NOVEMBER 1989 £2.95

Amateur RADIO

For all two-way radio enthusiasts

Test Equipment: Design and Use of Dip Meters

A User Review: The HF-225 General-Coverage Communications Receiver

Construction: Retractable Mast Construction

MORSE REPORT

YOU GET MORE AT RAYCOM!

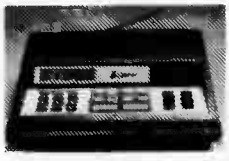
BEARCAT 200XLT

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!)

£229.99 .. save £49.45

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!

£159.99 .. save £30.00

ICOM IC-R7000

An unbeatable offer from Raycom - £30 off the retail price and a *free* Bearcat handy scanner covering 29-512MHz (with 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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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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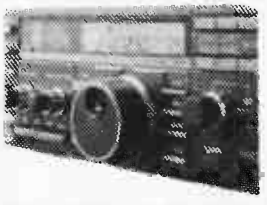
ICOM IC-725



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***

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YAESU FT-747GX

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

Regular retail prices:

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G5RV ½-sized antenna	£14.95
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Raycom package price	***£749.00***

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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
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Total regular price	*£466.74*
Raycom package price	***£425.00***

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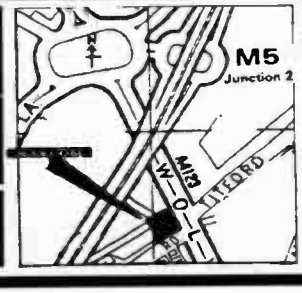

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We regret to inform readers that due to constantly rising production costs, and to enable us to maintain the high standard of content in ***Amateur Radio***, the price of the magazine will be £2.95 from this issue

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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	TID142	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	BR1D1	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	BR1D3	0.55	MJE520	0.48	RCA16029	0.85	TIS91	0.20	2SC931D	0.95
AC142K	0.45	BC114A	0.09	BC213L	0.09	BD137	0.32	BD698	1.50	BF338	0.32	BR303	0.95	MJE2955	0.95	RCA16039	0.85	TV106	1.50	2SC937	1.95
AC176K	0.31	BC115	0.55	BC214	0.09	BD138	0.30	BD7D1	1.25	BF355	0.37	BRC4443	1.15	MPSA13	0.29	RCA16181	0.85	TV106/2	1.50	2SC1D34	4.50
AC187	0.25	BC116A	0.50	BC214C	0.09	BD139	0.32	BD7D2	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	RCA16672	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/D2	0.85	MRF453	17.50	S20600	0.95	2N2219	0.28	2SC1162	0.95
ACY17	1.15	BC140	0.31	BC239	0.15	BD159	0.65	BF115	0.35	BF422	0.32	BT106	1.49	MRF454	26.50	SKE5F	1.45	2N2626	0.55	2SC1172Y	2.20
AD142	2.50	BC141	0.25	BC251A	0.15	BD160	1.50	BF119	0.65	BF423	0.25	BT116	1.20	MRF455	17.50	T6021V	0.45	2N2905	0.40	2SC1173	1.15
AD149	1.50	BC142	0.21	BC252A	0.15	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	BC258	0.25	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	BC258A	0.39	BD182	0.70	BF158	0.22	BF467	0.68	BU105	1.95	MRF479	5.50	T6036V	0.55	2N3055	0.52	2SC1413A	2.50
AF106	0.50	BC148A	0.09	BC284	0.30	BD201	0.50	BF160	0.27	BF493	0.35	NU108	1.69	OC16W	2.50	T9002V	0.55	2N3702	0.12	2SC1449	0.50
AF114	2.50	BC149	0.09	BC300	0.30	BD202	0.50	BF173	0.22	Bf4995	0.23	BU124	1.25	OC23	9.50	T9011V	0.75	2N3703	0.12	2SC1628	0.75
AF115	1.95	BC153	0.30	BC301	0.30	BD203	0.50	BF177	0.38	Bf4997	0.25	BU125	1.25	OC25	1.50	T9015V	2.15	2N3704	0.12	2SC1678	1.50
AF116	2.50	BC157	0.12	BC303	0.26	BD204	0.70	BF178	0.26	BFR39	0.23	BU126	1.60	OC26	1.50	T9034V	2.15	2N3705	0.20	2SC1945	3.75
AF117	2.50	BC159	0.09	BC307B	0.09	BD222	0.46	BF179	0.34	BFR40	0.23	BU204	1.55	OC28	5.50	T9038V	3.95	2N3706	0.12	2SC1953	0.95
AF118	3.50	BC161	0.55	BC327	0.10	BD223	0.59	BF180	0.29	BFR41	0.25	BU205	1.30	OC29	4.50	THY15/80	2.25	2N3708	0.12	2SC1957	0.80
AF121	0.60	BC170B	0.15	BC328	0.10	BD225	0.48	BF181	0.29	BFR88	0.30	BU208	0.95	OC32	5.50	THY15/85	2.25	2N3733	9.50	2SC1969	2.95
AF124	0.65	BC171	0.09	BC337	0.10	BD232	0.35	BF182	0.29	BFR90	1.50	BU208A	1.15	OC42	1.50	TIP29	0.40	2N3773	2.75	2SC1985	1.50
AF125	0.65	BC172B	0.10	BC338	0.09	BD233	0.35	BF183	0.29	BFR91	1.75	BU208D	1.35	OC44	1.25	TIP29C	0.42	2N3792	1.35	2SC2028	1.15
AF126	0.45	BC173B	0.10	BC347A	0.13	BD236	0.49	BF184	0.35	BFT42	0.35	BU326	1.20	OC45	1.00	TIP30C	0.43	2N4280	3.50	2SC2029	1.95
AF127	0.65	BC174	0.09	BC461	0.35	BD237	0.40	BF185	0.28	BFT43	0.35	BU326S	1.50	OC70	1.00	TIP31C	0.55	2N4427	1.95	2SC2078	1.45
AF139	0.40	BC177	0.15	BC478	0.20	BD242	0.65	BF195	0.11	BFW10	0.55	BU407	1.24	OC71	0.75	TIP32C	0.42	2N4444	1.15	2SC2091	0.85
AF150	0.60	BC178	0.15	BC527	0.20	BD246	0.75	BF197	0.11	BFW11	0.75	BU408	1.50	OC72	2.50	TIP33C	0.95	2N5294	0.42	2SC2098	2.95
AF178	1.95	BC182	0.10	BC547	0.10	BD376	0.32	BF198	0.16	BFW16A	1.15	BU426A	0.75	OC75	1.50	TIP34B	0.95	2N5296	0.48	2SC2166	1.95
AF239	0.42	BC182LB	0.10	BC548	0.10	BD379	0.45	BF199	0.14	BFW61	0.60	BU500	2.25	OCB1	1.00	TIP41A	0.45	2N5298	0.60	2SC2314	0.80
ASY27	0.85	BC183	0.10	BC549A	0.10	BD41D	0.65	BF240	0.20	BFW92	0.85	BU508A	1.95	OC84	1.50	TIP41C	0.45	2N5496	0.95	2SC2371	0.36
ASY77	1.50	BC183L	0.09	BC550	0.14	BD434	0.65	BF241	0.15	BFX29	0.30	BU526	1.90	OC139	12.50	TIP42C	0.47	2N5641	16.50	2SC931D	0.95
				BC557	0.08	BD436	0.60	BF245	0.30	BFX84	0.26	BU807	2.25	OC171	4.50	TIP47	0.65	2N5643	16.50	2SK19	0.55
				BC558	0.10	BD437	0.60	BF256LC	0.35	BFX85	0.32	BUY20	2.15	OC200	4.50	TIP48	0.65	2SA329	0.95	2SK33	0.55
				BC639/1D	0.30	BD438	0.75	BF257	0.28	BFX86	0.25			OC201	5.50	TIP50	0.65			3SK88	0.48
				BCY33A	19.50	BD510	0.95			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	CA313EM	2.50	LA4461	3.95	MC1358	1.58	SN7421	0.85	TA7061AP	1.50	TAA570	1.95	TBA750Q	2.68	TDA1170	1.95	TDA2655	4.50	UPC1365C	3.95
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AN262	1.95	CA3140T	1.15	LC7130	3.50	MC1723	0.50	SN76115N	1.25	TA7073	3.50	TAA6320S	2.95	TBA810AS		TDA1270Q	3.95	TDA2690	2.45	UPD2114LC	2.50
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AN303	3.50	HA1306	1.50	LM324N	0.45	MC1451BCP	7.50	SN76228N	2.95	TA7130P	1.50	TBA120AS/B/C	1.00	TBA890	4.50	TDA2010	1.95	TDA4050	2.95	741	0.35
AN313	2.95	HA1322	1.95	LM380N	1.50	ML231B	1.75	SN76533N	1.65	TA7137P	1.00	SA/SB/T/U		TBA920	1.65	TDA2020	2.95	TDA4600	2.50	747	0.50
AN315	2.95	HA1339A	2.95	LM380NB	2.95	ML232B	2.50	SN76650N	1.15	TA7146P	1.50	TBA395	1.50	TBA950/2X		TDA2030	2.80	TDA9503	3.15	748	0.35
AN316	3.95	HA1366W	2.75	LM383T	2.95	ML239	2.95	SN76660N	0.90	TA7176AP	2.95	TBA396	0.75		1.50	TDA2040	3.95	TEA1009	1.35	7808	0.50
AN331	3.95	HA1406	1.95	LM390N	3.50	MSM5807	8.75	STK011	7.95	TA7203	2.95	TBA440N	2.55	TBA990	1.49	TDA2050	2.50	UPC41C	3.50	7805	0.50
AN342	2.95	HA1551	2.95	LM1011	3.15	SAA500A	3.50	STK014	7.95	TA7204P	2.15	TBA480Q	1.95	TBA990Q	1.49	TDA2120	3.95	UPC566H	2.95	7812	0.50
AN362L	2.50	LA1201	0.95	M51155L	2.95	SAA1D25	7.25	STK015	5.95	TA7205AP	1.15	TBA510	2.50	TCA270	2.50	TDA2150	2.50	UPC575C2	1.50	7815	0.50
AN612	2.15	LA1230	1.95	M51513L	2.30	SAA1251	4.95	STK018	7.95	TA7208	1.95	TBA510Q	2.50	TCA270SQ		TDA2151	1.95	UPC1001H	1.95		
AN6362	3.95	LA3201	0.95	M51521L	1.50	SAA501D	5.35	STK025	11.95	TA7222AP	1.80	TBA520	1.10		2.50	TDA2160	2.50	UPC1D20H	2.95		
AN7140	3.50	LA4101	0.95	MB37D5	1.50	SAA5020	5.75	STK032	7.95	TA7227P	4.25	TBA520Q	1.10	TCA650	2.50	TDA2524	1.95	UPC1024H	1.50		
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						SAS57DS	1.75	STK415	7.95	TA7314P	2.95	TBA540	2.50	TCA830S	1.95	TDA254D	1.95	UPC1D32H	0.95		
						SAS580	2.85	STK435	7.95	TA7321P	2.25	TBA540Q	2.50	TCA900	2.50	TDA2541	2.15	UPC1158H	0.75		
														TCA940	1.65	TDA2560	1.15	UPC1167C2	1.95		
														TDA440	2.20	TDA2576	4.50				

BELT KITS

Akai VS1-2-4-5	1.75
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Amstrad 4600-5200	2.95
Ferg 3V22 HR3360	2.75
Ferg 3V23 HR7700	0.95
Ferg 3V29 HR7200	1.50
Ferg 3V31 HR7650	1.50
Ferg 3V35-36 HRD120	1.25
Ferg 42-43-44-45	1.25
Fisher 710-716-722	1.50
Hitachi VT11-33	1.25
Hitachi VT5000	2.25
Hitachi VT8000	0.95
Hitachi VT9300	0.95
Panasonic NV300-333-366	2.25
Panasonic NV370-430	2.50
Panasonic NV777	1.75
Panasonic NV2000	2.15
Panasonic NV7000	1.85
Panasonic NV8600	2.95
Sanyo 11-13-1500	1.50
Sanyo VTC5000	0.75
Sanyo VTC5300-5350	1.50
Sanyo VTC5500	2.95
Sanyo VTC9300	3.50
Sharp 9300-9500	1.75
Sharp 8300	2.95
Sharp 7300	2.95
Sony SLC5-7	2.75
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Sony SLC9	3.25
Sony SL8000	3.25
Toshiba 9600	1.25

20% Discount on 10 or more mixed belt kits

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3HSSHA	25.50
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10% Discount on Five Mixed Heads

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Decca 80	6.95
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Decca 1730	6.35
GEC 2040	5.45
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ITT CVC1-9	6.35
ITT CVC20/25/30	6.35
ITT CVC45	6.95
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Philips G9	6.00
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Pye 7135 lead	8.50
Pye 731/25	6.50
Rank A774	6.35
Rank A823	6.95
Rank T20A	6.95
Siemens TVK76/1	6.95
Siemens Europa	7.50
Thorn 1500	5.45
Thorn 1600	5.45
Thorn 3500	7.95
Thorn 8000	6.95
Thorn 8500	7.15
Thorn 9000	8.50
Thorn 9600	8.50
TV11 Stick	0.90
TV13 Stick	1.25
TV18 Stick	1.10
TV20 Stick	1.40
PYE 713 4 LEAD	8.50
PYE 713 5 LEAD	8.50
PYE 731/25	8.50
RANK A774	6.35
RANK A823	6.95
RANK T20A	6.95
SIEMENS TVK76/1	6.95
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THORN 1600	5.45
THORN 3500	7.95
THORN 8000	6.95
THORN 8500	7.15
THORN 9000	8.50
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TV11 STICK	0.90
TV13 STICK	1.25
TV18 STICK	1.10
TV20 STICK	1.40

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1 5Amp 2Amp 3Amp 7Amp
10Amp

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3Amp 4Amp 5Amp

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Supply and fitting of pre amp dumping rings — £1.00 per ring

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

PLUGS

OCTAL	0.85
B7G	0.35
B9A	0.65

CANS

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B9A	0.65
B9A SKIRTED PCB	1.25
B9D CERAMIC PCB	0.95
B9D CERAMIC CHASSIS	0.95
B9G CERAMIC CHASSIS	2.50
B1DB CHASSIS	0.50
B13B CHASSIS	0.50
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OTHERS ON APPLICATION	

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4CX250B MILITARY SOCKET	10.00
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BA115	0.13	BYX38 600R	0.60
BA145	0.16	BYX55 600	0.30
BA148	0.17	BYX71-600	1.75
BA154	0.06	BZX61	0.15
BA156	0.15	BZX88	0.10
BA157	0.30	BZY95C30	0.35
BA244	0.75	CS4B	8.00
BA301	0.75	CS1DB	18.50
BA302	0.85	MR510	0.65
BA313	0.75	MR512	0.65
BA318	2.95	OA47	0.15
BA328	2.95	OA90	0.10
BA521	1.75	OA91	0.15
BAV21	0.30	OA95	0.10
BAW62	0.19	OA202	0.40
BAX13	0.04	IN21DR	5.00
BAX16	0.12	IN23B	2.95
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BY126	0.10	IN23WE	2.95
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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	IN4148	0.02
BT182	0.55	IN4448	0.10
BY184	0.35	IN5401	0.12
BY187	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
BY298-400	0.22	ITT923	0.15
BY299 800	0.22	ITT2002	0.10
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BZX61 Series	0.15
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1N5GT 2.50
1P28 25.00
1R5 1.50
1S5 1.50
1T4 1.50
1U4 1.75
1U5 1.50
1X25 2.50
2A3 16.50
2AS15A 11.50
2B7 4.50
2B22 69.50
2C36 70.00
2C39BA 39.50
2C40 37.00
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2CY5 1.50
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5R4GY 4.95
5R4WGY 5.95
5T4 5.95
5T8A 1.95
5U4G 4.50
5U4GB 4.50
5V4G 2.50
5W4 4.95
5X4 4.95
5Y3GT 3.50
5Z3 4.50
5Z4G 2.50
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6AH6 3.50
6AJ4 3.50
6AJ7 2.00
6AK5 1.95
6AK6 2.50
6AL5 0.85
6AM4 3.25
6AM5 4.50
6AM6 1.95
6AN5 4.50
6AN8A 4.50
6AQ5 1.75
6AQ8 1.50
6AR5 8.95
6AS5 1.50
6AS6 2.50
6AS7G 4.50
6AT6 1.95
6AT8 1.75
6AU4GT 2.95
6AU5GT 4.50
6AU6 1.50
6AV6 1.95
6AW8A 3.50
6AX4GT 1.95
6AY3B 1.95
6AZ8 4.50
6B8G 2.50
6B10 1.95
6BA6 1.50
6BA7 4.50
6BA8A 3.50
6BC8 1.50
6BR3 2.95
6BE6 1.50
6BG6G 3.00
6BH6 1.95
6BH8 1.50
6BJ6 1.50
6BK4 6.50
6BL6 65.00
6BL8 1.15
6BM6 115.00
6BN6 1.85
6BN8 3.95
6BQ5 1.35
6BQ7A 1.50
6BR7 4.95
6BS7 5.50
6BW6 5.35
6BW7 1.50
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6BZ7 2.95
6C4 1.95
6C5 2.50
6C6 3.50
6C8G 2.50
6C9 4.95
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6CA7 3.50
6CB5 3.95
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6CF6 1.95
6CG7 4.50
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6CS6 0.75
6CS7 0.95
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6DJ8 1.35
6DJ8 Special 3.50
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6DT6A 1.50
6DW4B 3.50
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6EA7 2.50
6EA8 2.50
6EB8 3.50
6EJ7 0.85
6EM5 2.50
6EM7 2.50
6EU8 1.75
6EV7 2.95
6EW6 1.50
6F1 2.00
6F5 5.50
6F7 5.50
6F13 3.00
6F14 1.00
6F17 2.75
6F23 0.60
6F24 1.25
6F25 1.25
6F28 1.25
6F32 1.25
6F33 10.50
6FH5 8.50
6FH8 15.00
6FL2 4.50
6FQ7 4.50
6GE5 3.95
6GH8A 2.50
6GJ7 0.85
6GK6 3.95
6GM6 2.85
6GS7 2.15
6GV8 0.95
6GW8 2.50
6GY5 4.95
6GY6 2.50
6H1 9.50
6H6GT 2.50
6HB7 1.95
6HF8 3.50
6HM5 2.50
6HQ5 3.50
6HS6 4.95
6HS8 2.95
6HZ6 3.50
6J4 2.15
6J5GT 2.50
6J6 2.00
6J7 4.15
6J7G 4.15
6JB6A 9.50
6JE6C 9.50
6JM6 9.50
6JU8A 2.50
6JS6C 9.50
6K7G 2.00
6K8G 3.00
6KD6 10.50
6KG6A 5.95
6L1 2.50
6L6GC 3.50
GL6GC USA 9.50
6L6GT 3.50
6L7 3.50
6L15 3.15
6L19 3.95
6LJ8 2.50
6LD20 1.15
6LF6 11.50
6LQ6 9.50
6P28 2.00
6Q7GT 1.50
6R7 3.15
6RHH8 10.00
6S4A 1.95
6SA7 1.95
6SC7 1.95
6SH7 1.95
6SJ7GT 1.95
6SK7 1.95
6SL7GT 1.95
6SN7GT 1.95
6SQ7GT 1.50
6SS7 1.95
6T8 1.50
6U6GT 3.50
6U7G 3.50
6U8A 1.50
6V6G 1.45
6V6GT 2.50
6W4GT 1.95
6Y6G 3.95
6X2N 1.00
6X4 1.50
6X5GT 1.00
6X8A 2.25
7A6 4.50
7AU7 1.50
7B6 3.50
7B7 2.50
7D8 4.50
7J7 5.50
7K7 7.50
7L 1.50
7Q7 4.50
7Y4 2.50
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10EW7 2.95
10F1 1.95
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12AD6 2.50
12AE6 5.50
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12BR3 1.95
12BY7A 3.50
12C8 2.50
12CA5 1.95
12CX8 1.95
12DQ6B 3.50
12DW4A 3.50
12DZ6 3.95
12E1 19.50
12E14 38.00
12FX5 1.95
12GN7 5.50
12J5GT 3.95
12J7GT 3.50
12JZ8 2.95
12K7GT 1.50
12K8Y 1.95
12KU7 1.95
12S7GT 1.50
12SA7GT 1.95
12SG7 4.75
12SK7 1.95
12SJ7 1.50
12SN7GT 1.65
12SW7 3.50
12SY7 4.50
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13DE7 2.50
13DR7 2.95
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14B6 4.50
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16H 0.40
16L 0.40
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17DW4A 2.95
17EW8 1.50
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19AQ5 3.50
19AU4GT 2.50
19BG6 3.50
19G3 19.50
19G6 9.00
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19H5 33.50
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20P1 0.85
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20P5 1.15
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21KQ6 4.95
21LU8 3.75
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24B9 39.50
25BQ6 1.75
25DQ6B 2.95
25L6GT 1.75
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29KQ6 6.50
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30C17 0.40
30C18 1.45
30FL2 1.35
30FL12 0.95
30FL13 1.10
30FL14 1.25
30L1 0.45
30L15 0.60
30L17 0.60
30P4MR 1.00
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30PL13 0.60
30PL14 1.75
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50C5 0.95
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5726 2.50
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5963 1.75
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6057 3.75
6058 2.50
6060 2.25
6072 5.95
6080 8.50
6080WA 9.50
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6146W 12.50
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6156 125.00
6157 2.50
8158 3.20
6189 4.50
6201 6.45
6350 3.50
6360 4.50
6386 14.50
6442 75.00
6463 7.50
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6870 11.50
6883B 9.95
6973 8.95
7025 2.50
7025S 6.95
7027A 10.00
7119 9.00
7189 5.50
7199 7.50
7247 8.50
7475 5.00
7486 155.00
7527 125.00
7551 8.50
7581A 11.95
7586 15.00
7587 19.50
7591A 8.95
7815 59.50
7868 8.50
7895 17.50
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STRAIGHT & LEVEL

ON THE COVER

Featured on this month's cover is the IC-R9000 communications receiver, available from Icom (UK) Ltd.

With the IC-R9000's continuous, all-mode, super wideband range of 100kHz to 1999.8MHz, together with its unique CRT display and numerous scan functions, this rig is capable of receiving stations world-wide.

The IC-R9000 includes the following functions:
- All mode capability;
- DDS (Direct Digital Synthesiser) system, built into the PLL circuits;
- High frequency stability in ranges greater than 30MHz (±0.25ppm) and in ranges less than 30MHz (±25Hz);
- Direct keyboard entry for receiving frequencies and memory channels;
- 1000 memory channels;
- AFC function to compensate for frequency drift;
- Continuous and adjustable multi-scan functions with a speed rate in excess of thirteen channels per second;
- Four antenna connectors.

The IC-R9000's power consumption is less than 11.0VA and measures 424mm × 150mm × 365mm (WHD). The rig costs £3,995 including VAT.

For further information contact *Icom (UK) Ltd, Unit 9, Sea Street, Herne Bay, Kent CT6 8LD. Tel: (0227) 363859.*

OPTICAL RECEIVER FET

The semiconductor division of Toshiba Electronics Ltd has recently developed and launched a GaAs MESFET device for use in fibre optic communications.

The optical receiver FET is available in both chip (JS8873-AS) and packaged form (S8873) and is designed for use in high-speed lightwave detection systems.

