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design features**

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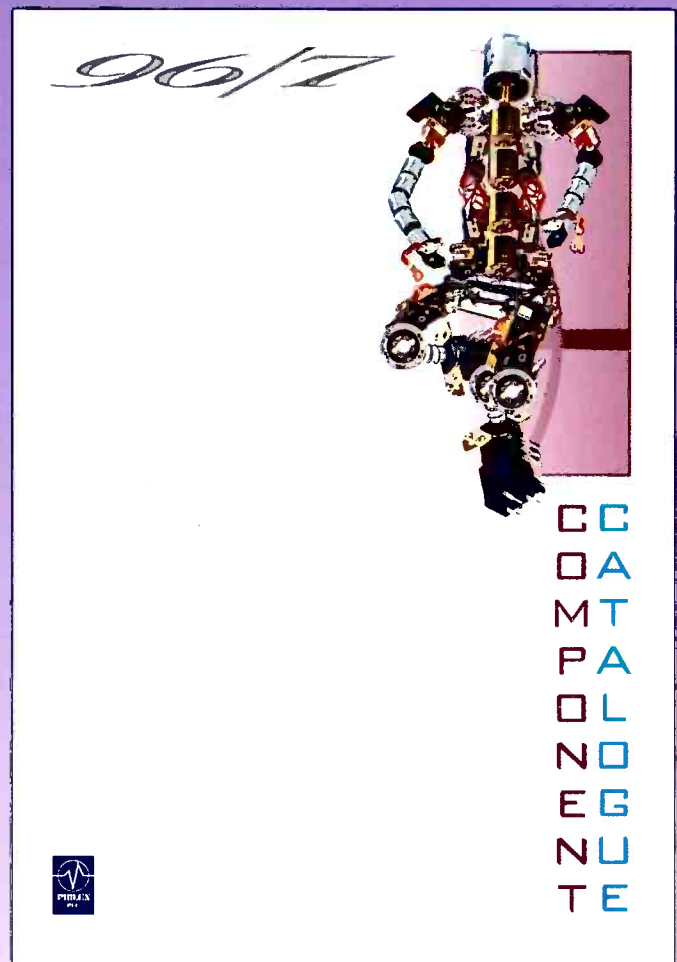
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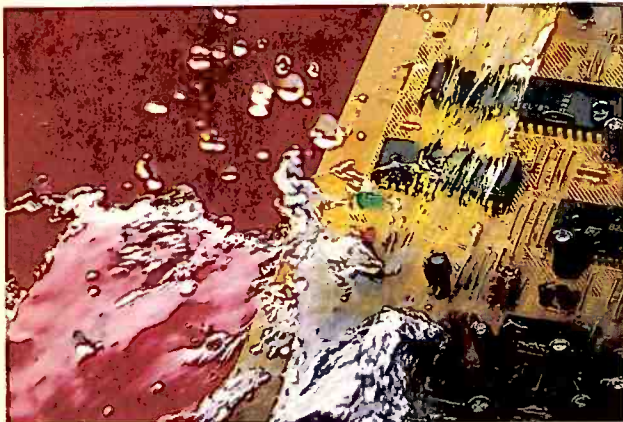
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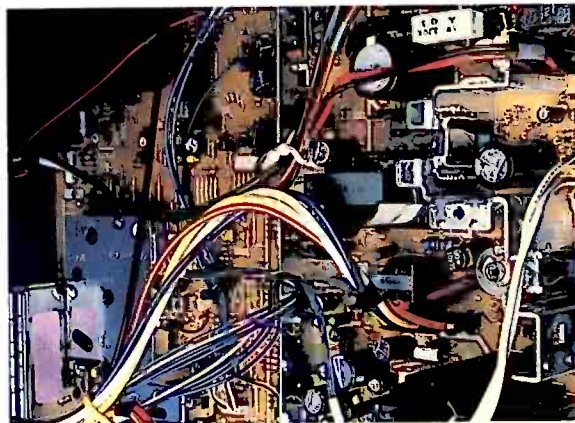
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A Look at the Panasonic Z5 Chassis **735**

Part 1 of a series on the technology used in Panasonic's current small-screen chassis. Interesting features include a 'hot' line deflection circuit. **Ray Meadows** describes the power supply circuitry, the microcontroller system and the signal switching arrangements.



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BC213	7p	B0681	45p	BU408D	85p	TIP30C	25p	2N5192	50p	79H12KC	700p	79H12KC	800p	BA4403	220p
BC213L	7p	B0682	45p	BU408D	85p	TIP31A	25p	2N5241	50p	79H12KC	700p	79H12KC	800p	BA5101	350p
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BC338	7p	B0W24	55p	BU508VF	110p	TIP42C	22p							BA6414	250p
BC441	28p	B0W93	50p	BU526	75p	TIP47	22p							BA6415	250p
BC446	8p	B0W94	50p	BU536	100p	TIP48	40p							BA6416	250p
BC477	18p	B0Y92	100p	BU546	125p	TIP50	60p							BA6417	250p
BC516	25p	BF131	30p	BU608	120p	TIP51	60p							BA6418	250p
BC537	25p	BF167	30p	BU628	120p	TIP52	60p							BA6419	250p
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BC558	8p	BF245	25p	BUJ03	110p	TIP112H	35p							BA6427	250p
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LM3909	100p	STK561	450p	STK5466	500p	STR50020	450p	TA8511	25p	TDA1701	300p	TDA3654	90p	TDA8192	275p	UPC1222	130p	2SA958	60p
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LM3915	160p	STK583	500p	STK5468	300p	STR50103A	260p	TBA396	70p	TDA1870A	200p	TDA3720	175p	TDA8214B	225p	UPC1230	200p	2SA965	40p
LM3916	270p	STK760	600p	STK5471	330p	STR50113	500p	TBA520	120p	TDA1872A	275p	TDA3725	500p	TDA8215B	300p	UPC1238	320p	2SA966	35p
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M494B1	700p	STK780	480p	STK5478	380p	STR50213	500p	TBA590	90p	TDA1908A	80p	TDA3740	480p	TDA8305	500p	UPC1277	240p	2SA979	35p
M50115P	320p	STK1039	460p	STK5479	300p	STR50341	500p	TBA800	40p	TDA1910	225p	TDA3750	400p	TDA8340	200p	UPC1278	240p	2SA984	25p
M50117P	500p	STK1040	640p	STK5481	280p	STR50404	550p	TBA810AS	40p	TDA1940	180p	TDA3760	350p	TDA8341	650p	UPC1288V	230p	2SA985	60p
M50119P	525p	STK1049	700p	STK5482	525p	STR55041	300p	TBA820	55p	TDA1941	180p	TDA3771	460p	TDA8342	250p	UPC1291V	300p	2SA988	200p
M50784	300p	STK1050	650p	STK5483	440p	STR56041	550p	TBA820M	35p	TDA1942	180p	TDA3771	460p	TDA8390A	650p	UPC1318	300p	2SA992	30p
M50786	500p	STK1060	700p	STK5486	400p	STR58041	350p	TBA820M	100p	TDA1943	180p	TDA3780	350p	TDA8405	550p	UPC1350	320p	2SA993	50p
M50789	600p	STK1070	450p	STK5487	480p	STR59041	350p	TBA820M	100p	TDA1943	180p	TDA3800	350p	TDA8415	650p	UPC1350	115p	2SA999	50p
M51124	300p	STK1080	940p	STK5490	450p	STR60001	525p	TBA890	600p	TDA1950	150p	TDA3810	200p	TDA8421	500p	UPC1363	190p	2SA1006	90p
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M51848	500p	STK2038	700p	STK6316	450p	STR61206	600p	TC3115	400p	TDA1967	100p	TDA3845	325p	TDA8433	600p	UPC1373	85p	2SA1012	85p
M54523P	200p	STK2048	470p	STK6324B	500p	STRD1406	600p	TC3129	220p	TDA1970	100p	TDA3857	350p	TDA8442	200p	UPC1377C	200p	2SA1013	100p
M5453P	200p	STK2110	550p	STK6431	850p	STRD1706	400p	TC9142	320p	TDA2010	150p	TDA3857	350p	TDA8444	300p	UPC1377C	200p	2SA1013	100p
M54884	500p	STK2125	580p	STK6722	725p	STRD1806	400p	TC9143	300p	TDA2020	120p	TDA3950	225p	TDA8444	350p	UPC1378	180p	2SA1015	150p
M51518	200p	STK2139	675p	STK6822	900p	STRD1816	400p	TC9145	150p	TDA2030	80p	TDA4050	150p	TDA8451	350p	UPC1382	425p	2SA1018	100p
MB3712	140p	STK2155	900p	STK6922	500p	STRD3035	300p	TC9148	200p	TDA2040	140p	TDA4080	140p	TDA8452	200p	UPC1384	425p	2SA1018	100p
MB3713	130p	STK2230	470p	STK6922	500p	STRD4412	300p	TC9150	200p	TDA2040	140p	TDA4100	225p	TDA8453	350p	UPC1387C	250p	2SA1020	30p
MB3714	270p	STK2240	740p	STK6962	275p	STRD4512	300p	TC9152	425p	TDA2054M	110p	TDA4180	145p	TDA8490	350p	UPC1394	120p	2SA1021	35p
MB3715	250p	STK2250	650p	STK6972	490p	TAW054	190p	TC9152	425p	TDA2107	250p	TDA4190	180p	TDA8702	275p	UPC1397	350p	2SA1023	60p
MB3722	280p	STK3041	370p	STK6981B	600p	TAW061	115p	TC9153	300p	TDA2148	350p	TDA4200	360p	TDA8703	500p	UPC1403CA	650p	2SA1026	90p
MB3730	160p	STK3042	375p	STK6982	600p	TAW066	120p	TC9156	300p	TDA2151	375p	TDA4220	360p	TDA8707	300p	UPC1430CA	650p	2SA1030	90p
MB3731	160p	STK3044	360p	STK7216	420p	TAW069	300p	TC9163	375p	TDA2170	260p	TDA4280	320p	TDA8708	300p	UPC1432CA	650p	2SA1036	60p
MB3756	160p	STK3062	550p	STK7216	420p	TAW071	150p	TC9164	400p	TDA2170	260p	TDA4280	320p	TDA8709	300p	UPC1432CA	650p	2SA1037	50p
MB3759	160p	STK3062	550p	STK7225	500p	TAW073	100p	TC9172P	300p	TDA2270	250p	TDA4290	300p	TDA8905	550p	UPC1470	200p	2SA1038	40p
MB8719	350p	STK3102H	530p	STK7226	600p	TAW140	100p	TC9172P	300p	TDA2320	80p	TDA4400	175p	TDA9080	180p	UPC1478H	200p	2SA1048	25p
MC1455	45p	STK3152H	530p	STK7251	500p	TAW157	100p	TCEP100	100p	TDA2501	400p	TDA4420	120p	TDA9083	550p	UPC1505C	400p	2SA1051	300p
MC1496	65p	STK3156	500p	STK7308	350p	TAW193	320p	TCE2308AP	200p	TDA2503	400p	TDA4426	170p	TDA9513	300p	UPC1514CA	200p	2SA1052	150p
MC3401	45p	STK4017	400p	STK7309	400p	TAW200	200p	TDB2382	200p	TDA2504	200p	TDA4427	200p	TDA9513	300p	UPC1514CA	200p	2SA1053	150p
NE555	20p	STK4019	380p	STK7313	470p	TAW202	110p	TDB2382	200p	TDA2506	300p	TDA4431	150p	TEA1007	120p	UPC1520CA	250p	2SA1076	230p
NE556	40p	STK4020	380p	STK7314	470p	TAW203	110p	TDB2382	200p	TDA2506	300p	TDA4431	150p	TEA1007	120p	UPC1520CA	250p	2SA1076	230p
NE558	80p	STK4024H	530p	STK7356	425p	TAW208	125p	TDB304AP	300p	TDA2510	400p	TDA4439	220p	TEA1017	280p	UPC1536C	550p	2SA1077	300p
NE565	110p	STK4025	530p	STK7358	440p	TAW214	220p	TDB304AP	300p	TDA2514A	550p	TDA4440	180p	TEA1019	130p	ZN423	100p	2SA1081	80p
NE567	115p	STK4026	480p	STK7402	560p	TAW217	145p	TDB350P	300p	TDA2515A	450p	TDA4442	240p	TEA1024	150p	ZN424	100p	2SA1082	80p
NE571	290p	STK4028	550p	STK7404	400p	TAW220	220p	TDB350P	300p	TDA2530	450p	TDA4442	240p	TEA1024	150p	ZN425	320p	2SA1084	100p
NE592	85p	STK4032H	510p	STK7406	400p	TAW220	220p	TDB350P	300p	TDA2532	450p	TDA4445	250p	TEA1062	225p	ZN426	50p	2SA1115	75p
NE593P	200p	STK4032H	510p	STK7408	480p	TAW223	210p	TC14129	200p	TDA2532	450p	TDA4445	250p	TEA1062	225p	ZN427	580p	2SA1091	100p
SA11006	300p	STK4038	680p	STK7410	900p	TAW225	300p	TC14129	200p	TDA2541	120p	TDA4450	225p	TEA1067	150p	ZN429	215p	2SA1094	190p
SA11024	400p	STK4040H	650p	STK7554	600p	TAW226	290p	TC14129	200p	TDA2542	110p	TDA4452	250p	TEA1080P	170p	ZN459	190p	2SA1095	300p
SA11024	400p	STK4042H	800p	STK7561	650p	TAW227	170p	TCEP100	100p	TDA2543	210p	TDA4453	275p	TEA1087	40p	ZN4104	640p	2SA1096	80p
SA11024	400p	STK4044	800p	STK7562	1000p	TAW230	100p	TCEP100	100p	TDA2545	120p	TDA4480	280p	TEA1101	425p	ZNA134H	2150p	2SA1102	130p
SA11025	250p	STK4046	950p	STK7563	800p	TAW232	100p	TDB2382	200p	TDA2546A	200p	TDA4482	350p	TEA1101	425p			2SA1104	140p
SA11075	350p	STK4050	820p	STK7563	800p	TAW232	100p	TDB2382	200p	TDA2546A	200p	TDA4482	350p	TEA1101	425p			2SA1104	140p
SA11124	200p	STK4060	810p	STK8250	500p	TAW237	300p	TDB2382	200p	TDA2556	175p	TDA4502	550p	TEA121A	80p			2SA1106	160p
SA1250	280p	STK4065	650p	STK8260	1200p	TAW238	400p	TDB2382	200p	TDA2556	175p	TDA4503	300p	TEA2018A	200p	2SA473	29p	2SA1111	90p
SA1294	280p	STK4101	500p	STK8280	1800p	TAW240	160p	TDB2382	200p	TDA2557	225p								

JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price		
2SA1371	100p	2SC1008	20p	2SC1730	10p	2SC2270	60p	2SC2750	300p	2SC3277	280p	2SC3893	225p	2SD836A	60p	2SD1279	600p	2SD1815	100p
2SA1380	75p	2SC1010	225p	2SC1735	70p	2SC2271	30p	2SC2751	270p	2SC3280	200p	2SC3895	400p	2SD837	55p	2SD1288	175p	2SD1825	60p
2SA1381	100p	2SC1012	75p	2SC1739	800p	2SC2274	15p	2SC2752	140p	2SC3281	200p	2SC3897	400p	2SD838	300p	2SD1291	250p	2SD1843	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2757	300p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1289	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2769	400p	2SC3293	85p	2SC3927	250p	2SD844	200p	2SD1292	60p	2SD1849	325p
2SA1386	400p	2SC1030	150p	2SC1755	90p	2SC2290	1800p	2SC2773	700p	2SC3298	50p	2SC3950	120p	2SD845	250p	2SD1297	300p	2SD1850	325p
2SA1423	30p	2SC1047	20p	2SC1756	35p	2SC2291	40p	2SC2774	50p	2SC3299	120p	2SC3953	60p	2SD850	170p	2SD1302	20p	2SD1858	40p
2SA1489	300p	2SC1050	280p	2SC1758	30p	2SC2295	60p	2SC2785	60p	2SC3300	400p	2SC3973	210p	2SD856	48p	2SD1308	80p	2SD1877	175p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	250p	2SD1309	140p	2SD1879	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	130p	2SC3996	1200p	2SD863	23p	2SD1310	140p	2SD1884	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2312	300p	2SC2792	220p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1313	1000p	2SD1887	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4023	325p	2SD866A	140p	2SD1326	200p	2SD1888	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB546	45p	2SC1106	180p	2SC1815	10p	2SC2320	10p	2SC2812	40p	2SC3323	480p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2324	120p	2SC2814	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	60p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2329	480p	2SC2815	40p	2SC3331	25p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB566	90p	2SC1124	270p	2SC1829	500p	2SC2333	200p	2SC2825	900p	2SC3345	100p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2334	80p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD892A	75p	2SD1384	50p	2SD1959	280p
2SB596	50p	2SC1165	750p	2SC1845	15p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	170p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB646	40p	2SC1166	100p	2SC1846	35p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD895	100p	2SD1391	250p	2SD1978	50p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2347	45p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	300p	2SD900	400p	2SD1395	150p	2SD2012	50p
2SB649	35p	2SC1173	150p	2SC1856	25p	2SC2360	120p	2SC2839	40p	2SC3361	50p	2SD198	140p	2SD905	450p	2SD1396	120p	2SD2125	225p
2SB688	90p	2SC1195	210p	2SC1865	700p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	195p	2SD916	130p	2SD1397	120p	2SD2333	200p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2362	50p	2SC2877	120p	2SC3377	50p	2SD200	180p	2SD917	300p	2SD1399	120p	2SD2348	425p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SD2349	425p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2369	100p	2SC2879	320p	2SC3383	80p	2SD257	195p	2SD923	360p	2SD1400	280p	2SD2350	425p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2371	25p	2SC2883	60p	2SC3387	20p	2SD257	195p	2SD926	360p	2SD1402	150p	2SD2351	425p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2373	210p	2SC2889	200p	2SC3393	80p	2SD313	75p	2SD947	100p	2SD1406	60p	2SD2352	425p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2383	50p	2SC2898	200p	2SC3399	50p	2SD315	75p	2SD950	300p	2SD1407	60p	2SD2353	425p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD330	65p	2SD951	290p	2SD1408	125p	2SD2354	425p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD348	300p	2SD957A	520p	2SD1409	170p	2SD2355	425p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD357	40p	2SD958	60p	2SD1412	75p	2SD2356	425p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SD358	40p	2SD965	35p	2SD1413	75p	2SD2357	425p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD969	170p	2SD1415	190p	2SD2358	425p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD973	60p	2SD1417	125p	2SD2359	425p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2459	50p	2SC2932	280p	2SC3417	120p	2SD381	50p	2SD973A	70p	2SD1425	260p	2SD2360	425p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2470	65p	2SC2934	75p	2SC3419	90p	2SD388	150p	2SD985	120p	2SD1426	160p	2SD2361	425p
2SB826	110p	2SC1318	40p	2SC1942	350p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SD2362	425p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD987	120p	2SD1428	220p	2SD2363	425p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD988	120p	2SD1429	410p	2SD2364	425p
2SB950	180p	2SC1328	15p	2SC1946	1500p	2SC2484	185p	2SC2944	300p	2SC3426	150p	2SD402	120p	2SD989	120p	2SD1430	280p	2SD2365	425p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2491	200p	2SC2958	50p	2SC3427	200p	2SD415	55p	2SD992	400p	2SD1431	250p	2SD2366	425p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2495	1900p	2SC2962	800p	2SC3441	200p	2SD415	55p	2SD993	400p	2SD1432	250p	2SD2367	425p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2498	50p	2SC2967	800p	2SC3446	200p	2SD424	350p	2SD994	400p	2SD1433	750p	2SD2368	425p
2SB1109	55p	2SC1358	270p	2SC1967	1300p	2SC2500	25p	2SC2977	160p	2SC3457	125p	2SD426	150p	2SD995	400p	2SD1434	140p	2SD2369	425p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2502	200p	2SC2988	150p	2SC3459	250p	2SD427	350p	2SD996	400p	2SD1435	140p	2SD2370	425p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2519	60p	2SC2989	150p	2SC3460	130p	2SD438	35p	2SD997	400p	2SD1436	140p	2SD2371	425p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2527	300p	2SC2995	50p	2SC3461	350p	2SD447	180p	2SD998	400p	2SD1437	140p	2SD2372	425p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2535	150p	2SC3001	1400p	2SC3466	225p	2SD451	130p	2SD999	400p	2SD1438	140p	2SD2373	425p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2538	100p	2SC3012	300p	2SC3488	70p	2SD471	20p	2SD1000	130p	2SD1439	165p	2SD2374	425p
2SC394	60p	2SC1393	15p	2SC1983	75p	2SC2540	1900p	2SC3019	320p	2SC3489	275p	2SD472	20p	2SD1001	130p	2SD1440	165p	2SD2375	425p
2SC403	25p	2SC1394	20p	2SC1984	150p	2SC2542	300p	2SC3025	500p	2SC3496	275p	2SD473	20p	2SD1002	130p	2SD1441	165p	2SD2376	425p
2SC404	60p	2SC1395	15p	2SC1985	100p	2SC2545	55p	2SC3030	300p	2SC3502	100p	2SD474	20p	2SD1003	130p	2SD1442	165p	2SD2377	425p
2SC454	15p	2SC1400	55p	2SC1986	100p	2SC2546	25p	2SC3037	125p	2SC3503	50p	2SD475	20p	2SD1004	130p	2SD1443	165p	2SD2378	425p
2SC458	10p	2SC1438	50p	2SC1987	100p	2SC2547	65p	2SC3038	125p	2SC3504	120p	2SD476	20p	2SD1005	130p	2SD1444	165p	2SD2379	425p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2550	50p	2SC3039	80p	2SC3505	240p	2SD477	20p	2SD1006	130p	2SD1445	165p	2SD2380	425p
2SC461	15p	2SC1407	50p	2SC2002	15p	2SC2551	70p	2SC3040	260p	2SC3506	250p	2SD478	20p	2SD1007	130p	2SD1446	165p	2SD2381	425p
2SC495	25p	2SC1413	150p	2SC2003	20p	2SC2552	60p	2SC3042	300p	2SC3507	250p	2SD479	20p	2SD1008	130p	2SD1447	165p	2SD2382	425p
2SC496	45p	2SC1419	50p	2SC2004	20p	2SC2553	200p	2SC3051	150p	2SC3508	750p	2SD480	20p	2SD1009	130p	2SD1448	165p	2SD2383	425p
2SC497	85p	2SC142																	

