling which operates whenever the transceiver is in the 'transmit' mode, enabling the rig to be used for three to four hours at a time without becoming overheated. A very helpful piece of design.

Two methods

Split operation is available using either of two methods. You can use the contents of VFO A and VFO B in the VFO mode or use memory channel 23 or 24 in the memory mode; both memorise independent transmit/receive frequencies and modes for each channel. While mentioning memories, channels 0-22 record one frequency and mode for each channel and channels 25 and 26 memorise one frequency and mode to be used as scan edges for 'Programmed Scan'.

Recording a frequency and mode is simplicity itself. You just dial up the frequency required and choose the mode, using whichever VFO you like. Then by pressing the MEMO key and either the UP or DOWN key, you will find a free channel. Pressing MW (Memory Write) records that frequency and mode in the channel you have chosen. The frequency is transferred to the VFO for any alteration by pressing FUNCTION followed by MW.

SCAN is another facet of the memory facility, giving three types of operation: 'Programmed Scan', where channels 25 and 26 are used as the scan edges, scanning the frequencies between the edges and jumping back to scan again; 'Memory Scan', in which the rig scans all the channels repeatedly; and 'Selected Memory Scan', where the IC-725 repeatedly scans all the memory channels with the same selected operating mode.

Although the scan speed is set at the factory, it can be slowed down by inserting a diode (D21), as described in the owner's manual. Inserting a second diode (D22) gives a slower scan speed when pressing the UP or DOWN buttons on the microphone. Interestingly, the front panel can be removed by unscrewing six screws. This has to be done to insert the diodes but apart from that, it means that this area is easily accessible for any service work.

The rig in operation

Operating the rig is a most enjoyable experience. For working CW, however, an additional FL-100 or FL-101 filter is recommended, since there is not really enough selectivity available in the normal position. The SSB filter (more than 2.3kHz at −6dB) is quite adequate.

The receive section of the rig is essentially the same as that of the well-known IC-735, so the sensitivity is well up to requirements (I had AMTOR contacts on 7MHz also using AFSK, which is available if required). Neither is there any difficulty with receiver recovery time for contacts over the British Isles. The packet mode can be used on 14.102MHz in conjunction with the AEA PK-232 in AFSK; the 100W output is perfectly satisfactory for making contacts.

It really was a most deceptive little rig. Once I was used to its small physical size, I could treat it as a proper base station (apart from the mobile side which is another story). The rig can be used for ordinary general-coverage reception of, for instance, Radio One, Two or Three. Of course, it is not a Hi-Fi receiver but despite the listed 10% distortion, I did not find it objectionable.

It can also be used to receive fax weather maps from Bracknell or Offenbach in Germany, the latter being at a frequency of 134.2kHz; use a Datong VLF converter and tune to 28.1342MHz. I had no trouble with reception, and several maps were printed perfectly from both stations. While operating on 28MHz I had several good QSOs, two being Ws.

A chance to change

In my view, this rig is ideal for a new licensee or someone who has, perhaps, a rather elderly unit. In the case of the newcomer, the operating techniques are straightforward and can be mastered very quickly. It isn't necessary to have any great experience in working HF. In the other case, the IC-725 is an ideal upgrade from a transceiver designed, say, twenty years ago. I know there is a number of amateurs in this situation, so this would be a chance to change without too much expense.

The Owner's Manual is very well produced in clear print and the drawings are large and clearly labelled. The manual contains three or four paragraphs on 'Tech Talk from Icom'. This has a question and answer format with questions such as 'What is ALC?', and then the answer is given. Or 'What is the function of the Band Stacking Register?' Again followed by the answer. This is a departure from conventional manuals and is very praiseworthy.

I can thoroughly recommend the rig as value for money, as well as being an excellent transceiver. The price of the IC-725 is £759.00. The UI-7 AM/FM module costs £40.00. The FL-100 filter costs £57.00 and the FL-101 filter costs £55.00. All prices are inclusive of VAT.

Thanks to Icom (UK) Ltd, Sea Street, Herne Bay, Kent CT6 8LD, tel: (0227) 363859, for the loan of the rig for this review.

PROJECT BOOK

by Martin Williams

A unit that we all have a use for is the heavy duty power supply. These, in their various ratings, can be bought for large sums of money or they may be home built.

In the latter case the accepted method seems to be to buy some bits and pieces that look about right for the job, stick them in a box and then hope for the best. You will certainly end up with a power supply but its aptitude for the job in hand, and its reliability, can certainly be called into question.

So what is required? Let us look at the basic design steps and see just what is needed to provide a well designed and well engineered unit at a reasonable cost.

The specification

The first, and known, requirement is the voltage you need and for our purposes we will assume this to be a nominal 12V. The next point to determine is the current capacity of the unit and here it is as well to estimate on the generous side. The difference in the overall cost of, say, an 8A or a 12A supply is not likely to be great when you take into account the fixed cost of a case, terminals and all the other bits that are common to both units. Let us assume that you decide on 10A.

The lump

New transformers with 150W ratings are, to say the least, rather expensive; hence the cost of the commercial units. Finding one for your project will probably mean hunting around under the tables at rallies.

Incidentally, 10A at 12V is only 120W, so where did the extra 30W come from? Remember that the specification figures are what you want to get out of the unit. You must also allow for the voltage drop across the regulator system. We actually need a transformer that will give us about 15 or 16V AT FULL LOAD.

Keep in mind the fact that the voltage and current required need not come from only one secondary winding. Add together, in every available combination, all the ratings that are available on the transformer you have found, to see if it will give you what you want.

Examples

You may find an old valve heater supply transformer which has two windings of 6.3V and one of 5V (these are quite common). In this case you simply wire all the secondaries in series to give you 17.6V, which is close to what you want.

If the voltages are correct but the current rating of individual windings is not enough, remember that you can connect the separate windings in parallel to get the current rating you need.

Checking out

When wiring the secondaries in series or parallel you need the help of an alternating current voltmeter. For parallel windings alternating current first connect the primary of the transformer to the mains supply then set the meter to a suitable range and connect it across one of the secondary windings.

Now, while keeping an eye on the meter, connect the first winding to be paralleled across the metered one. If the voltage stays the same the windings are correctly connected. However, if the voltage drops to zero the second winding is connected the wrong way round and the connections should be reversed.

Leave the second winding connected and continue in the same way for the remaining secondaries until all are connected.

Series connections

To increase the voltage you have to connect the windings in series. To check this, connect the primary to the mains and then series-connect two windings. Set the ac voltmeter to a suitable range and connect it across the ends of the windings in series.

You should get a reading which equals the total voltage of the two windings. If you don't, then reverse the connections to one of the windings. Now add the next secondary and rerun the test. Continue until all the windings are incorporated in the circuit.

Caution

Remember three things. Firstly, the open circuit voltages of the primaries with no load on them will be quite a bit higher than the marked voltages. The meter should be set to make allowances for this.

Secondly, *never* connect secondaries of different voltage ratings in parallel. If you connect windings with different current ratings in series, then the maximum current you can draw is that provided by the lowest rated secondary; the weakest link in the chain syndrome.

Remember that you have mains voltages around the circuit. So, *take great care* if you don't want to receive a nasty shock; in both senses of the word!

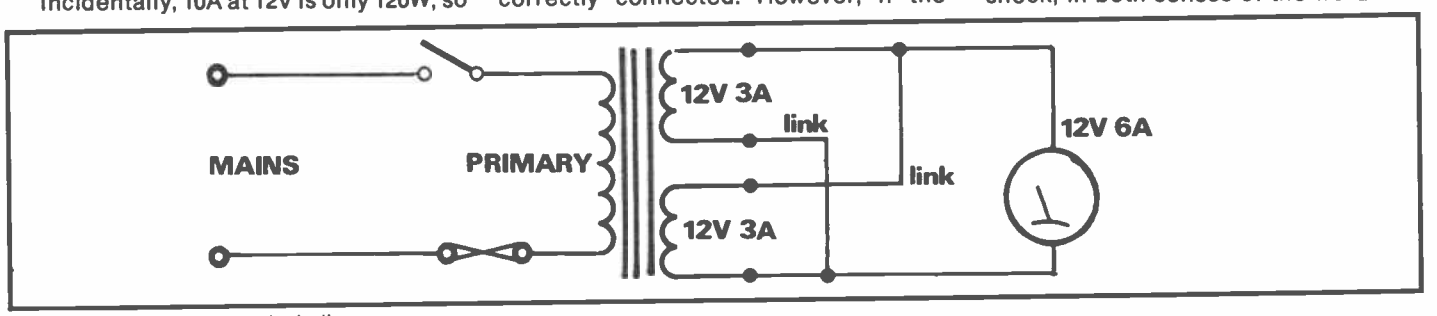
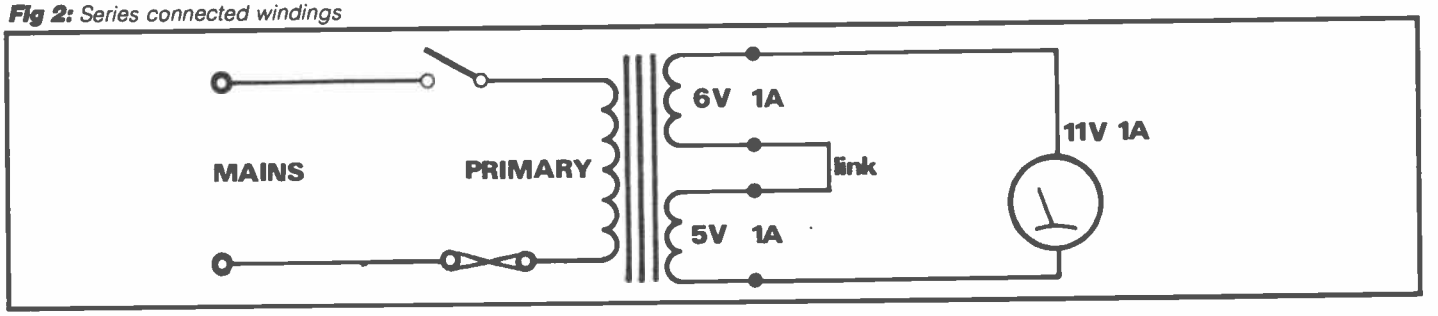


Fig 1: *Parallel connected windings*

Fig 2: *Series connected windings*



THE SOFTWARE FILE

by Stephen Phillips

Introduction

This is one of a series of articles giving software listings for amateur radio and electronic engineering usage. All the programs are written in a simple subset of GW-Basic and, although intended for Amstrad and other IBM clones, they are readily transported to other machines.

The following notes may help: BEEP makes a sound; LOCATE is the same as PRINT AT; CLS means clear the screen.

ERP calculator

The program shown in Table 1 calculates the effective radiated power of a station after allowing for feeder losses and aerial system gain. If the gain of the aerial is not known, then the program will ask for the number of elements in the array and will calculate an appropriate gain for the system.

The program

ERP is an erase string consisting of fifty-five spaces. Lines 110 to 150 contain all the data used by the program. Great care must be taken when entering these lines, since the commas and stops *must* be entered exactly as shown. Lines 160 to 210 read the data into the first array, which is a dB to ratio converter. You are then asked for various inputs. Please follow the instructions precisely, otherwise you will get stupid answers. Input over the maximum allowed is trapped and you are asked to re-enter the data.

If the aerial gain is not known the program goes to line 460. Here, data about aerial gain is read into an array, which is searched in order to find the result and is then shown on screen. The ERP is shown in consecutive steps as the data is entered. Lines 400 to 420 ask if you wish to rerun the program.

Checkout

With the program now running try the following inputs to check it out (see Table 2).

Power out	200	
Aerial gain	8.5	[1420W]
Feed loss	3	[710W]
ERP	710	

Table 2


```
10 REM
20 REM
30 CLS:REM ..... CLEAR THE SCREEN
40 ER$ = "
50 REM ER$ contains 55 spaces; use er$=space$(55) if available.
60 LOCATE 3,17:REM Print at vertical and horizontal position.
70 PRINT "This program calculates Effective Radiated Power."
80 LOCATE 5,17:PRINT "It allows for aerial gain and feeder losses."
90 LOCATE 7,17:PRINT "It is useable at any frequency."
100 DATA 1, 1.3, 1.5, 1.4, 2, 1.6, 2.5, 1.8, 3, 2, 3.5, 2.2, 4, 2.5, 4.5, 2.8
110 DATA 5, 3.2, 5.5, 3.5, 6, 4, 6.5, 4.4, 7, 5, 7.5, 5.6, 8, 6.3, 8.5, 7.1
120 DATA 9, 7.9, 9.5, 8.9, 10, 10, 10.5, 11.2, 11, 12.6, 11.5, 14.1, 12, 15.8
130 DATA 12.5, 17.8, 13, 20, 13.5, 22.1, 14, 25.2, 14.5, 28.2, 15, 31.6
140 DATA 1, 1, 2, 4, 3, 7, 4, 8, 5, 9, 6, 10, 7, 10.5, 8, 11, 9, 11.5
150 DATA 10, 12, 11, 12.5, 12, 13, 13, 13.5, 14, 14, 15, 15
160 DIM A(30, 2):REM ..... DIMENSION ARRAY FOR DATA.
170 FOR B = 1 TO 29:REM ..... SET FIRST READ LOOP
180 FOR C = 1 TO 2:REM ..... SET SECOND READ LOOP
190 READ A(B, C):REM ..... READ DATA INTO ARRAY
200 NEXT C:REM ..... RERUN SECOND LOOP
210 NEXT B:REM ..... RERUN FIRST LOOP
220 LOCATE 10, 17:REM ..... GOTO SCREEN LOCATION
230 INPUT "Enter transmitter power output in watts ..... ";ERP
240 GOSUB 430:LOCATE 12, 17:REM ..... GET AERIAL GAIN
250 LOCATE 13, 17:PRINT "If aerial gain is not known enter 0."
260 LOCATE 12, 17
270 INPUT "Enter aerial gain to nearest .5db [max 15].."; AG
280 IF AG=0 THEN GOSUB 460
290 LOCATE 13, 17:PRINT ER$
300 IF AG>15 THEN BEEP:LOCATE 12, 17:PRINT ER$:GOTO 260
310 FOR D = 1 TO 29
320 IF A(D, 1) = AG THEN ERP = ERP*A (D, 2)
330 NEXT D:GOSUB 430
340 LOCATE 14, 17:REM ..... GET FEEDER LOSS.
350 INPUT "Enter feeder loss to nearest .56db [MAX 15].."; FL
360 IF FL>15 THEN BEEP:LOCATE 14, 17:PRINT ER$:GOTO 340
370 FOR D = 1 TO 29
380 IF A(D, 1) = FL THEN ERP = ERP/A(D, 2)
390 NEXT D:GOSUB 430
400 LOCATE 21, 17:REM ..... ASK IF RERUN REQUIRED
410 INPUT "Rerun program Y/N ..... ";RR$
420 IF RR$="Y" OR RR$="y" THEN RUN ELSE CLS:END
430 LOCATE 18, 17:REM ..... PRINT RESULT
440 PRINT "The radiated power of this system is "; ERP;" watts."
450 RETURN
460 LOCATE 12, 17:PRINT ER$:LOCATE 13, 17:PRINT ER$
470 DIM G(15, 2)
480 FOR A = 1 TO 15
490 FOR B = 1 TO 2
500 READ G(A, B)
510 NEXT B
520 NEXT A
530 LOCATE 12, 17
540 PRINT "The input below will give a fairly accurate result."
550 LOCATE 13, 17
560 PRINT "Data is taken from the ARRL aerial handbook graphs."
570 LOCATE 15, 17
580 INPUT "How many elements in the array ..[max 15]...";EL
590 EL=INT(EL):IF EL > THEN LOCATE 15, 17:PRINT ER$:GOTO 570
600 FOR A = 1 TO 15
610 IF G(A, 1)=EL THEN AG = G(A, 2)
620 NEXT A
630 LOCATE 15, 17:PRINT ER$
640 LOCATE 12, 17:PRINT ER$:LOCATE 12, 17
650 PRINT "Estimated gain of a"; EL;"element beam in dbd is "
660 LOCATE 12, 63:PRINT AG:RETURN
```

Table 1

The World of D | A | T | A

BY DON FIELD G3XTT

Last month I promised that I would return to AMTOR. This is growing in popularity on the HF bands and allows solid contacts to be made with modest power, even when there are high levels of QRM.

Unfortunately, AMTOR has not been widely covered in the amateur radio press, which is perhaps one of the reasons it has taken a number of years to catch on. Life with AMTOR is slightly more complex than with conventional Baudot RTTY, but modern TNCs and computers take most of the pain out of it.

In the following I am indebted to Peter Martinex G3PLX, the 'father' of AMTOR, who has given me permission to draw on some of his copyright material.

Two modes of operation

The main concept you must grasp is that there are two quite distinct modes of operation:

1 Mode A – Automatic Repeat Request (ARQ)

In this mode all transmitted characters are sent in groups of three, checked at the receive station and, if necessary, resent until they are received error-free. The transmissions between the two stations are synchronised and if you listen to an ARQ contact you will hear a characteristic 'chirp-chirp' sound as the sending station sends three characters and then pauses while the other station acknowledges or requests a retransmission.

A variant of ARQ is the ARQ Listen mode (also called mode L). This allows you to monitor a contact between two stations using ARQ. As you are not a part of the conversation, but an eavesdropper, you will not be able to ask for retries but if they are sent they will all be displayed on your screen.

2 Mode B – Forward Error Correction (FEC)

You may have realised from the description above that ARQ requires two stations to be in contact, in synchronisation, if the system is to work properly. This does not lend itself to a broadcast transmission such as a CQ call. There is also a problem in that the timing demands of ARQ limit its range. For cases where ARQ is unsuitable FEC comes into its own.

In FEC, the sending station transmits each character twice. However, the repeat does not happen immediately. Four other characters are sent first, after which the original character is retransmitted. This results in a delay of 280 milliseconds between the two transmissions, which is intended to reduce the chance of both of them being taken out by a burst of noise or rapid fading.

Idle characters are also sent at the beginning of a message and after each twenty-eight characters. These, together with the repeat of each character, give the receiving station a pattern to synchronise to. The repeat of each character should minimise corruption, though obviously FEC can never be as error-free as ARQ.

Setting up your station for AMTOR is really no different to setting it up for RTTY. However, in ARQ mode your rig will be switching rapidly back and forth between receive and transmit which requires rapid changeover switching. Rigs designed for break-in CW with an elecronic changeover system will be most suitable. However, older rigs with relay changeover can usually be made to work on AMTOR with a simple modification, such as changing the time constants on the changeover system. Table 1 lists a number of rigs which can be used as they stand or with simple modification.

Before modifying your rig it is worth trying it on AMTOR as it is. You might just find that your particular one works all right. If not, a file of mods is held on the GB7PLX mailbox, or the supplier of your terminal unit may well be able to help.

450 millisecond cycle

It's worth looking at this timing issue in more detail. AMTOR works on a 450 millisecond cycle, this being the interval between the start of each burst of three characters. Each seven-bit character is sent at 100 bits/sec, which means that the actual transmission time for a three-character block is 210 milliseconds, leaving 240 milliseconds for the block to reach the distant end, the distant transmitter to send a single-character acknowledgement and for this acknowledgement to be received.

If the stations are on opposite sides of the same town then transmission delays will be minimal and the acknowledgement will be received almost immediately. If your rig is slow to return to receive you may miss the acknowledgement. However, if the stations are several thousand miles apart transmission delays become significant. In this case, if your changeover times are too long, then there will not be time left for the signal to get to the distant station and for the acknowledgement to be returned.

The result is that if your changeover time is more than about twenty milliseconds, you may well be able to work stations in much of the world, but not those in your own back yard or in the Antipodes, at least not without resorting to the less effective FEC mode.

One problem that some people have found when trying to get going on RTTY or AMTOR, is that the modem tones in their TNC are not compatible with the FSK tones generated by their HF radio. For example, my TS-940S uses the US tones when in FSK mode, whereas my UK-purchased PK232 TNC uses European tones. Therefore, I am unable to

The following rigs are known to work on AMTOR with, in most cases, only minor modifications:
FT1, DRAKE R4B T4 T4X T4XB TR5, FT7/FT7B, FT101E, FT101Z, HW101/SB102, FT102, SB104, TS130S, FT180, TS180, IC202, ATLAS 210X/215X, IC211E, FT221R, FT225, FT250, IC251, IC260, IC271/IC471, FT290, FT301, TS430S, TS430S/FILTER, TS520, TS530, TENTEC 546 OMNI, TENTEC 580 DELTA, FT680, CWR685, IC701, TS711/TS811, IC720A, FT726R, IC730, IC740, FT757, FT780R, TS830S, FT901, FT902, TL922, TS930S, TS940S, TR9000, TR9130.