The combination of a low leakage current (Igs=30) and very high transconductance (gm=40MS) provides the FET with the high sensitivity needed to operate the detection systems.

Other additional features include: pinch off voltage (−1.0V [TYP]), saturated drain current (Idss=25mA [TYP]) and thermal resistance (Rth=450 CW).

The gate length and width of the device measures 0.5μm and 300μm respectively.

By combining low power consumption with high speed the optical receiver FETs are ideally suited for high speed, high sensitive optical detective systems.

For further information contact *Toshiba Electronics (UK) Ltd, Electron Tube and Device Division, Riverside Way, Camberley, Surrey GU15 3YA. Tel: (0276) 694600.*

PCB CELLS

STC Electronic Services now stocks the Panasonic BR2/3AE2SP, a lithium polycarbon monofluoride cell, which is ideal for small load functions, such as CMOS RAM protection.

Designed for mounting on to a PCB, it has a ten year storage life with an annual deterioration of just 0.5%. The operating temperature range is −20°C to +60°C. The voltage is 3V, capacity is 1200mAh and the height above the board is 18.5mm.

For further information contact *STC Electronic Services, Edinburgh Way, Harlow, Essex CM20 2DF. Tel: (0279) 626777.*

LOW VOLTAGE DETECTORS

A series of low power voltage detectors is now available from Seiko Epson with either open drain N-channel or CMOS output.

Detection voltages range from: 0.9 to 4.9V minimum and 1.0 to 5.3V maximum; operating supply current varies from 1.4μA to 2.6μA.

The CMOS low voltage detectors give an indication of battery life, and monitor power supply faults, voltage protection, triggering back-up systems and tagging devices.

For further information contact *Hero Electronics Ltd, Dunstable Street, Ampthill, Bedfordshire MK45 2JS. Tel: (0525) 405015.*

BARTG

BARTG will hold its annual AGM on 4 November at the Churchill Room, London House, Mecklenburgh Square, London WC1. The meeting will start at 2.00pm.

London House is close to the junction of Grays Inn Road and Guildford Street – just a few minutes walk from Kings Cross and St Pancras rail stations.

One of the topics which will be discussed is the future of the BARTG rally. The rally organisor, G8VKY, would like to enlarge the 1990 event, but he is unable to organise enough volunteers to help.

For further information contact *Ian Brothwell G4EAN, 56 Arnot Hill Road, Arnold, Nottingham NG5 6LQ. Tel: (0602) 26230, or (0602) 592660.*

DTI NEWS

The DTI have announced the top young radio amateur of 1989. He is Ted Walker, aged sixteen, from Warwick. The runners up were Rachel Oakley, from Gateshead and Paul Moss, from Evesham.

Ted received a certificate from Nicholas Ridley, Secretary of State for Trade and Industry, and was presented with a £250.00 prize from Mike Codican, Head of Licensing at the DTI.

Ted is a keen radio enthusiast who impressed the judges with his efforts involving radio restoration, building his own antennas, and his various activities with radio clubs and on RAYNET.

Rachel, aged fourteen, of Low Fells, Gateshead, was the first guide to qualify for the new Girl Guides Radio communications badge. As well as building her own radio equipment, Rachel passed her RAE and Morse exams at only twelve years old.

Paul, aged seventeen, from Badsey, Evesham, successfully competes in radio

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

callsign collection competitions, builds his own antennas, and uses computers for communications via radio.

The Young Amateur of the Year Award is organised by the RSGB.

THE DIXON MURDERS

On 5 July 1989, Peter and Gwenda Dixon were found murdered on the Pembrokeshire coastal path.

Following police enquiries it has been revealed that at about 2.00pm on Sunday 25 June 1989, two men in a boat, who were fishing on Hellwick Bank, off Wormshead, near the Gower coast, overheard a conversation by two men on channel thirty-three on their CB radio.

The person transmitting on channel thirty-three said he was middle-aged, from the Oxford area and was holidaying in Pembrokeshire.

These details – and his complicated callsign, which could be similar to Peter Dixon's callsign of G0HFQ – indicate that this person could have been the murder victim.

This person had a conversation on Sunday 25 June with an unknown man called Tom, who had a broad Pembrokeshire accent. (It is also believed that Peter Dixon made contact with a mobile station on the morning of Wednesday 28 June 1989 on 10m FM). Tom agreed to meet this person at a later date. It is not known if this meeting took place, because Tom seemed disinterested.

If you have any information as to the identity of Tom or which might help the police with their enquiries, contact either the Dyfed-Powys Police at Haverfordwest, tel: (0437) 3355 or any police station.

CLUB NEWS

The Bridgend and District Amateur Radio Club will hold the 1989 Bridgend Rally on 19 November at the Bridgend Recreation Centre, Angel Street, Bridgend, Mid-Glamorgan. Doors open at 11.00am.

For further information contact *the Club Secretary. Tel: (0656) 723508.*

The MARS will hold the Birmingham Radio Rally on 19 November at the Stockland Green Leisure Centre, Slade Road, Erdington. Doors open from 10.00am to 5.00pm. Admission is 50p and parking is free.

For further information contact *Pete Taylor G6DRN, 131 Bevington Road, Aston, Birmingham B6 6HS. Tel: 021-472 7998.*

The South Bristol Amateur Radio Club will hold five meetings in November:

1 November, lecture; 8 November, 2m activity evening; 15 November, 10m activity evening; 22 November, free ice-cream evening; and 29 November, bring and buy/junk sale.

The club meets every Wednesday at 7.30pm at the Whitchurch Folkhouse Association, Bridge Farm House, East Dundry Road, Whitchurch, Bristol, Avon BS14 0LN.

For further information on the club's activities contact *the Club Secretary. Tel: (0272) 832222.*

A USER REVIEW

THE HF-225 General-Coverage Communications Receiver

The HF-225 general-coverage communications receiver from Lowe Electronics Ltd is the successor to the HF-125. It incorporates the same circuit design as its predecessor, but two years of extensive research and development have resulted in a vastly improved RF performance. This receiver will also cope with overloading from powerful stations adjacent to the one you want to hear. The specifications of the HF-225 are shown below.

The unit's steel case comprises two halves, split horizontally, and is finished in battleship grey heavy-duty epoxy paint.

The underside of the case has four rubber feet, with two extendable legs to raise the front of the unit.

The front panel

The front panel is finished in grey and white, the top half being a darker shade of grey than the body of the set, and the lower half of the front panel being white. The panel legends are printed on the reverse side, so they will not wear away in use.

The three control knobs are black with arrow-shaped indicators in white. The top half of the panel comprises, from left to right: the analogue 'S' meter which is calibrated from S1 to S9, +10dB, +30dB and +50dB; a six-way rotary switch; and a large five-digit, back-lit LCD display, which shows the receiver frequency to the nearest kilohertz. Additional indicators in the display show the memory mode and AMS detector lock.

To the right of the front panel is the tuning knob, which is a 'spin wheel' type with a finger detent. Its operation is satisfactorily smooth, but there is no adjustment to compensate for friction. The tuning step rate increases with rapid rotation of the tuning knob. There are three tuning rates: for CW, SSB and AMS modes the tuning rate is in 8Hz steps or 1.6kHz per revolution, for AM it is in 50Hz or 9kHz steps per revolution and for FM mode, the rate is in 125Hz or 25kHz steps per revolution.

The tuning knob selects a particular memory channel when used in conjunction with the memory CHANNEL button.

Ingenious design

The lower-left half of the front panel contains the 6mm 'phone socket, which accepts either mono or stereo-type headphones; the internal speaker is disconnected when the headphone plug is inserted. Next to this is the power on/off and volume control followed by the tone control, which has a very interesting operation. In its central position the response is flat. Turning it clockwise produces a high pass action cutting the bass response, whereas turning it anti-clockwise gives a lowpass filter cutting the top. This is a very helpful facility, particularly while listening on 7MHz, when used in conjunction with the various filters. An ingenious piece of design.

In the same horizontal line are five push buttons, four of which have multiple actions. These are: MEMORY MODE SELECT, RF ATTENUATOR/MEMORY CHANNEL, FILTER SELECT/MEMORY RECALL, MHz DOWN/MEMORY STORE and MHz UP/MEMORY STORE.

The rear panel

The rear panel contains a number of facilities. From left to right these are: a 3.5mm socket for the K-225 remote keypad (frequencies can be entered directly), followed by an SO239 socket for the antenna. Adjacent to this socket is the ANTENNA SELECT switch. Note that the WHIP position will only operate if the internal W-225 amplifier is fitted to the unit. Then there are: a 600 ohm terminal and its associated ground connection, followed by the FM squelch level adjustment. Like the W-225 amplifier, this pot will only be included if the D-225 detector option is fitted to the unit.

Finally there are two 3.5mm sockets, one for the RECORD output and the other for the EXTERNAL SPEAKER output. There is also a 2.1mm 12V power input socket. A regulated dc PSU is

Specifications of the HF-225

Frequency coverage	30kHz to 30MHz continuous coverage
Reception modes	AM, LSB, USB, CW, narrow band FM, synchronous AM (AMS)
Receiver system	Microprocessor-controlled PLL tuning, dual conversion superheterodyne receiver First intermediate frequency 44.999 to 45.000MHz Second intermediate frequency 455kHz
IF filters	SSB and AM: Operator selectable 2.2, 4, 7 and 10kHz AMS: Operator selectable 2.2, 4, 7 and 10kHz CW: 2.2kHz FM: 12kHz (750µS audio de-emphasis)
Audio filters	200Hz wide audio peak filter centred on 800Hz, selectable in CW mode
RF attenuator	Operator selectable 20dB attenuator
Antenna inputs	50 ohms via SO-239 socket 600 ohm input and earth connection on spring terminals High impedance active aerial for whip antenna via SO-239 socket
Audio outputs	Record output at approx 350mV (3.5mm socket) External loudspeaker (3.5mm socket) Headphone output (mono or stereo) 6mm socket Internal speaker is disconnected when headphones or external speaker are plugged in
Power supply	External 12V dc supply (2.1mm power jack) 240V ac mains power unit supplied as standard Internal Ni-Cad rechargeable batteries with charging circuit (optional extra) Quiescent current 200mA (no options, no audio output) Typical power consumption is 250 to 300mA
Dimensions	253mm × 109mm × 204mm (WHD) Weight is approx 1.9kg (2.6kg with internal batteries)

supplied with the receiver, the mains accepts the normal 240V ac. The rig comes complete with a lead fitted to the PSU which ends in a normal 2.1mm power plug ready for insertion into the back of the receiver.

The PCBs, both vertical and horizontal, are beautifully made, with the component values and their positions silk-screen printed on them. All the components are positioned in a neat and tidy manner, and the boards are a pleasure to look at. It is a tribute to the designer of the PCBs that so many facilities are available in such a small space without giving any appearance of overcrowding.

Crystal-derived frequencies

Note that only the local oscillator signal is produced by the phase-locked loop frequency synthesiser, and that the frequencies which affect the tuning of the receiver are crystal-derived to ensure good frequency accuracy and low drift in operation.

The switching and tuning functions of the receiver are controlled by a dedicated microprocessor system, which receives commands from the front panel controls and sends the information to the receiver control register and PLL system via serial DATA busses. The single chip microprocessor is supported by a controller which drives the LCD and a frequency memory chip with lithium battery back up. These components are mounted separately from the main RF and IF circuits on a PCB behind the front panel.

The control system uses the 'static idle' principle, whereby there are no signals (other than a basic clock oscillator) in the system until the operator requires a change in the receiver's condition. The system then reacts to commands from the receiver before returning to its static condition. This method of operation virtually eliminates spurious signals from the control system being picked up by the receiver's input stages. In operation, there are very few spurious signals and as they are rarely heard above the background noise of the receiver, they do not cause any degradation to the reception of radio signals.

The receiver can be used with three types of antenna: its own whip (employing the internal amplifier), a long wire running round the loft space, or an 80m short dipole fed through an ATU. The long wire antenna is used mostly for general reception, but under certain circumstances there is a high noise level present. To listen to the amateur bands, use the 80m dipole fed through an ATU.

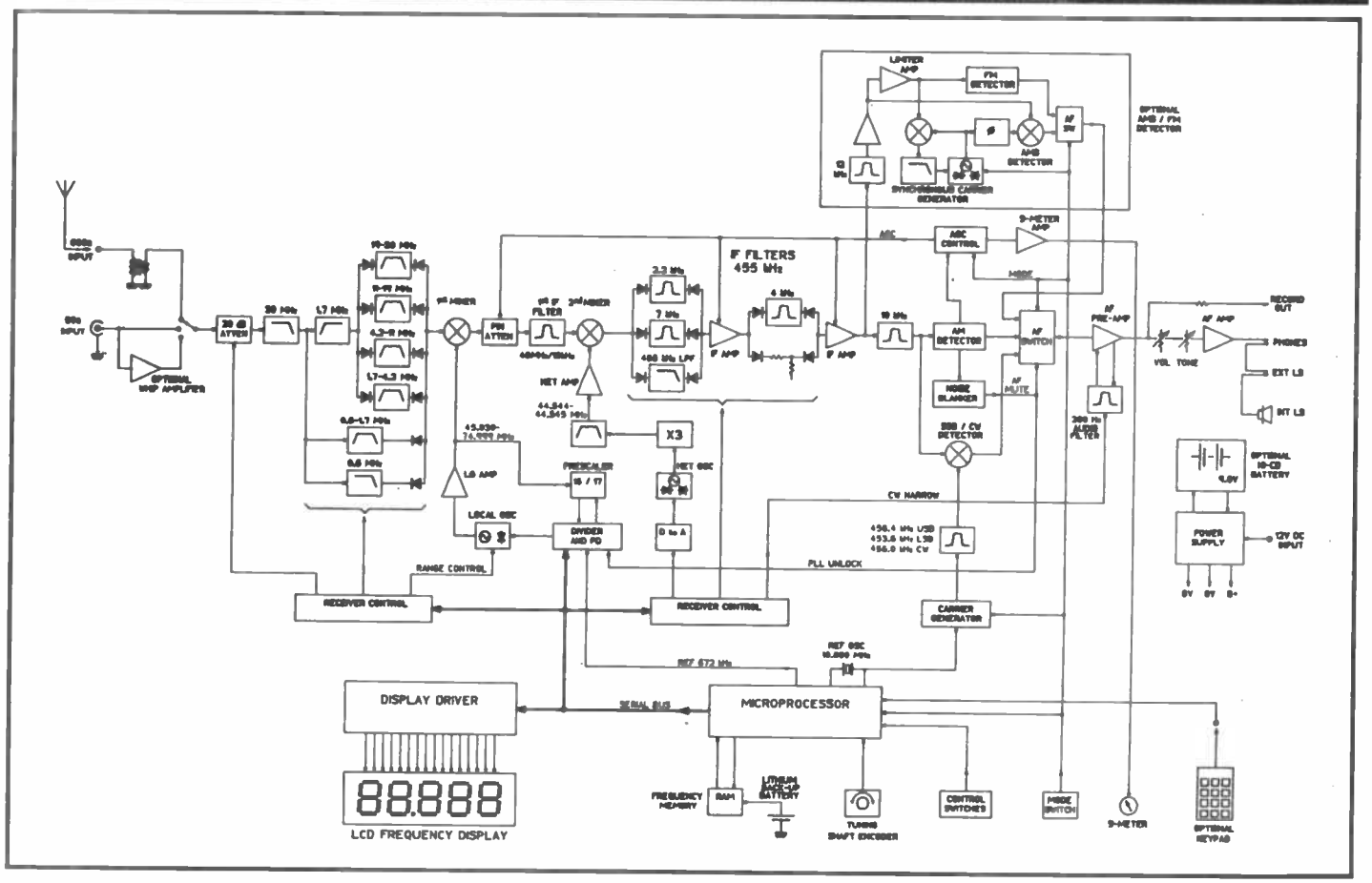
Receiver performance

Sensitivity	60kHz-2MHz:	AM typically 0.8µV FM typically 0.7µV SSB typically 0.4µV	
	2MHz-30MHz:	AM typically 0.6µV FM typically 0.6µV SSB typically 0.3µV	
Selectivity	IF filter	Bandwidth (kHz)	
	2.2kHz:	2.3 at −6dB	3.4 at −60dB
	4kHz:	5.9 at −6dB	9.8 at −60dB
	7kHz:	8.8 at −6dB	12.9 at −60dB
	10kHz:	10.5 at −6dB	21.5 at −60dB
Frequency stability	(Typical performance only – not guaranteed spec)		
	At constant 20°C	Drift ±30Hz in one hour Frequency error ±50Hz	
	−15°C to +50°C	Frequency error ±200Hz	
Audio output	1.6W into 8 ohm at 5% THD (with 12V power supply unit) 2.0W into 4 ohm at 5% THD (with 12V power supply unit) External loudspeaker output is suitable for speakers with impedances of 4 ohm or greater Headphone output: up to 4V from 220 ohm Record output: 350 to 400mV from 5k ohm		
AMS detector	Lock range: ±100Hz Audio distortion under carrier fade conditions: signal modulated to 70% depth at full carrier level 6dB carrier reduction: 2.8% THD (23% with conventional AM detector) 10dB carrier reduction: 4% THD (39% with conventional AM detector) 20dB carrier reduction: 4.1% THD (50% with conventional AM detector)		
Noise blanker	Audio blanking triggered by IF signal level is permanently enabled and operates on all reception modes Blanking period 500mS Threshold level 12dB above normal carrier		

Operation

It is very simple to operate the HF-225 but the Owner's Manual must be read and thoroughly understood. The rig's thirty memories are accessed by pressing MEMORY SELECT when the MEMORY MODE flag appears at the bottom-left of the display. After one second the display changes to that of the stored frequency in that particular memory. To receive the channel press the next button marked CHANNEL. It is not possible to delete a memory channel and leave it blank, but any frequency inserted into a particular channel will override what is already there.

The memory channels can be accessed in sequence by rotating the tuning knob and, in each case, one second after the memory channel number appears, the frequency stored in that channel will be displayed. Memory channels 1-9 can be selected using the optional K-225 keypad. Keys ★ and # select channels 10 and 20 respectively. The 0 key alternates between the preview and channel modes key. Since the memory does not store the mode in use when, for instance, going from AM to SSB, the MODE switch must be employed. To exit from the memory mode press RECALL and tune the receiver as usual.



There are three other facilities available, which now appear on all the bigger transceivers. The first makes the memory frequency the same as the main VFO frequency (A=B); the second swaps the frequencies in the memory and VFO (A/B); and the third locks and unlocks the tuning control and functions.

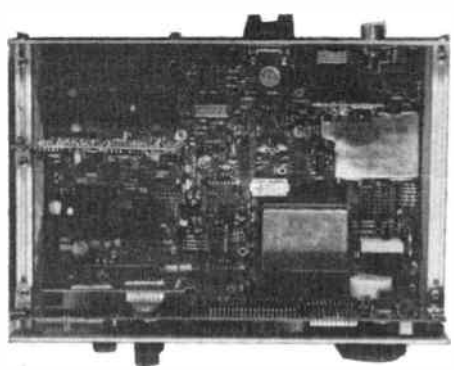
These facilities are enabled by pressing *and holding* the red button marked FN (in fact, the MEMORY SELECT button) and any one of the other four buttons.

Altering the display

I have to remark on the clever way in which the display is altered. If you want to see if the attenuator is in circuit, then it is only necessary to press RF ATTEN, and either OFF or ATTEN will be displayed for three seconds in place of the frequency, after which time the original frequency will return. The same method applies to the filter change by pressing FILTER SELECT. A most ingenious use of the microprocessor.

The use of the synchronous AM position when operating in the commercial broadcast bands results in far better reception than would be possible using normal means of AM detection, but it must be remembered that the receiver will only tune 4kHz in either direction when in this mode. The idea, therefore, is to tune in the desired station in the AM mode and then change to AMS (this has a

Above: *Block diagram of the HF-225.* ***Below:*** *An interior view*



locking range of only ±100Hz). When the station is tuned in the letter 'L' is shown in the top left-hand corner of the display.

You can move up to the CB band on 27MHz using the FM option. Switching to the FM mode brings in the squelch circuit, the level of which is set via a blue control projecting out of the rear panel.

The operation of the squelch can be bypassed by pressing the FILTER SELECT button when in the FM mode. When this is done, either the word OFF or the letters SQL appear in the display for three seconds, then the display returns to the tuned frequency.

The Owner's Manual contains thirty-two pages, two of which are available for listener notes. It begins with a discussion about aerials and earths under the title 'Getting Started', and continues with 'Types of Signals', to the receiver's specification and four pages of circuit diagrams. In addition to this, I received a booklet called 'The Lowe Listener's Guide', arranged by John Wilson and written by Bob Ellis and John Thorpe. It answers all the queries which short wave listeners might want to ask.

Conclusion

The HF-225 is a very impressive receiver, and represents extremely good value for money. In my opinion, its performance is equal to many imported units which cost twice as much to buy, and should prove to be an excellent choice for any serious short wave listener.

The price of the HF-225 is £395.00. The D-225 synchronous detector and the K-225 remote control keypad cost £39.50 each, and the W-225 whip antenna with the internal amplifier costs £19.50. All prices are inclusive of VAT.

Thanks to Lowe Electronics Ltd, Chesterfield Road, Matlock, Derbyshire DE4 5LE, tel: (0629) 580800, for the loan of the rig for this review.

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

EUCW Fraternising CW Party

The European CW Association's major event of the year will be held on 18-19 November, and is open to all amateurs and SWLs whether they are members of EUCW clubs or not.

Although mounted within a contest style framework, participants can treat the Fraternising Party how they wish. They can go all-out for contest points, or take it easy and just enjoy meeting friends, old and new, with more leisurely contacts. All are asked, however, to send in logs afterwards to help assess participation in the event.

Space does not permit reproduction of the rules, but I will gladly send a copy on receipt of an sae QTHR.

FOC, the First Class CW Operators' Club, has now joined EUCW. All major UK and European CW clubs are now members of the association which exists to encourage and promote amateur CW operating.

FISTS welcomes beginners

Nervous beginners to CW are reminded that the FISTS Morse Club operates a 'phone-a-sked' service for the benefit of *all* amateurs, not just members of the club. Those about to go on the air for the first time can obtain sympathetic help from an experienced operator who will gently steer them through their first QSO on the key. A list of these operators, with their telephone numbers, is obtainable from Geo Longden G3ZQS, 119 Cemetery Road, Darwen, Lancs BB3 2LZ.

FISTS extends a warm welcome to beginners generally. Full details about the club, which is a member of EUCW, can be obtained from G3ZQS.

USA no-code licence proposal

As anticipated in my September column, the ARRL has agreed that the time has come to support a class of amateur radio licence which doesn't require knowledge of the Morse code. Nevertheless, according to the W5YI Report, it is proposed that applicants be asked questions related to the code to instil in them that Morse is a basic part and tradition of amateur radio.

ARRL's Board of Directors did not entirely concur with the recommendations of its special committee, but by a vote of nine to six it finally agreed to petition for a new code-free 'Communicator' licence. This would have an upgrade path to the present Technician licence by way of the existing 5wpm code test. Privileges would be for all modes at 220MHz and above, and power would be limited to 250W PEP output.

This represents a considerable backing off from the committee's original proposals which suggested 50MHz and above, with digital privileges at 2m. So even if the new licence is agreed, US amateurs will still be some way behind the UK and other countries which already offer no-code entry into amateur radio above 30MHz.