Contrasts

By Japanese standards Sony is a comparative newcomer. It started out in May 1946, recently celebrating its fiftieth anniversary. Most of the major Japanese companies in the consumer electronics field were formed much earlier. Hitachi and Toshiba for example date from the nineteenth century, Matsushita from the early years of the twentieth century. During those fifty years however Sony's achievements have been second to none.

Sony started operations as Tokyo Tsuchin Kogyo (Tokyo Telecommunications Engineering Corporation). Its aim was "to make unique products", and to "create and introduce technologies that larger companies cannot match". One of its earliest achievements was Japan's first reel-to-reel audio tape recorder, which was launched in 1950. The tape to go with it, also developed by the company, was called Soni-tape. In 1954 the company launched the first all-transistor radio to go into production anywhere. When, in the following year, it decided to start exporting, a simple brand name that would be easily recognised in any part of the globe was required. Sony was the obvious answer, and in 1958 the company changed its name to the Sony Corporation. The Sony Corporation of America was set up in 1960. Sony UK, in 1968, brought Sony to Europe.

Innovation continued apace. In 1960 Sony launched the first fully transistorised portable TV receiver. Five years later the first open-reel video tape recorder for domestic use was introduced. The Trinitron colour system arrived in 1968. It was incredible, though typical, that Sony should develop its own colour TV tube from scratch. While relying on the traditional three primary colour phosphors and a shadowmask, the phosphors were laid down in stripes, the mask became a shadow grille, the guns were arranged in-line and the faceplate became much flatter. This was to be the way tube development would go.

The Betamax VCR system was introduced in 1975. It is today generally accepted that it was the best of its time. But, as with the Trinitron system, Sony wouldn't licence it to other manufacturers. That mistake led to its demise, and wasn't repeated. The 8mm video system, which has come to dominate the camcorder field, was launched by Sony ten years later, in 1985.

Meanwhile Sony had had an extraordinary success with the Walkman portable audio system, which was launched in 1979. This is claimed to have been "the single best-selling consumer electronics product ever marketed". Sony kept up the pace of

development, moving on to digital systems. The MiniDisc, capable of both record and playback, arrived in 1993. In 1995 Sony was first to launch a digital camcorder. A home DV recorder is due later this year, along with a device called the DV cap: this links a DV camera to a PC for editing and image manipulation.

There have been a number of other significant developments in recent times. The highly successful PlayStation established Sony in the video games market. Sony is to introduce its first PC later this year, while "a true living-room computer" is promised for next year. Plasmatron large, flat screen TV sets are already available in Japan. DVD players are another imminent prospect.

All in all it has been an extraordinary story, and Sony's position at the centre of electronics development looks set to continue indefinitely. The company has combined world-class R&D capabilities, manufacturing excellence, the ability to read and to create markets, and remarkable marketing skills.

The UK's main CE innovator for a long time, Amstrad, makes a sorry contrast. For a time Amstrad couldn't do anything wrong. It came up with a string of innovative ideas and products, skillfully meeting and developing user requirements. Packaged audio, wordprocessors then an IBM PC clone. There were the combined TV/VCR units, then the video Double Decker. Amstrad was in and out of audio, video and TV, always with highly competitive products. The company came up with the first Sky package at under £200. But while it came up with products that met contemporary needs, it never seemed to take root and grow. We are now witnessing its final dismemberment.

Psion, the hand-held computer manufacturer, is negotiating to take over Amstrad's digital telephone interests, which fit in with its own product development programme. Amstrad's loss-making consumer electronics interests are to be split between Betacom, an affiliated company, and a new company to be called Digicom Technology. The latter will take over Amstrad's analogue satellite business and inherit a small R&D operation.

How did Sony succeed, starting out with twenty employees, no machinery and negligible capital, while Amstrad simply shuffles off stage? Because Amstrad never developed a comprehensive business strategy. It came up with bright ideas, subcontracted production, stocked up then walked away as soon as the market turned. It's the tragic story of much of UK industry.

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ISSN 0032-647X



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TELETOPICS

Astra Developments

SES, the Luxembourg-based owner of the Astra series of satellites, has announced plans to use a second orbital position, at 28.2°E. The first two satellites here will be known as Astra 2A and 2B. Astra 2A, a Hughes HS601HP space craft due for launch in August 1997, will have 28 transponders using the frequency band 11.7–12.5GHz. BSkyB has already leased fourteen of them on a long-term basis, and SES is at the stage of "advanced negotiations" with other broadcasters who are primarily interested in reaching the UK

market. Astra 2B, to be launched in late 1998, will be developed by Matra Marconi Space and will also have 28 transponders, this time covering 12.5–12.75GHz. Both craft will have a power output of 108W, enabling 50cm dishes to be used for reception in locations across the UK and Ireland. According to SES, UK viewers should be able to use a 60cm dish with a universal LNB for reception from its satellites at both 19.2 and 28.2°E.

The final two Astra satellites at 19.2°E, Astra 1G and 1H, will be

launched in June 1997 and late 1998 respectively. Both will be used for digital TV transmissions. Astra 1G will have 16 transponders; Astra 1H will also have two Ka-band (28GHz) transponders. These will be used to provide interactive/multimedia services, for businesses initially though direct-to-home services are also planned. Users' dishes will provide both reception and a return path for the transmission of requests, instructions etc. This will be known as the Astra Multimedia Service Platform.

Pace's Answer to Channel 5

Pace has developed a module that could provide a solution to the problem of Channel 5 interference to domestic AV equipment. It shifts the Channel 5 signal to channel 69, just above the top end of Band V. This channel is at present unused, thus removing the potential for interference. The module also boosts the Channel 5 signal, which will be a help in fringe areas. If the unit goes on sale it is expected to cost about £15.

Fifth channel is tuning up for 1997 launch

Channel 5 Broadcasting, which is due to launch its service next January, is to start a national retuning programme this month (August). It is a condition of the franchise that some ten million households will be visited before the service starts, to check whether equipment needs to be retuned and to carry this out. Some 6,000 tuners are expected to be required to do the job, and C5B has been in negotiations with cable and rental companies to enlist the help of their

technicians. Fringe area viewers who suffer from interference are likely to be provided with a notch filter to deal with the problem.