The following rigs are believed to work on AMTOR without modification:
TS120V, FT200, FT480, TS700, FT707, IC745, IC751, FT980

Table 1: *Rigs suitable for AMTOR*

use FSK for RTTY or AMTOR operation and have to resort to USB. A friend who bought his PK232 in the USA has no such problems. So much for compatability! Of course, some TNCs have modem tones which are switchable between the US and European standards.

What AMTOR involves

Having got the station working, what does AMTOR operation involve? Firstly, you must programme your SELCAL into your terminal unit. This is a unique four-letter sequence, usually derived from your callsign. The convention is to use the first letter and last three letters of your callsign. Thus my (G3XTT) SELCAL would be GXTT. With some of the new fangled callsigns with less than four letters this doesn't work, so you may come across some oddities.

CQ calls should be sent, for the reasons discussed above, in FEC mode. Keep power low as FEC, like RTTY, involves continuous transmissions. Give your callsign and SELCAL several times and then return to ARQ STBY mode to receive calls in ARQ. When calling CQ do not send TYs as in RTTY but allow plenty of idle characters to enable the distant station to synchronise to your transmissions.

To reply to a CQ, enter the distant station's SELCAL into your terminal unit, ensure you are exactly on his frequency, check your power, and when your status changes to IDLE you are synchronised and in contact. Overs are completed by sending +? which will automatically hand transmission to the far end (this does not happen in FEC mode).

Ending an ARQ contact requires either station to send Control-D which will return you to ARQ STBY mode.

That really is all there is to it. However, if it all works perfectly first time it will probably be more by luck than judgement. The best way is to experiment with a co-operative local to make sure everything is working perfectly before trying your luck with more distant stations.

Linking with a mailbox

As with RTTY and packet, there are many AMTOR bulletin board systems working around the world. I described the GB7PLX AMTOR mailbox last month. You will often come across them when tuning the bands in mode L.

Unfortunately, unlike packet radio where the WORLI command set has become almost standard for mailbox operation, a number of different command sets exists for AMTOR mailboxes – it almost seems as if each mailbox operator invents his own! However, APLINK (AMTOR Packet Linking) auto mailboxes are now on the increase and use a command set which is not too dissimilar to the well-known packet commands.

The following APLINK stations are reported to be operating twenty-four hours a day (unless noted) with their AMTOR port on the (mark carrier) frequencies listed:

Call	SELCAL	SYSOP	Location
AH6D	AAHD	Paul	AIEA (Honolulu), Hawaii. 14071.5, 14073.5, 14075.0, 14077.5 (1630-0730Z)
DU9BC	DUBC	Fred	Davao City, Phillipines. 14072.0 (23hrs), 7023 (mornings)
G4SCA	GSCA	John	Plymouth, England. 14070 (1800-2200Z, temporary)
K2PEQ/4	KPEQ	Bill	Fort Lauderdale, Florida. 14079
K7BUC	KBUC	Del	Phoenix, Arizona. 7047.5, 7071, 10140, 14072.5, 14073.5, 14074, 14075, 14076
KB1PJ/8	KBPJ	David	Shaker Heights (Cleveland), Ohio. 14070.5
KS5V	KKSV	Ed	Canyon Lake (San Antonio), Texas. 14072.5
NI9Y	NNIY	Dan	Mishawaka (South Bend), Indiana. 14072.5
PJ2MI	PJMI	José	Curacao, Netherlands Antilles. 14077.8 (1000-1200 and 2200-0100UTC)
VK2AGE	VAGE	Gordon	Goonellabah (Lismore), NSW, Australia. 7045, 14075, 14077, 21076
VK2EHQ	VEHQ	Peter	Kulnura (Sydney), NSW, Australia. 14070.5
VK6YM	VKYM	Herve	Beckenham (Perth), Australia. 14081 (1400-23J0Z beamed Europe, 2300-1000Z beamed Pacific)
WA1URA/9	WURA	Frank	Grabill (Fort Wayne), Indiana. 14071.5
WA8DRZ/6	WDRZ	Craig	Palomar Park (San Francisco), California. 14072.5, 14073.5, 14074.5, 14075.5
WB7QWG/9	WQWG	Bob	Indianapolis, Indiana. 7072.5, 7075.5, 14071.5, 14073.5, 21071.5, 28075.5
ZF1GC	ZFGC	Frank	George Town, Grand Cayman Island. 14070.5, 14071.5, 14072.5
ZL1ACO	ZACO	Neill	Pukekohe (Auckland), New Zealand. 14072.5

Note that the Autos in the above list use APLINK Protocol. The following is a list of AMTOR Autos known to be reliable. There are of course many other stations which are active.
DK0MTV DKTV 3581/7038/14075/14078/21081/21115/28075/28115
GB7PLX GPLX (see last month for frequencies)
HB9AK HBAK 3581/3583/3588/7036/10146/14072/14075
JA5TX JATX 14072/14073/14074/14080
LA9OK LAOK 3588/3589/7036/10146/14073/14075/21075
PA0RYS PRYS 3581/3588/3589/7036/14073/14075/14077/14079/21075/28075
All of the Autos in the second list can be accessed from UK on at least one scan channel at some time on most days.
The VK (APLINK) Autos can usually be accessed on 14MHz.
The best time for VK is after 1800UTC but as autumn approaches, early afternoons should be possible again.

Table 2: *AMTOR mailboxes*

When you link with a mailbox for the first time you will need to register with your callsign and SELCAL. The mailbox will usually prompt you from then on. However, it is worth monitoring others using the mailbox to get an idea of what to do before you take the plunge.

Chas G3XTL often puts out helpful information about AMTOR via the VHF packet network, and it is worth looking out for his bulletins. I am also grateful to Chas for the summary of AMTOR mailboxes which appears in Table 2. Some of these are not licensed yet for unattended operation and may only be in use when the operator is in the shack, so don't expect to be able to get into all of them all of the time (even if propagation is favourable).

RSGB Data Symposium

This year's Symposium was held at the University of Surrey and attended by about 200 delegates from twenty countries and four continents.

The Symposium programme covered a wide range of topics, but an underlying message was that packet radio has reached something of a watershed. The 2m network is overworked and unstructured with the result that many people are becoming disillusioned with the whole idea. Solutions ranged from better co-ordination of the network to new technologies and new network services aimed at making the network more interesting and useful to the end users.

Steve G4YFB gave an insight into his mailbox software for the IBM PC, which has been designed to offer improved features compared with the 'standard' WA7MBL and W0RLI software from the USA. The other advantage of Steve's software is that, being developed in the UK, it is easier for UK users to influence future development of the software. Mind you, Steve and John G1AWD (who distributes the software) are wondering whether this is such a good idea now that the phone never stops ringing!

The G4YFB software really comes into its own when used in conjunction with G8BPQ's TheNode software, another UK-developed package of great interest to packet users. Unfortunately, TheNode was not covered at the Symposium, but it is a high-performance network node offering facilities similar to NET/ROM but, unlike other packages, requiring only one TNC and radio to support several simultaneous connects.

The G8BPQ and G4YFB software will run under DesqView, allowing several simultaneous sessions to take place. Imagine being able to access your local mailbox while other users are also logged on and while, on another band, it is forwarding and receiving mail via the nearest trunk node. Quite a number of SYSOPS are now using this combination of UK-developed packages and I am sure the number is set to increase rapidly.

All-purpose radio modem

N4HY, an ex-director of TAPR, the Tucson Amateur Packet Radio group, gave one of the most technical talks of the day. He is working with others on an all-purpose radio modem based on the latest Motorola DSP (Digital Signal Processing) chip.

This chip has phenomenal computing capacity allowing it to process signals in realtime so that it can behave as a filter, with the filter characteristics defined in the software.

In future there will be no need to buy different modems for HF and VHF, and for different transmission speeds. One box will be able to handle all existing standards and, with a simple software change, any future ones as well.

Sounds too good to be true? Well, the initial cost will be in the order of $500.00, which probably translates to £500.00 when it gets to the UK, but prices will no doubt fall. One great benefit should be on HF where, in N4HY's view, packet is currently more or less unusable because FSK is spectrally inefficient and because current transmission speeds make the signals susceptible to short noise bursts and rapid fading. By using 600Hz channel spacing (impossible with present transmission speeds and filter characteristics), more packet signals could be accommodated in the HF bands, and by using Quadrature Phase Shift Keying (QPSK) 600 bits/sec (twice the current rate on HF) could be sent at just 75 baud.

DX Packet Cluster

Andrew Demartini KC2FF spoke about the DX Packet Cluster software which I have mentioned previously in this column. He talked about its development and its rapid adoption by HF DXers in the USA as a way of alerting each other rapidly as to what is on the bands.

A proposal is currently with the RSGB for a similar system to be set up in the UK. Again it is the HF DXers who are the driving force, though the system lends itself to any sort of realtime messaging, for example for 6m DX alerting.

Andrew also gave a presentation on recent developments in packet radio in the US. Many of these, in his view, are being driven by the increasing sophistication of hardware (at least 50% of active amateurs in the US now have an IBM PC or clone), together with more sophisticated software for multitasking (DesqView, DoubleDOS etc). AX25 is well established as the basic networking protocol, with over 75,000 TNCs now in use, but Andrew believes that improved networking and other software will come about in the near future.

A lot of hardware development is taking place with 250k baud and even a 2 megabaud radio link is under test. Experiments are taking place with digitised voice and image, and with remote disc access and file storage. Andrew believes the kind of applications which will develop to use these capabilities will include a truly global messaging system, on-line news services making printed magazines largely redundant, on-line databases of callsigns and addresses, repeater directories etc, and disaster support for use by organisations such as RAYNET and IARN.

There were other presentations, and all in all, an interesting programme, and an excellent opportunity to meet other datacomms enthusiasts. Make it a date for your diary next year.

SECOND-HAND

by HUGH ALLISON G3XSE

SSM Europa

These are valve and transistor transverters, or 'transmit and receive converters' as they used to be advertised. They were designed to enable an amateur with an HF transceiver to go on 2m. A later variant came along with 4m – more of this anon.

The local oscillator and receive converter is transistorised, and runs on 12V. The transmit bit is valves, two QQV03/10 and one QQV06/40. Having said that, I bought one that had been dropped recently and it seemed happy to work with two QQV02/6 valves, which were to hand at the time. Surplus 3/10s should be 50p a throw, 6/40s often a couple of quid, so nothing too expensive.

Power supplies are a source of confusion. The original design was for a straight in 'run it off the HF rig' idea. In other words, there wasn't a mains supply built in and you nicked the appropriate volts out of the driving rig; overloading wasn't a problem since you turned off the PA stages in the HF rig. Many transverters now available second-hand come with a multiway plug/socket/lead arrangement that will plug into some old (mid '70s) Yaesu rigs and away you go. Note the 'some'. Some Yaesu stuff was 6.3 volt heater, the Europa wanted 12, so there was a transformer available, boxed or unboxed. The other common variant is a 'full' mains power supply – CPS 10 – produced so that the Europa could be run with any HF rig, and run from the mains.

How do they work? Brilliantly. The PA was advertised as 200W. Don't be fooled, that's input power. 50% efficiency gives us 100W out, nothing to be sneered at. The receive converter wasn't bad in its day, and is still quite a reasonable performer. Another strange thing is that there is no aerial changeover, but there are separate Tx and Rx aerial sockets, so fitting an aerial changeover relay shouldn't tax you too much.

Turning to prices. Well, the rig that had been dropped on the floor, in poor physical condition but working (except for the broken valves), cost me a quid. I've seen workers anywhere between £5.00 and £25.00 freely available, and selling. £45.00 examples have not moved.

The addition or lack of any power supply or leads seems to make no difference to price, nor does variant – 2 or 4m.

You can use a 4m rig as it is or, with a new crystal and a handful of 47pF capacitors liberally sprinkled about, you can use it on 6m.

Another use is as a straight PA. Your average 10W 2m box is sufficient to overdrive a 6/40; a loosely coupled turn or so up the grid winding of the Europa PA will drive it to distraction. 6/40s are very reliable bottles and will cheerfully take years of abuse. I know this from experience – I thought the anodes were supposed to glow red for years. A fiver for a 100W out linear can't be bad, can it?

Why make it difficult?

A fellow amateur was moaning about the price of a 30MHz 'scope. I knew he had recently bought a reasonable 10MHz device and wondered why he was upgrading so soon. His tale was that his main station receiver, beautifully hand-built, had died on him. Since it covered up to 30MHz, he thought he needed a 30MHz 'scope to repair it.

I asked him to tell me how it worked to receive a 2MHz signal on top band. The incoming signal mixed with a 3MHz signal to give a 5MHz IF (the 'tunable' IF). This had a 5.5MHz oscillator to give a 500kHz second IF, then detector and audio. I asked him if there was anything his 10MHz 'scope couldn't handle. Why repair it on 30MHz when it also didn't work on 2MHz?

The next week he'd fixed it. The detector winding in the last IF was open circuit, luckily near the tag, and repairable.

Buying a second-hand AVO

Good news. In the last year or so the price of a second-hand AVO has definitely dropped. Whereas £17.00 to £20.00 used to be the going rate for a model 7, I've seen good, clean, working examples sell recently for about a tenner. For this price don't expect leads or batteries, but the meter itself should be OK.

Model 7s used two flat 4½V batteries, the type with the long and short brass tongues. These aren't readily obtainable in your average high street shops, but cycle shops can sometimes get them. There is also one other cell in a 7, of 1½V. These have a wire and a screw terminal and are virtually impossible to obtain. Use a U2 (which is a good physical fit) plus a few inches of insulated wire and a couple of 6BA solder tags.

The battery problem is academic until you have bought yourself an AVO. Having found one, lie it on its back and check it zeros. Now stand it up and check it is *still* zeroed, a needle's width or so deviation is acceptable. Now lie it down on first the left and next the right side and check it is still zeroed, give or take an eighth of an inch. Using the 9V battery you just happen to have in your pocket, connect it across the appropriate terminals and check it smoothly goes up to 9 on the 10V scale, without sticking, and likewise obediently and smoothly returns to exactly zero on disconnection.

To be honest the above is about all you can do prior to purchase. You cannot really lug the appropiate gear about with you to check ac volts and current, but at least you will have checked out the movement, both physically and electrically.

A dangerous practice

Using 'scopes beyond their rated bandwidth is a dangerous practice. Not that you are going to hurt yourself, but boy, can you waste some time with the misinformation you are presented with. What I am discussing is, for example, observing a 35MHz waveform on a 10MHz 'scope. The problem is often compounded by the design of the trigger circuits, the damn thing triggers and displays 35MHz, it's often only the 'Y' amplifiers that let it down. A good trick is to wop the attenuator (volts/cm) switch round. If you go from, say, 1V/cm to 10V/cm the trace should be one-tenth the size; obvious stuff. If you are way beyond the frequency capability of the 'scope this may not be the case. I've even had traces getting bigger on 2V/cm than they are on 1V/cm, a sure sign you are into uncharted waters. This can lead to exciting effects when tuning up something; the 'scope displays more, you've actually got less!

Some 'economy' 'scopes use an inductor in series with the load in the output device to prop up the frequency response. These give really weird over-frequency results. Another wonderful response can arise when a wire-wound resistor has been used as a load in the amplifier circuits. This can often result from a poor choice of replacement during repair. Some 'scopes do indeed use wire-wound resistive loads as standard items, but they are non-inductively wound. Replace these with something else at your peril! I've come across similar effects with 'spirally cut to tolerance' carbon film resistors carelessly used in 150MHz+ 'scopes.

A great way of confusing yourself with a 'scope is to drive it with a complex signal, one containing frequency components both within and beyond the 'scope's capabilities. This too can cause apparently bigger waveforms with increasing attenuation. A multiplier stage in a 2m rig that was supposed to do 12MHz × 3 to 36MHz was oscillating, as well, at 500MHz and caused me tears of frustration until I sussed it.

Finally, one occasional clue that all is not well is an apparent dc shift on the trace when the coupling is on ac. It's trying to tell you something!

MFJ CW filter

These are insignificant looking boxes, about the size of two cigarette packets on top of each other. They are simply active filters, ie, an IC amplifier with a frequency sensitive response. The idea is that you connect the input to your receiver headphone socket, then plug your headphones into the MFJ. Being active, power is required, and a reasonable life can be expected from a small internal battery.

The good news is that the centre frequency of the MFJ seems to line up quite well with the passband of many commercial HF rig CW filters, so you can narrow down the response even more. Having said that, they are also brilliant when used with direct conversion receivers. I had lots of fun with one stuffed on the end of an HW8 QRP rig.

Second-hand you'll pay between a fiver and a tenner for the MFJ. You should easily get your money back if it's not for you, as they sell quickly at junk sales.

There are two modifications you could carry out. Obviously external power is often required. Although current consumption is modest, I specialise in leaving them turned on and get flat batteries with alarming frequency.

Another mod is to wire the thing up for stereo headphones, one ear gets the 'raw' signal straight from the receiver, the other gets it via the MFJ box. It's amazing how this can help with some conditions, and hearing people call you off channel after a contact has finished is not unusual with direct conversion transceivers.

There is one drawback, and that is trying to read chirpy signals. Really warbly signals become unreadable through any narrow bandwidth system, and the MFJ is no exception.

Icom 1050

These are genuine licensed early legal CB sets. The one big, big difference between them and any other CB set is the wonderful Motorola 'go anywhere' synthesiser chip. The chip isn't dedicated to only doing 27MHz; reprogram the address and tweak a few coils, and 29MHz FM is available. If you are mega-rich there are two mix crystals (one for Tx, one for Rx) that can be swapped, instead of changing the address, to get on 10m.

Beware of alternatives. The JWR rig has the same chassis and the Motorola chip. The very similar Murphy doesn't. An awful lot of the rigs you see for sale in amateur circles are converted to 10m and work really well. Incidentally, modesty prevents me from revealing who wrote the original, superb article on converting these sets . . .

I've bought non-workers for a couple of quid – they nearly all had broken cores in the early transmit stages. You should get workers, converted, for between £10.00 for a scruffy model and £25.00 for a boxed, mobile bracketed one with a mike and handbook.

One strange aspect of the design is that unlike all other CB sets, the Icom doesn't need a mike in to receive.

Right, it's cheap and the world can be worked with a few watts on 10m given the right conditions. Are there any catches? Maybe. Repeater working can be a pain. I never did work out an easy way of doing repeater shift and many examples don't feature it. Some really intelligent people went on to develop the idea and used binary adders to achieve the required offset, but this was beyond me. With the 'change the crystal' approach, a third crystal can do the business. I just rotate the channel knob ten clicks when working repeaters. Admittedly this is not ideal for mobile use.

Modifications and other uses

The transmitter can be made to go down the CW end of 10m, and keying can be achieved by modifying the high/low power switching. This is done by a transistor so CW modification is neat.

The thing can also run as a prime mover for a transverter. A permanently skint amateur friend uses a £5.00 Icom into a £5.00 transverter to get on 2m. Given the conditions, these rigs really do offer a cheap way of getting on the air with acceptable performance.

Aerial tuning units

ATUs for short, these come in all shapes and sizes. There are two advantages of having one between an aerial and receiver antenna rat hole. The first is that it can match the oddball impedance of random-length wire strung down the garden into the (nominal) 50ohms required by your beloved wonderbox.

Second advantage. I've gone on at length before about second channel problems with superhets (receiving 2MHz signals with a set tuned to 1MHz and a 500kHz IF). 'Cos the ATU has a coil in it, it's acting as another tuned circuit, thus giving you less apparent interference and helping to reject the unwanted mix. This is particularly advantageous when using a receiver without a built-in RF stage, and an external non-tuned RF amplifier upstream.

In its most simple form an ATU is no more than a tapped coil, a switch and a variable capacitor or two. There are often design articles for this sort of thing in radio magazines and one could easily be knocked up out of junk for a quid or two. The construction skill required to nail one together is roughly equivalent to that needed to build a crystal set, and results are well worth the effort.

