

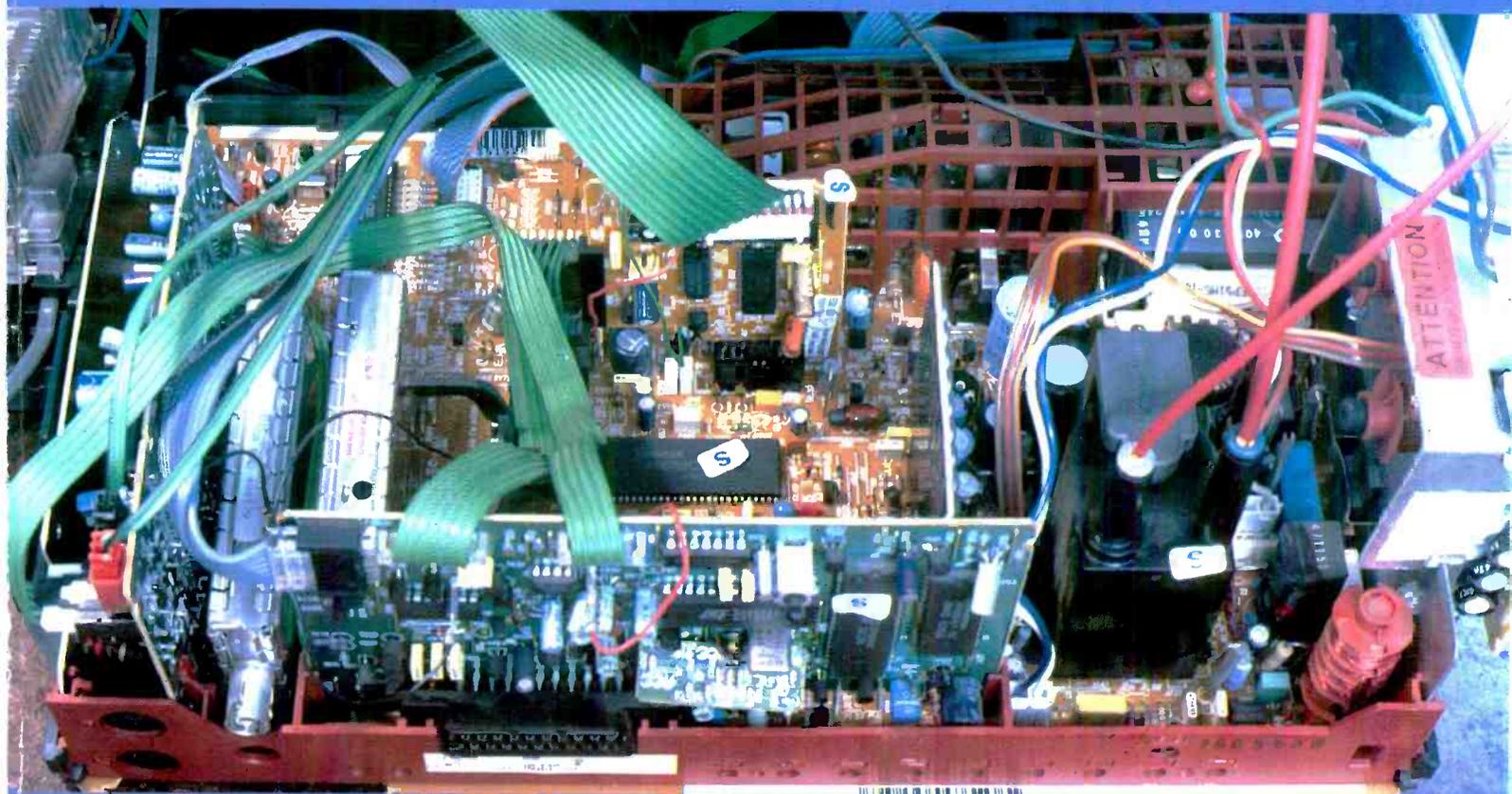
DECEMBER 1993

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TELEVISION

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VCR Clinic - TV Fault Finding**

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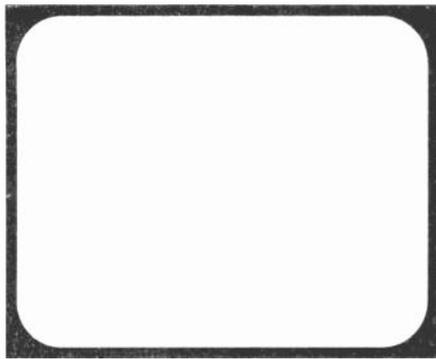


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BC109	8p	BD899	50p	S2800U	52p	3N143	85p	EY88	80p	AN7154	180p	LA2200	190p	NE557	110p	STK4192	800p	STR44115	550p	TD62506	200p	TDAS361	200p
BC196C	10p	BD915	50p	S2930U	52p															TD62511	700p	TDAS371	200p
BC141	20p	BDX32	100p	T2800M	72p	DIODES						LA2201	150p	NE561	115p	STK4272	720p	STR50020	550p	TD6304AP	300p	TDAS353	150p
BC142	20p	BDX33	100p	TP29	15p	Rectifier				AN7178	270p	LA3210	65p	NE571	25p	STK4273	650p	STR50082	650p	TD6306P	350p	TDAS354	150p
BC143	20p	BDW23	55p	TP29C	25p	Diodes				AN7179	270p	LA3220	100p	NE582	80p	STK4301	700p	STR50100	650p	TD6309P	350p	TDAS370	320p
BC148	8p	BDW24	55p	TP30	25p	PCF801	110p	PCF802	110p	AN7180	270p	LA3230	100p	NE583	80p	STK4302	700p	STR50101	650p	TD6310P	350p	TDAS371	320p
BC149	8p	BDW83	50p	TP30C	30p	PCF805	110p	PCF806	115p	AN7181	270p	LA3240	100p	NE584	80p	STK4303	700p	STR50102	650p	TD6311P	350p	TDAS372	320p
BC150	8p	BDY92	100p	TP31C	30p	PCF807	110p	PCF808	115p	AN7182	270p	LA3250	100p	NE585	80p	STK4304	700p	STR50103	650p	TD6312P	350p	TDAS373	320p
BC156	30p	BF137	35p	TP32	24p	PCF809	110p	PCF810	115p	AN7183	270p	LA3260	100p	NE586	80p	STK4305	700p	STR50104	650p	TD6313P	350p	TDAS374	320p
BC171	10p	BF180	15p	TP32A	21p	PCF811	110p	PCF812	115p	AN7184	270p	LA3270	100p	NE587	80p	STK4306	700p	STR50105	650p	TD6314P	350p	TDAS375	320p
BC177	14p	BF181	18p	TP33	50p	PCF813	110p	PCF814	115p	AN7185	270p	LA3280	100p	NE588	80p	STK4307	700p	STR50106	650p	TD6315P	350p	TDAS376	320p
BC178	14p	BF183	20p	TP33C	60p	PCF815	110p	PCF816	115p	AN7186	270p	LA3290	100p	NE589	80p	STK4308	700p	STR50107	650p	TD6316P	350p	TDAS377	320p
BC179	14p	BF195	7p	TP34	50p	PCF817	110p	PCF818	115p	AN7187	270p	LA3300	100p	NE590	80p	STK4309	700p	STR50108	650p	TD6317P	350p	TDAS378	320p
BC182	7p	BF209	6p	TP34C	60p	PCF819	110p	PCF820	115p	AN7188	270p	LA3310	100p	NE591	80p	STK4310	700p	STR50109	650p	TD6318P	350p	TDAS379	320p
BC183	7p	BF225	30p	TP36C	65p	PCF821	110p	PCF822	115p	AN7189	270p	LA3320	100p	NE592	80p	STK4311	700p	STR50110	650p	TD6319P	350p	TDAS380	320p
BC183A	7p	BF240	16p	TP41A	20p	PCF823	110p	PCF824	115p	AN7190	270p	LA3330	100p	NE593	80p	STK4312	700p	STR50111	650p	TD6320P	350p	TDAS381	320p
BC184	7p	BF245	15p	TP41C	20p	PCF825	110p	PCF826	115p	AN7191	270p	LA3340	100p	NE594	80p	STK4313	700p	STR50112	650p	TD6321P	350p	TDAS382	320p
BC184A	7p	BF254	15p	TP42A	20p	PCF827	110p	PCF828	115p	AN7192	270p	LA3350	100p	NE595	80p	STK4314	700p	STR50113	650p	TD6322P	350p	TDAS383	320p
BC212	7p	BF255	12p	TP42C	22p	PCF829	110p	PCF830	115p	AN7193	270p	LA3360	100p	NE596	80p	STK4315	700p	STR50114	650p	TD6323P	350p	TDAS384	320p
BC213L	7p	BF256	18p	TP42	40p	PCF831	110p	PCF832	115p	AN7194	270p	LA3370	100p	NE597	80p	STK4316	700p	STR50115	650p	TD6324P	350p	TDAS385	320p
BC213	7p	BF257	18p	TP43	40p	PCF833	110p	PCF834	115p	AN7195	270p	LA3380	100p	NE598	80p	STK4317	700p	STR50116	650p	TD6325P	350p	TDAS386	320p
BC212L	7p	BF258	18p	TP43C	40p	PCF835	110p	PCF836	115p	AN7196	270p	LA3390	100p	NE599	80p	STK4318	700p	STR50117	650p	TD6326P	350p	TDAS387	320p
BC214	7p	BF259	18p	TP44	40p	PCF837	110p	PCF838	115p	AN7197	270p	LA3400	100p	NE600	80p	STK4319	700p	STR50118	650p	TD6327P	350p	TDAS388	320p
BC214L	7p	BF262	25p	TP45	120p	PCF839	110p	PCF840	115p	AN7198	270p	LA3410	100p	NE601	80p	STK4320	700p	STR50119	650p	TD6328P	350p	TDAS389	320p
BC237	7p	BF263	25p	TP45C	120p	PCF841	110p	PCF842	115p	AN7199	270p	LA3420	100p	NE602	80p	STK4321	700p	STR50120	650p	TD6329P	350p	TDAS390	320p
BC238	7p	BF270	18p	TP45A	140p	PCF843	110p	PCF844	115p	AN7200	270p	LA3430	100p	NE603	80p	STK4322	700p	STR50121	650p	TD6330P	350p	TDAS391	320p
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BC301	20p	BF312	21p	TP46C	60p	PCF849	110p	PCF850	115p	AN7203	270p	LA3460	100p	NE606	80p	STK4325	700p	STR50124	650p	TD6333P	350p	TDAS394	320p
BC302	20p	BF337	20p	TP47	60p	PCF851	110p	PCF852	115p	AN7204	270p	LA3470	100p	NE607	80p	STK4326	700p	STR50125	650p	TD6334P	350p	TDAS395	320p
BC303	20p	BF338	20p	TP47C	60p	PCF853	110p	PCF854	115p	AN7205	270p	LA3480	100p	NE608	80p	STK4327	700p	STR50126	650p	TD6335P	350p	TDAS396	320p
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BC547	25p	BF489	60p	TP54	140p	PCF877	110p	PCF878	115p	AN7217	270p	LA3600	100p	NE620	80p	STK4339	700p	STR50138	650p	TD6347P	350p	TDAS408	320p
BC548	25p	BF490	60p	TP54C	140p	PCF879	110p	PCF880	115p	AN7218	270p	LA3610	100p	NE621	80p	STK4340	700p	STR50139	650p	TD6348P	350p	TDAS409	320p
BC557	25p	BF491	60p	TP55	140p	PCF881	110p	PCF882	115p	AN7219	270p	LA3620	100p	NE622	80p	STK4341	700p	STR50140	650p	TD6349P	350p	TDAS410	320p
BC558	25p	BF492	60p	TP55C	140p	PCF883	110p	PCF884	115p	AN7220	270p	LA3630	100p	NE623	80p	STK4342	700p	STR50141	650p	TD6350P	350p	TDAS411	320p
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BC562	25p	BF496	60p	TP57C	140p	PCF891	110p	PCF892	115p	AN7224	270p	LA3670	100p	NE627	80p	STK4346	700p	STR50145	650p	TD6354P	350p	TDAS415	320p
BC563	25p	BF497	60p	TP58	140p	PCF893	110p	PCF894	115p	AN7225	270p	LA3680	100p	NE628	80p	STK4347	700p	STR50146	650p	TD6355P	350p	TDAS416	320p
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UIC-1370	300p	2SA1200	70p	2SC570	100p	2SC1635	300p	2SC2335	120p	2SC2960	60p	2SC3584	200p	2SD-795A	140p	2SD-1409	170p	2SK-290	35p	2764	200p	280ADP	150p
UIC-1373	200p	2SA1208	70p	2SC571	100p	2SC1636	100p	2SC2336	100p	2SC2961	100p	2SC3585	200p	2SD-796	100p	2SD-1411	170p	2SK-292	35p	2766	200p	280ADT	150p
UIC-1377	200p	2SA1209	70p	2SC572	100p	2SC1637	50p	2SC2337	40p	2SC2979	160p	2SC3586	200p	2SD-819	400p	2SD-1413	170p	2SK-312	75p	27128	150p	280ACTC	140p
UIC-1378	180p	2SA1210	70p	2SC573	100p	2SC1638	120p	2SC2340	120p	2SC2987	325p	2SC3604	650p	2SD-820	450p	2SD-1414	70p	2SK-316	70p	27256-25	150p	280ACTC	140p
UIC-1382	110p	2SA1215	60p	2SC574	100p	2SC1639	100p	2SC2341	150p	2SC2988	250p	2SC3605	60p	2SD-821	550p	2SD-1415	190p	2SK-320	120p	27612	100p	280ASIO	210p
UIC-1384	420p	2SA1216	55p	2SC575	100p	2SC1640	40p	2SC2342	150p	2SC2989	60p	2SC3606	100p	2SD-822	400p	2SD-1417	190p	2SK-322	140p	27618	100p	280ASIO 2	210p
UIC-1387	250p	2SA1217	100p	2SC576	100p	2SC1641	60p	2SC2343	100p	2SC2990	150p	2SC3607	100p	2SD-823	60p	2SD-1426	160p	2SK-328	300p	4164-12	90p	280ADT	260p
UIC-1391	300p	2SA1220	120p	2SC577	100p	2SC1642	60p	2SC2344	100p	2SC2991	100p	2SC3611	120p	2SD-826	60p	2SD-1427	380p	2SK-370	40p	4164-10	100p	74S289	180p
UIC-1397	350p	2SA1221A	300p	2SC578	50p	2SC1643	40p	2SC2349	50p	2SC2992	320p	2SC3616	280p	2SD-837	80p	2SD-1428	380p	2SK-371	40p	4126-15	100p	74S287	200p
UIC-1403A	650p	2SA1242	80p	2SC579	45p	2SC1644	40p	2SC2351	45p	2SC3001	125p	2SC3619	60p	2SD-839	60p	2SD-1429	410p	2SK-386	60p	4126-12	100p	75107	65p
1420CA	450p	2SA1244	120p	2SC580	25p	2SC1645	45p	2SC2352	50p	2SC3002	550p	2SC3629	80p	2SD-844	200p	2SD-1431	400p	2SK-405	450p	4146-12	150p	75110	75p
1420CA	450p	2SA1246	80p	2SC581	25p	2SC1646	40p	2SC2353	50p	2SC3003	750p	2SC3629	120p	2SD-845	250p	2SD-1432	400p	2SK-413	50p	4146-10	200p	75113	100p
1421CA	650p	2SA1252	150p	2SC582	25p	2SC1647	30p	2SC2354	110p	2SC3007	125p	2SC3637	160p	2SD-848	260p	2SD-1433	75p	2SK-415	50p	6116	80p	75122	110p
1422CA	350p	2SA1262	160p	2SC583	25p	2SC1648	30p	2SC2358	120p	2SC3008	125p	2SC3637	280p	2SD-856	480p	2SD-1438	140p	2SK-415	50p	6264-15	160p	75150	95p
1423CA	200p	2SA1263	280p	2SC584	150p	2SC1649	100p	2SC2359	100p	2SC3009	120p	2SC3639	200p	2SD-868	250p	2SD-1439	270p	2SK-429	180p	8264-12	200p	75154	100p
UIC-1504C	400p	2SA1265	280p	2SC585	100p	2SC1650	100p	2SC2360	260p	2SC3042	200p	2SC3639	300p	2SD-869	200p	2SD-1445	200p	2SK-511	450p	8264-10	210p	75162	700p
UIC-1505C	400p	2SA1266	280p	2SC586	100p	2SC1651	100p	2SC2361	200p	2SC3043	200p	2SC3639	300p	2SD-870	200p	2SD-1446	200p	2SK-511	450p	8264-12	210p	75168	100p
UIC-1514CA	200p	2SA1284	60p	2SC587	225p	2SC1652	40p	2SC2362	100p	2SC3044	100p	2SC3639	300p	2SD-871	200p	2SD-1450	60p	2SK-531	35p	8502A	360p	75163	95p
UIC-1515CA	250p	2SA1285	60p	2SC588	225p	2SC1653	40p	2SC2363	100p	2SC3045	100p	2SC3639	300p	2SD-872	200p	2SD-1451	260p	2SK-534	70p	8502B	360p	75168	95p
UIC-1520CA	250p	2SA1286	60p	2SC589	225p	2SC1654	40p	2SC2364	100p	2SC3046	100p	2SC3639	300p	2SD-873	200p	2SD-1452	260p	2SK-534	70p	8502C	360p	75168	95p
UIC-1536C	100p	2SA1302	300p	2SC590	225p	2SC1655	40p	2SC2365	100p	2SC3047	100p	2SC3639	300p	2SD-874	200p	2SD-1453	260p	2SK-538	450p	8501	300p	75195	185p
ZN424	100p	2SA1303	300p	2SC591	225p	2SC1656	40p	2SC2366	100p	2SC3048	100p	2SC3639	300p	2SD-875	200p	2SD-1454	260p	2SK-538	450p	8502	300p	75195	185p
ZN425	320p	2SA1304	110p	2SC592	225p	2SC1657	40p	2SC2367	100p	2SC3049	100p	2SC3639	300p	2SD-876	200p	2SD-1455	260p	2SK-538	450p	8503	300p	75195	185p
ZN426	280p	2SA1305	110p	2SC593	225p	2SC1658	40p	2SC2368	100p	2SC3050	100p	2SC3639	300p	2SD-877	200p	2SD-1456	260p	2SK-538	450p	8504	300p	75195	185p
ZN427	560p	2SA1307	160p	2SC594	225p	2SC1659	40p	2SC2369	100p	2SC3051	100p	2SC3639	300p	2SD-878	200p	2SD-1457	260p	2SK-538	450p	8505	300p	75195	185p
ZN428	215p	2SA1309	50p	2SC595	225p	2SC1660	40p	2SC2370	100p	2SC3052	100p	2SC3639	300p	2SD-879	200p	2SD-1458	260p	2SK-538	450p	8506	300p	75195	185p
ZN429	340p	2SA1315	100p	2SC596	225p	2SC1661	40p	2SC2371	100p	2SC3053	100p	2SC3639	300p	2SD-880	200p	2SD-1459	260p	2SK-538	450p	8507	300p	75195	185p
ZN430	150p	2SA1317	30p	2SC597	225p	2SC1662	40p	2SC2372	100p	2SC3054	100p	2SC3639	300p	2SD-881	200p	2SD-1460	260p	2SK-538	450p	8508	300p	75195	185p
ZN431	215p	2SA1318	30p	2SC598	225p	2SC1663	40p	2SC2373	100p	2SC3055	100p	2SC3639	300p	2SD-882	200p	2SD-1461	260p	2SK-538	450p	8509	300p	75195	185p
ZN432	215p	2SA1321	80p	2SC599	225p	2SC1664	40p	2SC2374	100p	2SC3056	100p	2SC3639	300p	2SD-883	200p	2SD-1462	260p	2SK-538	450p	8510	300p	75195	185p
ZN433	215p	2SA1324	80p	2SC600	225p	2SC1665	40p	2SC2375	100p	2SC3057	100p	2SC3639	300p	2SD-884	200p	2SD-1463	260p	2SK-538	450p	8511	300p	75195	185p
ZN434	215p	2SA1326	80p	2SC601	225p	2SC1666	40p	2SC2376	100p	2SC3058	100p	2SC3639	300p	2SD-885	200p	2SD-1464	260p	2SK-538	450p	8512	300p	75195	185p
ZN435	215p	2SA1327	80p	2SC602	225p	2SC1667	40p	2SC2377	100p	2SC3059	100p	2SC3639	300p	2SD-886	200p	2SD-1465	260p	2SK-538	450p	8513	300p	75195	185p
ZN436	215p	2SA1328	80p	2SC603	225p	2SC1668	40p	2SC2378	100p	2SC3060	100p	2SC3639	300p	2SD-887	200p	2SD-1466	260p	2SK-538	450p	8514	300p	75195	185p
ZN437	215p	2SA1329	80p	2SC604	225p	2SC1669	40p	2SC2379	100p	2SC3061	100p	2SC3639	300p	2SD-888	200p	2SD-1467	260p	2SK-538	450p	8515	300p	75195	185p
ZN438	215p	2SA1330	80p	2SC605	225p	2SC1670	40p	2SC2380	100p	2SC3062	100p	2SC3639	300p	2SD-889	200p	2SD-1468	260p	2SK-538	450p	8516	300p	75195	185p
ZN439	215p	2SA1331	80p	2SC606	225p	2SC1671	40p	2SC2381	100p	2SC3063	100p	2SC3639	300p	2SD-890	200p	2SD-1469	260p	2SK-538	450p	8517	300p	75195	185p
ZN440	215p	2SA1332	80p	2SC607	225p	2SC1672	40p	2SC2382	100p	2SC3064	100p	2SC3639	300p	2SD-891	200p	2SD-1470	260p	2SK-538	450p	8518	300p	75195	185p
ZN441	215p	2SA1333	80p	2SC608	225p	2SC1673	40p	2SC2383	100p	2SC3065	100p	2SC3639	300p	2SD-892	200p	2SD-1471	260p	2SK-538	450p	8519	300p	75195	185p
ZN442	215p	2SA1334	80p	2SC609	225p	2SC1674	40p	2SC2384	100p	2SC3066	100p	2SC3639	300p	2SD-893	200p	2SD-1472	260p	2SK-538	450p	8520	300p	75195	185p
ZN443	215p	2SA1335	80p	2SC610	225p	2SC1675	40p	2SC2385	100p	2SC3067	100p	2SC3639	300p										

VCR PINCHROLLERS Cont.		GRUNDIG		TOSHIBA		ORION Cont.		ITT	
Sharp Cont.		MVS400, MVS440, VS400, VS410, VS440, VS460, VS460		V55, V57, V59, V5280		NHVL, NVHML, LOADING MOTOR		PART NO: 131074	
VC581, VC582, VC583, VC584, VC602, VC471, VC473, VC477, VC500, VC571, VC573, VC584, VC5W20E, VCA1031, VC651, VC681, VC685, VC750, VC780, VC781, VC785, VC787, VC789, VC792, VC800, VC882, VC684, VC688, VC699, VC700, VC772, VC7810, VC782, VC7822, VC782M2, VC783, VC783, VC786, VC800, VC83, VCA10, VCA2, VCA3, VCA4, VCA20, VCA30, VCA31, VCA32, VCA33, VCA501, VCA502, VCD801, VCD802, VCH952, VCH881, VC220		HINARI VXL2, VXL8, VXL9, VXL4, VXL3, VXL5, VXL6, VXL7, VXL20		V61, V63, V65, V9600, V9680, V61, V63, V65, V66, V67		VH450, VH254, VH288, VH300, VH404, VH412, VH512, VH530, VH535, VH600, VH630, VH635, VH640, VH666, VH704, VH720, VH725, VH744, VH770, VH774, VH820, VH844, VH850, VH888, VH893, VH900, VH974, VH1012, VH1204, VH1442, VH1500, VH1660, VH1800, VH2004, VH2300, VH2350, VH3000, VH4010, VH4015, VH4200, VH5010, VH5015, VHF2A, VP220, VR2928, VR2948, VR2956, VR2957, VR2966, VR2980, VXL20, VXL25, VXL30		USED ON: CP2020, 0211F, 0323, 0323A1, 034175, 0345F, 0351, 0351T, 0361, 0361T, 9350, CT0500, 0500T/1T, 0500T	
SAISHO VR2010, VCR300		VITACH VT11, VT14, VT17, VT19, VT33, VT34, VT35, VT38, VT39, VT88, VT165, VT330, VT170, VT250		UNIVERSAL THORN 9000 SERIES PHILIPS G9 G8 520/55		VH750, V805, REEL MOTOR VH750, V805, REEL MOTOR VH750, V805, REEL MOTOR		PRICE: £3.50 PART NO: LFC 005 USED ON: CVY40	
SOLARA SV650, SV660, SV7300, SV8303, SV8300, SV8300, SV8300, SV8400, SV8420, SV8500, SV8520, SV8550, SV8600, SV8620, SV8700, SV8710, SV8720, SV8800, SV8830, SV8950, SV9600, SV9810, SV800, SV8100		VIT700, VT8000, VT8500, VT8600, VT8500, VT8600, VT9300, VT9500, VT9700, VT9900, VT52, VT61, VT62, VT64, VT65, VT85, VT86, VT640, VT3000, VT100, VT110, VT111, VT113, VT115, VT118, VT120, VT125, VT128, VT130, VT138, VT145, VT150, VT175, VT220, VT225, VT250, VT225, VT258, VT260, VT130		DECCA 100 SERIES 120130		SAMSUNG VR705, VR805, REEL MOTOR VH750, V805, REEL MOTOR		PART NO: K30, K35, K40, K3, K4 PRICE: £1.50	
SAMSUNG SV716, SV717, VB510, VB520, VB610, VB616, VB617, VB619, VB620, VB621, VB622, VB623, VB624, VB625, VB626, VB627, VB628, VB629, VB630, VB631, VB632, VB633, VB634, VB635, VB636, VB637, VB638, VB639, VB640, VB641, VB642, VB643, VB644, VB645, VB646, VB647, VB648, VB649, VB650, VB651, VB652, VB653, VB654, VB655, VB656, VB657, VB658, VB659, VB660, VB661, VB662, VB663, VB664, VB665, VB666, VB667, VB668, VB669, VB670, VB671, VB672, VB673, VB674, VB675, VB676, VB677, VB678, VB679, VB680, VB681, VB682, VB683, VB684, VB685, VB686, VB687, VB688, VB689, VB690, VB691, VB692, VB693, VB694, VB695, VB696, VB697, VB698, VB699, VB700, VB701, VB702, VB703, VB704, VB705, VB706, VB707, VB708, VB709, VB710, VB711, VB712, VB713, VB714, VB715, VB716, VB717, VB718, VB719, VB720, VB721, VB722, VB723, VB724, VB725, VB726, VB727, VB728, VB729, VB730, VB731, VB732, VB733, VB734, VB735, VB736, VB737, VB738, VB739, VB740, VB741, VB742, VB743, VB744, VB745, VB746, VB747, VB748, VB749, VB750, VB751, VB752, 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VB896, VB897, VB898, VB899, VB900, VB901, VB902, VB903, VB904, VB905, VB906, VB907, VB908, VB909, VB910, VB911, VB912, VB913, VB914, VB915, VB916, VB917, VB918, VB919, VB920, VB921, VB922, VB923, VB924, VB925, VB926, VB927, VB928, VB929, VB930, VB931, VB932, VB933, VB934, VB935, VB936, VB937, VB938, VB939, VB940, VB941, VB942, VB943, VB944, VB945, VB946, VB947, VB948, VB949, VB950, VB951, VB952, VB953, VB954, VB955, VB956, VB957, VB958, VB959, VB960, VB961, VB962, VB963, VB964, VB965, VB966, VB967, VB968, VB969, VB970, VB971, VB972, VB973, VB974, VB975, VB976, VB977, VB978, VB979, VB980, VB981, VB982, VB983, VB984, VB985, VB986, VB987, VB988, VB989, VB990, VB991, VB992, VB993, VB994, VB995, VB996, VB997, VB998, VB999, V1000, V1001, V1002, V1003, V1004, V1005, V1006, V1007, V1008, V1009, V1010, V1011, V1012, V1013, V1014, V1015, V1016, V1017, V1018, V1019, V1020, V1021, V1022, V1023, V1024, V1025, V1026, V1027, V1028, V1029, V1030, V1031, V1032, V1033, V1034, V1035, V1036, V1037, V1038, V1039, V1040, V1041, V1042, V1043, V1044, V1045, V1046, V1047, V1048, V1049, V1050, V1051, V1052, V1053, V1054, V1055, V1056, V1057, V1058, V1059, V1060, V1061, V1062, V1063, V1064, V1065, V1066, V1067, V1068, V1069, V1070, V1071, V1072, V1073, V1074, V1075, V1076, V1077, V1078, V1079, V1080, V1081, V1082, V1083, V1084, V1085, V1086, V1087, V1088, V1089, V1090, V1091, V1092, V1093, V1094, V1095, V1096, V1097, V1098, V1099, V1100, V1101, V1102, V1103, V1104, V1105, V1106, V1107, V1108, V1109, V1110, V1111, V1112, V1113, V1114, V1115, V1116, V1117, V1118, V1119, V1120, V1121, V1122, V1123, V1124, V1125, V1126, V1127, V1128, V1129, V1130, V1131, V1132, V1133, V1134, V1135, V1136, V1137, V1138, V1139, V1140, V1141, V1142, V1143, V1144, V1145, V1146, V1147, V1148, V1149, V1150, V1151, V1152, V1153, V1154, V1155, V1156, V1157, V1158, V1159, V1160, V1161, V1162, V1163, V1164, V1165, V1166, V1167, V1168, V1169, V1170, V1171, V1172, V1173, V1174, V1175, V1176, V1177, V1178, V1179, V1180, V1181, V1182, V1183, V1184, V1185, V1186, V1187, V1188, V1189, V1190, V1191, V1192, V1193, V1194, V1195, V1196, V1197, V1198, V1199, V1200, V1201, V1202, V1203, V1204, V1205, V1206, V1207, V1208, V1209, V1210, V1211, V1212, V1213, V1214, V1215, V1216, V1217, V1218, V1219, V1220, V1221, V1222, V1223, V1224, V1225, V1226, V1227, V1228, V1229, V1230, V1231, V1232, V1233, V1234, V1235, V1236, V1237, V1238, V1239, V1240, V1241, V1242, V1243, V1244, V1245, V1246, V1247, V1248, V1249, V1250, V1251, V1252, V1253, V1254, V1255, V1256, V1257, V1258, V1259, V1260, V1261, V1262, V1263, V1264, V1265, V1266, V1267, V1268, V1269, V1270, V1271, V1272, V1273, V1274, V1275, V1276, V1277, V1278, V1279, V1280, V1281, V1282, V1283, V1284, V1285, V1286, V1287, V1288, V1289, V1290, V1291, V1292, V1293, V1294, V1295, V1296, V1297, V1298, V1299, V1300, V1301, V1302, V1303, V1304, V1305, V1306, V1307, V1308, V1309, V1310, V1311, V1312, V1313, V1314, V1315, V1316, V1317, V1318, V1319, V1320, V1321, V1322, V1323, V1324, V1325, V1326, V1327, V1328, V1329, V1330, V1331, V1332, V1333, V1334, V1335, V1336, V1337, V1338, V1339, V1340, V1341, V1342, V1343, V1344, V1345, V1346, V1347, V1348, V1349, V1350, V1351, V1352, V1353, V1354, V1355, V1356, V1357, V1358, V1359, V1360, V1361, V1362, V1363, V1364, V1365, V1366, V1367, V1368, V1369, V1370, V1371, V1372, V1373, V1374, V1375, V1376, V1377, V1378, V1379, V1380, V1381, V1382, V1383, V1384, V1385, V1386, V1387, V1388, V1389, V1390, V1391, V1392, V1393, V1394, V1395, V1396, V1397, V1398, V1399, V1400, V1401, V1402, V1403, V1404, V1405, V1406, V1407, V1408, V1409, V1410, V1411, V1412, V1413, V1414, V1415, V1416, V1417, V1418, V1419, V1420, V1421, V1422, V1423, V1424, V1425, V1426, V1427, V1428, V1429, V1430, V1431, V1432, V1433, V1434, V1435, V1436, V1437, V1438, V1439, V1440, V1441, V1442, V1443, V1444, V1445, V1446, V1447, V1448, V1449, V1450, V1451, V1452, V1453, V1454, V1455, V1456, V1457, V1458, V1459, V1460, V1461, V1462, V1463, V1464, V1465, V1466, V1467, V1468, V1469, V1470, V1471, V1472, V1473, V1474, V1475, V1476, V1477, V1478, V1479, V1480, V1481, V1482, V1483, V1484, V1485, V1486, V1487, V1488, V1489, V1490, V1491, V1492, V1493, V1494, V1495, V1496, V1497, V1498, V1499, V1500, V1501, V1502, V1503, V1504, V1505, V1506, V1507, V1508, V1509, V1510, V1511, V1512, V1513, V1514, V1515, V1516, V1517, V1518, V1519, V1520, V1521, V1522, V1523, V1524, V1525, V1526, V1527, V1528, V1529, V1530, V1531, V1532, V1533, V1534, V1535, V1536, V1537, V1538, V1539, V1540, V1541, V1542, V1543, V1544, V1545, V1546, V1547, V1548, V1549, V1550, V1551, V1552, V1553, V1554, V1555, V1556, V1557, V1558, V1559, V1560, V1561, V1562, V1563, V1564, V1565, V1566, V1567, V1568, V1569, V1570, V1571, V1572, V1573, V1574, V1575, V1576, V1577, V1578, V1579, V1580, V1581, V1582, V1583, V1584, V1585, V1586, V1587, V1588, V1589, V1590, V1591, V1592, V1593, V1594, V1595, V1596, V1597, V1598, V1599, V1600, V1601, V1602, V1603, V1604, V1605, V1606, V1607, V1608, V1609, V1610, V1611, V1612, V1613, V1614, V1615, V1616, V1617, V1618, V1619, V1620, V1621, V1622, V1623, V1624, V1625, V1626, V1627, V1628, V1629, V1630, V1631, V1632, V1633, V1634, V1635, V1636, V1637, V1638, V1639, V1640, V1641, V1642, V1643, V1644, V1645, V1646, V1647, V1648, V1649, V1650, V1651, V1652, V1653, V1654, V1655, V1656, V1657, V1658, V1659, V1660, V1661, V1662, V1663, V1664, V1665, V1666, V1667, V1668, V1669, V1670, V1671, V1672, V1673, V1674, V1675, V1676, V1677, V1678, V1679, V1680, V1681, V1682, V1683, V1684, V1685, V1686, V1687, V1688, V1689, V1690, V1691, V1692, V1693, V1694, V1695, V1696, V1697, V1698, V1699, V1700, V1701, V1702, V1703, V1704, V1705, V1706, V1707, V1708, V1709, V1710, V1711, V1712, V1713, V1714, V1715, V1716, V1717, V1718, V1719, V1720, V1721, V1722, V1723, V1724, V1725, V1726, V1727, V1728, V1729, V1730, V1731, V1732, V1733, V1734, V1735, V1736, V1737, V1738, V1739, V1740, V1741, V1742, V1743, V1744, V1745, V1746, V1747, V1748, V1749, V1750, V1751, V1752, V1753, V1754, V1755, V1756, V1757, V1758, V1759, V1760, V1761, V1762, V1763, V1764, V1765, V1766, V1767, V1768, V1769, V1770, V1771, V1772, V1773, V1774, V1775, V1776, V1777, V1778, V1779, V1780, V1781, V1782, V1783, V1784, V1785, V1786, V1787, V1788, V1789, V1790, V1791, V1792, V1793, V1794, V1795, V1796, V1797, V1798, V1799, V1800, V1801, V1802, V1803, V1804, V1805, V1806, V1807, V1808, V1809, V1810, V1811, V1812, V1813, V1814, V1815, V1816, V1817, V1818, V1819, V1820, V1821, V1822, V1823, V1824, V1825, V1826, V1827, V1828, V1829, V1830, V1831, V1832, V1833, V1834, V1835, V1836, V1837, V1838, V1839, V1840, V1841, V1842, V1843, V1844, V1845, V1846, V1847, V1848, V1849, V1850, V1851, V1852, V1853, V1854, V1855, V1856, V1857, V1858, V1859, V1860, V1861, V1862, V1863, V1864, V1865, V1866, V1867, V1868, V1869, V1870, V1871, V1872, V1873, V1874, V1875, V1876, V1877, V1878, V1879, V1880, V1881, V1882, V1883, V1884, V1885, V1886, V1887, V1888, V1889, V1890, V1891, V1892, V1893, V1894, V1895, V1896, V1897, V1898, V1899, V1900, V1901, V1902, V1903, V1904, V1905, V1906, V1907, V1908, V1909, V1910, V1911, V1912, V1913, V1914, V1915, V1916, V1917, V1918, V1919, V1920, V1921, V1922, V1923, V1924, V1925, V1926, V1927, V1928, V1929, V1930, V1931, V1932, V1933, V1934, V1935, V1936, V1937, V1938, V1939, V1940, V1941, V1942, V1943, V1944, V1945, V1946, V1947, V1948, V1949, V1950, V1951, V1952, V1953, V1954, V1955, V1956, V1957, V1958, V1959, V1960, V1961, V1962, V1963, V1964, V1965, V1966, V1967, V1968, V1969, V1970, V1971, V1972, V1973, V1974, V1975, V1976, V1977, V1978, V1979, V1980, V1981, V1982, V1983, V1984, V1985, V1986, V1987, V1988, V1989, V1990, V1991, V1992, V1993, V1994, V1995, V1996, V1997, V1998, V1999, V2000, V2001, V2002, V2003, V2004, V2005, V2006, V2007, V2008, V2009, V2010, V2011, V2012, V2013, V2014, V2015, V2016, V2017, V2018, V2019, V2020, V2021, V2022, V2023, V2024, V2025, V2026, V2027, V2028, V2029, V2030, V2031, V2032, V2033, V2034, V2035, V2036, V2037, V2038, V2039, V2040, V2041, V2042, V2043, V2044, V2045, V2046, V2047, V2048, V2049, V2050, V2051, V2052, V2053, V2054, V2055, V2056, V2057, V2058, V2059, V2060, V2061, V2062, V2063, V2064, V2065, V2066, V2067, V2068, V2069, V2070, V2071, V2072, V2073, V2074, V2075, V2076, V2077, V2078, V2079, V2080, V2081, V2082, V2083, V2084, V2085, V2086, V2087, V2088, V2089, V2090, V2091, V2092, V2093, V2094, V2095, V2096, V2097, V2098, V2099, V2100, V2101, V2102, V2103, V2104, V2105, V2106, V2107, V2108, V2109, V2110, V2111, V2112, V2113, V2114, V2115, V2116, V2117, V2118, V2119, V2120, V2121, V2122, V2123, V2124, V2125, V2126, V2127, V2128, V2129, V2130, V2131, V2132, V2133, V2134, V2135, V2136, V2137, V2138, V2139, V2140, V2141, V2142, V2143, V2144, V2145, V2146, V2147, V2148, V2149, V2150, V2151, V2152, V2153, V2154, V2155, V2156, V2157, V2158, V2159, V2160, V2161, V2162, V2163, V2164, V2165, V2166, V2167, V2168, V2169, V2170, V2171, V2172, V2173, V2174, V2175, V2176, V2177, V2178, V2179, V2180, V2181, V2182, V2183, V2184, V2185, V2186, V2187, V2188, V2189, V2190, V2191, V2192, V2193, V2194, V2195, V2196, V2197, V2198, V2199, V2200, V2201, V2202, V2203, V2204, V2205, V2206, V2207, V2208, V2209, V2210, V2211, V2212, V2213, V2214, V2215, V2216, V2217, V2218, V2219, V2220, V2221, V2222, V2223, V2224, V2225, V2226, V2227, V2228, V2229, V2230, V2231, V2232, V2233, V2234, V2235, V2236, V2237, V2238, V2239, V2240, V2241, V2242, V2243, V2244, V2245, V2246, V2247, V2248, V2249, V2250, V2251, V2252, V2253, V2254, V2255, V2256, V2257, V2258, V2259, V2260, V2261, V2262, V2263, V2264, V2265, V2266, V2267, V2268, V2269, V2270, V2271, V2272, V2273, V2274, V2275, V2276, V2277, V2278, V2279, V2280, V2281, V2282, V2283, V2284, V2285, V2286, V2287, V2288, V2289, V2290, V2291, V2292, V2293, V2294, V2295, V2296, V2297, V2298, V2299, V2300, V2301, V2302, V2303, V2304, V2305, V2306, V2307, V2308, V2309, V2310, V2311, V2312, V2313, V2314, V2315, V2316, V2317, V2318, V2319, V2320, V2321, V2322, V2323, V2324, V2325, V2326, V2327, V2328, V2329, V2330, V2331, V2332, V2333, V2334, V2335, V2336, V2337, V2338, V2339, V2340, V2341, V2342, V2343, V2344, V2345, V2346, V2347, V2348, V2349, V2350, V2351, V2352, V2353, V2354, V2355, V2356, V2357, V2358, V2359, V2360, V2361, V2362, V2363, V2364, V2365, V2366, V2367, V2368, V2369, V2370, V2371, V2372, V2373, V2374, V2375, V2376, V2377, V2378, V2379, V2380, V2381, V2382, V2383, V2384, V2385, V2386, V2387, V2388, V2389, V2390, V2391, V2392, V2393, V2394, V2395, V2396, V2397, V2398, V2399, V2400, V2401, V2402, V2403, V2404, V2405, V2406, V2407, V2408, V2409, V2410, V2411, V2412, V2413, V2414, V2415, V2416, V2417, V2418, V2419, V2420, V2421, V2422, V2423, V2424, V2425, V2426, V2427, V2428, V2429, V2430, V2431, V2432, V2433, V2434, V2435, V2436, V2437, V2438, V2439, V2440, V2441, V2442,									

VIDEO SERVICE KITS

AMSTRAD			
VCR700			
Contents			
BELT SET PINCH ROLLER REEL IDLER VIDEO LAMP			
Order Code: SK41		£5.50	
FERGUSON & JVC			
3V42/43			
HRD455/HRD725			
Contents			
BELT SET PINCH ROLLER		Economy Kit Contents	
CLUTCH MECHANISM TENSION BAND		BELT SET PINCH ROLLER	
ORDER CODE: SK37		SUPPLY CLUTCH TAKE UP CLUTCH	£9.50
£17.50	Order Code: SK38		
3V58/59/64/65			
HRD170/180/210/230/300/320/370/400/430/530/700/750			
HR55000			
Contents			
BELT SET PINCH ROLLER IDLER ARM TENSION BAND			
Order Code: SK44		£8.50	
3V29/3V30			
HR7200/7300/7350			
Contents			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK05		£6.00	
3V35/36/38/39/49			
HRD110/111/120/225			
Contents			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK04		£5.50	
3V31/3V42			
HR7600/7610/7650/7655			
Contents			
BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDLER T/U CLUTCH T/U IDLER TENSION BAND VIDEO LAMP		Economy Kit Contents	
ORDER CODE: SK33		BELT SET T/U REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T/U IDLER TENSION BAND VIDEO LAMP	£5.50
£12.00	Order Code: SK34		
3V35/36/38/39/49			
HRD110/111/120/121/225			
Contents			
BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U CLUTCH T/U IDLER REEL IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK35		BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U CLUTCH T/U IDLER REEL IDLER TYRE	£6.50
£10.50	Order Code: SK36		
3V29/3V30			
HR7200/7300/7350			
Contents			
BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER T/U CLUTCH T/U IDLER TENSION BAND VIDEO LAMP		Economy Kit Contents	
ORDER CODE: SK31		BELT SET T/U REEL IDLER TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER REEL IDLER TYRE T/U IDLER TYRE T/U CLUTCH	£5.60
£11.50	Order Code: SK32		
3V44/45/48/53/54/55/57			
HRP50/HRD140/150/158/160			
HRD250/257/565/566/755			
Contents			
BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION BAND		Economy Kit Contents	
ORDER CODE: SK39		BELT SET PINCH ROLLER	£9.50
£15.00	Order Code: SK40		
FISHER			
FVHP905/906/907/908/910/911/916/918			
Contents			
BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK57		BELT SET PINCH ROLLER IDLER TYRE	£5.00
£13.00	Order Code: SK58		
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840			
Contents			
BELT SET PINCH ROLLER IDLER GEAR IDLER UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK68		BELT SET PINCH ROLLER IDLER TYRE	£3.60
£12.50	Order Code: SK69		
HITACHI			
VT11/VT33			
Contents			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK08		£6.00	
VT11/VT33			
Contents			
BELT SET T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER FF/REW IDLER CLUTCH PLATE TENSION BAND		Economy Kit Contents	
ORDER CODE: SK45		BELT SET PINCH ROLLER FF/REW IDLER TYRE T/U REEL TABLE TYRE SUPPLY REEL TABLE TYRE	£4.50
£15.00	Order Code: SK46		

VIDEO SERVICE KITS (Cont.)

HITACHI			
VT52/61/62/63/64/65/85/86/640			
Contents			
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND		Economy Kit Contents	
ORDER CODE: SK49		BELT SET PINCH ROLLER FF/REW IDLER	£3.25
£14.00	Order Code: SK50		
VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/496/510/520/25/26/530/35/36/540/545/46/48/570/575/576/580/85/88			
Contents			
TIMING BELT PINCH ROLLER FF/REW ARM CLUTCH BASE TENSION BAND			
Order Code: SK52		£11.50	
VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/VTL30			
Contents			
BELT SET PINCH ROLLER FF/REW ARM CLUTCH PLATE TENSION BAND			
Order Code: SK51		£15.00	
PANASONIC			
NV2000/NV2010			
Contents			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRES			
Order Code: SK03		£6.25	
NV300/NV330/NV333/NV340/NV366			
Contents			
BELT SET PINCH ROLLER TENSION BAND IDLER TYRE			
Order Code: SK01		£5.50	
NV2000/NV2010			
Contents			
BELT SET PINCH ROLLER FF IDLER PLAY IDLER TENSION BAND VIDEO LAMP		Economy Kit Contents	
ORDER CODE: SK13		BELT SET PINCH ROLLER IDLER TYRE PULLEY TYRE	£4.50
£9.50	Order Code: SK14		
NV7000/NV7200/NV7800			
Contents			
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK11		BELT SET PINCH ROLLER IDLER TYRE CLUTCH TYRE	£4.20
£10.00	Order Code: SK12		
NV300/NV330/NV333/NV340/NV366			
Contents			
BELT SET PINCH ROLLER IDLER UNIT PLAY IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK15		BELT SET PINCH ROLLER IDLER TYRE PLAY IDLER TYRE	£4.00
£8.00	Order Code: SK16		
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (P/X/AC)/AG1810 (P/K)			
Contents			
LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK27		LOADING BELT CAPSTAN BELT PINCH ROLLER IDLER TYRE	£4.50
£9.50	Order Code: SK28		
NV332			
Contents			
BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND FF/REW IDLER		Economy Kit Contents	
ORDER CODE: SK29		BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE	£5.10
£13.00	Order Code: SK30		
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK			
Contents			
BELT SET PINCH ROLLER IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK23		BELT SET PINCH ROLLER IDLER TYRE	£3.50
£7.00	Order Code: SK24		
NV600/NV688			
Contents			
BELT SET PINCH ROLLER PLAY IDLER FF/REW IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK25		BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW IDLER TYRE	£6.50
£13.00	Order Code: SK26		
NV730/NV770			
Contents			
SLOT IN BELT LOADING BELT PINCH ROLLER IDLER UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK19		SLOT IN BELT LOADING BELT PINCH ROLLER IDLER TYRE	£4.30
£7.00	Order Code: SK20		
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK			
Contents			
BELT SET PINCH ROLLER IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK21		BELT SET PINCH ROLLER IDLER TYRE	£3.50
£7.00	Order Code: SK22		
NV777/NV788			
Contents			
BELT SET PINCH ROLLER IDLER UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK17		BELT SET PINCH ROLLER IDLER TYRE	£4.00
£7.50	Order Code: SK18		

VIDEO SERVICE KITS (Cont.)

SHARP			
VC341			
Contents			
BELT SET PINCH ROLLER REEL IDLER TENSION BAND VIDEO LAMP		Economy Kit Contents	
ORDER CODE: SK47		BELT SET PINCH ROLLER REEL IDLER TYRE	£5.00
£9.00	Order Code: SK48		
VC500/405/170/581/VC582/VC583/VC584/VC5F3			
Contents			
BELT SET PINCH ROLLER REEL IDLER TENSION BAND		Economy Kit Contents	
ORDER CODE: SK40		BELT SET PINCH ROLLER REEL IDLER	£6.50
£9.50	Order Code: SK61		
VC781/VC781G/VC782/VC785/VC786/VC793/VC800/VC8100/VC812/VC814/VC820			
Contents			
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK54		BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE	£6.25
£13.50	Order Code: SK65		
VC6B1/VC6B2/VC6B4/VC6B5/VC6B9/VC693/VC699/VC6F3/VC700			
Contents			
BELT SET PINCH ROLLER REEL DRIVE UNIT TENSION BAND		Economy Kit Contents	
ORDER CODE: SK62		BELT SET PINCH ROLLER REEL DRIVE UNIT TYRE	£6.25
£13.50	Order Code: SK63		

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ICPF15	ICPN10
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VS155, VS165 2600P
VS20, VS22, VS24, VS25, VS26, VS27, VS422,
VS425, VS426, VS427, VSF10, VSP8,
VSP9 1700P
VS240, VSP82, VS202 1500P
VS33 2600P
VSR9 1700P

AMSTRAD
VCR8800, VCR8804, VCR9340 2400P
DD8900, DD8904, TVR4, VCR6200, VCR8600,
VCR8602, VR8700 1300P
VCR8603, VCR8604, VCR8704, VCR8714 1350P

BAIRD
VC14L 3000P
VHS82 7000P

BLAUPUNKT
CR1000, CR1200, CR1500 4650P
CR1800 4100P
RTV321, RTV322 1700P
RTV330 2300P
RTV333 1000P
RTV33B 2800P
RTV348 2700P
RTV404, RTV414 3000P
RTV635 3000P
RTV640 3000P
RTV750, RTV800, RTV900 3500P
RTV810 4400P
RTV910 4500P

JVC
HRD330, HRD337, HRD440, HRD637, HRD641,
HRD660, HRFC100 2200P

JVC AND FERGUSON
8902/8903/8909/8912/8922 1000P
8923/8925/8929/8935 650P
8931/8933 750P
FV43H, HRD860 3800P
VC141L, HRD190, HRD610 3050P
FV44L 2200P
BR1600, HRD142, HRD156, HRD152 1550P
BR6200 720P
HRD154, HRD217, HRD321, HRD350, HRD521,
HRD522, HRD525, HRD527, HRD550 1700P
HRD580, HRD620, HRD650 2900P

FIDELITY
VR900, VR910 1600P

FISHER
FVHD140, FVHD40, FVHP1, FVHP10, FVHP20 1600P
FVHP40, FVHS10 2100P
FVHP200, FVHP210, FVHP300, FVHP310 1200P
FVHP500, FVHP5100, FVHP730, FVHP830 2500P
FVHP980 2500P

FUNAI
E1100, VIP5000 1200P
VCR5840, VCR8007, VIP2500A, VIP3000A,
VIP6000, VIP150 2200P
VCR4530, VCR6000, VCR6100 1600P
VCR8103, VCR600, VCR6100 1600P
VCR8103, VCR8107 2200P
VIP300A MKII 1900P

GEC
V4005H 2000P

GOLDSTAR
GHV1232, 1233, 1241, 1242, 1243, 1244, 1290,
1291, 1295, 1296, 1891, VCP4130, 4300, 4301,
4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321,
4326 1650P

GRUNDIG
VS456 1700P
SE6110, SE9100, TVR4510, TVR5510, VS500,
VS510, VS5180, VS6190, VS700, VS900 1800P
VS790, VS930, VS940 3800P
MVS660, SE6160, VERONA, VS660,
VS6690 3500P
MVS710, MVS720, MVS910, SE9120, VS800,
VSB10, VS910, VS920, SE7120, VS710,
VS720 1800P
VS160, VS740 4400P
VS170 4600P
VS680 4600P

HINARI
VCR34H, VTV200, VXL90 1850P

HITACHI
VT15, VTP10, VTP30 1100P
VT16B, VT260, VT498 2700P
VT570, VT575, VT576, VT580, VT585,
VT588 3400P
VT5600 1200P
VT60 1500P
VT660E 2600P
VT6700, VT6800 1200P
VTL30 2100P

VT522, VTM620, VTM622, VTM720, VTM722,
VTM822 2000P
VTM725, VTM726, VTM72B 1600P

ITT
VR3520, VR3701, VR3719, VR3720, VR3721,
VR3759, VR9720 2000P
VR3730, VR3731, VR3749, 2700P
VR3907, VR3908 1600P
VR3918, VR3919, VR3938 1800P
VR396B 7000P
VR3984 2300P
VR3958, VR4993 650P
VR4913, VRP3833 650P

LUXOR
9245, 9251, 9254 1225P
9255, 9256 2150P
9270, 9271, 9273 1800P
9272, 928217 2700P
9252 2500P
928017, 928077, 928097, 929107, 929117 1700P
9253 2500P
9281 2700P
9284, 9295, VR3701, VR3721, VR3731,
VR3761 2100P

MATSUI
VX600 1100P
VX750 1500P
VX990 1600P

mitsubishi
HSE12, HSE22, MX1 2400P
HS411EZ, HS411GZ 2900P
HS273 1700P
HSB10, HSB20, HSE10, HSE20, HSE21,
HSE41 2200P
HSB11, HSB21 2200P
HSB30 2400P
HSE31, HSB31, HSE32 2800P
HSE50 3300P

NATIONAL
NV8050, NV8051 2800P
AG1000, AG1050, NV260 1650P
AG6010, AG6015 2500P
AG6840 2400P
NV200 850P
NVD80 5000P
NVF65, NVH75 3400P
NVF51 4200P
NVG19 2300P
NVJ33, NVL21, NVJ30 1800P
NVJ35 3000P
NVM1, NVM3, NVM5 4200P
AG2100, AG2200 700P
NVF65 3200P

N.E.C.
DX2000 3400P
DS6000 3500P
DX1000, DX1600, N9040, N9053, N9055 2000P
DX4000, N9610, DX3000 3200P
N9052, N9530 3400P
N9110, N9120, N914C 2700P
VCP1 1700P
PVC2300, PVC240, PVC740, PVC744, PVC760,
PVC764 1600P

SAMSUNG
VM1560, VN1561 2200P

SANYO
VHR7900 3600P

SHARP
VC585, VC685 2300P
VC90ET 3900P
VFH815 2800P

SONY
SLV373UB 3000P

TOSHIBA
V660 2350P
V880MS 2600P
V700G 3700P
V500G, V509G 2500P
V9680 2900P
V300G, V301, V305, V309G 2550P
V61, V63 1700P
V110, V120, V130, V140, V210, V220 1800P

TELEVISION ON/OFF

MAINS SWITCHES
Baur, Normende, Nova, Pioneer, Quelle, Saba,
Salora, TEC, Thomson & Vega 375P

VIDEO MOTORS

HITACHI
VT11, VT14, VT15, VT16, VT17, VT19, VT35,
VT39, VT57, VT88 (capstan motor) 3100P

BANG & OLUFSEN
VHS65, VHS90 (capstan motor) 3100P

LOADING MOTOR UNITS

ITT
VR3605, VR3905, VR3955, VR3985 1100P
VP2826, VR3906, V43926, VR3976 1250P
VP3946, VR3906, VR3948, VR3986, VR3995,
VR6948 1500P

JVC
HRD110, HRD111, HRD120, HRD121,
HRD225 1600P
HRD140, HRD150, HRD157M, HRD158MS,
HRD160, HRD250, HRD257MS, HRD566,
HRP50 1250P
HRD455, HRD725, N895 1500P

SABA
VR6005, VR6014, VR7004, VR7011, VR8011,
VR8014 1100P
VR6006, VR6007, VR608, VR6009, VR6018,
VR7007, VR7018, VR9006 1250P
VR6016, VR6038, VR7016 1500P

TELEFUNKEN
VR1925, VR1930, VR1940, VR1950, VR925,
VR930, VR940, VR950 1100P
A920, VR2920, VR12970, VR7921, VR7926,
VR7931, VR7971, VR975 1250P
VR1970, VR1980, VR7970, VR7980, VR970,
VR980 1500P

THOMSON
V320, V321, V323, V326, V4200, V4300 1100P
V342, V343, V352, V353, V360, V4210, V4230,
V4260 1250P
V364, V368, V4400, V6000 1500P

THORN-FERGUSON
3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 1100P
3V44, 3V45, 3V48, 3V54, 3V55, 3V57, 8947,
8947B, 8948 1250P
3V43, 9845 1500P

TOSHIBA
V55, V57 1100P
V65, V66, V67 1250P
V61, V63 1500P

CASSETTE HOUSING

AKAI
VS35, VS53, VS55, VS66, VS75 2600P

FERGUSON
FV31R 4300P

JVC & FERGUSON
HRD515, HRD520, HRD527, HRD540, HRD550,
HRD580, HRD600, HRD610, HRD620, HRD660,
HRD670, HRD830, HRD840, HRD850, HRD860,
HRD4050, HRD6600 & FV37H 2400P

IC TRANSISTORS

M491BB1 500P
SAA5243PE 800P
TIP112H 50P
UPC1488H 150P
STR4090A 650P

IC AND TRANSISTORS

BU506DF 120P
BUZ11 200P
BUZ80 200P
M494B1 700P
SAA5231 300P
SAA1293 550P
S2000A3 175P
S2000AF 175P
S2055A 175P
S2000AF 200P
S2530A 100P
TEA201BA 200P
UC3844 100P
UPC1185H2 400P

REMOTE CONTROLS

AKAI
RC-V10A 1000P
RCV37B 1000P
V25A 1000P

BUSH
2020T, 2114T, 2321T, 2514T 1000P
2020, 2114, 2321, 2514 1000P

DECCA
RC70 850P

FISHER
RC905B 1000P

GRANADA/REDIFFUSION
UNIVERSAL, 79500C, 986700 850P
SATELLITE 1000P
MK4 TEXT, 70115G, 70133G, 70357E 850P
MK4A TEXT, 70375C 850P
95288E 1000P
94490D 1000P

REMOTE CONTROLS

GRUNDIG

TP160E	1050P
TP200, TP300	1000P
TP400	850P
TP590-600	1050P
TP390, TP610	1050P
TP621	1050P
TP630, TP650	1000P
TP660	1050P
TP661	1050P

HITACHI

CLE800-CLE830	900P
A617402/655602	1000P
A512120/230	1000P
A514790	1000P
A5088470	1000P
A518612	1000P
SCL002	1000P
C2096	1000P
A511940	1000P
655602H	1000P

ITT

IFB13, 14, 15	900P
FS4	850P
RG305	900P
RG306	900P
FS9/1-10/1	900P
VS5 RUK	900P
VS4-1	900P
MULTICONTROL (17C20)	1000P

KORTING

18279, 18396, 18460, 18521 SE	1000P
40540 VTS	1000P

LOEWE

DC11	1000P
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MATSUI

010270601	1000P
VX770	1000P

METZ

JAVA COLOR (6890)	1000P
COLOR (7156)	1000P
JAVA (7180)	1000P

MITSUBISHI

939P/03607, 939P/03609	900P
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NOKIA

SATELLITE	1000P
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NORDMENDE

TC2336	1050P
CMC1, TC3519	1050P

OCEANIC

390C9500	1000P
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ORION

RC53	1000P
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PANASONIC

EUR51200	900P
TC2200	900P
VSQ0357/NV730	1050P
TNQ1621	1000P

PHILCO

CARVEL, CONCORDE, MERCURY	1000P
TELESTAR	1000P
TC10	1000P

PHILIPS

RC5002, 5154	900P
KT3 NON TEXT	900P
69117032	1050P
69117194	1050P
RC5991 UNIV	850P
RC3B	900P
KT3 TEXT	900P
RC5352	900P
RC5375	900P
RC5 STANDARD	900P
RC5901	900P
RC5903	900P

SABA

T6772	1000P
TC319-320	1050P
TC356	1050P
TC358	1050P
TC360	1000P
TC365	1000P

SALORA

SERIES L	1000P
86173	1000P

SANYO

RC218, RC222, RC228, RC238	900P
JXGE	1000P
JXDE	1000P
VHR2300	1000P
RC628	1000P

SHARP

G0121CESA, 123CESA, 204, 251	900P
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SIEMENS

FC616	1000P
FC631	1000P
FC742	1000P

SONY

RM604, RM605, RM606	900P
32 CHANNEL	900P
RM613	900P
RM632, RM636	900P

TATUNG

FXA	1000P
RC70	900P
FX70 FASTTEXT	850P

TELEFUNKEN

FB632	1000P
FB639	1000P

THORN/FERGUSON

3V35-42	900P
3V31-32	900P
3V57-58	1050P
TX10 TEXT	850P
TX10 STEREO TEXT	850P
TX9-90-100	850P
3V55, FV11	1050P
TX100 FASTTEXT	900P
TX100 STEREO FASTTEXT	900P
PROFESSIONAL	850P

TOSHIBA

CT937	1000P
CT9117	1000P
201R4B	1000P

UNIVERSAL PROGRAMMABLE REMOTE CONTROL

Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (Need original remote control to program)
Order code: IR100R Price: 1950P

We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.