C5B has already run a pilot test retuning scheme in Wallington, Surrey, which is served by the Croydon transmitter. About 10,000 homes were visited by 22 authorised retuners who used test-signal generators to simulate the C5 transmissions. Retuning was estimated to take about 25 minutes on average.

C5B is seeking permission to

use ch. 35 as well as ch. 37 for its transmissions. The ITC is supporting this request, which could extend C5 coverage from around 74 to over 80 per cent of the population of the UK. An additional 3.7 million viewers could be added in parts of Devon and Cornwall, Hampshire, Kent, Sussex, Essex, Yorkshire, Tees-side, Herefordshire and Worcestershire.

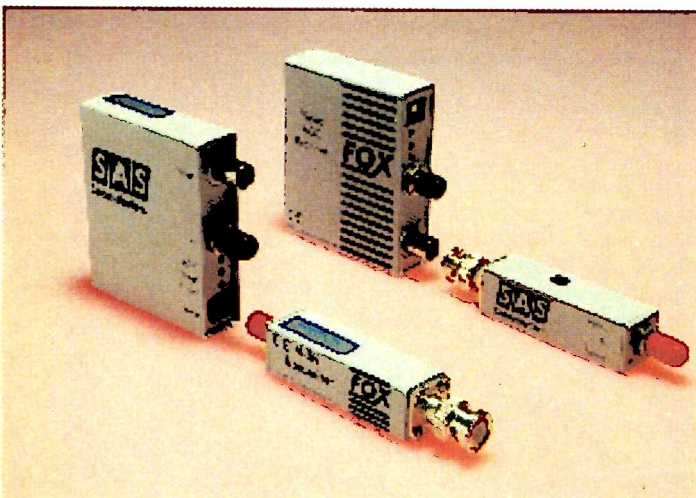
The ITC will this autumn invite applicants to bid for a licence to run a C5 teletext service.

Interactive TV/Internet

Cambridge-based Online Media has developed a second-generation set-top box, Model STB2, for interactive TV systems. The company has also joined forces with Westell to develop an asymmetric digital subscriber line (ADSL) system for use with the STB2. This will enable cable companies to offer interactive TV services via standard telephone lines.

Simplified computer terminals known as Network Computers (NCs) are being developed by a number of companies as a cheaper alternative to the PC and/or a means of access to the Internet. They rely on downloaded software from the Internet or a server computer.

Online Media is developing one to enable a TV set to be linked to the Internet. Acorn has a similar product, the Netsurfer, which sells at around £300. It plugs into the TV set and telephone line and is operated using an IR remote control unit instead of a keyboard or mouse. A smart card is used to log on the user after identification. Another similar unit, the Akai Internet Connection, is due for launch in the USA this winter. It uses an ARM (Advanced RISC – Reduced Instruction Set Computer – Machine) processor, 4–6Mbytes of RAM and a 28.8 modem. It will cost around £200 in the USA, but there are at present no plans for a UK launch.



These new fiberoptic transmitters and receivers from SAS communications increase the range of security CCTV systems dramatically. For further details phone SAS Communications Ltd. on 01732 849 444.

Investment at SEME

SEME has invested £300,000 on a fully-automatic, bar-code order picking conveyor system at its Melton Mowbray distribution centre. The previous manual system was handling an average of 1,500 orders a day from some 9,000 account holders, with over 45,000

individual items held in stock. The new system ensures that goods are picked and packed within twenty minutes of receiving an order. It enables over four times the original volume of goods to be handled. Orders received by 5 p.m. can be despatched on the same day.

BSB D-MAC Conversion Kits

3R Cardware, Henry Street, Pottery Lane, Chesterfield, Derbyshire (01246 455 150) has introduced a range of BSB D-MAC decoder kits to enable those with Philips STU902, Ferguson SRB1 or Nokia/Salora 5903 BSB decoders to convert them for use as Eurocrypt decoders. A comprehensive instruction sheet and component layout diagrams come with the kits. Cardware is currently developing a kit for the Tatung BSB decoder.

New from Philex

The Philex catalogue is now available in CD-ROM form. Thousands of products are included, with full colour photographs and technical line drawings for easy product identification. A fast-search facility enables users to enter manufacturers' part codes, Philex codes, model numbers, search prompt words or users' own part numbers. The CD can be obtained free by contacting Philex on 0181

202 1717. Each disc comes with full operating instructions.

Philex has also introduced the SLR100 cordless infra-red headset, which competes in sound quality with conventional hi-fi headphones but uses FM IR radiation to transmit to the listener a wide bandwidth stereo audio signal. The headset uses rechargeable AAA batteries and has a built-in charger. For more details phone 0181 202 1717.

Chas Hyde CD-ROM Stock File

The CHS customer stock file, which has been available in floppy disc form via the company's sales force for some time, is now available in a CD-ROM version. It's a sophisticated part-finder system that enables customers to find parts in four different ways: by CHS part code; by manufacturer's part number; by manufacturer's model and circuit reference number; or by make, model and product description. The system also enables orders to be generated and reviewed, after which they can be

printed and faxed to CHS or, if the user has programmed his computer software to use a fax machine to transmit CHS orders, faxed direct.

Use of a set-up disc enables the CD-ROM to be dedicated to an individual customer: this takes less than 1Mbyte of hard disc space. Installing the complete customer stock file from CD-ROM takes approximately 33Mbytes of hard disc space.

Further information is available from CHS sales representatives - or phone 01759 303 068.

Business Moves

Semi-Tech Global of Hong Kong, which owns Akai and Sansui, is to take over Nokia's TV businesses. Semi-Tech will be able to use the Finlux, Luxor, Salora, Schaub-Lorenz and Oceanic brand names, will have the right to use Nokia's TV and video technology, and be able to use the Nokia name on TV, video and related products until the year 2000. The company will take over Nokia's sales and marketing network in thirteen European countries, its TV plant at Turku in Finland and the machinery and equipment from the Bochum factory, which is being closed, in

Germany. Semi-Tech Global is a subsidiary of the Semi-Tech Corporation of Canada. Other subsidiaries of the group, which last year had a turnover of some £3.25bn, include Singer and Pfaff.

Nokia has relaunched its consumer electronics business in the UK as Nokia General Communications. It will continue to trade from Swindon, with a range of products that includes satellite equipment, multimedia and network terminals, PC monitors, audio and industrial electronics and mobile phones. The servicing and spares back-up for the discontinued Nokia lines will be continued.

Daewoo of South Korea has announced

its willingness to take over Thomson Multimedia, the consumer electronics section of the Thomson group which the French government intends to privatise later this year. The move would represent a massive increase in Daewoo's TV manufacturing interests and provide it with satellite and digital TV technology.

Aiwa plans to enter the TV market later this year. It is likely that sets will at some stage be manufactured at Aiwa's new plant at Newbridge, Gwent.

The LG Group of Korea is to drop the use of its brand name GoldStar worldwide, changing to LG. The change is likely to take place in the UK next spring.



Intel has announced a videoconferencing system called the Intel Video Phone to enable users with a Pentium system running at 133MHz to make video phone calls over standard telephone lines at frame rates as high as 12Hz. Users require a digital camera and a special 28.8kbits/sec modem that can be used for voice and data on the same line.

Miscellany

News Corporation plans to launch a multi-channel, Japanese digital satellite TV broadcasting service, JSkyB, within the next two years. The intention is to start off with at least a hundred channels and to become a leading force in the Japanese market.

BREMA reports a mixed year for brown goods deliveries in 1995. Overall, volume was healthy but turnover flat. Up-market TV sets did well, also VCRs which reached a record volume (2.61m) for the third year running. Over two thirds of UK production was exported. TV set production increased to 5.8m, VCR production to 3.6m units.

According to the latest ITC cable statistics, 30.6 per cent of households (over two million) in cabled areas take at least one of the services on offer - either cable TV, cable telephone or both. For the first time more homes have a cable telephone link than cable TV. The TV side of the cable business is at present generating, after VAT, annual revenues of around £360m.

Panasonic has launched its first digital camcorder, Model DX1. It provides broadcast-quality pictures, using a professional type CCD image sensor system with separate chips for red, green and blue. The still image capability is particularly impressive. Recommended price is around £3,000.



Reports from David C. Woodnott

Sharp VLC73H

A common fault with this model, reported previously, is power up then almost instantaneous power down. The cause is leakage from C921 (56 μ F, 16V), with resultant corrosion of the print beneath its pins. The remedy is to replace the capacitor and link the missing print. This particular one had already had the link fitted when we received it, but the capacitor was the original one! Replacing it failed to cure the problem. Q914 also had to be replaced.

Sony CCDF330

This model often suffers from intermittent or no autofocus operation. The nice Sony people have introduced a sensor kit that overcomes the problem at modest cost. Refer to information sheet part no. 9972880012 for details of whether the kit is appropriate for a particular symptom. The sheet also gives details of various replacement lens assemblies.

Ultrasonic Cleaning Tank

A month or two ago I mentioned that I was looking for a reasonably priced ultrasonic cleaning tank for cleaning PCBs that have suffered from capacitor leakage. The one I have since obtained from Langford Electronics Ltd. (01214 334 343), the Sonomatic SO175, fits the bill admirably. I no longer have to use nasty cleaning chemicals etc. It copes well with capacitor leakage and similar problems, using de-ionised water as the cleaning agent. Highly recommended. Various sizes are available to cope with PCBs of different dimensions.

Camcorner

The point to bear in mind is that considerable time may be needed to fit the kit, as all the lens PCBs etc. have to be removed to gain access to the slave lens assembly and sensor fittings. Setting up the autofocus unit is also time consuming, and has to be done before refitting the PCBs. The good news is that it always works – so far!