Buying them second-hand

'Joystick' was a variable frequency antenna, marketed up to roughly fifteen years ago. The ATU bit was called the Joymatch. These came with a plastic-boxed antenna tuner. Most were a pi network, though some had RF detectors and the like built in for transmit use.

Nowadays these are often seen in 'grot' boxes at flea markets, all alone and without their mating aerial. I'll always pick them up if priced for pence – often 10p will bag you one, sometimes without a lid. At this sort of price it's ideal just to give away to an aspiring short wave listener. They work just as well with your random-length wire as with their intended Joystick. A couple of quid is too much to pay; they were only £5.00 to £7.00 new.

Transmitting ATUs are similar to receiving ATUs, just more beefy to handle the higher power. The Joystick can be used on transmit up to 10W or so, go over 20 and it will probably arc over. The SEM ATU is well respected and second-hand seems to cost £35.00 to £45.00. The old KW 'EEZE' match (have I spelt that correctly?) seems to change hands at £45.00 to £55.00; more for later variants. This sort of expenditure is not really required for a simple receive set-up, though it could be argued it's an investment for the future if going for a licence.

There are still loads of war surplus ATUs about. Ask the seller what frequency range he thinks it will cover, as a lot of HF war equipment only went up to 10/20MHz. There are some real mechanical beauties available, often with designs based on the roller coaster. This is a variable inductance (a coil on which you can continuously vary the turns). Thus, you can juggle capacitance and inductance to your heart's content to achieve optimum aerial/receiver matching.

Prices? Well, from a fiver to about £15.00, depending on what it is and does.

Variometers

These are a sort of variable inductor and are famous for being part of the 19 set, a tank transceiver widely used during the Second World War. They are great for 160 and 80m bands, and used to be a fiver a time. In the last couple of years, no doubt due to collectors of military stuff, they have gone up to about the £15.00-£17.00 mark.

As a schoolboy, I tweaked up a mains valve receiver to cover top band. It worked surprisingly well but suffered a bit from second channel. I read an article in a radio magazine about a variometer and thought, 'This is for me'. I was into gliders at the time, and they have a variometer to tell you if you are in an area of lift or sink, a kind of sophisticated barometer, nothing to do with 19 sets at all. I obtained a glider variometer from a crashed and scrapped aircraft and had no luck trying to wire a barometer into a receiver. Ignorance is bliss . . .

TODAY'S TECHNOLOGY

by Ian Poole G3YWX

There is a vast number of new developments taking place at the moment. Some will definitely affect amateur radio, whereas others might not. This month, there is a selection from batteries to broadcast transmitters and synthesisers to superconductors.

New rechargeable batteries

Recent years have seen a marked increase in the number of portable transceivers in use, particularly on the VHF and UHF bands. There has been a similar increase in the use of nickel cadmium or Ni-Cad cells.

Ni-Cads have become the accepted type of cell where there is any real current drain from the battery. With a life of around 500 charge/discharge cycles, if they are used properly, they are the most cost effective means of battery power.

However, they have a number of drawbacks. Overcharging can reduce their capacity and, in addition to this, the actual charge they can store is limited. A standard non-rechargeable battery can hold significantly more charge and retain it for longer.

With the limitations of existing battery technology becoming more apparent, much research has been put into battery development. From this, many new ideas are beginning to emanate. Some of them are quite specialised, whereas others will almost certainly hit the consumer marketplace before long.

A new type of rechargeable battery is just one of these developments. Instead of nickel and cadmium it uses nickel and cobalt. At first sight this may sound expensive, but the rising demand for cadmium made by the increasing use of Ni-Cad batteries has meant that cadmium is more expensive than cobalt.

In addition to this, a Ni-Co battery can store more than twice the charge of a standard Ni-Cad. One final advantage is that a Ni-Co battery has a cell voltage of 1.28V. This is very nearly the same as a Ni-Cad, and means that new batteries can be used in existing equipment without any modifications.

With all these advantages, the new Ni-Co batteries are set to be winners. However, only time will tell. Hopefully we will see them on the market very soon.

GaAs FETs

Gallium arsenide is a substance which gives enormous benefits over silicon in some areas of technology. In amateur radio gallium arsenide (GaAs) FETs are used almost exclusively in VHF and UHF front-ends these days.

Gallium arsenide is a form of semiconductor which exhibits the same basic properties as the more familiar silicon and germanium. However, it has one major advantage – its high electron mobility. This is the ease with which electrons move around inside the crystal lattice; and in the case of gallium arsenide it is about seven times higher than in silicon and about two and a half times that of germanium. This means that transmit times are much lower and the frequencies which can be achieved are much higher than for either silicon or germanium.

For the most part, radio amateurs will come across gallium arsenide in FETs, although it is beginning to appear in other devices like MMICs as well. GaAs FETs have the advantage over their silicon counterparts in that they offer a lower noise figure. They also have higher gains and better cross-modulation characteristics. All of these features make them an ideal choice for VHF and UHF front-end devices.

GaAs FETs are also making their mark as power devices. Although they are not seen in the amateur market because of their high cost, they are being increasingly used in professional fields. Hopefully their cost will fall so that they will be seen on the amateur market soon.

Although GaAs FETs obey the same basic rules and laws as other FET devices, they do have some differences. Firstly, a GaAs FET is a depletion mode device, unlike most other FETs which are enhancement mode. This means that if no bias is applied to the gate, current will flow into the channel. Only when a negative bias is applied will the current fall.

Another difference is in the gate. Most FETs used for VHF work these days are MOSFETs, where the gate is physically insulated from the channel by an oxide layer. In the case of a GaAs FET, the gate consists of a very small Schottky barrier diode, in fact, its dimensions are measured in microns. This means that it must remain reverse biased. Any forward current will almost certainly destroy the diode and render the device useless. With this in mind, it is a wise precaution to remove an aerial from any GaAs FET front-end during a thunderstorm as the voltages picked up could well destroy the FETs.

High power GaAs FETs

Talking of GaAs FETs, NEC have recently introduced some new devices to their range. These devices show how much power can be developed at high frequencies using this technology.

The NE345L family of high power GaAs FETs delivers up to 20W of power at frequencies up to 2.3GHz. There are two devices: one is rated at 10W and the other 20W, both operate between 1.5 and 2.5GHz.

Heatsinking is an obvious problem. However, this has been overcome by using a plated heatsink-type of construction. Apparently this minimises their thermal resistance and maximises their reliability. These devices seem ideal for 13cm, but they are bound to be rather expensive.

Broadcast transmitter developments

Although not directly linked to amateur radio, it is still interesting to see what is happening in the world of broadcast transmitters. In line with the rest of technology changes are taking place, some of which will have a major impact on short wave broadcasting in the future.

One of the major changes is that new transmitters are able to broadcast on SSB. In 1987 the World Administrative Radio Conference (WARC) set 2015 AD as the deadline for the final changeover from AM to SSB. Currently, short wave broadcasting is full carrier double sideband. To overcome this waste of spectrum space and power, it is proposed to use single sideband reduced carrier. This will enable standard AM receivers to be used, and will reduce the spectrum and power used.

New transmitters currently being built and designed are able to use AM now, but they have the SSB facility incorporated for later use. This is necessary because the life of these transmitters is quite long to justify the investment needed.

There is also a large number of other developments taking place. Probably the major ones are in the improvement in efficiency of the transmitter. To the amateur this is not normally a problem, but this is not so in commercial circles. With transmitters running at powers of 500kW, or more, the cost of power alone is enormous. This means that even comparatively modest improvements in efficiency provide large cost savings. These savings are obviously important in Europe and America, but they take on a totally different significance in countries where power is not so easily available.

With this in mind many broadcasters are replacing their ageing, comparatively inefficient transmitters with new ones. These can offer SSB and efficiencies of 73%, or maybe even a little more when the conditions are favourable.

Superconducting antennas

Superconductors used to be associated with electromagnets, dc power transmission and heavy electrical applications. Now, with the latest discoveries, all this has changed. There are even several areas in amateur radio where they could conceivably be used in the future if progress continues at its current rate.

It all started in February 1987 when it was revealed to the scientific community that superconductors can be made to work at temperatures above the boiling point of liquid nitrogen. Until then they had only worked at temperatures a few degrees above absolute zero, making their use possible in only a very few specialised areas. With the new superconductors, temperatures as high as −153° can be used, although to gain the best results they are usually used below this.

One of their uses in the radio field is for superconducting antennas. Having very nearly zero resistance, it is possible to use them for constructing miniature antennas which can operate efficiently.

It is found that if any type of antenna is made physically smaller (whilst still keeping it resonant by the use of loading coils etc), its radiation falls rapidly. As this happens, the efficiency of the aerial also drops away as the resistive losses from the aerial material rise. If superconductors are used, then this loss can virtually be removed.

One example of a superconducting antenna has been made at Birmingham University. Using a ceramic superconductor, known as Yttrium Barium Copper Oxide, or YBCO for short, the antenna was found to operate very well. At a temperature of 77° (−196°C) it gave an extra 60dB of gain compared with an equivalent aerial made from copper.

In practical terms this means that it is now possible to make and use aerials which are about a tenth of their normal size, or less. For the radio amateur this may be the ideal solution to the problem of constructing an aerial to suit the 'postage stamp' garden. However, it will be a fair time yet before affordable systems are available, since operating temperatures will have to rise and the cost of the materials will have to fall. Even so, it is worth keeping an eye on what is happening in this field, especially in conjunction with loop antennas.

Synthesiser IC

Nowadays frequency synthesisers are an everyday part of radio communication technology. Their use is widespread in professional equipment, just as it is in amateur units. In view of this, it is hardly surprising to find that there is a number of synthesiser ICs available on the market. For example, Motorola market a large range of synthesiser chips, along with a number of other manufacturers.

Mullard, now Philips Components, also market some. One of these is their TDD 1742T or LOPSY (Low Power Frequency Synthesiser) IC. This is described as a low power, high-performance chip using local oxidation CMOS (LOCMOS) technology for the channellised VHF/UHF mobile and portable radio market. It includes many of the features of their older HEF 4750/51 combination. Features like a very high gain phase comparator for low phase noise, together with an 'on' chip sample and hold capacitor and a phase modulator make it a very comprehensive IC.

The IC is designed to interface with a processor for its control, as it uses a bus structured programming sequence. This has been implemented in a way which reduces current consumption to an absolute minimum, and any external memory in the form of ROM or RAM need only be powered up when the chip is being programmed.

One interesting feature is a second phase detector for fast locking. The two comparators act very closely together. The first has a very high gain to reduce phase noise but saturates for small phase excursions. It is at this point that the second comparator comes in to give fast locking without saturating and over a wider range.

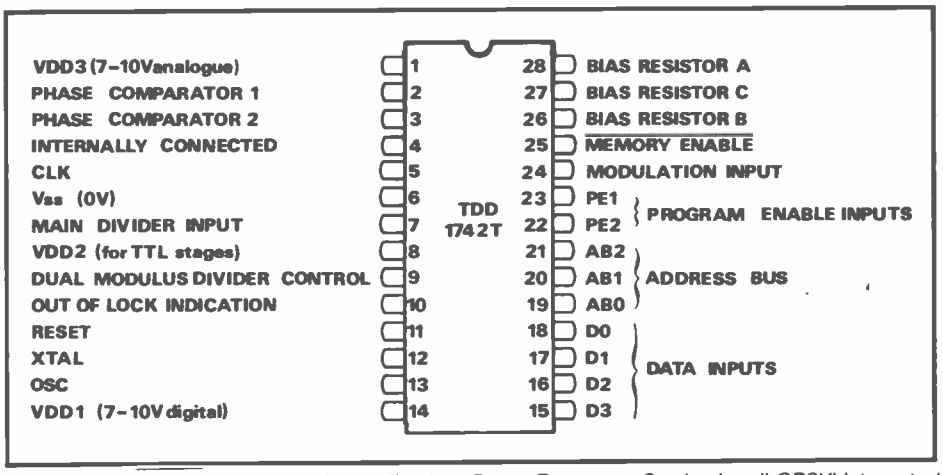
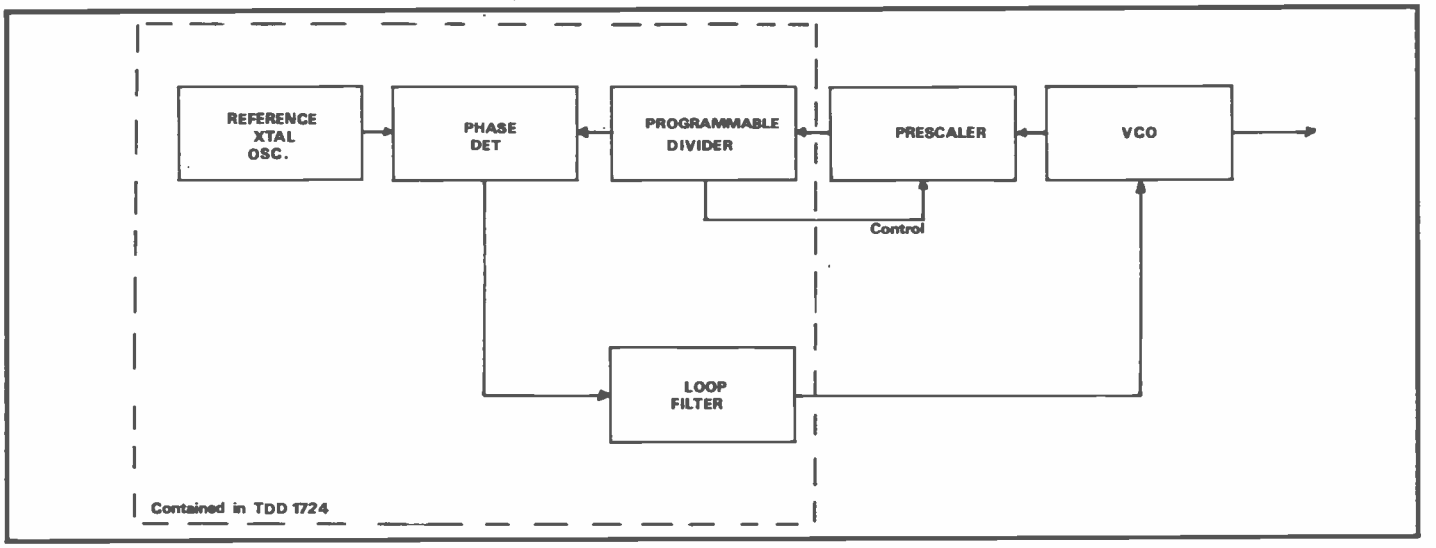


Fig 1: *Pin out diagram for the TDD 1742T or Low Power Frequency Synthesiser (LOPSY) integrated circuit*

Fig 2: *Circuit sections contained on the LOPSY integrated circuit*



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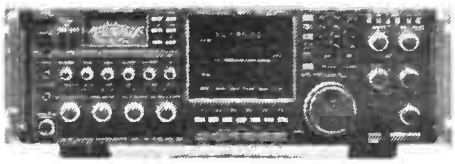

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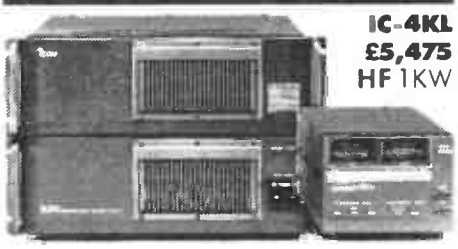

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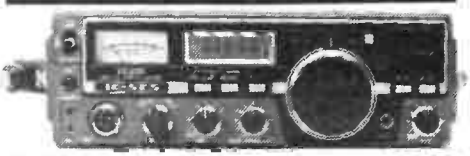

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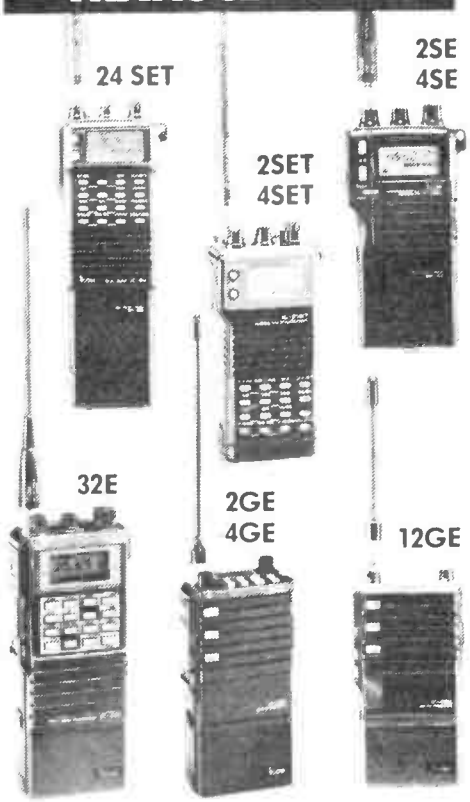

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A SIMPLE FET TESTER

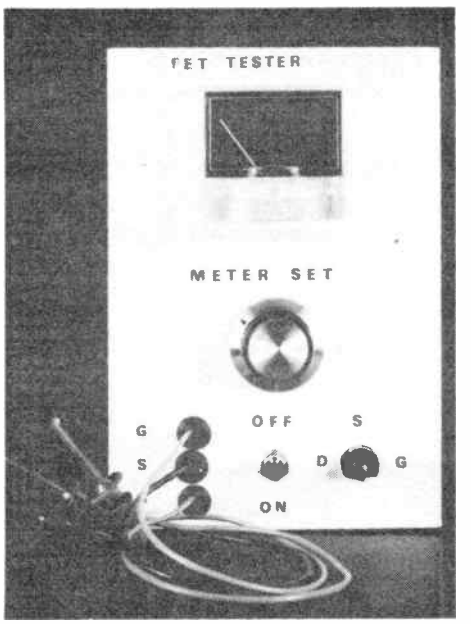
by Richard Cook G4XHE and Brian Kendal G3GDU

At the beginning of almost every constructional project the first move is to delve into the component store (ie, the junk box) to see whether it will reveal the required components, thus saving a trip to the local emporium.

Apart from the mandatory half kilo of fluff, a tattered copy of **Playboy** and fifty resistors with broken ends, a number of unmarked transistors will usually be found. These can then be sorted by physical inspection into power and small signal devices etc. The transistor tester is then brought into action to reveal a plethora of short circuit junctions etc. Some, however, will not answer to the familiar tests. These you realise must be FETs.

Although there are many published circuits for bipolar transistor testers, very few have the additional capability of testing Field Effect Transistors. It was to meet this need that the FET tester was designed. As the overwhelming majority of available FETs are N-channel, it was decided that it was not worth the added complexity to allow for the very few P-channel FETs which may be found in the average amateur's shack.

The basic intention in the design of this unit is to give a simple GO/NOGO indication as to whether the FET will operate without attempting any quantitative assessment of parameters, although the output meter indication will give some assessment as to the vigour of the transistor. No reading will obviously indicate a faulty transistor; a high reading suggests that the transistor is made for VHF or UHF service and that its gain is medium to high. A low indication may indicate that the transistor has been designed for HF use or that the gain is low to medium.



The FET tester

To achieve this, the transistor under test is placed in a crystal oscillator circuit and the RF output level is monitored on a panel-mounted meter.

In keeping with the theme of this project, most of the components required should be readily available in the average junk box. With only very slight modification the circuit can be adapted for P-channel FETs, as a frequency marker/oscillator, or as a crystal activity checker.

The circuit only consumes about 2mA from a 9V supply and will operate down to less than 5V. A PP3 battery should, therefore, last almost as long as its shelf-life.

Circuit description

The basic circuit is a Pierce crystal oscillator, followed by a simple diode detector feeding a microammeter (see **Fig 1**).

With the FET under test in circuit, the crystal is connected between the gate and drain. The crystal frequency is unimportant and a wide selection of HF crystals has been tried in the circuit, all giving excellent results. Obviously, if the circuit is also to be used as a crystal calibrator, then a standard frequency, ie, 1, 5 or 10MHz should be used.