UK Novice licence proposals

I see that the RSGB's proposals for novice entry to amateur radio, now submitted to the DTI, include a no-code Novice 'B' licence giving access to novice frequencies above 30MHz, while an 'A' licence with a 5wpm Morse test would also permit operation on selected HF frequencies.

The forty-six-page consultative document lays great stress on Project YEAR (Youth into Electronics via Amateur Radio) and an enormous amount of work has gone into it in the hope of attracting schoolchildren, members of youth organisations etc, into amateur radio to help safeguard the future of the hobby.

The modes suggested include Morse, telephony, data, RTTY, SSTV and FSTV. Presumably the 'low cost simple kits' proposed by the Society will be designed to enable novice youngsters to get on the air with all these modes on the recommended frequencies, ranging from LF to UHF. At first sight, however, the proposals seem to have lost some of the simplicity of the original idea, which was generally understood to be an introduction to basic radio techniques and operating practice by means of simple home-built CW rigs.

Overlooked?

With this emphasis on the young there is another viewpoint which can be overlooked. This is expressed by Gus Taylor G8PG, in **SPRAT**, journal of the G-QRP Club, summer 1989.

'I am all for encouraging the young (I became G8PF at age seventeen), but the shift in the age of our population means that more and more mature people are available to be attracted into amateur radio. Our own club does well in this respect; some other organisations do not yet seem to have woken up to this fact of late-twentieth century life.'

In subsequent correspondence with me, Gus has expanded on his views:

'... 60% of current purchasing power now lies with the over-forties, and many of them now have a great deal of leisure time. The amateur radio movement thus ignores them at its peril.

'... as parents, uncles/aunts and grandparents this group can often influence the young in a choice of hobby, both by example and joint participation.

'The supposed reason for youth emphasis in the novice area is our current lack of engineers. Amateur radio may help a little in the recruitment of such people, but a much more potent factor would be to give the brilliant young engineer capable of producing new techniques the same rewards as the young yuppie who sells insurance linked pension schemes.

'Until government and industry accept that hard fact our shortage of engineers will continue and no effort by the amateur radio movement is likely to make much improvement in the situation.'

Kitchen table key

Many home-made keys require workshop facilities and some engineering skill. In the autumn issue of **Morsum Magnificat** there is an ultra simple hand-key made by Barrie Brokenshaw ZS6AJY, based on a hacksaw blade, which can easily be made on the kitchen table using readily available materials and the minimum of tools. The key is bearingless and overcomes the problem of obtaining good electrical contacts by using self-tapping screws with sharp points. Barrie says this works well.

He makes these keys for his learners' class. They have simple oscillators each with a distinctive tone and students sit around a table making contacts with each other, with all spoken words prohibited.

Barrie sent me one of these keys and considering its simplicity I am quite impressed by its appearance and solid feel. The gap can be adjusted and it is even possible to vary the spring tension. It is suitable for learning and for newcomers on the air.

BITS TO BUILD

THE JANDEK TRANSCEIVER

One of the real pleasures for a constructor of amateur radio equipment is to build his or her own home station. However humble and modest it may be, the home-brewed station never fails to gain respect from fellow radio amateurs. What is more, the builder-owner can claim to be true to the real spirit of amateur radio.

In the past I have described a series of modules for the home constructor sold by a company called Jandek. The Jandek modules are inexpensive, flexible units which can be combined together, or with other circuit modules, to make a receiver or transmitter for any single band from 160 to 20m.

The designer, G3ZOM, supplies the kits with a PCB, which make the basic 'building blocks' of the equipment.

I described the Jandek receiver modules in June, July and August 1988 issues of ***Amateur Radio***. These modules are: the JD001 (audio amplifier), JD002-C and/or S (lowpass filter or CW/SSB), JD003 (product detector), JD004-xx (VFO where xx = the required band) and JD007-xx.

More recently, in **Amateur Radio** for August and September 1989, I described the transmitter modules. These are: the JD004-xx (VFO), JD005-xx (half-wave filter), JD009 (QRP CW transmitter) and JD010 (CW transmit/receive switch).

Looking at this list of modules, it is easy to see how a single band CW direct conversion transceiver could be made using the JD004 VFO as the common signal source for both transmit and receive. The result would be an easy to build low power CW direct conversion transceiver, the sort of equipment that thousands of members of the G QRP Club use on the bands to enjoy many contacts. To make the final result a functionally better transceiver, G3ZOM has added a couple of extra little modules to the Jandek range.

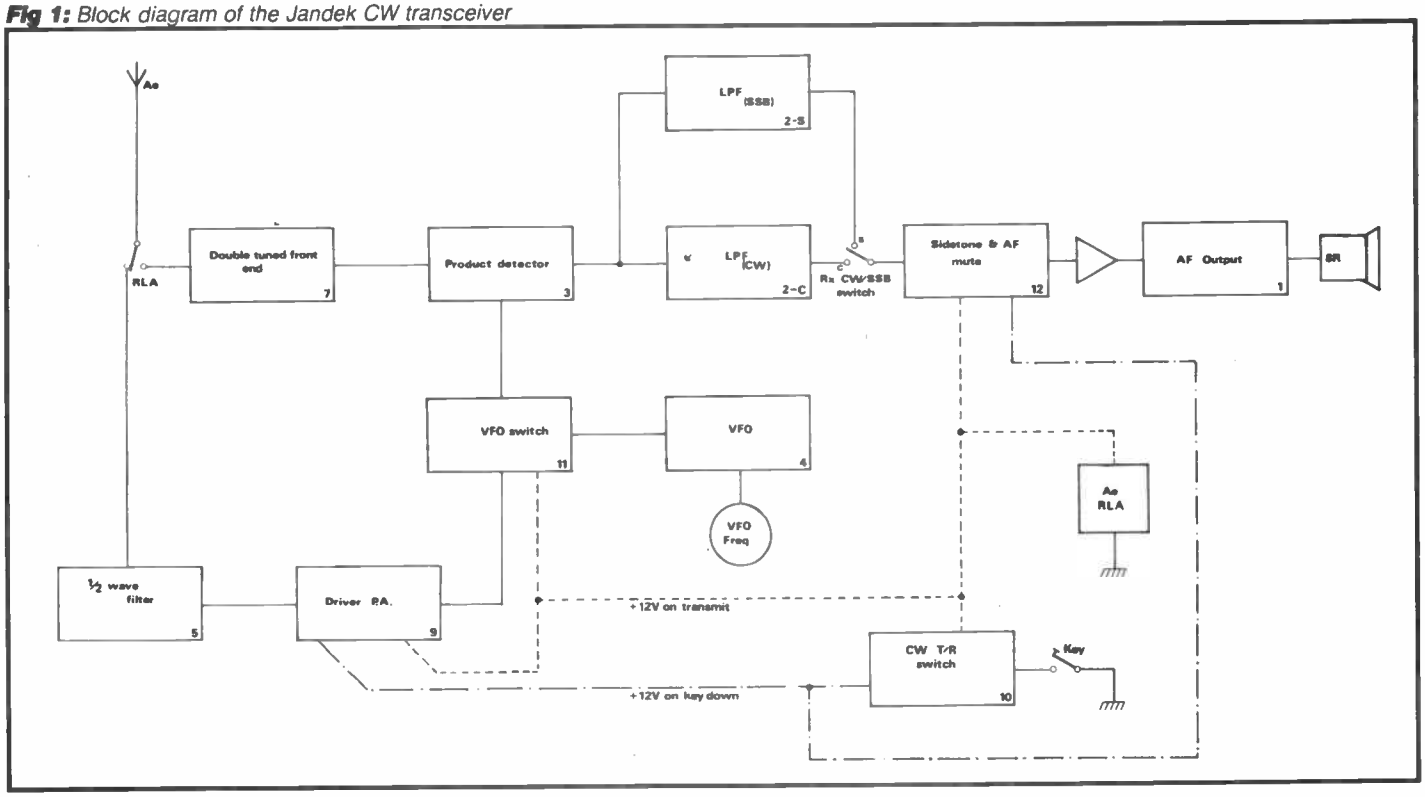
The Jandek transceiver

Fig 1 is a block diagram which shows how the Jandek modules can be combined to make a single band transceiver. Checking through the list of modules for the receiver and transmitter, it can be seen that two modules have been added. These are the JD011 (VFO switch) and JD012 (sidetone and audio mute). By following the blocks, it is easy to see how the transceiver works.

The VFO (JD004) for the band in question is the common signal source and transmit/receive. One of the new modules is a switching board which applies the VFO signal to either the receive or transmit circuits. On transmit, the VFO signal goes to the driver-power amplifier module (JD009). The half-wave filter for the desired band (JD005) suppresses harmonic output from the transmitter.

A changeover relay applies the antenna to the transmitter when the key is depressed. This relay is operated by the transmit/receive switch module

Fig 1: *Block diagram of the Jandek CW transceiver*



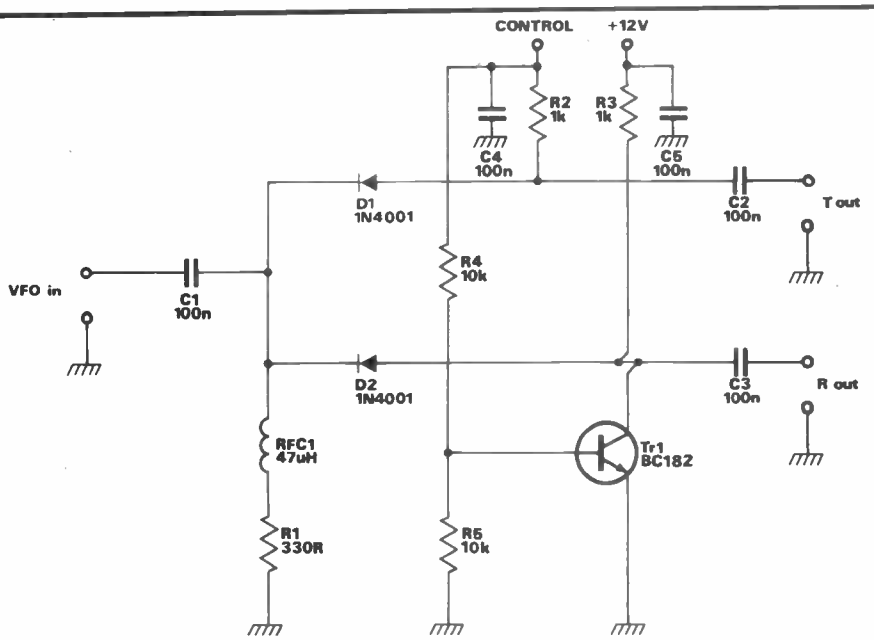


Fig 2a: *JD011 circuit, VFO T/R switch*

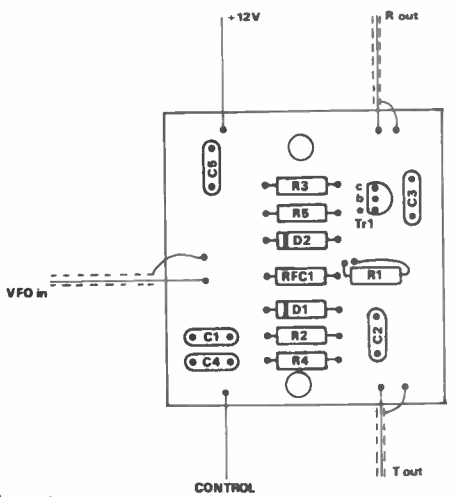
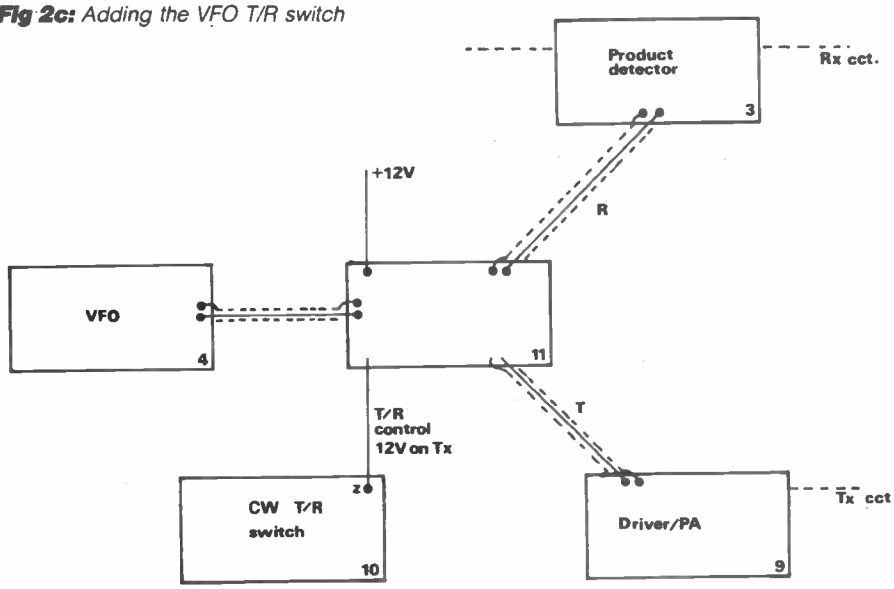


Fig 2b: *JD011 layout*

Fig 2c: *Adding the VFO T/R switch*



The VFO T/R Switch Parts List

Resistors (all 0.25W)

R1	330R	R2	1k0	R3	1k0
R4	10k	R5	10k		

Capacitors

C1 to C5 inclusive 100nF ceramic

Inductor

RFC1 47µH

Semiconductors

D1, D2 1N4001
Q1 BC182

Miscellaneous

8 1mm terminal pins
1 PCB

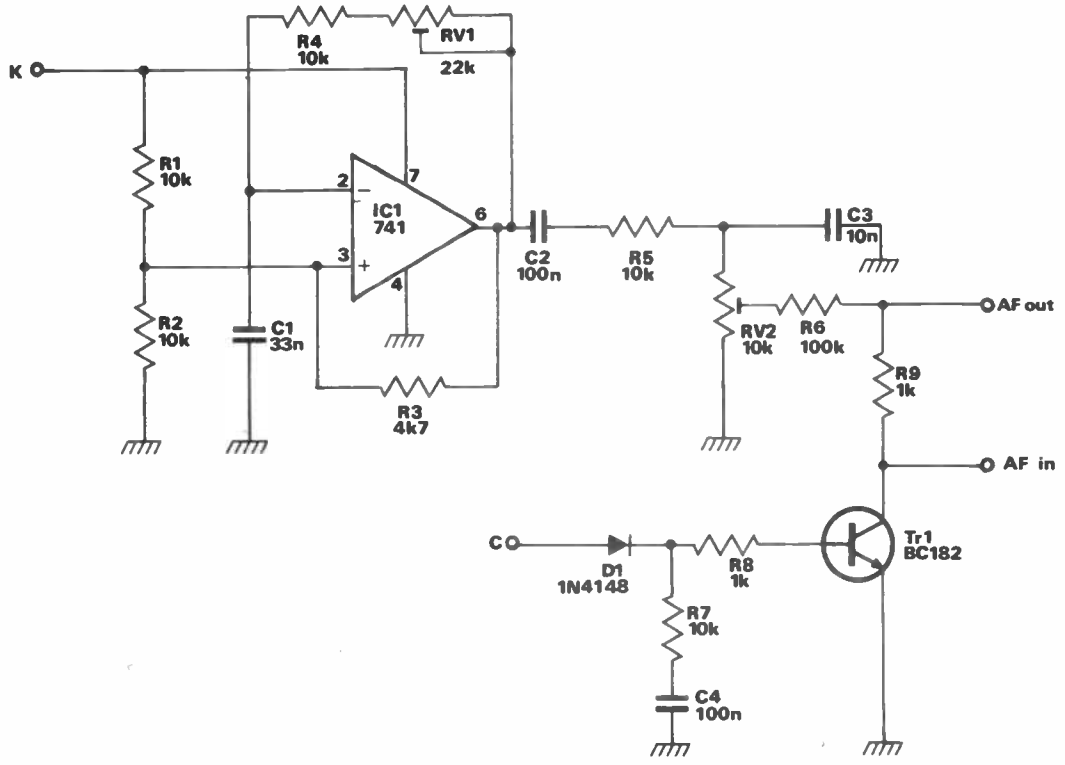
(JD010) which has a 'hang time', so that the relay is held in during normal Morse keying speeds and allows the relay to switch the antenna to the receive circuits when keying ceases. This board also supplies power to the appropriate boards during transmission.

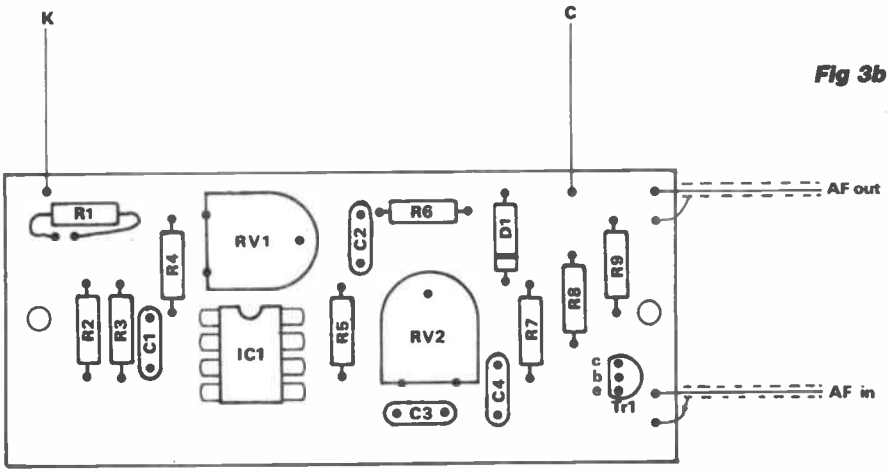
When receiving, the JD011 delivers the VFO signal to the product detector (JD003), which also receives the incoming radio signals, and is tuned by the front end module (JD007). The resultant audio signal may be filtered by either a CW (JD002-C) or an SSB filter (JD002-C), both options are shown in **Fig 1**.

Although this is a CW transmitter, there is an advantage in also having a filter with a wider bandwidth as an option when tuning for signals. The filtered signal then passes to the other new module: the sidetone and audio muting board. This module serves two functions. Firstly, it gives an audio tone switched by the action of the key via the transmit/receive module. Secondly, this tone allows the operator to monitor the Morse being sent by the transmitter.

The board also provides an audio muting facility. The receive boards are not switched off during transmit and, although the VFO input to the product detector is greatly attenuated by the VFO switch, the keyed transmitter signal will still break through on the receiver. The muting prevents this and allows the sidetone to be heard at the output. The audio output module (JD001) provides enough audio signal to drive a loudspeaker and also includes the audio frequency gain control – fancy name for a volume control!

The constructor has a choice of 160, 80, 40, 30 and 20m, depending on which frequency determining modules are used. The main modules have been described in previous issues, so let us look at the new additional modules.





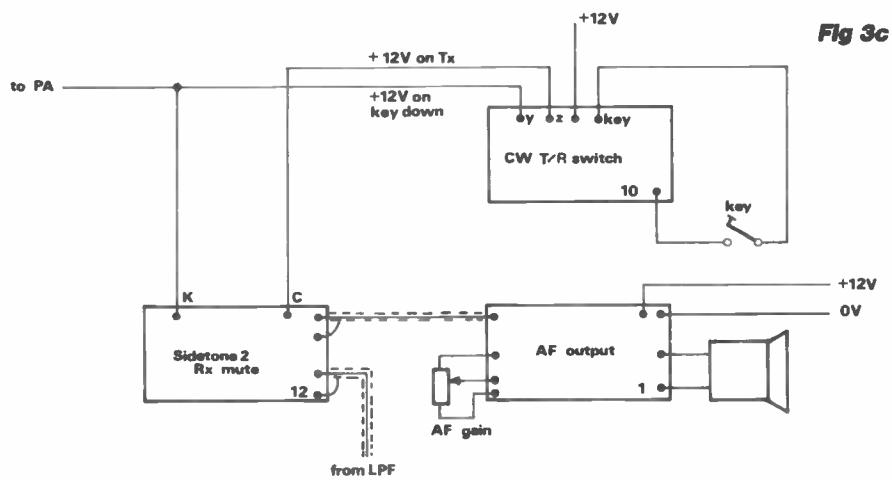


Fig 3a: *JD012 circuit, sidetone and RX mute.* ***Fig 3b:*** *JD012 layout.* ***Fig 3c:*** *Adding the sidetone and RX mute*

The VFO transmit/receive switch

The VFO T/R switch is shown in **Fig 2**, the circuit of which is quite simple (see **Fig 2a**). This diode-operated electronic switch allows the VFO signal to pass either to the transmitter modules or the receiver modules. The action is derived from a 12V line controlled by the transmit/receive module. With no voltage applied to the control point, the signal appears at the R OUT port. With 12V applied to the control point, the signal appears at the T OUT port. The insertion loss in both cases is less than 1dB. The attenuation on the unselected port depends upon the frequency. For the R OUT port it is 60dB at 1.9MHz and 40dB at 14MHz. For the T OUT port it is 40dB at 1.9MHz and 26dB at 14MHz.

The layout of the module is shown in **Fig 2b**. The circuit is very simple to build (mine took ten minutes) and the board is compact. The only error a beginner is likely to make is getting the diodes, or even the transistor, the wrong way round.

Fig 2c shows how the modules associated with the VFO switch are interconnected. The 12V T/R switch line from the T/R module must be at the output designed as 'Z' on the board. It is also important to use screened leads for the VFO signal paths, as shown in **Fig 2c**.

The Sidetone and Rx Mute Parts List

Resistors (all 0.25W)

R1	10k	R2	10k	R3	4k7	R4	10k
R5	10k	R6	100k	R7	10k	R8	1k0
R9	1k0						
RV1	22k	RV2	10k				

Capacitors

C1	33n polyester	C2	100n polyester
C3	10n polyester	C4	100n ceramic

Semiconductors

D1	1N4148
Q1	BC182
IC1	741

Miscellaneous

8 pin DIL socket
6 1mm terminal pins
1 PCB

Ideally, this should consist of miniature 50 ohm coax cable. Sometimes this is difficult to obtain so in the past I have used single core screened cable (sold as microphone cable) for such interconnections. Screened cable should be used for all the signal path wiring throughout the transceiver.

The sidetone and receiver mute

The sidetone and receiver mute is shown in **Fig 3a**. The circuit serves two functions which can be explained by considering IC1 and Q1. IC1, a 741 operational amplifier, forms an RC audio oscillator. The oscillator is switched on and off in time to the Morse keying by a 12V line from the transmit/receive changeover switch module. A preset RV1 controls the audio frequency range from around 350 to 1100Hz. A second preset control, RV2, adjusts the output of the module. The muting of the receiver is provided by Q1. A 12V line (on transmit only) attenuates the signal from the receiver prior to it entering the audio amplifier.

Fig 3b shows the layout of the module. Note that the polarity of IC1, Q1 and D1 must be correct. The audio signal wiring requires the use of screened cable between the modules.

Fig 3c shows how the sidetone and receiver mute module interconnects with the other modules. The correct output ports of the transmit/receive switch module must be used to give the required result. Point 'K' requires 12V during the keydown periods, and point 'C' requires 12V during the whole of the transmit condition.

Front end protection

Fig 1 shows how the antenna is switched between the receive and transmit modules in the transceiver.