Sharp VLC650H

Poor sound was the complaint with this one. Checks in the audio circuitry suggested that the main IC, which is on a ceramic substrate, was faulty. We noticed that an electrolytic capacitor on this unit had been leaking. Careful removal of this item and its replacement cured the problem without need for a new chip.

Sanyo VMD6P

This machine powered up all right and produced an E-E picture, but it wouldn't eject the tape. Play and rewind/fast forward worked for only a short period, then the unit went into the emergency mode. It's not uncommon for the loading gear train in this model to fail (the plastic gear teeth break). This causes a similar no tape eject symptom. With this camcorder the symptom was different however. When eject was pressed the tape would unload to the stop position, pause – then reload! When the tape was removed manually and the unit was then powered up eject was possible, but when a tape was loaded the previous symptom recurred. The cause of the trouble was traced – after some thinking time! – to a faulty take-up reel sensor. Most mechanisms would allow tape eject when this sensor fails, but some bug in the syscon micro confused the issue.

Canon E6E

We've had two of these in recently with similar faults. The symptom is vertical lines, which may appear intermittently, on the E-E picture. The trouble can be caused by a defective CCD image sensor or by SSG drive problems, which was in

fact the case here. Unfortunately it was not possible to carry out an economic repair. Once again the cause was our old friend the leaky electrolytic capacitor. The ones that were responsible are mounted on the sensor PCB. This is a ceramic substrate structure that doesn't allow easy component replacement. Because of the corrosion, the printed lands had disappeared. They cannot be bridged.

The problem is also affecting later Canon models, in particular the UC10 series that use the same type of sensor PCB construction. This is not good news for the customer!

Panasonic NVS85B

There was no capstan rotation. As with other models in this range, symptoms like this can be caused by intermittent connection of the ribbon cable plugs/sockets between the main and the MDA PCBs. We cured the fault by resoldering one such connector: as the unit then worked normally, we reassembled it and put it on test. This is where everything went wrong for us!

We found that in the record mode autofocusing and the viewfinder picture were intermittent. Anyone familiar with this model will know what's coming! We spent some time investigating the intermittent autofocusing. This included complete dismantling of the unit and a check on the ribbon cables, connectors etc. – all to no avail. As we were getting nowhere fast, we decided to look at the viewfinder problem. This proved to be our salvation. The picture came and went when the connecting leads were flexed. But careful checks on the connections drew a blank. It then dawned on us that moving the viewfinder didn't cause the problem – getting physically close did! Yes, this camcorder is fitted with a switchable power-save function that disables the autofocusing and the viewfinder picture when you are in record pause and are not looking through the viewfinder. The function is controlled by a small switch beneath the viewfinder. We won't get caught again! ■

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model		Price		Model		Price		Model		Price											
HR0520, 600, 620, 637, 641, 650, 830 HR0540, 550, 580, 660, 860, 960, HRS5800		95p 130p		VR6010, VR9010 VR6020, VR6022, VR6023, VR6028, VR7730 VR6024 VR6520, VR6540, VR6560 VR6710, VR6720, VR6735, VR6720 VR6720, VR6730, VR6760, VR6775, VR6780		70p 75p 75p 90p 130p 160p		Models & Description		Order Code Price											
KENWOOD KV901 KV903		70p 90p		SAISHO VR2000, VHL3 VR3800		90p 75p		UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)		VL01 25p											
LOEWE OC11, OC40 OC410, OC420, OC440, OC460 OC50, OC55, OC60, OC65, OC70, OC75		95p 130p 120p		SALORA SV6500 SV6600 SV6800 SV8100 SV8500, SV8520, SV9500 SV7400, SV8400, SV8420, SV8550 SV6700, SV8710, SV8750, SV9700 SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970 SV8600, 8620, 8700, 8720, 8830, 9600, 9610		100p 150p 120p 60p 150p 120p 120p 95p 130p		PANASONIC VIDEO LAMPS		VL02 35p											
LOGIK VR955		180p		SAMSUNG SV716, 717, V1616, V1621, V1626, VX616, VX617, VX619, VX626, VX627, VX629, 85p VB520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, 611, 616, 621, 626, VX10, 520 V6900, V6910, V1900, V1910 PX980, 981, 982, SE9001, SV9001, SVX307, 319, 322, V8770, 8220, 8225, V1770, 790, 8220, 8225, V8820, VPX31, VX750, VX790, 8220, 8225 SVX300, 303, 305, SX7301, V8710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972 VX9880		100p 110p 135p 100p 110p 230p 110p		SHARP VIDEO LAMPS		VL02 35p		HITACHI 5381682 (VT63, VT64) VIDEO LAMPS		VL04 135p							
LUXOR 9245, 9251 9252 9253 9254 9255 9256 9270, 9271, 9273, 9274 9272, 9280 9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781		130p 140p 140p 100p 130p 130p 115p 140p 95p		SANYO VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50 VTC5300, VTC5350, VTC5400, VPR5800 VTC5500 VTC9100, VTC9300 VTC1100, 1300, 1500, 1100, 1150, 1200, 1300, 1500 VHR1200, VHR2300, VHR2500, VHR2700 VHR3100, 3300, 3310, 3400, 3700, 3800, VHR0500, 700 VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8450, 8700, VHR04400, 4410, 4500, 4600, 4610, 4710, 4890, 6700		150p 100p 95p 220p 90p 150p 110p		AKAI, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA		AIWA, AKAI, ALBA, AMSTRAD, VL05 150p		MITSUBISHI HS200 HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70 HS303, HS304, HS306, HS307, HS330, HS400, HS700 HS318, HS319, HS410		200p 150p 150p 130p		MATSUI VX850		75p		PHILIPS USED ON: K30, K35, K40, KT3, KT4 PRICE: £0.95	
N.E.C. N830, N831, N832, N833 N895 PVC2300, PVC2400 DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530, 9610		100p 80p 180p 95p 95p		NATIONAL PANASONIC NV300, NV332, NV333, NV340, NV366 NV777, NV788 NV2000, NV2010, NV3000 NV7000, NV7200, NV7800 NV8600, NV8610, NV8620 NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050 NV370, NV380, NV480, NV630, NV780, NV830, NV850 NV600, NV688, AG6010, AG6015 NVH7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70		125p 100p 130p 95p 145p 125p 100p 110p 70p		AKAI, GRANADA (VHSTJ2), VL01 25p		HITACHI (VT3000), ITT (VR3912, VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)		35p		PRICE: £2.25 PART NO: (POWER SWITCH + REMOTE SWITCH) USED ON: KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1							
NORDMENDE V100, V140 V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905 V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503 V101, V102, V103, V112, V141, V142, V301, V302 V110, V333 V1500T, V2000B, V2000P, V400H V250, V460, V9460, V20035542, V20035543 V300, V303, V380 V500		70p 90p 110p 95p 130p 75p 75p		SHARP VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700 VC7300, VC7700, VC7750, VC7800, VC8000 VC8100 VC300, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481 VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3 VC600, 651, 682, 684, 685, 693, 783, VCF73, VCF73 VCF73, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 815, VCH80, 865, 910, VCS1000, VCT310, 410, VCT1314, VCTS312		150p 100p 150p 150p 80p 80p 70 70 80p 115p		BLAUPUNKT, ORION (VH1, 2A), VL02 40p		NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)		40p		PRICE: £2.00 PART NO: (POWER SWITCH 21mm + REMOTE SWITCH) USED ON: KV2020							
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PHILIPS VR6480, VR6920 VR6540 DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RV7, 25B01, 25B02, 302, 303, 305, VR30DV2, 35B02, 35B03, 63B57, 715B4, 715B5, 715B8, VR6B5B2, 915B2, 925B3, VR6180, 6186, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR68S84, 86S81, 92S83 VR6442, VR6542 VR2025, VR2580 VR44589, BR445B920, VR445B922, BR6843 VR6548, VR6648, VR49S8620, VR644869S		170p 100 100p 100p 80p 85p 70p 100p 100p 100p 110p		SONY SLC6, SLJ10, SLT6ME CLC5, CL7, SLJ7, SLJ9 SLC9, SL8000, SL8080, SLT50 SL8000E, SL8080E, SL8200, SL8600 SLV255		140p 160p 165p 95p		AUTHENTIC (N850), DECCA VL07 40p		(VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)		40p		PRICE: £0.35 PART NO: (4 PIN FUNCTION SWITCH) USED ON: VARIOUS PRICE: £0.50							
SABA VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2410, 70, 2820, 3820, 4410, 4820, 6410, 6470, 6520, 8820 VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN VR2000, VR6000, VR6012, VR7000, VR7720, PVR6068 VR5005, VHR7000 VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006		130p 130p 90p 130p 130p 130p 130p 65p		THOMSON SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540 TX8000, V309, V357, VK411 TX8500, V342, 343, 351, 352, 353, 360, 364, 366, 4210, 4230, 4260, 4400, 5500, 6000, 9564 V320, V321, V323, V326, V4200, V4300 V333 V340 V4100, VK308, VK309, VK410 VK300, VK301, VK302, VK303, VK305, VK3010 VK312		65p 75p 90p 90p 90p 120p 135p 65p		GRANADA (VHSAY3), SHARP VL08 60p		(VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)		60p		PRICE 20p EACH 16p EACH FOR A PACK OF 5 FOR EACH MODEL 13p EACH FOR A PACK OF 10 FOR EACH MODEL							
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HRD455/HRD725	
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	BELT SET. PINCH ROLLER. SUPPLY CLUTCH TAKE UP CLUTCH
Order Code: SK38 £9.00	
3V58/59/64/65	
HRD170/180/210/230/300/320/370/400/430/530/700/750	
HR755000	
<i>Contents</i>	
BELT SET. PINCH ROLLER. IDLER ARM. TENSION BAND	
Order Code: SK44 £7.00	
3V29/3V30	
HR7200/7300/7350	
<i>Contents</i>	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	
Order Code: SK05 £5.00	
3V35/36/38/39/49	
HRD110/111/120/225	
<i>Contents</i>	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	
Order Code: SK04 £5.00	
3V31/3V42	
HR7600/7610/7650/7655	
<i>Contents</i>	
BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER. T/U CLUTCH. T/U IDLER. TENSION BAND. VIDEO LAMP	
Order Code: SK33 £11.00	<i>Economy Kit Contents</i>
	BELT SET. T/U REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK34 £5.00	
3V35/36/38/39/49	
HRD110/111/120/212/225	
<i>Contents</i>	
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER. REEL IDLER. TENSION BAND	
Order Code: SK35 £10.00	<i>Economy Kit Contents</i>
	BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. T/U CLUTCH. T/U IDLER TYRE. REEL IDLER TYRE
Order Code: SK36 £5.50	
3V29/3V30	
HR7200/7300/7350	
<i>Contents</i>	
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	
Order Code: SK31 £10.00	<i>Economy Kit Contents</i>
	BELT SET. T/U REEL IDLER TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. REEL IDLER TYRE. T/U IDLER TYRE. T/U CLUTCH
Order Code: SK32 £5.00	
3V44/45/48/53/54/55/57	
HRP50/HRD140/150/158/160	
HRD250/257/565/566/755	
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BELT SET. PINCH ROLLER. CLUTCH MECHANISM. TENSION BAND	
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	BELT SET. PINCH ROLLER
Order Code: SK40 £9.50	
FISHER	
FVHP905/906/907/908/910/911/916/918	
<i>Contents</i>	
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND	
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	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK58 £5.00	
FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840	
<i>Contents</i>	
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. TENSION BAND	
Order Code: SK68 £11.00	<i>Economy Kit Contents</i>
	BELT SET. PINCH ROLLER. IDLER TYRE
Order Code: SK69 £3.00	
HITACHI	
VT11/VT33	
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BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	
Order Code: SK08 £5.00	