9V from a PP3 battery feeds the drain via a small HF choke. In theory this choke should be self-resonant at a frequency

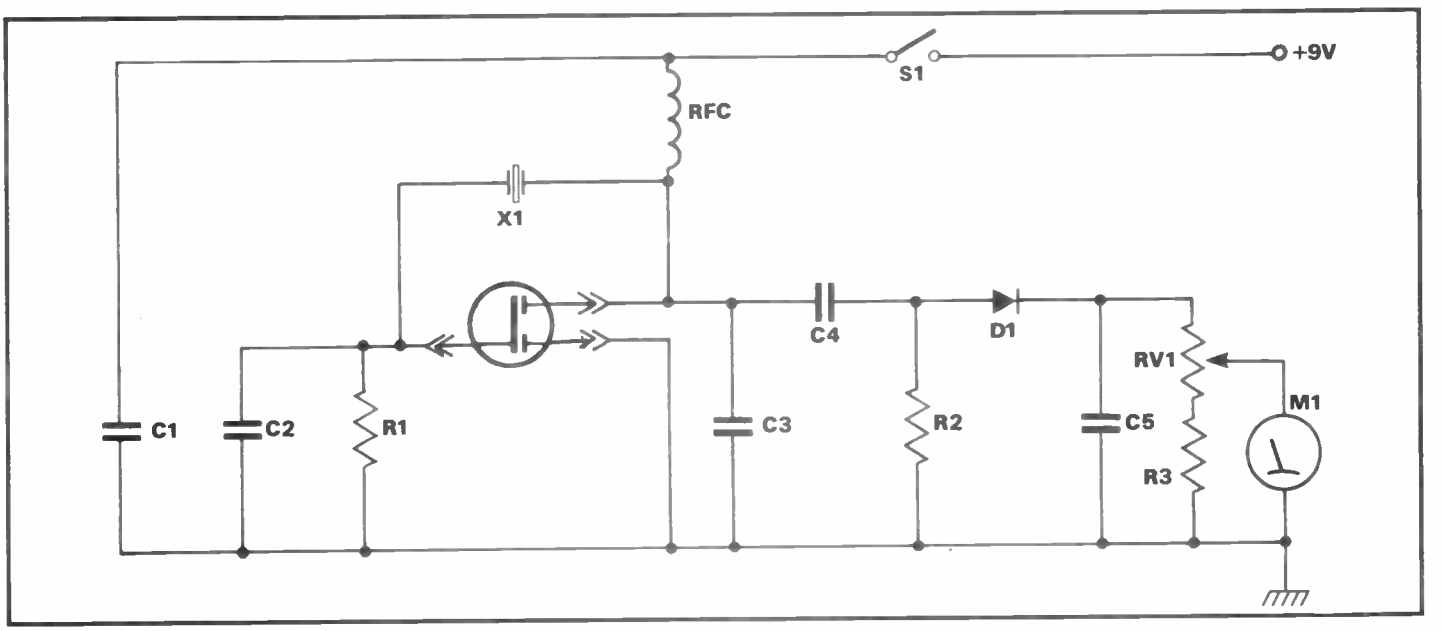


Fig 1: *The basic circuit layout*

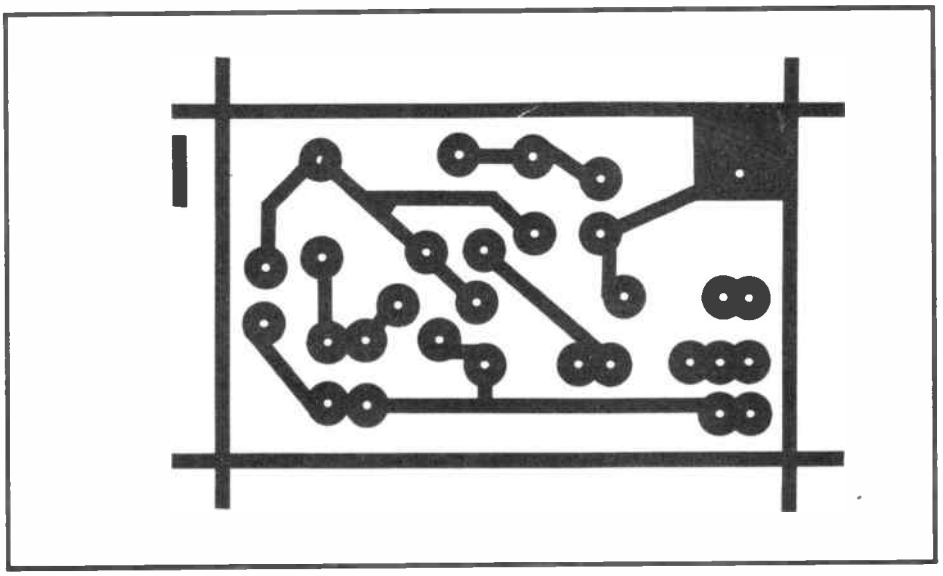


Fig 2: *PCB overlay*

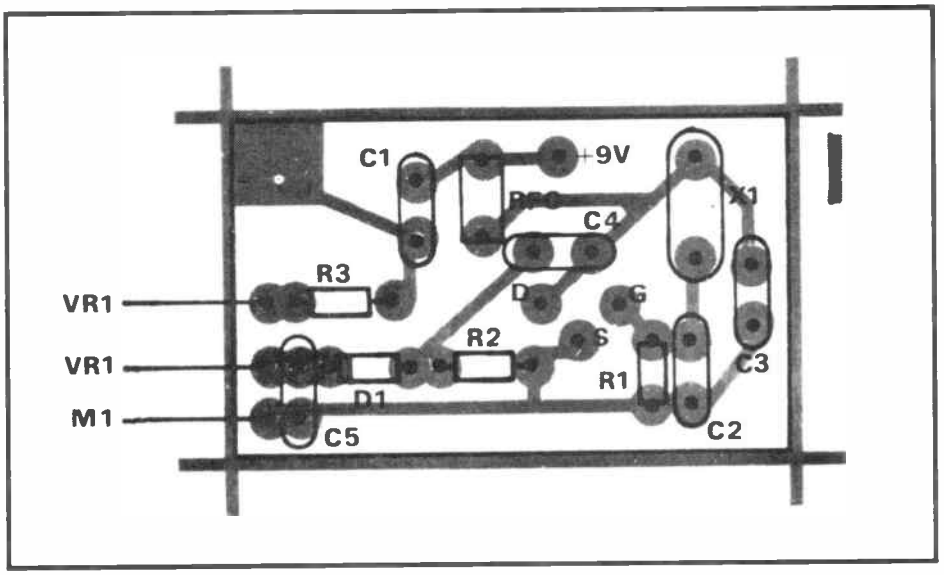


Fig 3: *Component overlay*

Component List

R1	100k	RFC	1mH
R2	10k	D1	1N4148
R3	1k	M1	500 microamps
		VR1	50k linear
C1	10 NF	X1	(see text)
C2	100PF	S1	SPST
C3	100PF		
C4	100PF		
C5	10 NF		

Miscellaneous

Crystal socket
Single-sided PCB, 70mm × 42mm
To five transisters socket
Test clips
PP3 battery connector
Three off 6mm grommets

below that of the crystal, but a small 1mH ferrite-cored choke was used in the prototype and is perfectly satisfactory for all crystals between 1 and 18MHz.

R1, 100 kilo ohms, provides an earth return from gate to earth which is bypassed to RF by C2, whilst C3 from drain to earth furnishes the necessary feedback to maintain oscillation. If a high frequency crystal (say, above 10MHz) is used this capacitor may be reduced somewhat in value, but 100pF has so far been found satisfactory for all crystals tried in the circuit.

The output from the drain is coupled via C4 to a simple diode detector, D1, the output of which drives the output meter. In initial tests a voltage doubling circuit was used, but was found unnecessary.

VR1 permits adjustment of the meter sensitivity, whilst R3 prevents an inadvertent complete desensitisation of the circuit.

Construction

The PCB uses a 70mm×42mm piece of single-sided board which can be etched using standard techniques to the design shown in **Fig 2**. After inserting and soldering the components, little difficulty should be experienced in making the project operational (see **Fig 3**).

Connections to the board have been made using standard 1.mm Veropins, since continual soldering and desoldering, which inevitably occurs during the development phase of any project, causes lifted tracks and other problems.

In the prototype the crystal was mounted in a holder, but there is no need for this complexity and it 'may be soldered directly to the PCB if desired.

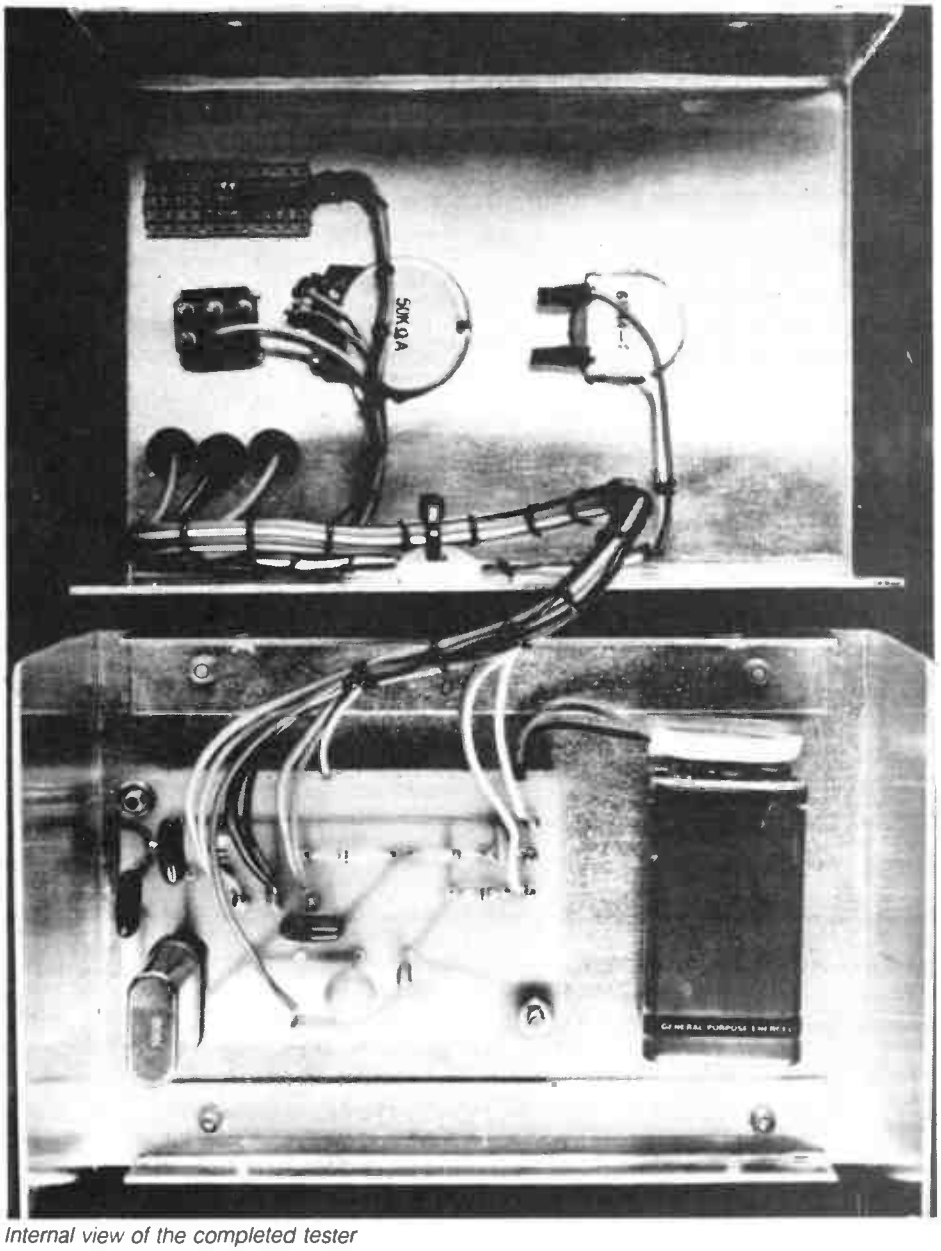
The case was home-made but, obviously, any commercially constructed item of suitable dimensions could be used.

Only two points arise concerning the components mounted on the case: the meter and the mounting of the transistor socket. Almost any meter with 500mA sensitivity can be used, but VU meters, sold by several surplus stores at 50p each, are perfectly satisfactory. Mounting the transistor socket on the panel presented a slight problem, since it was intended to be mounted on to a PCB. The problem was eventually resolved by soldering the socket on to a small piece of Veroboard and then, having cut a hole of suitable diameter in the front panel, fixing the Veroboard to the rear of the panel with Araldite.

The PCB should be mounted, track-side down, in the case using two M3 bolts and spacers, ensuring that a good connection to the case is achieved via the track extension in the corner of the PCB. The flying leads are connected directly in parallel with the transistor socket and are provided to enable testing FETs which will not fit into the socket or, alternately, are still mounted

on a printed circuit board, or similar.

If the additional facility for testing P-channel FETs is required, the only modification is the addition of a switch to change the polarity of the 9V supply from the battery.



Internal view of the completed tester

Operation

The FET under test is either mounted on the transistor socket or connected to the flying leads with the power switched on. If the FET is serviceable a reading will be obtained on the meter, which should then be adjusted to mid-scale.

The unknown FET can then be replaced by a known transistor to enable a comparison of gain, as suggested in the opening paragraphs of this article.

Using similar techniques, known FETs may be compared for similar characteristics for use in balanced circuits etc.

Other uses

The principle of this tester is that an unknown FET can be tested in an oscillator circuit using a known good crystal. Conversely, if a known good FET is used, the circuit may equally be used for checking the activity of an unknown crystal. If it is intended to use this facility with any regularity, it may be more convenient to mount the crystal socket on the front panel.

The unit can also be used as a calibrator or bandedge marker if a crystal of suitable frequency, such as 1MHz or 3.5MHz, is used. The prototype used a crystal of 1MHz and harmonics were readily audible throughout the HF band, even though there was no direct connection between the tester and receiver.

RESULTS

Several examples of the tester have been constructed without difficulty and all have been extremely useful in sorting out the myriad of unknown and unmarked tranistors and FETs which seem to inevitably congregate in the lower reaches of the junk box.

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ERA Ltd. is a manufacturing facility and as such has no showroom. We do however accept personal callers who may like to find out more about the Microreader or try one on their own equipment without obligation. Due to limited parking during the week we must restrict this to Saturdays only, but please do ring us first.

DX DIARY

News for HF operators compiled by Don Field G3XTT

There seems to be a mad rush to operate from potential new DX locations, even before the DX Advisory Committee has voted on their acceptability (which was due to happen during September).

At the end of July DJ6SI, K5VT, DJ6JC and DK2WV showed up from Conway Reef, operating mainly on CW and RTTY, with very little advance notice. VK9NS F2CW and JK1GDD also announced an operation from the reef in late August under the auspices of the Heard Island DX Association and the French DX Foundation, though this was called off at the last minute owing to 'paperwork difficulties in Fiji'. OH2BGD had also been planning an appearance from Conway Reef during his forthcoming Pacific trip, but now seems to have decided that the demand has been met by recent operations.

Meanwhile, there have been various reports about a possible operation from Banaba by SM0AGD under the callsign T33AG, this being in addition to a possible operation by VK9NS and others later in the year.

There has been comment in the DX press recently about the way in which major DXpeditions have been announced well in advance, only to be followed by an announcement from others that they plan to go off to the same spot. Fuel has been added to the fire by a report that I2MQP and others will go to Bouvet Island next January. It would be very unfortunate if we see the same sort of unseemly race between them and the Norwegian group, as we saw some years ago with the Heard Island DXpedition. Let's hope sense prevails and a pooling of resources is possible. As it is, the latest press release from the Norwegian Club Bouvet group reports that no other group has obtained the necessary permits for a landing on Bouvet Island (which is, of course, under Norwegian jurisdiction).

At the time of writing this article, some ninety DXers in fourteen countries had pledged money to support Club Bouvet, with individual donations as high as $5,000! One large donation came from someone who already has Bouvet Island worked and confirmed but wants to help others contact this rare one. The list of ninety DXers included only one UK station; let's hope that changes as a result of the DX News Sheet fund-raising DXCC Speed Challenge, which I mentioned in last month's article.

August DX

Rudi DK7PE put on an excellent show from Upper Volta in early August, signing XT2CW. He made 6,500 contacts in all, with some European and US stations managing to work him on nine bands. This was the first legitimate operation from XT since 1983, and required the personal intervention of the government minister responsible for licensing. There was also an unexpected operation from Trinidad Island, signing ZY0TI, and two operations from Christmas Island, both on at the same time, signing T32IO and T32PO respectively.

Of the many other interesting stations that showed up I would single out 3D2RJ from Rotuma Island, asking for QSLs via his home call, ZL1BQD. Another interesting piece of news relating to Rotuma is that one of the islanders has recently passed the amateur exams and is now licensed as 3D2AP.

Forthcoming DX

DL2GBT will sign 9H3EH until 19 October from Malta. Claus will operate on 10, 12, 15, 20m and possibly on 40 and 80m if propagation is favourable. He will be operating mostly on SSB.

SM7PKK is planning a follow-up to his previous tour of the Pacific. Mats will arrive in Fiji on 19 October and will be in the Pacific from four to six months. Beyond that his plans are fluid, though he expects to get to Fiji, Western Kiribati, Western Samoa, American Samoa, the South Cook islands and Tokelau. He may join up from time to time with other European DXpeditioners in the Pacific during that period. Otherwise look for him on 5kHz from the bandedges on CW and near the usual DX frequencies on SSB. QSLs should be sent to his home call, though they will be handled by a team of volunteers.

Andy G4ZVJ expected to start a six month operation from Ascension Island in September. He has been assigned the call ZD8VJ and plans CW operation on all the HF bands, including the WARC bands. QSL via the bureau or his UK address.

KA3DBN was due to tour Africa and Europe for a month from mid-September. The African stops included ZS, ZS3, 7P, A2 and 3DA0, as well as some of the South African 'homelands'. QSL to his home call.

5R8JD is active once again from the Malagasy Republic, though at the moment with only verbal permission to operate, which won't cut much ice with the ARRL. However, Jean-Paul will be there for eighteen months and hopes to get full written documentation before he leaves. DX News Sheet reports that on one occasion 5R8JD QSY'ed away from a 15m net operation to work G stations on 10m and while there, a number of stations on the 15m net still thought they were working 5R8JD, exchanging reports of the '3×3 over, over' variety!

EI8EM and others were due to sign EJ0A from the Aran Islands from 29 September until 1 October. Hope you bought your copy of ***Amateur Radio*** promptly, so that you still have time to look for this one.

Here is another one for IOTA chasers – a group of W5 stations will activate Marsh Island from 26-29 October, they hope this will be given an IOTA number after the operation has taken place.

Contest activity

Whether you take your contesting seriously or not, there should be plenty of activity to interest you over the October contest period. The table lists those I've heard about, though I'm sure there will be many others.

I haven't actually included the full rules of the CQWW SSB Contest, as I expect most readers are familiar with them. I can provide a copy, plus log and cover sheets, in return for an SAE.

The other main October contests are the VK/ZL/Oceania events. The SSB leg takes place on 7-8 October with the CW leg the following weekend. These twenty-four-hour contests start at 1000GMT on the Saturday.

Two of the RSGB's major HF contests are also scheduled for October: the 21/28MHz SSB on 8 October and the 21MHz CW the following Sunday. Looking towards November, RTTY enthusiasts should plan for the Worked All Europe RTTY Contest on the 11-12th.

Contesting

With the major international contests coming up, especially the CQWW events, it's a good time to pass on some hints and tips.

To start with KA1QXI, who is a doctor, offered some thought on sleep deprivation strategies to fellow members of the Yankee Clipper Contest Club. His recommendations during a forty-eight-hour contest are as follows:

Take a three hour nap before the contest starts, after a reasonably good meal. Have some coffee before the contest starts, but limit eating during the contest to snacks with a high carbohydrate content, low fat and reasonable protein.

During the contest take a one and a half to three hour nap, starting about two hours *before* you would normally awaken (this allows for a full sleep cycle) and then have another cup of coffee. Drink coffee only when you awaken from a nap; otherwise, you will find it harder to fall asleep, and will not awaken refreshed when you do sleep. Take a thirty-minute nap between 12.00pm and 1.00pm local time, with an optional thirty-minute nap during the same time-period on the second afternoon of the contest. Avoid alcohol and heavy physical activity during the contest (they promote deep sleep), and keep the shack brightly lit. When you do sleep, keep the room temperature between 72°-74°C to promote sleep.