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REPLACEMENT PHILIPS NI-CAD BACKUP BATTERIES

Replaces Philips Part No's: 138-10138, 138-10313. 1.2V - 90mAh	160P
Replaces Philips Part No's: 138-10229. 2.4V - 90mAh	260P

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES

Replaces Ferguson Part No: 00E6-067-001. 1.2V	
Used on: TX10	180P
Replaces Ferguson Part No's: 00E6-066-001. 2.4V	
Used on: 3V35, 3V56, 3V58, 3V65	375P

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Description	Price	Order Code
HITACHI 2433752	1500P	LOT01
ORION 3714002	1500P	LOT02
FIDELITY ZX300	1500P	LOT03
FE TX100 90 DEG	1500P	LOT04
SABA 490007182	1500P	LOT05
FE TX90 WHITE	1650P	LOT06
ITT D307/37 EQ	1600P	LOT07
BLAUPUNKT 210	1600P	LOT08
GRUNDIG 2922010	1600P	LOT09
ITT CVC800/1/3	1500P	LOT10
ITTD218/37 EQ	1600P	LOT11
NORMENDE 5255	1600P	LOT12
SABA 81000 200	1600P	LOT13
SALORA T236 EQ	1650P	LOT14
SABA 811-50-24	1600P	LOT15
SABA 770223500	1600P	LOT16
TELEFUNKEN AT1	1450P	LOT17
TELEFUNKEN EQ	1400P	LOT18
SALORA FM0218B	1600P	LOT19
NORMENDE 5255	1600P	LOT20
ITT CVC 1150/1	1500P	LOT21
ITT COMPACT 80	1500P	LOT22
FE TX100 GREEN	1450P	LOT23
HINARI CT4/5 5113	1500P	LOT24
SELECO 6320410	1600P	LOT25
BLAUPUNKT 8667	1600P	LOT26
ITT COMPACT B1	1450P	LOT27
ITT CT3326 MUL	1500P	LOT28
ITT D066/37 EQ	1600P	LOT29
ITT 3546 EQ	1500P	LOT30
LUXOR 5810110	1600P	LOT31
SABA 849380920	1600P	LOT32
HITACHI 2434141 CP	1450P	LOT33
FE TX100 110 D	1700P	LOT34
HANTAREX 28021	1600P	LOT35
SHARP C3700 EQ	1600P	LOT36
HITACHI 2432981 CP	1500P	LOT37

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Video Recorders Edition 2

Lists more than 2200 faults for 43 different brands

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VIDEO HEAD CLEANING STICKS



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Price: 17p Each
15p Each Pack of 10pcs
13p Each Pack of 25 pcs

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	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
4A	FUSE14	55P	FUSE30	50P
5A	FUSE15	60P	FUSE31	50P
6.3A	FUSE16	60P	FUSE32	50P

CERAMIC PLUG TOP

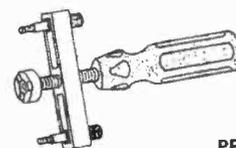
3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P

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Solder Mop 1.2mm x 10 metres	300P
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AMPLIFIER MAINS.....	21.75

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AA (pkt of 4).....	1.20
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PHILIPS MEMORY 2V4.....	2.75

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63v.....	18
47uf at 63v.....	18
100uf at 63v.....	22
220uf at 63v.....	35
250v.....	35
1uf at 250v.....	20
4 7uf at 250v.....	25
10uf at 250v.....	30
22uf at 250v.....	45
47uf at 250v.....	65
100uf at 250v.....	1.25
400v.....	1.95
1uf at 400v.....	23
4 7uf at 400v.....	35
10uf at 400v.....	70
22uf at 400v.....	85
(ALL PCB MOUNTING).....	85

DIODES

R2M.....	95
BY133.....	15
BY227.....	20
BY299/800.....	35
IN4007.....	10
IN5408.....	20
BZX16 C (pkt of 5) 6v8 7v5 12v.....	15
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GRUNDIG CUC2410 22.....	17.95
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BC640.....	20
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BU508D.....	1.95
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BU508F.....	2.25
BU807.....	1.75
BUT11AF.....	2.35
BUT56A.....	2.25
BUX84.....	.80
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T9064V.....	1.95
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PANASONIC F SERIES.....	42.95
SONY CMH-1.....	42.95
SONY CMH 333.....	44.95
TECHNPHONE TP2.....	42.95
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ERICSSON HOTLINE.....	14.50
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NEC P3.....	12.50
NEC P4.....	12.95
NOKIA 101.....	12.95
PANASONIC F SERIES.....	12.50
SONY CMH-1.....	14.95
SONY CMH 333.....	14.50
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TECHNPHONE TP405.....	12.95

Cellular dealers wanted

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PANASONIC F.....	24.50
SONY CMH-333.....	24.95

DESK TOP RAPID/COND.

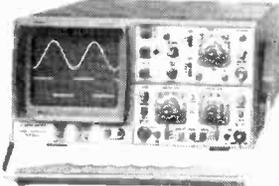
MOTOROLA 8000 SERIES.....	42.50
MOTOROLA 8800X.....	42.50

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HAMEG OSCILLOSCOPES

HAMEG are Europe's top selling DUAL TRACE OSCILLOSCOPES. Select from four superb models. All, with the exception of the HM 1005, incorporate a useful COMPONENT TESTER. Size - all models - 285mm x 145mm x 380mm. Clear display 8cm x 10cm. Mains supply: 110/220.240V AC 50/60Hz. All supplied with 2 PROBES, a COMPREHENSIVE MANUAL and a 2 YEAR WARRANTY.

HM203-7 20MHz STANDARD



Price **£362.00 + £63.35 V.A.T.** FREE Specialist Carrier Delivery

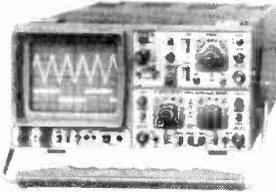
SPECIFICATION

- * 2 Channels
- * Bandwidth: DC - 20MHz
- * Sens: Ch.1, Ch.2, 1mV/cm
- * Timebase: 0.1s - 20ns/cm
- * Triggering: DC - 40MHz
- * Active TV - Sync - Separator
- * Variable hold-off
- * Trigger LED indicator
- * Calibrator: 1KHz Square wave
- * Component tester
- * Plus many features

SPECIFICATIONS

- * 2 Channels
- * Bandwidth: DC - 60 MHz
- * Sens: Ch.1, Ch.2, 1mV/cm
- * Timebase: 2.5s - 5ns/cm
- * Triggering: DC - 80MHz
- * Active TV - Sync - Separator
- * After delay trigger
- * Sweep delay
- * Delay line
- * Trigger LED indicator
- * Calibrator: 1KHz & 1MHz Sq. Wave
- * Component tester

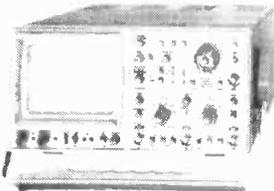
HM604 60MHz UNIVERSAL



Price **£653.00 + £114.28 V.A.T.** FREE Specialist Carrier Delivery

HM1005 100MHz UNIVERSAL

3 CHANNELS - UP TO 6 TRACES



Price **£847.00 + £148.23 V.A.T.** FREE Specialist Carrier Delivery

SPECIFICATION

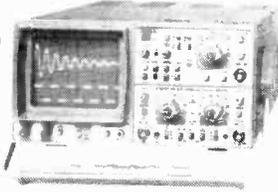
- * 3 Channels
- * Bandwidth: DC - 100MHz
- * Sens: Ch.1, Ch.2, Ch.3, 1mV/cm
- * Timebase A: 2.5s - 5ns/cm
- * Timebase B: 0.2s - 5ns/cm
- * Triggering DC - 130MHz
- * After delay trigger
- * Delay line
- * Trigger LED indicator
- * Overscan LED indicator
- * Active TV - Sync - Separator
- * Calibrator: 1KHz & 1MHz Sq. Wave

HM205-3 20MHz DIGITAL STORAGE

SPECIFICATION

- * Digital Storage
- * Analogue real time (Same as 203-7)
- * Bandwidth: DC - 20MHz
- * Sens: Ch.1, Ch.2, 1mV/cm
- * Timebase Digital: 5s-1µs/cm
- * Triggering DC - 40MHz
- * Active TV - Sync - Sampling
- * Max sampling rate: 2 x 20MHz
- * Memory: 2 x 2048 x 8 Bit
- * Dot joiner
- * Printer/plotter output

Price **£653.00 + £114.28 V.A.T.** FREE Specialist Carrier Delivery

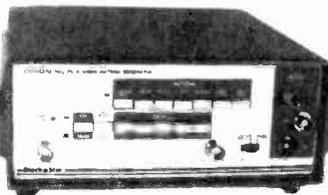


BLACK STAR COLOUR PATTERN GENERATOR THE 'ORION' THREE-IN-ONE PAL VHF/UHF - PAL VIDEO COMPOSITE - R.G.B.

The Orion is a compact, bench instrument offering a wide range of patterns and facilities at a truly low cost. In addition to a switchable sound carrier facility which allows use with the majority of PAL TV systems, the Orion provides highly flexible TGB outputs, ensuring compatibility with most video monitors. More than 50 pattern combinations can be selected, including those for testing static and dynamic divergence, video amplifier linearity, colour purity, general colour performance, focus etc. A separate video input to modulate camera signals; fully variable RF and video output levels facilitating AGC testing; trigger output allowing easy triggering of difficult oscilloscope waveforms; external sound modulation input via DIN connector for frequency response testing of TV sound systems; adjustable wide frequency coverage of VHF and UHF TV bands. Indispensable in the manufacture, test, and servicing of televisions, and computer and video monitors.

FEATURES

- * Colour bars, purity, greyscale, crosshatch, dots, focus, etc.
- * VHF/UHF Channels.
- * 5.5MHz, 6.0MHz, 6.5MHz Sound Carriers.
- * Internal/External Sound.
- * External Video Output.
- * Trigger Output.
- * PAL B,D,G,H,I,K.
- * Separate R, G, B and sync. O/P's.
- * RGB α TTL & 1V.
- * Green + 0.3V Syncs.
- * Composite Video Output.
- * Variable RF/Video Output.
- * Switchable Video Polarity.
- * Mains powered 220/240V AC 50/60Hz.
- * Size: 98 x 219 x 240mm.



Price **£229.00 + £40.98 V.A.T.**

NEW! DEGAUSSING COIL

A very effective degaussing coil, ideal for degaussing TV tubes, computer monitors, oscilloscopes etc. Mains Power: 220/240 50/60Hz. Size: 355 x 355 x 24mm.

Price **£46.00 + £8.05 V.A.T.**



B & K PRECISION CRT ANALYSER-RESTORER

The number one CRT Test Instrument. Over 5000 U.K. Television engineers wouldn't be without it.



- * All CRT's checked identically, including all in-line and one gun types
- * Tests all three guns of colour CRT's simultaneously under actual operating conditions (model 490)
- * Exclusive multiplex technique (model 490)
- * Measure true dynamic beam current that actually passes through G1 aperture to screen
- * Measures all shorts and leaks - preserving more CRT's
- * Tests focus electrodes lead continuity finding faults that other testers miss
- * Uses most powerful restoration method known with minimum danger to CRT
- * Rejuvenated CRT's guaranteed as new for two years
- * Obsolescence proof - perpetual set up chart updated and new adaptors developed
- * Tests and rejuvenates VDU's and oscilloscope tubes
- * A range of over 40 CRT base adaptors available
- * Increase profit * Pays for itself in months.

Prices

Model 490 Tri-dynamic three meter instrument inc. 6 common adaptors..... **£559.00 - £97.83V.A.T.**
Without adaptors..... **£496.00 - £86.80V.A.T.**
Model 480 Single meter instrument inc. 6 common adaptors..... **£425.00 - £74.38V.A.T.**
Without adaptors..... **£360.00 - £63.00V.A.T.**

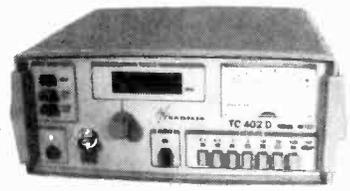
SADELTA SIGNAL STRENGTH METERS

The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-D, TC90 AND TC80, allowing the evaluation of signal conditions for satisfactory operation. All models have a clear LCD direct frequency readout, coupled to a multiturn tuning control enabling precise channel identification.

TC402-D VHF & UHF

FEATURES

- * Three bands: Low VHF: 45-170MHz High VHF: 170-450MHz UHF: 450-862MHz.
- * Digital display for direct frequency readout.
- * Built-in monitor loudspeaker AM/FM.
- * Signal measurement from 20µV to 3V.
- * Powered by eight 1.5V AA batteries.
- * Fully portable with sturdy carrying case.

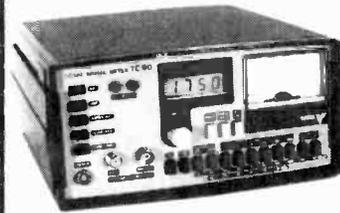


Price **£289.00 + £50.57 V.A.T.**

TC90 VHF-UHF- SAT.

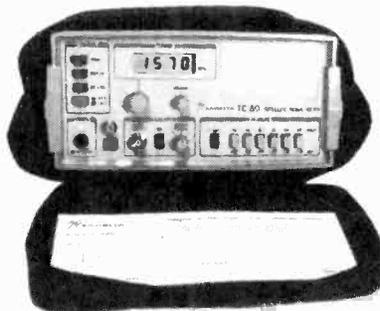
FEATURES

- * Five bands: Low VHF: 45-110MHz High VHF: 110-300MHz Hyper VHF: 300-470MHz VHF: 470-862MHz Satellite: 950-1750MHz.
- * Digital display for direct frequency readout.
- * Signal measurement VHF/UHF 20µV to 3V.
- * Signal measurement satellite -70dBm to -10dBm.
- * Audible indication of satellite signal level.
- * Built-in monitor loudspeaker AM/FM (not satellite).
- * Powered by rechargeable battery (complete with charger 220/240V AC).
- * Fully portable with sturdy carry case.



Price **£499.80 + £87.47 V.A.T.**

NEW! TC80 SATELLITE



TC-80 IN ITS STURDY CARRY CASE

The TC80 incorporates three unique features: video composite output; audio output with built in loudspeaker; ramp and RF signal outputs, which enable an oscilloscope to be used as a spectrum analyzer.

- * 4 digit LCD freq. display
- * Freq. range 950 to 1750MHz
- * Sweep mode sweeps entire freq. band for rapid satellite location
- * Tone select switch for audible tone proportional to signal strength
- * Measurement from 40 to 100dBuV
- * Audio demodulation with internal loudspeaker
- * Video demodulation
- * Rear SCART connector for A/V connection
- * Oscilloscope/spectrum analyzer output
- * Sound tuning 5 to 8MHz
- * LNC PSU 14V or 18V
- * LNC current measurement
- * Internal rechargeable battery with charger



TC-80, USING A LCD TV AS A MONITOR

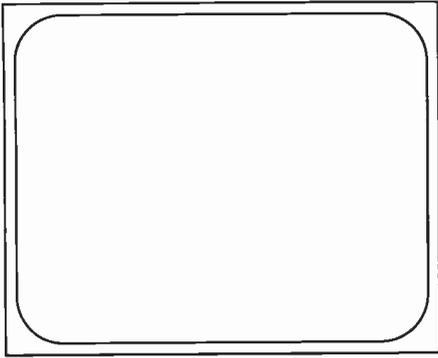
Price **£490.00 + £85.75 V.A.T.**



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Note that we are unable to answer technical queries over the telephone and cannot provide information on spares other than that given in our Spares Guide.

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COVER

This month's cover photograph shows the Ferguson ICC7 chassis as fitted in Model A59N. See article on pages 98-102.

Our apologies for the cover printing error – Goodmans Model CTV9200 should read GTV9200. See page 123.

HELD OVER

Because of space difficulties with the present issue we have had to hold over several items we had planned to include.

Times of Change

There are times when you can positively feel that things are hotting up. Such a time is right now, when much is becoming possible technically and those with power, resources and, most important of all, foresight are on the move. We are talking about exploitation of the ever-expanding possibilities offered by cable and satellite systems.

There have been times in the past when cable has been seen as a great prospect – the famous wiring up the UK business in the early Thatcher years for example. But at that point cable was seen primarily as some sort of interactive system that was going to revolutionise our way of life. That was not realistic. If you want people to buy a complex communications system, it has to have a large entertainment element – people won't buy a highly sophisticated and more expensive version of the perfectly adequate telephone. There are times when a technological advance has occurred but there is no obvious market for it, and times when there's a potential demand but the technology isn't right, i.e. it can't meet the demand at an acceptable price. Things begin to buzz when advances in technology coincide with genuine market prospects.

What has happened this time round in the cable field is that digital technology and in particular signal compression techniques are enabling vast quantities of information to be fed down cables economically. So you can offer a service such as video-on-demand, which has an obvious attraction for the punter. All he needs is a modem/decoder, which can be arranged with a chip or two, enabling him to select from a range of programming with a tap or two on his remote control unit.

Hence the merger moves between cable and telephone companies in the USA, also programme providers. It all makes sense, since there are cost advantages when entertainment, telephone and other services can be provided using a single infrastructure. There are certain complications in the UK, because regulation differentiates between the delivery and the provision of services. But ways will be found round what will increasingly look like an artificial distinction. If cable TV services can offer a telephone link as well, why can't BT and others provide entertainment services?

There's logic in all this and there are willing investors. There seems little doubt that we shall see a considerable expansion in the provision of communications/entertainment services to the domestic market over the next few years. Satellite services will play a part and could in some respects offer competition – VOD via satellite has already been proposed.

Interesting to reflect that it's now just ten years since Eutelsat I F1 entered into service – on October 12th, 1983. It was soon followed by Eutelsat I F2, which is about to be retired. At that time, back in 1984, it was thought that these two satellites would satisfy all likely European satellite telecommunications needs. Times do change like!

Another anniversary is with us this month (December): it's twenty five years since the start of regular colour TV broadcasting in the UK. Colour was slow to take off, being confined to BBC-2 initially. Once ITV and BBC-1 appeared in colour a TV boom was on, helped again by technological advances that brought down the cost of sets. It is perhaps hard to realise that a hand-wired colour TV chassis (the ITT CVC1) with a prodigious valve complement went into production in those early years. But 1967 was a time of considerable change as transistor technology advanced, making all solid-state receivers a practical proposition. Once the problems of high peak voltages had been sorted out, valves became redundant. The first TV chips were then being introduced – and domestic video, albeit in reel-to-reel form, had put in an appearance. As always, once technology and demand match up, times change.



REED
BUSINESS
PUBLISHING

TV Fault

Reports from Philip Blundell, AMIEE, Ian Bowden, Chris Watton, John Edwards, Brian Storm, Steve Cannon, Alfred Damp, Hugh Allison, John Hepworth and Richard Newman

Grundig CUC3400 Chassis

Dead with the 800mA d.c. fuse SI624 blown and the BUT11A chopper transistor T661 short-circuit is generally an easy fault to deal with in these sets. The cause is usually dry-joints on the Ipsalo (combined chopper/line output) transformer TR665 or faulty snubber network diodes (D663, D664 and D666). It wasn't on this occasion however. The power supply worked fine when the set was in the standby mode, but when it was brought on the chopper transistor went short-circuit. This was a later production set, in which BYV16 diodes are used in positions D663/4 while D666 is a BYD33M (they are all BA159s in the original version), but we nevertheless replaced them. A replacement TDA3640 chopper control chip and 4.7nF capacitor (C653) also made no difference. Another change in later sets is that C667 is 2.2 μ F instead of 0.1 μ F. The 2.2 μ F capacitor had dried up. **P.B.**

Philips Anubis B-AA Chassis

The picture had a horizontal grey line superimposed on it. Scope checks in the field output stage showed that the field scan waveform had an oscillation on it. C2413 (10nF) was found to be open-circuit. **P.B.**

Toshiba 2505DB

For field collapse check whether there is a ramp waveform at pin 15 of the TA8739P field generator/EW correction chip IC371. If the waveform is missing the chip is probably faulty. **P.B.**

Philips CP110 Chassis

If the 140V h.t. supply is low at 60-70V, check whether C2661 (2,200 μ F) is open-circuit. This is the reservoir capacitor for the chopper control circuit. Fit a Philips replacement, part no. 4822 124 21511 – standard capacitors won't work in this position. **P.B.**

Grundig CUC4620 Chassis

For field collapse with a small amount of scan above and below the line, check whether the 0.33 Ω safety resistor R525 is open-circuit and diode D7001 short-circuit. **P.B.**

Panasonic TX21T1 (Alpha 2 Chassis)

Faulty tuning was the reported fault. The picture looked as if the tuning was slightly off: there was a mainly dark screen with zigzag lines, though some signs of chroma would flash up intermittently, and the sound was muted. As the tuned channel readout was correct we took a look at the i.f. signal at the input pins (8 and 9) of the vision and sound i.f. chip IC101. It looked fine – a stable field-rate signal could be seen. But the demodulated output at pin 3 wasn't recognisable as a video signal. We scoped the 39.5MHz waveform at the pins (22 and 23) for the synchronous demodulator's tuned circuit and found that it was missing. As the coil wasn't open-circuit and the capacitor wasn't short-circuit we replaced the chip. This produced no

improvement. The capacitor was the next item to be replaced, but still no luck. When a new coil was fitted we had a healthy 200mV peak-to-peak waveform at both pins and normal operation. **I.B.**

B & O MX1500

This set couldn't be tuned: when the sweep tuning was activated you could see where there were transmissions as the snow would momentarily change to a virtually blank screen, but the set wouldn't stop at any of them. We connected an external d.c. supply to the tuner's varicap bias input and set it to a point where very weak vision could be seen, then used a scope to check the output (pin 16) from the i.f./detector can. This showed that a very noisy signal with no sync pulses was being fed to the BC548 video emitter-follower transistor 7070. A second video output (pin 18) from this can is fed to the scart socket. We moved the scope to this pin and found that the signal here was perfect. The next clue to the cause of the trouble was the fact that the 5V d.c. level at pin 16 seemed to be excessive. When the pin was disconnected from the print the 5V was still present at the print. This suggested that the emitter-follower transistor 7070 was faulty – in fact it was leaky from collector to base.

After fitting a replacement transistor the set was tuned up and left on soak test. Next morning we found that all the preset stations had gone – the rechargeable memory supply battery was short-circuit. **I.B.**

Panasonic TX21M1T (Z4 Chassis)

The fault in this set was very intermittent – we had to run the set for several days before it started to occur. The symptom was that the picture's chroma content would intermittently drop to a low level or disappear altogether. As soon as the back cover was removed the fault cleared, but we found that we could instigate it by some careful flexing of board C. When the fault was present the input to the chroma processing chip IC601 (pin 5) disappeared, though it was still present at the output from the chroma source changeover switching chip IC2651 (switches between tuner-derived chroma and S-video input chroma). The cause of all this trouble was an intermittently open-circuit 0.01 μ F surface-mounted coupling capacitor, C2651. **I.B.**

Saisho 250R

The problem with this set was intermittent loss of sound and vision. After much prodding, flexing, tapping, heating and cooling we eventually traced the cause to the TV/video slide switch on the back cover. This surprised us as its action was positive and there was no picture disturbance during a good waggle test. **C.W.**

Hitachi CPT1476

No colour was the fault here. We found that the voltage at the colour control pin 5 of IC501 was only 0.7V. It should vary between about 1.8V for minimum colour and 3.8V for

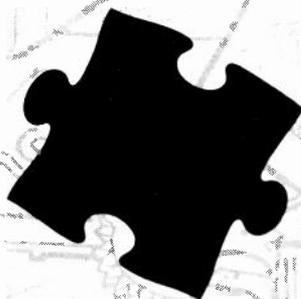
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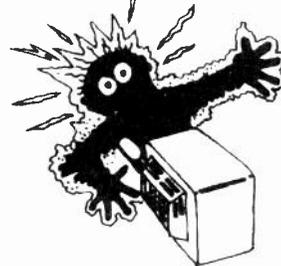
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maximum colour. Correct voltage readings were obtained at the slider of the colour control, the cause of the fault being the decoupling capacitor C507 (2.2 μ F) which was leaky. C.W.

Grundig CUC41 Chassis

There was sound but no raster. Checks showed that the supplies to the line driver and output stages were correct, but there was no line drive output from the TDA2595 chip. Replacing this restored the picture. C.W.

Orion CT3

There was a very dark picture with no colour. The contrast control worked backwards and, when visible, the highlights were negative. The voltages at pins 44, 45, 46, 47 and 48 of the huge video/colour decoder chip were all incorrect, but fitting a new chip made no difference. After checking scores of components in this area I finally replaced the CSB500F2 ceramic resonator X401. This cured the fault. It would seem to me that there had been a mishappen gating pulse within the chip. C.W.

Alba CTV746

This set was 'dead'. There was 300V at the input pin of the STR54041 power supply chip IC105 but nothing at any of its other four pins. As a new chip made no difference we checked the resistors in the power supply and found that R220 (270k Ω) and R223 (150k Ω) were both open-circuit. New resistors in these positions brought the set back to life, and refitting the original power supply chip proved that it was o.k. So the new one went back into stock. J.E.

Toshiba 210T6BZ

The problem with this set was intermittent partial field scan. We found that all five pins of the scan coil socket P570 were dry-jointed. J.E.

Panasonic TX24A1 (Alpha 2 Chassis)

This set led me a merry dance. At switch on the sound was completely muted. But the effect lasted for only about ten minutes and wouldn't return until the next day. On the first day I established that the fault was on the mute line. On the next day I reached another board, and on the following day yet another. I finally arrived at the front M board, but after painstaking tests this board proved to be faultless. The culprit was C1206 on the main board. It's the standby 5V reservoir capacitor, in the supply to the front control panel. B.S.

Philips D16 Chassis

This set came to us with the complaint that the on-screen display (OSD) would intermittently appear of its own accord. Not only that but in addition the picture would go off intermittently. We put the set on soak test. After about ten minutes the picture blanked out then reappeared a moment later with the OSD programme number displayed. This went on with increasing regularity until the set seemed to shut down altogether. When it was turned off then on again the fault had cleared.

It seemed at first that the cause of the fault might be in the power supply, but the give-away was the slight 'tick' that could be heard a fraction of a second before the picture went off. We quickly traced the cause of the fault to the c.r.t. base panel, where the focus spark gap was the culprit.

As is usual in modern sets, this is incorporated into the tube base socket. When a replacement socket had been fitted the set worked perfectly. S.C.

Philips FL1.9/1.1AD Chassis

One of these sets displayed an error code and there was no Nicam sound. The flashing LEDs that gave the error indication were those for power-on, standby and language-1. The manual tells you what all the possible error indications mean: this sequence of flashing LEDs indicates that the stereo decoder chip IC7600 is faulty. A previous dealer had already replaced it however. Checks around the chip showed that its power supply was o.k. but the 10MHz clock signal at pin 4 was missing. A new 10MHz crystal, X1602, solved the problem and the Nicam sound came booming out. S.C.

Sony KV2092

The sound would intermittently alter on its own accord, or the volume control wouldn't operate correctly with the volume bar, the sound jumping in fits and starts. It took us a time to pin the cause of this fault down: D016 was eventually found to be leaky. S.C.

Hitachi CPT2176 (G6P Chassis)

The set was tripping, which is an unusual fault with this chassis – the power supply usually either works or it doesn't. Surprisingly the h.t. voltage was constant at 110V. What was actually happening was that the line drive was pulsing. It comes from the M51338SP colour decoder/timebase generator chip IC501, and checks here showed that the start-up voltage at pin 24 was pulsing. This comes via D913 and Q904 which are on the secondary side of the power supply. Q904's base is in turn under the control of the standby switching transistor Q905. We found that this transistor was being switched on periodically, in turn switching Q904 off so that the set couldn't start up. When Q905's base was disconnected the set started up and everything worked correctly, except that there was of course no standby operation.

So we moved across to the microcontroller chip IC1101 and connected an oscilloscope, on a very low-speed setting, to pin 30, the power-control output that goes to the base of Q905. The voltage here could be seen to rise to 5V, stay there for a second or so, then return to zero. It seemed logical to suppose that the cause of the fault lay in the microcontroller chip's start-up circuit or reset line. The latter is connected to pin 16 and is controlled by transistor Q1102. At switch-on the 5V rail rises and C1101 (2.2 μ F) in this transistor's base circuit charges. The sequence is that Q1102 then switches on, C1101 discharges, Q1102 switches off and IC1101 resets. What seemed to be happening was that the reset line was being held low for too long. This curious fault was cleared when we replaced C1101. S.C.

Panasonic TC15M1F (Z4 Chassis)

The complaint with this portable set was of rolling from switch-on. When I switched it on it worked perfectly however. I ran it for the morning, switched it off then switched it back on later in the afternoon. This time the fault was present. Off came the back and I dived in with heat gun and freezer. It seemed sensible to concentrate on IC601, the video processor/timebase generator chip, which is on the small, vertical panel. It didn't take long to find that the culprit was C402 in the field oscillator section. It's a 3.3 μ F tantalum type.

connected to pin 34. Once a replacement had been fitted repeated cold starts showed that the fault had been cured. S.C.

Salora 1H6 (Ipsalo 1)

The set was completely dead. This didn't surprise us, but there was no 28V supply from the power supply despite the fact that the VSTART line and the line drive were o.k. Usually the 28V supply is there unless there's a fault on the primary side of the power supply. This was the case: we soon found that the Ipsalo transformer's primary winding, between pins 1 and 2, was open-circuit. A new transformer restored normal operation. S.C.

Tatung 140 Chassis

This set's power supply was tripping. Cold checks were carried out on the components in the line output stage but everything here seemed to be in order. So we tried the power supply with a dummy load. It still tripped. Cold checks on the resistors and semiconductor devices cleared them all of suspicion. I then wondered whether to try replacing the TDA4600 chopper control chip or check the various electrolytics in the circuit. Having got this far with cold checks, I decided to persevere and struck lucky first time – our Hameg component tester showed that C808 (100 μ F, 25V), which is connected to pin 9 of the chip, had a slight leak. Replacing it restored normal operation. I've since found that this component causes similar problems in Grundig sets. A.D.

Sony KV21XMTU

The complaints were of a faint picture and intermittent loss of the picture on changing channels. The first fault was cleared by resetting the contrast control. We then put the set on soak test. It worked happily for several days before the second fault showed up. When the channel was changed the screen blanked in the usual way and the new channel selection number was then displayed, but the screen stayed blank and the displayed number had jagged edges, suggesting that there was no sync. These sets also blank the screen when there's no signal input to the tuner. While the fault was present I tried the tuning and found that only channels at the top end of the band could be tuned in and that they couldn't be stored. Next time the fault occurred I was able to get some voltage readings around the memory chip IC1003. Pin 2 should be at -30V, but in the fault condition only about -15V was present here. After a lot of dry-joint resoldering I found that L807, in the -30V feed, was going open-circuit intermittently. A.D.

Eumig VM512

"Repair it regardless of cost" the ageing rock star said. "It's part of my security system. Oh, and tart the case up a bit – get rid of the white bits."

Shock set in as he roared off in his Lamborghini. Well, you don't hear "regardless of cost" every day. I'm not proud: it went straight to the front of the pile. The VM512 is a monitor that's built to run 24 hours a day, 365 days a year. Repair was dead easy. Massive hum bars indicated that the trouble was in the power supply, where the 12V output had 2V of ripple on it and sat at 17V. What had happened was that the set -12V potentiometer had cracked in half: a new one restored the Eumig's normal sharp picture.

It was the "get rid of the white bits" that was the problem. The substantial case is made of aluminium which was originally sprayed black. I guess that the white bits

were aluminium oxide. As I reached for the phone to get a few 'paint job' quotes in comes Kevin, on the scrounge. As he indelicately listened to my phone call he wrote down "I'll do it for free". He grabbed a tin of 3-in-1 oil and rubbed the oil into the paintwork with a rag. He then sat back. The Eumig looked the same.

"Silly bugger" I said.

"Wait" he said.

Ten minutes later the white bits had, slowly, turned black. It looked immaculate. I'm assured that the paint doesn't come off two days later – it was a new one on me. H.A.

Bush 2515T

This 15in. set uses the Siemens self-oscillating chopper circuit. The dead one that came in had, predictably, a short-circuit chopper transistor and open-circuit 270k Ω and 4-7 Ω resistors. When they had been replaced however the set was stuck in standby. Instead of using a relay for the standby function, the 12V regulator chip's chassis connection is made via a switching transistor, Q809. When this transistor is switched on the 12V regulator (IC803) works: switch it off and the 12V supply is lost, the set going to standby. The cause of the fault was the regulator, a new LM317T restoring normal operation. J.H.

Sanyo CTP6144

The problem with one of these sets was excessive brightness. We found that R478 was open-circuit. J.H.

Akai CT2179UK

This set came in with an intermittent blanking problem – the screen would periodically blank off in strips. Sometimes odd coloured dots would appear, at other times the screen would go completely blank. Scope checks showed that the video signal was present during the blanking periods. In addition there was a perfect video signal at the scart socket. I eventually found that the blanking signal at pin 11 of the TDA3505 video processor chip IC201 went missing or was replaced by a lot of noise. Replacing this chip made no difference. The blanking signal comes from pin 25 of RIC01 (SPH113). There were no further problems when one of these had been obtained and fitted. R.N.

Akura CX10 (Nikkai Baby 10)

The complaint with this 10in. set was "flashing on ITV and BBC-1". The effect looked like a.f.c. hunting. As a circuit diagram was not available I had to play this one by ear. The fault appeared only when the set had been working for about half an hour, and I found that it would go away if freezer was applied around the i.f. screening can. I removed the screen but couldn't find any faulty components. Quite by chance I discovered that slight adjustment of the a.g.c. potentiometer cleared the fault. There seemed to be a critical point at which instability occurred. R.N.

Akai CT2115UK (Samsung P58SC Chassis)

There was insufficient width and a smell of burning. R824, a 100 Ω 2W safety resistor in the line output stage, was burning up because the choke in parallel with it (L824) had never been soldered at one end. This meant that the entire line output stage current was flowing through R824 – no wonder it was overheating. Resoldering the choke and replacing the resistor put matters right. R.N.

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At the Berlin Show

George Cole

The 1993 International Funkausstellung (IFA), which was held in Berlin during August, attracted 740 exhibitors from 33 countries and had a display area of 103,500 square metres. Though the recession has hit Europe hard there were lots of new products and developments to be seen in the field of consumer electronics.

Television

The biggest TV news at the Show was the signing of an agreement which will lead to the establishment of European digital TV standards (see Teletopics last month). Over eighty European organisations signed the Memorandum of Understanding on digital video broadcasting. The European Digital Video Group that's been set up plans to use the MPEG-2 digital video compression standard which was agreed earlier this year and covers data rates between 2-15Mbits/sec, giving broadcast-quality pictures. The DVG's first task will be to set standards for digital cable and satellite decoders with a view to starting services in 1995.

There was also big news on the PAL Plus project, with Sony being the first Japanese company to join the group and Spanish and Italian companies expressing interest in joining. PAL Plus is an enhanced version of PAL featuring 16:9 aspect ratio pictures, CD-quality digital sound and improved picture quality thanks to the elimination of cross-colour effects. The system is partly compatible with the existing 4:3 PAL, though sets using this standard would display only 432 active picture lines, producing a letter-box effect. The PAL Plus group, which includes Philips, Grundig, Nokia, Thomson and a number of European broadcast organisations, has been carrying out test transmissions via cable, satellite and terrestrial transmission systems.

While the results have been mainly positive a paper presented by the chief engineer of Granada TV noted that there were problems in the UK – the ITV companies and the ITC are concerned about viewers' reaction to letter-boxing. The signs are that viewers will tolerate 14:3 pictures though 16:9 broadcasts generate a fair number of complaints – fewer from Channel 4 viewers because films have been transmitted in letter-box form on this channel for some years. German companies are keen to press ahead with regular PAL Plus transmissions from 1995, when the first consumer receivers are due to be shown at IFA 95.

No final decision has been made by UK broadcasters. But will the drive to develop digital TV systems make PAL Plus irrelevant? The group argues that there are over 120 million PAL TV sets in Europe and that it will be twenty years before the system becomes obsolete. PAL Plus is being promoted as a 'bridge' between analogue and digital systems: broadcasters and viewers may however prefer to wait for digital TV.

The flat-screen TV you can hang on the wall is still some way off, but Panasonic showed a remarkable set, the TH-14F1, which has a 14in. flat-panel display with a depth of less than 10cm. It uses a beam-matrix system, now known as Flat Vision, that Panasonic first demonstrated in 1989. The system operates by dividing the screen into a matrix of approximately 100,000 'mini screens', with each of these having a separate electron beam. Screen size is 272 x 202mm, with a 330mm diagonal measurement: it has 442 x

440 pixels. Power consumption of the receiver is 85W. Panasonic plans to develop larger, wall-hanging models, also models that produce HDTV-quality pictures. The TH-14F1 goes on sale in Japan this autumn/winter at an equivalent price of about £1,800.

Plenty of wide-screen TV sets were being shown, including Sony's first European 16:9 receiver, Model KW-HD3215D. It uses a Super Trinitron tube that's designed to show 525-, 625- and 1,250-line pictures with a 100Hz display rate. The set has two satellite inputs and a 'golden scart' socket for HDTV and PAL Plus decoders. Price is around £6,500.

Philips showed 28 and 32in. wide-screen sets, Models 28PW960A and 32PW960A respectively, with a 100Hz picture rate, picture-in-picture and switchable digital noise reduction. Samsung's WP3200 16:9 set has two tuners so that two channels can be displayed at the same time.

Philips showed a multimedia 16:9 TV set that can be used to display PAL or VGA pictures and is designed to work with desktop PCs. There were lots of sets with built-in Dolby Surround decoders, and quite a few 'designer TVs' – a lot of work has gone into making many sets look a little different.

Grundig had a number of interesting developments on show. Megatext is a new teletext decoder that offers improved graphics and a palette of 4,096 colours, while Megatron is a newly developed picture tube that has an anti-glare and antistatic coating to leave the screen dust free. This is made possible by conducting away the electrostatic screen charge that is normally created when a tube is driven. But my favourite set was a Grundig model that automatically censors programmes. This works by using VPS (Video Programme System) teletext and an electronic child-lock system. In Germany the programmes broadcast by all the state and some independent TV stations contain an identification code that's buried in the VPS signal. If this code signifies an adult programme the set automatically switches the picture off. Parents can watch the programme by keying in a four-digit code number.

VCRs

Germany has caught the VideoPlus habit – virtually every new VCR features this easy-to-use timer system, which in Germany is known as ShowView.

Sanyo's new Digest Play feature allows tapes to be played at double or triple speed while the sound is maintained at the correct pitch. The system even works at the times five and nine speeds in the reverse mode. Details of how it works are sketchy, but some form of digital processing is involved.

Samsung claims to have reduced the circuitry in its new Model VXK356 by over ninety per cent. This has been made possible by mounting all the components normally on five PCBs on just one and reducing the number of link circuits from twelve to two. It's claimed that this greatly reduces noise. The VXK356 also has a built-in tape door sensor to detect foreign objects: if a child pushes a toy into the slot a voice message gives a warning and advises the operator what to do.

The Siemens FM728, Grundig GV280S and Mitsubishi

HS-E82 have RS232 sockets for interfacing with a PC: the decks are designed for editing, and contain time-code systems for frame-by-frame manipulation.

Camcorders

The Video 8 system is strong in Germany, accounting for around 65 per cent of the camcorder market. It was not surprising to find that Philips has launched two new Video 8 machines, Model M820 which includes a x8 zoom lens, x 16 digital zoom and a remote control handset, and Model M870 which is a Hi-8 model with hi-fi stereo sound.

Sony's CCD-SC5 Handycam was the camcorder of the show. It weighs just 640g but includes an optical viewfinder and a 3in. colour LCD screen and built-in speaker for checking shots or playing prerecorded tapes. The screen folds away when not in use; it can be set in various viewing positions. The CCD-SC5 is to be launched next spring at around £1,300.

Multimedia

Philips showed the first CDi titles with digital full-motion video (see Teletopics), also the Digital Video cartridge, Model 22ER9141, which converts a basic machine into a digital video player – price of the cartridge is around £150. The video pictures were impressive, looking better than VHS quality. Philips also demonstrated CDi movies with wide-screen pictures and Dolby Surround sound, though these won't be part of the first set of titles. The company revealed that the first CDi movies have been 'optimised' for CDi and will not be compatible with the Video CD format, which is designed for movies and music videos. The CDi210 home player and CDi350 portable model were on show.

Panasonic showed the FZ-1 REAL 3DO multimedia player which was launched in the USA this autumn and is to appear in Europe next spring. It's a 32-bit machine (CDi uses 16-bit technology) with a special graphics chip set, but the pictures and graphics were disappointing.

Pioneer showed its LaserActive format, which combines an hour of analogue video with 600Mbytes of data. LaserActive machines can play an array of discs including LaserActive, Laser Disc and Laser Karaoke, also Sega games cartridges, CD-ROMs and audio CDs. The company showed various games titles and an 'electronic encyclopedia'. LaserActive is to be launched in Europe next year: the price of a player will be about £530. A plug-in cartridge to enable the machine to play Sega software will cost about £330 while LaserActive software will be priced at around £60.

Samsung displayed a PAL/NTSC Laser Disc machine, Model DV550KP.

Sony hasn't given up hope for its Data Discman electronic book format. A new machine, Model DD30DBZ, was on show. It has a 16-bit processor (previous models are 8-bit machines), a built-in loudspeaker and a wider screen (11.2cm diagonally). The company has also developed emulation software that will enable Data Discman CD-ROMs to be played with various computers such as ones using MS-DOS and Apple Macintosh machines.

Kodak's large Photo CD stand didn't attract much interest, but there were large crowds at the Sega and Nintendo stands where lots of computer games were being displayed. Nintendo announced that it will be developing a 64-bit games system with the US company Silicon Graphics: the system will be capable of virtual-reality games. A home system at "less than \$250" is to be launched in the USA in 1995.

Philips announced the development of a prototype digital decoder for Video On Demand (VOD) services: the Home Interactive Multimedia Terminal converts 1.5Mbit/sec digital TV signals to PAL or NTSC. The terminal is currently being evaluated by US broadcasters, telecommunications companies and programme providers. Philips expects the decoder to be used first in America, where telecommunications companies are experimenting with Video Dial Tone services: these deliver digital TV to the home via telephone lines.

Audio

The Sony Mini Disc and Philips DCC formats were conspicuously present. Sony announced that 300,000 MD players and three million discs have now been shipped (though it didn't say how many had been sold) and that around 850 titles are available, all these figures being worldwide. In-car MD systems were announced by Sony, including a dashboard unit that holds several discs. MD players on show included the JVC XM-D1 palm-top model, the Aiwa AMD-100, Samsung MY-MD5, Sharp MD-S10H, Sanyo MDG-P7 and Telefunken MDP1000.

Philips showed the DC821 and DCC811 in-car players and DCC hi-fi systems. Companies that have both MD and DCC equipment included JVC and Samsung. Philips also mounted a remarkable demonstration that compared a 16-bit DAT machine and a prototype 18-bit DCC system. I'm no golden-eared hi-fi expert but the DCC player did sound clearer and sharper: Philips says that DCC could be made into an 18-bit system, so there's scope for future development.

DAT isn't dead. Sony came up with the tiny WMD-DT1 that weighs just 200g and fits into a top pocket. It uses Sony's non-tracking technology, has remote control and costs about £350.

Miscellaneous

Apple, Sharp and Amstrad showed personal digital assistants (PDAs) – intelligent, electronic organisers that sort and store personal information. JVC had on show the neat ShowView programmer, which is the size of a cigarette packet. Nokia's Oscar-5 (Omni System Cable and Aerial) is a small unit that makes it easy to tune in cable, satellite and terrestrial channels. It works with Nokia's stereo-plus TV chassis, using a set of i.c. cards to transfer data.

Philips' Voice Commander allows TV and video equipment to be controlled by spoken commands. The unit is the same size and shape as a conventional remote-control handset but incorporates speech-recognition software and a microphone. You first have to train the unit to recognise your voice. This is done by reading into the handset a list of words: Philips says that the process takes about half an hour. The Voice Commander can store words from four different voices. It uses a RC5-code library and according to Philips should work with most makes of satellite, TV and VCR equipment. Four AA batteries that last for about six months provide the power. The unit can recognise 40-50 words in five languages (English, French, German, Italian and Spanish – not Dutch) and can be used for a wide range of commands including VCR timer programming and TV channel changing. It also has an advert-skipping system. If you say "zap it" to the handset the VCR misses the next minute of tape then automatically goes into the playback mode. Philips showed an American handbook that specifies this feature, but it may not be present with the European version – Philips doesn't want to upset TV advertising companies.

Lowdown on the Ferguson ICC7 Chassis

J. Lejeune

The ICC7 chassis has a strong resemblance to its lower-powered predecessor, the IKC2 (see April 1993 issue). A similar-style power supply is used, though the circuit differs and will be described in this article. Field output is provided by a TDA8178F chip instead of the thyristo: arrangement used in the IKC2. The TA8659CN chip is retained for luminance and chrominance signal and deflection processing. As it doesn't provide for auto grey-scale correction a subassembly is interposed between this chip and the RGB output stages. Audio is handled by one or two TDA2030 chips depending on whether the receiver has mono or stereo sound. Because of its large-screen drive capability raster correction is incorporated. Top-of-the-range models also incorporate teletext and Nicam sound. As with all Ferguson ranges in recent years, there's no simple non-remote control model.

Experience has shown that once a few early hiccups had been sorted out the chassis has proved to be reliable. When you encounter problems on a chassis with which you are

unfamiliar they always seem to be worse – and the more reliable a chassis, the less experience one is going to have with it! Power supply and field output problems have dominated the fairly sparse log of faults we've diagnosed and fixed.

The chassis layout is also similar to that of previous designs and thus has a familiar look to it. Location and repair of faults is fairly difficult. We hope this article will ease any problems that those handling these sets may experience.

The Power Supply

The power supply is of the chopper type with the transformer providing mains isolation. As the operation of this type of supply has been gone over many times in other articles we'll confine ourselves to specific points worth noting with this particular design.

Fig. 1 shows the circuit. At switch-on RP06 provides a

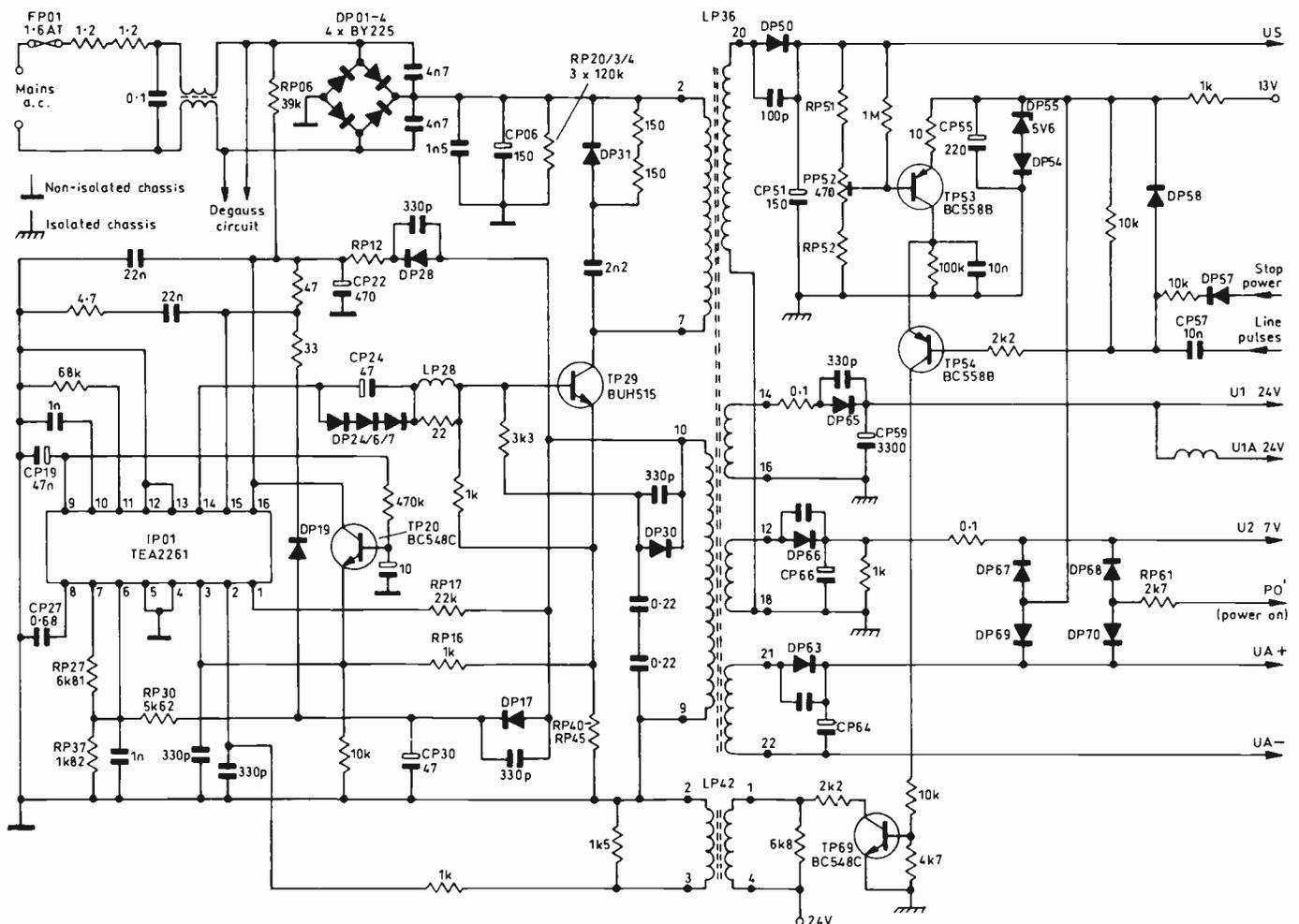


Fig. 1: Power supply circuit, Ferguson ICC7 chassis. Some component values depend on tube type.

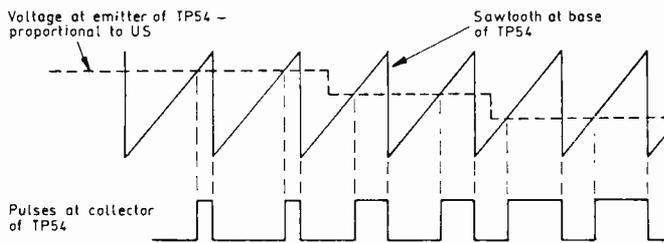


Fig. 2: Action of the pulse-width modulator transistor TP54.

start-up feed, charging CP22 so that the TEA2261 chopper-control chip IP01 is provided with a supply at pin 16. When the voltage here reaches about 7.5V IP01 wakes up and begins to supply, via CP24, short drive pulses to the chopper transistor TP29. By this time the mains bridge rectifier's reservoir capacitor CP06 has been charged to approximately 350V. Voltages now develop on the secondary side of the chopper transformer.

On the live side, winding 9-10 feeds rectifier diode DP17 which develops 13V across CP30. This is applied via the potential divider RP30/RP37 to pin 6 of the chip, the voltage here being 3V when full power output has been attained.

CP19 controls the soft-start phase of the powering up, which commences at switch on and is terminated when the voltage at pin 9 reaches 3V. A source within the chip charges CP19. It's rapidly charged to 1.5V, at which point the production of drive pulses for the chopper transistor commences. These are narrow at first, broadening gradually to raise the outputs from the chopper circuit to the normal levels. During this period CP19 charges at a slower rate until the voltage at pin 9 reaches 2.75V. At this point the mark-space ratio of the chip's drive-pulse output stabilises at 60-40 per cent. CP19 continues charging until the voltage across it reaches 3.1V. This completes the soft-start sequence.

Provided the receiver has been switched off whilst at full power and not in the standby mode, the microcontroller chip IR01 will produce an enable PO (power on) output at pin 20 and the line output stage will be operational. We'll see how this works later. Note that the enable output is 0V, with 5V at pin 20 giving the standby condition.

Regulation

The key item in the voltage regulation system is transistor TP54, which acts as a pulse-width modulator. Pulses from pin 11 of the line output transformer are integrated to provide a constant-amplitude sawtooth waveform at the base of TP54, whose emitter voltage is set by transistor TP53. Thus the point at which TP54 switches on during the sawtooth waveform at its base, and the timing of the pulses produced at its collector, depend on the conduction of TP53. The receiver's main h.t. rail US is sampled by the potential divider network RP51, PP52 and RP52 – PP52 acts as the set-h.t. control. TP53's emitter voltage is held constant by zener diode DP55, with DP54 in series to provide temperature compensation. Thus TP53 acts as a conventional error voltage detector. Fig. 2 illustrates the action of this part of the circuit. TP54 drives TP69, which provides a regulation-pulse input at pin 2 of IP01 via the isolating transformer LP42.

The h.t. voltage US should be either 145V or 155V depending on the type of tube fitted, flat-square or planar respectively. If the h.t. voltage falls, the action of TP53 and TP54 results in wider drive pulses being fed to the base of

the chopper transistor TP29 which therefore remains on for a longer time during each duty cycle, increasing the energy supplied to the chopper transformer. The h.t. is thus restored to the correct level. The opposite action occurs should the h.t. voltage rise. Regulation is very close, and because of the tight coupling of the windings that feed the 24V and 7V rectifier diodes DP65 and DP66 these supplies are also closely regulated. The exception is the supply for the audio amplifier(s), UA: the winding that provides this is loosely coupled to the transformer's core to avoid audio modulation at high volume levels because of the class AB operation of the audio output stage(s).

Protection

The chopper transistor could be at risk during the start-up sequence should there be a short-circuit across the 7V or 24V supply, since the current-limiting provided by IP01 is then inoperative. In the event of an overload during this period the voltage at pin 9 of IP01 rapidly rises to 3.1V, providing quick termination of the soft start. TP20 transfers the soft-start pin voltage to pin 3. As a result, the chip's drive pulse output is removed.

If the start-up sequence is completed successfully, the chip's excess-current sensing input at pin 3 is switched to look at TP29's emitter voltage, which is developed across the resistor chain RP40-45. This occurs when the voltage at pin 9 falls back to the full-power running level of 0.7V, switching TP20 off. Thus TP20 is present only to bring about excess-current shutdown during the start-up sequence, particularly during the transition to regulation of the secondary-side voltages.

If there is more than a transient overload the increased voltage at pin 3 will shut down the output from the chip.

Over-voltage is sensed at the chip's supply pin 16: an internal voltage-threshold detector comes into operation to remove the output when the supply voltage is excessive. To prevent unnecessary tripping because of transient overloads CP27, which is connected to pin 8, provides a trip time-constant.

A further protection circuit senses conditions in the line output stage: we'll deal with this later.

Standby Operation

When the receiver is switched to standby the voltage at the microcontroller chip IR01's PO pin 20 rises to 5V. This shuts down the line drive, acting on the TA8659CN signals/deflection processor chip IV01 via the switching transistor TR18 (see later). Since the line output stage is now inoperative, there are no pulses to provide an input at the base of TP54 and the power supply's load is much lighter. Logic circuitry within IP01 detects the absence of a line-frequency pulse input at pin 2 and selects 'neutral gear', i.e. the standby mode.