VIDEO SERVICE KITS (Cont.)

VT11/VT33		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. PINCH ROLLER. FF/REW IDLER. CLUTCH PLATE. TENSION BAND		Order Code: SK45 £13.00		BELT SET. PINCH ROLLER. FF/REW IDLER TYRE. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE	Order Code: SK46 £3.75
VT52/61/62/63/64/65/85/86/640		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND		Order Code: SK49 £14.00		BELT SET. PINCH ROLLER. FF/REW IDLER	Order Code: SK50 £3.00
VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88		<i>Contents</i>		<i>Economy Kit Contents</i>	
TIMING BELT. PINCH ROLLER. FF/REW ARM. CLUTCH BASE. TENSION BAND		Order Code: SK52 £9.75		BELT SET. PINCH ROLLER. FF/REW IDLER	Order Code: SK55 £14.00
VT100/110/111/113/115/118/120/125/118/130/135/138/145/150/175/220/225/250/255/258/260/VTL30		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. FF/REW ARM. CLUTCH PLATE. TENSION BAND		Order Code: SK51 £14.00		BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	Order Code: SK02 £5.00
PANASONIC					
NV2000/NV2010		<i>Contents</i>		NV7000/NV7200/NV7800	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES		Order Code: SK03 £5.00		BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRES	Order Code: SK02 £5.00
NV300/NV330/NV333/NV340/NV366		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. TENSION BAND. IDLER TYRE		Order Code: SK01 £5.00		BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE	Order Code: SK14 £3.50
NV2000/NV2010		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. FF IDLER. PLAY IDLER. TENSION BAND. VIDEO LAMP		Order Code: SK13 £6.00		BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE	Order Code: SK14 £3.50
NV7000/NV7200/NV7800		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND		Order Code: SK11 £8.50		BELT SET. PINCH ROLLER. IDLER TYRE. CLUTCH TYRE	Order Code: SK12 £3.25
NV300/NV330/NV333/NV340/NV366		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. IDLER UNIT. PLAY IDLER. TENSION BAND		Order Code: SK15 £7.00		BELT SET. PINCH ROLLER. IDLER TYRE. PLAY IDLER TYRE	Order Code: SK16 £3.25
NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PXIAC)/AG1810 (PK)		<i>Contents</i>		<i>Economy Kit Contents</i>	
LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TENSION BAND		Order Code: SK27 £6.00		LOADING BELT. CAPSTAN BELT. PINCH ROLLER. IDLER TYRE	Order Code: SK28 £3.00
NV332		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER TENSION BAND. FF/REW TYRE		Order Code: SK29 £12.00		BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE	Order Code: SK30 £5.10
NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. IDLER. TENSION BAND		Order Code: SK23 £6.00		BELT SET. PINCH ROLLER. IDLER TYRE	Order Code: SK24 £3.25
NV600/NV688		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. PLAY IDLER. FF/REW IDLER. TENSION BAND		Order Code: SK25 £12.00		BELT SET. PINCH ROLLER. PLAY IDLER TYRE. FF/REW IDLER TYRE	Order Code: SK26 £6.00
NV730/NV770		<i>Contents</i>		<i>Economy Kit Contents</i>	
SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER UNIT. TENSION BAND		Order Code: SK19 £5.00		SLOT IN BELT. LOADING BELT. PINCH ROLLER. IDLER TYRE	Order Code: SK20 £3.00
NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. IDLER. TENSION BAND		Order Code: SK21 £5.00		BELT SET. PINCH ROLLER. IDLER TYRE	Order Code: SK22 £2.75
NV777/NV788		<i>Contents</i>		<i>Economy Kit Contents</i>	
BELT SET. PINCH ROLLER. IDLER UNIT. TENSION BAND		Order Code: SK17 £6.00		BELT SET. PINCH ROLLER. IDLER TYRE	Order Code: SK18 £4.00

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SHARP	
VC381	
<i>Contents</i>	
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND. VIDEO LAMP	
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	BELT SET. PINCH ROLLER. REEL IDLER TYRE
Order Code: SK48 £3.25	
VC500/VC571/VC581/VC582/VC583/VC584/VC5F3	
<i>Contents</i>	
BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND	
Order Code: SK60 £9.50	<i>Economy Kit Contents</i>
	BELT SET. PINCH ROLLER. REEL IDLER
Order Code: SK61 £5.00	
VC781/VC7810/VC7822/VC785/VC786/VC793/VC800/VC100/VC102/VC104/VC2A02	
<i>Contents</i>	
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	
Order Code: SK64 £13.50	<i>Economy Kit Contents</i>
	BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE
Order Code: SK65 £3.75	
VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700	
<i>Contents</i>	
BELT SET. PINCH ROLLER. REEL DRIVE UNIT. TENSION BAND	
Order Code: SK62 £13.50	<i>Economy Kit Contents</i>
	BELT SET. PINCH ROLLER. REEL DRIVE UNIT TYRE
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TX2112, TX2162, TXC22		
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LUXOR	VR3761	3100p
DAIICHI	HSE51	3000p
NATIONAL	NVFS200, NVFS90, NVV8000	4600p
PANASONIC	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDF5PE	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL	NVG20, NVG21, NVG22, NVG25	3000p
PANASONIC	NVG25, NVG28, NVG200, NVDA8 PART NO: VEH 0343	2900p
	NVG33, NVG45, NVG46, NVL23 NVL25, NVL28 PART NO: VEH 0417	2700p
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130 PART NO: VEH 0416	2700p

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700,
FUNAI VS2, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER,
TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602,
8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY,
GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX,
SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG,
TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	825p
VBR 0125		625p

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Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1	CH05	1100p
	VHSVJ2	CH01	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2800p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
	VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	2800p
NATIONAL PANASDNIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG N895	CH01 CH02	2800p 2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49SB6	CH24	2500p
SHARP	VCA100, VCH851, VCH852 VCA103, 103GV, 106, 106GVM, 254GVM	CH22 CH23	2900p 2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300 V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH01 CH02	2800p 2800p
TOSHIBA	V55, V57 V65, V66	CH01 CH02	2800p 2800p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	220p
FREEZE IT	400ML	SP16	550p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	200p
AERO DUSTER	150ML	SP08	220p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	200p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

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CD Pick Ups

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Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems		
PART NO: KSS210B		
USED ON MODELS:		
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CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S		2200p

Cassette DC Motors

MOTOR TYPE	PRICE
6V MOTOR	170p
9V MOTOR	170p
12V CW MOTOR	170p
12V CCW MOTOR	170p
13.2 CCW MOTOR	290p

Cassette Tape Heads

HEAD TYPE	PRICE
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STEREO HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