Success on the air . . .

N6AR, an avid contester, gave some hints and tips last year at the Orlando DX meeting. These can be summarised as follows:

1. Make sure you have the right forms available (summary sheet, log sheets, rules, dupe sheets etc).
2. Have a band operating plan (normally, start on the highest band that is open; catch grey-line openings on 40-80m at sunrise and sunset; go to lower frequencies sooner on CW than on SSB; when several bands are open spot-check them all at regular intervals; if you operated on one of two open bands on the first day at a given time, reverse the pattern on the second day; and remember that 160m often has the most activity on the hour and half hour).
3. Know the propagation (usually by keeping an eye on the bands during the week or two before the contest).
4. Special operating tips: don't call anything for more than five minutes; watch for open windows in CW pile-ups; know where the DX windows are (and where to find the clearest spots for US stations on 403 SSB); on 20m CQs are often more successful above 14250, and on 15m above 21300; tune consistently from the bottom to top or vice versa (so you don't miss anything) and tune slowly, listening for the weaker ones; use short and frequent CQs, establishing a rhythm and not giving up prematurely; don't just call CQ, listen for the weaker ones, keep track of key multiplier frequencies (eg, put them into memory), work the propagation chart; and keep track of easy countries and zones.
5. Prepare for the contest with a nap ahead of time and then sleep during 'dead' times (11.00am to 2.00pm, and 2.00am to 5.00am); have meals prepared for ease of consumption; and avoid taking alcohol.
6. After the contest dupe the log, even if you did it during the contest, and submit it before the deadline.

There is not much I would want to add to all this excellent advice, except that if you plan on using a computer logging program, get used to it beforehand. Don't make major changes to your station or antennas just before the contest – something is bound to go wrong! Arrange for the family to be away, and the phone disconnected. Make sure your operating position, especially your chair, is comfortable – forty-eight hours is a long time to sit in one position.

There are also some tricks you can play

Operations Scheduled for CQWW Phone Contest

CT3 . . . Madeira	SM5GMG will operate both legs of the CQ WW from the Atlantis Hotel.
FS . . . St Martin	Craig Maxey WB7RFA will sign FS5R for his 10m single band/single op entry. Before and after the contest he will sign FS/FG5DX.
GJ . . . Jersey	GJ6UW multi-single operation. (CW and WARC outside contest).
J3 . . . Grenada	W8KKF, K8CV and others will be there from 25 October to 1 November, with CW activity outside the contest.
KH9 . . . Wake Island	AH2BE/KH9. Ops will include: AH2BE, KA1GMN, KA8GVS, KC4LJD and N8BJQ. They'll be there for two weeks and will operate other modes outside the contest. QSL to KA6V except for contacts with N8BJQ; Steve will be QRV only on CW outside the contest signing N8BJQ/KH9 and he will handle his own cards.
P4 . . . Aruba	Bill N1GL will sign P40A from 24-30 October, taking in the Contest. Check 1825kHz each hour from 04-0700hrs on the Friday and Saturday. QSL via KA1XN.
SV5 . . . Dodecanese	WB4FLB, N4FD and W1UA will be QRV from the QTH of SV0GM, signing either their own call/SV5 or a special J4 call.
USSR	RQ7W will be QRV in both legs of the CQ WW. UZ9CWA reports that a group of ops from the UZ9 Club hope to operate from UP, UQ and UR before and during the Contest.
V4 . . . St Christopher/Nevis	W9QQ and K2DOX will sign V44QQ. QSL to W9QQ. WB2P and K3IPK will be QRV from 24-31 October, taking in the contest. Call is not yet known.
VK9L . . . Lord Howe Island	KD2EU and K1JB will sign VK9AE and VK9LV respectively from 26 October, taking in the Contest. QSL via K1JB.
VP5 . . . Turks and Caicos	Steve NM2Y/G3YDV will sign VP5T.
5C . . . Morocco	French DX Foundation members including: F2CW, F6EEM, F6FYP, F6GKQ and some CN ops will sign 5C0A from Morocco. QSL to French DX Foundation.
9V . . . Singapore	K4UTE and N4KE may be QRV from here.
9X . . . Rwanda	5Z4BH is expected to operate as 9X5AA.

on yourself to get you psyched up for the contest: looking at past scores, giving yourself a target, deciding who you are going to beat, and so on. At the end of the day, of course, how much of all this you take seriously depends on whether you enter a contest seeing it as a fun run round the track in a go-kart, or as an opportunity to win at Le Mans. Either way, enjoy it. And, funnily enough, the evidence is that those who take part principally for enjoyment's sake often end up with higher scores than those who go all out for the top. Maybe contesting is just an extension of life as a whole!

WARC bands

Activity on 18 and 24MHz continues to increase and by mid-August GW3AHN had reached 155 countries worked on 18MHz and 200 on 24MHz. Mind you, Tom has been very active on both bands right from the start, but others have reached scores around the 100 mark on 18MHz, even in the short time since UK stations gained full privileges on the band. Some have put up high-gain antennas, while others are finding that the bands are still sufficiently quiet for excellent results to be obtained, even with very modest power levels and antennas. A couple of evenings back, for example, I was able to have a half-hour rag-chew with 9M2RI in Malaysia and another long chat with VP8BQE on Rothera Base in Antarctica. My current antenna on the band is a sloping dipole below my triband beam. VP8BQE, incidentally, has been booming in regularly on both 18 and 24MHz, looking especially for UK stations.

More tribulations

In recent months I have commented on the tribulations often experienced by DXpeditioners – and not appreciated by those of us sitting in our warm shacks trying to work them.

The most recent example appeared in **QRZ DX**, written by Norm YJ8JS, detailing the author's experiences in trying to put the Banks Islands on the air as YJ1BKS. The national airline was grounded three hours after Norm's arrival in the Banks Islands, cutting off further supplies of food and fuel. The boat to take him on his onward journey failed to turn up and the porters employed by Norm and his two colleagues to take them overland managed to get lost, despite the fact that the island is only eight miles by three. Meanwhile, the rain was torrential. On finally arriving at the village, Norm discovered that his generator, which he had shipped out earlier by sea, had been damaged by salt-water and was useless, leaving him confined to battery power. His antenna and tuner had also been damaged by the overland trek, so his signal left something to be desired. Finally, to add insult to injury, his stay on the island coincided with a visit by the New Zealand Deputy-Prime Minister.

This led to every able-bodied male being conscripted by the chiefs to help prepare the tribal feast and perform traditional dancing, leaving Norm with no one to turn to for assistance. The joys of undertaking a DXpedition!

Software

With a recent QSL card from Spain, I received details of what could be a useful DX aid. This is a list of QSL managers, up to 14,000 apparently, on IBM-compatible disc, menu-driven to allow rapid recall of the required information. The software is really intended for PCs with a hard disc. The cost is $25.00 (or equivalent), and is available from: QUFO Software, PO Box 351, 26080 Logrono, Spain. You need to specify what size and density of floppy disc you want the software to come on. Registered users will get an instruction manual and automatically receive updates to the list as they become available. I have no user feed-back on this software, though it sounds as if it could be quite useful for the active DXer.

DDR Forty Award

DX News Sheet recently carried details of a new award to celebrate the foundation, forty years ago this October, of the German Democratic Republic. To qualify, gain forty points between 1-31 October by working GDR amateurs and counties (indicated by the last letter of the call). For European operators, each contact with a GDR station counts as two points, and you must also work ten counties. The special station, Y40DDR, can be worked once and substituted for a missing county. The award is free to members of those societies which have agreed on the mutual and free exchange of their awards (which, I believe, includes the RSGB). Otherwise it costs seven IRCs. To apply, send a certified log extract (this normally means certified by your national awards manager or two licensed amateurs) by 28 February 1990 to: Y2 Award Bureau, PO Box 30, Berlin 1055, GDR.

40m DXCC

Congratulations are due to G3KMA, who was the highest placed European station for the new 40m DXCC award with 310 countries credited on the band. Only two other European stations, SM0AJU and DL1PM, appeared in the top twenty.

XU1SS

Finally, the Long Island DX Bulletin recently carried the interesting news that Seth, operator of XU1SS, from Kampuchea, arrived by air in the Philippines back in June and became something of a local celebrity with attention from the press as well as a triumphant motorcade through Manila. He had been released from confinement in Kampuchea with just the clothes on his back. While we might be disappointed that XU1SS is no longer active on the bands, at least we can be glad that Seth is now safe.

As always, if you have any news or comment, and would like further information on awards or contests, then drop me a line via the editorial office or direct to: 105 Shiplake Bottom, Peppard, Henley-on-Thames, Oxon RG9 5HJ.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

At the time of writing this piece the weather is becoming a little changeable, but who can complain about the summer this year? From reports received, the bands have been reasonable too, and we still have the best of the sunspot cycle to come.

Sunspots and the eleven-year solar cycle are a very interesting study and most of us are aware of the effects that high sunspot counts have on propagation, but it is also interesting to note the effects on our weather at the same time.

For instance, did you know that in periods of low sunspot activity our weather has been poor, while at sunspot 'peaks' we have enjoyed fine conditions?

The so-called 'Maunder minimum' occurred between 1640 and 1700 AD, at which time some of the coldest weather ever was recorded in Europe. In more recent times, the very hot summer in the 'seventies makes this year's extended warm spell on schedule with, perhaps, similar conditions in 1990. However, this does not look good for the next couple of winters. Remember the snow in the late 'seventies?

Book corner

I've had a couple of very interesting books passed to me which deserve mention here.

The first, the twentieth edition of Philip Darrington's **Guide to Broadcasting Stations**, is up to its usual high standard. This is a compendium of offerings from well-known writers such as Pat Hawker, Jonathan Marks and George Short. The book contains details of the world's short wave stations, where and when they can be heard, how to send in reports and what equipment to use. This has always been a useful volume and the new edition now includes data reception. Good value from Heinneman/Newnes!

The Short Wave Listening Handbook, by Joe Pritchard G1UQW, starts with the basics of electronics and takes you through radio theory, receivers, aerials and using computers in a simplified manner. The result is a book that offers the reader a grounding in the hobby and without being *too* technical, encourages a further look into the technical side of the hobby. Recommended for the newcomer, by Heinneman/Newnes.

Getting involved

Newcomers to the hobby of radio listening have a wide choice to interest them within the hobby, which they can develop into an absorbing pastime. Radio is very diverse and caters for a wide range of interests from simply listening and enjoying programmes broadcast by the world's news and leisure stations to studying satellite or other scientific communications systems. They all come under the 'umbrella' term of short wave listening and all areas have their devotees.

Whichever aspect of the hobby the beginner becomes interested in, it soon becomes obvious that there's more to listening than just switching on a radio receiver. Indeed, if this was all that was involved, it would soon become rather boring.

Developing the hobby into an interesting and even educational one means finding things out. For instance, why do stations disappear from certain frequencies at certain times of day? What makes some signals fade in and out and not others? If some stations transmit for twenty-four hours a day, why can't you hear them all the time?

These simple questions can have very involved answers, but finding a solution to them can help to make listening more enjoyable, thus enabling you to find stations more easily and hear them more clearly.

Even the simplest radio receiver can be put to good use. Given a couple of wavebands, preferably with at least one short wave band, many stations world-wide can be heard. It is useful – even at the initial stage – to start making notes of what you hear, when you heard it and on what frequency or 'spot on the dial'. This will enable you to return to the station later. You can also make a note of conditions at the time you heard the station. Was the frequency noisy or was the station fading occasionally? Next time you tune to that station, conditions could be quite different.

Although this type of 'random' listening tends to be a bit 'hit or miss', it has no restraints and can be done whenever time permits. As time goes by, you will build up a list of regularly heard stations and get to know their regular frequencies. You will also come to recognise their introduction of music (such as a few bars of the Warsaw Concerto introducing Radio Polonia, Poland), enabling you to tune in to the correct frequency before the broadcast begins.

Radio monitor

It is not a great step from this casual listening to becoming a radio 'monitor'. This chap takes his listening very seriously and knows his way around the bands, having clocked up many hours of listening and logged hundreds of stations. It doesn't matter what sort of receiver a monitor has, because you can bet he squeezes every ounce of signal from it using the best aerial he can manage and filters to reduce noise etc. Logging the stations heard is a major part of monitoring, and up-to-date schedules from radio stations are always to hand. Many radio monitors become official monitors of certain stations, reporting reception conditions to the station's engineers and noting any 'peculiarities' in their transmissions.

Even being a real enthusiast like a monitor doesn't necessarily mean having to spend a small fortune on equipment. It does, however, require making the best use of the equipment you have and getting to know its limitations.

A reasonably good short wave receiver with minimal facilities, coupled with a wire aerial and a simple antenna matching system can cost well under £100.00 and give many years service.

On the other side of the coin, you could become interested in the 'amateur' way of doing things. The licensed radio amateur is a very underrated chap, and many new developments in the world of communications have been sparked off by amateurs trying something different. Not every amateur is a budding Marconi, and many are quite content to chat to other enthusiasts round the world. Yet, even they experiment with aerials, filters and other aids to improve communication. Others do a lot of experimental work and play an important part in developing this field.

Amateur operators use many different modes for communication, the most common of which is sideband and Morse or CW. These two modes need a special device called a (BFO) beat frequency oscillator built into the receiver to resolve the signals. However, all but the cheapest receivers have this facility. It is possible to build a separate BFO to work in conjunction with other receivers.

Other modes used in communications include slow and fast scan television, teletype and other forms of computer data transmission, so there is plenty to interest the computer owner.

Although the hobby is becoming more technical nowadays, it can be enjoyed

by people of any age and without any technical background. All it needs is the germ of interest.

Awards

It's nice to hear from Peter Bowles, of Newhaven, again. Pete has found the 15 and 20m bands fruitful lately.

FO5MC, KL7XD, J52US, ZC4WP and 6W1AAD were nice ones on 15m, while SM4AIO/P/4, T77T, 4X6XZ and V31BB were found on 20m, all using his 'rather ancient' Trio R300 with an endfed wire aerial. QSL J52US via Ken Schefer WA8JOC, 5875, Cedar Ridge Drive, Cincinatti, Ohio 45247, USA. ZC4WP is via JSB, BFPO 53, London.

Dxpedition news

Here is some news about a DXpedition. K5MK/5 will operate from a new IOTA group (NA 119) on 20 October, from about 2100 UTC to 1800 UTC on 22 October. Operators should be K5MK, WA4DAN and AC5R. Frequencies to watch are: 14260 (including the IOTA net at 1300 UTC on Sat/Sun), 21260 and 28560 (all ±QRM, of course). Reports/QSL cards should be sent to K5MK, QTHR. Thanks for the information, Pete.

Joan Slater, of Matlock, reports that she is well on the way to a Premier Prefix award (for 2,000 prefixes) with over fifty countries confirmed. Joan has also just gained her amateur licence. Well done, Joan!

Another regular, George Jacobs, of Cardiff, also reports that he has passed the RAE and is now GW7EYF. Congratulations to George, and to all those others who were successful this time round.

Morse

Brian Biddle, of Leicester, claims a couple of awards this month for Asian and North American Continentals. Some very nice stuff logged, too. Well done, Brian . . . see you at the Leicester Rally!

The Continental awards are presented for logging 100 amateur or broadcast stations in any one continent. Any one mode, frequency or mixed entries are valid. QSL cards are not necessary.

RW O'Hara ZD8BOB, down there in the South Atlantic, sent the following letter:

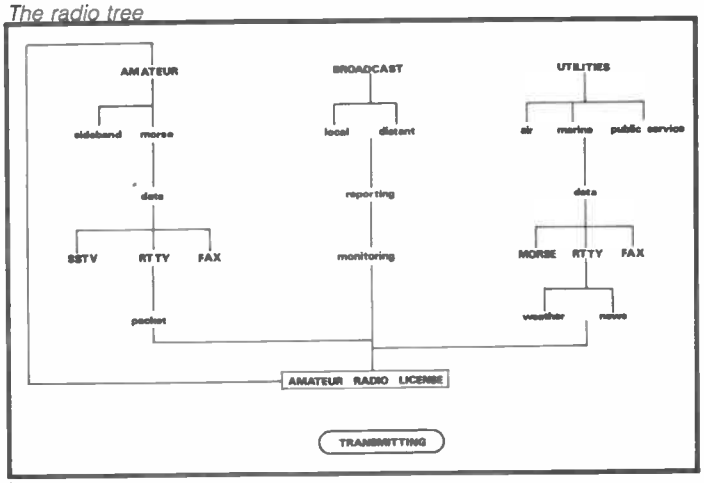
'There are three new awards available: the South Atlantic Award is for working at least one station on each of the dependancies, ie, Ascension, St Helena and the Falklands on any band or mode; the Ascension Island Award is for working at least three stations on the island in any band or mode; and the Air Bridge Award is for working one station in the Falklands, one on Ascension Island and one in the British Isles, again in any band or mode.

Bob doesn't mention a specific SWL award but maybe if you twist his arm a little? The application should consist of a certified log and be sent with ten IRCs or £2.50 to: The Awards Manager, PO Box 2, Ascension Island, South Atlantic.

Well, that's about it for this month. Next month we'll have a look at award hunting and getting into contests. Have a good month!

Band reports and award claims to: 1 Jersey Street, Hafod, Swansea SA1 2HF.

The radio tree



News and comment from Glen Ross G8MWR

Although everything we can and can't do is laid on in the schedule of our licence conditions there are, nevertheless, some points which are causing a certain amount of confusion in the class 'B' ranks. The following answers, provided by the DTI, may help to clarify some of the more common grey areas.

Rules and regulations

The first point is to do with CW and the bands on which a class 'B' operator can use it. The answer is that CW can be used on any band above 30MHz. On the use of automated Morse from a computer or any other machine which is designed to produce CW, the answer is that this is well within the rules. Another point causing confusion is in the realms of packet operating, where it is required that you identify your station using either Morse code or telephony at regular intervals. There has been some discussion as to whether the use of automated Morse is acceptable, and the DTI (like the man from Del Monte) says yes.

Speeds

On the question as to what speed this identification should be sent, the official requirement is that the speed should allow manual reception. It would seem that any speed up to around 20wpm is acceptable for this purpose. When the DTI was asked if a digitised voice identification would be acceptable, the answer was again yes, provided that the quality of the digital system was reasonable. This information should, hopefully, clear up some areas of heated discussion at the local club.

If you need clarification on other points, write to: The DTI, Room 613, Radiocommunication Division, Waterloo Bridge House, Waterloo Bridge Road, London SE1 8AU.

Policing

It is a common comment that the RIS seem to do little about clearing up the delinquents on the amateur bands. They may not be able to clear up the mess on the repeaters, but they certainly get to grips with technical infringements and rule bending.

The following information from G3ZHI shows the sort of fine you can expect if you don't play the game according to the rules:

'In the case of class "A" operators, the following fines have been handed down by the beak for various misdemeanors. At £300.00 you can take your pick from the following: communicating with an unlicensed station (do not talk to the "squeaky" on the local repeater!); failure to use a callsign as per regulations; failure to keep a proper logbook, as required by the licence conditions; monitoring RAF communications (watch what you are doing with your scanner); disclosure of US Navy communications (if you do listen illegally *don't* tell anyone what you heard); and aiding and abetting the use of an unlicensed transmitter.'

Going up

If you are a class 'A' man and want to spend more money, the following activity will set you back £800.00 a time: deliberate interference to an aeronautical network, or inciting others to use an unlicensed transmitter.

The class 'B' man gets into the act as well. All the following offences weigh in at £250.00 a time: communicating with an unlicensed station; failing to use a callsign as required; failing to keep a logbook complying with regulations, and monitoring police radio systems.

The interesting thing is that the 'B' operator gets away with a lower fine than the class 'A' man for the same offences. Perhaps that is another good excuse for not taking your Morse test? All the above fines have been imposed in the recent past. You have been warned.

Clean signals

In last month's edition, I mentioned some of the problems that cause splatter and ways to prevent it.

This month, we go one stage further and make sure you do not accuse someone of spreading when, in fact, they have a clean signal. We know from last month's discussion that linear amps are rarely linear, but the point to bear in mind is that the RF stages in your receiver are also supposed to be linear. If you overdrive them with too much in the way of a received signal level they will generate spurious signals up and down the band. If you are using a preamp in front of your rig the effect is even worse, because a strong local signal is really going to put the Rx RF stages into overdrive.