Note that it is possible to omit the changeover relay. In such an arrangement, the tuned front end is best placed as shown in **Fig 4a**. This circuit allows the transmitted signal to enter directly into the receiver front end. This could damage the front end and even the product detector, so extra protection should be provided.

Fig 4b shows a couple of silicon diodes, mounted back to back, which limit the RF voltage reaching the front of the receiver. This can be any common silicon diode, such as the 1N4148 or 1N914.

The completed transceiver is a very acceptable rig, even for use on the crowded HF bands. By building this transceiver, the radio amateur can not only have the satisfaction of operating on the air with a completely home-made station, but can also join the increasing number of operators who enjoy the thrill of working with low power on the amateur bands.

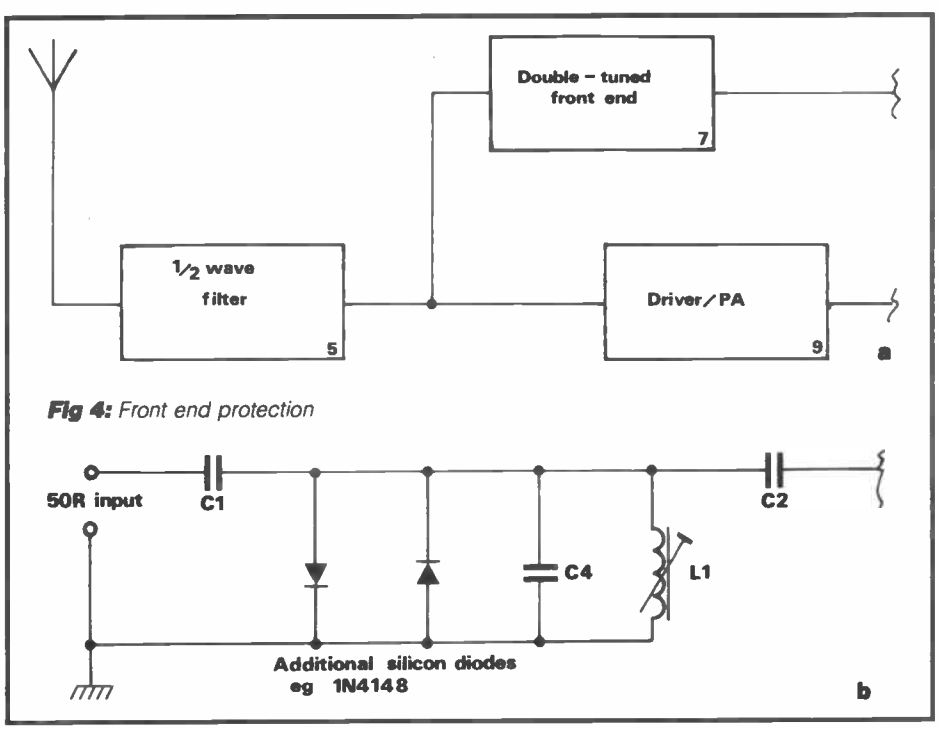


Fig 4: *Front end protection*

Sources

The JD011 VFO T/R module	£2.40
The JD012 sidetone and Rx mute	£2.65
All the modules for the transceiver can be obtained for a total of (Add £1.00 postage)	£45.00

Available from: Jandek, 6 Fellows Avenue, Kingswinford, West Midlands DY6 9ET. Tel: (0766) 762572. For postal inquiries, include a large sae.

The G QRP Club

The G QRP Club caters for those who like to build and operate low-powered amateur radio equipment. Details of the club and a free sample of the journal Sprat can be obtained in return for an sae from: Mr T Jackson G4HYY, Castle Lodge West, Halifax Road, Todmorden, Lancs OL14 5SQ.

DX DIARY

News for HF operators compiled by Don Field G3XTT

The forthcoming operation from Bouvet Island continues to be the main topic of conversation among DXers. At the time of writing some $76,000 has been pledged of the $100,000 needed from the amateur community to allow the Bouvet Island expedition to go ahead. However, the deadline for a final decision has been put back to 15 October, by which time the remaining funds may well have been raised.

This is only part of the story. Of the money pledged, 62% has been raised from Japan, and none of the US DX Foundations have come forward. Why not? Because, it seems, there are plans for a US-organised DXpedition to Bouvet Island next February (the Norwegian operation is scheduled for the Christmas holiday period). The Norwegian expedition will involve two amateurs and a small number of scientists. The American expedition is to be a much bigger affair. No less than fifteen amateurs will take part, and the aim is to keep six stations on the air round the clock. Eight FT-1000 transceivers have been donated by Yaesu.

There will also be scientific activities associated with the expedition, and seventeen US universities are involved in the scientific programme. Expedition sponsors include the **Saturday Evening Post, National Geographic Magazine**, IBM, Pan Am, Pentax and Nikon, as well as Yaesu.

Clearly this is no fly-by-night affair and has been in planning for a long time. In fact, it appears that they were almost ready to go last year, and had been allocated the callsign 3YOB, but in the end had to put the expedition back one season. The group plan to leave the US on 19 January and will travel via London to arrive in Cape Town on the 21st, where they will pick up their 168ft boat. They hope to be on Bouvet Island itself for twelve days.

The US group had invited the Norwegian amateurs to join them, rather than have two competing expeditions. The Norwegians, at least for now, have declined on the basis that they believe a Christmas expedition (therefore coinciding with the holiday period) will give more amateurs the chance to try for a contact, and also that the Americans are not planning to use a helicopter, which the Norwegians believe to be essential to make a successful landing on the island.

We can only hope all this gets resolved. Even at $100,000, the Norwegian expedition represents an extremely high cost per contact, assuming a QSO total of up to about 40,000. This seems an enormous waste of resources when another, externally funded expedition is ready to go. That sort of money could fund a myriad of operations from rather less remote but still much-wanted locations. Watch this space!

The bands

At a more mundane level, what did the bands produce during September? Rather less than last year by all accounts. Although the solar flux was high, the bands have been affected by frequent solar flares which have severely disrupted HF propagation. This may well be the pattern for the next few months as we approach the peak of this solar cycle. Between disturbances Pacific stations have been worked on 10m, and certainly the lower bands have been quite lively at times. I have spent a lot of time on 18MHz, and during the evening it is frequently possible to tune across the band and hear all continents at good strength.

In terms of DX I worked the ZS1IS expedition, from Walvis Bay, on a few bands. Although the pile-ups were large I have the feeling that many DXers are beginning to lose the thrill of the chase with these various 'new ones', at least until we know whether they will count. V63AR and others turned up with this new prefix from the Eastern Carolines, even showing up on 18MHz. Though, perhaps, the most interesting operation was one of the briefest.

GM4YLN/P showed up for a short, low power operation from Rockall, that remote outpost of the British Isles. Although seafarer Tom Maclean has operated from there previously, he did not hold a legitimate amateur licence, so GM4YLN's operation was definitely a 'first'. It's a pity he wasn't able to do more, but even getting ashore on Rockall is a major feat, never mind managing to set up an amateur radio station. Still, maybe this brief operation will encourage others to have a go in future. There have been endless debates in the past as to whether Rockall would count for DXCC. The answer has always been no, but there are lots of island chasers out there who would like a contact with this one. As it was, only a handful were lucky enough to catch it.

Forthcoming DX

By the time you read this, Christian OE2CAN will have started a world trip which will run until early February. Most of the countries he plans to visit are relatively common in DX terms but, nevertheless, it will be interesting to follow his progress. His itinerary includes: VS6, XX, BY1, BY4, JA, KH6, W6, XE, HK, HC, OA, CP, CE, CE0A, LU, CX, ZP, PY, YV, 9Y4 (Tobago), 8P, J6, FM, FG, V4, KP2, KP4, HI, HH, 6Y, C6 and W4.

F6EUX starts a one year tour of duty from Kerguelen island this month, and hopes to sign FT5XA. FD6ITD will handle the QSL chores.

DX News Sheet reports rumours of a possible operation during November from Cocos Island, with the callsign TE90M. Other news is that: RB5IJ/UG9G, UB4IYU/UG1G and UB4IRZ/UG8G will operate from oblast 004 from 9-20 November, and W1GAY will operate from the Turks and Caicos islands from 10-13 November.

Finally, some dates are firming up for the various Scandinavian operations from the Pacific this autumn. SM7PKK will join some of the Finnish boys from ZK3 (Tokelau) between 4 and 14 November, where they hope to keep two stations operating round the clock, and also to show up on RTTY and the WARC bands. SM7PKK will then move to Western Samoa where he will operate from 16-27 November, and then maybe to T30 (Kiribati). Meanwhile, OH4ML will sign A35ML from 7-22 November (3D2ML in the contest) and will then be in the South Cook islands from 28 November until 4 December.

To celebrate the period of maximum activity in the present-day sunspot cycle twenty-two, there will be a Dutch special event radio amateur station active from 11-12 November. This station will be situated within the grounds of the astronomical observatory 'Simon Stevin', at Hoeven, in the southern part of the Netherlands, near the sun observatory. Activity will be from 0800-2100hrs on the Saturday and 0800-1500hrs on the Sunday around 3675, 3775, 7075, 14275, 21275 and 28575kHz. All QSOs will be confirmed via the bureau with a special QSL card showing an aerial picture of the observatory in full colour.

Prefixes

To celebrate sixty years of amateur licensing in the Netherlands, Dutch

amateurs were to be allowed to add sixty to their prefix from 1 October until 30 November. Thus, for example, PA3ZZZ would become PA63ZZZ. A free certificate will be available for working thirty of these special stations. Send a certified list to PA0BN.

One of the US bulletins reports that stations from Franz Josef Land will soon have new prefixes, perhaps 4K3 or 4K5. To celebrate the 350th anniversary of the province, stations in Ontario were due to use the XL3 prefix from 24 October until 24 November.

Islands on the air

Roger G3KMA, who administers the IOTA programme on behalf of the RSGB, has recently announced some administrative changes to reduce his rapidly increasing workload. With immediate effect any claims and updates from UK amateurs and SWLs should be sent not to Roger but John Kay G3AAE. I will be dealing with claims from several European countries, including Eire. And for the island chasers, the Florida West Coast DX Ring will sign KO4J on all bands CW and SSB on 11-12 November. This is NA64 for IOTA. QSL to KO4J.

DXCC news

Still no clue as to when the DXCC will vote on the various potential new countries. Meanwhile, one piece of good news is that A61AC QSL cards are now acceptable for DXCC credit.

Hambank

The special telephone number for getting the latest DX information has recently changed to (0426) 925240. Calls from anywhere in the UK will now be charged at the local rate, which should do much to reduce the phone bills of active DX chasers!

Packet Cluster

The Chiltern DX Club have gained permission from the RSGB to set up the UK's first Packet Cluster network for DX alerting. The cluster node has been allocated the callsign GB7DXI (DX Information) and will be located in Wokingham. Primary access will be on 4m (probably 70.325MHz), though it will also be possible to network into the system via NET/ROM on 144.675MHz. Anyone interested in using the system is invited to contact G4LJF. A donation of a few pounds towards the setting up and running costs would be appreciated.

I have mentioned Packet Cluster in the past in both this and my World of Data columns but, just to remind you, it enables stations equipped for packet radio to put out or receive 'alerts' regarding DX stations, unusual propagation etc. The software also provides for a database of QSL managers, beam headings and other useful information. There is, of course, no reason why the system should not also be used by the VHF fraternity for similar purposes.

CQ World-wide CW Contest – Expected Activity

CT3 . . . Madeira	SM5GMG will operate single-op all bands from the Atlantis Hotel. CR3A will be a big multi multi
J6 . . . St Lucia	Members of the SW Ohio DX Association will return for a multi multi operation as J6DX. They will be there from 21-30 November with SSB and RTTY outside the contest
KC6 . . . Belau	K1XM and KQ1F hope to be on from here
P4 . . . Aruba	W2GD will sign P40GD from 22-28 November taking in the contest. During the contest check 160m each hour and 80m each half-hour from 0200-0800hrs. QSL to N2MM
T32 . . . Christmas Island	WC5P plans an operation as T32BE, and WD5F as T32BO
VP2M . . . Montserrat	NF6S and others will operate as VP2MU
3D2 . . . Fiji	OH4ML will sign 3D2ML
4U1ITU . . . ITU Geneva	CQWW CW will be operated by a large team consisting of N7BG, K5VT, KC7V, W7CB, W6OUL, W6MSG, WZ6Z (and maybe G3SXW). There will be SSB activity outside the contest
8P . . . Barbados	K4BAI will operate once again as 8P9HT. He will be there from 22-29 November, concentrating on 1832, 3525, 7025, 10118, 14025, 18070, 21025, 24898 and 28025kHz. QSL to his home call

Table 1

Contests

The big event this month is, of course, the CQ World-Wide CW Contest on 25-26 November (see the September column for general background and operating tips). Table 1 gives details of all the special contest operations which I am aware of. No doubt there will be others. To encourage single-operator multiband operation (perhaps the most challenging entry category) in the CQWW Contests, the Chiltern DX Club has announced that it will sponsor trophies for the leading UK station in each leg of the contest, starting with this year's events.

Of course, there are plenty of other contests during November. The OK DX Contest, a multimode event, is on 11-12 November and runs from midday to midday (GMT). The same weekend sees the Worked All Europe RTTY (thirty-six hours from 1200hrs on the Saturday), so these two contests manage to take up all three principal modes between them! If you want to escape it will have to be to the WARC bands. The RSGB and the Austrian 160m contests are on 18-19 November.

Looking into December, there is the ARRL 160m Contest on 1st-3rd, the EA DX CW Contest on 2nd-3rd, and the ARRL 10m Contest on 9-10th.

Awards

I am pleased to say that the price of the various Ascension Island awards which I mentioned in the September column has now been halved to £2.50, $5.00 or ten IRCs.

The special callsigns CT500A CT500B CT500C and CT500D will be aired from Portugal from 1-12 December to celebrate the discoveries made by Portuguese navigators five centuries ago. If you work all four stations you can apply for a special award, consisting of a colourful reproduction of an Old World map showing Portuguese discoveries. Send details of the contacts plus the fee of $5.00 or eight IRCs to: REP Awards Manager, Portuguese Discoveries Award, PO Box 2483, 1112 Lisbon, Portugal.

The Kuwait Amateur Radio Society is sponsoring a contest from 30 October until 12 November. The aim is to work at least two Kuwaiti stations or the club station 9K2RA on any of the 80 to 10m bands. The stations you work will give you a special serial number. Send details of the contacts including this serial number to: The Kuwaiti Society, PO Box 5240, 13053 Safat, Kuwait, to claim your award.

Congratulations

A number of congratulations are in order this month. Firstly to Andrew Shaw G0HSD, the first recipient of the G5RP Trophy for the most progress in DXing in a twelve month period. Andrew is a young amateur who has achieved a high countries score in just a short time, mostly running 'barefoot'. Andrew has also done his bit for other DXers by taking part in the GB0FLA/GB0SK operation last July.

Secondly, congratulations are due to Ian Shepherd G4LJF, who is this year's winner of the ROTAB Trophy for consistent DX achievement over a period of time. Ian is an airline pilot and spends long spells away from home, but has nevertheless achieved high DX scores on all bands and is one of the few UK holders of the five-band WAZ award. Ian has also put his travels to good use with excellent DXpedition operations from D68, 3B8, S7, V2A and other exotic locations. He is also the current chairman of the Chiltern DX Club.

While talking about the Chiltern DX Club, they have recently decided to award their Certificate of Merit to Martti Laine OH2BH, who this year alone has been involved in DXpeditions to XF4, SO, CT3, EA8 and 4J1, and over the years has done a tremendous amount for both DXing and contesting.

Roger GW4OFQ and Dave G4GED have both joined the exalted ranks of five-band WAZ holders in recent months. There are still fewer than 250 holders of this award world-wide, despite the fact that it has been around for over ten years.

Last but by no means least, congratulations to Fred Hall G3NSY, a 'white stick' operator, who recently made it to the DXCC Honor Roll.

That's it for another month. I'm always interested in any snippets of news you may pick up on the bands, so keep the information rolling in via the editorial office or direct to: 105 Shiplake Bottom, Peppard, Henley-on-Thames, Oxon RG9 5HJ.

SECOND-HAND

by HUGH ALLISON G3XSE

You've taken it to bits, repaired it and are just putting the final few screws back in the case when 'click' – the thread strips. It's bound to be a screw on the front, right where it shows. First of all, unscrew it. Very occasionally the thread has gone on the screw – if you can, wop in an identical replacement.

More often than not, it's the thread in the equipment. If the screw goes into wood (rare in amateur or domestic stuff these days), a matchstick, with the head removed, inserted in the hole might restore the action. I've occasionally got away with this in plastic, but take care, too much wood down the hole may split the plastic and make things worse than they are.

Another case has a thin metal panel tapped with a fine pitch thread – say a sixteenth of an inch of aluminium with a 6BA hole in it (no metric rubbish here!). Sure, you can enthusiastically drive in a slightly larger self tapper, but you are going to be extremely lucky if the head looks identical to all the other screws. One solution is to change them *all* for identical self tappers, though this can be time consuming.

The Allison bodge is to cut slivers of Sellotape and poke them through the hole, so that the sliver is sticking out of both the top and bottom of the hole. Now, do the screw back up. This works really well and can be tightened to a surprisingly high torque. For a 4 or 6BA hole, only one or two slivers, twenty-five thou wide, will be needed. When the screw is done up cut off any excess with a sharp blade. Incidentally, the adhesive side of the tape to the old thread in the hole seems to work best.

Lead lengths

In came an early Yaesu 2m wonderbox, FM and crystal controlled. The thing had stopped transmitting. The proud owner had found an open circuit driver transistor, replaced it and now there were only three watts out instead of the expected ten.

On opening up the rig, I discovered what a magnificent job he had made of his attempted repair. No half-burnt cable forms, no missing hardware, no blobs of solder – an excellent repair; well, almost.

I turned my attention to the repair. To my feeble brain it didn't look quite right. I got out the handbook (arrgh, don't tell anyone) and sure enough there was a photograph of the PA stage, not looking quite as it did now.

It later transpired that the owner had been worried about the emitter lead shorting to the transistor case (the transistor was inverted within the PA, about level with the track). Thus, he had put a bit of insulating sleeving over the emitter lead and run it round, in a big arc, well clear of everything to a new earth half an inch or so from the original Yaesu earthing point. This was his big mistake.

A short length of wire at 144MHz, or above, can have a considerable inductance compared with the low impedance of the emitter. This leads to low output power. In this case, restoring the layout to its original state, with about three-sixteenths of an inch of wire, instantly gave 11W out.

A very similar effect is noticeable in high power, lower frequency amplifiers, say the PA in an HF band transceiver. Short emitter leads or tags *must* be kept as per the original design, or you are going to be disappointed.

Lodge Farm car boot sale

How about a car boot sale held in an open field with no shelter, in a thunderstorm? You wouldn't expect it to be a success, would you? The surprising thing was, for buyers, it was excellent. The poor sellers were obviously trying to prevent their stock being ruined by the rain, yet, having paid their exhibitors' fee, wanted to sell it. Hence, there were some excellent bargains to be had.

The turnout, given the atrocious weather, was amazing. In a large field there were two rows of sellers, and a third of the field was taken up with buyers' cars. Given better weather this event could well mature into a winner. It has definitely got to be a date for your diary next year.

I have only two moans. One; my wife described the toilet as 'basic' – she was being polite. Two; buyers were left to park their cars, get out, don bad weather gear and get good and wet, *then* an official came up and asked them to park elsewhere. Why not show people where you want them to park when they come in, not five minutes later?

Screening

In came one of those modern Micro Miniature 'put it in your pocket and lose it 'cos it's so small' 2m FM boxes. The fault was it 'blocked out TVs'. The first move was to put it, via an attenuator, into a spectrum analyser. Good grief, it was a comb generator. Mucked every MHz or so from 1MHz to beyond 900.

I took the covers off and, keeping it transmitting, ran my fingers round the unit and watched the spectrum display. One can was obviously 'hot' – a finger on the can radically altered the rubbish coming out. I turned it off and AVO'd the said can, on ohms, to another can. It was a dead short, as it should have been.

I up-ended the board and examined the solder connections with an eyeglass. The can had two earthing lugs, as usual. One was a dry joint. Now, the can wasn't being used to transfer an earth across the board or anything flash, there was plenty of copper in the area and the lugs were only holding/earthing the can. I remade the joint and the set was clean, without a trace of instability.

'Wrong' IF

At the Lodge Farm 'do', I came across an elderly amateur flogging an amateur bands only receiver in good physical condition for a tenner. It was obviously easily worth that and, even if not working, I was sure I could sort it out. He said that it more or less worked, but the BFO didn't and the tracking (ie, the alignment of where it tuned and where the dial said it should be) was a bit out. He said he had aligned it himself. Perhaps I should have known better . . .

On the bench, the signal generator was 10μV at 14MHz, 90% AM, and a good healthy squark came out at the appropriate spot. 14.2MHz came up at an indicated 14.3. I turned on the BFO . . . and, nothing. I went in with a 'scope and the BFO started oscillating. I transferred the lead from the 'scope to the counter; 1.62MHz, spot on. Did I mention there were two crystals, resplendent in the IF chain, with 1.62MHz stamped on them?

I must confess, I tried to increase the BFO injection into the last IF coil. I really am stupid at times. Then I stuffed an aerial up the receiver's appropriate socket, tuned in an SSB station and reset the signal generator to carrier only, 1.62MHz, mod off, 1V out. Even this wouldn't produce any resolved SSB.

I swung the generator frequency round a bit; nothing. I swung the generator frequency round a lot; bingo, it 'mixed' at about 2MHz. Intrigued, I connected the counter to the local oscillator and set the receiver dial at the low band edge – 3.5, 7, 14MHz etc. Each local oscillator was coming up 2MHz high, not 1.62 as you would have expected.

I connected the signal generator to the IF strip, and got loads of reaction to a 2MHz signal, but bugger all to 1.62, despite those two crystals. I left the generator connected, 1.62MHz, 90% mod, 1V out blasting into the mixer grid, and tweaked an IF coil. There was a faint squark. Twiddled some more, and up came the sensitivity.

Of course, the set was now 400kHz out on all ranges, but the front end was soon re-aligned and then tracked well. As a bonus the BFO worked and overall sensitivity was about the microvolt level.

The previous owner must have really

put some effort into finding a spurious response with the two crystals and 're-aligning' the whole front end to suit. Arrgh!

Belcom LS20 XE

These fag packet-sized boxes are 2m FM hand-portables. Synthesised tuning in 10kHz steps is done on thumbwheel switches, then there is a push button for another 5kHz. There is a little flap for other tricks: ±600kHz offset, high, medium or low power etc.

These rigs are very, very reliable. Some people don't like their transmitted audio and it does, indeed, sound a little muffled, but it's not too bad. Receiver sensitivity is good; a couple of hundred nanovolts seem the going rate for 12dB or so quieting on second-hand examples that have come my way. The plastic case is a bit fragile and the little flap, referred to above, is easy to lose.

Now the good news. Internal batteries are four of the 'next size down from a pencell', AAA size if you must be technical. You can buy these for 25p each at photographic shops, and a quid's worth lasts a surprisingly long time. You can also buy rechargeables in this size quite cheaply.

Prices are all over the place. At the G-Mex rally at the start of the year I was amused to see two examples sell on the bring and buy, one at £85.00 and one at £35.00, both in equally presentable condition. The £85.00 rig sold first, which had me puzzled. I've seen another eight sell this year and overall the price averages out at a shade under £70.00, which seems reasonable. I like them.