Regulation of the output by sampling the voltages at the secondary side of the power supply is no longer possible. This task is taken over by DP17, CP30, RP30 and RP37. These components provide at pin 6 of IP01 an input which is a sample of the chopper transformer's output. The values of RP30 and RP37 are such that the output voltages are held at about 80 per cent of the normal running figure. RP27 provides feedback to an error amplifier in IP01, setting the gain and thus the 'tightness' of the control.

IP01 now operates in the 'burst-fire' mode, delivering an output that consists of bursts of approximately 21kHz pulses – this ultrasonic frequency was chosen to prevent those with good hearing being disturbed by the burst-fire operation. As

the output from DP17/CP30 rises, the voltage at pin 6 of IP01 will reach a level that inhibits the production of more 21kHz pulses. The output from the chopper transformer and thus DP17/CP30 then falls back and the pulse output is restored. As a result, the bursts of pulses occur at a frequency of about 100Hz – determined by the standby load on the power supply, the mains voltage and circuit tolerances.

RP17 provides a.c. feedback to pin 1 of IP01 so that it can detect zero crossings of the pulse output from winding 9-10 of the chopper transformer.

Protection is provided should there be a short-circuit across the 7V or the UA line in the start-up and standby modes. If there's a short across the 7V line D67 will conduct, removing the 6.3V supply at the emitter of TP53. This puts the power supply in the standby mode, but the chopper transistor would still be at risk. So D68 also conducts, which has the same effect as the microcontroller chip producing a power-on output: the line timebase thus comes into operation, adding to the current demand on the power supply. The chopper excess-current protection will then shut down IP01. TP20 receives at its base 3V from pin 9 of IP01 and by emitter-follower action feeds 2.4V to pin 3, holding the power supply drive off. A short across the UA line will make DP69 and DP70 conduct, producing the same results.

PO Switching

This brings us to the bit of circuitry that enables/disables the line timebase, see Fig. 3. In the standby mode the microcontroller chip IR01's PO pin 20 is at 5V. Since TR16 has 5V at its base it is held off. TR18 is also off. When the on command is given pin 20 of IR01 falls to 0V and TR16/18 switch on, providing a 14.7V supply at TR18's collector. This is reduced and regulated by RL46/DL46 to produce a 9V supply for pin 40 of the signals/deflection processor chip

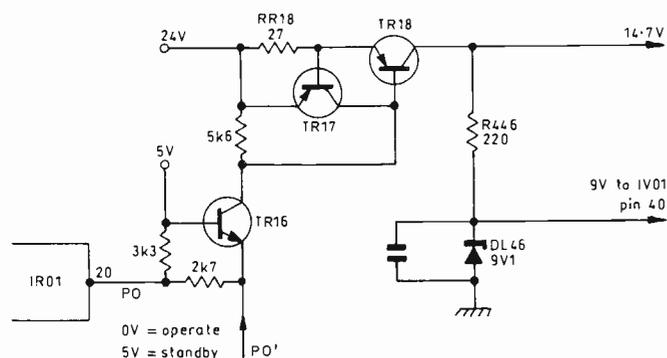


Fig. 3: The power-on switching circuit.

IV01, enabling the line generator circuitry. As noted above, conduction of DP68 or DP70 in the power supply will also switch TR16/18 on.

TR17 provides protection should there be a short-circuit across the 14.7V supply, by monitoring the voltage across RR18. Excessive current will switch on TR17: TR18 will then switch off since its base-emitter bias has been removed.

Line and Field Drive

Fig. 4 shows in block diagram form the sections of IV01 that produce line and field drive signals. A composite video signal is fed to the sync input pin 33. The sync separator feeds line-frequency pulses to the line phase comparator.

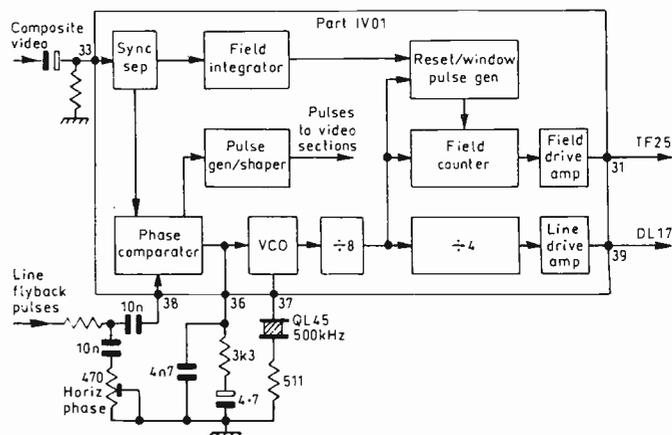


Fig. 4: Block diagram of the timebase generator sections of IV01.

whose other input (at pin 38) is a sawtooth obtained by integrating line flyback pulses. This loop caters for any time delays introduced by late switching of the line output transistor TL19, and maintains a centralised raster at varying levels of average beam current.

The master oscillator uses a 500kHz crystal, QL45, which is connected to pin 37. This oscillator's output is divided by 32 to obtain the 15.625kHz line drive output at pin 39, division being done in two stages, first by eight then by four.

The output from the divide-by-eight counter is fed to the field-frequency counter and is also used to time the field sync window. This window is open only towards the end of the field scan. Thus impulsive interference is prevented from upsetting the field sync. The field-frequency counter generates pulses by division of the master oscillator's output, so a field drive signal of close frequency to the field sync pulses will be generated even in the absence of the latter. This aids rapid locking of the field timebase at the transition from the unlocked to the locked state. The arrival of a field sync pulse resets the counter to zero, after which the count recommences. The field drive output appears at pin 31.

Line Driver and Output Stages

The line drive output from IV01 is fed via DL17, CL16 and RL16 to the base of the line driver transistor TL17. Fig. 5 shows the driver and output stage circuitry. A protection circuit, connected to the junction of DL17 and CL16, removes the line drive under overload conditions – we'll return to this later. The line driver stage is conventional, with transformer LL19 coupling the drive to the base of the line output transistor TL19. RL18 and CL18 damp the transformer's primary winding and prevent ragged raster edges.

The line output stage is also conventional, but differs from the IKC2 chassis in incorporating an EW diode modulator. The drive for this is obtained from the TDA4950 chip IG01

Safety Circuit

Fig. 6 shows the protection circuit that removes the line drive under various fault conditions. Zener diode DV08 monitors the voltage conditions in the line output stage, being connected via RV08 to the 13V supply. In the event of excess voltage here DV08 and TV02 switch on. TV02 provides forward bias for TV01, which also turns on, linking the junction of DL17/CL16 via DL16 and DV01 to

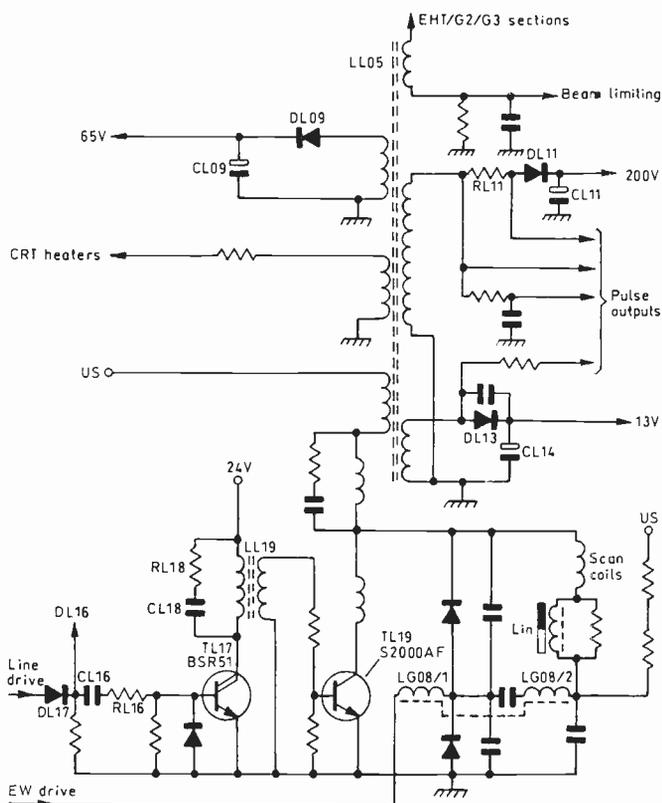


Fig. 5: Line driver and output stage circuitry. Some circuit details vary with tube type.

the 14.7V supply from TR18 (see Fig. 3). As a result DL17 is reverse biased and the drive to TL17 is removed. RV09 provides a hold-on bias for TV02 so that the circuit latches on. There is also a stop power (SP) feed to DP57 in the power supply, and a tube blanking feed via DV47 to the CDI panel (see later).

In the event of a short-circuit across the 24V rail CV02 will discharge negatively, switching on TV01. Once again TV01/2 latch on and the SP line goes high, putting the power supply into the standby mode.

The circuit also monitors the beam current, via zener diode DV02. Excessive beam current will switch on DV02/TV01/TV02, removing the line drive to protect the tube and the line output transformer.

The Field Timebase

The field drive output from the IV01 chip is used to switch a transistor on to discharge the field charging capacitor, which is charged from the 200V rail. The ramp thus produced is a.c. coupled to the TDA8178F field output chip IF01 via an emitter-follower buffer transistor. The i.c. operates in the conventional manner: an internal switch selects a 65V supply, derived from the line output transformer, instead of 24V during the field flyback. There is no field hold control.

Failures in the field timebase have been due mainly to short-circuit diodes – DF16/17/18/19 associated with the chip. If DF16 goes short-circuit 65V will be applied to the 24V rail, with the result that the line driver transistor TL17 is overrun. Thus it pays to check TL17 if you have to replace DF16.

Signals Circuitry

The signals circuitry follows the same lines as in the IKC2 chassis, with a TA8659CN i.c. to carry out colour

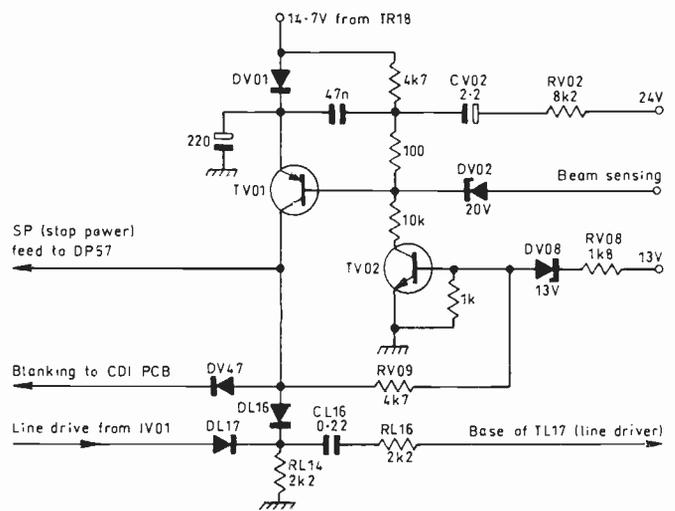


Fig. 6: The protection circuit.

decoding and RGB insertion/switching. There are however differences between the Nicam and non-Nicam versions of the chassis. In the Nicam version the vision and sound i.f. signals are handled separately. In mono sound sets an inter-carrier sound signal is obtained from the vision demodulator in the conventional manner. A frequency-synthesis u.h.f. tuner is used, with the vision i.f. output at 38.19MHz.

The audio amplifier circuits are conventional and include anti-plop components. Audio and video auxiliary input switching arrangements vary between the two versions of the chassis but are straightforward and needn't concern us here.

Video Circuitry

The CDI2000 panel that's interposed between the colour decoder chip IV01 and the c.r.t. base panel provides auto grey-scale tracking. There are two chips here. ID01 (TA8751N) contains the grey-scale system. ID12 (MC14053BCP) is a line and field flyback driven switch that provides blanking in conjunction with the black-level preset PD11, since IV01 does not provide a black-level reference during the field flyback.

Selection of internal (off-air) or external composite video and teletext or external RGB signals is accomplished by the teletext decoder and scart interface assembly, which can accommodate S-VHS inputs as well. A small rotary switch through the rear cover enables this latter option to be selected: note that if this switch is mis-set to a position midway between S-VHS and composite video the result can be very low or even no chroma at all with an off-air signal.

Conventional d.c.-coupled complementary-symmetry RGB output stages are used, mounted on the c.r.t.'s base panel. Fig. 7 shows the red channel. During the warm-up period the D line, from transistor TD11 on the CDI panel, goes high to blank the screen by cutting off the video driver transistors TT11/21/31. DT03, DT04 and CT03 provide spot quenching at switch off. During normal operation CT03 charges to 150V via RT03 while DT04 is held on via zener diode DT03. At switch off the 200V supply collapses rapidly, DT04 switches off and CT03 places a high negative potential on the tube's grid assembly.

Teletext

Full-specification teletext decoding is provided by a three-chip Fastext system. The decoder panel incorporates an MC14013 chip (IV30) that divides the field sync by two

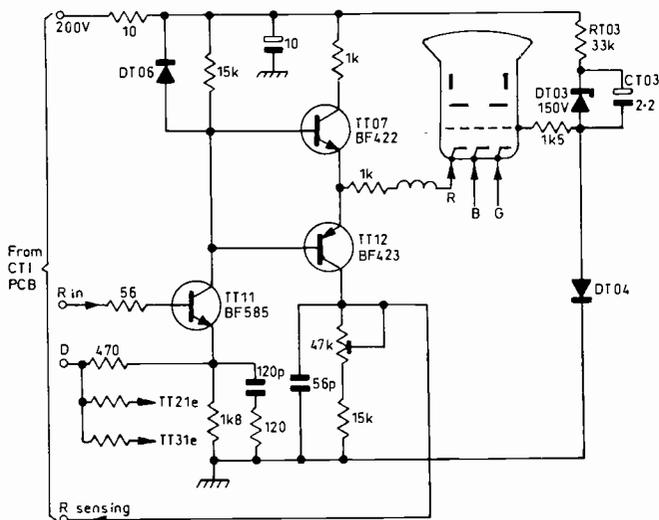


Fig. 7: Part of the tube base panel circuitry, including the red output stage.

to give a 25Hz output. This is amplified and inverted by transistor TH01 and is fed to the field timebase, during teletext operation only, to remove the interlacing and prevent vertical jitter. TH01 is enabled during teletext operation by an input from the microcontroller chip.

The RGB outputs from the character generator, plus monochrome text for the FB line (used for insertion of text into the picture in the mix mode), are buffered by four emitter-followers before being passed to the RGB inputs of IV01 on the main chassis.

The Microcontroller Chip

The microcontroller chip IR01 is a dedicated, 6-bit CMOS device that controls all the receiver's functions. The small bubble keyboard has a four row by five column cross-wire matrix that's scanned by IR01's PA and PB ports. There's an 8MHz clock oscillator and a second oscillator, operating at around 6MHz, that's used for the on-screen

display graphics. Several of IR01's pins are not used in UK models – they operate the standards-selection circuitry with multistandard models.

Servicing Aspects

Pin 20 is possibly the most important of IR01's pins since it controls the standby switching. When pin 20 is open-circuit the receiver can operate in only the standby mode. With pin 20 open-circuit the engineer can at least check that the primary side of the power supply is operating satisfactorily.

Lifting one end of DL17 removes the line drive. Since the line output stage is now no longer being driven, any 'dynamic' faults in the line scan circuit and the output transformer will disappear. If the power supply shuts down totally in this condition there could still be a d.c. leakage problem in the transformer.

Don't forget that isolating pin 20 of IR01 will remove its control over the power supply, so any problems related to IR01 will no longer have an effect.

Tripping can also be caused by DP55, the zener diode in TP53's emitter circuit.

Failure of the power supply to start up at all is usually because DP28 is leaky or short-circuit or IP01 is internally shorted between pin 15 and chassis.

We've encountered few faults in other parts of the receiver. Failure of diode DL42, which is associated with clamp pulse pin 35 of IV01, will remove the luminance and chroma signals. No colour is usually caused by the 4.43MHz crystal QC66, which can become 'sticky'. Remember that IV01 is a multistandard decoder chip that may take a moment or two to perform the correct colour system identification. This results in an occasional slight delay in the appearance of colour and is not a fault.

Finally, breakdown of the small bubble keypad at the front of the receiver is fairly common. The usual result is continuous programme stepping accompanied by a continually changing on-screen display of programme numbers. You can leave the keypad ribbon cable disconnected and use the infra-red handset to control the receiver.

CD Player Casebook

Philips CD150

If the problem is distortion and hum, check the -18V regulator IC6315. **J.H.**

Philips CDV475/05R

This machine was dead though a whistling noise came from the power supply. Checks in the power supply showed that there were a lot of dry-joints and that C2017 (470µF) was short-circuit. **P.B.**

Sony CDPM26

It made a change to repair a player that didn't have a laser or a turntable motor related fault. The ticket said "not reading disc". When the machine was switched on the laser hit the disc quite hard and nothing else happened: the turntable didn't rotate and there was no laser diode light. I

Contributions from John Hepworth Mike Leach, and Philip Blundell, AMIEE

got out the circuit diagram and checked the voltages in the power supply. Those around the f.e.t. Q1 and chip IC12 were all wrong, but changing these devices made no difference – the laser lens still hit the disc hard at switch-on.

Further voltage checks showed that the -5V line was sitting at -9V. I followed the circuit through to IC1 which incorporates both a +5V and a -5V regulator. Replacing this item cleared the fault and after fitting a new loading belt the machine worked perfectly. **M.L.**

JVC CAE37BK

The complaint with this fairly new midi system was that the repeat and programme lights on the front panel worked intermittently. On test the repeat facility appeared to work but the indicator wouldn't show. Luckily both symptoms were simply due to the fact that the LEDs on the front board had never been soldered. Although it was an obvious and easy fault, I thought it worth a mention as there could be a batch of these unsoldered ones out there – and any information is good information! **M.L.**

Camcorner

Reports from Simon Bodgett and
David C. Woodnott

Grundig VS8300

This Sony clone had a cassette jammed in the mechanism, minor scuffs and case stress. There were no emergency codes in the EEPROM and there was no tape damage. Perhaps the battery went flat?

Another of these machines had no camera output, or so it seemed until some video noise led us to the conclusion that the iris was closed. It's not uncommon with this model – oil from the zoom motor seeps into the iris vanes. The lens has to be carefully stripped and cleaned. I've never had to replace any parts to cure this problem. **S.B.**

Ferguson 3V50

When this camcorder was put into the record mode it remained in constant pause, with no camera operations. In this model the camera stop/start trigger is interlinked with vertical drive pulses to the camera control chip. There were no VD pulses because the camera SSG chip was faulty. **S.B.**

Some Panasonic Repairs

An NVMC6 was brought in because there were no EVF pictures in the camera mode. We found that a zener diode in the camera power supply had failed.

The trouble with an NVM5 was much easier to deal with. The complaint was of a dim picture: no one had noticed that the high-speed shutter was in operation because a ribbon cable was only partly into its connector. There was a much more difficult fault with another NVM5: the capstan motor produced sound warble in the record mode, but not much warble with playback. A misleading fault if ever there was one. The culprit was eventually found to be C2004 in the PWM integrator circuit. It was cracked – but not visibly so until it was removed!

According to the fault report an NVMS95 wouldn't always load a tape. According to me the drum often wobbled instead of rotating. A clear indication that a new drum assembly was required.

Defective transistors (T1006 and T1007) in the power supply regulator are the cause of flicker or intermittent camera pictures with the NVMC20. The recommendation is to replace them both. This is (a) if you can find them and (b) if you are equipped to remove them from the PCB without damage – their collectors are soldered to it.

An NVS5 chewed tapes and turned itself off. Sensible camcorder. As the capstan motor's stator had a damaged ribbon cable it was replaced.

Failure of a thermal fuse removes the ability of a VWAMC5B charger to charge a battery: a zener diode in this unit has to be upgraded from 15V to 18V. **S.B.**

JVC GRS77

One of these camcorders would play, with all the associated functions, but wouldn't record. After exploring other possibilities, such as the record switch, we found that the record button on the control panel was faulty.

Another GRS77 had been got at. It recorded in monochrome only. There were actually two faults, one in the camera head and one in the VHS standard record

section. The luminance record/playback chip IC1 had been replaced but nothing had been set up. For alignment purposes laser-trimmed resistors have to be removed and preset controls fitted. Resistors R384 and R362 in the encoder oscillator were rough: the colour problem was sorted out when these were replaced and excess flux was removed. Realignment of the luminance record/playback problems cured the other fault. **S.B.**

Sharp VLC650 and VLC690

A line on the playback picture with a VLC650 indicated that the video head switching was inoperative. A new servo chip had to be fitted. The complaint with a VLC690 was that it damaged tapes. It required a new cassette housing, take-up drive and pinch roller. **S.B.**

JVC GRS707

The 8V supply had failed. This was probably because the owner had a faulty AV lead or had made misconnections to the AV socket. Special care is required when replacing the regulator transistor – its collector tab is used to solder it to the print. **S.B.**

Sony CCDTR75

The caution light just flashed. The software said that the capstan motor wasn't going around, which was correct. A new one was required. **S.B.**

Sanyo VMD6P

A common fault recently has been lack of colour in two or three bands across the playback picture. Most of the picture is normal, the 'no-colour' lines (sometimes shaded blue) being stationary and each approximately twenty lines deep. The fault is very intermittent but continues for the duration of a recorded sequence. A new sequence may or may not display the symptom when played back. The cure is to replace the 28.375MHz crystal X901 on the CA1 PCB. **D.C.W.**

Canon VM1E

A common fault with this old-timer is no camera picture, either being recorded or through the viewfinder. We've previously reported that the cause can be a leaky or short-circuit electrolytic in the -6V supply to the camera's preamplifier circuit. Recently we had a case where another capacitor across this rail, but this time inside the preamplifier's screening can, was the cause. It's C11, 100µF, 6.3V. **D.C.W.**

Sony CCDTR75

Iris vane jamming can be a problem with this model, the result being either no picture or an over-exposed one. The usual cure is to clean the mechanism, but careful inspection of the iris motor ribbon cable may show signs of straining, with a possible poor connection. **D.C.W.**

Long-distance Television

Roger Bunney

September was a wet and dismal month throughout the UK, with minimal ionospheric and tropospheric activity. In the past September has usually featured enhanced tropospheric propagation: not this time! Here's the rather dismal log:

4/9/93	RTP (Portugal) chs. E2 and E3; TVE (Spain) E2-4; TVE-2 E2; Canal Plus L2, 3.
5/9/93	DR (Denmark) E3; TVE E2-4.
7/9/93	TVE E2.
12/9/93	RAI (Italy) IA.
15/9/93	DR E3.
25/9/93	TVE E3, 4.
26/9/93	DR E3; TVE E2, 3.
28/9/93	DR E3; TVE E2, 3.

Slight tropospheric lifts were noticed, mainly along the south coast, on the 19th and 23rd, with Band III/u.h.f. reception from the Benelux countries and, on the earlier date, an unusual signal – RTL (Luxembourg) ch. E7.

The Perseids meteor shower in mid-August was several times above average. During the peak around the 11-13th there were very strong, sustained signal pings. A pre-arranged transmission between amateur stations VE1HD (Canada) and G4CQM (UK) on the 11th produced recognisable s.s.b. signals, above the noise level, in Canada – a first for the 144MHz band (actually 144.49MHz) at some 4,100km. During that night European Band II f.m. stations were heard in Canada, though not identified.

In the June column I mentioned multiple-hop Sporadic E reception (93.9MHz f.m.) by Todd Emslie (Sydney, Australia), thought to be a signal from Hawaii. The station has since been identified – reception was rather less dramatic, from VL2NI-FM, Norfolk Island.

News Reports

UK: The BBC's Digital Audio Broadcasting tests at 226MHz (see Teletopics last month) could cause problems for TV-DXers, particularly those living in London and East

Kent. Use of filters or stagger-phased aerials should help.

Ch. E2 interference in the Isle of Wight may be caused by the 48.06MHz IW Radio link to the m.w. transmitter east of Newport. The vertically-polarised transmissions have been received as far east as Hastings! Radio France also uses Band I studio-transmitter links, the frequencies employed being 50.05, 50.075, 50.1 and, 50.125MHz.

Greece: The government has announced the franchise licence awards for private broadcasting. National channel operators will be Mega Channel, Nea Teleorasis, Star TV, Antenna TV and Seven X. Super Hellas, TeleTora and Tele City will operate in Athens, Macedonia TV in Thessaloniki and TV-100 in the Macedonia region. Nearly ninety groups applied for licences. National broadcaster ERT has been given permission to relay satellite programming.

Poland: The second channel will use PAL from January 1st, 1994. Compensation is to be paid to those with SECAM receivers.

Italy: As all pay-TV operators are to be confined to cable and/or satellite transmission terrestrial TV operator Telepiu has been ordered to cease transmissions within twelve months.

Germany: A previous report that the powers of many v.h.f. transmitters are to be raised to 500kW e.r.p. was perhaps optimistic: maximum powers remain at 100kW for v.h.f. and 500kW for u.h.f. Dudelange (Luxembourg) ch. E7 uses 130kW e.r.p. however.

Switzerland: S-Plus has taken over from Telecine TCR on ch. E69. Telecine is to move to satellite operation as Cinevision. S-Plus also operates on chs. E38 (Geneva) and E52 (Montreux). The authorities have confirmed that no daytime 50MHz amateur operation is to be permitted: night-time operation at up to 100W is allowed with certain restrictions.

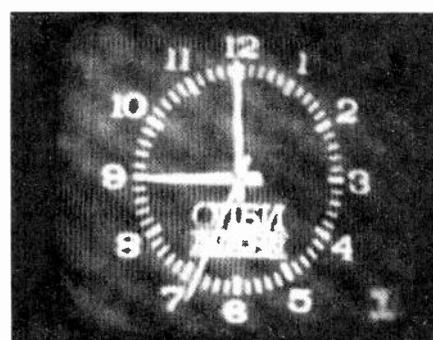
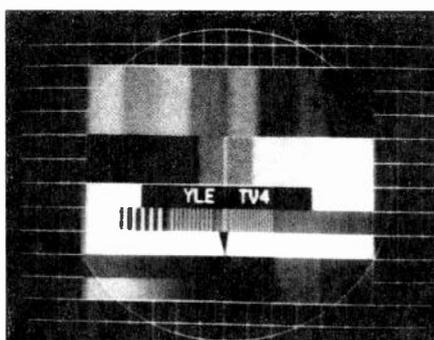
Jordan: The ch. E3 JTV transmissions now have teletext.

Ghana: A new private broadcaster, Hi-Tech Vision, is operating in Accra on ch. E35, the transmitter power being 100kW. The transmissions are scrambled. Tema City is to operate similarly on ch. E55 and further stations will be in Kumasi (1994) and Sekondi (1995).

Satellite TV

Eurovision's headquarters have been moved from Brussels to Geneva: a new identification, EVC-G, will now be seen. The Portuguese RTP International service has been transferred from Eutelsat II F3 to II F2 at 10°E (11.66GHz vertical).

Following the success of the Threshold Extension circuits now being fitted to receivers, an Austrian firm has intro-



Left: Sky SNG feed test pattern received by John Locker via Eutelsat I F2 at 25.5°E. Centre: YLE/TV4 (Finland) FubK test pattern. Photo from Petri Popponen. Right: Russian first programme clock, received by Ryn Muntjewerff in Holland. Note the 1 in the bottom right-hand corner.

duced a new unit called 'Sparkling 1 - Spike Killer'. It takes the video output from a satellite receiver and returns the processed signal via the normal video loop, removing black and white noise spots, stabilising the colour and carrying out resynchronisation. A 'cleaning control' is provided to adjust for optimum picture quality. The unit requires a 16-18V d.c. supply, consuming 300mA, and is available from Telelab Laboratories Vienna, Paniglgasse 20, A-1040 Wien, Austria.

Antenna Hungaria plans, with an Israeli partner, to launch a 16-channel, ten-transponder satellite called Domestic by mid-1996. It would cover all Europe and the Middle East. German broadcaster ZDF is to launch a scrambled pay-TV channel via Astra, with widescreen capability and digital compression. The MPEG-2 digital-compression standard is likely to be adopted by News International and SES (Astra) by 1996, offering up to 600 digital TV channels (180 for BSkyB).

Australian magnate Kerry Packer has taken options on ten transponders aboard AsiaSat-2 which is to be launched in early 1995. Its service area will extend from Australia across Indonesia into Asia.

Finally a plug for Dave Andrews of Bristol, a DXer and satellite enthusiast, who is now providing a satellite equipment installation service in the West Country. He specialises in motorised dishes for bands C, S and Ku and can be reached on 0454 778 887.

Publications

An English-language version of Alexander Wiese's publication *Tele-Satellit* is now available from Tele-Satellit - International Edition, PO Box 1234, D-85766 Unterfoehring, Germany (fax +49-89-9506165). Cost is DM120 or £48 and all credit cards are accepted. The magazine contains reviews of equipment and receivers, news, views and commentary, with twelve pages of close-type transponder loading lists, both radio and TV, covering 80°E to 60°W and including S, C and Ku band information. There's also a Russian-language edition.

The 3rd edition of *World Satellite TV and Scrambling Methods* and a new publication *Satellite Channel Report* are now available from Swift Television Publications, 17 Pittsfield, Cricklade, Swindon SN6 6AN. The *Report* is A4 size and has four sections as follows: dish alignment data, look angles etc.; information (video, audio and encryption) on nearly 800 satellite channels; similar information listed by channel and finally by language. It costs £15 plus £2 UK postage, £4 postage to the Continent. A new up-dated edition is published monthly.

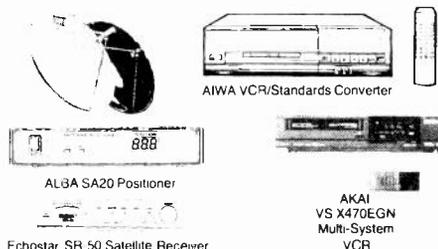
Andrew Emmerson's quarterly publication *405 Alive* has been such a success that separation into two is being considered, one magazine concentrating on news and views and the other on the more technical side - circuitry, servicing etc. Present annual subscription is £13 in the UK - there's a five per cent surcharge with credit card payment. For further information drop an SAE to Andrew at 71 Falcutt Way, Northampton NN2 8PH. Oh, and whatever you do don't throw away any old 405-line TV sets, magazines, annuals or anything to do with pre-1975 TV. A line to Andrew or myself will find a good home for anything you wish to dispose of.

TV-DXing for Beginners

Since we get numerous requests on how to go about long-distance (DX) reception and my *TV-DXers Handbook* is at present out of print, we'll run over the basics briefly in the following issues.

DX signals may arrive at the receiving site after reflec-

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tion from the ionosphere, the troposphere, reflective objects such as aircraft or even the ionised trail left by a lightning strike. Many DXers concentrate on reception of Band I and II signals (occasionally, under good conditions, Band III signals as well) reflected from ionised patches of the ionospheric E layer, which is about 70 miles above the earth. Since the required ionisation is random and unpredictable, such reception is referred to as Sporadic E (SpE) reception. It's more likely to occur during the period May-late August, with occasional December openings. Typical single-reflection (hop) reception distances are 400-1,400 miles. The occasional double-hop reflection makes it possible to receive N. American low-band (Band I) transmissions. As SpE signals can be very strong, they are easy to receive using a simple aerial. The likelihood of reception is increased when sunspot activity is high - there's an eleven-year sunspot cycle. During the winter in daytime reflection can occur via the F2 layer at some 220 miles above the earth, giving reception distances of 2,000 to 12,000 miles, though the signals can be very distorted and smeary with ghosting. Unlike SpE, for F2 reflection the local time midway along the path must be noon.

Signals can also be reflected from meteor showers that enter the E layer. MS reflection occurs daily, but the signals are weak and of brief duration. Reception is usually better in the morning and during times when meteor activity is high - there are showers that occur at regular intervals throughout the year. Simple aerials can be used for MS reception in Band I, but because of the relatively low signal levels a higher-gain system is required for Band III MS reception.

Tropospheric signal reflection is related to weather conditions and can occur in all bands. Settled, high-pres-

sure systems with clear skies are best for tropospheric reception. As the sun rises in the morning, heating the upper layers of the troposphere, ducting layers that carry signals for long distances with minimal attenuation can appear. Signals tend to travel along rather than across the prevailing isobar pattern – look at the weather map. Fog often produces really intense signals during the autumn/winter months. Band III and IV signals do better than Band I signals. Reception distances can reach 1,000 miles. Tropospheric signals are usually weaker than ionospheric ones and feature slow fading between extreme levels.

For lightning scatter reception the aerial(s) should be pointed at a known thunder storm area – but not a local one! The lightning strikes produce ionisation that reflects signals. Aircraft reflection can give reception of Band III/u.h.f.

TEST CASE 372

Deciding on whether or not to repair an old TV set or VCR is always difficult. Not necessarily because of any lack of confidence in the repair itself, but because of the risk of a comeback as a result of failure of some other part of the equipment – the latter always leads to difficulties with the customer, who will expect a free-of-charge job even when the new symptom is quite different.

The golden oldie in the spotlight this month is a Sharp VC9700 VCR that came in with the complaint that it chewed tapes. There was no tape with it to assist with diagnosis, but no matter. On to Sherlock's bench it went. It played all right, and careful examination of the tape after it had been shuttled back and forth dozens of times in the play, rewind and search modes showed no evidence of damage. The picture was amazingly good for such an old machine: Sharp video heads of this vintage never seem to wear out!

It seemed likely then that the cause of the problem was intermittent, and a phone call to the customer established that on a couple of occasions an ejected cassette had a foot or so of crumpled tape hanging from its flap. Sherlock inserted, played and ejected the workshop tape scores of times without any trouble. So it was going to be another of those jobs. . . Someone said that a very common cause of this sort of thing is the reel idler, which certainly looked as though it was the original one. So in went a replacement, and after a head clean and check the machine was sent on its way, with a bill for the idler and Sherlock's time.

The nights drew in, the winds got up and ere a month had passed the veteran Sharp was back on the bench. It had chewed another tape, which sat on top of the machine as evidence of the fact that it had failed once, after maybe a hundred successful operations, to spool the ribbon back into the cassette. No doubt this scenario will ring a bell in the minds of readers of *Television*!

Sherlock dismantled the machine and fed into it a dummy cassette – the sort with a transparent frame and no spools inside. The FL mechanism drew it in and down, and when the machine was asked to play it worked happily in all respects except that the spool turntable didn't rotate. Nor did the feed (left-hand side) turntable rotate when, a few seconds later, the deck reverted to the stop mode because of lack of spool-rotation sensor pulses. The fault was present right now! Our man checked that the reel-drive motor and the idler were perfectly free to turn. They were, and further tests showed that the machine had reverted to normal spooling, winding and whizzing. It behaved impeccably on the bench for the next week.

signals over distances of several hundred miles – in this case a directional aerial is essential.

The receiver used must of course be suitable for the transmission standard. In Europe 625-lines with negative-going video is the norm, the exception being France which uses positive-going video. The spacing of the audio and video carriers is something else that varies. As my TV-DXing book is out of print, if any reader in the UK would like four photocopied pages from it giving Band I/II/III/IV/V channel allocations and transmission standard details worldwide these will be despatched on receipt of three 18p stamps and an A4-sized stamped addressed envelope. Alternatively check whether your local library has a copy of the *World Radio and TV Handbook*. Next month we'll consider receiving equipment.

After the recalcitrant Sharp machine had run trouble-free for over forty hours Sherlock had a go at instigating the fault. He put the machine into the fast-forward mode, with the dummy cassette loaded, and held the take-up spool by hand: the idler didn't slip, and there seemed to be enough torque when the motor was slowed. Next the patient Sherlock traced out the connections, leads and links to the reel motor, checking them and the associated drive electronics for bad joints or thermal faults. None came to light, the machine continuing to work perfectly. Finally he hooked an old Avo meter across the reel-motor leadouts and left the machine running, ready to check when the fault cropped up once more. It didn't do so for weeks, and Sherlock wished he'd given the owner a fiver to go elsewhere at the outset!

The machine was eventually repaired properly. What had been the fault? Don't just turn to page 129 for the solution: think about it first!

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VCR Clinic

*Reports from Philip Blundell, AMIEE,
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Philips VR322

If the complaint with a current Philips VCR is that "the remote doesn't work", remember that they have a VCR1/VCR2 facility to enable two VCRs to be controlled by one handset. So if the handset shows VCR1 in the LCD try changing it to VCR2 before getting the manual out. You change the code by pressing the two set-clock buttons (on the handset) then select (to change from VCR1 to VCR2). Finish by pressing the two set-clock buttons again. **P.B.**

Ferguson 3V32/JVC HR7655

This machine recorded the sound but failed to record the picture in either the SP or the LP mode. There was no record f.m. signal at pin 5 of connector CN6 on the Y board. Checking back from here we found that the 1k Ω f.m. record preset control R128 was open-circuit. **P.B.**

Hitachi F700

The complaint was of noise when threading up and with fast winds. The complete gear-block assembly had been changed, which made a vast improvement, but the mechanism was still noisy. All operations apart from tape loading and unloading are driven by the capstan motor. After removing the belt we found that the flywheel was tight and noisy. As the bearings were dry we removed the flywheel and applied a few drops of oil to them. This cured the problem. **R.N.**

Lloyd LV400/Saisho VR705/Amstrad VCR7000

The problem with this machine was cyclical noise bars on the display. The symptom could be mistaken for absence of the control track pulses but was caused by failure of the 2.2 μ F, 50V electrolytic capacitor C503 in the power supply. It smooths the regulated 12V supply to the servo chip IC2007. A scope check showed that there was a 1V square-wave on this line. A new capacitor restored normal operation. **J.E.**

Sanyo VHR3300

This machine was dead with the 400mA fuse F5101 shattered. As there was no obvious short-circuit in the power supply we replaced the fuse and switched on. The fuse remained intact but the machine was still dead. Further investigation showed that R5001 (2.7 Ω) was open-circuit and that all the pins of the STK7226 power supply regulator chip seemed to be dry-jointed. A thorough resoldering, including many other joints elsewhere in the power supply, brought the machine back to normal operation and after a very long soak test we pronounced it fit. **J.E.**

Panasonic NVJ30

Except for play the tape modes were normal. When playback was selected the machine laced up but the capstan, and thus the picture, ran too fast – at roughly the same speed as fast search, the monitor's screen remaining in the E-E mode. Then after about five seconds the machine entered the stop

mode and shut down in the half-laced position. To cut a very long story short, the culprit turned out to be the mode switch. For those wishing to make a note of this the mode-switch voltages, measured for convenience at pins 73 and 74 of the microcontroller chip IC2001, should be as follows:

Pin 73: stop/half load position 5V; rewind/fast forward 5V; play 0V.

Pin 74: stop/half load position 2V; rewind/fast forward 2V; play 5V.

In the fault condition pin 73 remained at 5V. **J.E.**

JVC HRD120

The record and playback picture quality were good but in both modes the sound would 'pop and crackle'. In the E-E mode there was no sound. The 2SD636 transistor Q5 should have 9V at its emitter in this mode, but the reading was 0V. A replacement transistor restored normal E-E sound but record and playback remained distorted.

Scope checks on the audio waveform while a tape was being played back showed that a normal signal entered the LA7042 chip IC1 at pin 2 but the output at pin 3, after passing through a preamplifier, had a d.c. level that fluctuated wildly. Pin 3 is connected to the 150 Ω playback level preset control R6, which turned out to be faulty – in fact it fell to bits when it was gently removed during the fault diagnosis stage. A replacement restored normal sound. **J.E.**

Panasonic NV730

When this machine was switched on the capstan and reel idler would shuffle to and fro a few times then stop. The machine wouldn't accept a cassette. There were no channel indicators or power-on display, though the clock flashed. The cause of the fault was the 0.12 Ω resistor R1101, which was open-circuit. It's in the 20V feed from the power supply. **J.E.**

JVC HRD210

When this machine was plugged into the mains supply the left-hand spool carrier rotated and the mode motor operated. But the carriage, though in the eject position, tried to eject some more – this was accompanied by loud screeching noises. The switched 12V and 5V supplies were present, so the cause of the trouble wasn't our old friend the STK5481 regulator chip. In fact the cause turned out to be nothing more than a slipping mode-control belt.

Be careful when you remove the plate that contains the mode switch/rotary cam etc. underneath the deck, as the timing can be upset. This causes problems when it's refitted. In situations like this I use Tippex to mark adjoining movable surfaces. Refitting is then much simpler. **J.E.**

Samsung VI7220

The complaint was no playback sound. We found that the playback video level was much too high, with no playback or

E-E sound. Checks on the power supply's output voltages showed that there was only 2V at PC9, because the 800mA fuse F103 was open-circuit. When this fuse had been replaced the machine worked until record was selected. It then blew again. This led me to the 2SC1008 transistor Q0501 which was short-circuit. A replacement stopped the fuse blowing but there was no record/erase bias as the wire that connects the bulk erase head was broken. This had almost certainly been the reason for the transistor failure. C.W.

Akai VSF33

This machine came in dead. A nice easy fault for a change: the 16V zener diode D8 in the power supply was short-circuit.

The fluorescent display left a lot to be desired however. It's a common problem with VCRs in this series. The cause of the problem is that the display is overdriven. The cure is as follows. Fit 120µF, 10V capacitors in positions C446 and C447: they have to be high-temperature types rated at 105°. Change D416 and D417 to type RB-100AT. If L404 has a centre-tap, cut the print between C447 and L404 and connect a jumper wire between the negative side of C447 and L404's centre-tap. If L404 is not centre-tapped, cut the print between C447 and L404 and add a 2·2Ω resistor across the cut. Modification kits are available from Akai.

Sometimes this modification improves the operation of an existing display, but for best results a new display should be fitted. R.N.

JVC HRD210

This machine was brought in because it chewed tapes. A new pinch roller and idler wheel cured this fault but I then found that there was severe audio hum on record and playback, with very little audio present. The circuit was very sensitive around the BA7751ALS preamplifier chip which also switches the audio head for record or play. A call to Willow Vale brought a replacement the following day. Fitting it cleared the problem. R.N.

JVC HRD960

I was well and truly had by this machine. It had had a history of intermittent problems and reappeared in the workshop after an absence of about six months. This time the complaint was that it ejected tapes at random. When tested however it wouldn't even switch on. After a lot of checking around I decided that IC601 was at fault as its 'on' output, pin 40, was permanently low. As I've had a few faulty JVC microcontroller chips I made a note of the type then called the local friendly JVC dealer. "Hang on" he said, "have you got a little dash showing at the front next to the flashing clock zeros?" "Yes" I said. "It's in the child-lock mode" he replied. He then told me that all I had to do was to give the on command from the remote control unit. I didn't have the unit, but I borrowed a programmable one, keyed in the JVC codes and hey presto! the VCR powered up. Lots of VCRs have child locks but they are much more obvious than this one. I wonder how many other engineers have been caught out?

The random tape ejection problem was cured by replacing the light sensors. R.N.

Akai VS425

This machine wouldn't accept tapes. When I'd removed the top I found that a small label from a cassette had stuck itself

to the head and lower drum, thus locking the drum solid. But after removing the label and cleaning the head it still wouldn't turn. I carried out some further checks then removed the motor-drive PCB from under the drum motor. A hole had been blown through the control chip. The PCB is available complete, and when a new one had been fitted the drum ran at the normal speed. My troubles weren't over however as the head itself had been damaged. All was well when this had been replaced.

I always advise my customers not to put labels on the tops of cassettes. They can easily come off and cause expensive damage, as this customer found out to his considerable cost. R.N.

Panasonic NV333

This machine would accept a tape but refused to accept any instructions. Failure of the tape to even shuffle on insertion led me to the µPC358 dual operational amplifier IC6006 in the reel motor voltage regulator. A replacement restored normal operation. P.M.D

Proline 9000/Amstrad VCR6000

"Cannot program tuner" was the complaint with this machine. It would tune in only BBC-1! Replacing Q601 (2SA1038) in the 32V series regulator section of the power supply, followed by memory reprogramming, got things back to normal. P.M.D.

Philips VR522

Nicom sound was perfect but there was faulty 6MHz f.m. sound in the E-E mode. White noise was all that could be heard when 6MHz was selected. Demodulation of the 6MHz sound is carried out by the TDA3867T chip IC7820 on the front-end PCB. A replacement chip put matters right. S.C.

Philips VR422

This was one of the few faults we've seen on the Turbo-Drive deck. A tape could be loaded and would go to the cassette-down position but nothing else would happen. What should happen is that the tape should go into the sub-load position, i.e. the tape is taken up to the audio/control head. Curiously, if the carriage was loaded without a tape the machine did go into the sub-load position when the cassette-down position was reached. After first, incorrectly, looking for a brake fault we soon spotted the defective part. There's a V and a notch in the outer cam track of the main cam wheel on the upper side of the deck. When the sub-loading movement arm reaches this point the sub-loading arms are taken up to their positions. What had happened was that the notch had sheared slightly. Thus when there was some tension on the arms the movement arm ran straight past the notch. A replacement cam wheel, which is supplied in a kit, cleared the problem. S.C.

Philips VR712

There was no clock display and the drum rotated all the time. I suspected a microcontroller fault and while checking around the clock and microcontroller chips discovered that the POR line was permanently low. The reset generator is in IC7351, at pin 17 which was permanently high. A check on the supply to this chip showed that it was low at 4·7V instead of 5V, with a low-frequency ripple content that could be seen on the scope. So the cause of the problem was

in the power supply. Checks showed that there was 1.f. ripple on other lines. By now I had a sneaky suspicion where the cause of the fault lay and a scope check at the main 100 μ F, 385V reservoir capacitor C2112 on the primary side of the power supply produced a 200V ripple display. A replacement capacitor put matters right. **S.C.**

Philips VR713

There was severe teletext corruption with this machine. We found that the E-E picture was perfect, with no ghosting whatsoever, so it wasn't an i.f. fault. The usual cause of data corruption during text processing is an incorrect frequency text data clock. The 13.875MHz text data clock crystal is X1800. It's connected to pin 11 of the VIP chip IC7780. A new crystal cured the fault. **S.C.**

Ferguson FV57H

There was no E-E operation and no playback, just a blank raster. The channel numbers were o.k. but there was no station. The 5V regulator IC801 was defective. **E.J.**

Alba VTV10

This is a televideo with a 10in. screen. The fault we had with one of them was a blank raster with no sound or vision in either the TV or video modes though the on-screen graphics were o.k. Cause of the trouble was that the 1 Ω fusible resistor R24 in the VCR power supply section was open-circuit.

If you can't tune one of these televideos the 39 Ω resistor R20 is almost certainly open-circuit. **E.J.**

Panasonic NVJ40

Nothing was working and the display showed E9. When the machine was plugged in the clock flashed 0:00 for two seconds then the display produced E9. We checked for oscillation at pin 82 of the surface-mounted chip IC6001. There should have been 10V peak-to-peak but this was missing. The cause of the fault was Q6101 on the fold-down PCB. **E.J.**

Ferguson FV62LV

There was no full erasure. The BC337 transistor TL01 was found to be faulty. **E.J.**

NEC NS7000K

This top-of-the-range machine has hi-fi stereo recording, Nicam stereo – and a built-in satellite tuner. The driving is not obvious, particularly channel change, u.h.f./sat and tuning, so if it's the first one you've handled ask the customer for the User Instructions – it saves time. It's also helpful to have the service manual to hand.

The complaints with this one were of "jumping SP/LP and poor recording". On test, playback of prerecorded tapes produced varied results: part or all of the screen full of snow, part colour and part monochrome, with narrow bands of interference across the screen at various places. The machine wouldn't record at all. When it was put in the record mode the display said 'record' and all functions were apparently normal but playback showed that there had been no recording, nor had any previous signals been erased.

A check at the full-erase head showed that there was no waveform here during record. At pin 26 of IC501 on the

video/normal audio PCB there was only 2.4V instead of a high (5V) in the record mode. Isolating pin 26 proved that the device was not pulling the switching line down. Checks through the Delay REC H and Hi-Fi Rec H lines on the syscon/servo and hi-fi audio panels at last brought us to the drum preamp PCB where pin 1 of the BA7740S head preamplifier chip IC551 remained permanently at 2.4V whether the machine was in the record or play mode. When pin 1 was isolated the record high lines went from 0V to 5V and the machine recorded. A new BA7740S chip (part no. 37101417) cleared the record problem but still left the poor playback.

Checks on the tape path and the drum PG set-up control VR601 led us to the drum motor PCB. Slight pressure on this panel during playback would clear or change the fault. It's part of the lower drum assembly, and is not described or illustrated in the manual. So we removed the whole drum assembly to gain better access to the PCB and examined it closely. It has double-sided print, a plug/socket, a surface-mounted chip and several surface-mounted components, also seven lead-through pins. We resoldered these lead-through pins and the plug connections, then reflowed the surface-mounted resistors in the suspect area. After reassembling the drum and rechecking the tape path, record/playback tests showed that everything was now back to normal. The interference bands had been caused by the head switching point varying due to loss of or mistimed drum PG pulses as a result of the PCB fault.

During final checks before wrapping the machine up we found that there was a problem with the satellite tuner. On most channels the signal became noisy, flashed off for a split second then returned to normal over a two-minute cycle. This rang a bell: I described a similar fault with an NEC 3022 VCR in the October 1991 issue. A check at the a.f.t. pin (39) of the UPD17002-516 chip showed that the voltage here swung in time with the picture loss. This time it wasn't necessary to replace IC301: slight readjustment of the AFT Adjust control VR301 resolved the problem. **J.C.P.**

Toshiba V300B

This machine led us a bit of a dance. It had all the symptoms of a faulty mode switch, e.g. the deck would lace up with no tape in, it would load the tape but wouldn't eject it – all the symptoms being intermittent. But a new mode switch made no difference. After wasting much time on the mechanics we discovered, quite by chance, that the test signal wasn't available. The reason for this was that the 5V supply to the modulator was missing. The cause of all the trouble was that the 2SC2236 5V regulator transistor Q814 on the power supply PCB was faulty, a replacement restoring normal operation. **M.Dr.**

Hitachi VT430

There was no tuning and the clock display was dim and flashed 'on/off'. When the top was removed there was a terrible smell. Thinking that there had been liquid spillage we checked the boards thoroughly but everything seemed to be in order. We eventually found that the 1SS130M-T –40V supply rectifier D917 had burnt up – it turned out to be the source of the very toxic smell. To gain access to the PCB to replace D917 we had to remove the 100 μ F, 63V electrolytic C918, which is the reservoir capacitor for the +40V supply to the voltage-synthesis tuning PCB. While we had it out we thought we'd test it – and found that it was open-circuit! After replacing these two items everything worked normally. **M.Dr.**

Panasonic's Digital TV Chassis

Part 4

Ray Meadows

For the sake of completeness we will conclude this series by taking a look at some of the different features used in Continental models and see how they are put into effect electronically.

Secam

Models sold in countries that use the Secam colour system have an additional chip in the decoder section. It's called the Secam Processor Unit (SPU) and is fitted in parallel with the ACVP chip, being brought into action only when a Secam signal is detected. Fig. 1 shows a simplified block diagram.

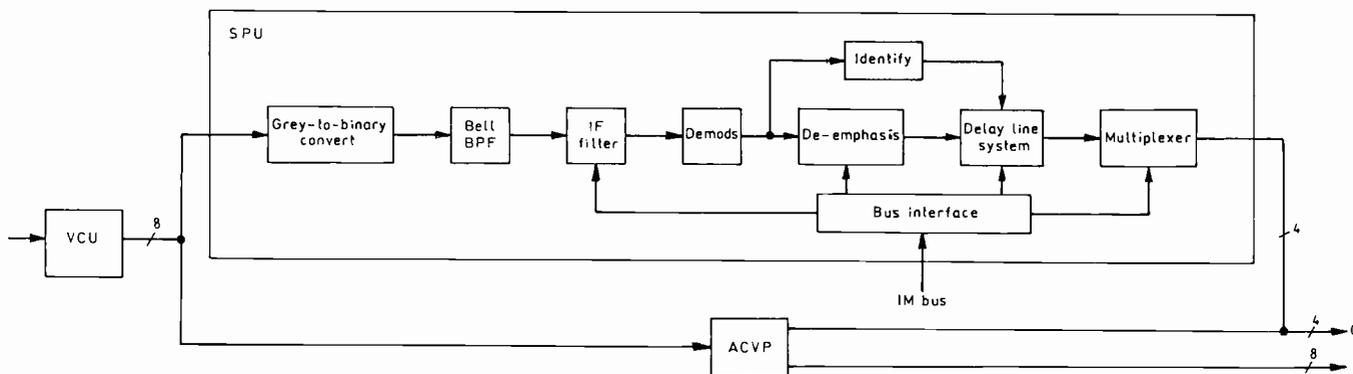


Fig. 1: Block diagram of the Secam processor unit.

As the SPU chip performs true Secam decoding rather than Secam-PAL conversion, the results are much better than with previous models. The SPU chip is fitted in sets sold in the French and German markets (model number suffixes F and C): the German version is also supplied to most central European countries.

Stereo Sound Reception

As we saw in Part 3, the AMU and MSP chips provide Nicam signal decoding and processing. In addition to UK models they are fitted in sets supplied to the Spanish and Scandinavian markets, for Nicam B/G reception. Other Continental countries use either the Zwietone stereo/bilingual system (Germany and France) or have no stereo broadcast system. Zwietone reception is catered for by the ACP chip, which is fitted to all models. Some countries, such as Denmark, can receive Nicam signals from Sweden and Zwietone signals from Germany: they are fitted with the

Scandinavian version of the chassis (suffix S) which is equipped for both.

MAC, PIP and Satellite

This rather wide option is fitted in special sets for the German market only, suffix CM. As well as having a dual-LNB input satellite tuner and an extra digital features panel these models have the tuner and i.f. section combined as a single unit that's made by Loewe – in fact the complete TV receiver is made on a special Panasonic production line at the Loewe factory in Kronach.

Model TX28W3CM is capable of PAL B/G, D/K and I, Secam B/G, D/K and L/L', and D2MAC reception via either an aerial or cable input, with Nicam B/G and Zwietone stereo. Because of the extra digital circuits and satellite operation the chopper transformer and power supply are updated. The software is also more complex, with more on-screen menus and service-mode functions. Because of this a 24C16 instead of a 24C08 EEROM is used.

Satellite Receiver

A Salora satellite tuner is used, fitted with two Belling-Lee type aerial connectors, one male and one female. It is assembled on a receiver module that's attached to the main chassis frame. Power supplies for the module and the LNBS are derived from a 150V feed from the main chassis. While working on one of these sets don't leave the earth lead from the satellite tuner to the main tuner disconnected – other-

wise you'll be reminded when you try to connect the satellite dish!

Fig. 2 shows a greatly simplified block diagram of the satellite receiver. All the signal processing is carried out in analogue form, the outputs being converted to digital form on the main chassis. The tuner itself is controlled by the main CCU via one of the I2C buses. Audio mode, PAL/MAC selection and the polariser are controlled by a U3082 I2C bus expander (IC800).

Analogue baseband video from the tuner is amplified and then passed to two filters, one for PAL and the other for D2MAC signals. These filters are in parallel, the PAL filter being switched in by IC800 via a diode when the PAL mode is selected. The filtered signal is processed by a TDA6151 video processor chip (IC500), buffered and fed out to the digital board.

The audio signals are extracted before the PAL/MAC filters and are fed to an NE612 sound i.f./demodulator chip (IC270). This device's output passes through three ceramic

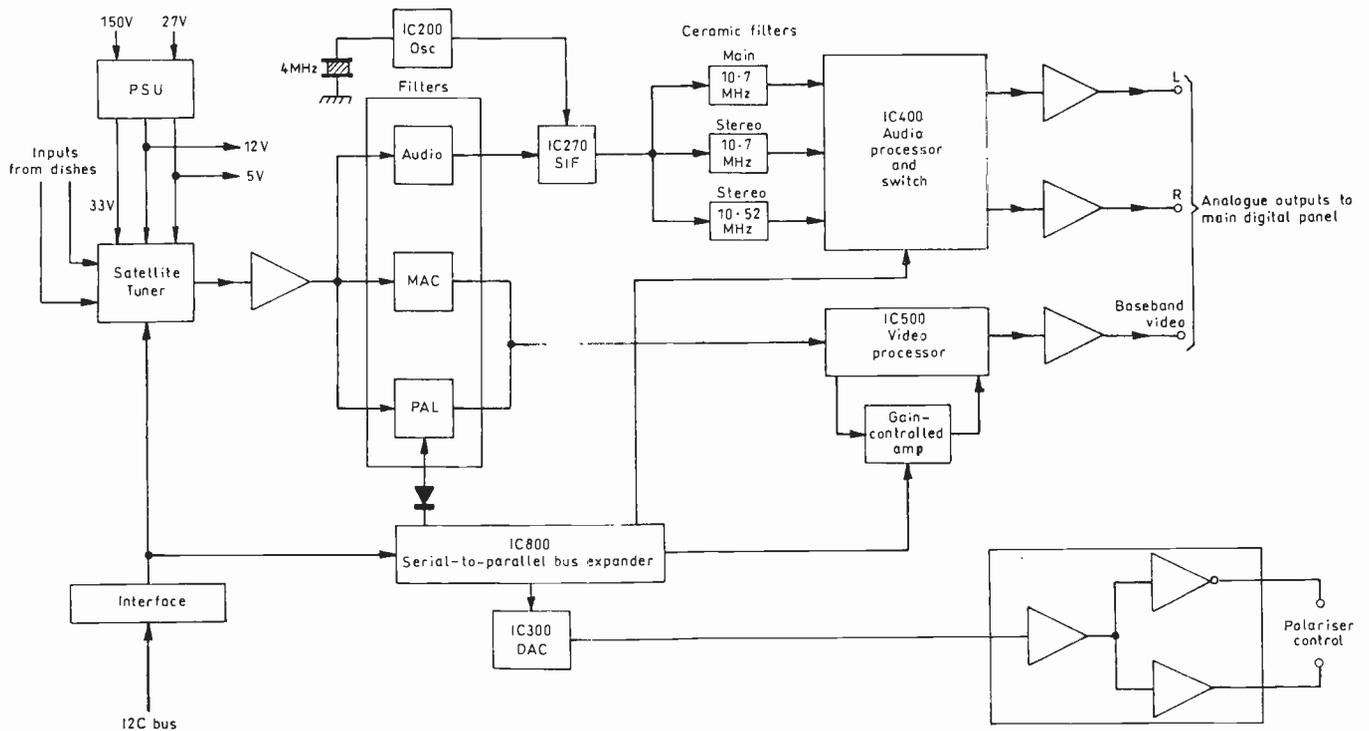


Fig. 2: Simplified block diagram of the satellite receiver.

filters (10.7MHz/280kHz, 10.7MHz/180kHz and 10-52MHz/180kHz) to obtain the carriers for the main mono and stereo narrow-band audio channels. Selection of these is performed by a TDA8741 audio processor/switch (IC400). Selectable J17 and 60µsec de-emphasis is provided, but there's no Wegener Panda for Astra.