Check it

Before you start accusing people of spreading, make sure the problem is not at your end. To do this you first switch off your preamp and then swing the beam away from the offending station until he drops to maybe S5 on the scale. Now tune around and see if the problem is still there. If it is, there is one other check to make. A major source of trouble is the noise limiter in your rig; this is usually a simple diode gate in series with the signal path. Now as we all know diodes are very non-linear devices, which is why they are frequently used as mixers. The next step is to make sure the noise limiter is switched off.

What next?

If the splatter still exists after making these checks then you can start slinging some mud. But remember, a gentlemanly approach will usually get a friendly response. Tell the person concerned that he is tunable over most of the band and suggest that he tries cutting the drive down a bit. Of course, if you only live half a mile apart, he runs 200W, and you both have twelve-element beams pointing straight at each other, then there is very little you can do but suffer.

GB2SM

This station, located at the Science Museum in London, has been on the air on both HF and VHF bands for more than thirty years and is well known worldwide. It is used to show visitors to the museum how amateur radio works and, in its time, it has brought many people into the hobby. During the next month or so, a decision is going to be taken on the possibility of closing the station down permanently. For such a well established amateur radio institution to be lost seems a great shame. If you agree why not write to the museum in South Kensington, London, and let them know your views on the subject?

Packet beacons

One of the problems with packet radio is actually finding a spare moment to send your breathless prose into the ether; there is so much clutter from other stations. Now we seem to be suffering a sort of midsummer madness which is causing even greater congestion. Why is

it found desirable to leave one's system churning out a beacon signal every couple of minutes? If people know you leave your PBBS running they will call you anyway. We know you have to send out recognition signals at the prescribed intervals when you are actually using the system, but what we do not need at two minute intervals are signals saying 'G9BF located at Hogs Norton, please leave a message'. The casual passer-by is hardly likely to respond and if he sends you a cheerful 'Hello, stranger, this is Fred in Upper Snodsbury, byeeee!' you are not going to get excited about it and, because the system took ten attempts before the message got through to your gear, it has successfully clogged up the airwaves and stopped something more important arriving. Please rethink your attitude to personal beacons and also think before sending messages that are really not needed. If we are not careful the whole system will come to a grinding halt.

6m

From Ray Cracknell G2AHU, who is the coordinator of the 50MHz Reporting Club, comes a very useful news sheet containing a tremendous amount of information about the 6m band. Generally speaking, he reports that conditions for Sporadic-E working into the Mediterranean area have remained fairly good. An opening to the USA took place when stations in the W1 to W4 area were worked. This occurred on 17 July when there was an opening into VE1.

Heading round towards Latin America, good openings have been reported to Uruguay with CX4RS being reported as a particularly strong signal. Good signals were also heard from Argentina. Moving round a little, Ascension Island was available to the lucky few who caught up with him.

Beacon report

Reception of various beacons and normal amateur stations in July provided some interesting information. In the following section the percentage figures refer to the number of days in the month when signals were heard.

Signals from ZB2VHF, on Gibraltar, (90%) were normally running at around S9, particularly in the mornings from 16-18 July when they stayed at S9 virtually all day. Signals from Portugal (61%) averaged out at about S8, with signals reported at S9 all day on 16 July. 9H1SIX and various Maltese stations (55%) were reported at around S5 to S6. French and Italian stations (65%) averaged out at S8, with activity being fairly evenly spread across the day. Lumping together Holland, Denmark, Germany, Austria and Switzerland (23%), their signal strengths spread over the S5 to S8 range. 5B4CY (29%) was, as you would expect, not very strong, averaging out at S5. ZS3VHF and amateurs in Namibia (52%) were really only heard in the afternoon and evening periods when their signal strengths were running at about S6.

Remember

Please remember that the 'S' points quoted are only an average strength guide, do not be disappointed if you did not hear them so well. In fact, you may not have heard them at all because these openings usually cover only a part of the country, rather than all of it. If you live on the south coast you will have a far better chance of hearing, say, the African stations than if you live in the far north of Scotland. Your turn will come with openings to LA, OY and DX etc.

Problems

I am beginning to receive reports of a rather queer noise on our 2m band. This seems to be centred around 144.4MHz and has a rather odd burbly character. It is quite different from the usual, drifting, nasty noise that seems to be generated by RF welding gear, which tends to start at the top of the band and then slowly drift towards LF, suddenly jumping back to the top end and starting the procedure all over again. If you have heard the burble, please let me know. These noises plus the cyclic splurge of radar interference on 1296MHz are becoming a regular nuisance on the bands.

The final

Thanks for all the interesting comments you are sending my way, ever more of them coming via packet. If you use that mode you can contact me at GB7NUN, or you can write to: 81 Ringwood Highway, Coventry.

MEDIUM WAVE DXING

by Steve Whitt G8KDL

This month, we have a couple of features for you: one item on aerial fundamentals (as a prelude to features on special medium wave aerials in coming months), followed by a few tips on obtaining QSLs from medium wave broadcasters.

Is bigger better?

It is often said that the larger your aerial the better the DX you will hear, but this rather sweeping statement needs to be examined more closely in the context of medium wave listening.

One of the basic laws of physics is that all electrical components will generate a small (usually unwanted) noise signal due to the flow of electrons. Your receiver is no exception in this matter. It is possible to detect this noise since it usually becomes audible as 'hiss' in the headphones when the aerial is disconnected. For you to hear a station on your radio, the received signal has to be substantially stronger than the receiver's internally generated noise, otherwise all that is heard is the background 'hiss'.

When you put up an aerial it doesn't only pick up the signal you want to listen to, since numerous unwanted signals, as well as unwelcome electrical interference and noise, are fed to the aerial socket on the back of your receiver. On medium wave (and indeed, for most short wave frequencies up to 20MHz or so) the limiting factor to reception is not the noise generated inside the radio but that which is generated outside, ie, man-made electrical noise and thunderstorm static. Even with a small aerial the received level of external noise far exceeds and dominates any other internal noise sources.

It therefore follows that if you double the size of your aerial not only will you increase the strength of the desired signal, but the level of the naturally occurring atmospheric noise simultaneously rises by the same factor (as indeed, will the strength of any interfering stations). The overall result is that there will be no change in the ratio of the received signal strength to the received noise and interference level.

As better reception is only possible by improving the received signal-to-noise or signal-to-interference ratios, simply making your medium wave aerial bigger is unlikely to yield better DX. Thus, if you are keen to DX the medium waves, but thought that you didn't have enough space for a sophisticated aerial, worry no more. A small 'active aerial', of which several examples are commercially available, will prove to be just as good as a random length of wire strung along the garden – and it is far less likely to irritate the neighbours!

If a bigger aerial won't give us any better DX, what can we do to improve the received signal? The only practical option is to reduce the level of received noise and interference without disturbing the desired signal – hence, the directional aerial is born! More about this topic next time.

Make reception reports work for you

If you are one of the many medium wave DXers who not only likes to hear a station but wants to collect a verification or QSL to 'prove' that reception actually took place, then you'll appreciate that hearing the station in the first place is only half the problem. I'm sure you've wondered why some stations do not reply to your letters or reception reports. Perhaps only around 50% of stations reply; what can be done to increase this ratio?

Firstly, imagine yourself as a station engineer who has received a letter from a faraway listener asking for a QSL card. Would you bother to reply if you've already received a hundred similar items in your in-tray that week? I know of station engineers who have commented, '... Some of the reports we get are terrible ...', '... We only now reply to reports containing IRCs, as the postage is getting rather expensive ...' and '... I always reply to DX reports, but never know if my letters are received.'

What a listener needs to do is to convince the station that reception really took place and that the report is not just being made up. In addition, you need to make the station's task in replying as simple as possible, and it always helps to make your reception report stand out from the crowd so that it doesn't end up in the 'round file'. Try the following ten steps to good reception reports:

1. Convince the station: Include full details of the commercials and public service announcements you have heard, since virtually all stations record these details in their logs. Station slogans won't convince anyone, since they are often well-known and widely reported. Also, lists of records heard are not always very useful, since details aren't always kept in station logs. Worst of all is something like 'man talking' or 'music', which won't help to convince anyone! The golden rule is: the more detail the better.

2. Make their job easier: Use the station's local time in reception reports so that they don't have any tricky time zone conversions to do. The only exception being if the station broadcasts internationally and has been announcing a different time zone on air. It is often wise to note down the actual time announced in time checks rather than what your watch says, since many stations have somewhat inaccurate studio clocks!

3. Make their job easier: Send return postage with your letter. Best of all include mint stamps from the station's country, but since this is easier said than done, you could send IRCs which are obtainable from the Post Office. Unfortunately, some countries do not accept IRCs for exchange into local postage stamps. For the USA or Canada, it is also feasible to send $1.00 (US), since this will save you a trip to the local post office.

4. Make their job easier: Enclose a prepared sticky label with your return address already on it.

5. Make their job easier: Write in the station's native language, unless it is a big international broadcaster with various language departments. Bear in mind that the native language may not be the main language of the country they are in; this is exemplified by the many Spanish-speaking stations in the USA.

6. Help the station: Local stations don't need listeners thousands of miles away; certainly they don't attract more advertising because of this. So if you can help the station by giving constructive comment on their programmes (those liked and disliked) and technical quality (eg, modulation, audio quality or frequency stability), or by identifying sources of interference, so much the better.

7. Make your letter stand out: *Be polite* and request a QSL card – never demand one.
8. Make your letter stand out: Introduce yourself and your location; maybe include a local picture postcard or some stickers from your local radio stations.
9. Make your letter stand out: Use commemorative or unusual stamps on the envelope; there may be a philatelist at the station.
10. Make your letter stand out: Give a realistic and detailed description of reception conditions in words that are not too technical (remember, it's not always the engineer reading your letter). Never use SINPO-type codes on their own.

If you follow some or all of these tips you should not only increase your chances of getting a reply from a station, but you will contribute to good relations between DXers and broadcasters. Finally, remember the basic courtesy of thanking the station for sending a reply. It is simple and quick (and not too expensive) to send a postcard to whoever wrote from the station letting them know that their letter arrived safely and thanking them for their trouble.

America in Europe

It is likely that the very first 'American' station a European DXer will hear will be rather closer to home than expected. Since the end of WWII there has been a number of American-operated stations in Europe, but the two most likely to be heard are Voice of America, from Munich (1197kHz), and the American Forces Network. After the initial disappointment of discovering the origin of these broadcasts has worn off, the medium wave listener will find that AFN stations are an interesting source of local radio DX.

AFN is the European arm of the American Forces Radio and Television Service; both its staff and audience are American armed forces personnel. It operates a network of around fifty radio and TV transmitters around Europe, but the medium wave DXer's prime area of activity is West Germany, where eight studios operate via thirty medium wave transmitters.

If you've never heard AFN before, try tuning (after dark) to AFN Frankfurt on 873kHz, the flagship station in the network. You'll hear a mix of programming intended to keep the audience in touch with what is happening back home in the States. There's a mix of programmes produced in Europe and those relayed by satellite from the major networks in the USA (you'll notice that the commercial breaks are filled with public service-style messages).

Whilst most European programming originates from the main studios in Frankfurt, the other seven studio stations opt out of the network with truly local material at certain times of the day. These stations can be quite a DX challenge, since local material is usually aired for only a few hours each weekday, mainly between 0600-1000hrs and 1600-1800hrs local time. Try looking for Berlin on 1107kHz, Bremerhaven on 1143kHz, Frankfurt on 873kHz, Kaiserslauten on 1107kHz, Munich on 1107kHz, Nürnburg on 1107kHz, and finally both Stuttgart and Würzburg on 1143kHz. If you positively identify any of these local stations it can be worthwhile writing direct to the local studio, as AFN does verify correct reception reports with a QSL card.

DX file

Summer is not particularly a good time for medium wave DXing, especially as we head towards a potentially large solar maximum. However, after all the excitement of solar disturbances earlier this year, it almost seemed as if the sun was taking a well earned rest during the summer. In fact, the quieter ionospheric conditions prevailing during July allowed some transatlantic DX stations to be heard; nothing outstanding but do look out for the new station from Boston on 1510kHz calling itself WKKU. In late July, signals from Newfoundland were detectable as early as 2400UTC.

From now on signals can only improve and by the time this appears in print, I hope to have taken advantage of the traditionally good autumn DX by going on a DXpedition to capture some really elusive DX signals. Full report next time, but till then good listening. 73s.

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DEADLINE AND CONDITIONS

Advertisements will be published in the first available issue on a first come first served basis. We reserve the right to edit or exclude any ad. Trade advertisements are not accepted.

FOR SALE

■ Framed oil painting of J J Thompson (1856-1940), invented the cathode-ray tube and received the 1906 Nobel prize, offers? Tel: (0277) 824323.

■ FRG-9600 (60-960), also converter, £385.00. Cobra 148GTL DX, good condition, £120.00. D100 converter for Sporadic-E, offers? 240V to 15-12V dc supply, 500mA, offers? Grundig Rx transistor 5000, 1974 model, offers? Tel: (0283) 221870

■ Sommerkamp FT-290R, soft case, Ni-Cads, charger, mobile bracket, ⅝ Magmount, £240.00. Yaesu FT-212RH, 45W, 2m mobile rig, perfect condx, £225.00. Tel: (0623) 34863

■ Lowe HF-125 Rx. Leader LPM-885 SWR power meter, 1000W. Hand-held capacitance meter (Beckman), vgc. Write to: N Cameron, 16 St Mary's Crescent, Westport, County Mayo, Eire

■ Tatung world-band Rx plus 9V adapter, offers? All ham bands SSB/CW with book, offers? Tel: (0202) 604806

■ MBA TOR disc for C64 1541 drive, and Morse, RTTY, ASCII, AMTOR, works with CP1, MP1 or ST5C terminal, with manual, £25.00. Write to: Bob Hearn, 70 Herbert Road, High Wycombe, HP13 7HN

■ Yaesu FT-757GX HF transceiver, superb condition, £525.00. SEM tranzmatch with Ezitune, excellent condition, offers? Datong D70 Morse tutor, as new, offers? Hansen FS-5E SWR/power meter, £25.00. Collection of ten Morse keys, old and new, offers? For further details, viewing etc, tel: (0532) 585806

■ QRT sale: FDK multi 700E 2m mobile rig, 25W, all the usual features, mint condition. Trio TR-2400 2m hand-held rig, boxed with accessories. Kenwood SW100B SWR meter, boxed. Western WE1145 antenna rotator, boxed. 10A and 3A power supplies. Sun ⅞ mobile antenna and mount. 2m and 70cm multi beams. All 100% mint and cheap. Tel: (08482) 314

■ Yaesu FT-480R 2m multimode transceiver, very good condition with BF980 fitted in front end and socket for hard wiring of linear, complete with mobile bracket and scanning mic, plus copy of maintenance and service manual, £275.00 ovno. Tel: (0268) 45573 after 6.00pm

■ Yaesu FT-102 transceiver fitted with following options: FM filter, AM filter, CW (N) filter – very powerful and excellent receiver – a fine operator, late model, mint, with manual, mic, coiled cable and plug, mains cable, £650.00. Tel: (0278) 782511

■ Amstrad CPC 464, green screen monitor, built-in cassette, loads of games, manual, two joysticks. Will swap for 2m or HF gear. What have you? Tel: 061-793 1292

■ Trio 9R-59DS all band (550kHz-30MHz) receiver with manual, circuit diagrams and ATU, excellent condition, £90.00. Tel: (0272) 326567

■ Sony PRO80, as new, £200.00. Several ex-equipment 4LX350B valves, £5.00 each plus postage. Calcomp 2000 series digitiser, new, with cursor, power supply, RS232 cable and handbook, 100μM resolution, £50.00. Visual 200 intelligent RS232 terminal, gwo, £40.00. Tel: (0525) 716547 between 6.30pm and 7.30pm

■ Harvard CBM404 legal CB rig, professionally converted to 10m FM bands, perfect condition, complete, boxes etc, £35.00. Telequipment S61 'scope service manual, £7.00. RSGB callbooks, back editions: 1983, 1984, 1986, 1987, £4.00 each. Video Genie micro system EG3003, perfect, complete with tapes and copies of handbooks etc, £80.00. I have circuit service manual for Genie, £9.50. Magazine back issues: LSAE for lists. Write to: M T Small, 14 Meare Estate, Wooburn Green, High Wycombe, Bucks HP10 0DX

■ Trio 9000, Kenwood PS20 power supply, Daiwa DC-7055 round controller, heavy duty rotator, five-element Jaybeam, good condition, £400.00 ono. Tel: 061-865 7896

■ VHF Communications back issues, all mint condx, fifteen issues between 1980 and 1987, £8.00. Three binders for £1.50. Postage extra. Tel: (0473) 270937

■ Yaesu FT-902 transceiver, complete with FC-902 ATU and SP901 speaker, all in very good working order, reluctant sale at £650.00. Tel: (0977) 703052

■ Trio TH21 2m hand-held with soft case and base station supply, £120.00. Tel: (0684) 298954

■ Uniden CR-2021 portable comms receiver, 150kHz to 29.999MHz, AM/SSB + FM broadcast, memories, scanning, digital display etc, 240 ac mains or batts, boxed with manuals, vgc, £65.00 ono. Exchange or part-exchange for VHF h/held scanner, quality digital multimeter, radio control, Tx/Rx or WHY? Tel: (0631) 65104 Monday to Saturday

■ Yaesu FRG-7000 comm receiver, 0-30MHz, vgc, manual, £250.00 ono. Kenwood Trio 1000, 0-30MHz, vgc, manual, £250.00 ono. Tel: (0484) 661101

■ Kenwood TS-830M HF transceiver, AT230 ATU and SP230 speaker unit, complete with filters, £875.00. Will exchange for TS-440S + internal ATU. Tel: (0462) 35248 after 6.00pm

■ Yaesu FT-290R, £250.00. FT-780, £350.00. YO 901P, £350.00. FL-2100Z, £550.00. All vgc, all ono, might p/ex or swap. CBM 64 128 software/hardware, books, comms, IF, etc, offers? Tel: (0924) 495916

■ TS-830 HF Tx, de luxe tuning knob, new bottles, fitted by Lowes, used on Rx, £550.00. Tel: (0654) 711403 Dave GW15PF

■ Realistic PRO-2004, £240.00. CTE International, 40-45m transverter with ant, £100.00. President Lincoln, 26-30MHz, £220.00. Ranger AR3300, 26-30MHz, £200.00. Tel: (0298) 78268

■ Marine Daiwa Search Nine, VHF/FM receiver, mint condition, fully crystalled, for 156-162MHz, can be tuned manually, £55.00 ono, or £30.00 without crystals. Tel: Holbeach 22649 after 6.00pm

■ Yaesu FT-101ZD MkIII HF transceiver, 160m-10m with FM, boxed, as new, £525.00 ono. Icom IC-240 2m FM mobile, 10W, S16-S23 plus R0-R7, CW bracket, mic, gwo, £100.00 ono. Jaybeam TB2 MkII 10-20m, two-ele yagi, used for only four months, £80.00 ono. Yaesu FT-75, 160m-10m, SSB/CW, plus VFO 50B, not working, suitable for spares or repair, £45.00 ono. Kenwood MC80 desk mic, £20.00. Tel: 041-771 1915 after 6.00pm

■ PSU 25A over volt and short circuit prot. Volts variable from 10V to 14V, price to include p&p, £60.00. Iambic keyer with built-in twin paddle, variable speed, £16.00. 4m receiver, full VFO coverage, £25.00. PSU by Farnell, approximately 15A at 13.8V, £30.00. Pye wessie, £18.00. Pye controller plus UHF Rx/Tx, OK for 70cm, £50.00. Morse code practice oscillator, £1.50. PSU 12V 6A, £18.00. Tel: (0664) 500228

■ Yaesu YR901 CW RTTY reader, RF module fitted, complete with Yaesu YK-901 ASCII keyboard, manuals and circuit diagrams for both. YR-901, needs a transformer. Open to offers or exchange, WHY? Tel: (0902) 25157

■ 934MHz Delta 1 mic, boxed, just serviced, £250.00. Also two Reftec 934 sets (gwo), £80.00 pair. Bearcat 250 scanner, non-working, damaged case, but repairable, exchange Super Star 360 or similar. Sony stereo cassette recorder, model TC-525, shoulder strap, mic, mains/batts, twin meters, £75.00. Write to: Ian Duffin, 'The Dormouse', 5 Sunset Walk, Bush Estate, Eccles-on-Sea, Norfolk NR12 0SX