Multitone TB1

I can remember, as a kid, going to the 'RSGB Show' in the Royal Horticultural Halls in London. It must have been in the early 'sixties, and there wasn't a lot of your Japanese rubbish there then.

One stand that really stood out was the Multitone display. They were exhibiting a really small, hand-held, self-contained transmitter. About the size of a small matchbox, these things ran a few milliwatts on 172.5MHz and were proudly stamped 'Made in England'. The aerial was a foot or so of trailing wire.

At the time my home-made 2m rig covered the best part of a table, so this wonderful little box was unbelievable. I remember standing in awe as the salesman demonstrated it, saying how it was rugged and designed for use on building sites and the like. The cost was staggering to me – about a year's pocket money – so I could only dream.

A few weeks ago I came across a box full of brand new Multitone TB1s, at a very reasonable price indeed. Shortly after I bought the lot I started coming across them at rallies; after twenty-five years of not seeing one they are now freely available.

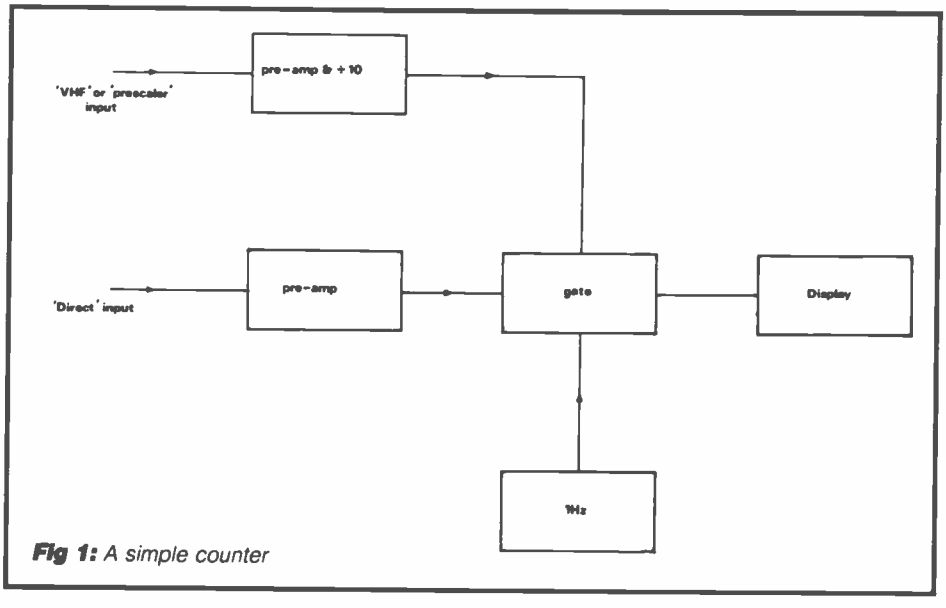


Fig 1: *A simple counter*

Most of the ones I have come across don't work. Nobody seems to know what batteries they are supposed to run on, or if they are still available. There is space inside for two cells – therefore, it could be 3V or the slots could be for, say, two batteries of 3V each, viz 6V. One I bought came with two good 1.4V mercury batteries fitted, but that didn't work either. As they come, they seem to run all right with greater than 4.5V applied.

On the workbench

Opened up on the workbench it was quickly revealed that, with 2.8V applied, there was only a couple of hundred millivolts to turn on the oscillator transistor. Increasing this produced all the required action, so assuming we are indeed modifying for 2.8V I'd suggest a 2.7k resistor across the oscillator base bias resistor. This is easy to find since it's the only 4.7k resistor on the board. There is, surprisingly, plenty of room inside to add this resistor.

Continuing with batteries, take care. There is, freely available through photographic shops, a battery that looks like it will fit. And so it will, but the connections, + and –, are wrong. The TB1 has a big red + inside and it means it (both cells point the same way). Since these are the only batteries I've managed to obtain for them, I've modified the battery contacts to suit.

I'll bet I've got the above totally wrong – someone is bound to write in and say the TB1 runs on 9V using such and such a battery, freely available in their area. Nevertheless, I'm happy with what I've done.

The TB1 will modify for 2m, given the correct crystal and a couple of 20pF capacitors across the coils, and the range is quite surprising, often half a mile hand-held to hand-held.

Prices seem all over the place, £5.00 to £15.00.

One final point, on getting it out of its case. First undo the crosshead screw on the front. Next, take the back off using the 'secret' button. It's hidden in the battery compartment, on the back, and looks like a silver dot. Press this in with a pin and off comes the back. The front is held with two very small screws halfway down the side. Incidentally, these screws *must* be present and correct as they make the contact to the case, which is part of the on/off switch. No screws, no action.

All in all, a dead handy little gizmo. Ideal for keeping in touch with friends at rallies, around the house etc.

Counters and stuff

A friend's counter had died on him. This was a fairly early device built by a firm that no longer existed. It did 0 to 35MHz direct, then 30 to 350MHz via another socket, ie, via a ÷10 prescaler, see **Fig 1.**

A counter is not that difficult a concept to understand. A preamp amplifies the minimum input signal, often 5 to 10mV, up to, say, 5V. This goes up one leg of a gate, the other leg being fed the time interval signal – often 1Hz. All that happens is the gate lets through a number of cycles of the input signal for a known time. This total is then displayed.

Since the overall accuracy of the instrument depends on the tolerance of the time signal, this is derived from a high stability crystal, often 10MHz, divided down to give an accurate 1Hz. For increased stability the crystal may be in a temperature-controlled oven.

For higher frequency work, say above 50MHz, special chips have been developed that will happily whizz away to GHz, often at millivolt input levels, and give out ÷10 of their input frequency at about the 5V level. This feeds directly into the gate, as in **Fig 1.**

This was not always the case. Some

years ago only ÷4 was available, for example. A counter that required its display to be multiplied by 4 was obviously not going to be a big seller, so the crystal in the timing circuit was changed to make the display read correctly. This explains why some counters contain 'odd ball' crystal frequencies.

The 'scope probe revealed . . .

Right, back to our friend's dead counter. The display just showed noughts. An attack by a 'scope-probe revealed that the preamp and prescaler were working, the timing was working but nothing was going through the gate into the display section. The gate had bought it, a humble 7400. In with a new one; bingo, it worked.

Most chips have a clearly defined upper frequency limit, let us say 30MHz. This is specified as the maximum speed they can whizz at *driving a defined number of loading gates.* A chip might be capable of going at 30MHz into ten loads, but load it with only one gate to drive and it *might* go at 50MHz.

I'd noticed that the ÷10 prescaler was a 520MHz spec device, yet the counter had been sold as a 350MHz unit. This was due to the 7400 being used as a gate. My friend confirmed that the counter did, indeed, conk out at 35/350MHz, yet with my 7400 fitted it now did 40/400.

My friend is a 70cm fiend and said that he would like his counter to work there. How could the response be 'stretched'?

In the end it was decided to gamble. A whole quid was fluttered at the Woburn rally to buy as many different versions of 7400 as could be found – ie, different manufacturers and dates. We got thirteen for our pound (priced from 5 to 10p) and one worked to 65MHz.

The counter now did 65MHz direct and 530MHz via the prescaler – the specification of the prescaler chip was now the limiting factor.

MX4/MX6

Many moons ago, no-one would have dared dream that British amateurs would get back 50MHz. Thus when Mizuho made a 50MHz variant of their super little SSB hand-portable transceivers, they became 70MHz boxes for this country. These sold quite well and turn up occasionally, second-hand, at rallies in the £35.00 to £55.00 price range. Of course, now people want to convert them back to 50MHz.

Good news. I received a few queries on the conversion from readers and contacted Lowes, the original importers. They have prepared what they call 'a screed' on conversion and are happy to send a free copy of this, which includes a circuit diagram, crystal calculations and what capacitors go where, if you send them an sae marked MX4 Conversion. Considering the sets were sold several years ago, and could well have changed hands many times, I think this is an excellent after-sales service!

A warning on legality. We are not permitted mobile or portable on 50MHz, and aerials are supposed to be horizontal. With such a fine little rig it's tempting to take one out for a walk with you. Naughty, naughty.

Next month Hugh Allison reviews a few of the rallies he has attended recently and reveals the bargains he found there

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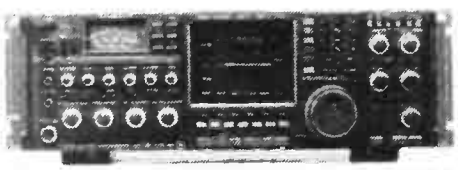

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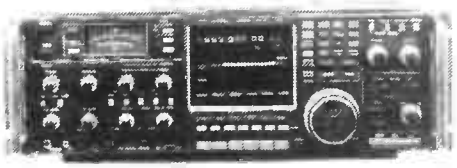

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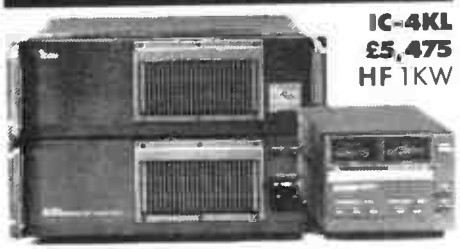

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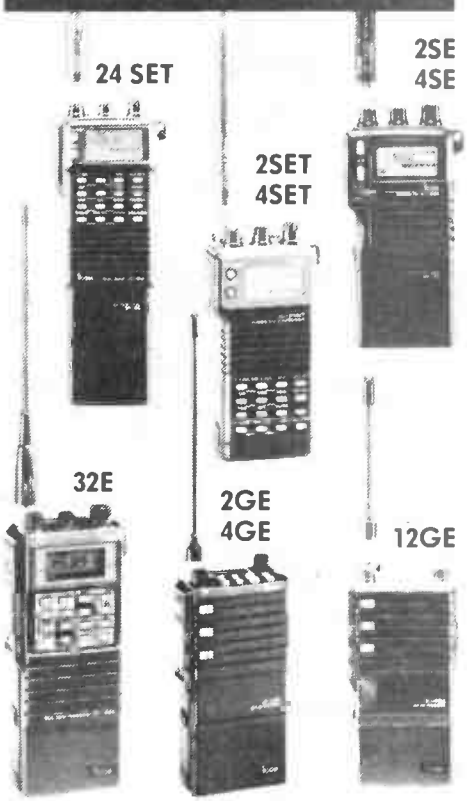

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News and comment from Glen Ross G8MWR

In the August edition of this column, I wrote about the problems of repeater abuse and how little seems to be done about it. I quoted some interesting points made in a DTI report which seemingly gave the RSGB the opportunity to engage in self-policing of the amateur bands. The idea was that the society would gather all the evidence, send it to the powers that be, then the offender would be warned and, if no notice were taken of this, would be closed down. It would seem that if this facility had been made available to us, the society would have grabbed the opportunity, advertised it like mad and waited for the documented complaints to come pouring in.

So what?

As none of this has happened, I assumed that these powers were not offered to the society or, if they were offered, had been refused. 'So', I ask, 'who blew it?' The answer seems to be that nobody blew it and that the society can actually do these things. Being very 'British' and therefore not the sort of people to advertise their importance ('I say, just not done, old man!'), they simply kept a discreet silence about it.

The mole report

Yes, our friendly little mole has been busy again with the following information from the society ranks. I quote, more or less verbatim:

'We do already have an agreed procedure *which is well established.* Under this the RIS will respond to any cases of fully documented illegal activity which are reported to them by the RSGB. Most reports of repeater abuse which the society receives do not contain any information which would stand up in a law court. I am afraid that, without proper evidence, our hands are tied.'

The evidence

Now we know the procedure exists and that it is not being put into operation owing to a lack of suitable evidence. This now brings up two further points. The first is that since the society has not told us that they have these powers, they are not likely to get any evidence. Secondly, they have not told us the type of evidence we need to obtain so that it will stand up in court.

Obviously, what we need to have in **RadCom** is a clear-cut statement telling members exactly what powers the RSGB now has and which also clearly defines the type of evidence that is required.

More feedback

You may remember my comment about the strange burbling noise being heard around 144.4MHz, a frequency used by many meteor scatter operators. A packet message from G4FIK throws some light on the problem.

After a lot of DF work the source of the problem was traced to an Economy Seven switching system, made by Sangamo Schlumberger. This time-switching device is used by several electricity authorities. It contains a receiver which is tuned to the Radio Four broadcasts on 198kHz and listens for a superimposed signal which tells it when to switch to and from the cheap rate. Martin says that further searches have located similar nasty noises at three other locations and that in each case the problem was traced to the same switching device. He is now trying to gather as much information as possible to pass on to the RSGB in the hope that they will do something about it. You can contact him QTHR.

Beaconry

Strange things have been happening to the 432.98MHz beacon at Sutton Coldfield. People have been reporting a vast increase in signal strength for short periods, with changes in apparent frequency and all sorts of odd-beat notes and heterodynes appearing. All is solved.

Someone, and at the moment no one seems to know who, has launched a new satellite which is transmitting on a central frequency of 432.88MHz. But owing to Doppler frequency shifting effects as the craft moves, the received frequency varies and so causes the problems. Doppler shift is well demonstrated when you hear the change of pitch to the siren of an ambulance as it passes you. The new craft takes about two hours to orbit the Earth and, on a fairly overhead pass, can be received for about twenty minutes.

Packet matters

A report from G8ADH mentions that he and G4FPV are now running a packet link on 10GHz. One thing is for sure, the system will not be asking for repeats on packets that have been corrupted because of collisions; it must be a real joy to operate that outfit.

There has also been a lot of interest in just how much privacy there is for messages that are sent around the country. Yes, I know that if you send your message as SP G8MWR @ GB7NUN then, in theory, it is a private message to me and is only readable by my TNC.

Simplistic

It really is not as simple as that though. What happens as one board passes it along to the next in the chain? Anyone who has spent some time monitoring will know that there is little privacy in that part of the chain. Also, if I want to be sneaky and read some other person's mail, then all I have to do is issue a MYCALL to the TNC telling it that I have changed my call to that of the person whose mail I want to read. The system will think it recognises me and promptly send me your mail. The truth is that there is no privacy on packet.

WT acts

The argument continues: it is an offence to read someone's mail under the various regulations, and you cannot make use of or divulge such information to a third party.

This may well be true if you are listening to, say, a Reuter's news service, but does it apply to the amateur service? The answer, I think, is it does not. Because under the general licence conditions *anyone* is entitled to listen to broadcasting stations, amateur stations, standard frequency transmissions, and the like. There is no implied confidentiality allowed to any of these types of transmission. The answer seems to be that, apart from expecting reasonable standards of decorum from your fellow amateurs, once you press CONTROL-Z to send your message it is open to anyone who cares to read it. About the only thing that SP achieves is to stop your message getting listed on the contents of the local bulletin board.

VHF nets

I thought it was easy to understand the uses of the VHF nets which operate on the HF bands, but there is still confusion as to where they are and how they work. So let's run it again.

First the VHF net on 20m. This one can be found by tuning around 14.34MHz using USB. There you will hear people setting up moonbounce skeds, details of tropo openings, and all sorts of other news. The net is not run on formal lines, people simply come on frequency, call CQ VHF and pass information to whoever may be around.

The second one is concerned with people who are not licensed for 50MHz and who try to work crossband from 10-6m. You will find this one on 28.855MHz USB. Listening on this frequency usually gives an early warning of openings on 6m and is a must for all serious operators.

6m

Good news of more countries coming up on 6m. ZC4 stations, in Cyprus, are now allowed on the band, and ZC4MK has been active from the Episcopi club station and regularly monitors 28.885MHz. There are no details so far as to any power, aerial or other restrictions that may apply. Turkey was due to appear on the 6m map early in October when G3SDL was given permission to operate from Antalya in locator square KM56IV.

Moving a little nearer home we come to the biggest surprise of all with the news that the Belgian authorities are going to start issuing permits for the band. Our own power limitations etc, are because of Belgian worries about TVI, so it would seem that either there have been no problems or the Belgian lads are going to have to operate under some very stringent constraints. This one is not a new country but rather news of continued operation from Gibraltar, where GM6TKS has been posted for a three-year period. He will probably be active by the time you read this.

50MHz analysis

Much of the following information is from G2AHU and his excellent analysis report. He starts by saying that August showed a definite seasonal decline in the amount of Sporadic-E activity, particularly from the middle of the month. At the same time the TEP activity started to improve, as did F layer propagation; this was particularly noticeable towards South America. A particularly good day in that direction was 24 August when signals from LU, CX, PY and ZD8 appeared in the late evening and culminated in the first QSOs between Britain and Brazil.

Track record

Looking at some specific paths and areas, we get the following results for August. The ZB2VHF beacon was heard on twenty-five days, with signal strengths averaging S7. CT1WW and various EA and CT amateurs were heard on fourteen days, with signals at about S8. The 9H1SIX beacon and various Maltese amateurs were heard on ten days, with signal strengths consistently around S6. Scandinavia (which, for our purposes, includes LA, SM and OH stations) was available on only four days, with signals running at around S7. France, Italy and San Marino did slightly better with signals at S9 on eight days.

Moving on

Central Europe, which includes Switzerland, Germany and Austria, was only available on five days. The Cyprus beacon, 5B4CY, only appeared on 2 August but Uraguay and Argentina managed five days each. Greece, Corsica and Algeria all weigh in with six days. Going South, ZD8VHF, the Ascension Island beacon, was received on four days at about S5, as was ZS3JO in Zimbabwe. The Transvaal ZS6 was heard on eight days while ZS3VHF, in Namibia, was heard on no less than seventeen days with signal strengths ranging from S3 to S9, but averaging out at S6. Reports of aurora were made on the 17th, 21st and 23rd of the month.

Close-down

Late news is that ZS3JO worked twenty-seven G stations on 5 August, three on the 6th, four on the 8th and three on the 25th, you must be in with a chance! We are now coming into the period when we usually get very good tropo openings on the VHF bands, early November being excellent year after year. Send your news and comment to: 81 Ringwood Highway, Coventry, or contact me on packet at GB7NUN.

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The main processor in the Microreader is an Intel 8032 running at 12MHz. This makes it fast enough to not only decode and display the text but also to measure and diplay the frequency a few thousand times each second. It's even fast enough to use its own dictionary to check and correct the text even down to punctuation. The RS232 port in the Microreader can if you wish be used to send decoded messages directly to the screen of a terminal unit or suitable computer. If a permanent record (hard copy) is needed, then just connect it direcly to a compatible serial printer.

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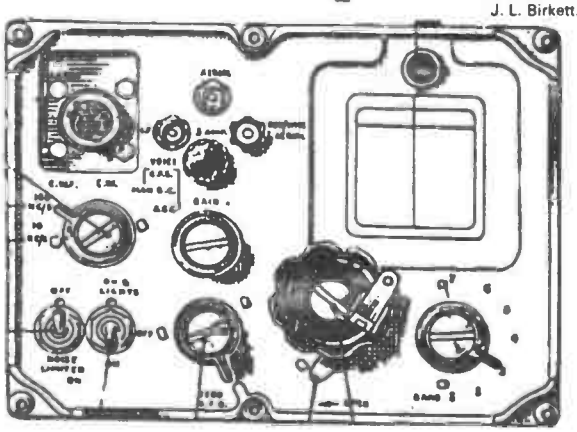

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PROJECT BOOK

by Martin Williams

This month, let's continue with the saga of useful ideas for building power supplies from material that is not what you wanted but is cheap.

The October edition ended with information on using more than one secondary winding to obtain the volts and amps that you want. What happens if, even after the horse-trading, you are still a bit short?

Boosting

The various voltages shown on the transformer label are only accurate if the mains voltage is fed to the correct tap. Now, there is nothing sacrosanct about these inputs and it is perfectly safe to feed the normal mains into the pin marked 240V. All that will happen is that the secondary output voltages will rise by about 10%, giving an extra 1.5V on a 15V secondary. This may make all the difference between having enough volts for the stabiliser to work properly or not.

Remember, though, if you have raised the voltage by 10% then you should downrate the current rating by the same amount so that the secondary wattage stays within specification. I say you should because, in fact, most secondary windings – and indeed the core ratings – always have more than enough in-hand to cope with the extra little bit of load.

Extra volts

If after using all the ideas presented so far you are still a little short on volts, then the answer may be to wind on some extra turns. Many transformers have sufficient space between the winding and the inner edge of the iron core to accept extra turns without much difficulty.

Now to the method. First of all wind ten turns of wire, the gauge is immaterial, around the existing transformer windings, taking the wire between the existing windings and the core. Now connect an ac voltmeter to this winding and connect the normal primary to the mains. This will show you how many volts the extra ten turns are providing, and from this information it is simple to calculate how many extra turns of wire you need to meet your extra voltage requirements.

Windings

Now remove your test winding and wind on the calculated number of turns, using some tension to keep the wire firmly in contact with the existing transformer covering. You should also ensure that there are no kinks or damaged insulation between adjacent turns of wire. Remember that you must use well insulated wire which is capable of carrying the current required. When this is done, connect one end of the new winding to one end of the secondary to be boosted.

Tested

Connect your ac voltmeter across the free ends of the old and new secondaries and switch on. If the voltage obtained is less than the original secondary voltage, then the new winding has been connected out of phase. Disconnect the join between the two secondaries and remake it using the other, previously free, end. Now check again and ensure that you have the voltage you were looking for. Remember that for a stabiliser to work correctly at full load, the voltage into the stabiliser should be at least 4V more than the required output voltage at full load. To finish the job cover the new winding with some tape, and then apply several coats of a good-quality varnish.

Next Instalment

Next month, I will look at rectifiers, capacitors and other mysteries of the power supply art.