Soldering Accessories

DESCRIPTION	CODE	PRICE
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15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	80p
SOLDER MOP 1.2mm x 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47CA34N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	750p
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301	750p
TP400	RC 401	675p	RC5352	RC 5352	800p
TP590-600	RC 600	850p	RC5375	RC 5375	850p
TP390, TP610	RC 610	850p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	850p	RC5901	RC 5901	850p
TP630, TP650	RC 650	850p	RC5903	RC 5903	700p
TP660	RC 660	850p			
TP661	RC 661	850p	SABA		
HITACHI			T6772	RC 149	900p
CLE800-CLE830	RC 140M	700p	TC319-320	RC 328	875p
A617402/655602	RC 192	875p	TC356	RC 356	875p
A512120/230	RC 900	800p	TC358	RC 358	850p
A514790	RC 901	800p	TC360	RC 360	800p
A5088470	RC 902	800p	TC365	RC 365	800p
A518612	RC903	900p	SALORA		
SCL002	RC904	850p	SERIES L	RC 190	875p
C2096	RC 905	850p	86173	RC 882	850p
A511940	RC 906	750p	SANYO		
655602H	RC 907	800p	RC218, RC222, RC228, RC238	RC 140M	700p
ITT			JXGE	RC 878	850p
IFB13, 14, 15	RC 143	875p	JXDE	RC 884	850p
FS4	RC 148	850p	VHR2300	RC 890	850p
RG305	RC 305	675p	RC628	RC 865	900p
RG306	RC 306	825p	SHARP		
FS9/1-10/1	RC 307	850p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
VS5 RUK	RC 308	825p	SIEMENS		
VS4-1	RC 310	850p	FC616	RC 130	850p
MULTICONTROL (17C20)	RC 311	800p	FC631	RC 132	850p
KORTING			FC742	RC 164	900p
18279, 18396, 18460, 18521 SE	RC 108	850p	SONY		
40540 VTS	RC 108	900p	RM604, RM605, RM606	RC 140	700p
LOEWE			32 CHANNEL	RC 140M	700p
DC11	RC 146	850p	RM613	RC 141	750p
MATSUI			RM632, RM636	RC 160	675p
010270601	RC 889	850p	TATUNG		
VX770	RC 892	850p	FXA	RC 877	850p
METZ			RC70	RC 883	750p
JAVA COLOR (6890)	RC 166	850p	FX70 FASTTEXT	RC 894	850p
COLOR (7156)	RC 183	850p	TELEFUNKEN		
JAVA (7180)	RC 184	850p	FB632	RC 632 ST	850p
MITSUBISHI			FB639	RC 639 ST	850p
939P/03607, 939P/03609	RC 140M	850p	THORN/FERGUSON		
NOKIA			3V35-42	RC 342	650p
SATELLITE	RC 550	850p	3V31-32	RC 344	800p
NORDMENDE			3V57-58	RC 628	800p
TC2336	RC 351N	850p	TX10 TEXT	RC 732	575p
CMC1, TC3519	RC 356	875p	TX10 STEREO TEXT	RC 738	575p
OCEANIC			TX9-90-100	RC 740	675p
390C9500	RC 339	900p	3V55, FV11	RC 783	800p
ORION			TX100 FASTTEXT	RC 785	650p
RC53	RC 892	850p	TX100 STEREO FASTTEXT	RC 789	650p
PANASONIC			PROFESSIONAL	RC 790	650p
EUR51200	RC 200	800p	TOSHIBA		
TC2200	RC 201	850p	CT937	RC 950	850p
VSO0357/NV730	RC 202	875p	CT9117	RC 951	800p
TN01621	RC 203	900p	201R4B	RC 952	800p
PHILCO					
CARVEL, CONCORDE,	RC 108	850p			
MERCURY, TELESTAR					
TC10	RC 152	900p			
PHILIPS					
RC5002,5154	RC 134	850p			
KT3 NON TEXT	RC 135	825p			
69117032	RC 178	875p			
69117194	RC 180	875p			
RC5991-UNIV	RC 300	580p			

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FUSES

Value	TIME LAG (20mm)		QUICK BLOW (20mm)	
	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

FUSES

CURRENT RATING	ORDER CODE	PRICE
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3A	FUSE33	100P
5A	FUSE34	100P
13A	FUSE35	100P
20MM CERAMIC TIME LAG		
3.15A	FUSE41	100P
4A	FUSE42	100P
5A	FUSE43	100P
6.3A	FUSE38	100P
8A	FUSE39	100P
10A	FUSE40	100P
32MM CERAMIC SLOW BLOW		
8A	FUSE44	210P
10A	FUSE45	210P
15A	FUSE46	210P
20A	FUSE47	210P
38MM CERAMIC SLOW BLOW		
10A	FUSE48	875P

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I.C. PROTECTOR

ICPF10	ICPF38	ICPN10	ICPN38
ICPF15	ICPF50	ICPN15	ICPN50
ICPF20	ICPF75	ICPN20	ICPN75
ICPF25	ICPN5	ICPN25	

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AUDIO CONTROL HEAD
 Amstrad Original No: 150751
 Used on Amstrad TVR1 2.3, VCR4600, 4600MII, 4700
 Funai V2S, VCR4600, 4800, 5200, 5600, 6800, VIP3000, 5000
 Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada, Ultravox

Order Code: AH01 Price: £13.50

Amstrad Original No: 153154
 Used on Amstrad 008900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244
 Also fits: Antitec, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguant, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Universum

Order Code: AH02 Price: £14.50

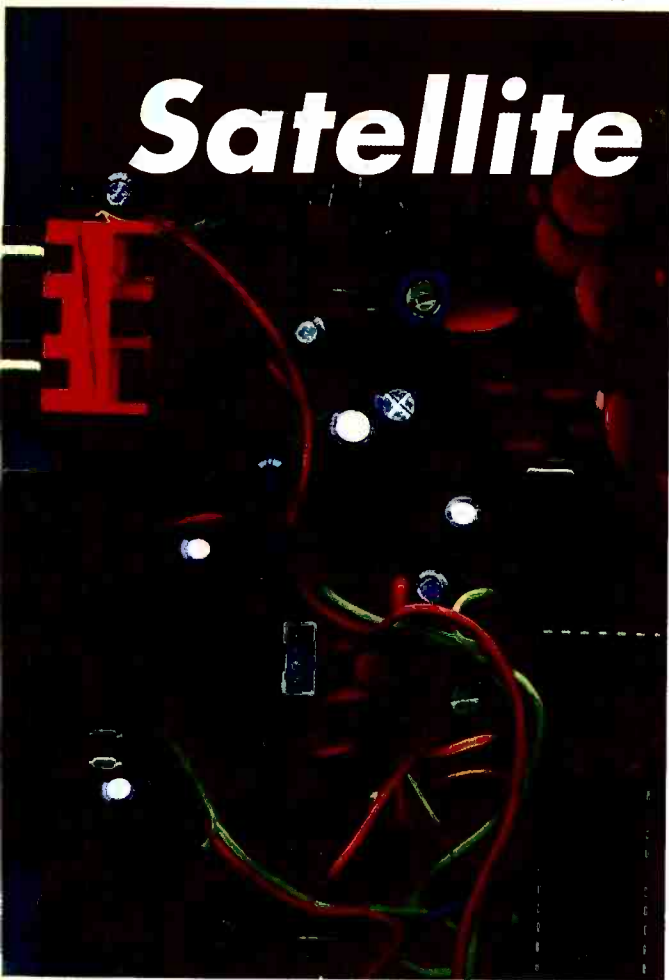
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Satellite WORKSHOP



Jack Armstrong

I mentioned in a previous article that the Series 10 Sky card seems to play up in some receivers. One of the card's contacts has a resistance spot on it. You can get an intermittent "Card Invalid" message with some Pace PRD receivers and clones. It happens with only a tiny percentage of them – usually as the card wears with use. But I have seen it occur with brand new cards.

With PRD receivers my answer is to cut the track that goes to the 'black spot' contact and insert a 2.2kΩ resistor. Pace has however stressed that this is not a recommended modification.

In other receivers, such as the Pace SS9200 and Cambridge RD480 Extra, I've solved the problem by carefully scraping the black spot off the card. Sky has stressed that tampering with the card cannot be authorised.

The official line is that you should request a replacement card, insert it in the decoder slot and, once the decoder is working, leave it there.

Amstrad SRD510

Wiggly graphics is a fault that has plagued me with this model since it

first appeared. Several possible causes have been found. With one that came in recently the cause was traced to the 12V supply being on the high side.

The 12V supply is obtained from the 13V rail via regulator transistor TR304, a large, plastic-insulated TO220 device at the front of the board. If the 12V supply is set too high, TR304's regulation efficiency is reduced and HF ripple gets through. The remedy is to reduce the value of R319 to set the 12V supply lower.

I've also had units in which TR304 runs very hot. This happens because the 13V and 23V supply tracks are shorted together! It's a manufacturing fault. The two tracks run close to each other and sometimes the etching fails to separate them. Receivers with this fault can run for months before TR304 finally melts.

Symptoms

I know of at least two magicians who were born in my home town of Middlesbrough. One was the famous Paul Daniels. Not so famous but well known locally was "Blind Des". I first saw him perform at my Granny's house in Longford Street. Her television set, a Decca DM4CA, had developed a rolling picture fault (OK, I know this is supposed to be about satellite TV, but you'll like it!).

"Run and get Blind Des" my mum said to my uncle. "He'll fix it." Ten minutes later my uncle returned with an elderly lady who had a white-haired gentleman with a suitcase in tow. I knew he was blind because he tapped things with a white stick.

At the impressionable age of seven I quite expected him to wave his white stick and mutter some magic words that would instantly cure the jittery picture. Instead he sat down in an armchair while his wife knelt down by the TV set. She described the symptoms to him in colourful detail. Blind Des listened intently, then sat back and clasped his hands to his chest. This was better than the cinema!

"Swap th' ECC82s" he pronounced. "If that dun' fix it,

replace grid bias resi'uh under th' flywheel sink valve." The little woman followed his instructions. Apparently it was the resistor, because she produced a large soldering iron from the suitcase, plugged it into a wall socket and, with amazing dexterity and much smoke, replaced the offending resistor in a matter of seconds.

This performance impressed me greatly, and I decided at that early age to be a TV repair man. I would learn all about "sink valves" before I went blind! (I'm still not blind, despite the evil invention of surface-mounted devices.)