■ Icom IC-751 tcvr with additional 2.8kHz filter and remote RC10 keyboard, high stability ref crystal, plus IC AT500 auto ATU and PS30 system power supply, will not split, £1,150. Tel: (0923) 241461

■ Text books: (all as new). University of Essex Electronics Course (four books), £10.00. Microwave Solid-State Circuit Design (Bahl and Bhartia), offers? Semiconductor Device Technology (Goodge), £11.00. Digital Fundamentals (Floyd), £12.00. Pascal (Findlay and Watt), £8.00. Network Analysis and Synthesis (KNO), £12.00. Control Systems Engineering (Nagrath and Gopal), £6.00. All are degree level books. Carriage extra. Tel: (0372) 722542

■ Trio 440S with auto ATU and PS50 heavy duty PSU, plus additional 1.8kHz SSB filter, little used, mint, £1,100. Tel: (0923) 241461

■ Cybernet Delta preamp, high gain mobile antenna, based collinear, twelve-element beam, eight-element beam, as new, £610.00. Exchange for FM dual-bander. Tel: Ecton Brook 415437 anytime after 2.00pm

■ Wireless set number nineteen. Headset with mic. Aerial variometer, control box, cables, mains, PSU (B set inoperative), £60.00. Tel: (0452) 612234

■ Matsui MR4099 HF Rx (gwo), signal R-537S airband Rx (vgc), Dragon 32 micro and cassette recorder (+ leads, books etc). Will exchange for good scanner (with airband) or £170.00 ono. Prefer local contacts so can inspect and collect. Tel: (0372) 722542 after 6.00pm

■ Icom IC-R70 communications Rx, excellent condition, complete with FM board, Microwave Modules, 2m to 28MHz, high performance converter, £450.00 ono. Datong FL3 audio filter, £70.00. GWR60E telereader, £100.00 ono. All in excellent condition. Tel: (0634) 717888 ext 2128 (Mervyn), or (0474) 874480 6.00pm to 8.30pm

■ Eddystone 830/4 receiver, 470kHz-30MHz, mint, unused, £140.00. RA17 II receiver, 500kHz, 30MHz, with RA98A sideband unit, £140.00. Good condition Pye C12 ATU, £25.00. Tel: (0484) 549249

■ CMOS static RAMS, 8k×8 bit Hitachi 6264LP, £3.80 each. Tel: (0252) 626693 evenings

■ Airband receiver signal R535 scanner, sixty memories, used only one hour, fast scan, VHF/UHF, civil/military aircraft, cost £250.00, will accept £190.00 with all aircraft books and maps. Tel: (060875) 202 after 8.00pm

■ Swap: Mamiya C330F TLR, mint condx (80mm plus 135mm lenses), for Yaesu 690 or 790 Tx (camera and lenses cost over £500.00). Would consider selling for £300.00 ono. Tel: (0773) 716033

■ Colt 444 low/mid/high, original mic and box, good condition and working order, original AM. Ideal for 10m conversion, £40.00 ono. Will swap for Daiwa Search Nine for use on 2m, discone, PR-27GB rig or Realistic Patrolman (crystalled) for use on 2m – must be 240V. Tel: (0302) 866256

■ Exchange Eddystone 880/2 in good working order + handbook, for Yaesu FRG7 in same order. Will collect or meet halfway. Tel: (0423) 567390

■ Grundy, Burns and Porter computer with stabilised power supply, sixteen green digit display, 400 words, ROM, ports for expansion modem, UHF, monitor, printer, comms, two tape ports, working up to 400 characters, needs attention to bring to full potential. In the right hands can provide many uses, CW/RTTY read etc, offers? WHY? Tel: (0443) 757569

■ 70MHz transverter for FT-230R. Also, HB9CV or yagi for 4m band. Interested in crossband contacts. Write to: Mr Pertus, 61 Allée des Chênes, 94440 Villecresnes, France

■ Nato 2000. Best set to convert to 10MHz, £120.00. Yaesu 9600 with converter, £425.00. Tel: (0283) 221870

■ Realistic PRO-57 ten-channel scanner, 68-88MHz, 138-174MHz, 380-512MHz, with broadband preamplifier. Both with power units and discone 50-700MHz, with coaxial cable. Only four months old, £100.00. Philip Berry. Tel: 061-428 7170

■ Trio R2000 CW 2m VC10 converter, original packing, one owner, mint condition, £450.00 ono.

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Tel: (0222) 709456 after 6.00pm (Cardiff)

■ Uniden Bearcat 50XL, 66-512MHz with gaps, plus set of Ni-Cads, £80.00 ono (as new condition). Yaesu FT707 with PSU and ATU, GWO, £650.00. Tel: (0604) 890821 daytime or (0604) 412690 after 6.00pm

■ BRT400 gen cov Rx. GWO and very clean with h/book, £145.00. Trio prof SWR/PWR meter, mod PF810, 200W, £75.00. Hantarex TV monitor, as new, 12in, £50.00. Digital Belman DM10 multimeter, £20.00. Marconi xtal calibrator TF1374, £12.00. Armstrong tuner-amp in oak case, £15.00. SP25 r/deck, £10.00. Tel: (0908) 313507 (Milton Keynes)

■ Realistic PRO-80 hand-held scanner, covers 68-960MHz with gaps, listen to aircraft, military and mobile phones, 200 memories, multifunction. CW Ni-Cads and manual, £180.00. Mr Jon Blacker. Tel: (0622) 29404

■ Yaesu FT902DM transceiver with FC902 ATU and YO901 multiscope. Complete base station with all instruction manuals. This station is in perfect order and can be tested on all freqs prior to sale. Comes complete with leads, boxes etc, £895.00 ono or will deal for HF portable station such as FT707, 120S, 130S. Tel: (0446) 742749

■ HQ170 comms Rx. Good condition, £80.00, cash only. Buyer inspects and collects. Alan Botley. Tel: (0923) 220977 after 8.00pm weekdays and anytime Sat/Sun

WANTED

■ Nato 2000, must be in good condition. 15m Antenna tuning unit icox cable, heavy duty. Tel: (0283) 221870

■ Dual band hand-held and Quad 405 amplifier. Tel: (0623) 34863

■ Zenith 7000 or Eddystone six-band general-coverage receiver, circa 1972-1980. Also, Panasonic RF-2900. Tel: (0633) 271754

■ Collins 51J4 or 390A receiver, must be near perfect condition, preferably with all filters and handbook. Tel: (0904) 794680

■ Pager, alphanumeric type will suffice, needed for conversion. Steve Nelhams. Tel: (0705) 827733 ext 330 or 207

■ Practica BC1/BC3, must be in mint condition. Tel: (08482) 314

■ Wavemeter or frequency meter, 3 to 30MHz. Tel: (0484) 533099

■ Sony CV2000 video recorder (previous vendor please contact again!), any 405 line TV recordings, 405 line camera. Tel: (0604) 844130

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■ Radio related software for the Atari 800XL. RTTY, CW, CW tutor, SSTV, packet, anything and everything wanted. Also, any help or advice on this matter would be much appreciated. Write to: Mark Lynch, 14 Seacliff Drive, Baldoyle, Dublin 13, Ireland

■ Circuit of Cossor 1039 oscilloscope. Manuals: ie, Mullard, Venus, Robot and Commodore. Write to: J Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS

■ Urgently needed for rebuild project: output trans for CR100. Also, Browns type 'F' phones. Tel: (0392) 61669 after 6.00pm

■ Handbook or CCT diagram for minimeter double superhet, outright purchase or photostat please if possible, set No MR44/MK2, ham bands only. Tel: (0442) 46910

■ IC-202, IC-402, IC-502, IC20L and IC-30L required. Must be clean and in good working order. Sensible prices paid for good examples of these classics. Inspection preferred. Tel: (0582) 862580

■ Icom R7000, must be in mint condition, will exchange Minolta 9000 A/focus SLD camera system – worth over £1,000. Tel: (0634) 364185 (Medway)

■ Grundig Satellit 2000 or 2100 SSB adapter, will pay cash. Tel: (04862) 66137

■ HRO power supply, type-5897 (for 2.5V tubes). Plug-in coils for National FBX-A receiver. Circuit diagrams and instructions for Oskerblock SWR200 and SWR300 SWR/power meters. Photocopy would suffice. Tel: (0786) 811237

■ Urgent: frequency display model YC7B to suit Yaesu FT-7B Rx/Tx. Write to: A J Earley, 91 Griffith Road, Finglas, Dublin 11, Ireland

■ Slimline telescopic tilt-over mast, extended height 30ft to 40ft. All letters answered. Malcolm Smith, 25 Ewart Road, Bentley, Walsall WS2 0EU. Tel: (0922) 614472

■ Icom AH7000 wideband antenna. Icom SP3 ext speaker. Datong FL3 filter. Tel: (0206) 394336 after 7pm

■ Ex-RAF radio and radar equipment, any condition, especially: TR3151, T3549, control panel-type 5, junction box 67, Rx unit – type 50, TR3188, T3538, R3189, R3537, drive unit 114, switch – type 220, Ind 237, junction box 266A, TR9 (just the case and chassis). Tel: (0483) 572653 ask for Phil

■ Dragon 32 instruction book, disc drive and interface. J Brown, 45 Marlborough Avenue, Falmouth, Cornwall TR11 4HS

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USE BLOCK CAPITALS (One word per box)

To avoid mistakes please write clearly and punctuate your ad

Name/Address Postcode/Telephone							

USE SEPARATE SHEET FOR MORE WORDS

Ensure that you have included your name and address, and/or telephone number

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Amateur RADIO SMALL ADS

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

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COMPANY .....

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

.....

C P I

ADVERTISERS' INDEX

Amateur RADIO

ADVERTISING RATES & INFORMATION

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depth mm x width mm	ad space	1 issue	series rates for consecutive insertions: 3 issues	6 issues	12 issues
61 x 90	⅛ page	£86.00	£82.00	£59.00	£53.00
128 x 90 or 61 x 186	¼ page	£115.00	£110.00	£105.00	£92.00
128 x 186 or 263 x 90	½ page	£225.00	£210.00	£200.00	£180.00
263 x 186	1 page	£430.00	£405.00	£385.00	£345.00
263 x 394	double page	£830.00	£780.00	£740.00	£660.00

COLOUR AD RATES

colour rates exclude cost of separations

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

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Facing Matter: 15% extra

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*Dates affected by public holidays

issue	colour ad	mono proof ad	mono no proof & small ad	mono artwork	on sale thurs
Nov 89	27 Sep 89	28 Sep 89	4 Oct 89	8 Oct 89	26 Oct 89
Dec 89	25 Oct 89	26 Oct 89	1 Nov 89	3 Nov 89	23 Nov 89
Jan 1990	22 Nov 89	23 Nov 89	29 Nov 89	1 Dec 89	28 Dec 89
Feb 1990	20 Dec 89	18 Dec 89	3 Jan 90	5 Jan 90	25 Jan 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.

THE *ORIGINAL* SURPLUS WONDERLAND!

THIS MONTH'S SPECIAL!

Very high resolution, fully cased 14" green or amber screen monitor with non-glare screen and swivel/tilt base. The very latest technology at the very lowest price! Fully compatible and plug compatible with all IBM PCs and clones fitted with a high res Hercules or equivalent card! Enables superb graphics and resolution, all at a give away price. Has many extra features including aux +5 & 12v DC outputs to power at least 2 disk drives, if your PC power supply is getting hot! Supplied BRAND NEW and boxed. State whether amber or green screen required.

Amber .....£79 Green .....£69 (E)

COMPUTER SYSTEMS

TATUNG PC2000. Big brother of the famous Einstein. The TPC2000 Professional 3 piece system comprises: Quality high resolution Green 12" monitor. Sculptured 92 key keyboard and plinth unit containing Z80A CPU and all control circuits. PLUS 2 integral TEAC 5.25 80 track double sided disk drives. Generous other features include dual 8" IBM format disk drive support. Serial and parallel outputs, full expansion port, 64K ram and ready to run software. Supplied complete with CP/M, Wordstar and Basic. Brand new and covered by our famous 90 day guarantee and backup. Normal price of this unit is over £1400!

Our price .... only .....£299 (E)

PC-AT 286 CLONE Lowest ever priced 8 mhz PC-AT clone complete with a 20mhz hard drive, a 5.25" 360k floppy, 640k of RAM plus Hercules card compatability. The keyboard is NCR with 85 keys in an attractive beige, grey and cream finish to match the computer. The monitor is very high resolution 14" non-glare, with your choice of amber or green screen. A very nice package at a super price!

Our price .... only .....£799 (E)

SPECIAL PURCHASE
V22 1200 baud modems

We got a tremendous buy on further stocks of this popular **Master Systems 2/12** microprocessor controlled V22 full duplex 1200 baud modem - we can now bring them to you at ***half last advertised price!*** Fully **BT approved** unit, provides standard V22 high speed data comm, which at 120 cps, can save your phone bill and connect time by a staggering 75%! Ultra slim 45 mm high. Full featured with LED status indicators and remote error diagnostics. Sync or Async use; speech or data switching; built in 240v mains supply and 2 wire connection to BT. Units are in used but good condition. Fully tested prior despatch, with data and a full 90 day guarantee. What more can you ask for - and at this price!! **ONLY £69 (D)**

Write to us today and get your name on our mailing list for our FREE eight weekly bargain flyer *The Display News* with thousands of unadvertised special offers.

MONITORS

COLOUR MONITORS

Decca 16" 80 series budget range colour monitors. Features include PIL tube, housed in a beautiful teak style case and guaranteed 80 column resolution, features which are only normally seen on colour monitors costing 3 times our price! It is absolutely ready to connect to a host of computer or video outputs. Manufacturers fully tested surplus, sold in little or hardly used condition with 90 day full RTB guarantee. **Decca 80 COMPO** 75 ohm composite video input with integral audio amp & speaker. Ideal for use with video recorder or our Telebox ST, or any other audio visual use. **Any type only £99.00 (E)**

HI-DEFINITION COLOUR MONITORS

Brand new Centronic 14" monitor for IBM PC and compatibles at a lower than ever price! Completely CGA equivalent. Hi-res Mitsubushi 0.42 dot pitch giving 669 x 507 pixels. Big 28 Mhz bandwidth. A super monitor in attractive style moulded case. Full 90 day guarantee. **Only £149 (E)**

20",22" and 26" AV SPECIALS

Superbly made UK manufacture. PIL all solid state colour monitors, complete with composite video & sound inputs. Attractive teak style case. Perfect for Schools, Shops, Disco, Clubs. In EXCELLENT little used condition with full 90 day guarantee.

20"....£155 22"....£170 26"....£185 (F)

MONOCHROME MONITORS

Wang green screen 12" chassis monitor with composite video input. Adjustable for tilt. Requires 12 vdc. Brand new and boxed in perfect condition. **Only £39 each or 2 for £75 (F)**

Motorola M1000-100 5" black & white compact chassis measuring only 11.6H x 12W x 22D. Ideal for CCTV or computer applications. Accepts standard composite or individual H & V syncs. Needs 12vdc at only 0.8a. Some units may have minor screen blemishes. Fully tested with 30 day guarantee and full data. **£29.00(C)**

Fully cased as above in attractive moulded desk standing swivel. Dim 12 x 14.5 x 26cm. **£39.00(C)**

JVC 751 ultra compact chassis monitor for 12vdc 0.7a. Dim 11 x 14 x 18cm. Simple DIY data included to convert to composite video input. Full data. **BRAND NEW £65.00(B)**

20" Black & white monitors by Aztek, Cotron & National. All solid state, fully cased monitors ideal for all types of AV or CCTV applications. Standard composite video inputs with integral audio amp and speaker. Sold in good used condition - fully tested with 90 day guarantee. **£95.00(F)**

FLOPPY DISK DRIVES BARGAINS GALORE !

NEW 5¼ inch from £29.95!

Massive purchases of standard 5¼" drives enables us to present prime product at industry beating low prices! All units (unless stated) are removed from often brand new equipment and are fully tested, aligned and shipped to you with a 90 day guarantee and operate from +5 & +12vdc, are of standard size and accept the standard 34 way connector.

SHUGART SA405. BRAND NEW £29.95(B)
TANDON TM100-2A IBM compatible DS **£39.95(B)**
TANDON TM101-4 80 Track DS **£49.95(B)**
CANON, TEC etc. DS half height. State 40 or 80T **£75.00(B)**
TEAC FD-55-F. 40-80 DS half height. **BRAND NEW £99.00(B)**

3½ INCH BRAND NEW AT £19.95!!

Never before seen price for a 3½" drive. Standard size believed to be by Canon. Brand new and packaged - mint condition! 40 track SS, run from +5 & +12vdc with standard power connector.....Only..... **£19.95 or 2 for £34.50(B)**

CHOOSE YOUR 8 INCH!

Shugart 800/801 SS refurbished & tested **£125.00(E)**
Shugart 851 double sided refurbished & tested **£195.00(E)**
Mitsubishi M2894-63 double sided switchable hard or soft sectors- BRAND NEW **£250.00(E)**

SPECIAL OFFERS!!

Dual 8" drives with 2 megabyte capacity housed in a smart case with built in power supply! **Only £499.00 (F)** Ideal as exterior drives!

End of line purchase scoop! Brand new **NEC D2246** 8" 85 megabyte of hard disk storage! Full CPU control and industry standard SMD interface. Ultra hi speed transfer and access time leaves the good old ST506 interface standing. In mint condition and comes complete with manual. Only.....**£399(E)**

MAINS SUPPRESSORS & FILTERS

The "Filtan" from Crotan is a British made high current mains spike suppressor and RF filter in one, capable of handling up to 10 amps! The attractive case has an integral 13 amp socket for your equipment plug and a flying lead terminates in a quality plug (to BS 1363A standard) to go to the mains socket. There is an internal fuse plus one in the plug. Two LED indicators, one for power on and the other lights if the internal fuse fails. Dims: 6" x 3" x 2". Brand new. Normal distributor's price is £65.00!

Our price only .....£15.95 each or 2 for £29.95 (B)

Belling-Lee type L2127 mains RFI filters rated at 250 volts 3 amps maximum. Comes complete with a built in mains cable (English coding), and a three pin miniature non-reversible socket and a mating plug, to go to the equipment. Ideal for those who are bugged by RF interference. Very compact. Dims 3-1/8" x 2.5" x 1.5".....**£3.95 each or 3 for £10 (A)**

COOLING FANS

Please specify 110 or 240 volts for AC fans.

3 inch	AC. 1½" thick	**£ 8.50(B)**
3½ inch	AC ETRI slimline. Only 1" thick.	**£ 9.95(B)**
4 inch	AC 110/240v 1½" thick.	**£10.95(B)**
4 inch	AC 1½" thick	**£ 9.95(B)**
10 inch	Round. 3½ thick. Rotron 110v	**£10.95(B)**
62 mm	DC 1" thick. No.812 for 6/12v. 814 24v.	**£15.95(A)**
92 mm	DC 12v. 19 mm thick.	**£10.95(A)**
4 inch	DC 12v. 12w 1½" thick	**£12.50(B)**
4 inch	DC 24v 8w. 1" thick.	**£14.50(B)**

RECHARGEABLE BATTERIES

LEAD ACID

Maintenance free sealed long life. Type A300.

12 volts	12 volts 3 amp/hours	**£13.95(A)**
6 volts	6 volts 3 amp/hours	**£ 9.95(A)**
6-0-6 volts	Centre tapped 1.8 amp hours	**£ 5.95(A)**
12 volts	12 volts 24 amp hours. A200. RFE.	**£29.00(B)**

SPECIAL OFFER!