Fig 1: *Method of fitting extra turns*

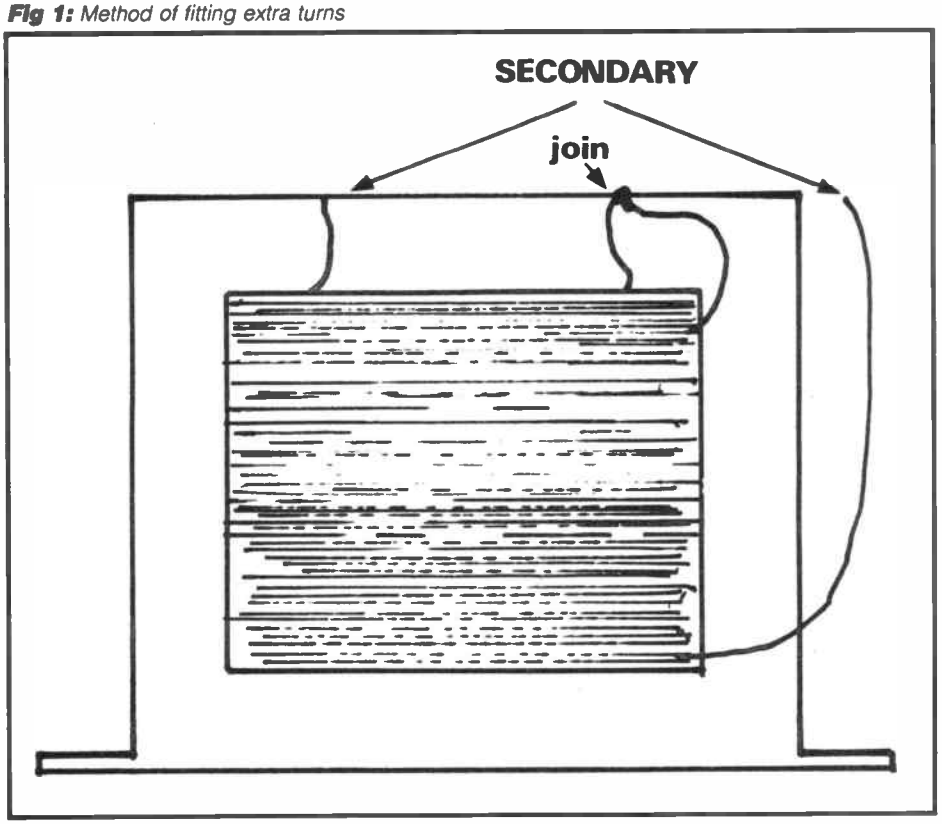
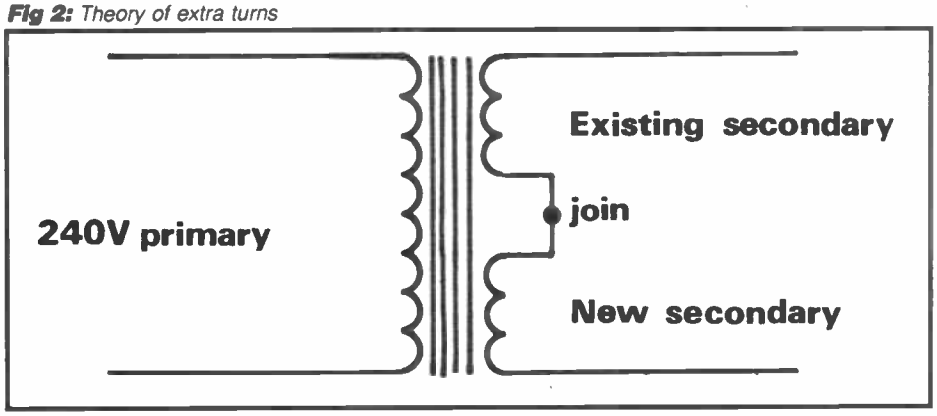


Fig 2: *Theory of extra turns*



The World of D | A | T | A

BY DON FIELD G3XTT

The winter months mean long dark evenings and plenty of time to sit in the shack and experiment. Just as well, since anything to do with computers takes for ever to sort out! Every application writer has his own approach, therefore very few applications can be used intuitively from the word go. Perhaps one day we will see some consistency!

Future potential

It will be interesting to see how our software develops, though at least there are now some very easy-to-use TNC driver programs, not only catering for packet but also the other data modes as well. If we are to take full advantage of the potential which these modes offer, it is essential that they are easy to use. Mind you, this makes some operators a little careless, so this month I want to pass on some hints and tips about packet operating procedure and the avoidance of POOP (Poor Operating on Packet).

One of the first lessons to be learned is to avoid sending frequent and elaborate beacon messages. I still see plenty of them about, with long and involved station details sent every few minutes. The beacon facility offered by the TNC2 and its clones is useful if used sparingly, but can cause lots of unnecessary channel congestion.

I explained in an earlier column about the need to set up the timing parameters on your TNC so that your packets were not corrupted by your radio as it is switched between transmit and receive. On the other hand, to set too long a timing interval will mean that you are putting out unmodulated carrier when you could be transmitting useful information. This slows down throughput from your own station and causes channel congestion for others. Experimentation is important to optimise not only these settings but others, such as PACLEN (length of packet) to make the most efficient use of the channel.

The ideal settings for PACLEN, RETRY (the number of retry attempts), FRACK (length of wait before retransmitting a frame), MAXFRAME (maximum number of frames transmitted at one time) and others will vary according to prevailing channel conditions and whether you are operating on HF or VHF, in direct contact, or via one or more repeaters, and so on.

Some software packages will allow you to store various combinations of parameters which can be reloaded into your TNC as required. Despite this, I suspect that many packet operators find a combination which suits them when they first become active on the mode, and then leave well alone.

Operating procedures

I could say quite a lot about operating procedures when connected to a bulletin board:

The way in which some operators *must* sit and have a cup of tea while thinking about which messages they want to read; their reluctance to change their user profile to eXpert (yes, just type X), despite having used the BBS for months; their insistence on typing messages into the BBS in realtime, when many TNC drivers allow you to prepare messages off-line; their insistence on reading just one message at a time, despite the fact that you can ask for up to six or more with one READ command (depending upon which BBS software is in use at your local box); and so it goes on.

All these practices mean that you are taking longer on the BBS than is necessary, and are therefore keeping other users waiting.

Fortunately, a rather different cure is in sight. As I mentioned last month, the G8BPQ and G4YFB software, running under DESQview, make it possible for the first time to have more than one user connected at once so that, unless demand is very high, you probably won't be preventing someone else from getting access.

Mailboxes

There are, of course, much worse 'crimes' where mailboxes are concerned. Every BBS carries every national bulletin, all local bulletins and personal mail addressed to its registered users. Therefore there is simply no need to connect to one BBS after another, as you will find the same bulletins at each. Despite this, I often see it happening, and mailbox DXers get in on the act when there is a lift in propagation. Mailbox DXing is downright antisocial, especially now that the packet channels are getting so busy.

Another aspect, which is often forgotten when operating packet is the tuning control! The main packet frequency of 144.650 is highly congested, but it's the standard frequency on 2m for BBS activity. This has been done deliberately to keep '625 and '675 free for other uses. Therefore, if you are involved in any sort of direct contact, QSY off '650 at the earliest opportunity. The wonderful thing about packet is that this can be done without losing the connection. Even better, of course, aim to have capability for the other bands in order to keep off 2m as much as possible.

Finally, keep your transmitted power to the minimum necessary to maintain a reasonable data rate and, if possible, use a directional antenna. This will minimise interference to other stations and reduce the amount of interference you suffer and will lead to increased throughput. Most BBS stations, by necessity, will use omnidirectional antennas. There is no excuse for the rest of us doing the same.

If you can plead innocent to all of the above, then you are doing better than I am! However, as with all things in life we really shouldn't wait for others to set a good example, but should make the running ourselves and hope that others start to see the light.

I realise that those of you living in more remote parts of the country may be wondering what all the fuss is about. What is all this congestion I am talking about? Count your blessings. Those of us who live in the South East or in or near the major centres of population are only too well aware of the difficulties. In time more channels may become available on 2m as 12.5kHz channel spacing becomes the norm and, hopefully, it won't be too long before we see BBS access being allowed on 70cm. However, learning good operating procedures now will undoubtedly help in future, because traffic is likely to keep rising to fill the bandwidth available. I suppose what we need is some driver software which will automatically adjust the transmission parameters to maximise throughput, but at least some of the factors I have

mentioned will always be up to you, the operator.

Incidentally, I'm quite sure there are other good and bad practices I could have mentioned. I will be pleased to receive any hints and tips to pass on through these pages.

DOSGATE

I was very interested to read in a recent issue of **Gateway**, the US packet radio publication, an article by Rich Bono NM1D about DOSGATE, especially given my enthusiasm for new ways to use the packet network. I make no apology for going into some detail on DOSGATE, and in the following I have drawn heavily on Rich's article (which first appeared in **NEPRA**, **PacketEar** before being picked up by **Gateway**).

Rich started the DOSGATE project about seven years ago. He saw a need for users to understand that packet radio has a greater purpose in life than simply being a great big network of PBBSs. Packet radio promised to bring computers and radio together, and most users tend to think 'PBBS' when they think of packet radio. In contrast, Rich sees packet radio evolving into something more and of DOSGATE as 'a ray of light creeping under the door that is waiting to be opened'!

If you are familiar with using an MS-DOS-based PC, then you are familiar with the DOSGATE system, as DOSGATE is the only window between the amateur packet radio network and the MS-DOS machine (MS-DOS is the operating system for IBM and compatible PCs). The functions that may be performed by a DOSGATE system are limited only by the imagination.

Where the typical PBBS allows users to send, read or forward mail, messages and files to one another and to the world at large, DOSGATE is not limited to these functions. DOSGATE allows the packet radio user to access a PC and perform almost any task, just as if he were sitting in front of the PC in his own shack. The user can be in complete control of the computer and decide which software application to use. Any hardware available to the DOSGATE system can be used by the remote network user.

It takes little imagination to understand the power available to the packet radio network with one of these machines. Just think about the applications that could be made available with a system that has a 32 bit, 25MHz, 80386 CPU, an 80387 floating-point co-processor, sixteen Mbytes of RAM and 300 Mbytes of disc storage – not to mention optical disc drives! This power is available to any user on the amateur packet radio network, including users who have only 'simple' computers at home. For example, C-64s or lap-tops, or even a 'dumb' terminal. Of course, all this presupposes that amateurs with sophisticated machines are willing and able to offer them for use to the amateur world at large, just as many already do by way of tying up their PCs as mailboxes.

Technically, DOSGATE is a software device driver for the MS-DOS operating system, running on PC-compatible computers. Simply, this means that DOSGATE is a software product that runs in conjunction with MS-DOS and allows the packet radio world to interface with the PC via an EIA-232 serial port. Basically, the computer console (the keyboard and CRT) is 'paralleled' with the EIA-232 serial port. When a remote packet radio user types something into his TNC, the data is entered into the system as if the user had been sitting in front of the DOSGATE computer and typed the data on the local keyboard. Similarly, as data is sent to the local screen on the DOSGATE system, the same data is sent out via the EIA-232 serial port in order to be sent to the remote user via the packet radio network.

Interface problems

The DOSGATE driver is needed to resolve packet radio interface problems. All problems are not solved, however, and there are some limitations. For instance, most packet radio users have local echo of their keyboards, so they can see what they are typing without the usual packet radio delays. The first problem is that most DOS systems that are not designed to be used remotely, also have local echo of the keyboard. If you were simply to interface the computer with a TNC the results would be unsatisfactory, since the user would see each character echoed twice, once immediately as the character is typed and again as it is echoed from the remote computer, but delayed by the turnaround delays of the packet radio network. DOSGATE attempts to solve this problem by cancelling the echoing of characters to the remote port.

All this sounds wonderful but, inevitably, there are limitations. DOSGATE is tightly coupled with the operating system. Any programs that bypass the operating system and use the system BIOS or directly access the hardware will not be compatible with DOSGATE. This software will still work correctly for a local user, but the remote user will be unable to make use of it. Unfortunately, mainly for reasons of speed, a lot of current software bypasses the operating system in this way and, in these cases, DOSGATE cannot help. Also, any software that simply erases the screen or uses graphics, direct cursor addressing, or ANSI escape sequences should be considered as non-DOSGATE compatible.

Using DOSGATE

By the very nature of packet radio, we have many different types of users on the network. Some use C-64s with only forty columns on their screens, some have lap-tops with limited LCD screens, while others use Macs or ATs. This all boils down to one thing: for programs to be usable with the wide range of systems that appear on the packet radio network, all software should use only the normal printable ASCII character set. This means no block graphic characters, no erasing of screens, and no direct cursor addressing etc. If you wanted to limit DOSGATE activities to a small group of compatible computers, then you could remove many of these restrictions.

So how might DOSGATE be used in practice? NM1D describes a system currently in use in Derry, New Hampshire (callsign NM1D-2), which consists of the following hardware: PC-XT with 640 kbyte of RAM; 10 Mbyte of hard disc storage; 8087 math coprocessor, Kantronics TNC 2 compatible TNC; Icom 2m 25W transceiver; 12V power supply for the transceiver; and a 2m omnidirectional antenna.

On-line software

The following software is available 'on line' to users:

AUTOEXAM – Allows a user to 'take' an amateur radio exam from Novice to Extra class. Generates a different exam for each session.

SEESATS – Generates realtime output to show where various OSCAR satellites are currently located, and can be used in a prediction mode to allow the user to plan for future passes.

GCIRCLE – The user inputs his latitude and longitude and the program then outputs a custom great circle bearing and distance chart for the DXCC countries' list.

DOSMAIL – A simple (not auto-forwarding) mail system, similar to a typical PBBS that uses the standard READ, LIST and KILL commands.

AUTOCALL – An on-line (electronic) callsign directory that allows the user to find other amateur radio operators. Type AUTOLOG NM1D and you will be given NM1D's name, address, licence, Class and previous callsign, if any (I find this ironic in the light of the heated debate currently raging as to whether the UK callbook should be made available on disc).

REPEATER – An on-line database of repeaters in the local area. For example, type REPEATER 146.85 to receive a list of repeaters on the area in 146.85MHz, or type REPEATER BOSTON to receive a list of repeaters in Boston.

HELP – Type HELP to receive a list of some of the more popular commands, or type HELP MAIL to receive help on the mail utilities.

GAMES – Various text-based adventure-style games that can be played in realtime.

Applications

Having read all this, you may be tempted to compare DOSGATE with the AK1A Packet Cluster software which I have described here previously. The difference is that Packet Cluster includes several specially written applications, whereas DOSGATE allows access to a range of traditional application software resident on a remote machine.

And on that note, I had better wrap up for this month. Please pass on any items of news you think may be of interest to your fellow data enthusiasts.

THE SOFTWARE FILE

Stephen Phillips with the second in his series of articles giving software listings for amateur radio and electronic engineering use

This month's listing is for a program which will calculate the resistor values required to build a wide range of T and PI-type attenuators. The circuit diagrams of both types are drawn on screen and a listing is given of the components required. If the listing contains any values of less than one ohm, then use the alternative type of attenuator.

Program details

This program is written for the IBM, Amstrad and similar machines but is easily portable to other systems. The section which draws the circuits is located in lines ninety to 250. If your machine is not IBM compatible do not enter these lines, but keep the numbering of the following lines as they are shown. You should also remove the statements 'SCREEN 2,1:KEY OFF:' in line twenty. The program will still give all the component values but will not draw the circuit.

Input and output impedances are asked for in lines 260 and 270 and the required loss, which must be 40dB or less, is entered at line 350. Any error is trapped at line 360.

Matching

If the attenuator is used to match between different impedances the larger impedance must be entered first. If you get it wrong the program will trap the error (in line 300) and ask you to re-enter the data. On receipt of valid data the program will indicate the minimum loss that can be used for this purpose (in line 350) and ask you to enter the loss required. This cannot be less than the minimum loss indicated and if your input is too low, the program will trap the error and ask you to re-enter the data (in line 370).

The Program

```
10 CLS: REM This program is copyright AMSOFT 1989.
20 SCREEN 2,1:KEY OFF:LOCATE 12,15
30 PRINT "This program calculates resistor values for"
40 LOCATE 13,27:PRINT "T and PI attenuators.":LOCATE 15,12
50 PRINT "It will match UNEQUAL impedances, eg 50 and 75 ohms."
60 LOCATE 17,16:PRINT "Values under 1 ohm show unusable solution."
70 FOR T=1 TO 8000:NEXT T:CLS
80 LOCATE 1,25:PRINT "Resistive T and PI attenuators."
90 WINDOW SCREEN (0,0)-(600,85):VIEW(90,10)-(590,90)
100 LINE (0,80)-(550,80):LINE (0,25)-(50,25)
110 LOCATE 5,8:PRINT "In":LINE (50,20)-(90,30),,B
120 LOCATE 6,19:PRINT "R1"
130 LINE (90,25)-(130,25):LINE (130,25)-(130,40)
140 LINE (120,40)-(140,60),,B:LOCATE 6,31:PRINT "R2"
150 LINE (130,60)-(130,80):LINE (130,25)-(170,25)
160 LINE (170,20)-(220,30),,B:LOCATE 8,21:PRINT "R3"
170 LINE (220,25)-(270,25):LINE (300,25)-(350,25)
180 LINE (350,25)-(350,40):LINE (340,40)-(360,60),,B
190 LOCATE 6,55:PRINT "R5"
200 LINE (350,60)-(350,80):LINE (350,25)-(400,25)
210 LINE (400,20)-(440,30),,B:LOCATE 8,45:PRINT "R4"
220 LINE (440,25)-(480,25):LINE (480,25)-(480,40)
230 LINE (470,40)-(490,60),,B:LOCATE 8,65:PRINT "R6"
240 LINE (480,60)-(480,80):LINE (480,25)-(550,25)
250 LOCATE 5,72:PRINT "Out"
260 LOCATE 12,20:INPUT "Enter input impedance in Ohms.....";Z1
270 LOCATE 14,20:INPUT "Enter output impedance in Ohms.....";Z2
280 IF Z2>Z1 THEN BEEP ELSE 320
290 LOCATE 14,20
300 PRINT "Output ohms must be equal to or less than input ohms."
310 FOR T=1 TO 4000:NEXT T:LOCATE 14,20: PRINT SPACE$(55):GOTO 270
320 T=(SQR(Z1/Z2)+SQR(Z1/Z2-1))▲2
330 M=10*LOG(T)/2.3025:M=INT(M):LOCATE 16,20
340 LOCATE 16,20
350 PRINT "Enter required loss [";M;" to 40 db ]...";:INPUT L
360 IF L<40 THEN 390 ELSE BEEP
370 LOCATE 16,20:PRINT "Loss must not be greater than 40 db."
380 FOR T= 1 TO 4000:NEXT T:LOCATE 16,20:PRINT SPACE$(55):GOTO 340
390 IF L<M THEN BEEP:GOTO 400 ELSE GOTO 430
400 LOCATE 16,20:PRINT SPACE$(55)
410 LOCATE 16,20:PRINT "Loss must be equal to or more than";M;"db."
420 FOR T=1 TO 4000:NEXT T:LOCATE 16,20:PRINT SPACE$(55):GOTO 340
430 L=10▲(L/10):R3=(2*SQR(L*Z1*Z2)/(L-1))+1
440 R1=Z1*(L+1)/(L-1)-R3:R2=Z2*(L+1)/(L-1)-R3
450 R5=(L-1)/2*SQR(Z1*Z2/L):T=(L+1)/(L-1)/Z1-1/R5
460 R4=1/T:T=(L+1)/(L-1)/Z2-1/R5:R6=1/T
470 LOCATE 18,20:PRINT "R1.....";CINT(R1)
480 LOCATE 19,20:PRINT "R2.....";CINT(R3)
490 LOCATE 20,20:PRINT "R3.....";CINT(R2)
500 LOCATE 18,50:PRINT "R4.....";CINT(R4)
510 LOCATE 19,50:PRINT "R5.....";CINT(R5)
520 LOCATE 20,50:PRINT "R6.....";CINT(R6)
530 LOCATE 23,27:PRINT "Type R to rerun or E to end."
540 LOCATE 23,60:A$=INKEY$
550 IF A$="R" OR A$="r" THEN GOTO 570
560 IF A$="E" OR A$="e" THEN 590 ELSE 540
570 FOR ER= 23 TO 12 STEP-1
580 LOCATE ER,10:PRINT SPACE$(70):NEXT ER:GOTO 260
590 LOCATE 23,20:PRINT SPACE$(50)
600 LOCATE 23,27:PRINT "..... Program closed ....."
```

RETRACTABLE MAST CONSTRUCTION

by Alan Malcher G4TPM

Like many radio amateurs, I gained my 'B' licence before I sat my Morse exam. And being restricted to very high frequencies, I raised my antennas as high as possible in an attempt to hunt those elusive DX stations on the continent.

Using scaffolding poles as a means of securing a mast is very effective, but carrying out routine maintenance or adding another antenna to the mast requires the help of an army of fellow radio enthusiasts to lower the mast and erect it again. Even when the greatest of care is taken, some damage to the garden is inevitable.

I therefore decided to construct a retractable mast which could be raised and lowered by one person. Since I live on a hill surrounded by wide open fields, my antenna also had to be capable of withstanding gale-force winds.

Prior to constructing and erecting a mast which can be considered a permanent structure, I strongly recommend that planning permission is obtained. You should also inform your immediate neighbours of your intention, otherwise you may find your array being blamed for causing interference in the neighbourhood.

The height of your mast can be varied to suit your particular environment. The construction is the same for a 25ft or 40ft mast, but the latter requires more elaborate guying to overcome the additional torque encountered during high winds.

The mast pivots on a 1in diameter bolt between two steel supports, one either side of the mast. In fact, these supports are cut-down scaffold poles embedded in concrete (see **Fig 1**). A counterbalance connected to the base of the mast enables it to be raised or lowered by one person. Weighting the counterbalance is achieved by making a simple wooden box, filling it with concrete and embedding the mast into it. Once the concrete is dry the box can be painted, if necessary. The principle of how the mast will pivot is shown in **Fig 2**.

Drilling the base of the mast

Using a very large drill and file make a hole for the 1in diameter bolt, upon which the entire mast will pivot. If the mast is intended to be more than 40ft high, then an 18ft hardened steel scaffold pole should be used as the first section. Instead of drilling through these hardened steel poles, which is laborious work, I contacted a local mobile motor mechanic to carry out some on the spot welding. Within a few minutes, he had cut a hole using an oxyacetelene torch; this only cost about £5.00. There will be no problems if the hole is drilled but if it has been cut, you will need to file down the jagged edges.

To prevent the bolt biting into the steel when weight and torque are applied simultaneously, greased steel bushes must be hammered into the two holes at either side of the mast. There is a large variety of steel bushes available from car spares shops – ask for the type used on aluminium wheels.