When the video and audio signals reach the digital panel they enter the appropriate cross-point switches and are then digitised. This is important: it means that scrambled signals are not converted unnecessarily before they are fed to

external decoders. MAC audio and video cannot be processed here: they are passed to the features board for decoding.

The Features Board

The features board performs D2MAC decoding and the picture-in-picture functions. The main devices on this board and their functions are listed in Table 1. Some of these devices have already been encountered, as they are also

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A computerised index to *TELEVISION* magazine covering volumes 38 to 42 (1988 – 1992) is now available. It contains over 3500 references to TV/VCR fault reports and articles, with synopses. It includes a TV/VCR spares guide, an advertisers list and a directory of trade & professional organisations. The software is easy to use and very quick. It runs on any IBM or compatible PC with 512K RAM and a hard disc.

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Video Interface Products Ltd., 1 Vineries Close, Cheltenham GL53 0NU, UK.

Table 1: The features board chips.

Position/type	Name and function
IC301 AMU2481	AMU – Audio Multiplex Unit
IC731 SAD2140	SAD – S-VHF and composite DAC
IC861 VDU2146	VDU – Video Display Unit
IC771 DMA2281	DMA – D2MAC decoder
IC810 MSE3000	MSE – Multi-Standard Encoder
IC791 MCU2600	MCU – Master Clock Unit
IC681 PIP2250	PIP – Picture In Picture
IC631 SPU2243	SPU – Secam Processor Unit
IC601 VCU2133	VCU – Video Coder/encoder Unit
IC641 VSP2860	VSP – Video Sync Processor

used on the main digital panel. Others are new. A few other devices are present: a TEA5114 RGB switch, two 41464 DRAMs for the PIP processor and a third 41464 DRAM for the D2MAC decoder.

D2MAC Decoding

Fig. 3 shows in block diagram form the D2MAC section of the features board. Baseband MAC signals from the satellite or main tuner are low-pass filtered then digitised in the SAD chip. The output from this is fed to the D2MAC decoder chip (DMA) for decoding and expansion in the time domain to produce digital Y, C and audio outputs (remember that MAC signals are time-division multiplexed). A DRAM is used as a temporary store for the expansion process.

The digital Y and C signals next go to a very interesting chip, the MSE, which is able to convert one digital video format to another format. It's used here to convert D2MAC into a PAL S-VHS output for connector AV3 to give improved quality MAC signal recording. The Y and C signals then pass to the DTI chip, which acts as a delay line, and finally to a VDU chip which converts them to analogue RGB signals. These are finally passed to the TEA5114 switch chip.

After processing by the DMA chip the MAC digital packet audio signals are fed via the local sound bus to the AMU (audio multiplex unit) chip which converts them to another S-bus form which can be accepted by the ACP chip on the main digital panel.

Note that during MAC reception the 18.432MHz MAC clock becomes the master clock on the main digital panel.

MAC text is stripped off the video signal by the DMA chip and is sent to the main panel teletext processor chip (TPU).

Picture in Picture

Fig. 4 shows in block diagram form the PIP part of the features board. As the set has only one TV tuner, it's not possible to watch two channels simultaneously unless one is a satellite TV channel or the signal comes from a VCR through one of the AV inputs.

When the viewer selects PIP, the required PIP video source is selected and switched via the video cross-point switching chip on the main digital panel. The signal is in analogue form of course: it's fed to the VCU chip, which incorporates a seven-bit resolution analogue-to-digital converter (this resolution is not a limitation when you consider the size of the inset picture). The digitised output goes to parallel VSP and SPU chips: this takes care of both PAL/NTSC and Secam signals. The next chip in the chain is

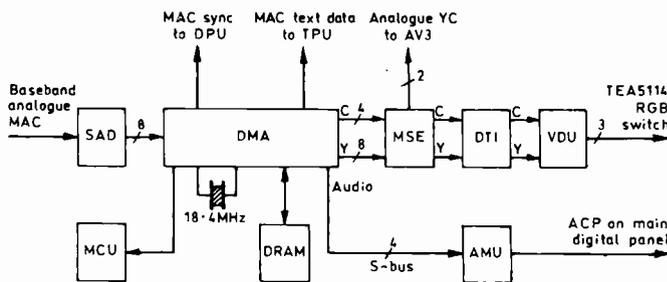


Fig. 3: Block diagram of the D2MAC part of the features board.

a DTI type that's used to compress the picture to a third of its original height. This is done by simply ignoring two out of every three video lines. The following PIP chip carries out the required horizontal reduction. It does this by writing the signals into and then reading them from external DRAMs at different speeds. The line time is in this way reduced to a third, the net result being that the PIP picture is now a ninth of its original size.

To inset the PIP picture in the main picture the PIP chip generates a blanking signal that's sent via the TEA5114 i.c. to the TPU chip. The digital Y and C signals from the PIP i.c. then go back to a DA converter in the VCU chip, emerging from this i.c. as analogue RGB signals which are switched by the TEA5114 chip (shared with the MAC circuit) and are finally sent to the TPU chip for insertion into the main picture. As PIP operation uses the TPU's

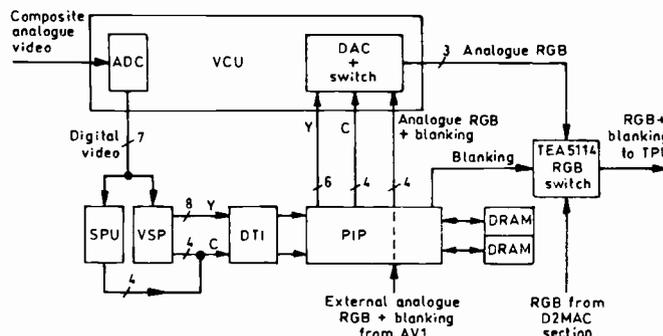


Fig. 4: Block diagram of the PIP part of the features board.

external RGB inputs, analogue RGB signals from connector AV1 are routed to the PIP chip which simply passes them on to the VCU and then the TEA5114 chip. Note that after the PIP chip the luminance part of the PIP signal is limited to six-bit resolution: this is done by disregarding the least significant bit and, again, is not a serious limitation.

The PIP and D2MAC functions are controlled via buses IM4 and IM5, which are not used in other models. As some of the PIP and MAC chip addresses conflict, a small switch circuit is incorporated in the bus to avoid problems.

In Conclusion

This about covers the Panasonic Euro 1 chassis and its variants. Since we started this series a new model, the TX29A3, has been released. It's basically the same as the TX28W3, which we have used as the basis for these articles, but is fitted with the new Philips Super Flat picture tube. As a result there are a few differences in the scan and e.h.t. circuits. There are also some new on-screen displays and menu changes.

Teletopics

PIRATE CARDS

Suppliers of pirate satellite TV decoder cards have been in the news recently. As we go to press with this issue BSKyB has obtained from Satellite Decoder Systems, an Irish-based pirate card supplier, an undertaking that it will stop selling its cards in the UK. BSKyB and News Datacom, producer of the official smart cards, have announced that they will take action in both the civil and criminal courts against suppliers of unauthorised cards. Injunctions have been taken out against Hi-Tech Innovation of Camberley, Surrey, Satellite Communications of Chorley, Lancashire and RSD of Stirling, Scotland. At present BSKyB obtains eighty per cent of its income from subscriptions rather than advertisements. If nothing else the pirates have demonstrated that the present encryption system is not secure.

3D-TV

Sanyo and Toshiba both demonstrated three-dimensional, high-definition projection TV systems at the recent Japanese Electronics Show, which was held at the Makuhari Messe exhibition centre on the outskirts of Tokyo. Sanyo has developed a system that requires the viewer to wear special glasses and, in conjunction with the Japanese public broadcasting organisation NHK, a system that doesn't require glasses but does require special transmissions. According to Sanyo further work is required on its system, which has been

described as providing "fairly impressive 3D video". Toshiba considers that 3D-TV transmissions and video sources could be a reality by the year 2000.

FIRST CDi MOVIE TITLES

Philips has announced the first full-motion CDi video titles, which should be available before Christmas. The discs will contain up to seventy-four minutes of MPEG-1 video and audio and will cost £15-£30 each. Over twenty titles are expected to be included in the initial launch, including *Top Gun*, *The Hunt for Red October*, *Fatal Attraction* and the computer game *7th Guest*. There will also be music titles. Frames in the movie titles will be individually numbered for instant access, and there will be trick-frame features such as freeze frame and slow motion. Philips will also launch, at £150, a digital video module that slots into the back of existing CDi decks.

SATELLITE TV

SES has now commissioned from Hughes Space and Communications its Astra 1F satellite. Output power will be 82W, the footprint will be similar to that of Astra 1E and there will be twenty active transponders plus eight spares. 1F will be used to provide additional digital services and as a back-up to 1E. From 1996 SES will have 40 transponders available to broadcasters allowing several hundred digital TV and radio services to be provided. Astra 1E will provide the first digital services in 1995, with 1F being launched in the following year.

NTL has been awarded contracts by Television New Zealand to provide a TV link from the UK to NZ with the signal kept in compressed digital form over the entire route.

ICN AC188 0.20 25A748 AD161 0.50 25A777 AD162 0.50 25A841 AD163 0.50 25A893 AD168 0.07 25A1011 BC141 0.30 25A1102 BC142 0.20 25A1123 BC307 0.08 25A1175 BC337 0.07 25A1262 BC546 0.07 25A1307 B0131 0.30 25B370 B0132 0.30 25B524 B0243 0.38 25B541 B0246 0.65 25B546 B0333 0.50 25B548 B0354 0.50 25B541 BF197 0.20 25B649 BF259 0.70 25B717 BF494 0.16 25B861 BF681 0.30 25B1015 BF751 0.80 25B1016 BF796 2.00 25C013 BU124 1.35 25C458 BU180 1.90 25C581 BU206 0.85 25C741 BU208 0.68 25C867 BU208A 0.70 25C941 BU208B 0.90 25C998 BU225A 1.10 25C1008 BU267 0.65 25C1103 BU409 1.10 25C1123 BU426 1.50 25C1222 BU508A 0.85 25C1327 BU508B 1.35 25C1382 BU508C 1.10 25C1429 BU536 1.05 25C1447 BU626 1.45 25C1514 BU580F 1.20 25C1569 BU580G 1.35 25C1614 BU11A 0.70 25C1767 BU11AF 0.85 25C1815 BU112A 0.85 25C1852 BU112AF 1.10 25C1914 BU156A 0.80 25C1983 TP130C 0.25 25C2002 TP131A 0.25 25C2027 TP132B 0.30 25C2076 TP141A 0.30 25C2236 TP147 0.45 25C2278 TP110 0.45 25C2347 TP112 0.85 25C2500 TP142 0.90 25C2579 TP1791 1.30 25C2603 TP2955 0.50 25C2668 MIE340 0.25 25C2688 MIE521 0.35 25C2838 2M222 0.20 25C2979 2M3035 1.10 25C3182 2M3773 1.50 25C3262 2M6130 0.40 25C3345 25A500 0.60 25C3506 25A606 2.85 25C3883 25A679 1.95 25C4242 25A722 0.62 25D198		0.85 25D2340 0.35 25D325 0.40 25D355 0.50 25D400 1.35 25D467 1.60 25D525 0.49 25D600 0.40 25D612 0.80 25D632 0.10 25D636 0.95 25D716 3.50 25D725 0.75 25D836 0.55 25D856 0.35 25D1136 0.70 25D1273 0.58 25D1275 0.58 25D1278 0.40 25D1398 2.05 25D1426 3.50 25D1441 4.40 25D1093 2.65 25D1013 6.40 25D5041 1.35 25D5157 1.35 25D521 2.00 25D522 2.25 25D526 2.35 25D564 1.40 25D8205 1.75 25D8207 3.60 25D8210 1.50 25D8214 3.40 25D8215 3.00 25D8216 1.20 25D574 1.35 25D1020 1.40 25D1032 0.60 25D1185 4.00 25D1186 1.50 25D1230 1.45 25D1352 2.05 25D1394 1.50 25D1395 1.00 25D1396 1.00 25D1363C 1.45 25D1378 1.80 25D4000-5000 16.25 3546 0.50 25D4556		0.45 25D461 0.35 25D1050 0.45 25D2029 0.18 25D3042 0.15 25D3042.2 0.60 25D4151.5 0.40 25D5325 0.80 25D5332 2.40 25D5333 0.95 25D5422 4.00 25D5476 3.15 25D7348 4.00 25D73410 3.50 25D7401 0.70 25D7441 0.58 25D7441 4.75 25D7441 13.95 25D7451 4.40 25D7452 5.90 25D7453 2.65 25D7454 6.40 25D7455 1.35 25D7457 1.20 25D7458 2.00 25D7459 2.25 25D7460 2.35 25D7461 2.90 25D7462 1.65 25D7463 3.50 25D7464 3.40 25D7465 3.00 25D7466 0.50 25D7467 0.50 25D7468 0.50 25D7469 0.50 25D7470 0.50 25D7471 0.50 25D7472 0.50 25D7473 0.50 25D7474 0.50 25D7475 0.50 25D7476 0.50 25D7477 0.50 25D7478 0.50 25D7479 0.50 25D7480 0.50 25D7481 0.50 25D7482 0.50 25D7483 0.50 25D7484 0.50 25D7485 0.50 25D7486 0.50 25D7487 0.50 25D7488 0.50 25D7489 0.50 25D7490 0.50 25D7491 0.50 25D7492 0.50 25D7493 0.50 25D7494 0.50 25D7495 0.50 25D7496 0.50 25D7497 0.50 25D7498 0.50 25D7499 0.50 25D7500		LINE OUTPUT TRANSFORMERS AKAI CT 2576/2871 21.25 CT 2570M/2870M 23.85 BANG & OLUFSEN M20 MKX2000 23.00 LXA 2500/2800 25.50 BINATONE CF65A/B2 21.20 EDMITEC D347/37 33.30 GRUNDIG C462200 16.99 T56-220 15.99 T55-34090 15.50 T63-240 TUR6300 15.99 HINARI CT4C15 15.00 CT10 CT11 13.00 CT6 CT7 26.90 HITACHI CPT 2888 21.99 CPT 1544/2028 19.65 CPT 1470/CTP1472 34.50 2433451 17.99 2433253 18.25 CPT 2276/2246 17.75 24 33891 12.99 CPT 1455/1476 20.90 CPT 2176/2178 17.99 CMT 1910 13.99 CPT 2284 23.00 ITT Mono Print 8 18.15 D307/37 17.50 D218.37 26.50 CT3326/4246 14.99 CVC 1150 17.15 Mini 80-1R2 18.50 3546 22.00 C100/CVC/2C100 18.15 Mini 25T2 22.75 D307/37 17.50 Compact CTR254-S0 21.99 Compact 80 (Euro) 21.99 Core 25P25 21.50 Core 90 XAM 20.99 CVC 200 15.90 CVC 32 10.25 TX 3447/TX 3546 18.50 Mono Print 1.1UK 22.50 Mono Print A7NH 17.75 Mono Print Scant 21.99 C848 20.99 CEC C1400 18.50 C2087 19.65 C2213/C2621 11.50 GOLDSTAR CB7 9222 31.99 8082/9562 27.99 GOODMANS TV70RC 24.50 GRANADA 14E2121 18.50 14F841 12.85 16G151 20.50 BY133 15.25 M8R54 25.95 M8R56 0.12 LUXOR 15 10 110 01 15 15 MATSU 1470A 1440 19.99 NORFANDI 525577 17.50 525597 17.50 ORION 4830RC 2001RC 19.90 STC1010 28 25.50 LUXOR 15 10 110 01 15 15 MATSU 1470A 1440 19.99 NORMANDE 525577 17.50 525597 17.50 ORION 4830RC 2001RC 19.90 STC1010 28 25.50 PANASONIC TC 1460/1665 38.50 TC 1485 35.50 TC 1631/TLF14567F 17.50 TLF14521F 25.00 TC 1651/TLF 14586F 34.95 TC 2175/TC 682 25.00 TC 2160 (TLF 1458 4F) 30.50 TC 2031 30.50 TC 1651/TLF 1458 6F 25.00 TC 2175/TC 682 54.90 TX 2/TX3 40.50 TX 2461/2658 34.50 TC 2232/TLF 14568 25.00 PHILIPS KT3 17.99 G90AE 17.49 CTX-3/CTX S 23.49 KT4 45.99 LA 2B 3A 20.45 K30-35 29.19 PIONEER SD 214W1 20.99 SD 25AW1 21.30 SV 2101 21.99 SV 2103 20.85 SABA TS 520/542 19.99 TS 583 23.00 M628/3654 PMA 21.99 6356/6390 21.99 SAISHO CT142RX 19.99 SALORA 1M218 25.65 14150 23.99 21080/21-81 20.99 26A42 17.99 25C40L 20.99 28081 21.50 28080 20.99 28E890 21.25 0246/37 26.99 1236 27.99 SANYO CDP190RV 57.99 AT2080 11.50 F1188 50.99 CTP 3206 PMA 6265/6267E 24.99 SENTRA CWS000/9200 15.00 SHARP SONY Please Ring for Models SOLIVER 16R19 2-719 18.15 265109 16T09 15.99 20S09 18.99 20T09 PMA TOSHIBA 14507T 47.99 IS06F RB58 33.85 TB84032DF PMA ZANUSSI ZETA 3145B 30.99	
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Two Intelsat satellites will be used, at 57°E and 180°E.

US broadcaster NBC has bought, for about £40m, a majority stake in the UK-based Super Channel, which broadcasts general programming across Europe – Super Channel is understood to be available in 56m homes in Western and Eastern Europe. NBC's aim is to grow "by expanding its presence outside the USA and by diversifying domestically into cable and new media". It will be adding its own programmes to Super Channel with a view to creating a "truly premium channel".

At the Berlin Radio Exhibition Hirschmann showed a wide variety of receiving equipment including its new CMF512A/B multi-feed system that enables a single fixed dish to be used for reception from three satellites spread over a range of more than 12°. The triple feedhorn/LNB support system has a three-dimensional adjustment facility, making reception from the Astra system and all the Eutelsat craft from 7° to 16°E possible.

DISPLAY SYSTEMS

Philips has now put into full production at its Dreux plant in France the flattest-face TV tube it has ever introduced, a 29in. 'supper-flat' tube whose screen has a vertical radius of 400cm. The features of Philips' Black Line S range are all incorporated, including a proprietary Black Matrix system, dark tinted screen glass and internal coatings for high contrast, and an invar shadowmask. In addition the Black Line SF tube has enhanced red phosphor and low-power, quick-heating impregnated cathodes that give improved sharpness.

Japan's public broadcasting organisation NHK has for several years been developing a plasma display panel (PDP). The latest version, a 40in. screen with an aspect ratio of 16:9 (screen size 874 x 520mm) and HDTV capability was recently exhibited. Panel thickness is 8cm while the thickness of the complete unit is 80mm: there are 1,344 x 800 pixels. One of the main problems has been the life of the device. This has now been extended to 7-8,000 hours: for a commercial product the aim is at least 10,000 hours.

VOD

British Telecom is to carry out trials of its video-by-phone system (see Teletopics last month) some time next year: the system is now known as video-on-demand (VOD). A pilot scheme is expected to be introduced for some 25,000 subscribers. This move follows the decision by the regulatory authorities to waive the need for BT to apply for a local delivery licence. The asymmetric digital subscriber loop technology enables video signals to be distributed via existing copper-pair telephone cables. Siemens has also been developing video-via-copper transmission.

An alternative approach, VOD via satellite, is being developed by EMC3, a group that is backed by Hitachi, Samsung, GoldStar and Daewoo. Customers would be able to rent films from a library of about 2,000 titles via a personal keypad. Jerrold/GI have developed a set-top converter for this and interactive satellite services.

CABLE TV

US regional telephone group Bell Atlantic has bought Telecommunications Inc. (TCI), America's largest cable TV company, for about \$22bn (£14bn). The deal will have a radical effect on the US communications industry and will also affect the UK since TCI owns fifty per cent of Telewest, whose cable franchises include south London, Bristol and Edinburgh.

As an adjunct to the interactive cable TV service (I-TV) to

be started by Time Warner in Orlando, Florida next year subscribers will be provided with specially modified Hewlett-Packard colour printers to enable them to make paper copies of TV frames. The technology to be used in these printers is based on Hewlett-Packard's new professional Vidjet Pro range, which provides much cheaper print-outs than other current methods. Other I-TV features will include shopping, movies on demand, video games and information services.

BUSINESS NEWS

In a recent statement of results Nokia mentions that the company is in talks with other groups on forming a partnership in the fields of tubes and home electronics. The aim is to stem losses in these activities in the depressed European market. A company spokesman declined to specify the proposed partners but expressed the hope that agreement would be reached within months.

Philips is to invest £16m in expanding its Durham CTV tube plant, which is the European centre for production of the company's 21in. FS tubes. Capacity will be increased from 2 to 2.3 million tubes a year initially, and production of 17in. FS tubes will be added.

Sony is to carry out a major expansion of its Pencoed, Bridgend, S. Wales CTV manufacturing plant over the next eighteen months, creating about 1,000 new jobs. Production capability will be increased to 1.2m sets a year, of which more than eighty per cent are expected to be exported to other European countries.

The Vintage Wireless Company is to close down: the business will be split up and offered for sale in six separate sections. Anyone interested can contact the Vintage Wireless Company at Tudor House, 20A Cossham Street, Mangotsfield, Bristol BS17 3EN (fax 0272 575 442).

NEW PRODUCTS

Panasonic has launched a portable DCC player, Model DP7 at £400, in Europe. The unit weighs less than 500g and includes an LCD screen and a power-saving system that automatically switches the unit off within four minutes of playback completion if no buttons are pressed.

A 64-bit computer games system, the Jaguar, has been launched by Atari in the USA. The console costs about \$200 while games software is priced at between \$50-\$80. A UK release is expected in time for Christmas. There are plans for an add-on CD-ROM unit that will enable CD audio, CD plus graphics and Video CD discs to be played as well.

The BBC has launched a new high-quality loudspeaker system, type LS5/12A, that uses commercial woofer and tweeter units with a crossover network and cabinet of BBC design – using computer aided design and measurement techniques. Provisional specification includes a typical in-room frequency response of 55Hz-22kHz, a system power handling capability of 120W, and a sensitivity of 81.5dB/W. The system will be available from Harbeth Acoustics under BBC licence.

VIDEO NEWS

Panasonic has introduced a modular personal computer that can also be used as a TV set or a CD-ROM or audio CD player. There's a choice of three types of LC display, monochrome, colour or monochrome with pen input. In a similar move Apple Computer has launched in the USA a Macintosh PC that has TV reception and CD player functions. It uses a 14in. c.r.t. Price is \$2,079. Some Apple PCs now have multimedia capability, being able to play back audio CD discs, record and playback video, etc.

Sharp has extended its range of Viewcam camcorders with the VL-H400H, a Hi-8 type at £1,100. Optional extras include a TV tuner and underwater housing.

Fujifilm has introduced a high-performance Hi-8 metal particle (MP) tape designed for use as an evaporated metal (ME) tape: the new tape, called HI8 ME-Position, combines the best of both formulations – the vivid colour, durability and low dropout rates of MP tape and the superior h.f. response and picture quality of ME tape. Several years of research have led to the new tape, which uses Fujifilm's Super Double Coating technology. This new coating process simultaneously applies an ultra-thin metal magnetic (Super Metallix) upper layer and a tough lower layer of non-magnetic Titan Fine particles. The recognition holes in the cassette shell are preset to the ME position. Suggested prices are £11 for an E5-60 and £13 for an E5-90 cassette.

An upmarket Italian TV brand, Brionvega, has been launched in the UK. The brand is owned by Seleco. UK distributor is Brionvega (UK) Ltd., 19 Grange Road, Houston Industrial Estate, Livingston, West Lothian EH54 5DD – telephone 0506 31 555, fax 0506 32 244.

PUBLICATIONS

Greenweld's 1994 catalogue is now available at £2 in the UK, £4 overseas. It has 172 pages plus a 24-page surplus bargains section and can be obtained from Greenweld at 27 Park Road, Southampton SO1 3TB - telephone 0703 236 363, fax 0703 236 307.

The *Satellite Channel Report*, compiled by W.T. Smith, is now available from Swift Television Publications, 17 Pittsfield, Cricklade, Swindon, Wilts SN6 6AN at £15 plus £2 postage in the UK, £4 to Europe. The manual is laser printed on A4 pages and comes in six sections – alignment data, satellite channel video and audio details with almost 800 entries, satellites serving Europe/Africa/the Middle East, channel details listed by description and by language and coding.

A Christmas greeting card service is available during the period November 1st to December 15th 1993 with copies of *The Setmakers*, a history of the UK's radio and television industry, ordered from John O'Neill, 13 Green Curve, Banstead, Surrey SM7 1NS (0737 373 545, fax 0737 357 587). Inclusive price of the book is £17.45. Purchasers can send their own card to be included with the book or alternatively a standard seasonal greeting card will be provided by the distributors.

CORRECTIONS

There was an error in Fig. 5 on page 43 of last month's issue (November). The connection between pin 10 and pins 12/13 of the 74HC00N chip was omitted.

Because the computer at our printers misread the disc produced by our office computer, four lines were lost at the end of Donald Bullock's article in the November issue (page 35). The missing lines read as follows:

UC3844 chopper control chip IC8 had a crack across it. When I replaced it and switched on the set burst into life. So it was a question of boxing it up and putting it back on soak test. An hour later it was still working well.

There is an error in the address given for Allparts Distributors in our TV/VCR Spares Guide 1993 – in the section headed General/miscellaneous parts suppliers. The company is at 79 (not 101) Rocky Lane, Tuebrook, Liverpool 6.

Next Month in TELEVISION

SERVICING THE REDIFFUSION Mk 4

The Rediffusion Mk. 4 chassis was in production in the early Eighties. Being solidly built, these sets last. As they were used mainly for rental purposes however many engineers are unfamiliar with them. Chris Watton provides guidance on servicing and a list of faults.

ALL ABOUT FUSES

Fuses come in a wide variety of types with different specifications. As they are safety components, it's essential to fit the correct type. Ray Porter explains the different forms of protection provided by the various types of fuse.

PANASONIC'S CARDIFF CHASSIS

A number of quite different CTV chassis have been produced at Panasonic's Cardiff plant. Ray Meadows describes their various features and the evolution of the series.

TV RECEIVER POWER SUPPLIES

Close regulation of the supply lines is essential in a solid-state TV receiver. Nowadays various types of chopper circuit are used for this purpose. In the next instalment in his series, Eugene Trundle describes the operation of switch-mode power supplies.

TEST REPORT: THE EMERSON UPS

A sudden power cut or even a voltage reduction can cause havoc with electronic systems. The answer is to use an Uninterruptible Power Supply. Donald Bullock reviews the Emerson Accupower Model 10.

FAULTS THAT AREN'T

All sorts of apparent fault conditions can fool even the most experienced engineer, particularly as control systems become ever more complex. David Chaplin describes the sort of thing to watch out for.

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15/85R	3.84	ZSC1413A	1.30	ZSD476	0.97	BC107B	0.20	BD201	0.40	BF960	0.27	BYX55600	0.20	M21C	1.65	SGSF344	6.62	TA7193AP	3.36	TDA1200	0.91	TEA1014	1.87
17052	3.85	ZSC1509	0.51	ZSD525	1.27	BC108	0.15	BD203	0.46	BF966	0.61	CA1310E	0.78	M293	14.63	SKE4F104	0.87	TA7193P	7.09	TDA1210	1.79	TEA1039	2.15
17053	2.38	ZSC1520	0.54	ZSD551	5.81	BC109A	0.16	BD232	0.28	BF970	0.30	CA3094	3.06	M490	15.30	SKE4F210	0.87	TA7205AP	1.51	TDA1470	0.77	TEA2018A	1.49
17088	2.38	ZSC1573	0.36	ZSD613	0.63	BC109B	0.15	BD234	0.25	BF973	0.35	CD4001	0.14	M491	7.94	SKE5F310	1.68	TA7207P	1.68	TDA1506	4.59	TEA2164	2.68
17089	3.39	ZSC1573Q	0.26	ZSD636	0.14	BC1117	0.14	BD237	0.30	BF974	0.44	CD4011	0.21	M5115AP	3.24	SL1430	1.41	TA7210P	1.50	TDA1510	2.54	TEA2165	6.26
17127	1.77	ZSC1675	0.09	ZSD637	0.12	BC139	0.33	BD238	0.11	BF980	0.61	CD4013	0.34	M51102L	1.77	SL1431	1.70	TA7214P	3.74	TDA1512	3.17	TC1060	0.55
1N4001	0.04	ZSC1685	0.17	ZSD667	0.26	BC140	0.21	BD239	0.29	BF990A	0.77	CD4016	0.14	M51231P	2.03	SL1432	2.10	TA7217P	1.27	TDA1515A	2.54	TC1061	0.75
1N4002	0.07	ZSC1740	0.12	ZSD669	0.63	BC141	0.34	BD241	0.41	BF991	0.43	CD4021	0.43	M51393AP	4.64	SL471	1.70	TA7222	1.24	TDA15160	3.56	TC45	0.59
1N4003	0.05	ZSC1741	0.17	ZSD669A	0.63	BC147A	0.04	BD243	0.39	BF996	0.53	CD4052	0.29	M51515L	2.01	SL490	2.31	TA7222AP	1.27	TDA15180	3.32	TIL100	0.52
1N4004	0.07	ZSC1815	0.14	ZSD716	1.46	BC148	0.12	BD243A	0.43	BF992A	0.48	CD4055	0.20	M51521L	0.54	SN29764AN	1.99	TA7227P	2.29	TDA1670A	2.81	TIP110	0.36
1N4005	0.06	ZSC1826	0.72	ZSD718	1.45	BC148A	0.06	BD243C	0.44	BF985	0.55	CD4066	0.30	M5218L	0.48	SN7474N	0.38	TA7230P	1.60	TDA1701	4.86	TIP112	0.00
1N4006	0.06	ZSC1827	1.00	ZSD734	0.24	BC148B	0.04	BD244A	0.34	BFY50	0.34	CD4069	0.17	M5231L	0.55	SN76013ND	7.99	TA7233P	1.95	TDA1870	3.37	TIP112H	0.58
1N4007	0.06	ZSC1845	0.20	ZSD762	1.51	BC149	0.04	BD244C	0.42	BFY51	0.34	CD4070	0.21	M53216P	1.48	SN76227N	1.07	TA7240P	2.46	TDA1904	1.21	TIP120	0.57
1N4148	0.04	ZSC1846	0.51	ZSD774	0.43	BC149C	0.04	BD245C	0.72	BR100	0.17	CNX62A	2.95	M54543L	1.61	SN76666AN	1.26	TA7241	2.30	TDA1905	0.94	TIP121	0.42
1N4448	0.05	ZSC1923	0.14	ZSD87E	0.36	BC157	0.13	BD246C	0.71	BR101	0.98	CR3CM	2.62	M54854L	1.87	SN76705AN	1.70	TA7250	4.03	TDA1908A	1.14	TIP126	0.48
1N5061	0.38	ZSC1942	3.33	ZSD887	0.90	BC159	0.06	BD278A	0.56	BR103	0.53	CRQ2AM	2.17	M54846L	3.29	STA341M	2.54	TA7267P	2.02	TDA1940	2.77	TIP132	0.46
1N5402	0.12	ZSC1959	0.11	ZSD841	1.34	BC161	0.27	BD317	0.87	BR303	1.22	CV12E	2.70	M54644BL	3.30	STA401	2.46	TA7270	1.68	TDA1950	1.86	TIP137	0.48
1N5404	0.13	ZSC1969	2.46	ZSD856	0.94	BC167	0.42	BD318	1.10	BR444	1.02	CX109	7.05	M54648L	6.62	STA441C	2.80	TA7270P	1.73	TDA2002	0.85	TIP2955	0.83
1N5406	0.12	ZSC1983	1.78	ZSD869	3.28	BC171B	0.14	BD380	0.34	BR556	0.43	D7A124E	0.13	M54898AP	20.45	STK0029	5.88	TA7271P	1.76	TDA2004	1.27	TIP29C	0.30
1N5408	0.12	ZSC2001	0.14	ZSD870	3.81	BC177	0.14	BD433	0.29	BS338	0.23	D7A144E	0.17	M54858P	5.95	STK0039	7.11	TA7273	3.21	TDA2005	1.36	TIP29E	0.46
1N914	0.04	ZSC2073	0.51	ZSD871	5.08	BC178	0.11	BD434	0.34	BT120	1.28	ER1400	2.15	M58730	2.38	STK0040	7.40	TA7274P	3.72	TDA2006	1.06	TIP3053	0.77
1S1555	0.22	ZSC2078	0.77	ZSD880	0.48	BC182L	0.06	BD435	0.38	BT129	3.26	HAI1235	1.95	MB3731	2.20	STK0059	9.75	TA7280	2.11	TDA2009	2.29	TIP30C	0.37
1S2076	0.29	ZSC2141	1.48	ZSD882	0.43	BC182LB	0.06	BD436	0.32	BT139600	1.14	HAI1244	3.83	MB3732	2.88	STK025	9.61	TA7299	2.34	TDA2020	3.72	TIP31A	0.32
2N2719A	0.27	ZSC2166	1.27	ZSD898B	4.23	BC184	0.09	BD437	0.31	BT151500R	1.10	HAI1244A	1.21	MC13002P	5.74	STK3042	6.90	TA7313AP	0.62	TDA2030H	0.63	TIP31B	0.30
2N2222	0.22	ZSC2168	0.85	ZSD904	5.95	BC184L	0.04	BD438	0.31	BT151800	1.15	HAI1423	2.02	MC1310P	0.85	STK3062	8.88	TA7317P	0.93	TDA2030V	1.05	TIP31C	0.44
2N2905	0.21	ZSC2236	0.25	ZSD973	0.38	BC184CL	0.10	BD441	0.34	BZ205	1.07	HAI1440	2.92	MC1327AP	1.62	STK4131	7.79	TA7325P	0.45	TDA2170	2.55	TIP32A	0.39
2N2926G	0.37	ZSC2271	0.22	ZS090	0.21	BC204	0.14	BD442	0.29	BZ208A	1.16	HAI1668	3.43	MC1330AIP	1.26	STK4141	9.31	TA7343AP	0.72	TDA2270	1.68	TIP32C	0.38
2N3053	0.36	ZSC2274	0.22	ZS095	0.28	BC207B	0.23	BD510	1.34	BZ208D	1.53	HAI1713	1.24	MC1350P	1.82	STK4142	8.21	TA7358P	0.78	TDA2530	3.76	TIP33A	0.82
2N3054	0.98	ZSC2274K	0.22	ZS098	0.06	BC212B	0.06	BD529	0.97	BZ326A	1.36	HAI1724	1.36	MC1352P	1.45	STK4162M	9.51	TA7358P	0.68	TDA2540	0.88	TIP33C	0.90
2N3055	0.77	ZSC2314	0.33	ZS12	0.30	BC213	0.06	BD530	1.10	BZ406	0.68	HAI1745	5.10	MC1358P	1.59	STK4171	10.50	TA7607AP	2.62	TDA2541	0.72	TIP34	0.89
2N3442	1.00	ZSC2335	1.43	ZS105	0.30	BC213L	0.11	BD535	0.43	BZ406D	1.02	HAI3001	1.72	MC145288CP	1.92	STK4181	12.85	TA7609P	1.95	TDA2560	4.46	TIP34C	0.00
2N3702	0.11	ZSC2458	0.12	ZS108	0.41	BC214L	0.09	BD536	0.48	BZ407	0.53	HAI3108	3.56	MD2062E	2.21	STK4181A	12.46	TA7630P	0.97	TDA2576A	5.95	TIP41A	0.38
2N3704	0.14	ZSC2482	0.34	ZS109	0.34	BC237	0.10	BD675	0.30	BZ407D	0.97	HAI3118	1.87	MJ2955	0.29	STK4332	5.54	TA7640AP	1.88	TDA2577A	9.25	TIP41C	0.37
2N3773	1.27	ZSC2547E	2.40	ZS12	0.43	BC237B	0.05	BD677	0.32	BZ426A	0.96	HAI3119	2.03	MJ802	0.27	STK4352	1.70	TA7676P	4.25	TDA2578A	2.55	TIP42A	0.39
2N3819	0.34	ZSC2565	8.46	AA119	0.36	BC238	0.11	BD707	0.51	BZ426E	0.91	HAI3166A	4.66	MJ13005	0.85	STK437	8.30	TA7680AP	3.81	TDA2581	5.75	TIP42C	0.37
2N3904	0.11	ZSC2570A	0.29	AA143	0.13	BC238B	0.05	BD839	0.05	BZ500	0.32	HAI377	2.42	MJ2955	0.68	STK4392	5.92	TA7688AP	5.93	TDA25810	10.15	TIP47	0.51
2N4444	3.22	ZSC2570A	1.46	AC127	0.11	BC239	0.04	BD901	0.51	BZ508A	0.95	HAI388	2.63	MJ2955	0.51	STK441	11.81	TA7697P	1.68	TDA2582	1.95	TIP4791A	1.24
2N6292	0.62	ZSC2581	3.05	AC114C	0.46	BC252B	0.07	BD902	0.47	BZ508F	1.27	HAI389	2.52	MJ2955	0.50	STK459	11.17	TA7699P	1.43	TDA2591	1.15	TIS43	0.66
2SA1015	0.10	ZSC2632	0.43	AC176K	0.30	BC300	0.08	BD911	0.65	BZ508D	1.27	HAI392	1.61	MJ323	14.26	STK461	10.49	TAB205	3.89	TDA2593	0.75	TIP101CP	1.36
2SA1016	0.17	ZSC2655	0.25	AC187	0.16	BC301	0.28	BD912	0.63	BZ508DF	1.87	HAI397	2.63	MJ1405VNF	11.08	STK4843	11.10	TAB210H	4.74	TDA2594	2.21	TIP101CP	0.61
2SA1020	0.43	ZSC2671	0.68	AC187K	0.33	BC302	0.36	BD958B	1.16	BZ508V	1.43	HAI398	2.33	MJ1435VX	14.35	STK5211	15.78	TAB215	4.57	TDA2595	2.41	TIP494	1.38
2SA1029Y	0.43	ZSC2688	0.30	AC188	0.36	BC303	0.22	BDW84C	1.28	BZ526	1.41	HAI452	4.86	MJ1435VXB	10.66	STK5322	6.35	TAB291N	6.67	TDA2620	3.08	IMP4C432AP	11.24
2SA1095	7.44	ZSC2785	0.12	AC188K	0.82	BC307	0.06	BDW93C	0.59	BZ536	1.60	HM6232	10.36	MN650	2.50	STK5325	5.92	TAG626	1.05	TDA2611A	0.64	IMP4C439N-3555	17.87
2SA1102	2.54	ZSC2791	5.44	AD149	0.52	BC307A	0.06	BDW94C	0.46	BZ508	1.44	HM6251	9.52	MPS442	0.23	STK5326	6.20	TBA120	0.93	TDA2611AQ	2.03	UC3844	1.78
2SA1143	0.17	ZSC3150	1.44	AD161	1.02	BC307B	0.06	BDX32	1.70	BZ705	1.61	HM7103	14.07	MPS456	0.12	STK5331	3.02	TBA120AS	0.50	TDA2640	4.13	UPA81C	0.94

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BU208A x 5	3.99	TDA 2600 x 2	3.95
BU 426A x 5	3.50	TDA 2579A x 2	5.00
BU 508A x 5	3.60	TDA 3562A x 2	3.99
BU 508AF x 5	5.00	TDA 3654 x 2	2.20
BUT 11AF x 5	3.25	TDA 4501H x 2	2.49
TV FAULT FINDING GUIDE	9.99	TDA 4601 x 2	2.50
VIDEO FAULT FINDING GUIDE	9.99	TDA 4601D x 2	2.95
SATELLITE FAULT FINDING GUIDE	14.95	STK 5481 x 2	9.00
CO AXIAL AERIAL PLUG x 25	3.75	STR 54041 x 2	7.50
'F' CONNECTOR (SCREW TYPE) x 25	3.00		

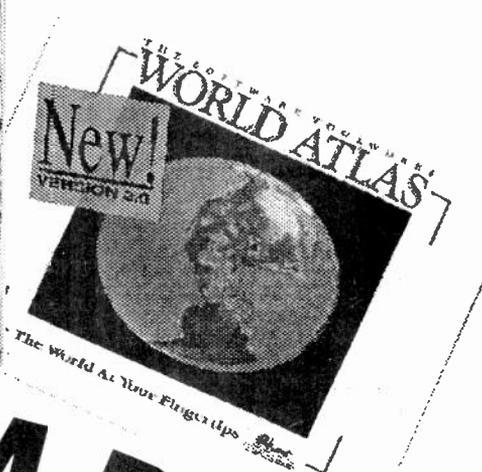
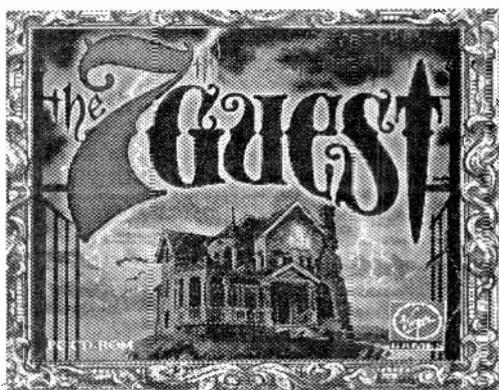
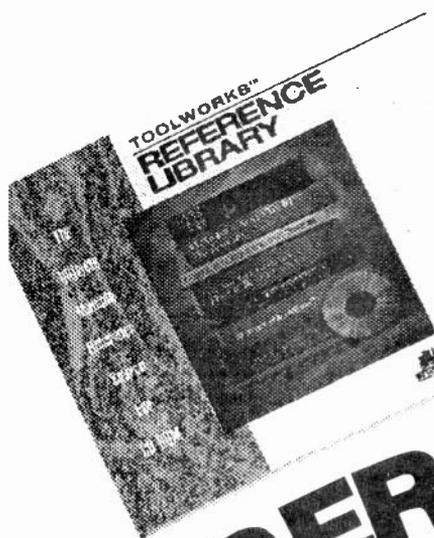
2SA1175	0.25	ZSC3153	2.37	AD162	0.96	BC308	0.06	BDY20	2.13	BU806	0.82	ICH281	0.26	MPSA93	0.09	STK5332	2.74	TBA120S	0.89	TDA2652	14.32	UPC1181H	6.80
2SA1186	3.73	ZSC3156	4.22	AF124	0.77	BC308A	0.09	BF115	0.43	BU806A	0.80	KA2101	0.83	MR954	0.14	STK5333	4.28	TBA120T	0.51	TDA2653A	3.26	UPC1182H	5.95
2SA1208	0.34	ZSC3182	3.25	AF127	0.59	BC308C	0.06	BF179	0.31	BU807	0.51	KB108	0.47	MSM5840H	0.36	STK5337	3.40	TBA120U	0.39	TDA2680	5.10	UPC1185H	10.20
2SA1265	1.95	Z																					

November 1993

GREENWELD

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Welcome to our Seasonal Supplement, bringing you tidings of good cheer & copious quantities of delightful deals! Inside you'll find a super selection of scintillating stock, all offering extraordinary value for money! Whether its technical books, video equipment, CD's, audio mixers, power supplies, software on CD & disk, electronic kits, storage containers, scanners, personal stereos or metal detectors you're looking for, it's all inside. There's an order form on page 29, so why not send, fax or phone your order through now? Our staff are just waiting to serve you!



SUPER CD-ROM DEAL!

12

GREAT PROGRAMS ON CD
+ Mitsumi CD-ROM Drive

WOW!!

Details in Cat, Page 66

This is what you get:

1. The 7th Guest (RRP £69.95)
2. World Atlas V2.0
3. Reference Library

- Software Jukebox:
4. Links
 5. Faces... Tris III
 6. Jetfighter
 7. Berenstain Bears Fun with Colours

- Software Toolworks:
8. Chessmaster 2000
 9. Beyond the Black Hole
 10. Life & Death
 11. Bruce Lee Lives
 12. Gin King/Cribbage King

ALL FOR £249.95



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26 PALLETS OF FIDELITY/SAMSUNG TV, AUDIO & MICROWAVE PANELS

Just arrived as this brochure is about to go to press, so no chance to sort through it yet. Some of the items we have pulled out are listed below. More details in next month's Bargain List (See page 31 for how to subscribe)



Z5645



Z5646



Z5647



Z5648



Z5649



Z5650



Z5640



Z5641

Z5645 Complete AM/FM stereo tuner - chassis with horizontal tuning dial, and it's even fitted with an FM ribbon aerial! Just needs 12V and an audio amp. Overall size 255x110x80mm. Push switches for AFC, mono/stereo, FM, LW, MW. **All for £5.95**

Z5646 Complete AM/FM tuner panel, has mechanics but no dial. 4 push buttons: AFC/FM/MW/LW. PCB is 195x105mm, but plastic frame makes it 315x120x50mm overall. **Only £3.95**

Z5647 Stereo audio amp, mains powered. PCB 265x85 has transformer bolted to one end, complete with 2.3m mains lead. Uses 2 x TBA820M chips; vol, tone and balance controls; 2 PC mntg DIN spkr sockets and 5 pin DIN tape in/out skt. **£3.50**

Z5648 Stereo radio chassis. This one has a 6 way rotary selector switch and uses LA3220, LA3361, LA3160, LA1185, and AN7223 chips. **£3.00**

Z5649 Audio board 195x200mm. Apart from a complete stereo amp using 2 x TDA1908A 8 watt chips, there's an awful lot of additional (unknown) circuitry on board. Bank of 7 push switches. Other chips include M104B1, LM1036N, TDA3810. **All this for £3.20**

Z5650 Similar to above, bu board has treble, bass and vol controls and is 295x170mm. 7 input selector switches. **£3.65**

Z5640 Motor panel - small PCB with KA2404, a couple of transistors plus a few other bits, and a Sanyko 12v motor 31.5mm dia x 25mm. Spindle 12x2mm dia. **Only £1.00**

Z5641 Fidelity stereo deck - transport + electronics. 6 silver keys, 3 digit tape counter. PCB has motor speed control and pre-amp/oscillator circuitry for record/replay head. **Only £3.95**

SPEAKERS AT KNOCK-OUT PRICES

Few hundred just purchased from 2" tweeters to 13x8" full range. Prices from 25p each! See next month's Bargain List for full details

1994 CATALOGUE

Our 196 page main Catalogue is **OUT NOW - Only £2, post free**

ODDS & ENDS

Z5636 High quality, high power tweeter 53x53mm. 35mm dia magnet. Solder tags. Rated 8R 40W **£2.50**

Z3100 In-car LCD. This shows the plan view of a saloon, and indicates whether doors are shut, lights are on etc **£2.00**

Z3101 Solder sticks 295x6mm dia, wt 89g. Could be 40/60. DP 2.49 **Our Price £1.00**

Z5639 Commodore 128 Personal Computer System Guide. The complete original 406 page handbook 210x145mm, spiral bound. Contains a lot of useful general info - esp. on BASIC programming. **Only £3.95**

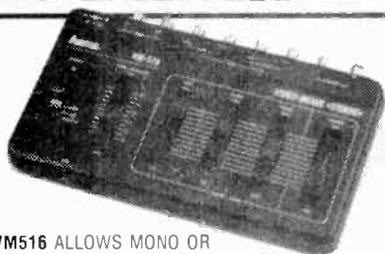


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ENTRY LEVEL SOUND MIXER THAT ALLOWS SOUND TO BE ADDED TO EXISTING VIDEOS. UNIT HAS 3 INPUTS, MIC, AUX AND CAMCORDER. FOR SIMPLE AND EFFECTIVE RESULTS

VM512 MONO SOUND MIXER £29.99
VM514 STEREO SOUND MIXER £39.99



VM516 ALLOWS MONO OR STEREO SOUND MIXING WITH THE ADVANTAGE OF BEING ABLE TO IMPROVE PICTURE QUALITY. PREVIEW FACILITY ALLOWS FOR BEFORE AND AFTER COMPARISON OF PICTURE PRIOR TO COPYING.

VM516 STEREO MIXER, ENHANCER C/W MAINS ADAPTER £59.99



ONE OF THE BIGGEST SELLING ENTRY LEVEL EDITOR/PROCESSORS IN THE WORLD. MONO/STEREO AUDIO MIXER/ENHANCER WITH SPLIT LINE FACILITY TO ALLOW BEFORE AND AFTER COMPARISONS ON SCREEN VIDEO SIGNAL FADER COMBINED FOR EFFECTIVE ENTRY LEVEL EDITING. FADES TO BLACK OR WHITE.

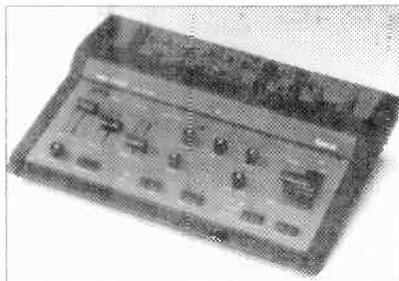
VM518 STEREO MIXER, ENHANCER, PROCESSOR C/W MAINS ADAPTER, MIC, LEADS £84.99



VIDEOSCRIPT 550 TITLE GENERATOR.

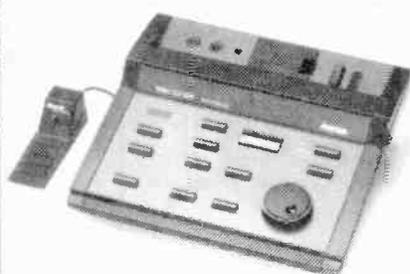
AFTER FILMING THE SCRIPT 550 IS THE IDEAL UNIT TO OVERLAY TITLES ONTO EITHER FILM OR COLOUR BACKGROUND. WORKS WITH ALL FORMATS, 10 PAGE MEMORY, 4 SIZES OF TITLES, 6 WIPES, 3 SCROLL EFFECTS & 8 COLOURS. VERY EASY TO USE

VIDEOSCRIPT 550 £199.99
C/W MAINS ADAPTER (CODE 40550)



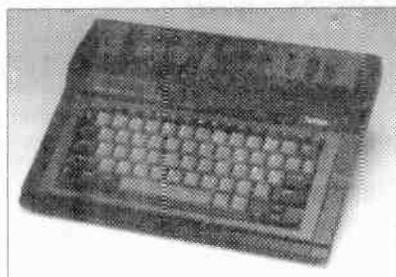
THE COMPLETE EDITOR: ALL HIGH BAND OR COMPOSITE IN OR OUT OUTPUTS • AUDIO MIX AND DUB • ENHANCE COLOUR CORRECT • ALTER BRIGHTNESS • SPLITSCREEN • AUDIO VIDEO FADE • 15 WIPE PATTERNS • CONTROLS RECORDING VCR VIA IR CONTROL • ALSO CONTROLS NEW SCRIPT 250 TITLE GENERATOR.

CUT 204 £399.99



TIME CODE EDITOR WITH 99 SCENE MEMORY • RCTC & REAL TIME COMPATIBLE • CONTROLS BOTH PLAYER & RECORDER, PLAYER VIA LANC OR PANASONIC EDIT LEAD, RECORDER VIA IR CONTROL • MOVE, COPY, DELETE FUNCTIONS • JOG SHUTTLE • FRAME ACCURATE WITH RCTC • CONTROL FOR SCRIPT 250 & NEW GENLOCK S290

CUT 220 £349.99



NEW PRO VIDEO TITLER: HIGH BAND & COMPOSITE • 240 CHARACTERS • NOTEBOOK STYLE KEYBOARD • 24 LETTERS PER LINE • 4 SIZES OF LETTER • 3 RESOLUTIONS • COLOUR BACKGROUNDS OR HND OR COLOUR LETTERS • 10 PAGE MEMORY • 11 LINES PER PAGE • SPECIAL FX WIPES & SCROLLS ETC.

VIDEOSCRIPT 250 £449.99

HIGH BAND & COMPOSITE VIDEO SWITCHING UNIT

• 6 INDIVIDUAL INPUT SELECTORS • SCART OUTPUT • (SVHS) TO VCR/MONITOR • HANDLES AUDIO & VIDEO • AUDIO MUTE SWITCH • NO MAINS REQUIRED

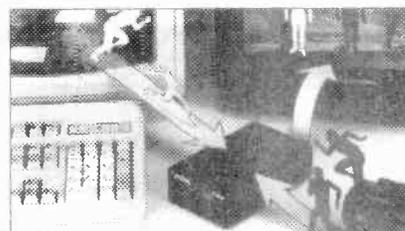
CODE 40180 £199.99



THE SIMPLEST EDITOR

ON THE MARKET. SVHS, HI-8 & VHS COMPATIBLE, STEREO SOUND MIXER BUILT IN. THE CUT 200 WILL CONTROL THE RECORDING VIDEO PLAYER VIA ITS INFRA-RED REMOTE CONTROL. HARD CUTS & FADES WILL BE CONTROLLED BY ONE LEVER.

CUT 200 £199.99



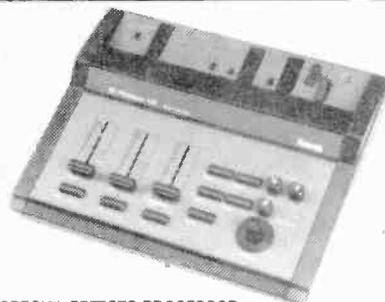
PC GENLOCK FROM HAMA IBM, APPLE MAC, ARCHIMEDES, ATARI ST COMPATIBLE • S-VIDEO & COMPOSITE INPUTS • S-VIDEO, COMPOSITE & RGB OUTPUTS • COMPUTER FADE, VIDEO OVERLAY • 256,000 COLOURS AVAILABLE • COMPUTER MONITOR OUTPUT.

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Seasons Greetings from Greenweld

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ECONOMICAL UNIDIRECTIONAL MICROPHONE EXCELLENT HI FI SOUND QUALITY WITH A WIDE FREQUENCY RANGE 7.5M CABLE FOR OFF CAMERA REPORTING

RMV 01 UNIVERSAL £24.99



A HIGH PERFORMANCE CLIP ON MICROPHONE IDEAL FOR REPORTERS AS IT PICKS UP SOUND FROM ALL DIRECTIONS (OMNIDIRECTIONAL). THE WORDS OF THE INTERVIEWER ARE ALSO RECORDED IN GOOD QUALITY.

LM09 £19.99

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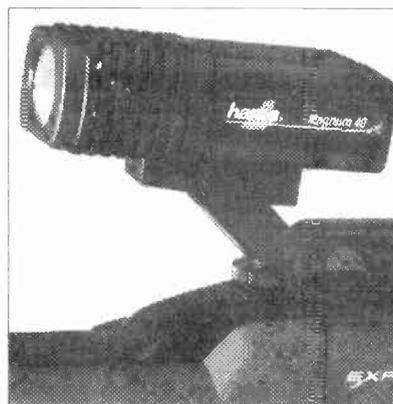
RMS 20 SOUND MIX £34.99



VIDEOLIGHT FOR USE WITH PANASONIC/JVC CAMCORDER BATTERIES. HIGH LIGHT YIELD FROM 20W OUTPUT THROUGH A DICHROIC REFLECTOR FOR BRILLIANT UNIFORM ILLUMINATION.

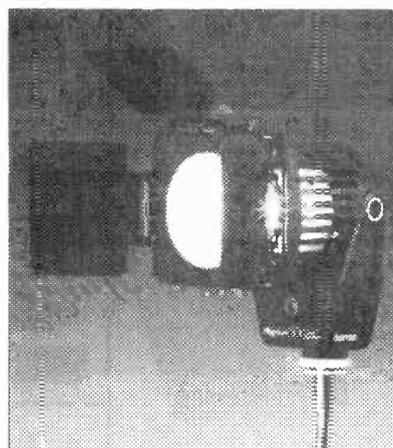
30W VERSION AVAILABLE*

MAGNUM 20P £24.99
***MAGNUM 30P £29.99**



COMPACT 40W LIGHT SUPPLIED WITH BATTERY, CHARGER AND TILTING BRACKET.

MAGNUM 40 MINI £79.99



VIDEO FRIENDLY 300W LAMP. THERMODYNAMIC VENTILATION COOLING THE LAMP WITHOUT THE USE OF A NOISY FAN. IMPORTANT WHEN LIVE RECORDING.

MAGNUM 300 WITH BARN DOORS
£89.99

THE RSM 22 IS A SUPERCARDOID VERSION OF THE RSM 20. ITS DIRECTIONAL RESPONSE IS EVEN MORE PRONOUNCED. EARPHONE SUPPLIED TO MONITOR THE TWO MIXED SOUNDS.

RSM22 SOUND MIX £39.99



DIRECTIONAL CHARACTERISTICS CAN BE ADJUSTED TO COINCIDE WITH ZOOMING OF LENS. NOISES WILL BE STRONGLY SUPPRESSED. HIGH SENSITIVITY ALLOWS EXCELLENT TONE. 7.5M CABLE FOR OFF CAMERA REPORTING.

RMZ 10 ZOOM UNIVERSAL £39.99



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30W VERSION AVAILABLE*

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***MAGNUM 30S £29.99**



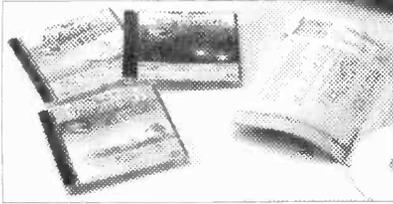
VIDEO MICROPHONES & LIGHTS FROM hama.