100 amp/hours at 6 volt! Brand new Chloride Powersafe 3VB11. Leakproof with additional snap-on security lid. Perfect for uninterruptable power supplies, portable power source, caravans etc. Normally costs £80! **£39 (E)**

NICKEL CADMIUM

Quality 12v 4ah cell pack. Originally made for the Technicolor video company. Contains 10 GE top quality D nicad cells in a smart robust case with a DC output connector. Ideal for portable equipment. Brandnew. **£19.95(B)**

Ex-equipment NICAD cells by GE. Removed from equipment and in good, used condition: D size 4ah **4 for £5(B)**, F size 7ah **6 for £8(B)**

SPECIAL INTEREST

Racal-Redac real time colour drafting PCB layout system. Includes furniture and huge monitor. Complete ready to go! **£3950**

DEC VAX11/750 inc. 2 Meg Ram DZ and full documentation, in brand new condition! **£3900**

Large Calcomp plotter **£ 650**

Tektronix RM529 Waveform Monitor **£ 300**

1.5kw 115v 60hz power source. **£ 950**

Wayne Kerr RA200 audio real time freq.res.analyser. **£3000**

VG Electronics 1033 Teletext Bridge **£3750**

Tektronics R140 NTSC TV test signal standard. **£ 875**

Versatek V80 Printer plotter **£1500**

DEC LS11/02 CPU board **£ 150**

SPECIAL EXPERIMENTERS PSU's

These 2 PSUs are built to BT's rigorous specs and give fully protected DC outputs ideal for the electronic hobbyist & experimenter. Type EPSU1 input is 240v AC; outputs are 5v @ 2a, ±12v @ 1a, 24v @ 1a, 5v fully floating 50ma. EPSU2 input is 30-70vdc outputs are 5v @ 6a, 12v @ 1a, -12v @ 0.5a & 5 others. Circuit diagram on request for EPSU1. No data with EPSU2 - hence the price! Both at parts alone price!

EPSU1.....**£16.95** (C) EPSU2.....**£9.95** (C)

BARGAIN PARTS & BOARDS PACKS

Its stock taking time once more so we have made up a lot of our famous bargain parcels again! These parcels represent the best value for money available and the greatest bargains of the century - a real thrill to open them up when you find that you have bought equipment and components (mostly brand new) for well under a third of our normal low price!!!

Mix of general electronic parts & equipment:
5klos weight for.... **£8.95(B)** **20 klos** weight for ....**£22.50(D)**

Boards Parcels for parts recovery:
Parcels contain almost any type of boards including ICs, memory, logic, passives and vast assortments of parts!
10 board parcel....£7.50(B) **20 board parcel....£13.95(C)**

POWER SUPPLIES

All PSUs 220-240vac input and are BRAND NEW unless stated. Many types ranging from 3v to 10kv always in stock.

Byte BD301 5vdc @ 1.6a. 12vdc @ 1.5a. Perfect for disk drives; with Molex sockets. Very attractively cased. Illum. sw. **£19.50(B)**

Greendale 19AB0E 60 watts switch mode. +5v @ 6a, ±12v @ 1a, ±15v @ 1a. RFE and fully tested. 11 x 20 x 5.5cms. **£24.95(C)**

Conver AC130. 130 watt hi-grade VDE spec. Switch mode. +5v @ 15a, -5v @ 1a, ±12v @ 6a. 27 x 12.5 x 6.5cms **£49.95(C)**

Boshert 13090. Switch mode. Ideal for drives & system. +5v @ 6a, +12v @ 2.5a, -12v @ 0.5a, -5v @ 0.5a. **£29.95(B)**

IBM KEYBOARD DEAL

A replacement or backup keyboard, switchable for IBM PC, PC-XT or PC-AT. LED's for Caps, Scroll & Num Locks. Standard 85 keyboard layout. Made by NCR for the English & US markets. Absolutely standard. Brand new & boxed with manual and key template for user slogans on the function keys. Attractive beige, grey and cream finish, with the usual retractable legs underneath. A generous length of curly cord, terminating in the standard 5 pin DIN plug. A beautiful clean piece of manufacturers surplus. What a deal!

BRAND NEW AND BOXED ONLY.... £49 (B)

THE *AMAZING* TELEBOX!

Converts your colour monitor into a QUALITY COLOUR TV!!

TV SOUND & VIDEO TUNER!

Brand new high quality, fully cased, 7 channel UHF PAL TV tuner system. Unit simply connects to your TV aerial socket and colour video monitor turning same into a fabulous colour TV. Dont worry if your monitor does'nt have sound, the TELEBOX even has an integral audio amp for driving a speaker plus an auxiliary output for Headphones or HI FI system etc. Many other features: LED Status indicator, Smart moulded case, Mains powered, Built to BS safety specs. Many other uses for TV sound or video etc. Supplied BRAND NEW with full 1 year guarantee.

Telebox ST for composite video input monitors.....**£29.95(B)**
Telebox STL as ST but with integral speaker.....**£34.95(B)**
Telebox RGB for analogue RGB monitors.....**£59.95(B)**

NOT suitable for IBM or Clone type colour monitors.

BRAND NEW PRINTERS

Epson MX-80 F/T One of the most popular printers around! Bi-directional printing with full logic seeking. 9 x 9 dot matrix for enlarged, bold, condensed etc. Standard parallel interface. Brand label removed from front. Handles tractor, fanfold and individual paper. OK with IBM PC and most others. A tremendous buy! **£129.00 (E)**

Hazeltine Esprint small desktop. 100 cps with RS232 and standard parallel. Full pin addressable and 6 user selectable fonts. Up to 9.5" paper. Sheet & tractor feed. **£149.00(E)**

Centronics 150 series. Always known for their reliability in continuous use - real workhorses in any environment. Fast 150 cps with 4 fonts and choice of interfaces.

150-SN up to 9.5" paper.....**£155.00(E)**
150-SW up to 14.5" paper.....**£199.00(E)**

Specify whether serial or parallel required.

CALL FOR THE MANY OTHERS IN STOCK INCLUDING DAISY WHEELS.

Visit our Shop - Technical help always on hand plus many un-advertised specials. You can buy a colour television for as little as £29! Come and join the gang at 215 Whitehorse Lane!

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Visa

All prices for UK Mainland. UK customers ADD 15% VAT to total order amount. Minimum order £10. PO orders from Government, Universities, Schools & Local Authorities welcome-minimum account order £25. Carriage charges (A)=£1.50. (B)=£3.50. (C)=£6.50. (D)=£8.50. (E)=£12.50 (F)=£15. (G)=Call. All goods supplied subject to our standard Conditions of Sale and unless otherwise stated guaranteed for 90 days. All guarantees given on a return to base basis. We reserve the right to change prices & specifications without prior notice. Orders accepted subject to stock. Quotations willingly given for higher quantities than those stated.

No. 3 LIST BAKERS DOZEN PACKS

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

BD152	1	Gas or liquid shut off valve, clockwork dial, setting can be on for up to 12 hours.
BD153	1	Same as BD152 but thermostatically operated.
BD154	1	12v operated drip proof relay, ideal for outdoor or in-car operation.
BD158	4	12 way 5 amp screw down polythene bodied connector strips. Used to be called choc blocks when made of Bakelite.
BD159	2	12 way 25 amp connector blocks
BD160	1pr	Plug together 12 way connector blocks, ideal for quick joins in leads.
BD168	2	Component mounting tag strips each with 50 stand up tags.
BD169	4	Short wave air spaced trimmers 3-30pf. Screw driver operated.
BD170	4	Assorted neon type numicator tubes made by HIVAC.
BD175	1	2 watt mains motor driving gearbox, final speed 200rpm.
BD177	5	12v Lilliput bulbs.
BD178	3	Panel mounting slim line indicator lights with amber lens. These take Lilliput bulbs.
BD179	3	Oblong mains neon indicator lights, approx 1in x ½in.
BD181	100	PVC grommets for insulation through 3/8th hole.
BD182	1	25pf air spaced tuning capacitor, small hole fixing with ¼in spindle.
BD189	1	20 amp double pole switch on flush plate which fits standard 3x3 electrical box, illuminated when on.
BD190	1	20 amp dp switch but surface mounting, oblong shape.
BD191	6	Lamp holder adpators which take two pin plug, also supplied.
BD200	1	10 digit switch pad, telephone type.
BD205	1	Very small 12v operated relay with one pair change-over contacts.
BD212	1	Mains transformer 230v primary and two 8v ½ amp secondaries.
BD213	2	5 core curly leads, tinsel wire for phones, etc.
BD214	2	Sub-min toggle switches double pole double throw.
BD215	4	Mini dpdt slide switches with chrome dolly instead of the usual plastic toggle.
BD217	100	Standard wire ending push-ons for standard ¼in tags.
BD218	100	Ditto, but right angled.
BD219	100	Soldercon tags. With these you can make your own sockets for ICs etc.
BD223	4	1200 watt fire spirals, bright nickel chrome wire.
BD224	1	Battery operated motor made for 9v cassette players but speed controllable by lowering voltage.
BD227	4	50k quad pots. Standard ¼in spindle single hole fixing.
BD228	1	Ice stat thermostat. Ideal for controlling water pipe antifreeze coils.
BD229	1	Instrument buzzer, variable low, medium or soft.
BD233	2	Eagle educational kits. One makes chemical balance with weights and the other has electricals for experiments.
BD234	4	500µf + 500µf 50v electrolytics.
BD236	1	Mains transformer with 9v 750mA secondary.
BD237	1	Computer grade electrolytic 3150µf at 40v.
BD243	2	8x4 16 ohm loudspeakers permanent magnet, 5 watts.
BD246	4	Standard size ½meg with ¼in spindle and dp switch
BD247	1	The medium wave permeability tuner, couple this to a ZN414 and you have a radio.
BD248	1	A noise suppressor mains filter
BD249	1	13A socket on plate with spur, fits normal electrical box.
BD253	1	Oven thermometer — bimetal type, reads 200-500°F.

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

CAMERAS. Three cameras, all by famous makers, Kodak etc. One disk, one 35mm and one instamatic. All in first class condition, believed to oe in perfect working order, but sold as untested. You can have the three for £10 including VAT, which must be a bargain — if only for the lenses, flash gear etc. Our ref 10P5B.

EQUIPMENT WALL MOUNT It is a multi-adjustable metal bracket that could be used for mounting flood light, loudspeaker, TV camera, even a fan and on almost any sort of wall or ceiling even between wall and ceiling. The main fixing brackets rotate such that an inward or an outward corner can be accommodated. Front panel also tilts upward or downwards to a reasonable angle and can be easily removed separately for wiring. A very useful bracket. Regular price would be around £6 each. Our price only £3. Our ref 3P72. Or 2 for £5. Our ref 5P152.

MICROPHONE LEADS 6m twin screened wire terminating one end with a standard ¼in mono jack plug and the other end with the usual screwed on microphone connector. With coiled spring for lead protection. Price £1. Our ref BD174.

EXTRA SPECIAL CROC CLIPS Medium size, just right for most hook-ups. Normally sell for around 10p to 15p each. These are insulated and have a length of wire connected to them but this is very easy to snip off if you do not need it. 20 for £1. Our ref BD117A.

DON'T MISS THAT IMPORTANT CALL Fit an extension lead and take your phone in the other room with you. 5m long, one end has the standard flat BT socket and the other the standard flat BT phone plug so you don't have to interfere with the house wiring, you simply plug it in. Price £3. Our ref 3P70.

COPPER CLAD PANEL For making PCB. Size approx 12in long x 8½in wide. Double-sided on fibreglass middle which is quite thick (about 1/16 in) so this would support quite heavy components and could even form a chassis to hold a mains transformer, etc. Price £1 each. Our ref BD633.

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

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

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

SUB-MAN TOGGLE SWITCH Body size 8mm x 4mm x 7mm SBDT with chrome dolly fixing nuts. 3 for 1.00. Order ref BD649.

POWERFUL IONISER

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

LINEAR RECORD PLAYER Made by BSR, their ref VL315. Hailed as the most sophisticated of record players, is completely electronically controlled. Due to cancelled export order we are now able to offer these brand new, complete with cartridge and diamond stylus at only £15 plus £2 post. This is a 12v DC operated unit. Our ref 15P25. Two or more post free.

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 £8. Our ref 8P30.

THERE IS GOING TO BE A BURIAL! For several years now we have been offering mains operated clocks at only £1 each. These are cooker clocks which in addition to telling you the time would also switch things on and off at pre-set times. However, despite this silly price these have been very slow sellers and as we have still almost 10,000 of them in store which we have to clear we are making one even sillier final offer before burying them. You can have 16 brand new clocks still in original packing for only £5. Our ref 5P151. Add £3 post if not collecting.

BUSH RADIO MIDI SPEAKERS Stereo pair. BASS reflex system, using a full range 4in driver of 4ohms 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 manufacturers 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. Complete with PSU, TV lead, owner's manual and six games. Can be yours for only £45 plus £3 insured delivery.

REMOTE CONTROL FOR YOUR 65XE COMPUTER With this outfit you can be as much as 20 feet away as you wil 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.

AGAIN AVAILABLE: ASTEC PSU. Mains operated switch mode, so very compact. Outputs +12v 2.5A, +5v 6A, ±5v .5A, ±12v 5A. Size: 7½in long x 4¾ in wide x 2¼in high. Cased ready for use. Brand new. Normal price £30+, our price only £10. Our ref 10P34 plus £1 postage.

VERY POWERFUL 12 VOLT MOTORS. ⅓rd 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 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. £30 plus £3 insured delivery. Mains operated power supply for this tube gives 8kv striking and 1.25kv at 5mA running. Complete kit with case £15. As above for 12V battery. Also £15. Our ref 15P22.

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. Can be used with many computers, request information sheet. Brand new, only £15 plus £3 postage. Our ref 15P15.

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.

A REAL AIR MOVER Circular axial fan. It moves 205cu ft per minute which is about twice as much as our standard 4½in. square fans. Low noise, mains operated, 6½ in diameter. Ex computers. Regular price over £30 but yours for £10 if you order quickly. Our ref 10P71A.

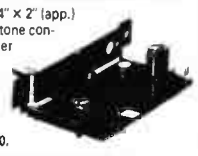
HIGH RESOLUTION MONITOR. 9in black and white, used Philips tube M24 306W. Made up in a lacquered frame and has open sides. Made for use with OPD computer but suitable for most others. Brand new. **£16 plus £5 post.** Our ref 16P1.

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 BP26.

FDD BARGAIN

3½in made by Chinon of Japan. Single sided, 80 track, Shugart compatible interface, interchangeable with most other 3½in and 5¼in drives. Completely cased with 4 pin power lead and 34 pin computer lead £40 plus £3 insured delivery. Our ref 40P1.

MINI MONO AMP on p.c.b. size 4" x 2" (app.) Fitted Volume control and a hole for a tone control should yopu 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 AR, 250 PORTLAND ROAD, HOVE BRIGHTON, SUSSEX BN3 5QT

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

POPULAR ITEMS — MANY NEW THIS MONTH

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

POPULAR ITEM AGAIN AVAILABLE Twin 0005 tuning capacitor with normal ¼in spindle now listed by many firms at over £10 each. We have htme brand new and in perfect condition at £2 each. our ref 2P40.

SUB-MIN PUSH SWITCHES Not much bigger than a plastic transistor but double pole. PCB mounting. Three for £1. Our ref BD688.

CARTRIDGES for the Double Microdrive. Price 4 for £5. Our ref 5P146.

NICAD CHARGER UNIT Metal pronged, plastic case contains mains transformer and rectifiers with output lead and plug — made to charge two cells but no doube adaptable or wonderful spares value. Only 50p each, two for £1. Our ref BD385.

EDGEWISE PANEL METER If you are short of panel space then this may be the answer. It has a FSD of 100µA and a nice full vision scale. It fits through a hole approx 1¼in x ½in. Another feature is that it has an indicator lamp behind the scale which you could light up, it would then serve as an on/off indicator. Price £1. Our ref BD700.

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

COMPUTER SPECIAL The Perex 16meg Byte tape streamer. These are brand new and really an exceptional bargain. A few only so hurry. Only £15. Our ref 15P29.

20 WATT 4OHM SPEAKER With built in tweeter. Really well made unit which has the power and the quality for hi-fi reproduction. 6½in diameter. Price £5. Our ref 5P155. It is heavy so please add £1 to cover postage if not collecting.

MINI RADIO MODULE Only about 2in square with ferrite aerial and solid dia tuner with its own knob. It is a superhet and it operates from PP3 battery and would drive a crystal headphone direct but be better with our mini mono amp. Price £1. Our ref BD716.

BULGIN MAINS PLUG AND SOCKET The old faithful 3 pin with screw terminals. The socket mounts through a 1½in hole and the mains is brought in by the insulated plug. Used to be quite expensive but you can have 2 pairs for £1 or 4 of either plug or socket for £1. You could make yourself a neat and compact bench panel with these. Our ref BD715, BD715S or BD715P.

MICROPHONE If you want a low cost microphone then just arrived we have a very small hand-held dynamic mic with on/off switch in the handle, its lead terminates with one 3.5 plug and the other a 2.5 plug for remote control. Price only £1. Our ref BD711

EXTENSION CABLE WITH A DIFFERENCE It is flat on one side making it easy to fix and to look tidy. It is 4 core so suitable for telephone, bell, burgular alarms, etc. 50 yard coil for £5. Our ref 5P153.

MOSFETS FOR POWER AMPLIFIERS AND HIGH CURRENT DEVICES 140v 100w pair made by the famous Hitachi Company. Reference 2SK413 and its component 2SJ118. Only £4 the pair. Our ref 4P42.

BATTERY OPERATED TRAVEL MECHANISM On a plastic panel measuring approx. 9in x 3½in. Is driven by a reversible 12v battery motor, fitted with a pulley and belt which rotates through a threaded rod and causes a platform to travel backwards and forwards through a distance of approx. 5in. Price £5. Our ref 5P140.

MAINS OPERATED WATER VALVE with hose connection for inlet and outlet suitable for low pressure. Auto plant watering, etc. Only £1 each. Our ref BD370.

20 VOLT 4 AMP MAINS TRANSFORMER Upright mounting with fixing feet. Price £3. 3P59.

16 OHM PM SPEAKERS Approx. 7in x 4in. 5 watts. Offered at a very low price so you can use two in parallel to give you 10 watts at 8 ohms. £1 for the two. Our ref BD684.

EHT TRANSFORMER 4kv 2mA Ex-unused equipment. £5. Our ref 5P139

4 CORE TINSEL COPPER LEAD As fitted to telephones, terminating with flat BT plug. 2 for £1. Our ref BD639.

EHT TRANSFORMER 8kv 3mA. £10. Our ref IOP56

VERY USEFUL MAGNETS Flat, about 1in long, ½in wide and ¼in thick. Very powerful. 6 for £1. Our ref BD274(a).

ACORN COMPUTER DATA RECORDER Ref ALF03. Made for the Electron or BBC computers but suitable for most others. Complete with mains adaptor, leads and handbook. £10.00. Ref 10P44. Add £2 special packing.

SOLAR CELLS Will give good current (depending on size) from sunlight or bright daylight. Module A gives 100mA. Price £1. Our ref BD631. Model C gives 400mA. Price £2. Our ref 2P199. Model D gives 700mA. Price £3. Our ref 3P42.

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

METAL PROJECT BOX Ideal for battery charger, power supply etc., sprayed grey, size 8"x4¼"x4" high, ends are louvred for ventilation other sides are flat and undrilled. Price £3. Order ref 3P75.

13A PLUGS Good British make complete with fuse, parcel of 5 for £2. Order ref 2P186.

13A ADAPTERS Takes 2 13A plugs, packet of 3 for £2. Order ref 2P187. 20v-0-20v. Mains transformers 2½ amp (100 watt) loading, tapped primary, 200-245 upright mountings £4. Order ref 4P24.

CAPACITOR BARGAIN Axial ended — 4700µf at 25v. Jap made. Normally 50p each, but you will get 4 for £1. Ref 613.

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

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

3 CORE FLEX BARGAIN No. 2 Core size 1.25mm so ideal for long extension leads carrying up to 13 amps or short leads up to 25A. 10m for £2. Order ref 2P190

ALPHA-NUMERIC KEYBOARD This keyboard has 73 keys with contactless capacitance switches giving long trouble free life and no contact bounce. The keys are arranged in two groups, the main area field is a QWERTY array and on the right is a 15 key number pad, board size is approx. 13"X4" — brand new but offered at only a fraction of its cost namely £3 plus £1 post. Ref 3P27.

⅛ HORSEPOWER 12 VOLT MOTOR Made by Smiths, the body length of this is approximately 3in. , the diameter 3in. and the spindle 3/16th of an inch diameter. It has a centre flange for fixing or can be fixed from the end by means of 2 nuts. A very powerful little motor which revs at 3,000rpm. We have a large quantity of them so if you have any projects in mind then you could rely on supplies for at least two years. Price £6. Our ref 6P1. discount for quantities of 10 or more.