Connecting the aluminium sections

Now that you have completed the base section, you can now build the rest of the mast. All the other sections are made of aluminium, which is obtainable from

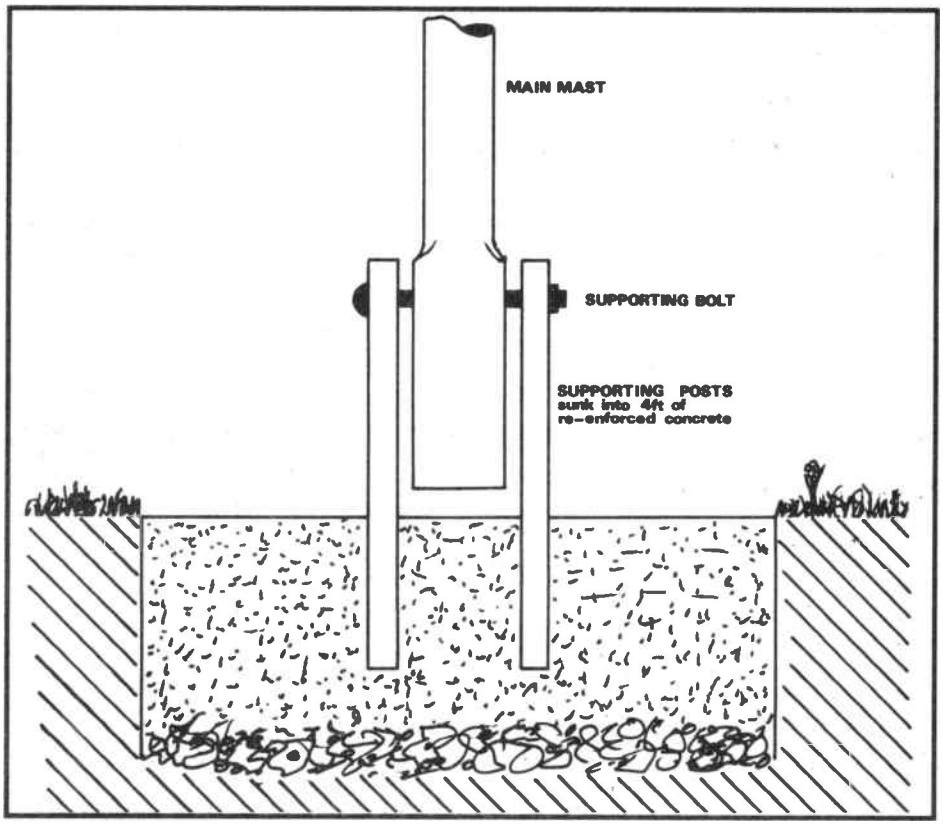


Fig 1: *The two steel supports embedded in concrete*

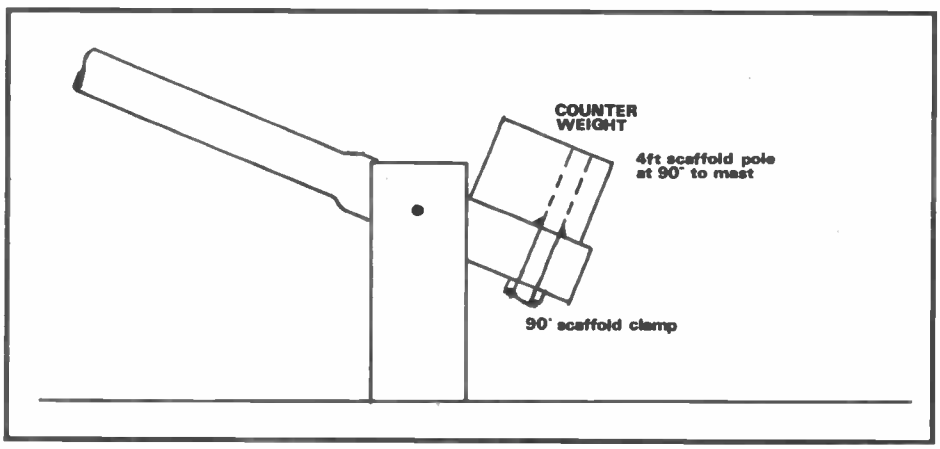


Fig 2: *Showing how the mast pivots*

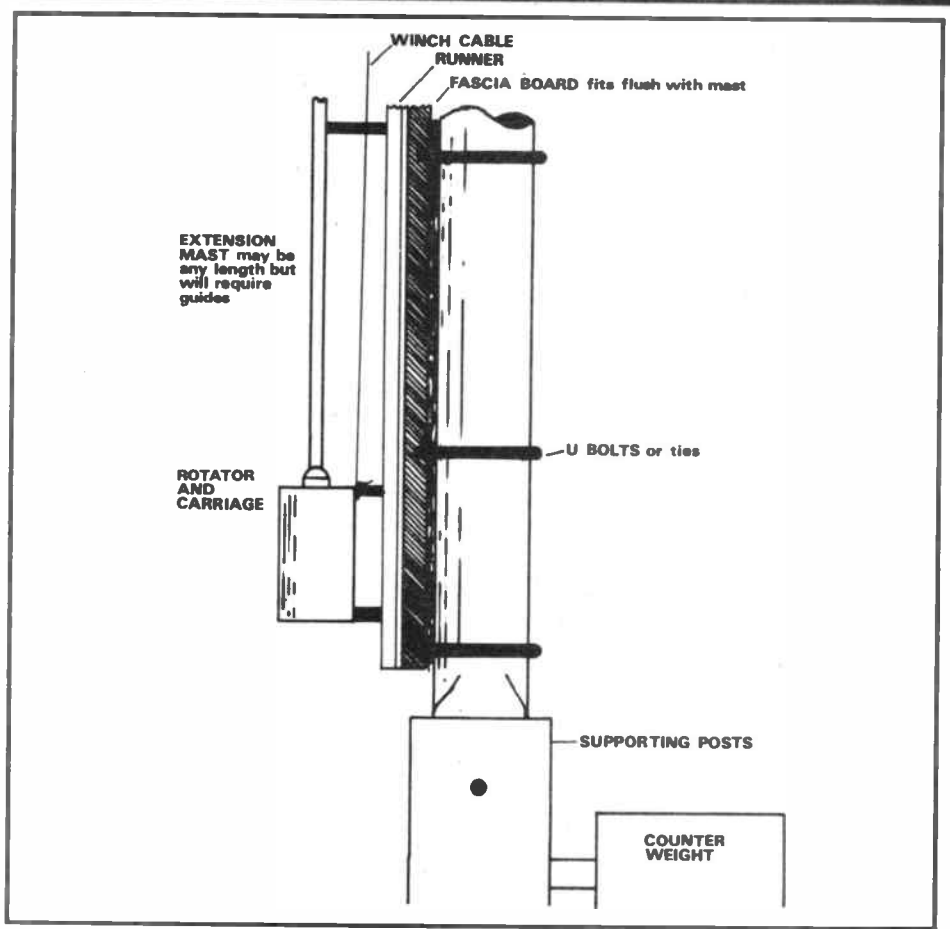


Fig 3: *The carriage assembly*

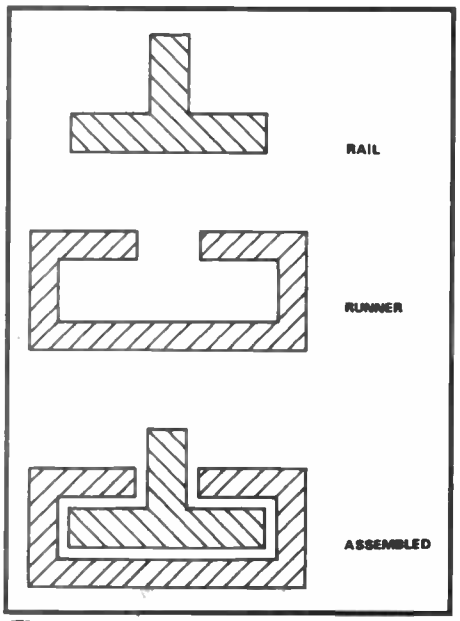


Fig 4: *Cast-iron runners*

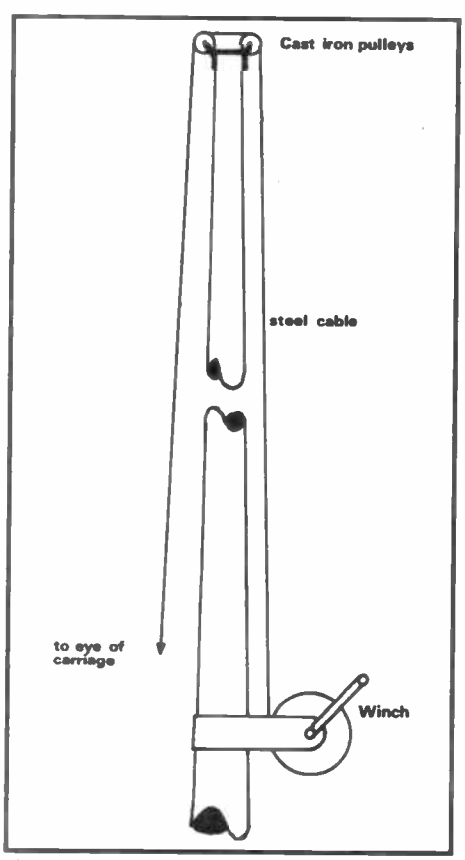


Fig 5: *The pulley system*

aerial erecting contractors. Each section is secured with a purpose-made collar, also obtainable from aerial erecting contractors. These collars bolt together and require no further explanation.

Facia board and tracking

A facia board is attached to the entire length of the mast and secured in place with 'U' bolts. Ensure that the board is made of 1½in thick wood, since it will need to take the strain of the antenna and rotator being buffeted in high winds. The facia board should be weather-proofed with yacht varnish to prevent it warping or rotting.

The iron track used in this project is made of cast-iron and is available from manufacturers of up-and-over garage doors. Although this type of track is readily available and has been used in this sort of project before, I suggest that a few extra pounds are spent on the heavy-duty commercial variety used to support doors in factories and other such premises. Whichever type of track used, it will have been predrilled by the manufacturer and is easily secured into place using 1in wood screws.

Once securely in place, ensure that it is straight and apply a liberal coating of grease. It should be noted that the last screw at the top of the mast secures the track to the facia board and holds a ¼in wooden block, which acts as a stop at the top of the track.

Connecting the carriage to the track

The carriage carries the antennas, rotator and coaxial cable up and down the mast, as shown in **Fig 3**. We now come across a slight problem, depending on the type of antenna rotator used. If the fitting on your rotator is similar to that shown in **Fig 3**, then you will have no problem. But if it is different, then a little improvisation is required to secure it to the carriage.

It should be noticed that the two cast-iron runners slide into the track and that a further carriage stop is built into the base of the mast (see **Fig 4**).

Winches

There are two separate methods of winching the antenna system up or down the mast. The simplest method is to attach a boat winch to the mast (see **Fig 5**). Alternatively, a dc motor can be used. Although more expensive the latter can be operated directly from the shack, so it is easy to lower your antennas when, for example, gale-force winds are forecast. Whichever method is used, the pulley system is the same.

Pulley system

In this design, I used steel cable with a braking strain of half a ton. The cable runs from the boat winch to the top of the mast and is then guided by a pulley, as shown in **Fig 5**. The cable runs down the front of the mast and the end is secured to the carriage.

Although the cable has a breaking strain that should be more than adequate for supporting the carriage, some form of guard must be used to prevent the cable whiplashing if it snaps whilst under tension.

SHORT WAVE LISTENER

TREVOR MORGAN GW4OXB

Another month bites the dust and we are entering winter once again with its longer periods of darkness. Of course, now we expect some reduction in propagation on the higher bands but an improvement in conditions on the lower bands from 40m to 160m. More importantly, it means that many of us can relax after the summer chores of gardening and exterior decorating. It's now just a matter of dodging the paper-hanging to get into the shack.

I like the winter months as I can, when work permits, sit in the shack knowing that I'm not missing the glorious sunshine or neglecting the garden. Because it's a lot cooler I can concentrate on working a few stations on the WAB net or getting stuck into a contest or two.

Cursing contests

Of course, contests are not everyone's cup of tea and there are many amateurs and listeners who curse every time one is announced. The main problems are that they are normally held over a weekend, which is when most people have their only spare time to get into the shack, and many are held on more than one band simultaneously, often using the whole band. Naturally, there are operators who wish to pursue their own interests in the hobby, such as regular DXing, operating their favourite net or simply rag-chewing, so this is where the antagonism arises.

Although I do enjoy working a few contests, I must agree that it's high time the contest organisers limited the range covered to set areas of the bands, leaving plenty of space for the general traffic. Why not impose a 'not above .200' rule on 20, 15 and 10m, for instance?

I know this is an old argument, but it is still something that has to be resolved and a solution is long overdue.

However, as listeners, we can detach ourselves somewhat from the 'in-fighting' and concentrate more on an overall view of contesting.

Preparing for operation

Setting up for a contest is an essential part of the operation and can often take as long as the contest itself. You should know your receiver and its capabilities well enough to limit the setting up to a quick check shortly before the contest to ensure that everything is working well. Your antenna system will, I assume, already be the best you can manage, considering your budget/location, and be in tip-top working condition.

These things are obvious. Much more important, if you intend submitting an entry to the organisers, is the attention to the rules governing the contest and the necessary paperwork involved in keeping accurate logs and score sheets.

Rules for contests can be very complicated, especially as regards scoring, and must be studied carefully before the day. Many otherwise excellent contest entries have been disqualified or lost valuable points by not complying with the rules.

The 'multiplier' system used by most contest organisers for calculating points can be very involved and a simple miscalculation can lose an awful lot of points. Let's take a look at a simplified scoresheet to see exactly what happens.

Say, for instance, the rules state that multipliers are in operation for countries and bands. During that contest, you work seven stations in seven countries on five bands. Your total score could be 245 points (6×6×5). However, if the operation is broken down (see the table), you can accumulate a score of 10,584 points! See how an error in translating the rules can make a difference?

Losing just one point in the last column can lose you 3,528 points in your total score.

Duplicates

It is obvious that the way to be in the top scorers in any contest like this is to get the highest number of entries you can in each column, but it is also important not to get *any* duplicate entries.

Duplicates are the pitfall in contests, the trap to catch the bloke who doesn't check his entry properly. Although you can use one sheet to each band for each country, in a twenty-four-hour contest you could finish up with a couple of dozen sheets; checking for duplicates each time you hear a station will waste valuable time. Even using an 'idiot board' with everything laid out as the sample chart would take a lot of checking.

This is where the computer really comes into its own and saves an awful lot of headaches. During the contest, you can concentrate on the job in hand, getting as many stations as you can on the bands in use without the need to check for duplicates. After the contest, you can feed the computer with the details and let it find the duplicates for you. When you make up your entry forms, you can be sure there are not any duplicates which will lose you points.

Any good filing program could be adapted for this purpose or you could write one yourself if you are reasonably competent. (A suitable program by Mike Ribton, ILA 328, for the Spectrum is available from the ILA for £1.50, with a program for 'Bearings and distance' on the same tape.)

'New' stations available

This may all seem very complicated and a waste of time if your interests do not include contesting, but consider for a moment. If you are an enthusiastic listener or just an occasional DXer, you may well find that you can hear and log a great many 'new' stations that are not around at other times, at least, not at the times you are usually listening.

Contests can take place over a few hours or a whole weekend and, during that time, stations that may normally spend only an hour or so a day on the air will be available to be logged. Also, some club stations use either their official club callsigns or special ones during contests, so these are worth looking for. Therefore, even if you are not interested in entering the contest, you can still use it as a vehicle for your listening.

A final point about entries to major contests. Some organisers prefer dedicated contest forms (the RSGB, for instance). These forms are of a standard format which

Rules: points are 1 for each station heard. Multipliers are 1 for each country heard on each band.First logging only counts on each band.

	80	40	20	15	10
GW4XX	1	1			
DL1XX	1	1	1		1
OK7XX	1		1	1	
UA5XX		1	1		1
ON4XX	1		1		1
LA6XX	1		1	1	
PA0XX		1	1	1	
	7	4	6	3	3

7 × 7 × 4 × 6 × 3 × 3 = 10,584 points

makes it easier for the judges to check the scores, saving them a lot of time. You can get these forms from the organisation concerned.

Normally, contest stations are not interested in QSLing, so unless you have something very unusual to report, don't bother to send cards. However, I have known a listener to log a contest station over the whole period and send a checklog which was appreciated.

Aiming for awards

Award hunting is another side of listening that has its devotees and many readers of this column have entered for awards promoted over the years. Once again, it's a matter of personal preference and not everyone is prepared or able to put in the time and effort necessary.

As with contesting, it is very important to study the rules of the game. Although not as involved as contest rules, awards attract their own scoring systems and your entries must be correct.

The date, time, frequency, mode and report format is usual but the rules should be checked for anything that may be peculiar to that particular award.

Prefixes

For some reason, prefixes seem to confuse people. The prefix is the 'designator' of a callsign, it denotes the location of the station. For the most part, the last three letters are the actual station code or suffix and the first part of one or two letters and a number are the prefix. So, GW4 is the prefix or designator (GW = Wales – full 'A' licence) and OXB is the station code.

For award purposes, the usual rule again is no duplications, so if you have logged GW4 on a band, it should not be repeated, regardless of the suffix.

In the UK and most other countries, the number in a callsign denotes the type of licence issued. For instance, 'A' or full licences in the UK are 2, 3, 4, 5 and 0, while 'B' or restricted (144MHz and up) licences are 1, 6, 7 and 8. Other countries have similar arrangements for different licence grades.

There is a huge number of awards available to the interested listener. They range from the very simple ones principally aimed at promoting clubs or organisations to the more complicated ones promoted by national societies.

Books are available from the RSGB and other sources with full details of awards available.

Japanese award

An interesting award from Japan has just been brought to my attention.

The award is presented for confirmed loggings of Japanese 'prefectures'. The 'A' award is for ten prefectures and the 'B' award is for five. A log extract giving the usual details with seven IRCs should be sent to: Tuyoshi Ohashi, 62 Sakuraoi, Yoro-Gun, Gifu, 530-12, Japan.

The prefectures are Aichi, Chiba, Gifu, Hyogo, Kanagawa, Kyoto, Nagano, Okayama, Shiga, Shimane, Shzuoka, Tottri and Yamanashi.

Thanks to Hitoshi Ohashi JA2-8764 for the information.

Award winners

Our latest award winner is Clifford Tooke G1516, of Rayleigh, who claimed the ILA Lifeboat award. This is offered for logging 100 stations based in towns in the UK that support a lifeboat service. It is not an easy task, as Clifford will verify, but after some hard listening over nearly two years, he got his claim in and it was a pleasure to present him with his trophy. Well done, Cliff!

Our hearty congratulations to Dave Burt EI982/G, of Bideford, who succeeded in winning the Ian Morris Memorial Trophy via the IRTS by being the SWL with the greatest number of confirmed reports in the year; a total of sixty-four countries.

Luciano Marquardt of Hereford is still in there pitching, and has logged some nice stuff with D44BS, 5H3ZW, N7JJQ/P/DU3, TR8SA, PP5JD and LU4AA on 10m, HC2AQ on 15m, JX7DFA, JF2JYH, UJ8JCM and VK2QK on 20m and HG89HQ on 40m.

Geoff Hughes of Chelsea is one of those with a new callsign to celebrate. After taking his Morse test, he now has G0LUJ and hopes to be around the bands with his Swan SS200, linear and dipole. Well done, Geoff!

News from the RSGB

Well, the proposed new novice radio licence is in the news and the RSGB is 'banging the drum' for its introduction. This may mean that more listeners will be tempted to get the ticket.

I am all for promoting the hobby, but I have found, as one American was reported as saying, that if a million licences were given away at the entrance to the World Fair, very few would ever be put to use and of those, even fewer would continue to be used after a year.

People who become interested in radio tend to do so regardless of outside influence rather than because of it. The trouble nowadays is that youngsters are so technically orientated that a 'simple' thing like radio holds little interest.

The RSGB has announced that it *will* be holding its International Convention and Exhibition on 21-22 April 1990 at the NEC in Birmingham. Many of you will remember the 75th Anniversary Exhibition, and we hope this event is as successful. With any luck the listeners will be represented by yours truly.

SWL in Poland

Finally, news sent in by Dines Bogoe OZ1CFV of an SWL club in Poland. Remarkably announcing itself as the *only* SWL club in the world (where have they been?), it offers awards for DXCC and WAZ. Membership is open for ten IRCs. Letters to Kazimierz Czech, Ul Gornicza 36/6, 44-300 Wodislaw S1, Poland, should bring interesting replies!

Sign-off

Well, that's it for this month. Our final for 1989 will include some useful Christmas gift ideas.

Reports, please, to 1 Jersey Street, Hafod, Swansea SA1 2HF.

DESIGN AND USE OF DIP METERS

by Joe Pritchard

One of the most useful pieces of test gear that an amateur can possess is undoubtedly a dip meter, also called a grid dip oscillator, dip oscillator or GDO. What other single piece of equipment will allow you to roughly align receivers or transmitters, tune aerials, provide a low power modulated or unmodulated RF signal, calculate the values of capacitors or inductors and act as a transmitted field strength meter? Other uses are limited only by the imagination.

What exactly is this marvellous piece of kit, and how can we build and use one? In this series I'll be showing you the basic principles of design and use of dip meters.

A short history lesson

A simple physical effect is at the heart of the dip meter, that of resonance. If you have an LC tuned oscillator, the frequency of which is made variable via the adjustable capacitance, and you loosely couple it to a tuned circuit, the resonant frequency of which is within the range of the oscillator, the tuned circuit will absorb power from the oscillator as resonance is passed through (see **Fig 1**). In the good old days of valves, a meter connected in the grid circuit of the oscillator (**Fig 2**) would show a dip in its reading as resonance was passed through and power was lost from the oscillator to the tuned circuit. The dip given by such a circuit would be quite sharp, because the meter applied very little loading to the tuned circuit.

The accuracy with which the dip is determined depends largely on the depth of the dip, and this in turn depends upon the Q of the tuned circuit and the Q of the tuned circuit under test. The Q can be reduced by overclose coupling of the dip oscillator coil to the circuit under test or by the meter used to monitor the dip applying heavy loading to the tuned circuit.

A valve oscillator as shown in **Fig 2** doesn't suffer from the latter problem owing to the high impedance applied to the tuned circuit via the grid connection of the triode valve, but the former problem can only be solved by skill in use.

The frequency at which the dip occurred could be read off a calibrated scale, and so the resonant frequency of the circuit under test can be measured. If the capacitance or inductance is known, the other value can thus be calculated. As well as being used in an active mode, a dip oscillator can be used in a non-oscillating mode as a field strength meter to indicate the frequency of another signal source.

Modern circuits

With the advent of semiconductors, transistor oscillators were soon put to use, but the name 'grid dip oscillator' stuck.

Bipolar or field-effect transistors can both be employed in modern dip oscillator circuits, and good results can be obtained from either type of transistor. The performance of a dip oscillator depends mainly on two things: the type of oscillator circuit used and the means of measuring the dip at resonance.