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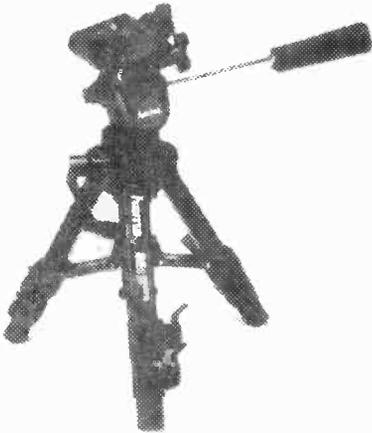
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£24.99 EACH**

PROFIL 20 DESKTOP TRIPOD

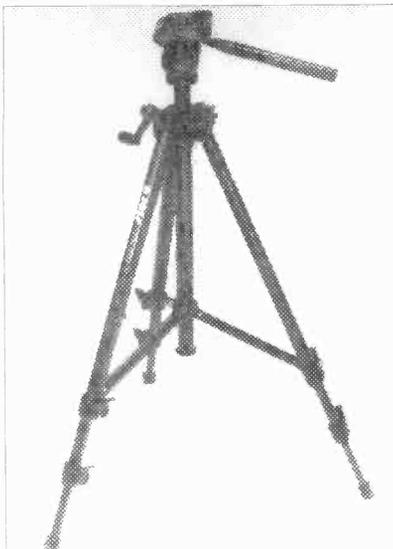
• EXTENDS TO 0.5METRE • CENTRAL COLUMN COLLAPSES TO 27CM • 3 WAY HEAD • QUICK RELEASE PLATE • RUBBER FEET • VERY STURDY



CODE 4120 PROFIL 20 £24.99

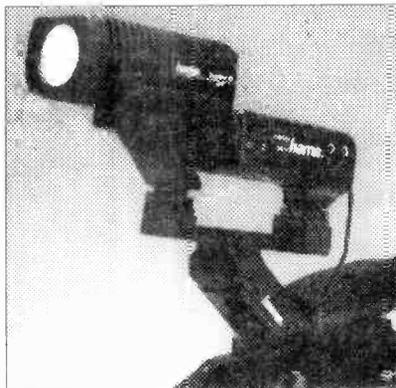
STAR 3 TRIPOD

LIGHT WEIGHT VERSATILE TRIPOD FOR VIDEO CAMERAS. • SMOOTH 2 WAY HEAD • CARPET SPIKES OR RUBBER FEET



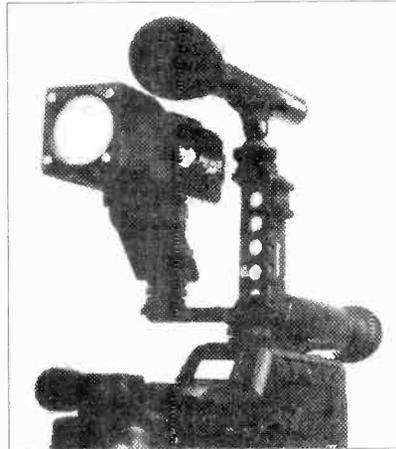
CODE 4141 STAR-3 TRIPOD £39.99

**CODE 4147 STAR 2 TRIPOD £49.99
SAME AS ABOVE BUT HEAVIER DUTY C/W CARRYING HANDLE**



VIDEO ACCESSORY BRACKET THAT ALLOWS YOU TO USE A VIDEO LIGHT AND AN EXTRA MICROPHONE OFF THE EXISTING ACCESSORY BASE

CODE 6340 £12.99



MULTI EXTENDER BRACKET THAT ALLOWS 3 ACCESSORIES TO BE MOUNTED OFF THE CAMERA

CODE 6335 £11.99



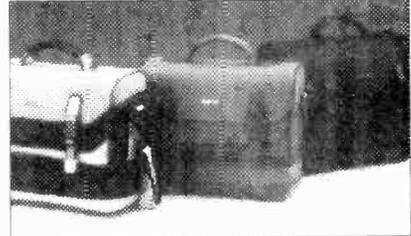
CLASSIC V COMBI UNIQUE PALMCORDER BAG THAT COMES COMPLETE WITH TRIPOD THAT FOLDS DOWN AND FITS IN THE BOTTOM OF THE BAG LEAVING PLENTY OF ROOM FOR THE CAMCORDER.

CODE 4141/29240 £79.99

CLASSIC V PLUS 1 CAMCORDER BAG

PALMCORDER BAG THAT HAS A USEFUL DETACHABLE BASE. ALLOWS FOR BATTERIES, CHARGERS, VIDEO LIGHTS, DISCHARGERS ETC. TO BE STORED SAFELY. WHEN NOT REQUIRED YOU CAN DETATCH LEAVING CAMCORDER LIGHTWEIGHT AND FREE.

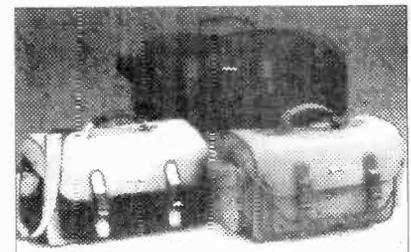
CODE 26124 £34.99



CLASSIC V PLUS 2

SAME AS V PLUS 1 BUT FOR LARGER CAMCORDERS E.G. MOST VHS-C 8MM CAMERAS

**CLASSIC V PLUS 2 £39.99
CODE 26126 BLACK
CODE 26127 GREY CODE 29444 BLUE**



CLASSIC V122

LARGE HOLDALL FOR ALL VHSC AND MOST 8MM CAMERAS. WITH ADDITIONAL SPACE FOR ACCESSORIES.

**CLASSIC V122 £49.99
CODE 26144 BLACK CODE 26145 GREY**



CLASSIC RUCKSACK FOR PHOTO/VIDEO CAMERAS. PLENTY OF POCKETS. SPLITS INTO TWO PIECES FOR ACCESS TO LENSES ETC. WATERPROOF.

CLASSIC RUCKSACK £79.99



VIDEO FASCINATION

THE COMPLETE GUIDE TO MAKING BETTER FILMS WITH WHAT'S AVAILABLE IN THE ACCESSORY WORLD AND HOW TO USE IT.

97426 BOOK 97598 FILM £14.95 each

CAMCORDER & PHOTOGRAPHIC GADGET BAGS FROM hama.



Seasons Greetings from Greenweld

hama CAMCORDER ACCESSORIES

27 Park Road, Southampton, SO1 3TB, Tel (0703) 236363 Fax 236307

CHARGERS & DISCHARGERS



UNIVERSAL DISCHARGER THAT WILL DISCHARGE & RECONDITION EVEN THE MOST BADLY CONDITIONED BATTERIES. FOR MOST 6V, 7.2V & 9.6V BATTERIES.

46499/5 DISCHARGER £19.99

CAMCORDER COMBI WORKS THE SAME WAY AS ABOVE BUT ALSO CHARGES BATTERIES FROM THE CAR OR ANY 12V SOURCE WITH CIGARETTE LIGHTER SOCKET

46310 CAMCHARGER COMBI £29.99



COMBI CHARGER. UNIVERSAL CHARGER, DISCHARGER, C/W MAINS ADAPTER & 12V ADAPTER. **EXCEPTIONAL VALUE!**

46493 COMBI CHARGER £59.99



DISCHARGER FOR USE WITH MOST 6V CAMCORDERS. SUITABLE FOR MOST SONY, PANASONIC & JVC MODELS C/W CHARGE INDICATORS.

46300 DISCHARGER £14.99



3 IN 1 CONVERTER THAT HELPS YOU TRANSFER SLIDE, CINE & 6X4 PHOTOS ONTO VIDEO. SIMPLE TO USE WITH EXCELLENT RESULTS

3018 CONVERTER £59.99 S.R.P. £84.99

BATTERIES

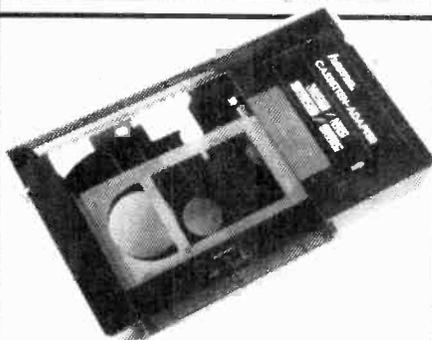
CP417 CANON 1200MAH	£29.99
CP419 CANON 2000MAH	£44.99
CP421 PANASONIC 12V 2000MAH	£44.99
CP429 PAN/JVC 9.6V 1400MAH	£44.99
CP435 PAN/JVC 6V 1000MAH	£29.99
CP437 PAN/JVC 6V 2000MAH	£39.99
CP438 PAN/JVC 6V 24000MAH	£49.98
CP405 SONY/SANYO 1200MAH	£29.99
CP407 SONY/SANYO 2000MAH	£39.99
CP408 SONY/SANYO 2400MAH	£49.98
CP447 HITACHI/FERG 2000MAH	£54.99
CP401 SONY NP22H TYPE 1600MAH	£29.99

ALL OF HAMA'S BATTERIES ARE MADE FROM THE HIGHEST QUALITY NI-CD'S WITH UNCONDITIONAL 2 YEAR WARRANTY



8MM REWINDER SAVE WEAR AND TEAR ON 8MM CAMCORDERS. BATTERY OPERATED + FAST FORWARD

CODE 43046 £34.99



VHS-C ADAPTOR CONVERTS VHS-C TO VHS FOR PLAYBACK IN VCR

CODE 44705 £24.99

CAMCORDER LENSES

USING HAMA'S HIGH RESOLUTION LENSES WILL BRING A NEW PERSPECTIVE TO YOUR FOOTAGE!

HR 0.5 & HR 1.5 X LENS KIT FOR USE WITH ALL COMPACT CAMCORDERS HAVING 27/36 OR 37MM LENSES.

CODE 44398 £69.99



HR 0.5X WIDE ANGLE LENS FOR ALL 27/36 OR 37MM COMPACT CAMCORDERS.

CODE 44394 £49.99

HR 2X TELE CONVERTER MULTIPLIES THE CAMERAS ZOOM BY 2. FOR COMPACT CAMCORDERS WITH 27/36 & 37MM LENSES.



CODE 44362 £49.99



HR 0.45X ULTRA WIDE ANGLE LENS DISTORTION FREE LENS. FITS 27/36/37MM COMPACT CAMCORDERS

CODE 44361 £59.99



FOR LARGER CAMCORDERS HR0.65X & HR 1.5X LENS KIT. FITS 46/49 & 52MM CAMERAS

CODE 44384 £79.99

HR0.5X WIDE ANGLE LENS. FITS 46/49 & 52MM THREADED CAMCORDER LENS



CODE 44380 £79.99



HR2X TELE CONVERTER LENS. MULTIPLIES ZOOM BY 2X FOR LARGER CAMCORDERS WITH 46/49/52MM FILTER THREADS

CODE 44382 £79.99

DISCHARGERS • CHARGERS • BATTERIES • LENSES FROM *hama*.



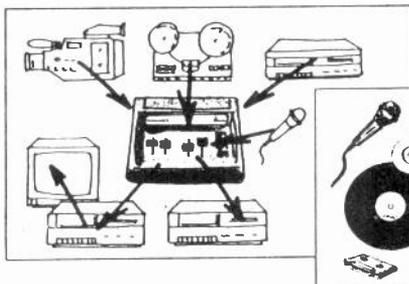
VIDEO PROCESSORS

27 Park Road, Southampton, SO1 3TB, Tel (0703) 236363 Fax 236307

HUGE REDUCTIONS IN AUDIO/VIDEO PROCESSORS SUPER QUALITY PRODUCT FROM HAMA

It couldn't be easier

Video film copying is child's play with the HAMA AV 140. Two Euro-AV sockets establish the contact between the playback and recording units. And there is no longer any replugging if the copying direction is to be reversed. Simply push the input key to decide whether copying is from unit 1 to unit 2, or vice versa. Two LEDs indicate the selected direction. And with the bypass switch you can decide whether the signals require enhancement or not. Everything is under your complete control, and the results can always be checked on the monitor which displays either the original or the enhanced picture.



LIST PRICE
£179.99

To get the best from your home movies, you'll need the book and the video...



Video Fascination
The New Guide to Better Video

Superb quality large format (A4) 256 page hardback book full of tips, procedures and equipment produced by Hama. Not just a showcase for their excellent quality goods, but lots of useful information, including how to produce a finished video - storyboard, planning, shooting, editing. Excellent value at £14.95. Order Code 97426

To accompany the book, a 40 minute video has been produced, showing how to achieve the best results from your camcorder. £14.95. Order Code 97598

SALE PRICES:
(Only when purchased with one of these processors)
£7.50 each

Audio Video Processor AV 140

Corrects the video colour signals from recorders or cameras while copying from tape to tape. Both colour intensity and contrast can be continuously changed. A record player, CD player or cassette deck can be connected to add a new source of sound to the original sound in any variable mixing ratio. A microphone connection is also provided. A significant benefit: Two copies can be simultaneously produced!

40140



£79.95

For the ultimate in creativity and copying performance. Also for Super-video!

The AV Processor 144 makes it possible

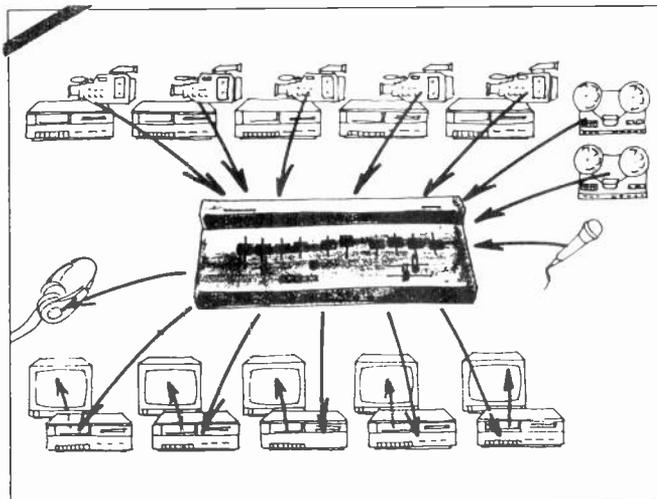
Obviously, to secure and multiply your private wealth the highest interest rate must be obtained. And the same should apply to your video films, particularly since the value of your film treasures can be enhanced without the hazards of fluctuating interest rates. Video processors always enjoy a big demand because they can enhance video films for presentation to a wider audience. The AV Processor 144 should be a must for all video film editing and copying as it guarantees optimal processing of the video and audio signals, also in the new and superior S-VHS or Hi-8 technology.

£199.95



LIST PRICE £459.99

gies. It is fitted with a variety of different connecting sockets, including EuroAV (= SCART), RCA and BNC assigned. And should you still encounter connecting problems with your recorders, the HAMA Adapter Cable Set (Art. No. 43197) will cope with any situation. The screen splitter function enables you to compare the processed picture with the original one to immediately reveal all changes on the screen. The console is provided with five input selector keys with which the source VCR can be selected without any bothersome replugging of cables. The AV Processor 144 can produce up to five copies simultaneously - a tremendous time-saving feature when considering how long it would take to produce these copies individually. And all this can be combined with colour and contrast correction, the addition of a poster effect, and the ability to influence contour sharpness. The latter is particularly important as contour sharpness suffers greatly as a result of copying losses. Such lack of definition has to be nullified. This is easily effected with the HAMA AV Processor 144. Only the very best should be good enough to protect video film treasures against losses.



Technical data	
Contrast control:	± 6 dB
Colour saturation	+4 dB, -20 dB
Contour control:	± 10 dB, above 2 MHz
Video input/output:	2 x Scart (input/output) 2 x Hosisden (output) 1 x BNC/RCA (input) 1 x BNC/RCA (output) 2 x Hosisden/RCA (input)
Audio input/output:	2 x RCA stereo (AUX 1) 1 x MIC 6.3 mm mono jack plug 2 x RCA stereo (AUX 2) 1 x headphones 6.3 mm stereo jack plug
Video bandwidth:	7.7 MHz
Audio bandwidth:	30 Hz - 25,000 Hz
Resolution:	> 430 lines
Features:	Automatic noise suppression S-video compatible
Power supply:	Separate mains unit 12 V/500 mA
40144	



Seasons Greetings from Greenweld

AUDIO/VIDEO MIXERS

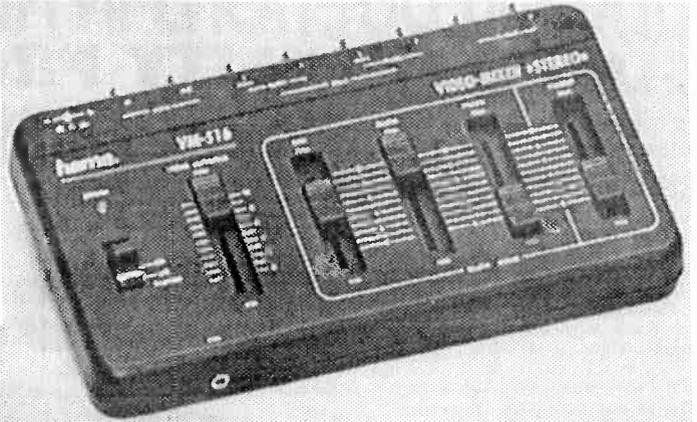
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MORE AUDIO/VIDEO MIXERS FROM HAMA

VM516 Stereo Video Mixer

Desk type video sound mixer with enhancer. Allows separate smooth adjustment and mixing of original video sound with 3 external sources (mic, cassette etc). Master output control. Also continuously adjustable slider corrects video signal when copying. Supplied with 12V mains adaptor

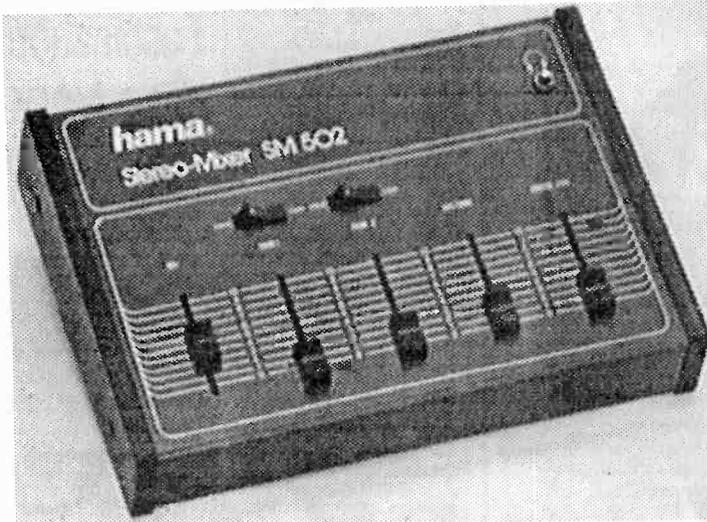
Our Special Low Price: £39.95



SM502 Stereo Mixer

4 Channel audio mixer with inputs for mic, mag/cer phono and tape/tuner. Outputs for headphones and to amplifier. Freq Res 20-20000Hz, S/N ratio >55dB. Supplied with 9V mains adaptor

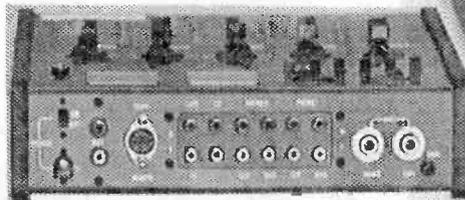
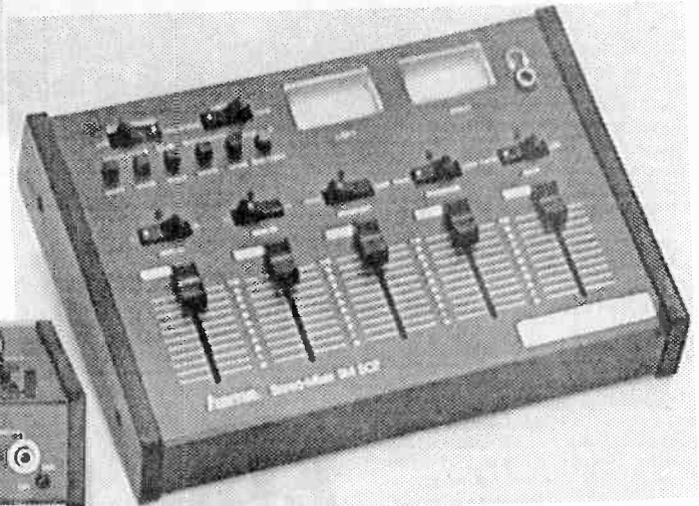
Our Special Low Price: £44.95



SM507 Stereo Mixer

Big brother of SM502 - this one has all the facilities of the above mixer + twin VU meters and an additional record/replay DIN socket. As can be seen from the inset pic, the socketry on the rear is excellent.

Our Special Low Price: £69.95



HANIMEX

Electronic Graphic Writer

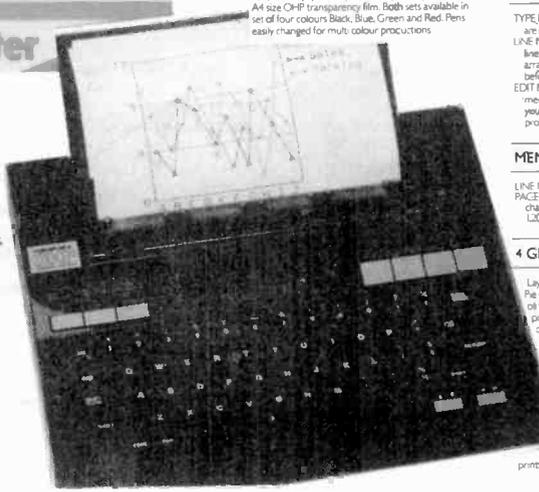
452 80
7.4 3.6 6.3 5.9
5.4 8.3 5.3 4.8
212 430 452 645
500 400 300 200

TEXT
TEXT
TEXT

operations of the keyboard
characters can be entered in four
formats: normal, bold, italic
and underlined. The background
can be set to any of the 16
colours.

PRINTS ON PAPER OR CLEAR FILM IN UP TO 4 COLOURS

Interchangeable pen facility allows choice of colour with paper or acetate film option. Use ballpoint pen set with A4 paper, or special felt tip OHP pen set with A4 size OHP transparency film. Both sets available in set of four colours: Black, Blue, Green and Red. Pens easily changed for multi-colour productions



ORIGINAL SELLING PRICE £299!

3-MODE OPERATION

TYPE MODE: Characters, Numbers and Symbols are printed immediately on pressing the keys
LINE MODE: A line of characters is entered into the line memory. Up to 16 Characters can be arranged on the LCD display and then corrected before printing
EDIT MODE: Allows for easy editing of the page memory. Add, delete, insert words or graphics as you wish then press 'PRINT' to automatically produce the amended version.

MEMORY

LINE MEMORY: 250 Byte
PAGE MEMORY: 3k Byte 1800 Byte for characters
1200 Byte for graphs and layout.

4 GRAPH MAKING FUNCTIONS

Layouts (for tables) bar graphs, Linear Graphs and Pie Charts easily and accurately produced in choice of three sizes with multi-colours if desired. It is possible to enter into page memory a maximum of two layouts and/or three graphs (Bar, Linear, Pie) for a maximum of five.

18 FONTS IN 9 TYPE SIZES

Choose from Gothic, Courier and Helvetica outline type faces each in plain or italic, and each available in nine character sizes ranging from 75 characters per line to 8 per line. Letters may be printed in Standard, Half bold or Full bold.

COMPACT, PORTABLE AND CONVENIENT

Measuring a mere 320 mm (W) x 60 mm (H) x 260 mm (D) and weighing 2.3 kg (excluding batteries) the Hanimex OHP Graphic Writer will travel anywhere. Takes four size D 1.5V Alkaline Batteries fitted with 6V DC input for use with AC Mains Adaptor (Batteries and AC Mains Adaptor available extra).

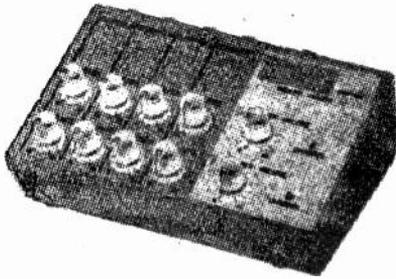
Supplied brand new in original boxes, complete with mains PSU and FREE OHP set containing 10 OHP sheets and 2 4-colour pen sets!
Order Code HANI01

£99

FREE - when you buy one of these machines
Bargain List Subscription worth £6

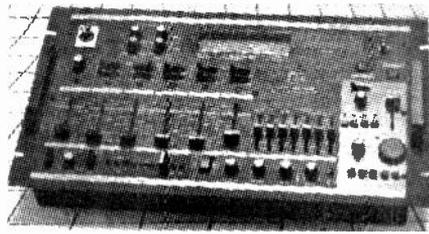


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Stereo Mixers**G105D STEREO MIXER**

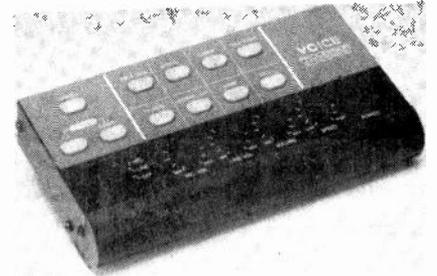
4 channel stereo mixer. Inputs and outputs via 6.35mm sockets with individual volume controls. Powered by 9V battery or AC mains adaptor. Complete with two 1.4m patch leads.

Input sensitivity	1mV
Input impedance	600
Output impedance	1.5k
Output level	90mV(at input 5mV)
Frequency response	Mic 20-20000Hz
Power	9Vdc(PP3) or AC mains adaptor
Price	£38.95

**G103R FOUR MEMORY/DIGITAL SAMPLING MIXER**

4-channel stereo mixer with built-in digital sampler having four 3-second samples, all with push button ease, and single/repeat playback. Full cue facility on all modes and channels. The mixer is capable of mixing a total of 8 line or phono inputs, switchable on the front panel, the output section has a master gain control, 7 band graphic equalizer and overall analogue echo delay.

Input sensitivity	Phono 3mV, Mic 1mV, Line 150mV
Input impedance	Phono 47k, Mic 600, Line 27k
Output level	1V nominal
Frequency response	Phono/Mic/Line 20Hz-20kHz
Power	220/240ac 50Hz
Dims	482 x 280 x 100mm
Sampler Section	
System	8 bit ACPCM system 20Hz - 10kHz
Max. sampling length	20 seconds (adjustable)
RAM memory	1024 megabits
Sampling rate	Continuously variable
Mode function	Singe/Repeat/Write
Price	£299.95

**VOICE PROCESSOR****G025Q**

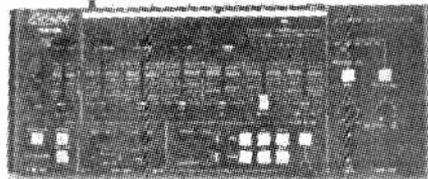
A compact voice processor designed to increase or decrease voice pitch at the touch of a button. Included in the voice processor are 8 sound effects with speed control.

Input: sensitivity:	Line 150mV
	Mic 1.5mV
Output	250mV
S/N ratio	> 65dB
Power	9Vdc (PP3 battery, not supplied)
Dims	190 x 140 x 34mm
G025Q	Voice processor £52.95 3+ 34.37

**G101BC STEREO MIXER**

4-channel stereo mixer capable of accepting inputs from tape, tuner, phono, CD or mic sources. Front panel has gain control sliders for each channel and pre-listen (input monitoring). Twin VU meters. Outputs to amp and tape.

Inputs: Mic	0.3mV 600/3mV 50k
Inputs: Line	150mV 50k
Inputs: Phono	3mV 50kHz/150mV 50k
Outputs: Amp and tape	220mV 50k
Frequency response	20-40000Hz
Distortion	0.3%
S/N ratio	60dB
Power	220/240v ac
Dims	316 x 210 x 67mm
Price	£79.95

**G103L MIXER**

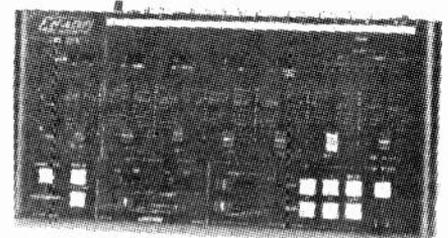
8 second digital sampler
DJ mic channel with pitch changer and auto talkover

2 phono inputs
6 line inputs
assignable, removeable cross fader
LED bargraph monitoring of output
6 built-in sound effects
Input sensitivities

Output
Autotalkover
Sampler
Frequency response

DJ mic: 1.5mV 10k
Phono: 3.0mV 47k
Line 150mV 27k
1V to 7.2V
cut 12dB of program level
8 seconds (G103L only)
Mic: 20-20000Hz
Phono: 30-20000Hz
Line: 20-20000Hz
12Vac via adaptor
485 x 35 x 190mm
£249.95

Power
Dims
Price

**G103N MIXER**

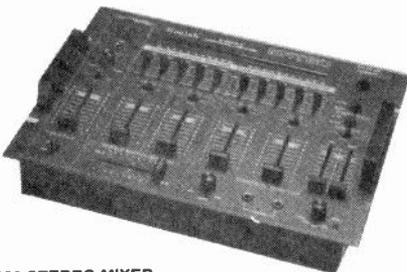
DJ mic channel with pitch changer and auto talkover

2 phono inputs
6 line inputs (4 channels)
assignable, removeable cross fader
six built-in sound effects
LED bargraph monitoring of output
input sensitivities

Autotalkover
Frequency response

Power
Dims
Price

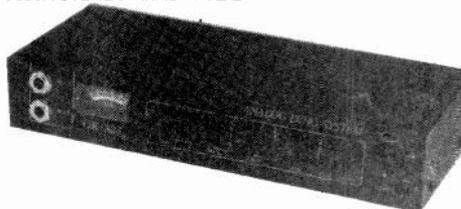
DJ mic: 1.5mV 10k
Phono: 3.0mV 47k
Line 150mV 27k
Output 1V to 7.2V
cut 12dB of program level
Mic: 20-20000Hz
Phono: 30-20000Hz
Line: 20-20000Hz
12Vac via adaptor
385 x 35 x 190mm
£139.95

**G102 STEREO MIXER**

5 channel mixer in rack mounting case capable of mixing a total of 10 phono, line and mic inputs, switchable on the front panel. Twin 5 band graphic equalizer with Insert/bypass switch. DJ mic channel with low cut filter, pan pot and auto fade. Cross fader between channels 1 and 2. Separate L & R output levels and stereo/mono switch. Outputs to amp, tape and headphones

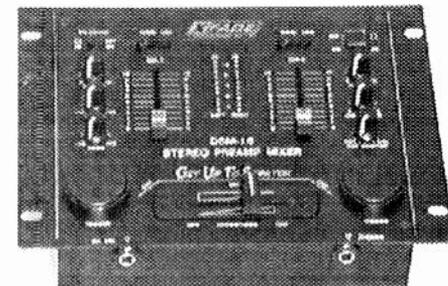
Inputs: Mic	0.3mV 600R
Phono	2.5mV 47k
Line/CD	150mV 47k
Outputs: Amp & Tape	2V nom
Headphone	150mV 8R
Freq Res	20-30000Hz
Hum & Noise	6mV
Equalizer control freqs	60 250 1k 3.5k 16k
Equalizer control range	±12dB boost or cut
Talkover	decrease 14dB prog level
Power	220/240V ac
Size	334x100x92mm

PRICES: £169.95 2+ 113.23

G020A STEREO ANALOGUE ECHO

Electronic BBD echo system accepting inputs from 2 low level impedance mics and a line level stereo input, mixing to a stereo output. Mic 1 & 2 level, treble bass and echo volume controls. Metered output.

Inputs: Mics 1 & 2	-73dB 600R
Outputs load Imp	10k
Delay time	200ms
Power	9V dc (PP3) or ext source
Size	240x105x45mm
G020A	Stereo Analogue Echo £26.95 3+ 17.18

**G103Q STEREO DISCO MIXER**

A compact 2-channel stereo mixer with inputs for line and phono on each channel. Separate triggers/scratch buttons are provided for each channel. The crossfader is panel mounted for ease of maintenance. The DJ mic has volume, bass and treble controls with switched talkover facility. Outputs for amp, tape and headphones. Twin 10-LED bargraph level indicators are provided.

Type
Channels
Input impedance

Output level
Frequency response
Power
Dims
Price

Stereo mixer
Two
Phono 3mV - 47k
Mic 1mV - 600
Line 150mV - 27k
1.6V max
Phono/mic/line 20-20000 Hz
12Vac
255 x 192 x 45mm
£99.95



Unregulated Power Supplies

P007X A replacement 12Vac power supply for use with models:- G025P, G025Q, G025R, G025S, G025T
Price £6.95

P007Y A replacement 12Vac power supply for use with models:- G103L, G103M, G103N, G103P
Price £6.95

WARNING These units are not stabilized. Their maximum rating is as stated and if less current is drawn there is a corresponding voltage rise. At less than half rated output this rise could be considerable.



P006D Plug in power supply with 6 output voltages. Polarity switch and output it via a 4-way spider plug and 1.3mm dc Walkman plug.
 Input voltage 110/240Vac 50Hz
 Output voltage 3,4,5,6,7,5,9 & 12Vdc
 Output current 300mA max
 Stability 40%
 Dims 75 x 52 x 54mm
Price £3.95

P006E Plug in power supply with 6 output voltages, polarity switch and LED indicator. Output via a 4-way spider plug and 1.3mm Walkman plug. Thermal fuse protection.
 Input voltage 220/240Vac 50 Hz
 Output voltage 3,4,5,6,7,5,9 & 12Vdc
 Stability 40%
 Ripple 1V
 Dims 96 x 67 x 62mm
Price £5.95



P006F Plug in power supply with 6 output voltages. Polarity switch and LED indicator. Output is via a 4-way spider plug and 1.3mm Walkman plug. Thermal fuse protection.
 Input voltage 110/240Vac 50Hz
 Output voltage 3,4,5,6,7,5,9 & 12Vdc
 Output current 1000mA max
 Stability 40%
 Ripple 1V
 Dims 97 x 67 x 56mm
Price £8.95

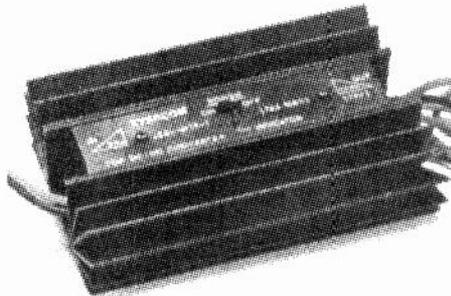
Regulated Power Supplies



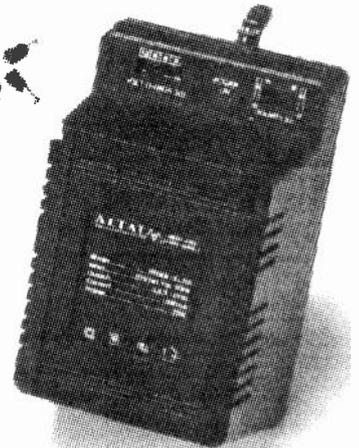
P006G A plug in regulated power supply, 3-12Vdc output switchable. Reverse polarity switch and LED indicator. Designed for radios, walkmans, calculators, keyboards, toys etc. Supplied with 6 DC adaptor plugs. Features include:
 IC regulated output
 Automatic thermal cut off
 Short circuit protection
 Automatic overload cut off.
 Input voltage 220/240Vac 50Hz
 Output voltage 3,4,5,6,7,5,9 & 12Vdc
 Output current 300mA max
 Stability 2%
 Ripple 1V
 Dims 87 x 62 x 62mm
Price £6.50

P006Y A plug in regulated power supply for use with the Commtel COM 203 and COM 204 scanners.
 Input voltage 220/240Vac 50Hz
 Output voltage 9Vdc
 Output current 350mA max
 Stability 2%
 Ripple 10mV
 Dims 80 x 56 x 55mm
Price £7.95

P006H POWER SUPPLY-REGULATED
 Plug in regulated power supply with 3-12Vdc switchable output. LED indicator and polarity switch. Complete with 6 DC adaptor plugs. Features include:
 IC regulated DC output
 Automatic thermal cut off
 Short circuit protection
 Automatic overload cut off
 Input voltage 220/240Vac 50Hz
 Output voltage 3,4,5,6,7,5,9 & 12Vdc
 Output current 650mA max
 Stability 2%
 Ripple 1mV
 Dims 97 x 68 x 63mm
Price £7.55

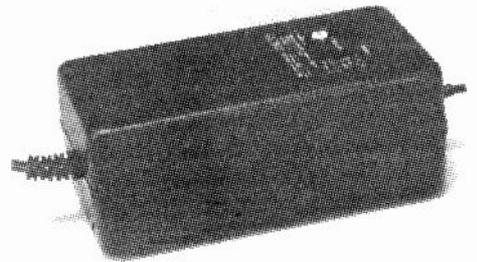


P008C 12A DC-DC CONVERTOR
 Heavy duty DC to DC convertor designed for use in commercial vehicles, converting from 24Vdc to 12Vdc. Constructed with a matt black heatsink, input internally fused. Includes a power on/off switch and LED on indicator.
 Input 24Vdc
 Output 12Vdc
 Max. Rating 7A continuous, 12A Max
 Dims 200 x 100 x 42mm
Price £22.95



P006K POWER SUPPLY-REGULATED
 Plug in regulated power supply 3-12Vdc switchable output. Polarity switch and LED indicator. Complete with 6 DC adaptor plugs. Features include:
 IC regulated DC output
 Automatic thermal cut off
 Short circuit protection
 Automatic overload cut off
 Input voltage 220/240Vac 50Hz
 Output voltage 3,6,9 & 12Vdc
 Output current 1200mA max
 Stability 2%
 Ripple 10mV
 Dims 120 x 75 x 63mm
Price £8.95

P006Z POWER SUPPLY-REGULATED
 A plug in regulated power supply designed for use with the Commtel COM 102 scanner.
 Input voltage 220/240Vac 50Hz
 Output voltage 9Vdc
 Output current 350mA max
 Stability 2%
 Ripple 10mV
 Dims 80 x 56 x 55mm
Price £7.95



P007V REGULATED POWER SUPPLY
 Superior quality regulated power supply. Several output voltages selected by a rotary switch with a current rating of 1.2A (1200mA). Input via a 3-core mains. Output via a fitted lead with 4-way spider plug, 9V battery snap and walkman plug.
 Output power 1.5, 3, 4.5, 6, 7.5, 9 & 12Vdc
 Power input 220/240Vdc
 Output current 1.2A (1200mA)
 Dims 150 x 77 x 62mm
Price £14.95

P006V REGULATED POWER SUPPLY
 Superior quality regulated power supply. Several output voltages selected by a rotary switch, with a current rating of 1A (1000mA). Input via a 3-core mains lead. Output via a fitted lead with 4-way spider plug, 9V battery snap and a walkman plug.
 Output voltage 3,6,9,12,13.5,17 & 18Vdc
 Power input 220/240Vac 50Hz
 Output current 1A (1000mA)
 Dims 150 x 77 x 62mm
Price £16.95



27 Park Road, Southampton, SO1 3TB, Tel (0703) 236363 Fax: 236307

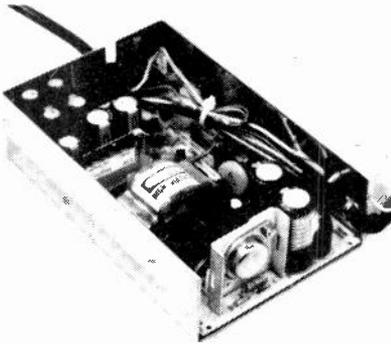
SAM POWER SUPPLY & MODULATOR



Z9111 Never heard of the SAM Coupé Computer? Well, the holding company SAMCO went bust, and now someone is trying to resurrect it - but the liquidators were anxious to turn piles of stock into cash, so we purchased all remaining stocks of the Astec made PSU's and can offer them at an amazing price! Inside the 170x150x70mm grey and black vented case is a linear power supply (240V ac in; 5V 2A & 12V 0.1A dc out) PLUS a UM1286 UHF colour TV + sound modulator! There are 3 leads: 2.2m phono to co-ax; 2m mains & 1.9m output lead fitted with a 6 pin DIN plug. All brand new stock. All this for just

£9.95 100+ 4.40

SWITCH MODE PSU'S

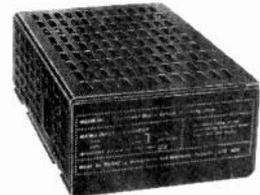


AA12531 Switch mode PSU by Astec partially cased. 160x104x45mm overall with 160x100mm Eurocard PCB. Inputs and outputs are on colour coded flying leads. Input 115/230V 50/60Hz. Outputs: +5V @ 5A; +12V @ 0.15A. Total wattage 50W.

£6.95; 25+ 5.43; 100+ 4.53

Conversion Kit

K725 This kit converts the AA12531 PSU into a much more versatile supply, giving +5V @ 2.5A; +12V @ 2A; -12V @ 0.1A and -5V @ 0.55A. Complete set of parts and full instructions £3.50 Instructions only (K726) £1.00

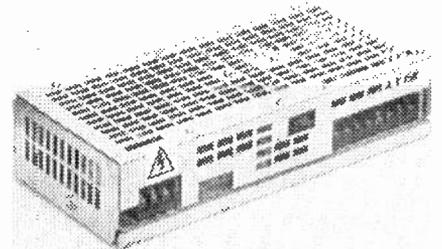


Farnell NO55P Power Supplies

We've taken delivery of these popular supplies from several different sources, and now have the following models available. All are switch mode 115/230V input rated 55 watts max. Size of cased units 182x112x55mm, uncased size 160x100x40mm.

Z5304 Model 326. cased. Outputs: +5V 3A; +12V 0.1A; -12V 0.1A. Price £12.95

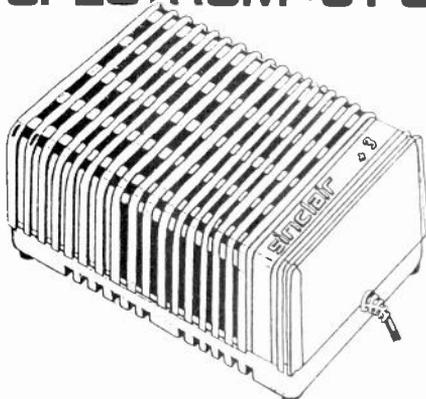
Z5334 Model 314. Outputs: +5V 3.5A; +12V 3A -12V 1A. Price £14.95



Z9148 QUEL Powerline switch mode PSU. Ventilated case 267x120x57mm. Input: 42-56V DC. Output: +5V 25A; -5V 4A; +12V 4A; -12V 4A; +24V 4A. Max. output power 200 watts. £9.95

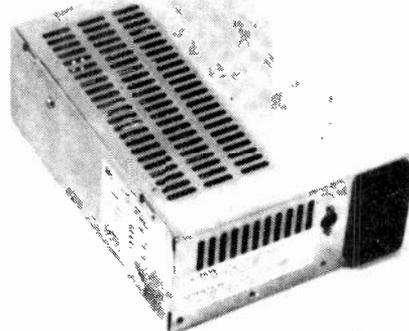
Z9145 As above, but input 115/230vac (or 325v DC). Outputs: +5v 25A; -5v 4A; +12v 3A; -12v 3A; -48v 2A. Max output power 200 watts. £19.95

SPECTRUM +3 PSU



Brand new product - our scoop purchase of these linear power units enable you to buy at less than one third the normal price! Attractively cased in a black vented plastic case 155x102x70mm, they have a 1.3m mains lead and an output lead 2m long fitted with a 6 pin DIN plug. Input: 220/240V ac. Output: +5V @ 2A; +12V @ 0.7A; -12V @ 50mA. Z9110

£9.95 100+ 4.50



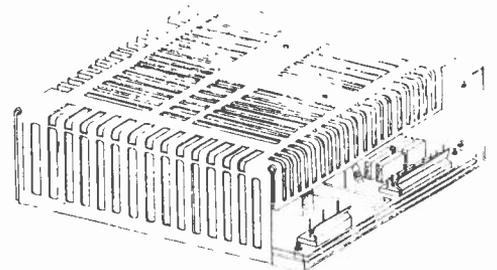
BM41012 Superb switch mode PSU made by Astec. Enclosed case 175x136x65mm with switched and fused IEC mains Inlet. 160x80mm PCB with output pins extended to external connector. Input 115/230V 50/60Hz. Outputs: +5V @ 3.75A; +12V @ 1.5A; -12V @ 0.4A. Total wattage 65W £14.95; 25+ 11.70; 100+ 9.75

Z8887 Made by STC, this 160x100mm panel is attached to an aluminum chassis. 165x102x65mm and has a single 5V 6A output. Supplied with connection details, we can offer these at a fraction of their normal cost.

Price £5.95 10+ 4.30 100+ 3.43

Z8888 A larger version of the above, PCB 220x100mm and chassis 225x102x65mm providing a single 5V 10A output Supplied with connection details.

Price Only £8.95 10+ 6.50 100+ 5.20



Z9114 This is a super unit 168x110x50mm in its steel case. Again, removed from gaming machines and tested before despatch. Std mains input. Outputs: +5V 3A; +12V 3A; -5V 0.5A; +12V 0.3A. Excellent Value at

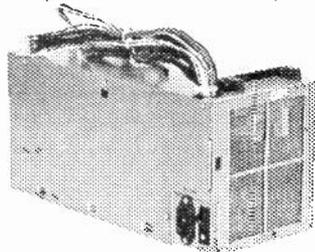
£12.50 100+ 5.75

POWER SUPPLY BARGAIN

One of the best power supplies we've seen for the money - this 397 watt switch mode beauty is of the highest quality, made by Delta Electronics Inc. Removed from equipment, but in excellent condition (less than a year old!) the unit is totally enclosed in a steel case 340x152x152mm. It has an IEC mains inlet with suppressor fitted and on/off mains rocker switch, and all outputs are on leads with power connectors. Now for the Spec:

Inputs: 100-120V @ 10A or 200-240V @ 6A, switchable on front panel.

Outputs: +5V @ 40A
+12V @ 15A
-5V @ 1A
-12V @ 1A

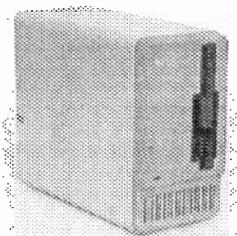


A 12V DC 120x120mm fan is fitted at the rear of the case. Current distributor price of a unit of this ilk would be around £400!

OUR PRICE £29.95
SAVE 92%! Order Code Z 9157

DISK DRIVE CASE + PSU

Z9158 These brand new and boxed steel cases made for 5.25" drives are of excellent quality, manufactured for Data General. Overall size is 300x220x130mm, and within the beige exterior is a fully cased, slide-out switch mode power supply giving out 5V @ 4A and 12V @ 1.5A, with power connectors fitted; an 80x80x26mm 12V fan and a controller PCB made by TEAC with 23 LS chips, 4 delay lines, D765 & SED9420 chips. From the panel is a lead with a 34 way edge connector. Mounted on the rear panel of the unit are an IEC mains filter inlet; a double pole rocker switch; a fuseholder and a 37 way D skt. The 5.25" disk drive is NOT included - but this unit is a snip at



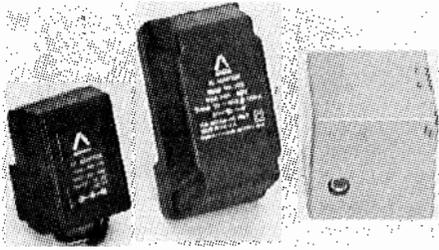
£12.95



Seasons Greetings from Greenweld

POWER SUPPLIES, BATTERIES & CHARGERS

27 Park Road, Southampton, SO1 3TB, Tel (0703) 236363 Fax 236307



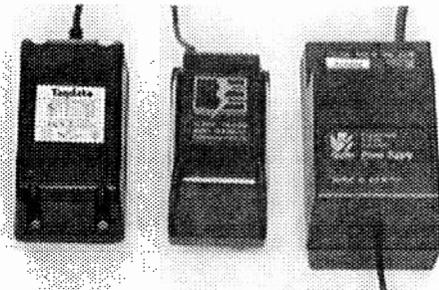
Z5583 'Agenda' PSU 13A plug in type - output 12V 100mA DC on 2m lead with right angle 1.3mm power plug. **£1.00**
Z5584 'Agenda' PSU 13A plug in type - output 15V 100mA DC on 2m lead with right angle 1.3mm power plug. **£1.25**
Z5585 PSU with mains input via 1.5m lead. Output 8V 200mA regulated on, unusually, a phono socket! **£2.00**



Z5586 US Microwriter PSU. Input 117V ac via US 2 pin plug. Output 12V DC 200mA on 2m lead with 3.1mm power plug. **2 for £1.00**
Z5587 Another Microwriter PSU. 220V input via continental plug (2 thin pins). Output 12V DC 200mA on 2m lead with 3.1mm power plug. **£1.00**

Z5573 Switch mode PSU Eurocard 160x100mm with the following outputs: +5V 2.5A; +12V 2A, -12V 0.1 A 110/230v input. Great Value at **£7.95**

Z9168 30W Switch mode power supply on PCB 140x80mm. 115/230V input, outputs +5V 3A; -12V 0.3A; +24V 0.3A. This is mounted in a grey plastic case 285 x 108 x 50mm with 2 x 9 way D sockets and 1 plug on rear. 3m black mains lead with 13A plug. **£4.95**



Z5611 Plug in PSU by Tandata. Rather strange one, this - has 3 separate outputs, +16V 100mA; +8V 500mA and -8V 40mA terminating on a 4 pin DIN plug on the end of a 2m black lead **£3.95; 100+ 2.00**

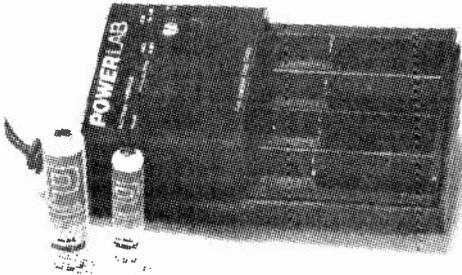
Z5612 Plug in power supply giving out 10V 300mA ac on a 2.5mm power plug on the end of a 2m lead. **£1.95; 100+ 1.10**

Z5613 Griffin Power Supply. High quality cased unit with 1m mains lead and 1m output lead with a 0.25" stereo plug on the end. Output is 9-0-9V 1A ac. **£4.95 100+ 2.65**



Z5549 Black plastic cased transformer 102x77x70mm with single keyhole hook for hanging on wall. 2m long 3 core mains cable and 2m long output lead terminating in 3 pin socket. 240v ac input, 18v 2.15A ac output. Room inside for bridge, cap and regulator if required **£4.95**

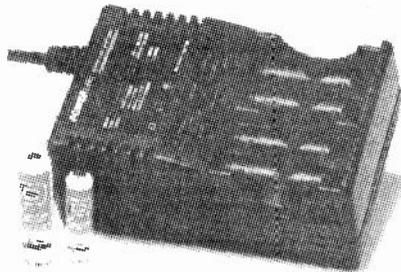
Z5550 Similar to above, but output lead has 4 way socket. This one is rated 230v ac input, 12v+12v each at 1A ac output. **£4.95**



P011: BATTERY CHARGER

Compact NiCad battery charger. Charges 4 x AA or 4 x AAA cells. High or low charging current selector with LED indicators. Charging time 6-14 hours.

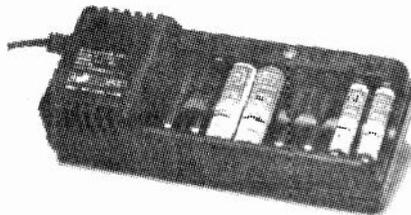
Input voltage	220/240Vac 50Hz
Charging current	32-72mA
Charging time	6-14 hours
Charges	4 x AA or AAA batteries
Dims	125 x 75 x 37mm
Price	£6.95



P011F BATTERY CHARGER/DISCHARGER

A NiCad charger with discharger for use with AA and AAA batteries. Fast charge in 2 hours with automatic switching to trickle charge. The discharge function results in full capacity of batteries and prevents the 'memory effect'. LED indicators for discharge, fast charge and trickle charge. Charges 2 or 4 cells

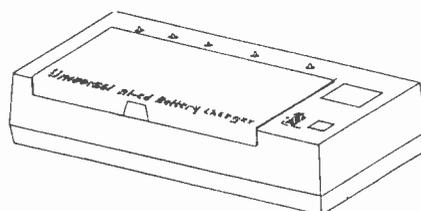
Input voltage	220/240Vac 50Hz
Charging current FAST	AA x 2 380mA
	AAA x 2 100mA
Trickle Charge	AA/AAA 20mA
Price	£12.95



P011H FAST BATTERY CHARGER

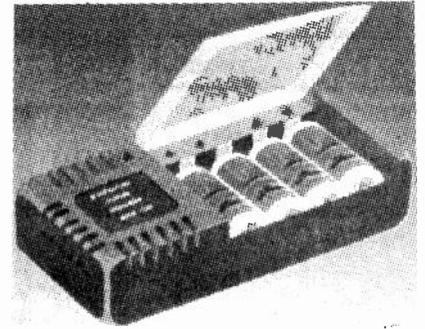
Fast charger for 8 pcs AA and AAA NiCad batteries. Charges in pairs with automatic current adjustment for AA, AAA. Automatic switch to trickle charge to prevent battery damage. Supply 220/240Vac 50Hz

Charging current:	
Fast charge	AA 30mA
	AAA 100mA
Trickle charge	AA/AAA 15-20mA
Price	£14.95



A123 NI-CAD CHARGER

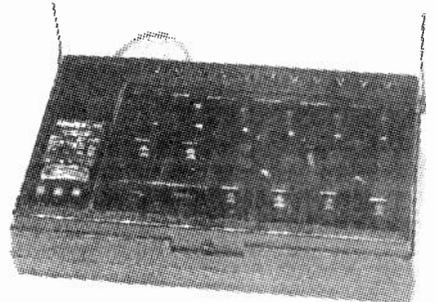
Neat attractive instrument will charge 4 different sizes of battery: AA, C, D and PP3 either singly or in any combination. Charge times 7-8hrs for AA, 14-16 hrs for others. Test facility to check if battery needs charging. Size 210x100x50mm
PRICES 6.95 10+ 4.12



P011K FAST CHARGER WITH DISCHARGER

A compact robust unit for rapid charging of 1-4 NiCad batteries, types AAA, AA, C, D and 2 x PP3(9V). Built-in timer prevents overcharging by switching to 'trickle' charge automatically. A discharge facility is incorporated to fully discharge batteries prior to recharging resulting in a longer useful life. LED indicators are provided to indicate operation mode.

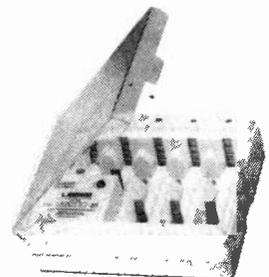
Power	220/240Vac 50Hz
Charge time	4 hours
Charges	4xAAA, AA, C, D and 2xPP3 (9V) batteries
Price	£17.95



P011M BATTERY CHARGER

A deluxe universal charger which accepts all the popular types: AAA, AA, C, D, N and 9V types. Batteries can be charged singularly or in groups and the unit has a battery test facility with meter indicator for battery status. Finished in tough black plastic with a tinted hinged lid.

Dims	280 x 188 x 68mm
Weight	1.5kg
Power	220/240Vac 60Hz
Price	£17.95



CX2000 This large and versatile battery charger will recharge the complete range of domestic rechargeable batteries. It will charge up to 8 1.2V batteries, and/or up to 3 RX22 batteries, in various combinations simultaneously. It is designed to complete the recharge in 14-16 hours.

The CX2000 incorporates reverse polarity protection and LED charging indicators. A battery tester is provided to check whether a battery needs charging or not. Stylishly designed in an attractive white, it is simple and easy to operate and is supplied in an eye-catching display box.

Price **£18.95** 5+ 15.39 25+ 13.11



POWER SUPPLIES, BATTERIES & CHARGERS

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DRY CELLS

A range of batteries from Hi-Tech featuring long life and reliability at a competitive price.



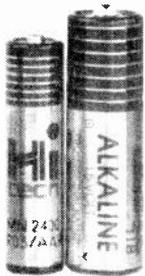
Code	Description	1+	20+	100+
X111	AA/RG/HP7	37p	0.19	0.15
X112	C/R14/HP11	66p	0.34	0.27
X113	D/R20/HP2	75p	0.39	0.31
X114	PP3/6F22	£1.25	0.64	0.51
X115	1289/3R12	£1.25	0.64	0.51
X116	PJ996/4R25	£3.15	1.61	1.29

Low cost dry cells

5 popular sizes of battery packed as shown at very attractive prices.



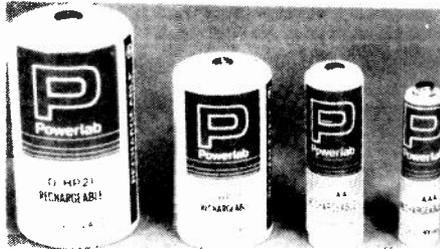
Code	1+	25+	100+
X1070 AAA Cells			
Price per pack of 4	£1.10	0.70	0.56
X1090 AA cells			
Price per pack of 4	97p	0.62	0.50
X1092 C cells			
Price per pack of 2	39p	0.25	0.20
X1093 D cells			
Price per pack of 2	61p	0.39	0.31
X1095 PP3 cells			
Price each	51p	0.33	0.26



Alkaline Batteries for heavy duty use

Code	Description	1+	20+	100+
X121	AA/MN1500/LR6	75p	0.40	0.32
X122	AAA/MN2400/LR03	75p	0.40	0.32
X123	PP3/MN1604	£2.99	1.57	1.26
X124	D/LR20/MN1300	£1.95	1.02	0.82
X125	C/R14/MN1400	£1.48	0.79	0.63

NI-CAD BATTERIES



Code	Rating	Size	1+	25+	100+
X131	180mAh	AAA	£1.46	0.93	0.75
X132	500mAh	AA	£1.20	0.81	0.65
X133	1.2Ah	C	£2.60	1.79	1.44
X134	1.2Ah	D	£2.60	1.79	1.44
X135	110mAh	PP3	£4.50	3.60	3.30

High Capacity Ni-Cads

Code	Size	Capacity	1-24	25-99	100+
P009BB	C	2250mAh	3.95	2.72	2.17
P009CB	D	5100mAh	6.95	4.60	3.68



EX107 Panasonic Racing Cell. Standard 7.2V 1300mAh NiCad as used in most electric model racing cars. £17.99

BUTTON CELLS

A range of popular button batteries. Long life alkaline manganese cells. Rated voltage 1.5V. Packed in individual compartments on attractive display card holding 10 batteries.

Code	Equivalents	Dims	1+	10+	100+
AG2	397, 536	7.9 x 2.6mm	45p	0.30	0.09
AG3	192, BSR41H, 10L125	7.9 x 3.6mm	45p	0.30	0.09
AG7	395, 523	9.5 x 2.6mm	60p	0.40	0.12
AG8	391, 533	11.6 x 3.0mm	45p	0.30	0.09
AG10	LR1130, RW89, V10GA, 89A, 4274, BSR54H, 10L122	11.6 x 2.1mm	45p	0.30	0.09
AG12	LR43, RW84, V12GA, 86A, 4278, BSR43H, 10L124, 186	11.6 x 4.2mm	45p	0.30	0.09
AG13	LR44, RW82, 76A, A76, V13GA, 4276, BSR44H, 10L14, 186	11.6 x 5.4mm	45p	0.30	0.09
*SG1	364, SR621SN, V364, RN320	6.8 x 2.1mm	45p	0.30	0.09
*SG13	A76, LR44, V13GA, RW82,	11.6 x 5.4mm	£1.20p	0.70	0.25

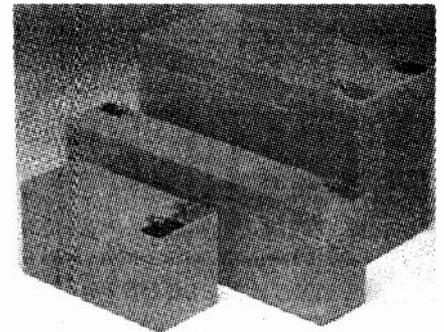
*Silver Oxide



Lithium Batteries

Popular 'coin' type, as used for memory back-up in camcorders etc. Individually blister packed

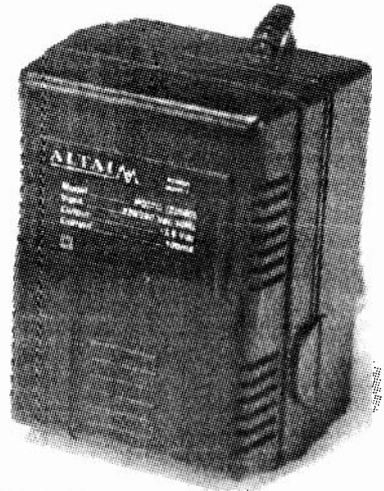
Code	1-9	10+
CR2016	£1.00	0.66
CR2025	£1.00	0.66
CR2032	£1.00	0.66



RECHARGEABLE LEAD-ACID BATTERIES

A range of rechargeable lead-acid batteries suitable for high cyclic and stand-by applications. Constructed in sealed, rectangular high impact plastic cases with 5mm spade connections.

Code	Rating	Size	Weight	Price
P013A	12V, 1.2Ah	96 x 451 x 50mm	0.54Kg	£11.95
P013B	12V, 6Ah	150 x 65 x 93mm	2.69Kg	18.95
P013C	12V, 1.9Ah	177 x 34 x 60mm	0.95kg	£13.95



P006M CHARGER

Plug-in 13.8Vdc 100mA power supply designed to charge 10 x AA NiCad batteries found in mobile CB rigs etc. Plugs directly into 13A socket. Output via integral lead with 2.1mm DC power plug. Input voltage 220/240Vac 50Hz Output voltage 13.8Vdc Output current 100mA Stability 40% Ripple 1V Dims 87 x 63 x 55mm Price £3.95



P011 BATTERY CHARGER

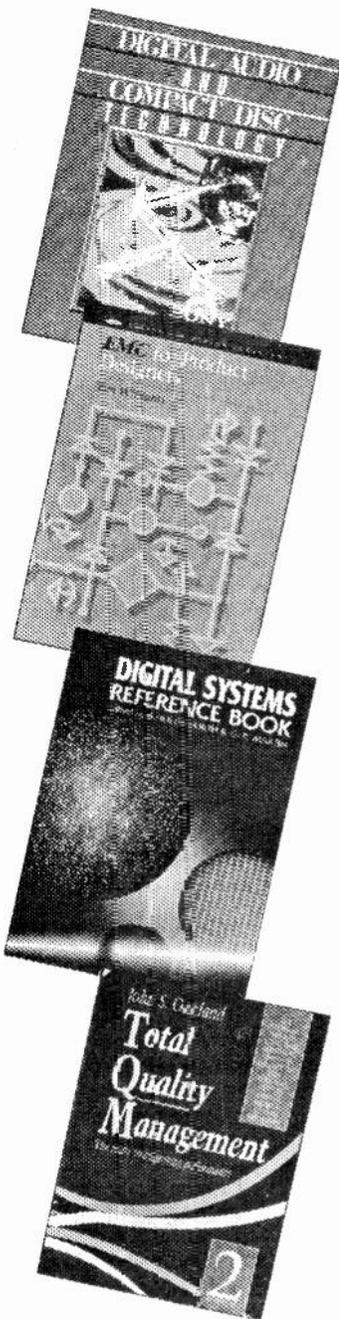
A compact plug-in charger for up to 4 'AA' NiCad rechargeable batteries. The unit plugs directly into the mains socket and can charge 2 or 4 cells simultaneously. Each charging section has an LED indicator.

Input voltage	220/240Vac 50Hz
Charging current	2 x 60mA
Charging time	12 hours
Battery type	AA NiCad
Dims	98 x 36 x 73mm
Price	£4.50



BUTTERWORTH
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GENERAL REFERENCE/ ENCYCLOPEDIAS



BH115 DIGITAL AUDIO AND COMPACT DISC TECHNOLOGY
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Luc Baer/Luc Theunissen/Guido Verguit
"Decidedly a book for which the market has been waiting ...should find wide appeal amongst audio engineers, students and hi-fi enthusiasts." Practical Electronics.
1992 256pp PAPERBACK 0 7506 0614 2
Price: £16.95

BH106 EMC FOR PRODUCT DESIGN
Tim Williams

This book provides information to design engineers on integrating EMC design principles into products, meeting standards and resulting in a better overall product. Assuming knowledge of electronic product design, this book is primarily for newly qualified design engineers.
1992 304pp HARDBACK 0 7506 1264 9
Price: £24.95

BH114 DIGITAL SYSTEMS REFERENCE BOOK

B Holdsworth/G R Martin

Designed to provide comprehensive coverage of the field of digital systems in a concise but authoritative form, this up-to-date and wide-ranging reference should appeal to everyone in the digital field.

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BH105 TOTAL QUALITY MANAGEMENT

Second Edition John S Oakland

This updated, best selling book, presents a comprehensive yet practical model of implementing and integrating TQM strategy in all activities to achieve top quality performance overall. A must for managers, students of management, science engineering and professional qualifications in management of quality assurance.

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Price: £30.00

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Sixth Edition

F F Mazda

This updated reference book has been revised to meet changes in standards and materials and advances in techniques, and includes new chapters on surface mount technology, hardware and software design techniques, semi-custom electronics and data communications.

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R M Marston

Aimed at those who work directly from a circuit diagram, this book deals with strictly linear ICs (each chapter deals with a specific type or class), covering basic principles and presenting a wide spectrum of applications, circuits and tables.

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Price: £12.95

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R M Marston

Passive components and discrete devices form the bedrock on which all modern electronic circuits are built. This practical, user-friendly, pocket book is a single volume applications guide to the most popular and useful of these devices (all of the active devices used are modestly priced and readily available).

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Price: £12.95

The circuit designer's companion



Tim Williams

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A tour through the world of analog design combining theory and applications with the philosophies behind the design process.

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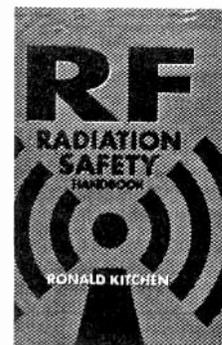
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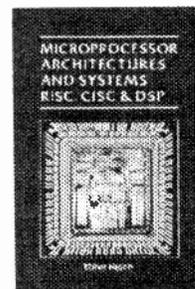
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The Best of EDN

Edited by Ian Hickman

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Price: £19.95



Electronic Components: A Complete Reference for Project Builders
Delton T. Horn
233x187mm, 315 pages, Soft Cover
Price £16.50 Order Code HM173

An all in one guide to electronic component specifications and applications for constructors. Electronic Components lists all the commonly encountered electronic devices and explains their function to a level aimed at the amateur project builder. Topics covered include: wire and solder, capacitors, resistors, coils and transformers, diodes, transistors, and linear and digital integrated circuits.

500 Electronic IC Circuits with practical Applications
190 x 235mm, 235 pages, soft cover, publication date 1987.
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Price: £19.05 Order Code: MH145
Comprehensive and detailed coverage of 500 electronic IC circuits. Electronics enthusiasts will value the easy-to-follow practical circuit applications and will learn from the basic theory behind each one. A handy tool for anyone working with IC circuits



BH101 THE ART OF LINEAR ELECTRONICS

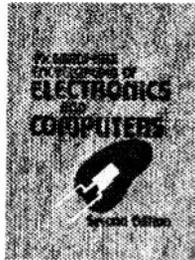
John Lindsey Hood
This practical handbook gives a complete working knowledge of the basics and technology of linear electronics, with application examples in such fields as audio, radio, instrumentation and television and offers a grounding in electronics technology, as applied to linear circuit applications.
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Price: £25.00



McGraw-Hill Encyclopedia of Electronics and Computing. 2nd edition
220 x 280mm, 1040 pages, hard cover, publication date 1988.
Many contributing authors.
Price: £75.00 Order Code: MH107
Something of a Rolls Royce of the book world this one - well, you get what you pay for. Clear diagrams, photographs, and text covering all aspects of modern electronics and computing. Historical notes tracing the development of components and equipment, for example: The first fax machine was developed and used in 1843 (!) by Alexander Bain. Mathematical models and more technical descriptions make the encyclopedia suitable for all levels of user access. A superb text that no reference bookshelf should be without.

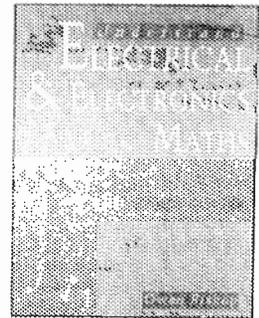
The Illustrated Dictionary of Electronics - 5th Edition
190 x 235mm, 723 pages, soft cover, publication date 1991.
Turner
Price: £23.95 Order Code: MH146
Featuring more than 27,000 entries, an exhaustive list of abbreviations, and appendices packed with schematic symbols and conversion tables, this is by far the most comprehensive dictionary of practical, electronics and computer terms available today.

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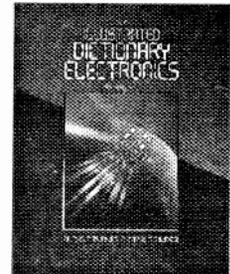
K Ellis Norden
The application of transducer and data processing technologies to the problems and industrial weighing are described. Read this book and cut costs by applying weighing systems correctly to the process at hand.
Oct 1993 204pp HARDBACK 0 7506 1737 3
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Price £16.95



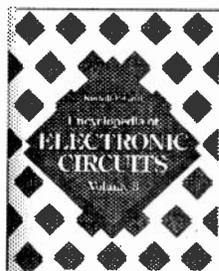
**BH113 UNDERSTAND ELECTRICAL AND ELECTRONICS
MATHS Owen Bishop**
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Price: £14.95



The Concise Illustrated Dictionary of Science and Technology
Sian Gibilisco
190 x 240mm, 520 pages, soft bound, Publication date: 1992
Price: 30.95. Order Code: MH170

Whether you are puzzled by some new technical term, or confused by one of those irritating acronyms that smug sales assistants quote at you, then this dictionary is a life line. With more than 5,500 entries and 450 illustrations of today's scientific and technical terms the Concise Illustrated Dictionary of Science and Technology is an essential reference book for all ages.

The GIANT book of Easy-to-build Electronic Projects
190 x 235mm, soft cover, 352 pages, publication date 1982.
Editor of Elementary Electronics
Price: £19.95 Order code: MH143
Here's a giant collection of useful, low-cost electronic projects for both the beginner and experienced hobbyist. Ranging from simple circuits to state-of-the-art electronic gadgets, there are dozens of fascinating projects that simply are not available elsewhere. There are construction and assembly details, and printed circuit board templates reproduced in actual size.



The Encyclopedia of electronic circuits - Volumes 1-3
190x 235mm

Volume 1 - 760 pages, soft cover, publication date 1985

£28.15 Order code: MH140

Volume 2 - 732 pages, soft cover, publication date 1988

£28.15 Order code: MH141

Volume 3 - 837 pages, soft cover, publication date 1990

£26.95 Order code: MH142

Graf.

This fully comprehensive best-selling series includes coverage of all aspects of the electronics world. There are fascinating insights into schematics for the latest available alarm and security circuits; smoke, moisture and metal detectors; computer, fibre optic and laser circuit; and hundreds of other areas

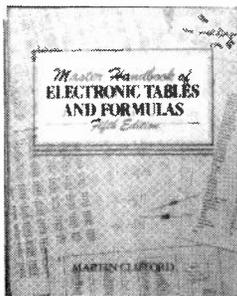
Encyclopaedia of Electronic Circuits Volume IV

Rudolf F. Graf / William Sheets

240x190mm, 729 pages, Hard Cover

Price £52.50 Order Code MH182

The fourth volume in this extremely popular series of circuit 'recipe books'. Volume IV introduces many more new circuits taken from popular international electronics magazines, manufacturers data books, and a variety of other sources. With the complete set of four volumes no project builder will ever be short of ideas again!



Master Handbook of Electronic Tables and Formulae 5th Edition

Martin Clifford

241x195mm, 553 pages, Hard Cover

Price £29.95 Order Code MH183

Can't remember the equation for impedance in a parallel RCL circuit? Unable to fathom the Boolean associative law? Want to know how to splice wires? Problems with microphones? The answer to all these problems and many more can be found in the Master Handbook of Electronic Tables and Formulae. This book is not just a list of equations as some, but contains clear explanations of the equations' derivation and their use, plus some very useful background information.

All the following books are written by the author the popular Encyclopaedia of Electronic Circuits volumes. They are similar in style but focus on designs for a particular aspect of electronics, saving money for anyone who wishes to construct projects in one area.

Modern Amplifier Circuit Encyclopaedia

Rudolf F. Graf

233x186mm, 194 pages, Soft Cover

Price £11.50 Order Code MH184

Modern Measuring Circuit Encyclopaedia

Rudolf F. Graf

233x187mm, 229 pages, Soft Cover

Price £10.95 Order Code MH185

Modern Power Supply and Battery Charger Circuit Encyclopaedia

Rudolf F. Graf

232x186mm, 133 pages, Soft Cover

Price £9.50 Order Code MH186



The Laser Cookbook

190 x 235mm, 404 pages, soft cover, publication date 1988.
Gordon McComb.

£18.95

Order Code: MH133

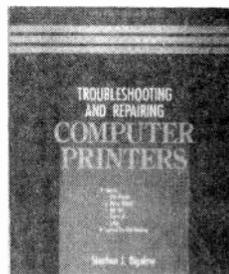
A hands-on introduction to laser theory and operation, with over 80 practical and easy-to-follow projects. These projects range from simple acoustic modulation of laser beam to super-accurate interferometers that precisely measure the speed of light, light wave-lengths, and light frequencies. Readers wanting to increase their knowledge of this subject should look no further than "The Laser Cookbook", "...provides a fascinating tour through the world of lasers. It is well written, amply illustrated, and lots of fun." (Modern Electronics)

Upgrade Your Computer Printer and Save a Bundle
LaBadie

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From adding ROM's to improve dot matrix quality to adding RAM to increase the input buffer size. From adding Adobe Postscript emulation to changing mirror rotation speed in laser printer engines. This book is a complete guide to getting the most from your printer at the lowest possible cost. Printers covered include Apple LaserWriters, Hewlett-Packard, Canon, Epson, Panasonic, and Okidata, plus many more since HP, Canon and Epson make many printer engines that are badged up under different names.



Troubleshooting and Repairing Computer Printers

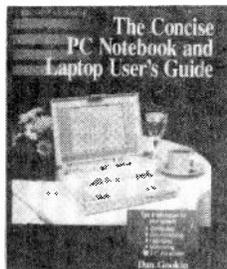
Stephen J Bigelow

237x193mm, 310 pages, Hard Cover

Price £ 27.95 Order Code MH175

A guide to repairing all types of printers that covers all levels of mechanical faults and electronic problems and an essential companion to anyone wishing to repair printers. Topics covered include memory, main logic, sensors, paper transport, print heads, power supplies, interfaces, etc. Also described are printing techniques, electrostatic, thermal, impact, and ink jet; software and hardware compatibility; plus much more.

COMPUTING



Concise PC Notebook and Laptop User's Guide

Dan Gookin

233x187mm, 275 pages, Soft Cover, includes software

Price £16.42 inc. VAT Order Code MH179

Portable computers are rapidly becoming the computer of choice for thousands of computer buyers. The convenience and flexibility of computers that weigh less than six pounds, along with the introduction of colour screens will ensure that laptops will become even more popular. This book provides a complete guide to laptop and notebook computers, from deciding and buying what you require, through setting up and use, to telecommunications and file transfer.



Simply PCs

150 x 220mm, 200 pages, soft cover, publication date 1992

Bob Albrecht

Price: £11.95

Order Code: MH125

New to the world of personal computers? lost amid the profusion of jargon and equipment? Then this book is a life line. A simple text that sets out to explain the basics and to help you choose exactly what you need. Descriptions of PC's, software, disk drives, modems, faxes, printers, operating systems etc in plain English - something of a first for a computer book.



Microcomputer Servicing: Practical Systems and Trouble Shooting 2nd Ed

Stuart M. Asser et al

190 x 240mm, 597 pages, hard cover. Publication date 1993

Price £24.95. Order Code MMI 005.

A practical guide to the principles of microcomputer repair, the book contains detailed explanations of the chips and circuits used in modern computers (predominately the IBM PC). Also covered are floppy disk drives and their servicing; hard disk data storage, interface, and handling techniques; memory organisation; and other peripheral devices including monitors. An ideal book for anyone who really wants to get to know the nuts and bolts of PC's.



The Setmakers

Order Code SET1

Price £14.95

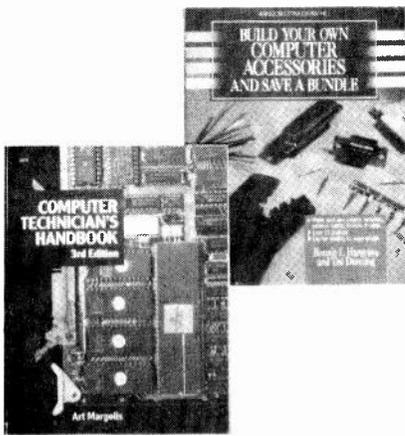
Keith Geddes & Gordon Bussey

464pp 243x172mm HB

An excellent volume covering the history of radio and television in great detail from the beginning. Printed on high quality paper and illustrated with nearly 500 photographs, over 100 in colour, many of which have never been reproduced before. An extremely carefully researched publication with an extensive bibliography.



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Bonnie J. Hargrave and Ted Dunning
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Miscellaneous**Computer Technician's Handbook**

Art Margolis
234x182mm, 571 pages, Soft Cover
Price £24.95 Order Code MH158

A fully up to date reference book for those involved in computer repair and those wishing to learn more about the subject. Hands on instruction to mend all the latest home or personal computers from descriptions of common 32 bit processors, large dynamic RAM's, to tips on surface mount chip replacement and soldering techniques this book has it all.

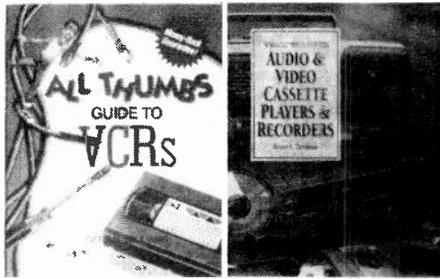
TV & VIDEO**HDTV Advanced Television for the 1990's**

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K. Blair Benson and Donald G. Fink.

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**Electronics and Related****Test and Repair****All Thumbs Guide to VCRs**

Gene B. Williams
190 x 240mm, 134 pages, soft cover
Price: £7.95. Order Code MH160

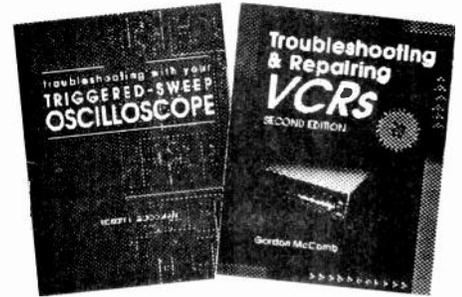
If your video recorder is a black box that sits in the corner of the room that is used time and time again with no thought to maintenance. Then this book is for you. Failure to clean and maintain VCR's leads to degradation of picture quality, damaged tapes and general poor performance, yet video recorders are perhaps the most intricate piece of equipment found in the home, and people are discouraged from touching them. This All Thumbs Guide takes you through all the basic maintenance procedures from cleaning the tape heads to tape repair and splicing.

Troubleshooting and Repairing Audio & Video Cassette Players & Recorders

Homer L. Davidson
190 x 240mm, 414 pages, soft cover.
Price £15.95. Order Code MH161

A guide to repairing domestic electronic equipment at all levels from cleaning to component level fault finding. Items covered include personal stereos, ghetto blasters, portable cassette recorders, car and home CD players, VCR's and camcorders. Hint and tips are available for all makes of equipment plus complete schematics for selected items and manufactures. This coupled with a clear text and diagrams make this book a must for any repair technician, or anyone else who has lost hope of having domestic equipment repaired.

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190 x 240mm, 300 pages, soft cover, publication date 1992.
Robert Goodman
Price: £16.50 Order Code: MH101

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Troubleshooting and Repairing VCR's 2nd Edition

190 x 240mm, 400 pages, hard cover, publication date 1991.
Gordon McComb.

£23.95 Order Code: MH102
A guide to fault finding, maintenance and repair of video recorders, for non-experts. This book takes you through all the basic cleaning and repair techniques, that do not appear in the user manuals. Sections on what to tweak and what not, when to consult a professional, what do when coffee is spilt inside a VCR, etc. Save a fortune on unnecessary repair shop visits.

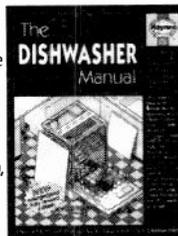
**Compact Disc Player Maintenance and Repair Manual**

190 x 235mm, 244 pages, soft cover, publication date 1987.
Gordon McCombs.

£11.95 Order Code: MH137
Specific guidelines for maintaining and repairing more than a 100 brands of CD players. Packed with quick and reliable answers to the problems of maintaining and repairing CD players, this illustrated do-it-yourself guide takes the apprehension out of first-time repairs. "A valuable accompaniment to a CD purchase...should be in the reference library of anyone who owns or is planning to own a CD player." (Midwest Book Review)

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HUMORESQUE OP 107
Pianist - Nicholas York
FOUR SLAVONIC DANCES: OP 46 nos. 1 and 2, OP 72
nos. 10 and 15
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CONCERTO GROSSO OP 3 NO. 4
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SHAREWARE PACKS

NOW ALL AT HALF PRICE!

All packs for PC's only. 3.5" disks will be sent unless stated otherwise. Please remember shareware programs require a separate payment to the author if found useful. Further info on Packs 1-7 & 21 on request (no room here!)

SHAREWARE PACK 1 (Kid's Educational 1) ~~£14.00~~ £5.50
These programs require a CGA, EGA or VGA monitor. These programs are suitable for children from about 3 to 7 years.

SHAREWARE PACK 2 (The Graphics Pack) ~~£12.00~~ £8.50
This pack contains 4 programs and many B&W clip art pictures.

SHAREWARE PACK 3 (VGA Games and Displays) ~~£14.00~~ £7.00
This pack contains a range of great games

SHAREWARE PACK 4 (Computer Start-Up Pack) ~~£14.00~~ £5.50
This pack contains many useful programs for those just starting on computing.

SHAREWARE PACK 5 (EGA Games) ~~£14.00~~ £7.00

SHAREWARE PACK 6 (EGA Games) ~~£14.00~~ £7.00

SHAREWARE PACK 7 (CGA Games) ~~£14.00~~ £5.50
These programs require a CGA, EGA or VGA monitor.

SHAREWARE PACK 8 (CGA Games) ~~£14.00~~ £5.50
Ford Simulator 1, Burger, Chernobyl, Galactic Conquest, Blastcga, Lawn, Pinball Games 1, Willy the Worm, Mario Brothers, Tetris, Motorman, Pango, Dul, Frogger, Ships, Landmine, Oilwell, Caverns of Gink, Wheel of Fortune, Boa, Mainbreak, Busido, Romaz, Stained Glass, Gapper, Kamakaze, Space Miner, Xetris, Boatwar, Brain Child, Conqueror, Darwin's Arena, Rimtrix, Stopsgn, Artic Adventure, ZZT - The Object Orientated Game, Alfie and Tear Down the Wall. These programs require a CGA, EGA or VGA monitor.

SHAREWARE PACK 9 (Windows ATM Fonts 1) ~~£20.00~~ £10.00
This pack contains 134 fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3 and the Adobe Type Manager program.

SHAREWARE PACK 10 (Windows ATM Fonts 2) ~~£14.00~~ £7.00
This pack contains 94 fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3 and the Adobe Type Manager program. These are different fonts to Shareware Pack 9.

SHAREWARE PACK 11 (True Type Fonts 1) ~~£17.00~~ £8.50
This pack contains about 130 True Type fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3.1.

SHAREWARE PACK 12 (True Type Fonts 2) ~~£14.00~~ £7.00
This pack contains about 90 True Type fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3.1. These are different fonts to Shareware Pack 11.

SHAREWARE PACK 13 (Archivers) ~~£17.00~~ £5.50
This pack contains a large number of file and program archivers (compressors). There are also many utilities specific to archivers and also some source code. Includes: Lha; Pkzip; Pak; Zoo; Arj; Splint; Zook; Zzap; Looz; Shez; Zip Chunker; Zip-Kit 9; Arcmaster; Diet; Slim; Pkzmenu; Noah; Lhmenu; Lhasrc; Lhx; Sez; Okumura; Zlptv; Nabob; Lzexe; Unlzxex; Compack; Pkllite; Ozf; Reccoment; Stripzip; Unzip; and Cvt.

SHAREWARE PACK 14 (Apogee Games Collection) ~~£17.00~~ £8.50
This pack contains a collection of the best games from Apogee Software. Includes: Wolfenstein 3D; Cosmo's Cosmic Adventures; Word Rescue; Secret Agent; Duke Nukem; Commander Keen (Invasion of the Vorticons), Commander Keen EGA (Goodbye Galaxy), Commander Keen Demo (Aliens Ate My Babysitter), Crystal Caves, and now Spear of Destiny (demo), the sequel to Wolfenstein 3D. This pack requires an EGA/VGA monitor for most of the games. Cosmo & Word Rescue require a 286 or better machine - Wolfenstein & Spear of Destiny require a 286 or better machine and a VGA monitor.

SHAREWARE PACK 15 (True Type Fonts 3) ~~£14.00~~ £7.00
This pack contains about 90 True Type fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3.1. These are different fonts to Shareware Pack 11 & 12.

SHAREWARE PACK 16 (Windows Games) ~~£14.00~~ £5.50
This pack requires Windows 3 and contains over 45 games. Includes: Lucas; Brick; MB; Moku; Mr Mind; Taipei; Winpoker; Yacht; Alien-F; Bang Bang; Bitmap; Klotz; Slot; Spacewar; Wordhai; Backgammon; Tsetse; Winchess; Winpente; Yahzee; Arachnid; Biorhythm; Blackout; Calculation Solitaire; Concentration; Roulette; Take One; Attaxx; Columns; Neko; Trails; Blackjack; Las Vegas Blackjack; Code Breaker; Cubic; Command; Plite; Triplets; Champ; Second Conflict; Win-Adv; Scramble; Hangman; Match; Frocks; Search2; and Canfld. Also included are 3 replacement VGA video drivers.

SHAREWARE PACK 17 (KJV Bible) ~~£14.00~~ £7.50
This pack contains the complete KJV Bible text with a concordance search facility. It will work on all types of monitor but requires 4.5M of hard disk space. Both the DOS and Windows 3 versions are included. The program comes from the USA and is called Seedmaster.

SHAREWARE PACK 18 (Murder & Mystery) ~~£10.00~~ £5.00
This pack contains five great graphical adventure games for those with murder in mind. Includes: Hugo's House of Horrors; Hugo II - Whodunit?; Hugo III - Jungle of Doom; Last Hall of Darkness; Dracula in London. These games require an EGA or VGA colour monitor and are highly graphical but do require some typing of words.

SHAREWARE PACK 19 (Junior Educational) ~~£14.00~~ £5.50
This pack contains many educational programs suitable for children from 5 years to 11 years old. Includes: Mathmaster; Dad's Choice; Math Practice; Memory; Save the Planet; Math-test; Mom's Math; What's the Problem; Mighty Math; Animated Memory Game; Animated Math; and Animal Quest. The last 3 programs require an EGA or VGA monitor, the others require a CGA, EGA or VGA monitor.

SHAREWARE PACK 20 (Learn a Language) ~~£12.00~~ £6.00
If you want help on your French, Spanish, Italian, German, Chinese or Japanese then maybe this pack is for you. Includes: French Hangman; French Tutor; French Assistant; German Tutor; Italian Tutor; Spanish Hangman; Spanish Tutor 1; Spanish Tutor 2; Spanish for Travellers; Chinese; Chinese Flashcards; Cantonese; Japanese; Translator Dictionaries. All these programs require a CGA, EGA or VGA monitor.

SHAREWARE PACK 21 (A Windfall of Windows) ~~£14.00~~ £8.00
This pack has over 80 different utilities, games, fonts, educational programs, etc. All these programs require Windows 3 (some will require Windows 3.1).

SHAREWARE PACK 22 (DOS Tutors) ~~£12.00~~ £6.00
This is a collection of DOS tutors, reference text files and utilities ranging from the very simple to the extremely hard. Includes: Tutor Dos; PC Prompt; Tutor Com; Dos Help; GCSE Computers; Dos Practice; Dos Manual; Quikhelp; File Ext; Help Dos; Dos Summary; Dosea - Absolute Beginners; Dosea for MSDos 5; and Dosea 6.

SHAREWARE PACK 23 (Super EGA Games) ~~£14.00~~ £5.50
This is a collection of 8 games for colour EGA or VGA monitors. It consists of: Jill of the Jungle; Mike Rock 1; Lavacap; Kiloblaster; The Orion Odessey; Solitile; Ladder Man; and Keen Dreams.

SHAREWARE PACK 24 (Great EGA Games) ~~£17.00~~ £5.50
This is a collection of 13 games for colour EGA or VGA monitors. It consists of: Crusher; Green; Catacomb Abyss; World Empire; EgaTrek; Intra Galactic Battles; Oilcap; Dodgem; Robomaze 3; Tile Match; Kalaha; Leong; and Palanda.

SHAREWARE PACK 25 (VGA Games) ~~£14.00~~ £5.50
This is a collection of 7 games for colour VGA monitors. It consists of: Death Watch; Capture the Flag; Corncob 3D; Doublelink; Galactix; Moraff's Escapee; and Phiox.

SHAREWARE PACK 26 (True Type Fonts 4) ~~£14.00~~ £7.00
This pack contains over 90 True Type fonts. They vary from reasonable to good and are mainly decorative. This pack requires Windows 3.1. These are different fonts to Shareware Pack 11, 12 & 15

SHAREWARE PACK 27 (Windows Waves) ~~£14.00~~ £5.50
This pack contains over 100 WAV files and lots of WAV utilities, such as VOC to WAV converter, AdLib WAV player, drag and drop Sez; Okumura; Zlptv; Nabob; Lzexe; Unlzxex; Compack; Pkllite; WAV player, etc. This pack requires Windows 3.1.

SHAREWARE PACK 28 (Junior Educational) ~~£14.00~~ £5.50
This pack contains many educational programs suitable for children from 5 years to 11 years old. Includes: Math Workout; Math Castle; Dinosaur Database; Melissa's Music Flashcards; Googol Review; Googol Math Games; Logo Graphics; Wordtrix; Flags of the World; Algebrax; and Flags. Requires EGA or VGA monitor.

SHAREWARE PACK 29 (GIF Images) ~~£17.00~~ £5.50
This pack contains over 80 colour images in GIF format. Most are in 256 colours and they vary from drawings to photographs. Also included is VUIIMAGE, a utility to print and view GIF, PCX and TIFF files. You will need a VGA colour monitor to view these images properly and also some computer experience to set up the program.

SHAREWARE PACK 30 (Windows Games) ~~£14.00~~ £5.50
This pack requires Windows 3.x and contains over 30 games. Includes: Ant Farm; Almonds; Bandit; BattleSat; Blitzter; Block Breaker; Button Madness; Dice; GNU Chess; Gatling; Hop; IC Test; Ico Frite; Lander; Landmine; Puzzle; Slide; Space Walls; Termite; TicTacToe; Triplets; WinJack; WinTris; WinWheel; Window Craps; Wormwar; Mines; Checkers; Icon Hunt; Simon. Patience; Accordion; MLC GuessIt; and Brain Games.

SHAREWARE PACK 31 (Soundblaster) ~~£14.00~~ £5.50
This pack contains a mixture of programs and music files for your SoundBlaster board. Includes: Musician 1 (music composing); Modplayer (plays MOD files, requires 386 or better machine); JMplayer (plays MOD files); Drumbaster (electronic

drum machine); Trakblaster (plays MOD files); and many sample MOD music files for you to try out. This pack requires the SoundBlaster board, a 286 or better machine and a VGA monitor.

SHAREWARE PACK 32 (Soundblaster Demos) ~~£14.00~~ £6.50
This pack contains many stunning demos for computers equipped with a Soundblaster board. The music and visual content are both excellent. Titles include: xmas256; groan; land; inspdemo; jidemo; tztechno; vega; wetdream; putfac; mental-s; rebalfun; spacelun; vectordemo; and yardemo. This pack requires the SoundBlaster board, a 286 or better machine and a VGA monitor. This pack is only available on 3.5 inch disks.

SHAREWARE PACK 33 (Soundblaster Demos) ~~£14.00~~ £6.50
This pack contains many stunning demos for computers equipped with a Soundblaster board. The music and visual content are both excellent. Titles include: comly; cronolog; dreamteam; bugs bunny video; collapse; comodemo; dragnet; fishro; vicky; vv; balmania; coldcut; friday the 13th; and meat. This pack requires the SoundBlaster board, a 286 or better machine and a VGA monitor. This pack is only available on 3.5 inch disks.

SHAREWARE PACK 34 (Demo Games Pack) ~~£14.00~~ £5.50
This pack contains many games demos. They are all playable to some extent - some will not save, some have only a few levels and some play for only 10 minutes. Most require a 286 or better machine and a colour VGA monitor. Titles include: Out of this World; Christmas Lemmings; Lemmings; Covox level Lemmings; Prince of Persia; McArthur's War; IFR Flight Simulator; Indiana Jones and the Fate of Atlantis; Falcon 3D simulator; Rick Dangerous 2; and Freaking Fuzzballs. Well worth having this collection even though they are demo versions. This pack is only available on 3.5 inch disks.

SHAREWARE PACK 35 (Tetris Mania) ~~£14.00~~ £5.50
This pack has all Tetris type games for those of you who cannot get enough of them. Includes: Atomic Tetris; Blox; Colours; Columns; Double Blocks; Doublelink; Egaint; Fallout; Fence; Flipdrop; Frac; Kentris; Netris; Notrus; Quatris; Rammer; Ropo; Soviet; Teamtris; Towerx; Wordtris; Xetris; and more. Requires an EGA or VGA monitor, some games may require a 286 or better machine.

SHAREWARE PACK 36 (Kid's Educational 2) ~~£14.00~~ £6.50
This pack contains programs suitable for children from about 3 to 7 years. It includes: Animated Alphabet; Baby Keys; Dressup; Animated Words; Fun with Letters & Words; Preschool Playpak; ABC Funkeys; Addit; Flashcard Arithmetic; Shapes & Letters; Shoot the Letters; Katie's Clock; and Fun Face. These programs require an EGA or VGA monitor and most require a mouse.

SHAREWARE PACK 37 (Kid's Educational 3) ~~£14.00~~ £6.50
This pack contains programs suitable for children from about 3 to 7 years. It includes: Danny's 1st Program; 123 Talking Teacher; DTQ (memory match); Counting Shapes; John (baby's animated game); Numbers drop game; Sparky's adding game; Wunder Book; Spellit; Mole's Colouring & Drawing Book; Musical Paint Brush (requires VGA); Crayon Box; Drawsome; EGA Mouse Paint; Sarah Kid's program; Kidzmath; Nathas Flashcards; Dino Maker; ABC for Tots; Kinder Sketch; Alphabet (requires VGA); Musical Alphabet; Animated Shapes; ABC Talking Teacher. These programs require an EGA or VGA monitor and most require a mouse.

GREAT ARCADE ACTION

SHAREWARE PACK 38 (Great Arcade Action) ~~£14.00~~ £6.00
This pack contains the latest and best shareware arcade games. All require a 286 or better machine and an EGA or VGA monitor. Most support Soundblaster or Adlib cards. MONSTER BASH is the latest platform jumping game from Apogee. It contains great graphics, sound and action. KEN'S LABYRINTH is a 3D virtual reality maze game similar to the Wolfenstein 3D game. It requires a VGA monitor. ZONE66 is a fast and furious fighter jet bombing raid game that requires a 386 or better machine, at least 2M of memory and a VGA monitor. LEGEND OF MYRA is a Boulderdash type game where you travel underground as a rabbit. Requires a VGA monitor. ELECTRO BODY is a platform jumping game with great graphics. MAJOR STRYKER is a space shoot-em-up game with good scrolling graphics from Apogee. These programs only come on 3.5 inch HD disks.

JURASSIC PACK SPECIAL

SHAREWARE PACK 39 (Jurassic Pack Special) ~~£14.00~~ £5.00
This pack contains games, amusements and educational programs on the dinosaur theme. Most of these programs require a VGA monitor and some require a mouse. DORK'S DREAM is a maze/puzzle game where Dork the Dinosaur must traverse 8 levels avoiding all the nasties. DINOSAUR DATABASE is a good educational program for children showing loads of information on dinosaurs both in graphics and text. PICTURE PUZZLE is a computer jigsaw puzzle which includes a great picture of a Tyrannosaurus Rex. DINOFLI is an animated scene of a Tyrannosaurus Rex. DOLLARS & DINOSAURS is an educational game for young children offering spelling activities. BERT'S DINOSAURS is a colouring book for children where you choose from many landscapes and dinosaurs. DINO is a simple picture 3D virtual reality educational toy where you can zoom in and out at any angle around a dinosaur. DINOSORCERER is a program where you can make up different types of dinosaurs from a range of heads, bodies and tails.



New CD-ROM Disks

So new in fact that details are a little sketchy on some of them. We will need time to take a better look and more details will be available in the Greenwald Guardian and on the fax on demand system.

Notes

1/ In advising the minimum system requirements we have reproduced the equipment specified by the software supplier. Those disks marked * do not have relevant information supplied; so we have tended to err on the side of caution and it may be possible to run the software on a lower system but that cannot be guaranteed.

2/ Obviously you will require a CD-ROM drive to use these disks (see page 65 for suitable drive). You will also require Microsoft's CD-ROM extension (MSCDEX) version 2.2.

3/ SVGA is mentioned a number of times in this list and implies that the computer requires a VGA card with at least 512k of video RAM that is capable displaying resolutions of at least 640 x 480 pixels x 256 colours. To use higher resolutions than standard VGA (640x480x16) Windows display you will have to install the Windows drivers supplied with your SVGA card - see your card manual and the Windows manual.

4/ Many new programs are written for Windows 3.1 and will not work on the older 3.0

5/ The term multimedia refers to computers that use both sound and vision and are generally assumed to be running Windows 3.1, with its advanced sound control programs, and have a sound card installed that is Soundblaster compatible.

Atlases, Encyclopædia, Educational, and Reference.

World Atlas

Software Toolworks Copyright 1991.

Price £39.95 Order code CDR101

Minimum requirements: 286 PC, 1Mb RAM, hard disk, VGA, DOS 3.1.

An atlas of the world with zoom and country information utilities.

International Business and Economic Atlas

Software Toolworks Copyrighted material

Price £29.95 Order code CDR102

Minimum requirements: 8086 PC, 640k, hard disk, VGA, DOS 3.1.

An international economic atlas that is a powerful data base, combining state of the art maps and business information. All information can be printed as text, maps, and graphs. An atlas, almanac, and business resource book in one program.

Great Cities of the World Vol. 1.

InterOptica Publishing Ltd Copyrighted material.

Price £34.95 Order code CDR103

Minimum requirements: 286 PC, 2Mb, hard disk, VGA, audio board, DOS3.1, Windows 3.1

Multimedia travel guide providing fast facts on: Climate, currency, useful phrases, culture, sights, transport, shopping, recreation and much, much more in your chosen destination.

Great Cities of the World Vol. 2.

InterOptica Publishing Ltd Copyrighted material.

Price £34.95 Order code CDR104

Minimum requirements: 286 PC, 2Mb, hard disk, VGA, audio card, DOS3.1, Windows 3.1

More of the above!

World Traveller Vol. 1

Chestnut CD-ROM Inc. Copyrighted material.

Price £16.95 Order code CDR105

Minimum requirements: 8086PC, 640k, SVGA, DOS 3.1.

A photo library of places to visit around the globe.

National Parks The Multimedia Family Guide

Eduquest Copyrighted material.

Price £44.95 Order code CDR106

Minimum requirements: 286PC, 1Mb, hard disk, VGA, audio card, DOS 3.1, Windows 3.1

Multimedia guide to all of America's national parks, monuments, memorials, etc.

Terrorist Group Profiles

Quanta Press Inc. Copyrighted material

Price £44.95 Order code CDR107

Minimum requirements: 8086PC, 640k, VGA, DOS 3.1.

A collection of photographs, written profiles, aims, objectives and MO of various terrorist groups around the world. A must for anyone who has ever had a picture of Ché Guavara pinned to their wall.

Time Desert Storm

Time Magazine/Warner New Media Copyrighted material

Price £39.95 Order code CDR108

Minimum Requirements: 386PC, 4Mb, hard disk, VGA, audio card, DOS 3.1, Windows 3.1.

Time Magazine's multimedia account of the 1991 Gulf war.

Colossal Cookbook

Chestnut CD-ROM Copyright/shareware/PD/freeware.

Price £19.95 Order code CDR109

Minimum requirements: 8086PC, 640k, DOS 3.1, .

A collection of recipes from around the world, meal planners, health and nutritional information. Thousands of recipes for the home chef.

Masterpiece Library

Pacific HiTech Inc. parts copyright

Price £34.95 Order code CDR110

Minimum requirements: 8086PC, 640k, DOS 3.1

A complete library of the great works literature from ancient Greece to the present all on one CD. Indexing and search software make finding quotes and phrases a dream compared to wading through volumes and volumes of written books.

Mayo Clinic Family Health Book Interactive Edition

Mayo Foundation Copyrighted material.

Price £34.95 Order code CDR111

Minimum requirements: 386PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

A medical encyclopædia on disk - see if you can guess what horrible disease you have.

The family Doctor

Creative Multimedia et-al Copyrighted material.

Price £49.95 Order code CDR112

Minimum requirements: 286PC, 1Mb, hard disk, VGA, DOS 3.1

As CDR111.

Composer Quest

Jeff Pucci / Richard Viard Copyrighted material.

Price £49.95 Order code CDR113

Minimum requirements: 386PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

A multimedia encyclopædia of classical composers from 1600 to present.

Multimedia Computer Tutor

Multimedia Products Corporation Copyright.

Price £34.95 Order code CDR114

Minimum requirements: 286PC, 2Mb, hard disk, VGA, DOS 3.1, Windows 3.1.

Tutorial disk for PC users that introduces PC's, DOS, Windows, and typing to the new comer to computing.

The Animals of San Diego Zoo

Software Toolworks Copyright.

Price £34.95 Order code CDR115

Minimum requirements: 386PC, 2Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.

Learn all about the world animals with this multimedia experience.

Games

Barney Bear Goes to Space

Free Spirit Software copyright 1993

Price £34.95 Order code CDR116

Minimum requirements: 286PC, 1Mb, audio card, VGA, DOS 3.1.

Multimedia children's musical game that introduces space flight and astronomy.

King's Quest V

Sierra On-Line Inc. Copyright 1992

Price £29.95 Order code CDR117

Minimum requirements: 386PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

Game in which an unfortunate king's castle and kingdom disappear, can you help him get them back?

Death Start Arcade Battles

Chestnut CD-ROM copyright 1992-1993, shareware, PD, freeware.

Price £19.95 Order code CDR118

Minimum requirements: 8086PC, 640k, VGA, DOS 3.1. Note: some games on this disk will require higher systems.

A huge collection of arcade and strategy games

Jones in the Fast Lane

Sierra On-Line Inc. Copyright 1992

Price £27.95 Order code CDR119

Minimum requirements: 8086PC, 640k, VGA, DOS 3.1 for DOS version. Note: the following are required for the windows version on the same disk. 386PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

Game based on life in the 1990's whereby you have achieve certain goals, such as, money, job, education, etc.

The Games Master 2nd Edition

Advantage Plus Distribution shareware

Price £19.95 Order code CDR120

Minimum requirements: 8086PC, 640k, CGA, DOS 3.1. Note: some games on this disk will require higher systems.

A collection of over 700 shareware games with index, help, and search software.

Giga Games

Walnut Creek CD-ROM shareware

Price £19.95 Order code CDR121

Minimum requirements: 8086PC, 640k, CGA, DOS 3.1. Note: some games on this disk will require higher systems.

A collection of more than 8000 games and utility files for the computer games addict. Fixes for infinite lives and cheat files for commercial games, source code listings, education games, puzzles and trivia, and much, much more!

Space Quest IV: Roger Wilco and the Time Rippers

Sierra On-Line Inc. Copyright 1992

Price £32.95 Order code CDR122

Minimum requirements: 8086PC, 640k, VGA, DOS 3.1 for DOS version. Note: the following are required for the windows version on the same disk. 386PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

Game involving the intrepid Roger Wilco and his attempts achieve the goal of this game - more information when we have time.

Games 1993

Shareware

Price £32.95 Order code CDR123

Minimum requirements: 8086PC, 640k, CGA, DOS 3.1. Note: some games on this disk will require higher systems.

Assortment of more 6000 games and related files.

Hardware Utilities

Encyclopædia of Sound Volume 1

Chestnut CD-ROM Copyrighted material

Price £16.95 Order code CDR124

Minimum requirements: 286PC, 2Mb, hard disk, audio card, VGA, DOS3.1, Windows 3.1.

A number of years ago the BBC released a sound effects

album and strangely enough it became a hit album as far as sales were concerned. Now technology provides an easier access to sound effects via CD-ROM and computer. Includes 211 WAV effects, 13 WAV music clips, 7 full length musical scores, VOC sound effects, sound players, and utilities for multimedia applications.

SoundWAV Volume 1

Data Express Inc. Copyright 1993

Price £39.95 Order code CDR125

Minimum requirements: 286PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

600Mb of professional recorded royalty free WAV files ranging from the everyday to the exotic; to bring life to your multimedia presentations.

Sound Sensations

Chestnut CD-ROM shareware

Price £19.95 Order code CDR126

Minimum requirements: 286PC, 2Mb, hard disk, audio card, VGA, DOS 3.1, Windows 3.1.

A selection of sound effects, voices, music, sound clips, and utilities for Soundblaster, Adlib, Covox, and MIDI sound systems.

Laser Printer Companion

Wayzata Technology Copyright 1992

Price £19.95 Order code CDR127

Minimum requirements: 286PC, 1Mb, hard disk, VGA, DOS 3.3/Apple Mac 1Mb, hard disk.

A guide to professional publishing techniques, photograph transparencies, transparencies, film negatives and positives. Service and maintenance tips, efficient use of printers, and much more.

Utilities for Programming and Non-DOS Operating Systems

AB20 Amiga CDROM

Walnut Creek CDROM shareware

Price £16.95 Order code CDR128

Minimum requirements: Amiga A600

Innumerable collection of Amiga programs, utilities, demo's, pictures, source code, and much more from the Internet AB20 Archive.

Hobbes OS/2 CDROM

Walnut Creek CDROM shareware

Price £16.95 Order code CDR129

Minimum requirements: 386PC/PS2, 8Mb, hard disk, SVGA, OS/2 or OS/2 V2.1.

A vast collection of OS/2 utilities from the Internet Hobbes archive. Includes word processors, calculators, icons, bitmaps, games; a complete programming environment with C++ compiler, prolog interpreter, and other languages; UNIX GNU utilities ported to OS/2.

X11R5 GNU CDROM

Walnut Creek CDROM shareware

Price £19.95 Order code CDR130

Minimum requirements: SUN4 SPARC station

X11R5 window system and GNU software binaries for the SUN4's SPARC processor. X11R5 can also be run on other UNIX systems that support bitmapped displays and the disk contains all the X11R5 distribution at patch level 17 along with many user contributed X11 programs. Software includes C/C++ compiler/cross compiler, GNU assembler and linker, Bison compiler-compiler and FORTRAN to C translator. Many other programming tools and utilities are included, some of which can run under MSDOS.

Source CDROM

Walnut Creek CDROM shareware

Price £19.95 Order code CDR131

Minimum requirements: DOS systems with appropriate compilers and hardware for source codes.

Collection of source codes for games and utilities in various languages. More details when we have time to take a better look.

Pictures.

Media Clips Wild Places

Arts Entertainment limited freeware

Price £39.95 Order code CDR132

Minimum requirements: Macintosh, 8 or 24 bit colour display, System software 6.0.5, 32 bit colour QuickDraw / 8086PC, 640k, SVGA / Windows version requires 386PC, 2Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.

Photo library of beautiful scenery around the United States for wall paper and DTP applications.

Media Clips Money, Money, Money!

Arts Entertainment limited freeware

Price £34.95 Order code CDR133

Minimum requirements: Macintosh, 8 or 24 bit colour display, System software 6.0.5, 32 bit colour QuickDraw / 8086PC, 640k, SVGA / Windows version requires 386PC, 2Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.

Extraordinary photo and multimedia library of money, money movies and money sounds!

Media Clips Jets and Props

Arts Entertainment limited freeware

Price £44.95 Order code CDR134

Minimum requirements: Macintosh, 8 or 24 bit colour display, System software 6.0.5, 32 bit colour QuickDraw / 8086PC, 640k, SVGA / Windows version requires 386PC, 2Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.

Two disk photo and multimedia library of jet and propeller driven aeroplanes for wall paper, DTP, and multimedia presentations.



COMPUTERS, SOFTWARE & ACCESSORIES

27 Park Road, Southampton, SO1 3TB, Tel (0703) 236363 Fax 236307

Media Clips Island Designs

Aris Entertainment copyright 1992
Price £34.95 Order code CDR135
 Minimum requirements: Macintosh, 8 or 24 bit colour display, System software 6.0.5, 32 bit colour QuickDraw / 8086PC 640k, SVGA / Windows version requires 386PC, 2Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.
 Two disk set of Hawaiian and Polynesian patterns and fabric designs. Sound files give your computer an authentic tropical paradise feel!

Image Library

Powersource Inc. shareware, PD, freeware
Price £19.95 Order code CDR136
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1.
 A collection of over 6000 GIF files, from abstract art to test patterns.

GIFs Galore CDROM

Walnut Creek CDROM
Price £16.95 Order code CDR137
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1.
 A collection of over 5000 GIF images and viewers for PC's, Mac's, Amigas, and UNIX based systems.

So Much Space

Power User Software inc. shareware, PD, freeware
Price £24.95 Order code CDR138
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1, sound card optional.
 Over 400 high quality images ranging in resolution from 320x200x256 to 1024x768x256, that feature shots from space and astronomy.

Tempra Access Photo CD Imaging Software

Mathematica Inc. copyright 1992
Price £39.95 Order code CDR139
 Minimum requirements: 286PC, 2Mb EMS, VGA, photo CD compatible CD-ROM drive, DOS 4
 Manipulate bitmapped and photo CD-ROM pictures on your PC. Converts between image formats.

Our Solar System

Chestnut CD-ROM shareware, PD, freeware
Price £19.95 Order code CDR140
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1.
 Astronomy and space photographs and programs, including: NASA photos, planet and star locators, planetarium programs, and much more.

Voyage to the Planets Volume 3

Astronomical Research Network copyright 1991
Price £57.95 Order code CDR141
 Minimum requirements: 286PC, 1Mb, VGA, DOS 3.1 / Apple Mac.
 Contents a little Sketchy at the moment; may contain photos of Mars

Island Girls

Pacific CD copyright
Price £26.95 Order code CDR142
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1.
 Collection of photographs of scantily clad and completely unclad girls - a must for the lecherous PC user.

Exotic Girls

Pacific CD copyright
Price £34.95 Order code CDR143
 Minimum requirements: 286PC, 1Mb, SVGA, DOS 3.1.
 More of the above that will insure the complete blindness of teenage computer users.

Clip art and Fonts

PCX Potpourri

Florida Lions Den limited freeware
Price £31.95 Order code CDR144
 Minimum requirements: 286PC, 1Mb, VGA, DOS 3.1, DTP software.
 An extensive collection of PCX clip art files and fonts for DTP applications.

Clip Art Gollath

Chestnut CD-ROM shareware
Price £19.95 Order code CDR145
 Minimum requirements: 286PC, 1Mb, VGA, DOS 3.1, DTP software.
 A PCX and TIFF library of over 11 000 images suitable for most DTP programs

Fonts for the Professional Publisher

Micro Media Inc. shareware
Price £29.95 Order code CDR146
 Minimum requirements: 8086PC, 640k, VGA, DOS 3.1, DTP software.
 A huge collection of PD and shareware fonts that are grouped into the following formats: Atech Fast Font, Adobe Type Manager (Type1), Agfa Intellifont, Geoworks, True Type Fonts, Royal Unv.

Too Many Type fonts

Chestnut CD-ROM shareware
Price £19.95 Order code CDR147
 Minimum requirements: 8086PC, 640k, VGA, DOS 3.1, DTP software.
 More shareware and PD fonts for the following formats: True Type, First Publisher, Ventura, HP LaserJet, Adobe Type Manager, Windows, and more.

Publishers Paradise

Media Graphics International copyright 1993
Price £36.95 Order code CDR148
 Minimum requirements: 8086PC, 640k, VGA, DOS 3.1, Windows 3.x, DTP software./ Equivalent Apple Mac.
 150 fully scalable True Type fonts for use with any Windows application. Plus 1500 Clip art images PCX/TIFF format and 550 images in EPS and CoralDraw/ CDR format.

Miscellaneous Shareware

PC-Medic

PC Medical Centre shareware.
Price £34.95 Order code CDR 149
 Minimum requirements: 8086PC, 640k, DOS 3.1
 A collection diagnostic, reference, tutorial and utility software for PC's. Thousands of programs on this disk to keep your PC in tip top health.

The Best from the World of Shareware

The Software Farm shareware
Price £39.95 Order code CDR150
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on these disks will require higher systems or alternative operating systems.
 3 Disk set of shareware programs.

14 000 Programs

Powersource Inc. shareware
Price £19.95 Order code CDR151
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems or alternative operating systems.
 14000 shareware programs covering just about every field.

Garbo CDROM

Walnut Creek CDROM shareware
Price £16.95 Order code CDR152
 Minimum requirements: 8086PC, 640k, DOS 3.1 / Apple Mac
Note: some software on this disk will require higher systems or alternative operating systems.
 Thousands of DOS and Mac programs from the Garbo archive.

Simtel MSDOS CDROM

Walnut Creek CDROM shareware
Price £16.95 Order code CDR153
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems or alternative operating systems.
 Over 9000 programs from the Simtel20 Internet Archive.

The 640Meg Shareware Studio CD ROM Volume 2

Data Express Inc. shareware
Price £26.95 Order code CDR154
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems.
 A collection of over 5000 shareware programs covering all fields.

The Education Master 2nd Edition

Advantage Plus Distribution Inc. shareware.
Price £24.95 Order code CDR155
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems.
 A collection of education shareware covering: astronomy, biology, games, maths, history, chemistry, language, spelling, and many other topics.

The Business Master 2nd Edition

Advantage Plus Distribution Inc. shareware.
Price £19.95 Order code CDR156
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems.
 Business shareware collection covering: accounting, banking, calculators, databases, DOS help, engineering, real estate, spreadsheets, word processing, Windows, and much more.

HAM Radio

Chestnut CD-ROM shareware
Price £17.95 Order code CDR157
 Minimum requirements: 8086PC, 640k, DOS 3.1. **Note:** some software on this disk will require higher systems.
 Shareware for the amateur radio enthusiast covering: packet radio, frequency lists, equipment mod's, exam study, SWL and DX, and more.

MIN2 Well balanced material, 7,700 files, 630Mbytes. **£29.95**
MIN3 Latest disk, over 85% 1992 files, 6,600 files, 550Mbytes **£29.95** Two further disks are due out soon.

Windows

MPC Wizard

Aris Entertainment limited freeware
Price £16.95 Order code CDR158
 Minimum requirements: 386PC, 4Mb, hard disk, audio card, SVGA, DOS 3.1, Windows 3.1.
 Diagnostics and test disk for PC's running Windows. Programs to test and optimise the video, sound, and performance of your MPC (multimedia personal computer). Also included are 5C picture and 50 sound files.