The oscillator design

Spectral purity

Any oscillator used as the heart of a dip oscillator must have an output frequency that is spectrally pure – that is, containing only one frequency. This means that the oscillator must not generate any harmonic frequencies, and so in practical terms we're talking about a sine-wave oscillator. This is essential because if a signal was generated that contained harmonic energy, a tuned circuit tuned to the harmonic frequency being tested with the dip oscillator would absorb the harmonic energy, and would thus cause a dip on the meter which would be indistinguishable from that caused by

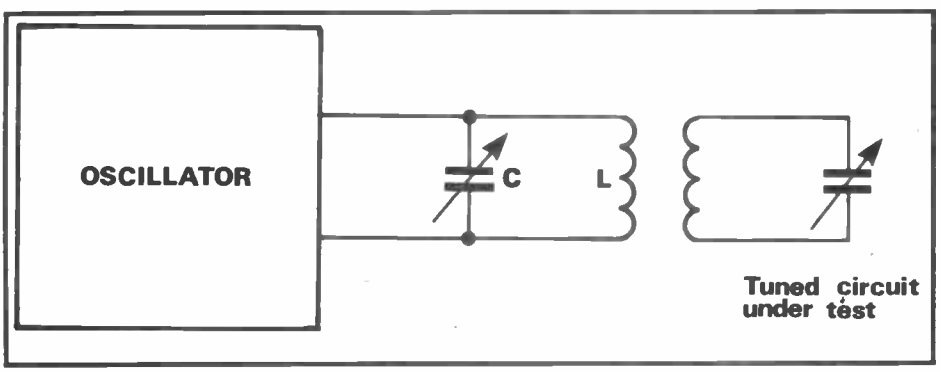


Fig 1: *LC tuned oscillator*

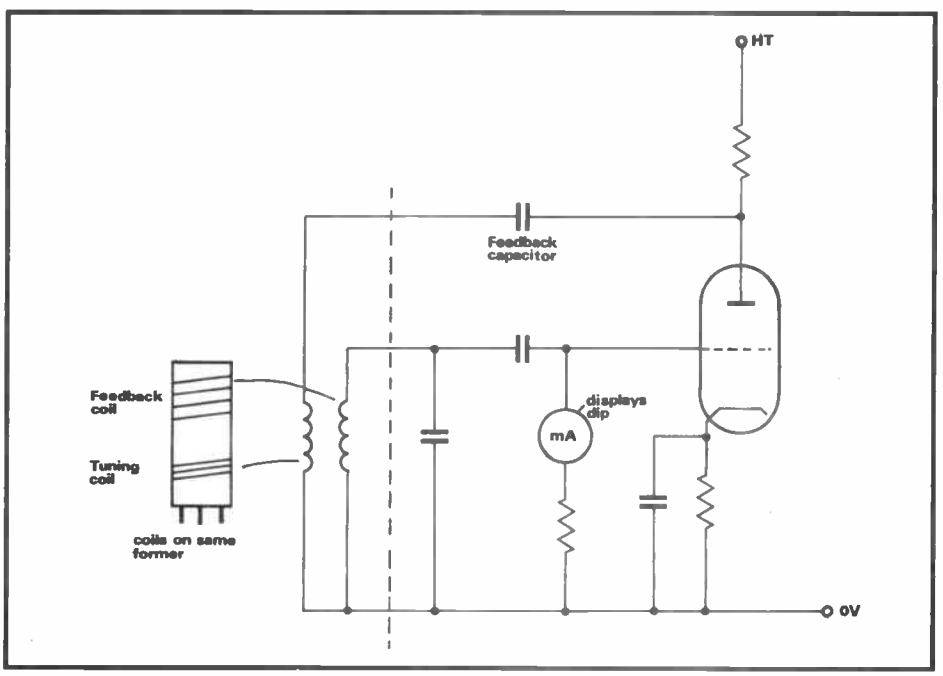


Fig 2: *A valve oscillator with a grid circuit*

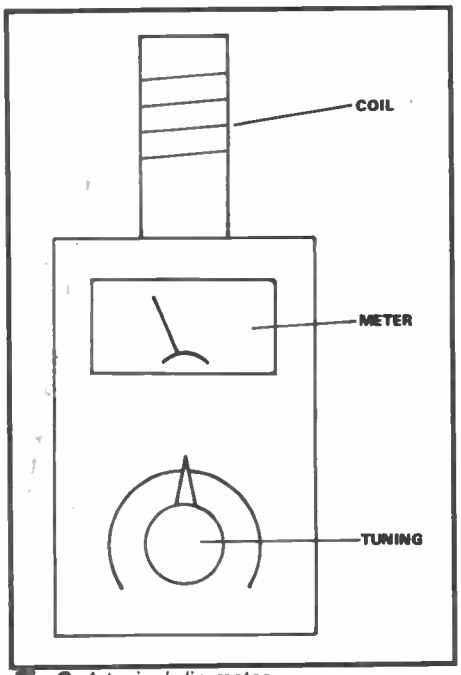


Fig 3: *A typical dip meter*

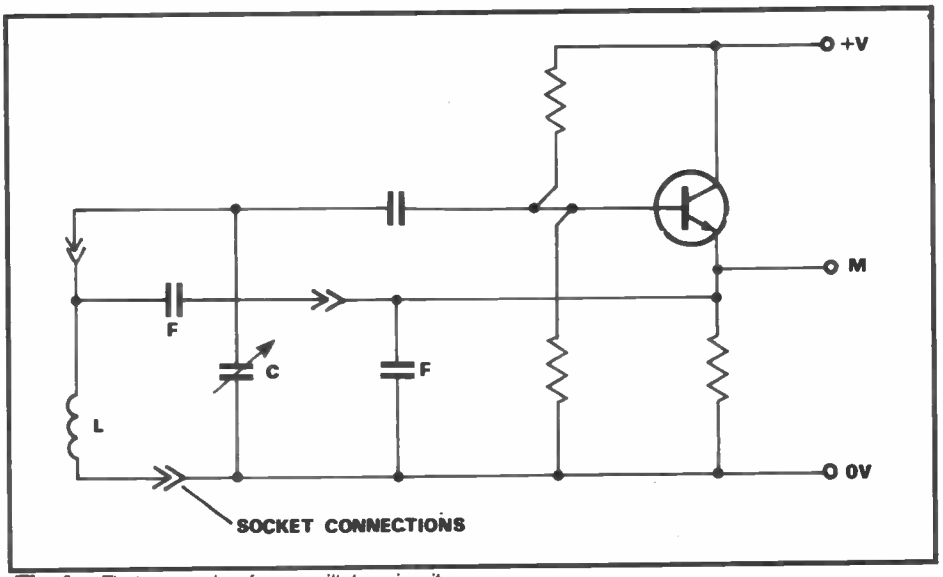


Fig 4a: *First example of an oscillator circuit*

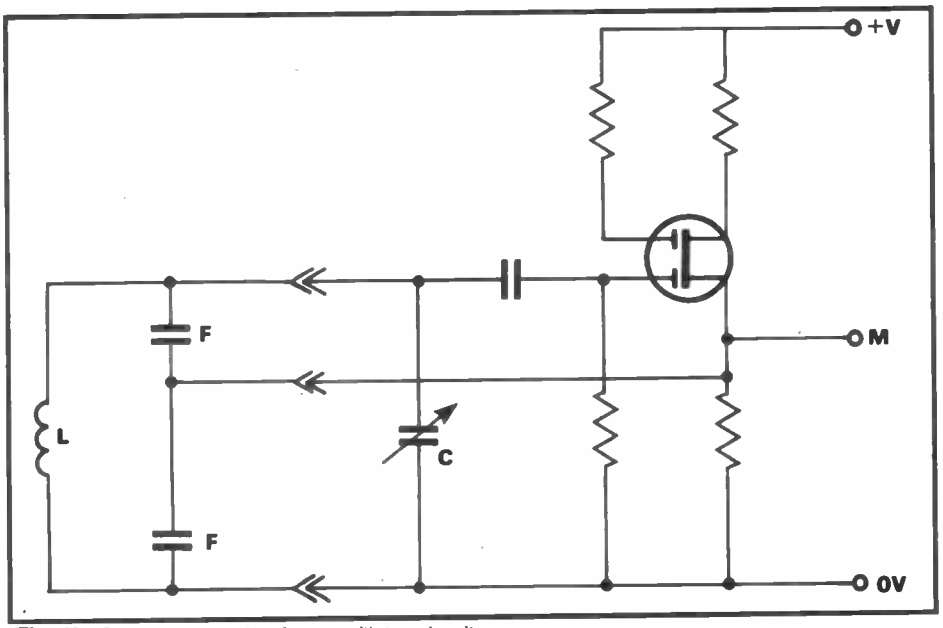


Fig 4b: *Second example of an oscillator circuit*

the fundamental frequency generated by the dip oscillator.

Tuning range and the tuned circuit

The oscillator must, of course, be tunable! The tuning range of the oscillator is set by a variable capacitor and a range of plug-in coils. For practical purposes, it's often useful for a coil to cover a fair range of frequency. For example, a commercial dip meter may cover the range 100kHz to 250MHz with five coils. Owing to the physics of the tuned circuit, the frequency range in terms of number of megahertz covered by a coil won't be the same for each coil. For example, the coils at low frequencies will cover a few hundred kilohertz whilst those in the low short range frequencies may cover a few megahertz and those at VHF frequencies will cover a few tens of megahertz. On commercial dip meters, the tuning scales are very much 'ball park' figures, especially at higher frequencies.

A slow motion drive on the variable capacitor is most useful in determining the precise position of the dip. I've already mentioned that the Q, or 'goodness' of the tuned circuit is important; the coils should have as low an electrical resistance as possible, and should be wound on low loss materials and in such a way as to minimise losses. Owing to the role of the circuit in testing other circuits, the coil must be positioned in such a way so as to allow it to be brought into close proximity with the circuit under test. A typical arrangement to allow this is shown in **Fig 3**. In addition, coils in dip meters are air-cored. Ferrite cores aren't used.

One problem that you need to bear in mind whilst winding coils and producing a suitable means of mounting is that of self-resonance, especially at VHF frequencies. The sockets used for coils and the wiring leading from the coil to the variable capacitor and oscillator circuit, may be resonant at particular frequencies in the range covered by the dip meter. Thus, spurious dips would be introduced if these resonances were present.

Unfortunately, there are going to be some resonances like this in any piece of equipment. The best way to reduce the problem to manageable proportions is to minimise the length of connections, thus pushing any self-resonances into areas of the VHF spectrum preferably not covered by the GDO.

Mechanical construction

The tuned circuit and oscillator circuit must clearly be mechanically robust and there shouldn't be any possibility of vibration or movement causing detuning of the circuit. This would cause the frequency generated by the GDO to vary should the oscillator be moved around. In addition, you need to be careful about such effects as 'hand capacitance', where the movement of the operator's hand near the tuning control of the oscillator varies the oscillator tuning. This is best dealt with by building the oscillator into a metal case, which will screen the oscillator and tuning capacitor from detuning in this way.

Output level

The output level of a GDO should be fairly constant across the range of frequencies covered, and it's often useful if the output level can be varied by a simple control. This allows you to test a wide range of circuits without the risk of

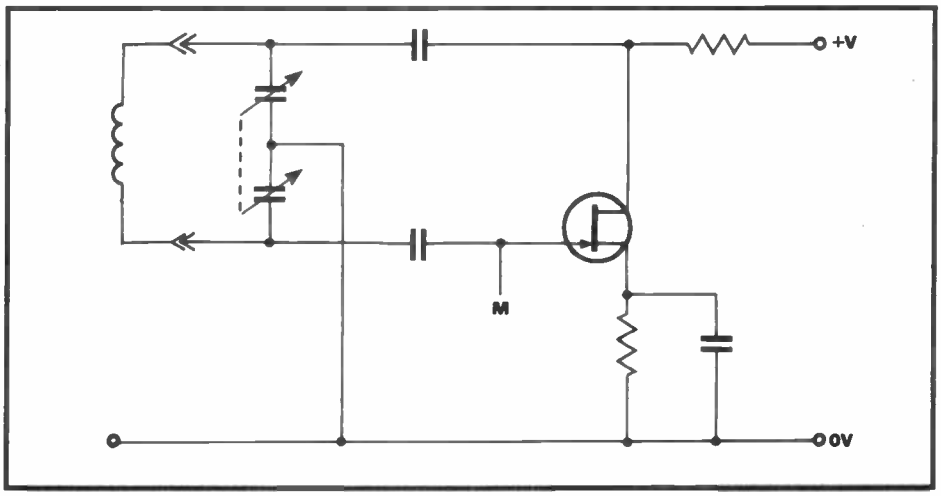


Fig 4c: *Third example of an oscillator circuit*

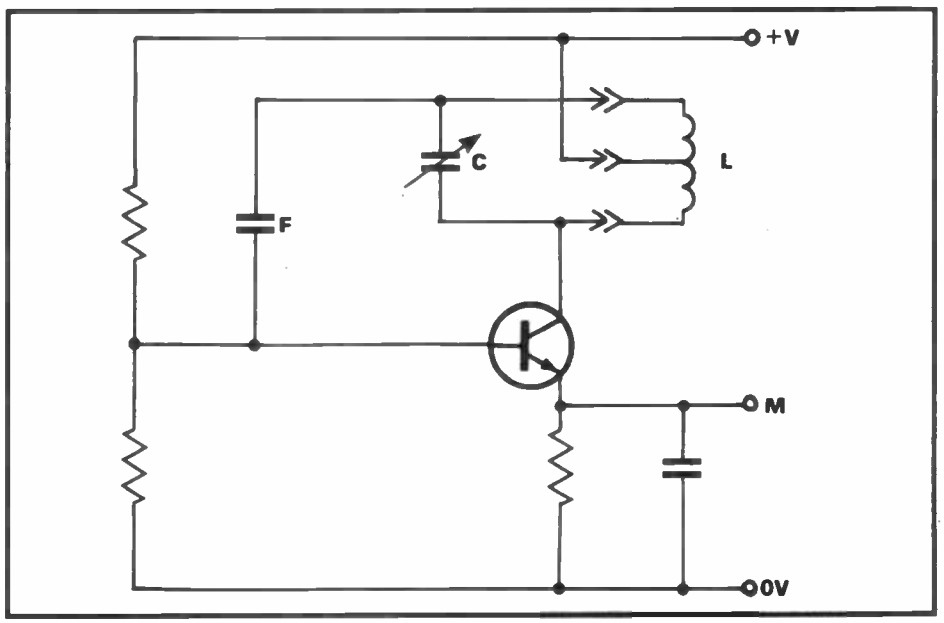


Fig 4d: *Fourth example of an oscillator circuit*

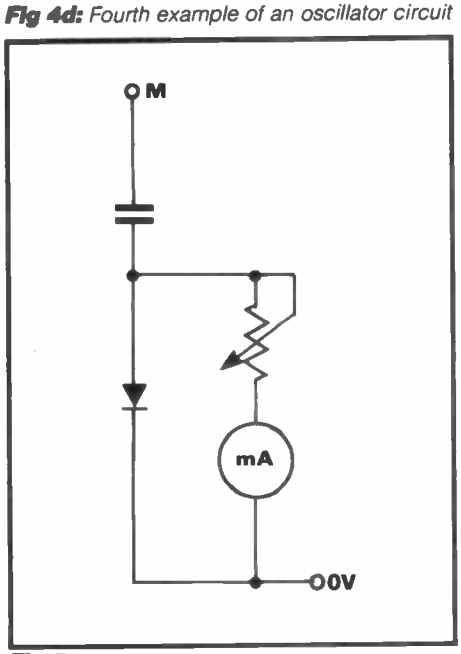


Fig 5a: *Micrometer connection*

overloading the circuit under test. It also makes comparative readings at different frequencies more straightforward, as you don't have to constantly adjust the output level to obtain a particular meter reading at a new frequency before looking for a dip at that frequency.

The active device

Oscillators used in GDO circuits can be based around bipolar, FET or MOSFET transistors. Your first consideration must be whether or not a transistor will operate at the frequencies of interest – no point trying to build a GDO for VHF using a 2N3055 power transistor!

For bipolar transistors, the Ft parameter in the transistor's specifications is the one to watch. This is the 'Current Gain – Bandwidth Product'. In simple terms the higher the Ft parameter the higher the frequency at which the transistor can operate will be. For low frequency GDOs, the common 2N2222 transistor can be used, and some good specimens of BC108s or BC109s may work quite well up to 10 to 15MHz. In my experiments, I've never got good results from these transistors above this frequency. A good choice for general-purpose use in GDOs would be either the 2N2369FA or, preferably, the BFY90. The latter has an Ft parameter of over 1GHz, and so will work well into the low UHF frequencies! Regarding FET devices, the internal capacitance must be as low a possible, and for low frequencies the 2N3819 FET will work. For general-purpose usage, the 2N5486 FET will work. The 40673 MOSFET will work up to about 60MHz, and for higher frequencies the 3N202 will work.

One thing that you need to be cautious about here is that parasitic oscillations don't start, especially if the active device can work at VHF or UHF. Any self-resonances in the circuit, as might be caused by the wiring to the coil and tuning capacitor, may allow these parasitic oscillations to take place if there's enough stray feedback in the circuit. So, when you build the circuit take care to minimise the possibilities of stray feedback. More on this next month.

Finally, the device chosen will have some impact on the Q of the tuned circuit and thus on the dip given at resonance. The FET devices will not load the tuned circuit as much as bipolar devices, and so will give a better dip.

Figs 4a to **d** show some possible oscillator circuits. One interesting point about the circuits in **Figs 4a** and **4b** is that to ensure constant feedback at all frequencies of operation, the feedback capacitors need to be combined with the coil assembly. This is so that on plugging

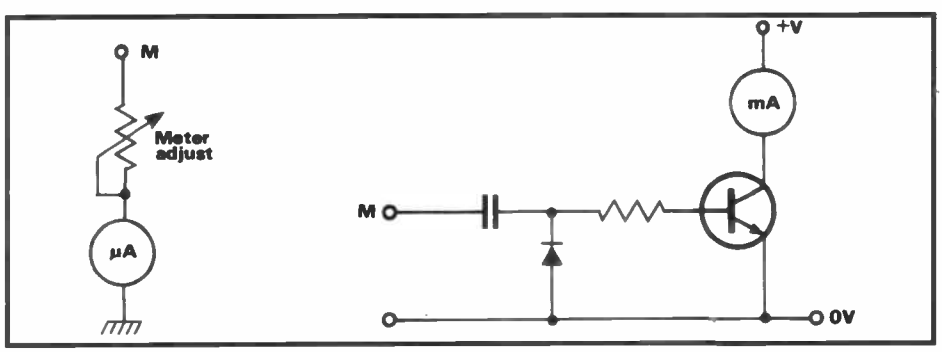


Fig 5b: *Micrometer connection to the oscillator*

in a new coil, new feedback capacitors are plugged in as well to give the best results over that frequency range, and thus keep a fairly constant output level over the different frequency ranges.

In each circuit, feedback components are shown with a letter 'F', and L and C indicate the tuned circuit. Point 'M' in each circuit indicates where the metering circuit is connected.

The metering circuit

The word 'metering' might be a misnomer here; what we need is simply some sort of indicator to determine whether a dip has been detected or not. Three techniques are in common use:

1. The meter

In this method, a microammeter is connected in one of the configurations shown in **Figs 5a** and **b** and is connected to the oscillator at the point shown by the letter 'M' in **Fig 4**. It is common for a variable resistor to be included in this metering circuit to allow the sensitivity of the circuit to be varied.

The use of an active device, as shown in **Fig 5b** is valuable, because such a metering circuit will not load the oscillator as much as a direct meter connection and will offer greater sensitivity. 'VU' meters designed for use in tape recorders and other audio equipment are available for a couple of pounds, and are suitable for this sort of application.

2. The LED

An LED can be fed by a circuit such as that in **Fig 6**. Here, the LED is extinguished at the dip frequency. Personally, I don't like this sort of detector device as I find it more difficult to detect slight dips with an LED than with a meter, but it has the advantage of being cheaper and is also easier to build into a small case.

3. Audio indication

The signal from a detector circuit such as that used in the metering arrangement shown in **Figs 5a** and **b** drives a voltage controlled oscillator in such a way that a dip corresponds to a drop in the frequency of the audio oscillator. Again, I find that I cannot accurately determine a dip by this method. However, this method of determining a dip is invaluable for blind amateurs.

Next month, I'll get on with the construction of a practical dip meter.

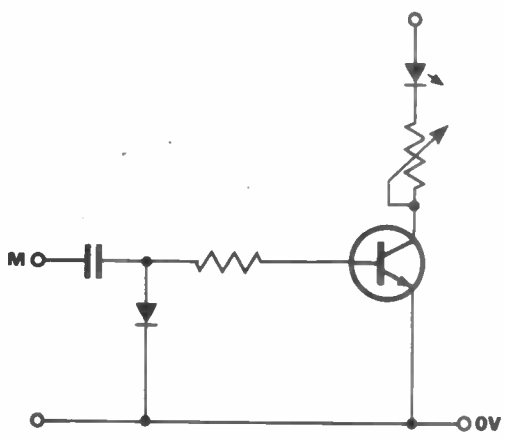


Fig 6: *Feeding the LED via a circuit*

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Amateur RADIO

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Amateur RADIO

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

Recal-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**
1.5kw115v 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**
Sony KTX 1000 Videotex system - **brand new** **£ 790**
DEC LS11/02 CPU board **£ 150**
ADDS 2020 VDU terminals - **brand new** **£ 225**

Microwave Speech / Data Links

Made for the US military to the highest possible spec, these units were originally designed as a highly rugged portable point to point distance measuring set. Inbuilt in the unit is a full duplex speech link which may be used as is, or adapted for use as a data link. Many features include **50 km point to point range,** approx 10.5 GHz operation for **max security ,**low power consumption (typ. 2 amps at 12 vdc), and small physical size 14w, 15h x 13d **including built in dish,** fully portable weatherproof case. Supplied in used but tested condition complete with instructions and accessories.

Only £295 per pair (E)

Optional 12v integral nicad pack (3 hours approximate duration).....£22

Limited quantity - don't miss out this time!!!

May require licence for UK use

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 attractvely cased.Mum. sw. **£19.50(B)**
Greendale 19AB0E 60 watts switch mode.+5v @ 6a,±12v @ 1a,±15v @ 1a. RFE and fully tested.11 x 20 x5.5cms. **£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)**
Farnell G6/40A. Switch mode. 5v @ 40a.Encased **£95.00(C)**
Farnell G24/5S. As above but 24v @ 5a. **£65.00(C)**

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.

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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)=£2.00. (B)=£4.50. (C)=£8.50. (D)=£10.00. (E)=£12.00 (F)=£17.00 (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.

BAKERS DOZEN PACKS

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

BD2 5 13A spurs provide a fused outlet to a ring main where devices such as a clock must not be switched off.

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

BD9 2 6V 1A mains transformers uorioht mountino with fixing clamps.

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

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

BD22 2 25 watt loudspeaker two unit crossovers.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

BD180 6 Neon indicators in panel mounting holders with lens.

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

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

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

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

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

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

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

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

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

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

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

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

BD293 50 Mixed silicon diodes.

BD305 1 Tubular dynamic mic with optional table rest.

BD400 4 Books, useful for beginners, describes amplifiers equipment and kit sets.

BD653 2 Miniature driver transformers. Ref. LT44. 20k to 1k centre tapped.

BD553a 2 3.5V relays each with 2 pairs changeover contacts.

BD667 2 4.7 µf non-polarised block capacitors, pcb mounting.

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

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.

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

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

POWERFUL IONISER

Generates approx 10 times more IONS than the 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

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

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

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

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

ELECTRONIC SPACESHIP. Sound and impact controlled, responds to claps and shouts and reverses when it hits anything. Kit with really detailed instructions. Ideal present for budding young electrician. A youngster should be able to assemble but you may have to help with the soldering of the components on the pcb. Complete kit £8. Our ref 8P30.

12" HIGH RESOLUTION MONITOR. Black and white screen, beautifully cased for free standing, needs only a 12v 1.5 amp supply. Technical data is on its way but we understand these are TTL input. Brand new in maker's cartons. Price: £25.00 plus £5 insured delivery. Order ref: 25P10.

14" COLOUR MONITOR made by the American Display Tek Company. Uses high resolution tube made by the famous Japanese Toshiba company. Beautifully made unit intended for console mounting, but top and sides adequately covered by plated metal panels. Full technical spec. on its way to us. We have a limited number of these. All brand new still in maker's cartons. Price: £89 each plus £6 insured carriage. Order ref: 89P1.

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.

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 £12.95. Order ref 13P2.

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.

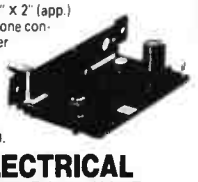
ORGAN MASTER Is a three octave musical keyboard. It is beautifully made, has full size (piano size) keys, has gold plated contacts and is complete with ribbon cable and edge connector. Can be used with many computers, request information sheet. Brand new, only £15 plus £3 postage. Our ref 15P15.

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.

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

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

MINI MONO AMP on 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.**



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MAIL ORDER TERMS: Cash, PO or cheque with order. Orders under £20 add £2.00 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

JOYSTICKS for BBC, Atari, Dragon, Commodore, etc. All £5 each. State which required.

TELEPHONE TYPE KEY PAD. Really first class rear mounting unit. White lettering on black buttons. Has conductive rubbers contacts with soft click operation. Circuit arranged in telephone type array. Requires 70mm by 55mm cut out and is connected by 10-pin IDC socket. Price: £2.00 each. Order ref: 2P251.

TELESCOPIC FM AERIAL. Stands up or folds over. Solidly constructed and heavily nickel plated. Supplied complete with fixing nut. Price £1 each. Order ref: BD741.

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 25K413 and its component 25J11B. 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 fittd 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.

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.