Windows Programs

Powersource Inc. shareware
Price £19.95 Order code CDR159
 Minimum requirements: 286PC, 2Mb, hard disk, VGA, DOS 3.1, Windows 3.1. **Note:** some programs on this disk may require SVGA, 386, and an audio card.
 Huge collection of windows shareware covering all fields.

CICA Microsoft Windows CDROM

Walnut Creek CDROM
Price £16.95 Order code CDR160
 Minimum requirements: 286PC, 2Mb, hard disk, VGA, DOS 3.1, Windows 3.1. **Note:** some programs on this disk may require SVGA, 386, and an audio card.
 Thousands of MS Windows programs from Indiana University's Centre for Innovative Computing Applications collection.

Windows 1993

Chicago Computer Broker shareware.
Price £34.95 Order code CDR161
 Over 7000 Windows shareware files featuring: CorelDraw! utilities, BMP files, wallpaper, games, icons, fonts, screen savers, clip art, and more.

Windoware

Walnut Creek CDROM
Price £19.95 Order code CDR160
 Minimum requirements: 286PC, 2Mb, hard disk, VGA, DOS 3.1, Windows 3.1. **Note:** some programs on this disk may require SVGA, 386, and an audio card.
 Even more shareware for Windows.

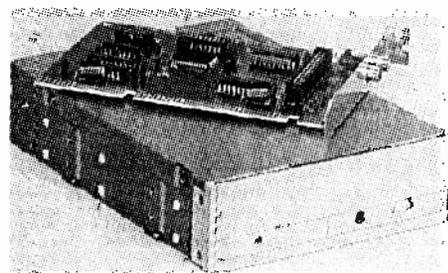
The Window Master

Advantage Plus Distribution shareware
 Walnut Creek CDROM
Price £21.95 Order code CDR160
 Minimum requirements: 286PC, 2Mb, hard disk, VGA, DOS 3.1, Windows 3.1. **Note:** some programs on this disk may require SVGA, 386, and an audio card.
 A collection of more than 2000 Windows shareware programs.

SPECIAL PACKAGE DEAL!

All the CD-ROM's shown on the front page of this brochure for just **£89.95**

CD ROM DRIVE



More and more software is becoming available on CD-ROM and once you've purchased a suitable drive, it's an incredibly cheap way of buying shareware. We can supply a Mitsumi CD ROM drive kit which is Kodak Photo CD compatible (multi-session) with the following spec. We can vouch for it's speed and reliability, as we have one fitted to one of our computers. Look at these features:

- ◆ Slide Top Loading
- ◆ Mscdex Supported
- ◆ Multi Media Support
- ◆ Audio Playback
- ◆ Direct Interface to PC/AT
- ◆ 380 Millisecond access

Full data on request

PRICE £199.95

ROM drive kit!

Also the popular **Soundblaster V2 Pro**. This amazingly versatile package will give you stereo music, voice, game port, midi, CD-ROM interface. Supplied with Stereo Card, Audio cables, 3.5" disks, Manual + lots of exciting software - Indy 500, Lemmings, Text to speech, multimedia encyclopaedia (really amazing - includes still & moving pictures + sound). We'll send you more info on request.
 The whole package for just **£149.95**



A new range of high quality electronic kits. All supplied with a full set of components, inc sockets for the IC's; screen printed, solder masked tinned fibreglass PCB's with comprehensive instructions.

Kit 1. THREE DIGIT PANEL METER and COUNTER MODULE Basic low cost counter. Two or more counter modules may be plugged together with 6-pin sockets & harness provided. Uses a single-unit 3-digit LED display. Built around the 14553 & 14551 chips. Box & battery provided. The separate COUNTER MODULE shows how to use the Kit as a counter. Has COUNT & RESET switches with debounce circuit built in to eliminate problems from noisy switches. 9V battery operation. £16.53

Kit 2. LCD TEMPERATURE METER Introduces 3 1/2 digit LCD and the very popular 7106 IC. This IC has been used in low-cost multimeters for over 13 years. We use it to measure temperature using an ordinary signal transistor as the sensor. Data sheets provided. Breadboard area so you can extend the circuit to build your own voltmeter, ammeter, resistance meter or extended-range temperature meter. Takes away the mystery of how multimeters work. Box provided. 9V battery operation. £29.80

Kit 3. LED DICE WITH SLOWDOWN. A kit to introduce you to electronics and circuit analysis. Seven LEDs arranged like a real dice face. Push the switch and the dice rolls then slows down. Ingenious circuit design used to minimise components. Uses 14017 & 555. Box included. 9V battery operation. £9.70

Kit 4. INTRODUCTION TO A POWER SUPPLY Batteries soon become an expensive way to power your electronic kit and electronic games. This is a basic power supply using two 7805 regulators. Input up to 20V AC from a transformer or power pack. Two regulated outputs - fixed 5V, the other variable. Box provided. Good introduction to electronics. £11.48

Kit 5. STAIRWAY TO HEAVEN. A game of skill to turn on the Stairway of 6 LED's as the bi-colour LED flashes. Introduces you to several electronics basic circuits with a surprisingly difficult game to play. Box included. Good introduction to electronics. 9V battery. £9.79

Kit 6. ROULETTE LED. Electronic game. Ten LED's in a circle. One LED is turned on at a time to simulate the spinning of a roulette ball around the wheel. Uses voltage controlled oscillator circuit. 'Ball' gradually slows down and stops on a number. 'Ball' speed can be adjusted. Uses 9V battery. £12.44

Kit 7. 3V FM TRANSMITTER. The most powerful 'bug' available for its size, 3V supply and number of components. Guaranteed to transmit over 100 meters within buildings and to 500 meters in the open. Easily tunable in the FM band. Greater range at higher voltage and better aerial. £4.95

Kit 8. LIGHT ALARM. Detects very small amounts of light and sounds the piezo alarm. Put it in your cash box or cupboard. Uses Darlington photo transistor MEL12 and 14011 IC. Educational kit. £5.74

Kit 9. OSCILLATOR BUILDING BLOCKS. A learning module. Build and experiment with the Astable, Monostable and RS flip-flop Multivibrators on the one PCB. 6 LED's & 9V battery powered. See and understand exactly how each works. Good introduction to electronics. £5.65

Kit 10. TOUCH and CONTACT SWITCH. Both types of switch are built onto the one PCB so you can see and explore how each type works. A battery can power the touch switch (2 contacts) but a mains power supply (like DIY Kit 4) must be used for the touch plate (1 terminal) to work. High quality 12V relay rated at switching 240V/3A supplied. Uses 14011 IC. £8.05

Kit 11. INTRODUCTION TO LM3909. CONTINUITY TESTER & LONG-LIFE FLASHER. Most IC's operate in the 4V to 40V range. The LM3909 from National Semiconductor changed this. Two PCB's supplied. A 1.5V D cell will flash an LED for over two years. Use as an imitation car alarm. A second PCB connects the chip as a 1.5V continuity tester. Seven pages documentation provided from National Semiconductor. £7.83

Kit 12. AUDIO-TO-LIGHT MODULATOR. Introduces the Optocoupler-triac MOC3010 and triac. Complete electrical isolation between input audio signal (low voltage circuit) and output light modulation (mains supply voltage levels) is achieved. £7.27

Kit 13. SOUND ACTIVATED SWITCH FOR TAPE RECORDER. Can be adjusted to turn on your tape recorder through its REMOTE plug. Has feedback and delay circuit for robust operation. Very sensitive. Proven circuit. Needs 6V plug pack for most stable operation. £7.52

Kit 14. 220V/240V STROBOSCOPIC LIGHT. Kit contains Xenon Flashtube as found on aircraft, camera flash units, signal beacons and disco lights. Adjust to flash from 1 every three seconds to 3 flashes per second. Caution: connects directly to mains power supply. Must be put in a suitable enclosed box before using. £13.94

Kit 15. 6V TAPE SWITCH FOR TELEPHONE. Record your phone conversations. Turns tape recorder on when the handset is lifted. Easy to connect to your phone line. Plugs into REMOTE & MIC jacks of your tape recorder. Best for 6V tape recorders. Educational Kit, not for illegal use. £7.27

Kit 16. FM TELEPHONE TRANSMITTER. Miniature transmitter which attaches in series to one of the two lines to your telephone. Transmits over 200 meters to an ordinary FM receiver. Transmits further if the FM

receiver is near the phone line. Tune with ceramic trim cap. Uses the phone line as an aerial and power source. Not for illegal use. £4.95

Kit 17. LM386 AUDIO AMPLIFIER MODULE. This Kit is designed as a building block in other projects where a battery powered, variable gain audio amplifier is required. Data sheet from National Semiconductor included. £4.22

Kit 18. 9V FM TRANSMITTER. More powerful FM transmitter 'bug' than Kit 7. Tank oscillator coil built into the circuit board. Can be tuned anywhere in FM band. 9V battery operation. Over 400m range in the open depending on aerial used. £5.95

Kit 19. MAINS LIGHT DIMMER. Text-book light dimmer circuit using diac and triac. This circuit operates better than some commercial units. Does not flicker at low light levels. A choke and capacitor used to reduce RF noise which comes from the non-zero switching of the triac. Caution: connects directly to 220V/240V mains power supply. Must be put in a suitable box for regular operation. £8.05

Kit 20. 40kHz ULTRASONIC MOVEMENT DETECTOR CRYSTAL LOCKED. Matched 40 KHz transmitter/receiver pair of transducers detects movement at over 7 meters. Separate PCB for mounting the active units. Latch/reset PCB mounted switch on board. Sensitivity control. 9V battery operation. Transmitter is crystal locked using 40kHz crystal for maximum efficiency. £20.44

Kit 21. TWO STATION INTERCOM / HARD WIRED 'BUG'. Simple two wire intercom. Each unit with its own speaker, microphone and amplifier (LM386). Can be modified to a hard wired 'bug'. With 4 strand ribbon cable the power to bug can be sent to the remote 'bug' unit from the receiving unit. £15.19

Kit 22. 9V XENON TUBE FLASHER. 9V battery powered xenon tube flasher. Transformer supplied. Wire is pre-wound on the bobbin but you must do the final winding of two outer coils. Full instructions provided. Trimpot to vary flash rate. Useful & educational. £13.99

Kit 23. LOW COST OPAMP FUNCTION GENERATOR. Cheap and simple circuit to generate square, (pseudo)sine and triangle waveforms in the audio range. Uses quad opamp LM348. £5.22

Kit 24. LOGIC PROBE. This is the most important piece of equipment for testing and measuring digital equipment. It is usually used in fault finding and testing but can also assist in design work and to find out how digital equipment works. Switch for either TTL or CMOS. Our own modern design using a PUT. Includes detection circuit for very fast pulses. Gives visual (3 LED's) and audio (piezo buzzer) response. £9.13

Kit 25. 220/240V MAINS TIMER. A 1 to 5 minute timer for the mains 200/240V power supply using standard electronic building blocks. Uses LM358 and BT136 triac. Has START & RESET buttons. Educational Kit mounts on box provided to show how it works. Caution: uses mains 200/240V power supply. Kit must be safely placed in closed box for routine use. £12.14

Kit 26. FIBRE OPTIC AUDIO LINK. Allows you to send sound through plastic 1mm fibre optic cable. Matched transmitter/receiver pair from Motorola. Two circuit boards with a microphone at one end and a speaker at the other. 14 feet fibre optic cable supplied. Will work over 200 meters. £28.06

Kit 27. TDA7052 1W AMPLIFIER MODULE. A 1W power amplifier building block designed to be part of a larger project needing a low power battery operated operation into an 8 ohm speaker. £4.87

Kit 28. SOUND ACTIVATED FM TRANSMITTER A sound activated switch and an FM transmitter joined together to make a sound activated FM Tx. Set the level of sound that it will respond to. Two stage transmitter needs tuning to get best results. Tuning Kit & instructions enclosed. Transmits up to a Km in the open depending on the aerial used. £8.95

Kit 29. COMBINATION LOCK. An introduction to a basic but fully working combination lock. Separate touch pad with 9 pads. Lock is reset if an incorrect digit is pressed. Relay capable of switching 240V supplied. 12V operation. Robust and versatile. £11.31

Kit 30. PIR MOVEMENT DETECTOR Modern design for PIR detector. Uses movement IC to replace the usual collection of op-amps & amplifiers. Has PCB mounted Fresnel lens. IC has circuits to turn off detector in day light. Two levels of sensitivity. £30.45

Kit 31. 9V SIREN A surprisingly loud siren for such simple circuit. Uses voltage controlled oscillator. Half watt, 8 ohm speaker supplied. 9V operation. Ideal to attach to an alarm system which needs an sound module. £4.23

Kit 32. TWO STAGE FM TRANSMITTER Our most powerful FM 'bug' to date. A two stage FM transmitter with an RF transistor (2N3563 or ZTX320) in its output stage. 9V operation. On/off switch mounted on the PCB. £6.95

Kit 33. LOW VOLTAGE TAPE RECORDER SWITCH Kit 15 was designed to switch on a standard 6V tape recorder when the phone was used. This is a redesign using an FET to switch low voltage tape recorders as low as 1.5V. Tape recorder will turn on when the phone

is used. Plugs into REMOTE & MIC jacks of recorder. £6.09

Kit 34. GENERAL PURPOSE 3 1/2 DIGIT PANEL METER Make this general design 3 1/2 digit LCD panel meter into your own voltage or current meter. Or custom make it to measure input from a transducer. Full details given in the documentation. LCD may be cut from the main circuit board and mounted separately. £23.84

Kit 35. 1.5V/3V TO 9V DC TO DC CONVERTER Replace your expensive 9V battery by one or two more cost-efficient 1.5V cells. Uses Texan Instruments TL496 IC. Jumper switches between 1 or 2 cell operation. Battery holders for 1 & 2x1.5V cells included. £5.44

Kit 36. GENERAL 4 1/2 DIGIT COUNTER This general purpose 4 1/2 digit LCD counter is built around the 7224 IC. All the 7224 pins are brought out. You can custom design it for your own counter application. £46.98

Kit 37. ALARM DRIVER CIRCUIT Powerful 9V to 12V driver circuit for piezo element. Uses 2 ICs and transformer. Note: piezo must<D> be mounted in a resonant cavity for maximum sound output. Circuit will deliver a deafening 100dB (at 30 cm) with proper cavity. You must construct the cavity from plastic or wood and mount the piezo element in it. On-board potentiometer to trim oscillation to match the cavity frequency. Details provided in the documentation. £5.80

Kit 38. INTRODUCTION TO MICRO- CONTROLLERS Learn to program micro-Controllers without going to technical college. This Kit introduces the Motorola 68HC705K1, an 8 bit, 16 pin micro-controller released in 1992. The Kit is a down counter from 60 or 90 seconds with beeps every 10 seconds. All the software code is supplied and fully explained. See how easy it is to change the time and beep settings by simple changes in the software program. You can judge for yourself how using micro-controllers is a huge advance over using logic ICs. On/off switch and pull-down resistors on input lines are all built into the K1 and are under software control. 9V battery powered. All the information about how to continue learning to programming these 'computers-on-a-chip' is supplied. The tools to program the K1 are available at very low cost (under \$US 200) from Motorola. The K1 is the simplest 8-bit microcontroller available. £37.80

Kit 39. FULL DUPLEX AUDIO FIBRE OPTIC COMMUNICATION Kit 26 demonstrated how to send audio signals through a single plastic fibre optic cable. However, with the right interface to the cable it is also possible to have simultaneous two-way voice communication over a single cable. We have made a stripping and heating machine to make the two-to-one interface and designed a PCB to allow two way communication to be demonstrated. POA

Kit 40. MICROCONTROLLER REACTION TIMER Over the years there have been many logic circuits published for simple reaction timers - the logic shows which of two contestants was first to press a button after a sound or light stimulus. However, none of them has ever shown how many milliseconds both the winner and the runner-up took to press their buttons. The use of microcontrollers again demonstrates how software can replace logic ICs to give a smaller and much more versatile electronic circuit. The software is an extension of that already presented in Kit 38. The major change is the addition of a crystal controlled oscillator. Instead of an RC network. Pressing either button turns the unit on. '000' is displayed on a single-unit 3-digit LED display. Press either key again and a 'beep' sounds a few random seconds later. The display starts to count in msec. The exact time when both persons press their buttons (if within 999 msec) is recorded and displayed alternately on the display. The unit will power down automatically after one minute. There is no off/on switch. It is built into the Motorola 68HC705K1 chip. 9V battery powered. £41.40

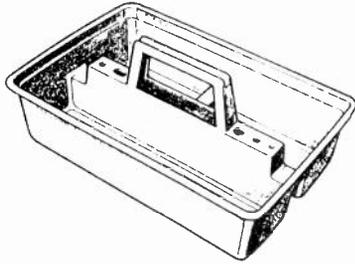
Kit 41. MINIATURE 5mW VISIBLE RED LASER DIODE MODULE Just connect 3.0 VDC to this small, self-contained module and you have 670nm red, visible laser light to experiment with. Only 18.5mm x 11.5mm (0.75" x 0.45") in a brass tube this module consists of the drive circuit, 85mA laser diode and collimating lens system. Typical beam diameter is 4mm x 6mm. Make your own laser pointer or security beam fence £135.00.

All prices shown include VAT. Quantity and trade discounts available as follows:
1-9 kits List Price
10-24 kits less 25%
25-99 kits less 35%
100+ kits less 45%
Any mix of kits is acceptable for these discounts.

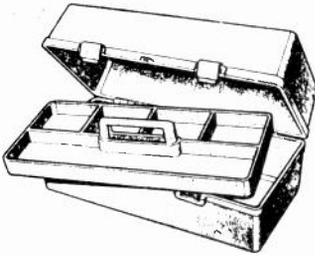


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NEW RANGE OF STORAGE CONTAINERS



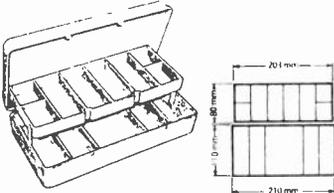
7050 Tool tray 380x250x100mm **£1.95**



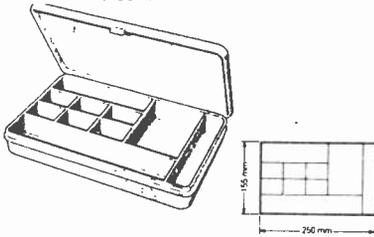
001 Tool Box with lift out tray 430x190x180 **£12.95**



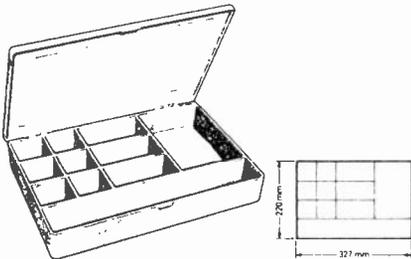
004 Single tray cantilever tool box 342x165x145mm **£3.95**



7033 Storage box with open out cantilever tray. 13 compartments. 210x110x50mm **£1.99**



7034 Storage box with 10 compartments. 250x155x35mm **£2.50**



7035 Storage box with 11 compartments. 327x220x48mm **£3.25**



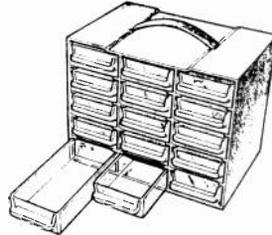
320 16 drawer storage cabinet 220x70x158mm **£2.95**

Nail & Hook Chest

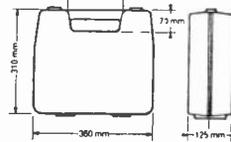
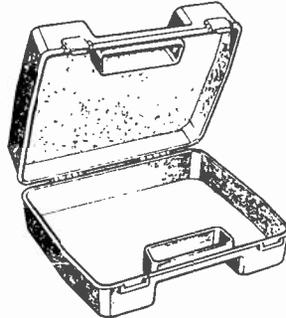
740 Above cabinet supplied with over 2000 fixings - nails, hooks, pins, tacks etc. 220x70x158mm **£6.95**

Screw & Bolt Chest

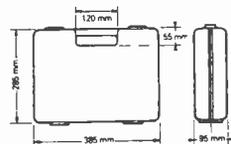
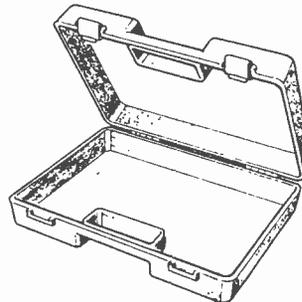
730 Above cabinet supplied with a super assortment of over 500 fixings, including flat and round head wood screws, self tappers, machine bolts, washers and plastic wall plugs. **£6.95**



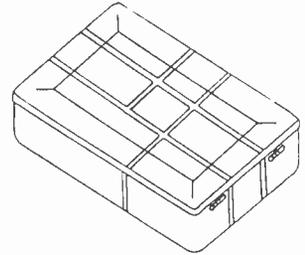
0600 15 drawer storage cabinet 230x160x180mm **£4.50**



010 Tool & hobby case **£5.95**



020 Tool & Hobby case **£5.50**

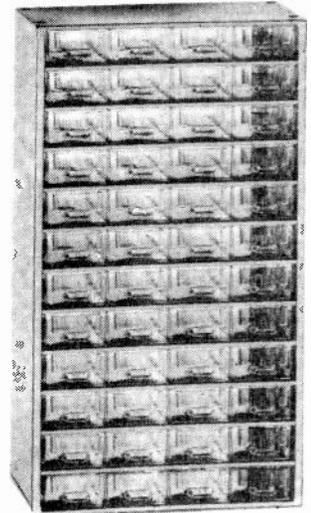


COMPARTMENT BOXES

A range of 3 strongly constructed polypropylene compartment storage boxes with hinged lids. Translucent finish

- F662 180x97x43mm, 5 compartments **£1,20 40+ 0.74**
- F662A 185x142x42mm, 9 compartments **£1,60 40+ 1.03**
- F662B 275x180x42mm, 18 compartments **£1,99 40+ 1.33**

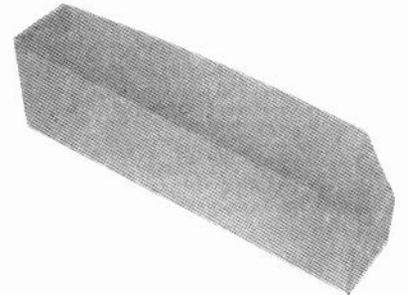
Storage Cabinets



Link-Hanson type 501. This contains, within a steel case 540 x 300 x 160mm, 48 plastic drawers, each drawer is divisible into a maximum of 6 compartments. Individual drawer size 155 x 70 x 37mm

Price **£37.95** 4 + 28.04
 V1 dividers in packs of 10 **£1.40** 100 + 0.10

Storage Bins



G1061 As used in the GREENWELD shop, these bins are made of corrugated cardboard. 2 staples front and back (or sellotape) is all that is needed to assemble. Overall size 390L x 80W x 155H. Using 15" wide shelving (eg contiboard) and suitable brackets, a wall 6ft high and 3ft wide will accommodate 154 of these bins, giving over 18 cubic feet of storage.

Sample **50p** 10 + 0.25 100 + 0.18



PROGRAMMABLE RADIO SCANNERS

A range of top quality radio scanners manufactured by GRE at amazingly low prices! All portable models are supplied complete with Nicads and charger unit.



BI10A £272

PROGRAMMABLE SCANNER

The COM204 programmable scanner gives you direct access to more than 48000 frequencies, it incorporates a custom designed microprocessor giving you these special features:

- ▶ AM/FM Selectable
- ▶ 200-channel direct entry scanning
- ▶ Triple conversion superheterodyne receiver
- ▶ High speed scanning at 50 steps per second
- ▶ Liquid crystal display indicating all active functions
- ▶ Manual and auto scan for rapid selection of broadcasts
- ▶ Lockout function allowing you to skip specified channels

Frequency coverage	.....68-88MHz (in 5kHz steps)
	.....118-136.975MHz
	.....137-174MHz
	.....220-225MHz
	.....225.0125-400MHz
	.....400.0125-512MHz
	.....806-999.9875MHz
Sensitivity	.....1µV (FM) 2µV (AM)
Antenna impedance	.....50Ω
Audio power	.....250mW
Power requirements	.....9Vdc (6 x AA batteries) or suitable mains adaptor
Dims (H x W x D)	.....145 x 58 x 42mm
Weight	.....250g without antenna and batteries

BI10 £230

PROGRAMMABLE SCANNER

The COM203 programmable scanner lets you in on all the action, giving you direct access to over 35,000 frequencies which can be stored in its 200 channels.

Its custom-designed tiny microprocessor gives the scanner these special features:

- ▶ Nine radio bands ranging from 68 - 980MHz
- ▶ Superscan enables you to carry out frequency scanning up to 50 steps per second
- ▶ Liquid crystal display
- ▶ Memory back-up
- ▶ Built-in charging circuit for rechargeable batteries

Frequency coverage	.....68-88MHz
	.....108-136.975MHz
	.....137-144MHz
	.....144-148MHz
	.....148-174MHz
	.....380-450MHz
	.....450-470MHz
	.....470-512MHz
	.....806-960MHz
Antenna impedance	.....50Ω
Audio power	.....200mW
Power requirements	.....9Vdc (6 x AA batteries) or suitable mains adaptor
Dims	.....145 x 58 x 42mm
Weight	.....250g (less batteries)

BI10B £109

PROGRAMMABLE SCANNER

A compact hand held programmable scanner covering wide VHF/UHF ranges of more than 22000 frequencies, enabling you to scan through up to ten channels. The liquid crystal display indicates channel, frequency and all other key modes.

- ▶ Front panel keypad
- ▶ Liquid crystal display with back up light
- ▶ 2-second scan delay
- ▶ Memory back up
- ▶ Lockout function
- ▶ *Built-in charging circuit for rechargeable batteries

Frequency coverage	.....30-50MHz
	.....50-54MHz
	.....138-144MHz
	.....144-148MHz
	.....148-174MHz
	.....380-450MHz
	.....470-512MHz
Sensitivity	.....1µV
Antenna impedance	.....50Ω
Audio power	.....250mW
Power requirements	.....9Vdc (6 x AA batteries) or suitable mains adaptor
Dims (H x W x D)	.....160 x 70 x 40mm
Weight	.....300g without antenna and batteries

BI11 £370

PROGRAMMABLE SCANNER

The COM205 is the last word in programmable scanners. A free standing desk top unit covering nine radio bands in the 25-520MHz and 760-1300MHz. Operates from AC mains or car cigar lighter via suitable adaptor. It incorporates a microprocessor/computer chip, avoiding the need to change crystals, giving special functions as scan delay, memory back up, priority channels and many more.

Frequency coverage	.....25MHz-50MHz
	.....760MHz-1300MHz
Sensitivity	.....3µV (Nominal)
Antenna impedance	.....50Ω
Audio output	.....1.3W
Tape out	.....600mV @ 10KΩ
Memory back up battery	.....9V (PP3)
Power requirements	.....220/240Vac 50Hz/13.8Vdc
Dims (H x W x D)	.....76 x 220 x 205mm
Weight	.....2.2Kg

Read The Greenweld Guardian every month - news, views, competitions & special offers + information on our products & a constructional article. Only £6 a year UK, £10 O'seas. Free with every issue is our latest Bargain List, showing goods not advertised elsewhere.

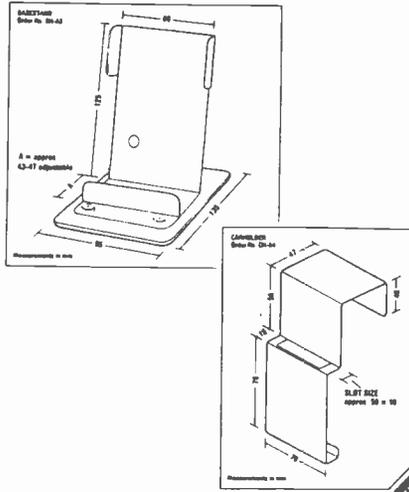


SCANNER ACCESSORIES

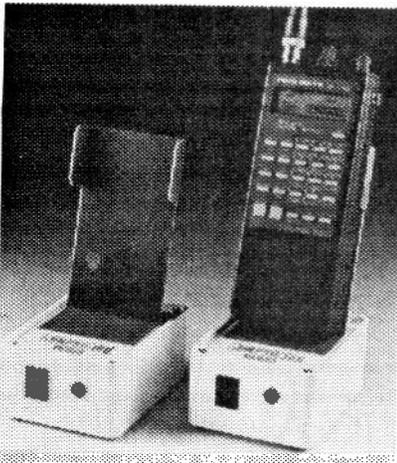
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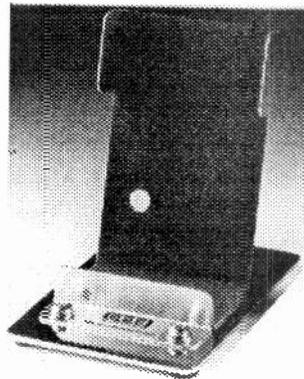
All units shown in this section are made in the UK to an exacting standard, and come with comprehensive information.



BC45A Universal constant current Nicad charger. Charge indicator LED, std 2.1mm output socket and adjustable constant current from 40-80mA, 3 leads provided: 2.1 - 2.1 power, 2.1 rover - 3.5 jack and 2.1 power to PP3 clip. Mains input via 1.7m lead. £14.95



PSU101TA PSU and radio base holder combined - not only powers scanner but will charge internal Nicads. Fitted with 2 DC Sockets and a bracket for external aerial socket. Illuminated D.P. mains switch and 1.7m mains cable. Input 220-240V AC 50Hz. Output 9V DC @ 350mA for scanners shown on page 128. £29.95



BHA3 Universal base holder, enabling handheld scanners to be safely and conveniently supported on table or desk. Heavy duty 3mm chromed base. Adjustable front support stop. Pre-punched with BNC hole. £10.95



BC4H Constant current Nicad charger with inbuilt electronic charge timer control. 2 charge times - 4 and 14 hrs (180mA and 60mA) with auto switch off. Will charge up to 10 Nicads at a time. 4 leads supplied. Mains input via 1.7m lead. £19.50

PSU101 12 volt version for Fairmate, Yumeru, AOR, Icom, Strides scanners. £29.95

CHA4 Car holder for use with scanners with belt clip support. Mounts between doorwindow rubber seal. £7.95



Air Band Radio Handbook 3rd Edition
155 x 215mm, 173 Pages, Soft Cover, Publication Date 1990
David Smith
£7.99. Order Code RS113
An essential guide to airband broadcasts, protocols and abbreviations for pilots and radio enthusiasts.

The Pocket Guide to RTTY and Fax Stations
A5, 57 Pages, Soft Cover, Publication Date 1991
Bill Laver
£3.99. Order Code RS106
An international listing of stations transmitting non-voice communications, their broadcast frequency, and the nature of the data transmitted.

Short Wave Communications
A5, 187 Pages, Soft Cover, Publication Date 1991
Peter Rouse
£8.95. Order Code RS109
An introduction to receiving short wave broadcasts, listings of stations, and a guide to transmission techniques for the radio enthusiast.

United Kingdom Airfield Guide
A5, 75 Pages, Soft Cover, Publication Date 1990
M A Farley
£4.50. Order Code RS110
A Complete listing of all the UK's airfields and strips, along with their location and frequencies used.

Short Wave International Frequency Handbook
A4, 188 Pages, Soft Cover, Publication Date 1993
Bill Laver
£9.95. Order Code RS105
A comprehensive listing of frequencies and broadcasting stations from 400kHz to 30MHz.

Scanners A VHF/UHF Listeners Guide 3rd Edition
155 x 215 mm, 245 Pages, Soft Cover, Publication Date 1989
Peter Rouse
£8.95. Order Code RS114
Scanners are sophisticated radio receivers that can sift through hundreds of frequencies to find those that are in use. This book is a comprehensive guide to the use of scanners, their installation, and how to get the best results.

The Aviation Enthusiast's Handbook
155 x 215mm, 249 Pages, Soft Cover, Publication Date 1991
Kevin Fox
£9.95. Order Code RS116
An informative guide to receiving aircraft radio and aircraft movements over the UK

Scanners 2 International VHF/UHF Communications Guide
155 x 215 mm, 261 Pages, Soft Cover, Publication Date 1989
Peter Rouse
£10.95 Order Code RS115
More of the above with a look at the workings of radio receivers. Some circuits and projects are included.

The UK Scanning Directory Third Edition
A5, 130 Pages, Spiral Bound, Publication Date 1993
Author Unknown
£16.95. Order Code RS112
A list of more than 12000 spot frequencies and their users found in the UK.

The World-wide Aeronautical HF Radio Handbook
A5, 124 Pages, Soft Cover, Publication Date 1991
Martyn Cooke
£6.95. Order Code RS107
An international guide to frequencies used by aviation. Includes information on comprehending terminology used by pilots and air traffic control.

The Complete UK VHF and UHF Airband Guide
A5, 48 Pages, Soft Cover, Publication Date 1989
Ron King
£3.50. Order Code RS111
Listing of UK VHF airbands and glossary of terminology.

The VHF/UHF Scanning Frequency Guide
A4, 156 Pages, Soft Cover, Publication Date 1993
Bill Laver
£9.95. Order Code RS103
A Comprehensive listing of all frequencies and users from 26MHz to 12GHz and invaluable guide to anyone thinking of buying a scanner. Explanatory notes on receivers, aeriels, and signals you are likely to receive.

VHF/UHF Airband Frequency Guide Forth Edition
A4, 124 Pages, Soft Cover, Publication Date 1991
Bill Laver
£6.95. Order Code RS104
A quick introduction to UK air traffic control, receivers, aeriels, and of course a complete list of UK airfields, navigational aids, and airband frequencies between 2MHz and 400MHz.



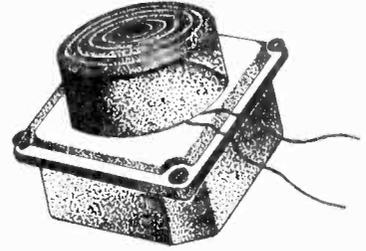
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SUPERB ALARM SYSTEM!!

Consists of:

- (a) Weatherproof metal case with a plasticized finish 100x100x50mm;
 - (b) Alarm module (open & closed loop) with delay on PCB 78x48mm. Needs 12V supply that drives strobe and/or audible alarm via relay and charges PP3 back-up Nicad;
 - (c) Highly visible red xenon strobe light 75mm dia.
- Supplied with wiring diagram and circuit details



Order Code: Z5651
ALL FOR JUST
£12.95

Z5652 Similar, smaller version consisting of:

- (a) Case as above but 80x80x50mm;
 - (b) Alarm trigger module on 55x55mm PCB
 - (c) Strobe light as above
- Supplied with wiring diagram & circuit details

£9.95

Parts available separately, as follows:

- Z5653 Box 100x100x50mm £2.50
- Z5654 Box 80x80x50mm £2.00

- Z5655 Strobe light £4.95
- Z3102 Alarm module for Z5651 £4.95
- Z3103 Alarm module for Z5652 £2.95

AMAZING AMSTRAD MOTHERBOARD OFFER!

A parcel of returns - these panels are all complete, but may well have one or more faults. They offer great value for spares and memory chips!

Z5656 PC1512 Panel 295x240mm with:

8086 µP; Z765 floppy disk controller, 18 x 4256 256k x 1 RAM chips, 3 expansion slots + all the other Amstrad chips and in/out sockets. Super value at just

£6.99

Z5657 PC1640 panel 322x240mm with:

18 x 41256 (256kx1 DRAM)
2 x 4164 (64k x 1 DRAM)
12 x 41464 (64k x 4 DRAM)
+ the µP (8086) & VGA and support chips. There are 4 expansion slots, and all the input and output socketry. Offered "as seen" for just

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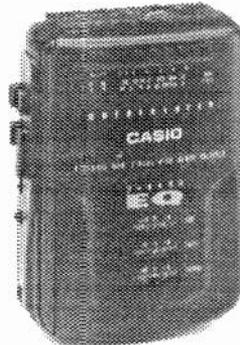
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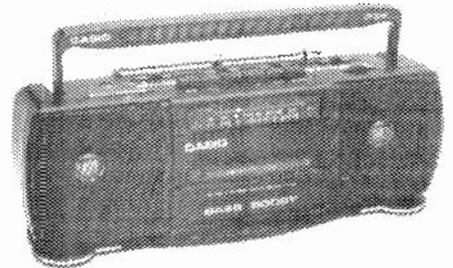
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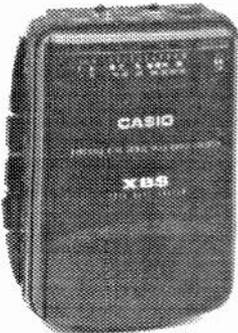
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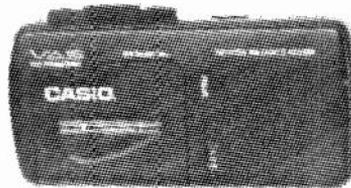
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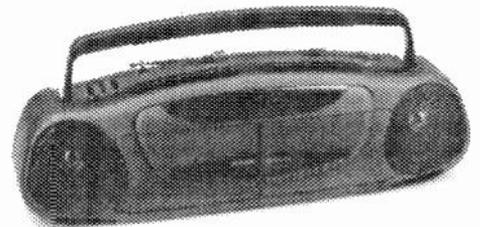
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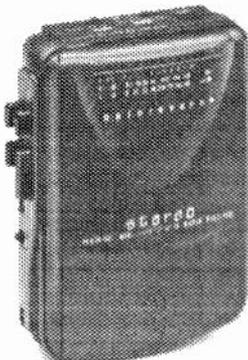
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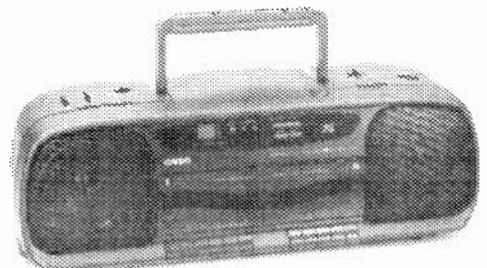
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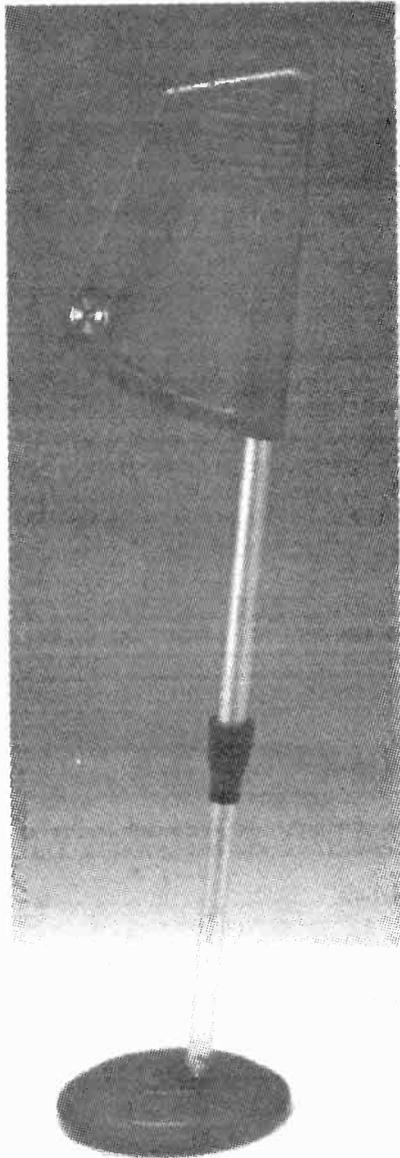


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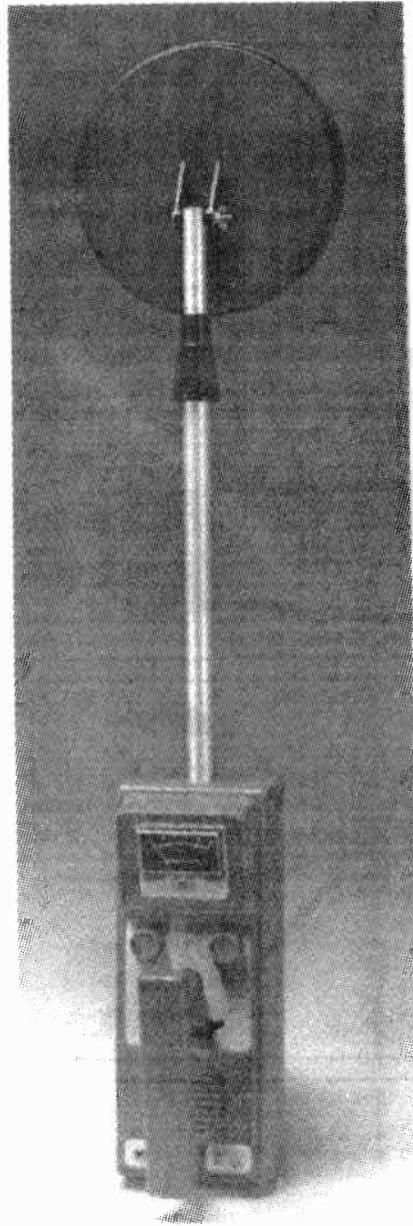
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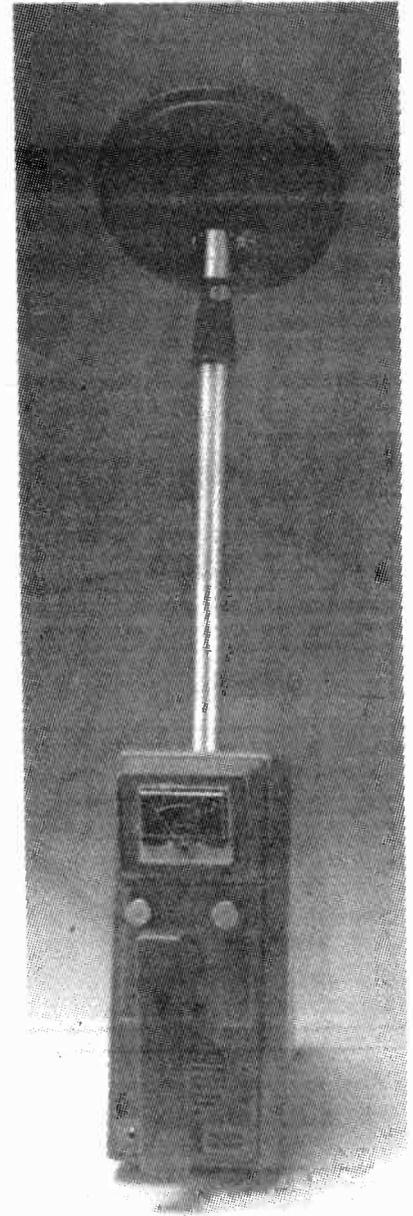


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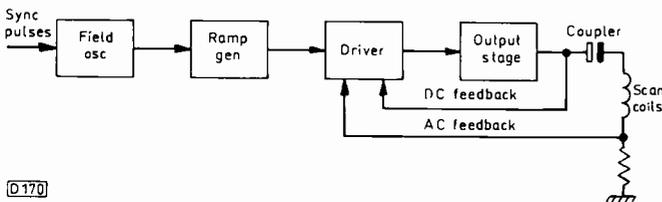
Modern TV Receiver Techniques

Part 12: The Field Timebase

Eugene Trundle

Last month we saw how the sawtooth line scan current is generated by the line output stage, whose drive is used simply to initiate the flyback at the correct time. This is possible because at the 15.625kHz line scan frequency the deflection coils are virtually pure inductors. Field scanning ensures that the lines are traced out progressively from the top to the bottom of the screen, thus producing the raster. So the vertical deflection system runs at the much lower rate of 50Hz. At this frequency, the scan coils are predominantly resistive: their inductance plays a part only during the relatively short (approximately 1msec) flyback time, during which the direction of the scan current has to be reversed so that the scanning beams are driven back to the top of the screen. Since the coils can take no part in generating the sawtooth current that flows through them, operation of the field timebase is totally different from that of the line timebase. In addition the power involved is much less, and the field output stage is not involved in the production of auxiliary power supplies etc.

Because the field section of the deflection yoke acts like a resistive load during the forward (top to bottom) part of the scan, the circuit that drives it must take the form of a sawtooth current generator followed by a power output stage that's in many ways similar to an audio output stage. Fig. 1 shows in block diagram form the basic elements of a field timebase. It starts with an oscillator whose frequency is controlled by the field sync pulses: it's used to produce timing pulses that trigger the generation of a precision ramp.



0170

Fig. 1: The basic elements of a field timebase.

This has a duration of 20msec and excellent linearity. The ramp is amplified by a driver stage which is d.c.-coupled to the power output stage. A.C. and d.c. feedback are used, for linearity adjustment and stabilisation of the working conditions respectively. In a large-screen set the output stage has to drive a current of 2-3A (peak-to-peak) through the scan coil resistance of 5-10Ω.

Sync and Oscillator Action

The nominal frequency of the field oscillator is 50Hz, but with direct sync pulse control it free-runs at about 46-47Hz so that the sync pulses can trigger it early to lock the field scan to the picture information. When the oscillator is unlocked it runs too slowly and the picture rolls upwards. Conversely an oscillator that's running too fast produces a downwards roll.

In early field timebase designs the oscillator itself produced the ramp waveform, being triggered by the sync

pulse to start a new cycle just before it would have done so by virtue of its own time-constant. This is the simplest form of direct sync. In later designs the functions of oscillation and ramp generation are separate. This in due course led to the arrangement described in Part 10, in which the 50Hz field trigger pulses are derived from the line oscillator via a programmed count-down/divider circuit.

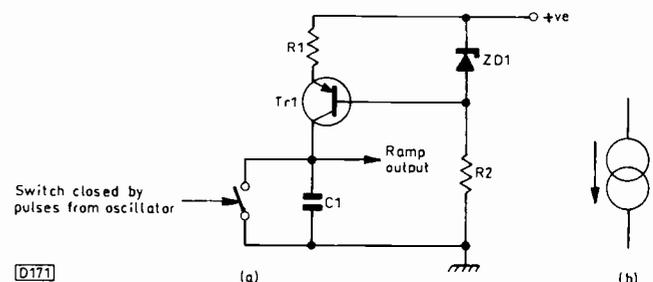
Whatever form the field oscillator takes, in modern systems it's required only to close a transistor switch momentarily once every 20msec, but with great timing accuracy – last month we saw how crucial the flyback triggering point is for good interlacing of the horizontally scanned lines. Ideally a timing tolerance of $\pm 10\mu\text{sec}$ is required. It's easy to appreciate how noise in the system can upset the interlacing, and why a countdown system is much better than direct sync.

The Ramp Generator

The ramp generator section of the field timebase is responsible for producing a very linear sawtooth waveform. There are many ways in which a ramp waveform can be generated, but the most common method for field timebase use is to charge a capacitor from a constant-current source – with a constant charging current, the voltage across the capacitor rises linearly with time. At the end of the ramp the capacitor is shorted out by the transistor switch, which is triggered by the field oscillator to initiate the field flyback. When the short-circuit is removed, the capacitor begins to charge once more, producing the next downwards scan.

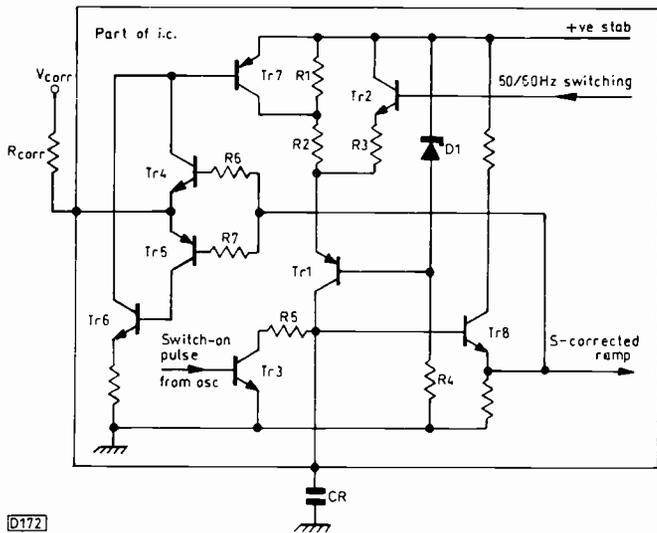
A transistor whose base is held at a fixed voltage can be used as the constant-current source – see Fig. 2(a), where zener diode ZD1 sets the transistor's base voltage. With this circuit the transistor's collector-emitter current depends on the resistance in series with its emitter, not at all on any in series with its collector, provided only that the latter is low enough for the required current to flow at the supply voltage used. Fig. 2(b) shows the symbol used to represent a constant-current generator.

The amplitude of the ramp produced in this way is proportional to the charging current and time. In Europe the field scan period is 20msec: at the end of this period the ramp generator's output will have reached some fixed voltage and the flyback will be initiated by closing the switch across the capacitor to discharge it rapidly. If the set



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Fig. 2: Simple constant-current generator circuit (a), constant-current generator symbol (b).



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Fig. 3: Principle of in-chip s-correction: the circuitry actually used is much more complex than this.

is required to operate with 525-line, 60Hz signals as well, the ramp produced at 60Hz will be smaller because the charge acquired by the capacitor during a 16.7msec period is less. With sets that employ automatic switching between systems the charging current is increased to compensate for this – such things are very easy to arrange within an i.c.

Geometric Correction

As with line scanning it's necessary to s-correct the vertical scanning current to compensate for the relative flatness of the tube's faceplate, but this time it's not possible to use the scan-coupling capacitor for the purpose. Three alternative techniques are possible: first to add a sinusoidal waveform to the sawtooth before it reaches the driver stage, doing this perhaps in a deflection processor chip like that described last month; secondly to feed back the parabolic voltage waveform developed across the scan-coupling capacitor, adding this, with adjustment as necessary, to the sawtooth; or thirdly to incorporate geometric correction in the ramp-generator circuit within the relevant chip.

The latter approach is illustrated in outline in Fig. 3, which shows in simplified form the circuitry in a small section of a particular type of timebase generator chip. CR is the external ramp-generating capacitor, which is charged by a constant current supplied by Tr1 whose base voltage is set by D1. The charging current is determined by R1 and R2, with R3 added in parallel (Tr2 switched on) for 60Hz operation to correct the height. Tr8 acts as a buffer, passing the sawtooth waveform to the driver stage. There is also feedback from the emitter of Tr8 to the bases of the npn/pnp pair Tr4/5. Tr4 conducts during the first half of the scan and Tr5 during the second half: the onset of their conduction during the progress of the ramp depends on the voltage applied to the chip's V-correction pin, the degree of conduction thereafter depending on the current restriction offered by the series resistor Rcorr. Tr4's collector current, and that of Tr5 via the inverter transistor Tr6, vary the extent to which Tr7 shunts R1, thus modifying CR's charging current. The s-correction can be set to suit the type of picture tube by adjusting the values of Vcorr and Rcorr.

Driver and Output Stage

The field driver and output stages are similar to those used in a medium-power audio amplifier. There is usually

an impedance-matching stage and a complementary-symmetry class B output stage, whose mid-point drives the field scan coils via a large-value electrolytic coupling capacitor. As previously mentioned d.c. feedback provides stabilisation while a.c. feedback is used for linearity correction and to set the gain. In most current designs the whole thing is encapsulated in a single chip that's capable of driving the deflection yokes of tubes with a diagonal faceplate measurement of up to 34in. For high-power applications the chip is provided with a heatsink: typically the internal dissipation, most of which is accounted for by the class B output stage, is 4W. The collectors of the output transistors are formed on the internal part of the heatsink.

The Flyback

In a large-screen TV set with a bulky pincushion-distortion free yoke the field scan coils will have a d.c. resistance of typically 10Ω, an inductance of 20mH and require a scanning current of 2A peak-to-peak. To drive 2A p-p into an impedance of 10Ω a supply of about 20V is required for the downwards scan. During the flyback period however there must be a complete reversal of the current flowing through the yoke within a period of about 1msec. The time-constant of the field scan coils is $t = L/R = 0.02/10 = 2\text{msec}$, which defines the time required for the reversed current to reach 63 per cent of its final value when a d.c. voltage is applied. To complete the flyback within 1msec, the 'aiming current' needs to be about 4A, and with a 10Ω yoke this calls for a supply voltage of about 40V.

If the field output stage is operated with a 40V supply however the difference between this and the 20V required during the downwards scan must, as Fig. 4 shows, be absorbed by the upper transistor of the output pair. This high and unnecessary dissipation within the chip can be

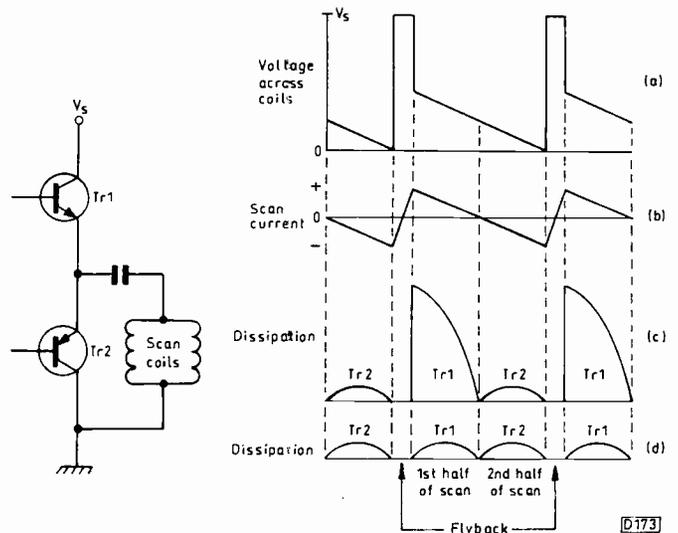


Fig. 4: Reason for using a flyback generator. (a) Voltage waveform developed across the scan coils. (b) Scan current waveform. (c) How the upper transistor (Tr1) would have to absorb the difference between the applied and the required energy during the first half of the scan without a flyback generator. (d) The low, equally-shared output transistor dissipation when a flyback generator is used.

avoided by using a 'flyback booster' system to generate the required higher supply voltage during the flyback period only.

Fig. 5 shows how this is done – it represents, much simplified, the circuitry in a field output chip that's operated

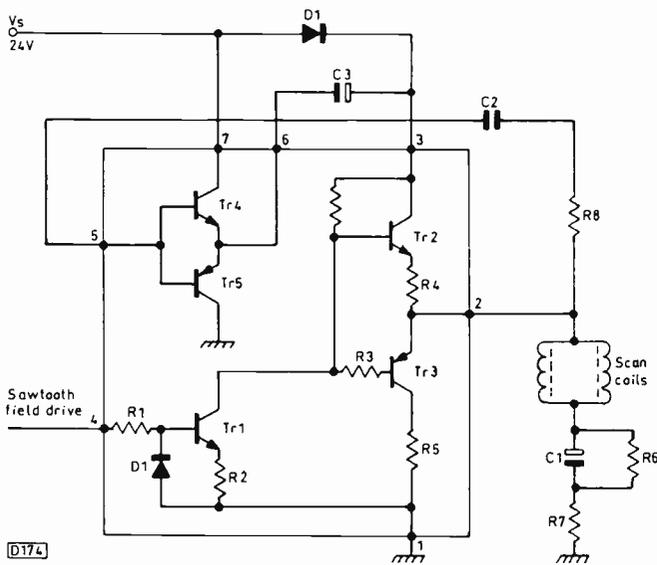


Fig. 5: Principle of the flyback-boosted field output stage: the chip's internal circuitry has been simplified to illustrate the basic operation.

with a 24V supply fed via D1. During the first half of the forward scan, from the top of the screen to the centre, the current path is from chassis via the low-value resistor R7, C1, the yoke, R4, Tr2 (which is switched on by the drive waveform) and D1. During this period C1 charges. To provide the second half of the forward scan the drive waveform switches Tr2 off and Tr3 on: C1 then discharges via the yoke, Tr3 and R5, with R7 as before on the chassis side of the circuit. At the end of the scan the voltage at pin 2 of the chip is at near chassis potential.

The steep falling edge of the drive waveform at pin 4 of the chip then switches Tr1 off. Tr2 switches on abruptly while Tr3 switches off. As a result the voltage at pin 2 suddenly rises to 24V. This positive pulse is fed via R8 and C2 to pin 5 of the chip, whereupon Tr4 switches on and Tr5 off. As a result the negative plate of C3 is connected to the 24V supply instead of to chassis. C3 has already been charged to 24V via D1 and Tr5. Now, jacked up from below as it were by another 24V, the voltage at its positive plate jumps to 48V, the sum of its new voltage charge and the supply line voltage. D1 promptly switches off and the 48V becomes available at pin 3 of the chip and, via the conductive Tr2, at pin 2 and the top end of the yoke. This relatively high voltage rapidly reverses the scan current and, with it, the magnetic flux. At the end of the oscillatory flyback the voltage at pin 5 of the chip goes low, Tr5 turns on, Tr4 turns off and C3 recharges via the now conducting D1.

We don't get anything for free: the boosted voltage during the flyback appears as a debit, in the form of C3's charging current during the scan period. But the average dissipation in Tr2 within the chip has been greatly reduced – Fig. 4(d) illustrates the effect – and the overall circuit efficiency is much improved.

Yoke Coupling and Feedback

As the current in the field scan coils must swing symmetrically above and below zero, the coupling between the field output stage and the yoke is via a large-value electrolytic capacitor – C1 in Fig. 5. The value of the series resistor R7 is of the order of 1Ω: it acts as a sampling device developing across it a voltage that's proportional to the scanning current. This sawtooth voltage is fed back to the chip's inverting input, via an RC network, for linearity adjustment:

a variable resistor may be included for adjustment purposes. If the feedback sample is taken from a potential divider connected across R7 the variable resistor acts as a height control.

The advantage of this form of current-sampling negative feedback is that the scan coils themselves form part of the loop. Their copper wire has a positive temperature coefficient, i.e. their resistance increases with rise in temperature. Without the compensation provided by the feedback, this would lead to reduced height as the yoke warmed up.

Vertical Shift

Modern picture tubes are built to such a close tolerance that the inherent picture centring error with a 22in. screen is less than 3mm. If the scanning current is perfectly balanced about zero there will be no residual d.c. in the field scan coils and no need for any centring correction. In practice the relatively small inductance of the coils is effectively in series with their resistance. As a result, the scanning current has a slightly exponential shape. This asymmetry of the upper and lower halves of the waveform results in a small net d.c. bias which pulls the picture downwards slightly. In the circuit shown in Fig. 5 this effect is offset by the bleed current that flows via R6.

Where a deflection processor chip is used (see Fig. 12 last month) a bleed resistor such as R6 is retained while the mid-point voltage of the chip's output pair is varied by adjusting the standing bias applied to pin 4 to give vertical shift in either direction. This chip is d.c.-coupled throughout. In simpler sets the bottom of R6 is taken to a manually-variable voltage from a preset potentiometer, or to a tapped resistor network, that's connected across a suitable supply.

Representative Practical Circuit

The relative simplicity of modern field output stages is illustrated by the circuit shown in Fig. 6, which is used in an Hitachi chassis. The sawtooth drive waveform is fed to pin 1 of IC601 via R607. Positive-going pulses from the line

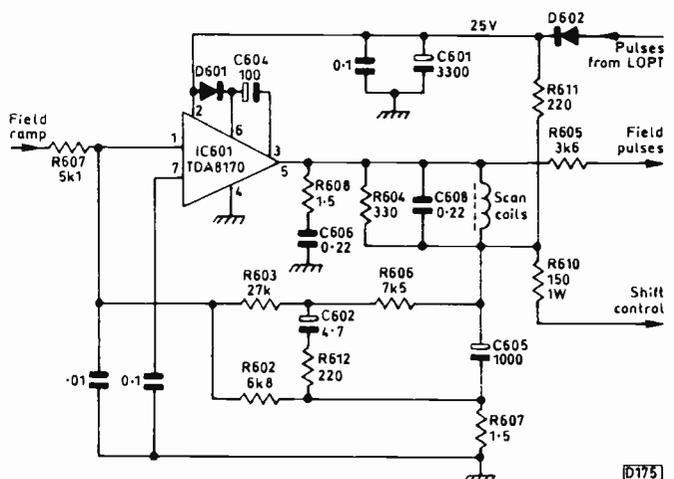


Fig. 6: Field output circuit used in a current-production, large-screen TV chassis.

output transformer are fed to rectifier diode D602, which develops a 25V supply across C601. This is fed to pin 2 of the chip, where an internal voltage stabiliser supplies the preamplifier and driver stages. Pin 6 is the supply to the output stage, 25V during the downwards scan but hoisted to almost 50V during the flyback by the action of C604 and

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D601 in the flyback boosting circuit.

Output pin 5 is taken straight to the yoke and is connected to chassis at h.f. by the Zobel network consisting of R608/C606 to prevent instability – the chip's frequency response extends to high radio frequencies. The field deflection coils are damped by R604 and bypassed to prevent line-frequency pick up from the adjacent line scan coils by C608. A shift current is injected by the potential divider

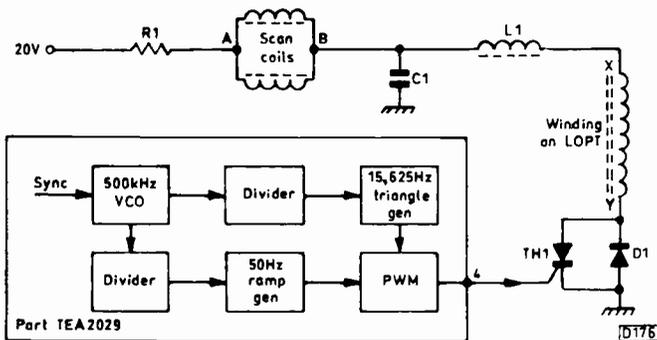


Fig. 7: Outline of a thyristor-controlled, pump-mode field timebase.

R611/R610: R610 is connected to the collector of a transistor whose conduction is governed by the vertical positioning adjustment.

The earthy side of the scan coils is connected to chassis via the coupling capacitor C605 and the sampling resistor R607. The latter supplies a sawtooth feedback waveform via R602 to pin 1 of the chip, where it's mixed with a parabolic waveform fed back via R606 and R603. The network R602/3/6/12 and C602 shape the waveforms to obtain the required scan current linearity correction. R606 and R603 also provide d.c. feedback to stabilise the operation of the circuit.

Modern field output chips incorporate a thermal sensing bridge circuit on the silicon substrate to limit the base current in the output transistors when the internal temperature exceeds about 150°, and a SOAR (safe operational area) limiter to keep the operation of the output transistors within their permitted I_c/V_{ce} boundary in the event of malfunction or incorrect adjustment. Very often a 'guard' output is provided for the purpose of protecting the tube's phosphors by cutting off the tube in the event of field-scan failure.

Bus-controlled Multi-purpose Chip

We've already encountered the deflection processor chip that modifies and controls the scanning. Some even more remarkable devices are around. The MC44000 for example combines in a single 40-pin package the functions of deflection processing with triple-standard colour decoding, RGB matrixing, sync processing and the countdown generation of line and field drive waveforms. A 17.7MHz (625-line standard) crystal-controlled oscillator is used by both the colour decoder and timebase sections. There is also an EW drive output, and everything is under two-way I2C control.

The Pump-mode Field Timebase

In the systems described so far the sawtooth current for the field scan coils has been supplied in a linear manner by using a push-pull pair of power transistors to amplify a sawtooth drive. An alternative approach is to pump energy into the yoke circuit in small, discrete steps, gradually

increasing the energy 'packages' as the field scan progresses. The first commercial example was the TDA2600 field timebase chip that was used many years ago in the Philips G11 chassis. It used a class D (switch-mode) output stage, a chop rate of 150kHz and an LC integrator to build up a sawtooth current ramp from the widening pulse output from the chip. The idea was that switch-mode operation would reduce the dissipation in the chip and provide greater reliability. In practice the system had few advantages over the conventional approach and proved to be less reliable.

A later approach, used in some Thomson chassis (and thus in several Ferguson models – those fitted with the ICC5 and IKC2 chassis), is outlined in Fig. 7. One end (A) of the field scan coils is connected to a 20V d.c. supply. By varying the charge on capacitor C1, current can be made to flow through the scan coils in either direction. Variation of its charge between +30V and +10V in a linear fashion will build up the required sawtooth scanning current, symmetrical about zero, in the coils.

The charge stored by C1 comes from winding X–Y on the line output transformer. This winding is so phased that during each line flyback period the voltage at pin X rises to about +200V with respect to pin Y. If thyristor TH1 remained permanently off, diode D1 would act as a simple rectifier, charging C1 to 200V via L1. If, on the other hand, thyristor TH1 remained conductive all the time pin Y would be permanently earthed and the pulses at pin X would position themselves symmetrically about chassis potential (d.c. zero). Thus the charge on C1 would be zero. By switching the thyristor on and off in a controlled manner throughout the 20msec field period the charge developed by C1 can be varied to produce the required sawtooth scan current. Since TH1 is switched off at the beginning of each line flyback by the negative pulse produced at pin Y of the transformer, its conduction period (it switches on once per line) depends on the timing (phasing) of the positive switch-on pulses applied to its gate.

In the arrangement shown in Fig. 7, at the start of each field scan the thyristor's trigger pulse arrives at a late point in each line. Thus C1 develops a high voltage and current flows through the scan coils from A to B. As the field scan progresses, TH1 is switched on at an earlier point in each line. As a result the charge developed across C1 is reduced in a linear manner and the current flow through the coils is likewise reduced. Halfway through the scan (10msec from the start) the charge on C1 has fallen to 20V and no current flows through the scan coils. The timing of the thyristor's gate switch-on pulses continues to advance, with the result that the charge held by C1 falls below 20V. Current now flows through the coils from B to A. This current reaches a maximum value at the end of the field scan, with the beams now at the bottom of the screen. The thyristor's switch-on pulses are then suddenly narrowed, the charge across C1 reverts to the high-voltage condition and a large current flows through the yoke in direction AB. This produces the required rapid flyback.

It remains to see how the triggering pulses for the thyristor are developed. In the arrangement shown this is done by a TEA2029 chip which, incidentally, also contains the sync separator, the line generator, the sandcastle pulse source and the switch-mode power supply control system. Fig. 8 shows the relevant section of the circuit, in simplified form. An externally generated field-frequency ramp waveform is fed to a differential amplifier at pin 2. This is the amplifier's inverting input, so a negative-going ramp is produced at its output. Pin 2 is also connected to the height control. The amplifier's other input (at pin 1) is connected

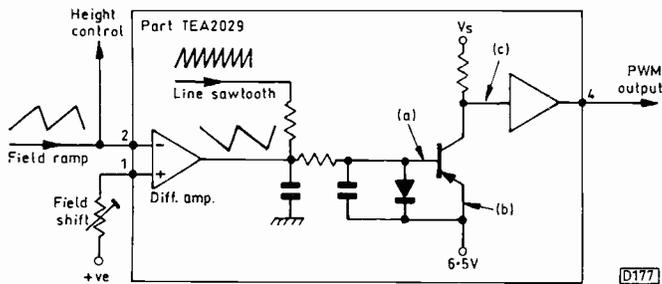


Fig. 8: Generation of the variable duty-cycle pulse waveform required to control the thyristor field output circuit.

to the vertical shift control. The ramp output from the differential amplifier is fed to the following transistor along with a line-rate sawtooth waveform that's generated within the chip. This transistor acts as a pulse-width modulator, with a 6.5V threshold level at its emitter. As the field-rate sawtooth

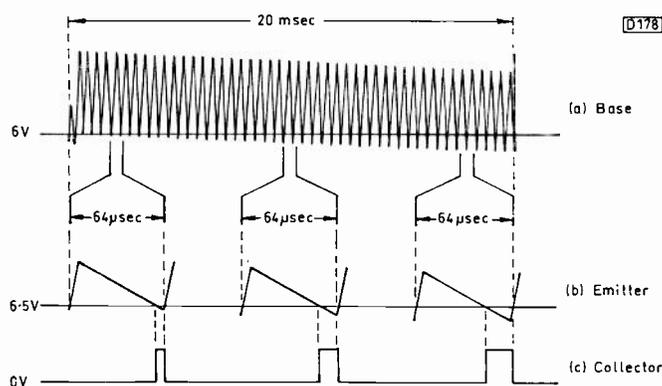


Fig. 9: How the arrangement shown in Fig. 8 works. The drawing is not to scale! There are in practice 612.5 line sawtooth cycles superimposed on the 20msec field ramp at the base of the transistor. Even at the end of the field scan the thyristor conducts during only part of the line scan, so C1 (Fig. 7) is never fully discharged. Note also that during the flyback and at the start of the downwards field scan the conduction period of the thyristor is such that C1 cannot charge to the peak voltage across winding X-Y on the line output transformer.

ramps down, see Fig. 9, the line sawtooth that's superimposed on it falls progressively lower with respect to the 6V level. As a result, the transistor switches on for a progressively longer period during each line sawtooth cycle. Its output, a pulse-width modulated signal, is then amplified to

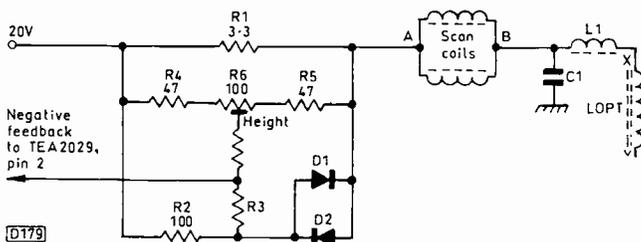


Fig. 10: The feedback arrangement for s-correction and height control with the type of circuit outlined in Fig. 8. Both rely on the voltage developed across R1.

12V peak-to-peak before leaving the chip at pin 4 to control the thyristor's switch-on timing.

The variable d.c. voltage applied to pin 1 (field shift control) sets the transistor's slicing level (nominally 6V), altering the average voltage developed across C1 and thus the residual current in the scan coils.

Fig. 10 shows how s-correction is implemented with this arrangement. The scan current develops a sawtooth voltage across R1, a 3.3Ω resistor that's in series with the scan coils. At the centre of the vertical scan the voltage across R1 is virtually zero, so no current flows via either D1 or D2. Away from screen centre a greater voltage is developed progressively across R1. Thus either D1 or D2 passes more current, increasing the negative feedback via R3 to reduce the deflection current.

Alternative Configurations

Most modern TV sets use separate i.c.s for field drive generation and power output. In a few designs, mainly portables and basic sets, the complete field timebase is in a single chip that requires only a sync pulse feed and a power supply. Other sets have a field timebase or output stage that consists of discrete components but follows the basic principles described above. Because of the low impedance of the field scan coils used with monochrome, viewfinder and small-screen, narrow-neck colour c.r.t.s a flyback generator is not required: a simple class B output stage suffices.

Next Month

In the next instalment we'll examine TV receiver power supply principles and practice. We'll then have covered every aspect of 'basic' television. The rest of the series will be concerned with 'optional extras' such as teletext, elaborate control systems and enhanced display techniques.

HELP WANTED

Wanted: Main chassis board for the Hinari CT4 and the Indesit T12SGB. Prefer working boards but faulty 'unworked' might do. Keith M. Twamley, 25 Davena Drive, Weoley Castle, Birmingham B29 5UL.

Wanted: Tube type 85JB4 for the JVC Model 3060UK Mk. II TV/radio/cassette player. M. Wright, 7 Dundas Street, Spennymore. Co. Durham DL16 6AS.

Wanted: (1) Panasonic process board YFVPC1001EA for the WVP100E camera – or a camera for spares. (2) Panasonic post adjustment plate VFK0259 for VCR Model NV200. (3) A manual for the Ferguson 3V23/JVC HR7700 VCR. (4) *Radio and Television Servicing* books from 1976-7 to 1987. David Syddall, 1070 Bury Road, Brightmet, Bolton, Lancs BL2 6QA. 061 234 4036 (day), 0204 33793 (evenings).

Wanted: Manuals/circuits/handbooks etc. for the following: (1) Marconi Instruments TF1099 20MHz sweep generator. (2) Heathkit OS1 oscilloscope. (3) Eagle Model MV72 a.c. millivoltmeter. (4) AVO transistor analyser type TA. (5) Radivet wobblator type 211 (made by Airmec). K. Phillips, 39 Llwyn Ynn, Talybont, Merioneth, Gwynedd LL43 2AG.

Wanted: Twelve-way tuning switchbank and tuning unit for the Philips Model 20CT2026 (CTX chassis). R. Fisk, 16 Sterry Drive, Thames Ditton, Surrey KT7 0YN. 081 398 6088.

Servicing the Goodmans GTV9200/Samsung CI125R

John Riggs

These receivers were sold mainly by Goodmans and via mail order some three and a half years ago. Their specification – a 5in. portable colour TV/monitor with m.w./f.m. radio – and compact size made them particularly popular with caravan users.

Power Supply Arrangements

Powering can be via a mains adaptor that provides 13.5V at 1.4A. These are inclined to run hot, occasionally failing. For car or caravan use a suitable d.c. lead is required to plug in instead of a mains adaptor: to minimise the voltage drop, the lead should be capable of carrying several amps. Internal batteries can also be used: because of the fairly heavy current consumption, rechargeable types are best. Maximum viewing time is one and a half hours.

The power supply circuitry within the set is conventional. A series regulator fed from the internal batteries or the d.c. input provides an 11V output that's used by the main power consuming sections of the set. A second, i.c.-type regulator is fed with 17.6V derived via a rectifier from the line output transformer, providing a 12V supply that's used by the low-power sections of the set.

Sensitivity

Sensitivity is good with both TV and radio reception. If the TV signal is weak the sound will mute: this can, if required, be overridden by removing plug CN106.

Fault Listing

No results (no sound or vision): Check for cracks at the corner of the PCB adjacent to the line output transformer (T402). The usual cause of cracks here is that the set has been dropped.

Low brightness/contrast: Try adjusting the sub-brightness control VR312 and the sub-contrast control VR311. If necessary try realignment of the bias controls in the RGB output stages – VR307 red, VR308 green, VR310 blue.

Small picture/line speed incorrect: Replace C407 (2.7nF).

No/low 11V supply: The KTA1015 (may be KSA539) regulator driver transistor Q604 could be faulty or the 5k Ω preset control VR601 (+B ADJ) open-circuit.

Patterning with strong signals (effect is similar to a.g.c. overloading): Check whether the print on the earth side of the aerial socket is open-circuit.

Loss of height: Check for 11V at pin 10 of IC401. If the voltage here is high the MC7812C/KIA78012 12V regulator chip IC402, which is on the metal shield that surrounds the line output transformer, is probably short-circuit.

Corona effect/large picture/high brightness/poor focus: Check for a dry-joint or open-circuit at the earth lead connection to the c.r.t. base.

Intermittent loss of or no colour: Override the colour-killer by linking TP5 to TP17 and TP13 to TP14. If unlocked colour appears, adjust the a.p.c. preset VR304 for minimum colour rolling then remove the test point links. The colour should now be correct. If the colour disappears, suspect C315 (1 μ F) and check the value of R321 (1M Ω). If necessary replace the 8.86MHz crystal X301.

Loss of colour after several hours: The TDA3565 colour decoder chip IC301 is probably faulty – use freezer to prove this.

Incorrect colour: Check for dry-joints at the chroma delay line DL302.

No Sound: Check the earphone socket and loudspeaker.

Tuning drift: Replace D407 (1N4148) and the 33V regulator IC403 (KA33V). Also check R417 (33k Ω , 0.5W) and Q101 (KTC1815 or KSC815).

Not tuning: Drive cord broken. See Fig. 1.

Internal battery charger doesn't work: Check whether R604 (10 Ω , 5W) is open-circuit or dry-jointed. Note that the maximum charge rate is 200mA.

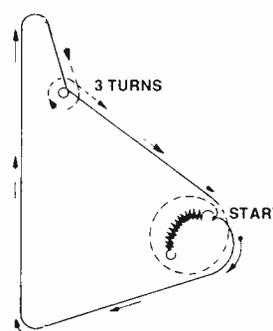


Fig. 1: Drive cord stringing.

Notes

The 11V regulator transistor Q603 is type KTB834Y. The line output transistor Q402 is type KSD362R or KTC2233, the driver transistor Q401 being type KSC1008 or KTC1959. The three RGB output transistors Q302/3/4 are type KTC2482Y or KSC2310Y. The field output transistors are Q503 (KTC2236A-Y or KSC2328A-Y) and Q504 (KTA966A-Y or KSA928A-Y), the driver being Q502 (KTC1815 or KSC815). The timebase generator chip IC401 is type TDA2579A. The audio amplifier/output chip IC201 is type KIA7313AP.



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Servicing Ferguson FC08 and FC28 Camcorders

David C. Woodnott

Large numbers of these Ferguson-branded, full-size VHS camcorders recently became available when they were sold off by the Thorn Rental group. The two models are similar, the FC08 being introduced in 1988 and the FC28 about a year later. They were manufactured by JVC, the equivalent model numbers being GF450 and GF500 respectively. Intended originally for the Saudi Arabian market, a great many of them came to be used as rental stock.

When placed side by side the two camcorders look almost identical. In practice however they share very few components, either electrical or cosmetic, the deck mechanism being the section with the greatest degree of commonality.

Features

The user functions are very much the same. Both models have manual and automatic control over most of the common camera functions. Both have HQ enhancement, insert edit and audio dub. Two unusual features common to both are the animation mode, which produces cartoon-type movement automatically, and BGM (background music) input from an auxiliary source. They were the first Ferguson full-size machines to have a flying erase head: this was to give a clear 'join' to animation-mode sequences.

The optical systems are also similar but not identical. The FC08 has a x6 lens while the FC28 has a x8 type. The major difference between the two, in fact the only functional difference, is the digital titler used in the FC28. This has a three-image memory with eight colours and a reverse image facility. It's something that became commonplace on later models of all makes. Sensitivity is quoted as 10 lux for the FC08, 7 lux for the FC28.

When the camera is held in the normal operating position the camera function buttons are at the front left-hand side of the case. This group of controls includes the power on/off switch. The VCR function buttons and LCD display are at the rear of the case while the record trigger and wide/telephoto controls are, as usual, at the right-hand side of the hand grip. There's a cover for the VCR function buttons (record, play, fast forward/rewind etc.). It can be slid over them to provide protection but is otherwise purely cosmetic, i.e. it doesn't, as with some models, engage the record mode.

Similarities

Although few parts except for the deck mechanism are common to both models there's a strong 'family' sense in the designs. The optical units for example have the same autofocus system, with a slave lens that tracks the movement of the main focusing lens and the output from the focus sensor

driving the autofocus motor to position the main focus lens correctly. There are also many family likenesses in the electronic circuitry – the same chips and circuit features are used. Other models of the period, e.g. the mini C versions, the FC05 and Philips VKR6840, share many circuit features. The deck is very similar to that used in the earlier FC04, which was also much used by the rental companies.

Casing and Access

It's not unknown for these camcorders to arrive in the workshop with case screws missing. In fact we've had examples where almost all the screws have fallen out, the camera arriving in 'kit' form! The point about this is that missing screws don't necessarily mean that the customer has been inside the camcorder. It could be to do with the less than perfect way in which some rental customers use equipment. An owner, having parted with his hard-earned cash, would probably take greater care.

Case removal for servicing is straightforward. Except for a special shanked type used to secure the optical unit at the front left-hand side most of the screws are of the same pattern. The camcorder can be operated for deck checks etc. with the 'top case' (cassette-housing side) removed. The deck and camera head sections are completely separate and are secured to the 'lower case' individually. Two ribbon cables that run between the lower case and the underside of the deck assembly provide the main interconnections between the two assemblies. These cables are stuck to the lower case but can be unstuck for servicing. There are also various plug/socket connections between the camera and deck sections, carrying Y and C signals, electronic viewfinder data, supply lines etc.

The innards can be removed complete after first removing the VCR operation assembly from the rear end of the unit and releasing the deck securing screws. The ribbon cables can be disconnected or unstuck from the lower case. It's easy to release the camera section from the case.

There are two PCBs, audio/servo/mechacon (ASM) and video, fixed to the rear of the deck assembly by three screws. Removal of these boards gives access to two small PCBs that are mounted directly on the deck. One serves as a junction point for the deck sensors, the other is for motor drive.

The Deck Mechanism

The deck mechanism is straightforward and shouldn't present servicing problems. With very few parts to fail it has proved to be very reliable. The well-proven JVC optocoupler deck position sensing system, which is similar to that in many full-size domestic VCRs, is used. Things to watch for are broken actuating levers, distorted or broken cam gear teeth, slipping loading belts etc. – all common stuff.

Note that the ribbon cable from the lower drum to the video PCB, carrying the f.m. signals, is very short and can easily become partly detached from its connector. This can give the impression that there's a faulty video head or intermittent play.

When refitting the ASM and video PCBs make sure that the coupling edge connectors are properly fitted. If the VCR operation assembly should suffer impact damage it's likely that a replacement ASM PCB will be required, as damage to the connector that links it to the operation PCB assembly is rarely repairable.

Cassette Housings

The cassette housing assemblies are prone to damage as a

result of mistreatment. Cassettes are inserted in a downward direction. The cassette lid's upper edge overlaps the top surface of the case. There is sufficient gap for an immense amount of pressure to be exerted, and this will badly deform the housing. Fortunately because the housing can be distorted so easily it can also often be returned to (almost) its correct shape by means of a little metalwork. To avoid interference to correct tape transportation it must of course seat properly in its down position.

Mechanical Points

The two small pressure pads that hold the tape firmly in position when laced up can become slack: spring retension usually provides a cure. It's also quite common for the record prevent switch and its housing to become detached from the cassette housing. If this happens a new housing will be required. Make sure that the record prevent switch is fitted properly.

If a tape has been inserted incorrectly and pressure has been applied to the cassette lid it's possible for the capstan shaft to be pushed into the machine with the result that the motor jams. The shaft can usually be released without trouble, but remember to relocate the dust washer on the shaft.

The Camera Section

As previously mentioned the camera section can be released from the case for servicing. In both models it consists of the optical assembly which has two video PCBs fixed at the rear. These carry the CCD image sensor and all the SSG and video circuits. The outputs to the encoder PCB, which is mounted at the edge of the video 1 PCB, are R – Y, B – Y and luminance (plus the necessary control signals). The encoder provides a Y/C output to the deck section.

The camera control functions (white balance etc.) are on two further PCBs which are mounted to the rear and below the optical assembly.

The autofocus systems are similar, but there's a slight difference to the coupling between the master and slave lenses in the two models. In the FC08 a cam follower (peg) sits in a track around the circumference of the main lens: any movement of the main lens thus produces a corresponding movement of the slave lens. The same principle is used in the FC28 but the 'peg' on the slave lens is sprung against a raised cam on the body of the main lens. This means that the slave lens may jam, rendering the autofocus system inoperative, if it gets pushed into its most inward position. With either model the slave lens assembly can become jammed because the slide bearing is contaminated. A strip down and clean normally cures this.

Note that the FC08 has a 49mm lens, the FC28 a 52mm lens.

All setting up adjustments are by means of preset potentiometers or capacitors – this was the generation before the advent of the EVR (electronic variable resistance).

It's easier to replace the CCD image sensor in the FC28 as it plugs in. With the FC08 the imager is soldered in.

Common Faults

Common faults with these camcorders are few – apart from those caused by damage to the cassette housing, such as fouling of the take-up reel and consequent shutdown. A few known faults are listed below – these are in addition to those previously mentioned. Note that where component

circuit reference numbers are given these apply to the FC08. Similar faults are caused by the equivalent components in the FC28.

VCR Section

Intermittent loading/unloading or any other mechanical function: Replace the optocoupler.

Capstan speed fast/slow: C124 open-circuit or IC102 faulty.

Intermittent shutdown in play/record (intermittent counter): Resolder dry-joints on the supply-reel sensor.

Mechanical noise, noise bands on the picture: Drum assembly floating because all three screws are loose or missing.

No functions: IC103 not being reset or Q4 in the regulator section open-circuit.

Intermittent battery alarm indication (battery o.k.): R4 intermittent.

Noise on sound: IC701 on Mic2 PCB faulty or C7, C8, C9 or C703 open-circuit or leaky.

Recorded sound is low/distorted: Check for a dry-joint on the bias oscillator transformer L201 on the main PCB.

Playback output from only one f.m. channel: C11 or C12 on the Y/C PCB leaky.

Camera Section

No colour: BFP301 or R334 on the encoder PCB is open-circuit.

No E-E picture: CP1 on the camera Ctrl PCB is open-circuit.

Noise on E-E pictures: Cause is spikes on the supplies because the camera d.c.-d.c. converter is faulty.

No camera picture: IC2 (SSG chip) faulty.

No camera luminance: EQ101 or Q15 open-circuit.

Viewfinder

A very common complaint with the FC28 is of poor pictures. Careful removal of the 'blue' substance around the c.r.t. pins will usually improve the situation. Also clean the pins and socket connections.

Other Useful Information

The following power consumption figures, for the FC28, may be helpful: power off 150µA; power on 380mA; monitor 750mA; record 900mA; record pause 780mA; play 520mA; play pause 450mA; FF/rewind 530mA; zoom 22mA; autofocus 40mA.

Test Report: Wavetek 9020 Oscilloscope

David Botto

The Wavetek Model 9020 is a 20MHz, dual-trace oscilloscope with a multitude of operating features including a built-in component tester and a delayed-sweep facility. It is sturdily built and is housed in a tough-looking metal case. A strong handle/stand adjusts to a wide range of angles and is far better than the flimsy wire-tilt stands that some scopes have. Size is 310mm in width, 160mm height and 400mm depth, weight being about 9kg. Power requirements are 110/120/220/240V a.c., 50/60Hz, consumption being approximately 35W.

Clearly-labelled, solid-response front-panel controls make range and function selection easy. The 8 x 10 division screen graticule is nicely marked and calibrated. It does tend to reflect external light however – a non-reflective screen would have been better. I also missed the inclusion of a graticule illuminating light, though the bright-green trace produced by the 150mm rectangular c.r.t. is easy to view and focuses beautifully. You can't lose the beam trace: a beam find button brings it to the centre area of the screen when required.

Operating Modes

There's a choice between single- and dual-trace operation. In the dual-trace mode pushbuttons provide selection of alternate (ALT), chopped (CHOP) or ADD modes. The latter adds or subtracts the channel one and channel two inputs, which is useful for differential waveform measurement and analysis.

Push another button and you get the X – Y mode. The channel one input now provides vertical deflection and the channel two input horizontal deflection. Amongst other things you can use this mode for colour signal vectorscope analysis: connect the channel one probe to the R – Y signal and the channel two probe to B – Y, adjust the gain controls and the well-known colour vector signals appear on the screen.

Vertical Deflection

Two front-panel switches give you a choice of d.c., earth or a.c. inputs at the X and Y BNC input sockets. With each channel the bandwidth is d.c. to 20MHz (–3dB point). Checks with inputs from a.f., r.f. and digital signal generators produced good results. The rise time is approximately 17.5nsec and the overshoot less than three per cent.

The use of dual-channel f.e.t.s and i.c.s minimises drift in the two vertical input preamplifiers. Ten-step frequency-compensated RC input attenuators ensure accurate measurement of displayed waveforms. Calibration is from 5mV to 5V/division. Two 5:1 panel calibration controls enable fine adjustments to be made: the maximum clockwise position increases the sensitivity from 1mV to 1V/division, though

the bandwidth is then reduced to 10MHz.

A test point connection on the front panel provides a calibration test signal. Should the calibration panel need adjustment there's no need to remove the case: d.c. balance, X/Y gain and trace rotation controls can be easily adjusted through holes beneath the instrument.

Diode protection guards the vertical inputs against overloads. In the ALT and CHOP modes diode gates alternately switch the vertical inputs. The CHOP mode is controlled by the 500kHz squarewave output from a bistable multivibrator while the ALT mode is controlled by blanking pulses from the scope's timebase.

Horizontal Deflection

The rotary time/division switch has twenty calibrated positions giving sweep speeds from 0.2sec to 0.1 μ sec/division. In addition the VAR control provides a continuously variable sweep rate up to a factor of 2.5 – a neat red LED lights when this control is in use. A pull-out control increases the sweep rate by ten.

Cleverly-designed triggering circuitry makes it easy to lock to a signal being measured. Push-button trigger source switches offer a choice: you can use the input signal to trigger the scope's two channels or use it to trigger each channel alternately. An external trigger source can also be used.

The push-button trigger-coupling switch has four positions: AC rejects d.c. and attenuates signals below 100Hz; DC accepts all trigger signals from d.c. to 20MHz or higher; LF accepts low-frequency signals, below about 10Hz; HF accepts signals above 10Hz.

There's also a trigger-mode push-button. This enables you to select AUTO, with automatic triggering, or NORM. In the NORM mode a trigger level range of +5V to –5V is obtained by use of the trigger-level control. When this

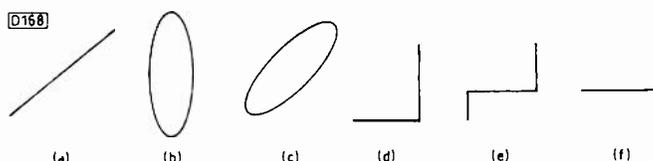


Fig. 1: Typical component tester waveforms obtained with the 9020. (a) 680 Ω resistor; (b) 47 μ F capacitor; (c) mains transformer primary winding; (d) transistor base-collector junction; (e) transistor base-emitter junction; (f) gate-source f.e.t. check with the source earthed.

control is used a red LED lights as soon as the scope locks to the measured signal. The trigger slope button selects between triggering from positive- or negative-going slopes.

Another panel switch selects Normal, Search (searches for a position at which the horizontal sweep will be delayed) and Delay. A rotary switch calibrated in six steps from 10msec to 0.1 μ sec sets the selected delay time after the triggering point, enabling short-duration waveforms to be viewed. This is useful when checking the one-shot oscillators used in VCRs.

Probes

Two neat, lightweight 10:1 probes are supplied with the 9020. They are well made and are rated at up to 60MHz. This is a good point: there's no sense in having a 20MHz scope if the probes are rated at up to a bare 20MHz or less.

Each probe's BNC connector incorporates a frequency-

compensating trimmer. I found these far easier to adjust than the usual type of trimmer set into the probe itself. By using the special trimmer driver provided to set the trimmers I found that excellent squarewave patterns from my signal generator could be viewed.

Rear Sockets

There are two BNC sockets at the rear of the scope. One provides Z-axis modulation: this enables you to use an external signal to control the beam intensity. The other provides a sawtooth output signal of approximately 5V peak-to-peak amplitude derived from the scope's timebase.

Component Tester

More and more service engineers are finding that a component tester makes life a lot easier. It's often quicker to use one to check every component on a PCB rather than spend time tracing out the circuitry and then checking suspect items.

Press the Comp Test button and the component check feature is available. Two 4mm front-panel sockets accept standard test leads and probes. Fig. 1 shows some typical waveforms to expect. You can also check i.c.s and make continuity tests. One thing that the Operator's Manual doesn't tell you is how to check large capacitors with values as high as 2,000 μ F or so: to do this simply pull out the times ten sweep control knob then increase the brightness level.

There's no provision for checking thyristors. You can do this however by connecting the thyristor's cathode to the chassis socket and its anode to the 'hot' component test socket, then biasing its gate with an external 1.5V battery connected via a series 3k Ω linear potentiometer – see Fig. 2. Adjust the potentiometer to switch the thyristor on. For a complete account of component tester principles see my articles in the July and August 1990 issues of *Television*.

Safety

Wavetek has paid close attention to safety. X-ray radiation is less than 0.5mR/hour at a distance of 5cm from the surface of the c.r.t. The scope is well shielded, meeting the stringent safety and health requirements of IEC 348.

Wavetek recommends use of an isolating transformer between the mains supply and the scope to minimise electrical hazards (every service test bench should be powered

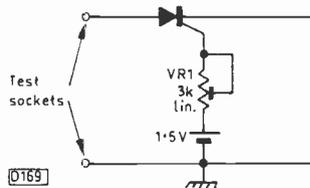


Fig. 2: How to test a thyristor using the 9020.

via a suitably rated 1:1 mains isolating transformer). Never connect an earthed oscilloscope to a live TV chassis: the set will suffer damage, and so will you.

Conclusion

The Wavetek 9020 is excellent for TV/VCR servicing and proved to be quite at home when checking computer circuitry – on-site computer servicing and maintenance can be a highly profitable source of extra income for the alert service engineer.

Complete with test probes and power cord the 9020 costs £346 plus VAT. This seems to be a reasonable price in view of the scope's sweep-delay facility.

The Operator's Manual is clearly written and packed with information. It contains complete circuit diagrams for the 9020. A couple of extra pages on component testing would in my view have been helpful.

You can obtain the Wavetek 9020 from Wavetek Ltd., Astec Building, High Street, Wollaston, Stourbridge, West Midlands DY8 4PG (telephone 0384 442 394). My thanks to Sue Round for arranging the loan of a 9020 for test purposes.

Answer to Test Case 372

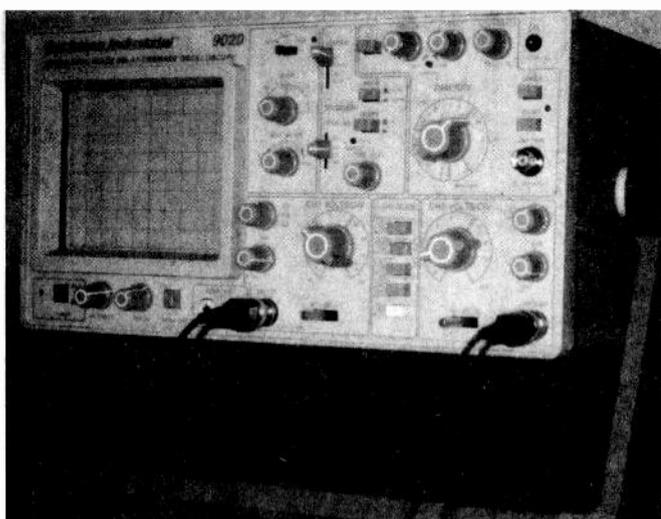
– See page 106 –

The reel idlers in many Sharp VCRs of yesteryear were unreliable and, more often than not, were the root cause of reel-drive problems. But this time idler replacement had not cured the fault.

In retrospect, the fact that until the reel-drive motor shaft was turned the machine, on its second visit to the workshop, failed to work was a very important clue in the diagnosis. It was unfortunately lost on Sherlock, despite his nickname. Dr. Watson, in the form of another technician, came to the rescue. He removed the two screws and two wires from the motor and took it out of the machine. He then hooked it up to a 6V battery, with a 10 Ω resistor in series, and connected an oscilloscope across the motor's terminals. The waveform on the scope's screen revealed all!

It was very spiky, with needle pulses of over 4V peak-to-peak amplitude superimposed. This showed that the brush-to-commutator contact was dodgy to say the least. It was possible, with the motor-drive boss between the thumb and forefinger, to find a dead spot at which the motor stuck, regardless of the applied voltage, until the shaft was turned a little. It then ran again by itself. So the cause of the trouble was wear in the reel-drive motor.

A new – free of charge of course! – reel motor provided a permanent cure. If Sherlock gets another such Sharp machine in for repair he intends to give the reel motor a thorough medical before quoting for the job!



The Wavetek 9020 dual-trace, 20MHz oscilloscope.

Letters

BUYING A TV SET

Readers of *Television* are probably more interested in the technical performance of the sets they buy than most people. I wonder how much luck they have however when trying to assess performance before making a purchase?

Recently I wanted rather more than the information, though excellent, given in Sony's brochures. What I wanted to know about was the geometry of the display produced by the company's latest large-screen sets – at times I need to show computer graphics to groups of people. The displays, with their S-shaped tops and bottoms, seen at exhibitions on sets from various manufacturers have been less than satisfactory.

So I looked at the Sony brochures. No luck. I then rang the Sony Customer Information Centre, which subsequently sent me details of local (?) dealers. I visited these dealers, at very quiet times, to ask whether they would, at a suitable time, show me on a set of my choice a video-taped test card that was on high quality tape recorded using a Sony SLV777 VCR. Two said "no" in no uncertain terms. The third had such a small 'showroom' that I didn't dare ask.

I rang SCIC again, repeated my request and this time asked to speak to a technical person. This person asked whether I was a Sony dealer? When I said "no" he came up with what sounded like a standard response – "sorry, we may have this information but it's available only to... etc."

I became devious, asked amongst friends in the trade and was told about The Sony Service Centre, 100 Ballards Lane, Finchley. When contacted this firm said they had the set I was interested in and would be happy to show me the test card display. I went along, viewed, and was completely satisfied (comb filters do make a difference!). A comment from this dealer's Customer Service Director says it all: "if we want to sell, we must do our utmost to please a potential customer."

So you can get the attention you require, but why does it have to be such a struggle?

Roger Goodman,
Wandsworth.

DIGITAL VCR FORMAT

In the September Teletopics column there was reference to a basic digital VCR specification to be submitted to the IEC by a group of ten major consumer electronics manufacturers as a proposed international standard. I think it a pity that signal bit reduction using cosine transformation was specified. An alternative would have been fractal image compression, which has the best compression ratio of all methods at present known. It has another important advantage. On expansion beyond the initial resolution, the image can be made to show detail not present in the original source. This detail is spurious of course, but for entertainment use would give an impression of improved sharpness, particularly when the image is being expanded for display on a large screen or monitor with a higher resolution than that of the original material.

For those interested, a demonstration disc that shows how extreme compression ratios can be achieved for graphic images is available, for IBM PCs with Windows 3.0 or higher, from Iterated Systems Ltd, Wyvols Court, Swallow-

field, Reading, Berks RG7 1PY, together with explanatory brochures.

John de Rivaz, B.Sc. (Eng.), AMIEE,
Truro, Cornwall.

SPECTRUM SPACE

Your October editorial refers to a suggestion by BSKyB's director of programmes that 50 channels could be used to transmit a single feature film, a prospect made possible by digital compression. But to use 50 channels, whether compressed or not, to show a single feature film so that Joe Public can decide when to watch it is an obscene waste of the radio spectrum. If someone wants to watch a particular film at a specific time, I'm sure they could nip out to the local video hire shop.

In your sister magazine *Electronics World and Wireless World* Frank Ogden suggests that the innovators of today have lost sight of the reason for innovation – necessity. When will they get back to designing things that people want, rather than coming up with whizz-bang schemes then wondering whether there are uses for the invention? He was referring to those ridiculous personal organiser things that do exactly the same job as a 50p notebook and pen, but far more awkwardly and at umpteen times the price.

A lot of very intelligent people have put an enormous amount of work into squeezing high-quality TV pictures into a narrow bandwidth. We now have to convince marketing men to use this technology to give us better, not just more, TV.

Andrew Howlett,
Dukinfield, Cheshire.

SIGNALS FROM TDF1/2

With reference to Roger Bunney's October column and Colin McCormick's letter in the November issue about the D2MAC Supervision satellite transmissions of 16:9 films and sport, at present (late October) the D2MAC TDF test card from 19°W seems to give the answer. Superimposed on the test card pattern are the words "France Supervision sur TC2A. Radio France Hector est maintenant sur Le Canal 5". I'm not at present equipped to receive signals from Telecom 2A at 8°W, but I assume that those who are can receive France Supervision in the clear.

Incidentally I'm getting perfect reception of TDF1/2 signals here with a modified Ferguson SRB1 tuner using a standard Squarial indoors by a first-floor window. Alongside I have another indoor Squarial, modified for left-hand polarisation and mounted on a camcorder tripod. The latter provides adequate RTL, SAT 1, 3SAT and Eins Plus signals via TV-SAT2 at 19°W!

Ivor Nathan,
Southgate, London N14.

SERVICING CAR AUDIO EQUIPMENT

Further to my previous letter (November, page 23) on car audio equipment faults, here are some more things to look out for.

Sharp cassette players have a reed switch under the back capstan wheel. It tends to shatter because of vibration. When fitting a replacement, make sure that it's the correct way up and watch the leads when you bend them – they can shatter the glass.

If poor radio reception is the problem, check for rust at the aerial input socket. Rust here indicates that the aerial lead is taking in water and that the aerial will have to be

replaced. A tip: tie a piece of string to the aerial cable before pulling it out – this will enable you to pull the new aerial in with ease. Don't forget to adjust the trimmer to match the aerial to the radio. Adjust for maximum signal or noise with the aerial fully extended and the radio tuned to 200m/1.5MHz.

Some radio receivers/cassette players have an input protection diode in the power lead. Always check this as it can go open- or short-circuit.

The problem we had with one radio receiver that kept coming back was loss of its memory store. A poor car battery was the cause of the problem: when the car was started the voltage would fall to such an extent that the memory would drop out. A new battery worked wonders. Some Fiat radios are designed so that they can be removed when the car is left: a standard cell is incorporated to retain the memory. Use only a DVM when checking these cells – a standard meter will draw current and flatten the cell.

The following things can cause faults: a leaky windscreen can allow water into the radio; if the radio is too close to the car heater the output stage may blow; omission of an earth lead, relying on the aerial lead for the power return, doesn't always work.

Finally, watch out for the following types of aerial: wing mounted; roof mounted; door pillar mounted; windscreen; aerials in the wing mirrors; and finally, for oldies like myself, the aerial under the car – who out there remembers that they pick up the ground wave?!

*B.D. Andrew,
Devizes, Wilts.*

HANDSET PROBLEMS

The complaint with a 16in. Philips KT3 teletext portable we had in recently was sound but no picture. When we unplugged the text panel the picture appeared. Several migraines later I decided to try to get the teletext supplement for my KT3 manual, something that's not easy. I even-

tually got one however and can already hear the chorus from other engineers saying "I could have told you what that was". Yes, I eventually found that the fuse in the teletext power supply had gone, removing the rail that provides the TV-text switching voltage. But that wasn't the end of the story.

We returned the set to the customer but the very next day it was back in the workshop with the complaint that "text pages can't be selected and the clock keeps appearing on the screen". I was sure that the set had been all right when I'd tested it with our own handset, and sure enough it was o.k. when retested. When the customer's handset was used however things went to pot and after this the set wouldn't work with our unit. Back to the set. After changing the remote control receiver chip to no avail I resorted to shunting the supply rails with 1,000µF electrolytic capacitors. When this had been done the set would revert to the picture mode. It subsequently responded to my handset then reverted to the index page after which no further selection was possible. More migraines.

I decided to scope the output from the infra-red sensor in the set. A nice healthy waveform appeared when our handset was operated but when the button was released a low-amplitude signal was still displayed. Thinking that there was a fault with our handset I pointed it away from the set and even under the bench, but the low-amplitude signal was still present. I then had a sudden attack of intelligence: I removed the battery from the customer's handset, which had been lying on the bench. Hey presto, the signal disappeared. But the set still wouldn't respond to our handset until it had been switched off and on again. Then pernick.

I had wondered why the battery in the customer's unit seemed to be running down quickly. This was why. The unit had been permanently transmitting the clock call signal, thus jamming and confusing the logic.

*Peter Nutkins,
Charmouth, Dorset.*

OBITUARY

Many of our regular readers will be saddened to learn of the death of Les Lawry-Johns in late August. He had been in poor health for some years, but managed to keep on top of his health problems: he died of a heart attack.

Les joined the Royal Navy Fleet Air Arm early in the war and saw service in the middle east. After the war he returned to Gravesend, Kent, where he started a radio and TV sales and repair business. He became well-known in the area as a local character, in particular for being so helpful to all who came to him with their problems. Some might say too helpful, since he was reluctant to

charge fully for his services.

His long Servicing Television Receivers series started in the September 1954 issue of *Practical Television* (as we then were), with the HMV Model 1807. He went on to cover just about every TV chassis up to and including the earlier all solid-state, single-standard colour chassis. His experience was legendary – he could pinpoint just about every stock fault, and many of those who used the advisory service we then ran benefitted from his know-how. But above all he introduced humour and the human element into his servicing articles. After all repairers have feelings, and customers often present as many

problems as the sets they want repaired. Les felt, rightly we believe, that this overall view was relevant in writing about servicing matters. In addition to the articles that appeared under his own name, he contributed to the magazine under various pen-names such as S. Simon (Simple Simon!) and Peter Gaymead-Frazer – his sense of humour was never far below the surface. Many contributors made a point of paying a visit to the famous shop in Parrock Street.

His death is a great loss to his family, to his many friends and acquaintances in Gravesend and to the *Television* readers he informed and entertained for many years. **J.A.R.**

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TOWERS INTERNATIONAL TRANSISTOR GUIDE, A very useful book for finding equivalent transistors, leadouts, specs etc. £20 REF: MAG20P1

SINCLAIR C6 MOTORS We have a few left without gearboxes. These are 12v DC 3,300 rpm 6"x4", 1/4" OP shaft. £25 REF: MAG25

UNIVERSAL SPEED CONTROLLER KIT Designed by us for the above motor but suitable for any 12v motor up to 30A. Complete with PCB etc. A heat sink may be required. £17.00 REF: MAG17

VIDEO SENDER UNIT, Transmits both audio and video signals from either a video camera, video recorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel) 12v DC op. Price is £15 REF: MAG15 12vpsuis £5 extra REF: MAG5P2

***FM CORDLESS MICROPHONE** Small hand held unit with a 500' range! 2 transmit power levels, Reqs PP3 9v battery. Tuneable to any FM receiver. Price is £15 REF: MAG15P1

LOW COST WALKIE TALKIES Pair of battery operated units with a range of about 200'. Ideal for garden use or as an educational toy. Price is £8 a pair REF: MAG 8P1 2x PP3 req'd

***MINIATURE RADIO TRANSCIEVERS** A pair of walkie talkies with a range of up to 2 kilometers in open country. Units measure 22x5x1.55mm. Complete with cases and earpieces 2xPP3 req'd £30.00 pair REF: MAG30

COMPOSITE VIDEO KIT, Converts composite video into separate H sync, V sync, and video. 12v DC operation £8.00 REF: MAG8P2

LQ3600 PRINTER ASSEMBLIES Made by Amstrad they are entire mechanical printer assemblies including printhead, stepper motors etc etc in fact everything bar the case and electronics, a good stripper! £5 REF: MAG5P3 or 2 for £8 REF: MAG8P3

PHILIPS LASER 2MW helium neon tube. Brand new full spec £40 REF: MAG40 Mains power supply kit £20 REF: MAG20P2. Fully built and tested unit £75 REF: MAG 75

SPEAKER WIRE Brown, two core, 100 foot hank £2 REF: MAG2P1

LED PACK of 100 standard red 5mm leds £5 REF: MAG5P4

JUG KETTLE ELEMENTS good general purpose heating element (now 2kw) ideal for all sorts of heating projects etc 2 for £3 REF: MAG3

UNIVERSAL PC POWER SUPPLY complete with flyleads, switch, fan etc. Two types available 150w at £15 REF: MAG15P2 (23x23x23mm) and 200w at £20 REF: MAG20P3 (23x23x23mm)

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***FM TRANSMITTER** housed in a standard working 13A adapter! the bug runs directly off the mains so lasts forever! why pay £700? or price is £26 REF: MAG26 Transmits to any FM radio

***FM BUG KIT** New design with PCB embedded coil for extra stability. Transmits to any FM radio. 9v battery req'd £5 REF: MAG5P5

***FM BUG BUILT AND TESTED** superior design to kit, as supplied to detective agencies etc 9v battery req'd £14 REF: MAG14

TALKING COINBOX STRIPPER originally made to retail at £79 each, these units are designed to convert an ordinary phone into a payphone. The units we have generally have the locks missing and sometimes broken hinges. However they can be adapted for their original purpose or used for something else?? Price is just £3 REF: MAG3P1

100 WATT MOSFET PAIR Same spec as 25K343 and 25J413 (8A, 140v, 100w) 1 N channel and 1 P channel, £3 a pair REF: MAG3P2

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AT KEYBOARDS Made by Apricot these quality keyboards need just a small modification to run on any AT, they work perfectly but you will have to put up with 1 or 2 foreign keycaps! Price £6 REF: MAG6P3

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PC CASES Again mixed types so you take a chance next one off the pile! £12 REF: MAG12 or two identical ones for £20 REF: MAG20P4 component pack bargain 1,000 resistors +1,000 capacitors (all same value) £2.50 a pack REF: MAG2P7

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HEADPHONES 16P These are ex Virgin Atlantic. You can have 8 pairs for £2 REF: MAG2P8

PROXIMITY SENSORS These are small PCB's with what look like a source and sensor LED on one end and lots of components on the rest of the PCB. Complete with flyleads. Pack of 5 £3 REF: MAG: 3P5 or 20 for £8 REF: MAG8P4

FIBRE OPTIC CABLE Made for Hewlett Packard so pretty good stuff! you can have any length you want (min 5m) first 5m £7 REF: MAG7 thereafter £1 a metre (ie 20m is £22) REF: MAG1 Max length 250m

SNOOPERS EAR? Originally made to clip over the earpiece of telephone to amplify the sound-it also works quite well on the cable running along the wall! Price is £5 REF: MAG5P7

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DOS PACK Microsoft version 5 Original software but no manuals hence only £3 REF: MAG3P6 5.25" only

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MONO VGA MONITOR Made by Amstrad, refurbished £49 REF: MAG49

CTM644 COLOUR MONITOR Made to work with the CPC464 home computer. Standard RGB input so will work with other machines. Refurbished £59.00 REF: MAG59

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COMMODORE 64 TAPE DRIVES Customer returns at £4 REF: MAG4P9 Fully tested and working units are £12 REF: MAG12P5

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PLUG 420? showing your age? pack of 10 with leads for £2 REF: MAG2P11

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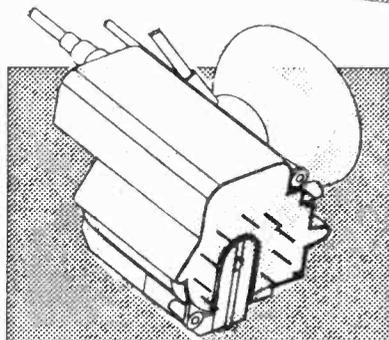
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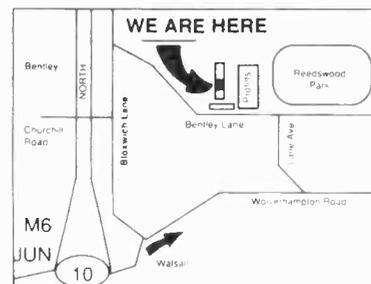
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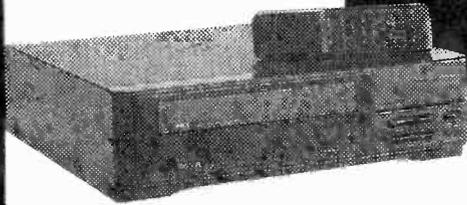
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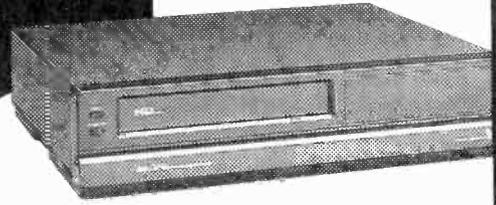
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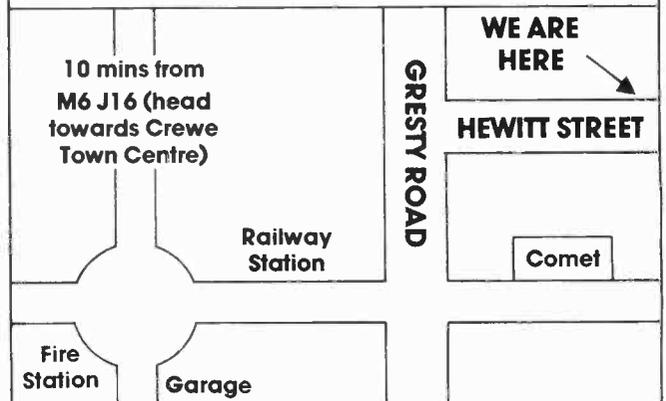


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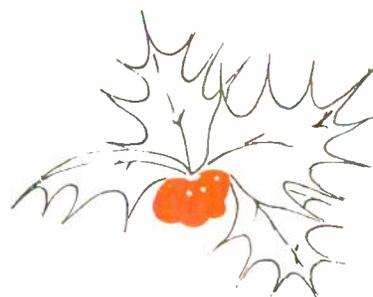
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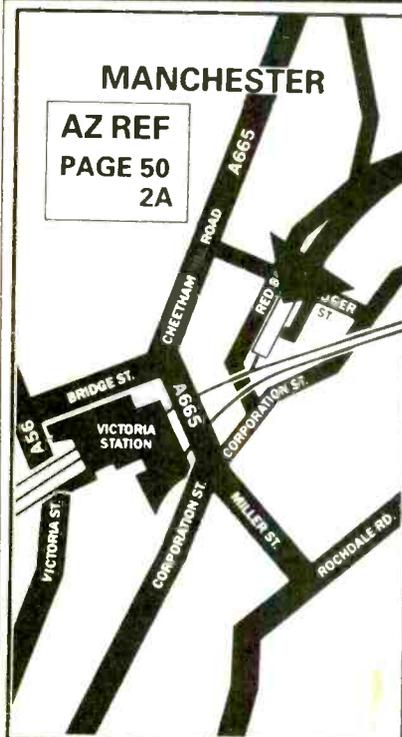
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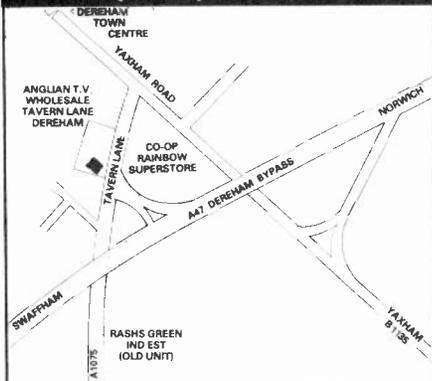
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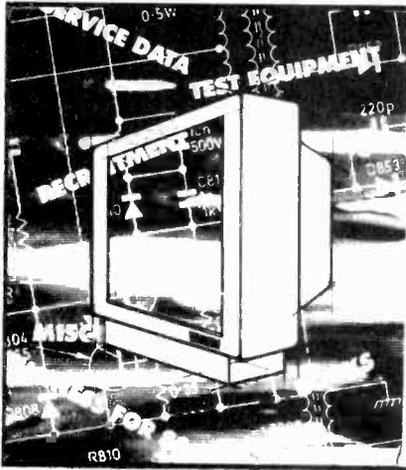
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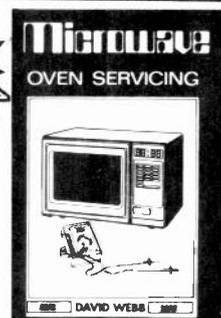
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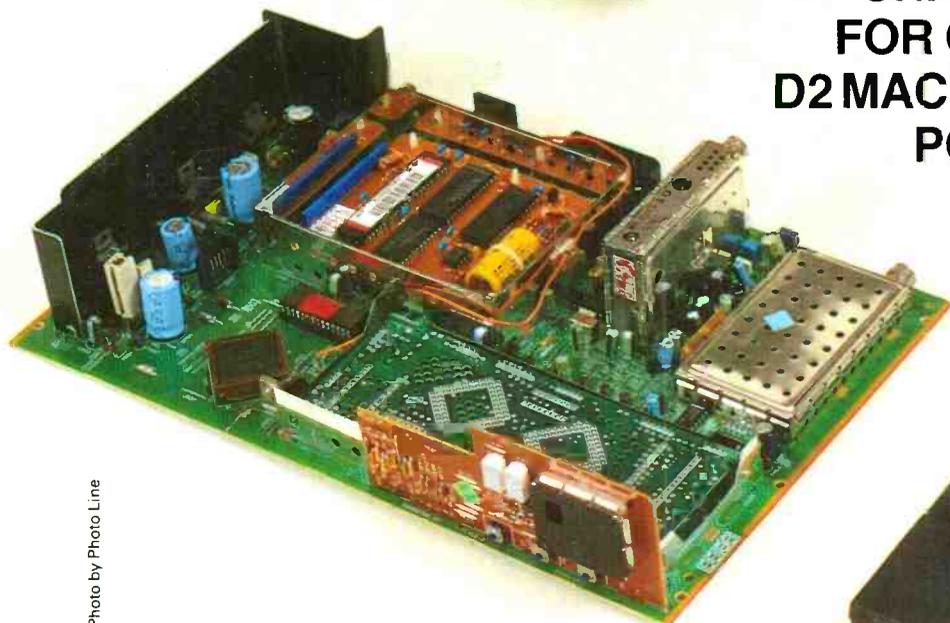
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