The moral of this story is that you can fix things even if you can't see them, provided you have a clear description of the symptoms. Most of my headaches arise from telephone calls or e-mail communications where the enquirer simply cannot provide an accurate description of what he sees and hears. We put up with this from ignorant customers of course, but it becomes very frustrating when those in the trade make the same mistake. So next time you ask me about, say, "interference lines", shut your eyes and try to create a verbal picture. How many lines; how far apart; what orientation; what colour; what form – solid, dotted, dashed? Anything that helps me to envisage what is being complained about.

Amstrad/Fidelity SR950

I saw my first dead Fidelity SR950 recently, the cause being the 'Topswitch' device that's bolted beneath the power supply panel. It's awkward to remove – you need a really hot iron, because the tab is soldered to the copper land. I could find no reason for the failure, and no other component had been damaged. A case of 'infant mortality' perhaps.

The SR950 has no factory reset, and is causing some problems with local installers. To set the receiver up you have to connect it to a dish system then put it into the search mode. It scans the entire frequency band to pick up all the horizontally-polarised channels, then does the same for the vertically-polarised

channels, storing them in memory as it goes. Unfortunately this can take several minutes, and the receiver stores some blank channels on which there's nothing to see but snow.

If a standard 10GHz LNB is in use, the receiver will attempt to store the Astra 1D channels, many of which are very weak and sparkly. As a result, several perfectly good receivers have been returned as "faulty - poor pictures" when the problem is in fact caused by the old LNB.

Another common problem is to find that there are no decoder messages because the video bandwidth has been set to "wide".

Thus although this is a basic receiver it has proved to be troublesome for less knowledgeable installers, who don't seem to understand its operation.

In addition, a small number of the receivers produce decoder 'dropout' if the picture goes bright momentarily. Amstrad has issued a modification for receivers that do this, but it's a workshop job that calls for the use of an oscilloscope.

In common with the other new Amstrad models, the SR950 and SRD700 have a hybrid tuner that incorporates most of the video and audio sections as well. My first impression is that this module,

which uses tiny surface-mounted components, is going to be very difficult to repair should it fail (I've had one fail already). To replace the complete module is going to be as expensive as spending time searching for the cause of the fault. I think that over the next few years many of these receivers will end up being scrapped as "beyond economic repair".

Tone Controlled Pace 9200s

I had an interesting problem with a Pace SS9200 receiver the other day. It had come in as dead. The power supply was soon repaired, but I then found that the receiver appeared to have lost most of the Astra channels. In fact only a few Astra 1B programmes could be found, and these were at the bottom end of the tuning range instead of the top. It seemed that the tuner had slipped by some 600MHz!

The reason for this struck me when I eventually noticed that there was power supply interference on the picture. I'd recently fitted a Grundig Universal LNB to my dish. What was happening was that the power supply was sending interference, at a frequency of around 22kHz, up the cable. As a result the LNB was switching to its

Jack Armstrong is willing to try to sort out readers' satellite TV receiver problems via e-mail. You can reach him via the Internet at:

repairman@netcentral.co.uk

One model per message - state make/model and fault symptoms. If you have no e-mail facilities you can write to him c/o Television, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Please enclose two stamped envelopes.

high-band state, with the local oscillator at 10.6MHz. This explained the 600MHz shift.

The fault was cleared by replacing all the front-end capacitors in the power supply. Not that the customer, with his Blue Cap LNB, would have noticed - but then I'm a perfectionist!

I had almost the same fault shortly afterwards with another SS9200. This time replacing the 17V supply reservoir capacitor C33 (1,000µF, 25V) cured the problem, which occurred only when horizontal polarisation was selected.

So beware, those of you who have upgraded to a Universal LNB. ■

Test Case 404

Our rental customers have a very casual attitude to our time and resources. For example they don't hesitate to call us to attend to a non-working remote control unit when the batteries are tired! We find that most renters demand dual-speed VCRs, whether new or used, so that they can halve their already very modest tape costs. Never mind that the picture is more grainy and the sound muffled and constrained: they are saving a fraction of a penny per time-shift recording.

These two factors led to Doc Colin's call on Mrs Hind. She said she didn't even know the remote zapper had batteries - but it was on rental. And while he was there could he take a look at the VCR? It didn't produce a picture when a recording her son had made for her of a film was played back, though the sound was present. The recording had been made in the LP mode and, unusually for a rental VCR, this one had hi-fi sound. Doc Colin tried it. Sure enough the TV screen was blank during playback though the sound came through fine. The pictures were OK in the E-E mode and with Mrs Hind's own recordings. Colin installed a loan machine and took the rented VCR, a Sanyo VHR7700E, back to the workshop along with the recording that was causing the problem.

The machine found its way to Technocrat's bench. He was familiar with the ordinary range of Sanyo VCRs, but not with this posh Nicam/hi-fi model. When he tested the VCR he found that it recorded and played back happily in the SP mode. But for some reason the vision channel was blocked in the LP mode, in both record and playback. There was neither snow nor grain, just a clean, blank screen - the brightness had to be turned up to confirm that a raster

was present. The sound system worked fine throughout the tests.

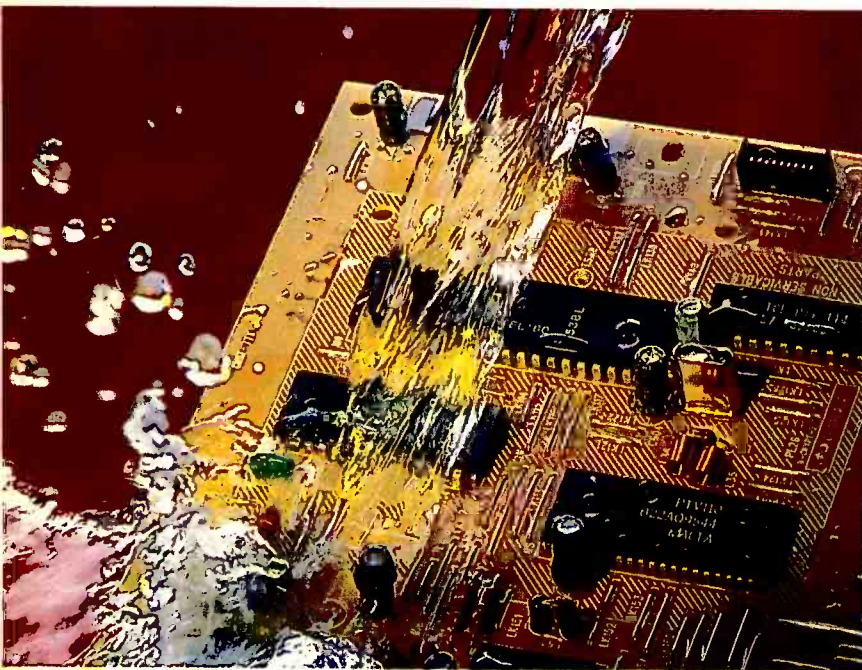
TC got out the service manual and dismantled the machine. He inserted the LP tape and checked for video at the RF modulator and at the video output socket. There wasn't any. His next test was for a video carrier output from the tape heads. A waveform was present at TP182 (ENV) on the video preamplifier panel. So the signal was being lost between TP182 and the video output socket, though the video processing circuits were clearly working correctly as pictures were produced in the SP mode. Strange!

The luminance signal processing chip is IC101 (LA7340), on the video board CP1. TC found that there was no output at pin 21, from which the composite video signal should emerge during playback. He removed the cassette and inserted one that contained an SP recording. Up came the video waveform at pin 21 - along with a picture on the screen. Some odd fault in the LA7340 chip perhaps?

To gain further clues TC went to the E-E mode in LP record. He found that the video input signal got no farther than the AV/tuner select chip IC161, whose output at pin 8 disappeared whenever the LP mode was selected. He also found that the voltage at pin 7 (labelled PB 5V on the block diagram!) went high for LP. He investigated the source of this voltage: it came from the microcontroller chip IC301, via diode D1313, on a line marked LP high. Into the control circuit then, specifically to pin 65 of IC301.

At this point light finally dawned in TC's brain. How could he have been so stupid?! He remembered a similar case with a JVC machine, and cursed Mrs Hind, Doc Colin and all. What was the cause of all this hassle? The solution will be found on page 755.

CLEANING *with water*



Traditionally, water and electricity have not mixed. As an environmentally safe measure however water-based solvents are being increasingly used to clean electronic equipment. Pete Roberts reports

Not getting it wet is probably one of the most important precautions normally required with electronic equipment. In this article however we're going to describe the cleaning of PCBs and mechanical bits and pieces with water. I can hear it now: "man's obviously out of his mind!" But I can assure you I'm not, nor would I suggest dumping someone's telly into a sink full of hot water and Fairy Liquid – though some could certainly do with it!

Many electronic equipment manufacturers are already water washing. The rest will probably follow suit before long. When you think about it, most of the crud that finds its way into domestic gear is water based, so water is obviously the best thing for removing it. Bear in mind that when used as a cleaning solvent the only differences between water and 'chemical' solvents are a moderate electrical conductivity and a longish drying time.

The Montreal Protocol

You've probably heard of the Montreal Protocol. It's the international agreement under which all chemicals known to cause damage to the stratospheric ozone layer are to be

phased out, worldwide, as soon as possible. They include many of the solvents used in the electronics industry, particularly 1-1-1 trichloroethane, which is used to clean PCBs and as an industrial degreasing agent, and chlorofluorocarbons (CFCs) such as trichlorotrifluoroethane, which is used as a refrigerant and aerosol propellant, also for cleaning tape heads, disc drives and other delicate items. In passing, the only permitted future use for CFCs will be as propellants in medical aerosols such as asthma inhalers.

When organochlorine or CFC solvent vapours escape, they eventually rise fifteen miles or so where they reach the ozone layer, which they break down to leave, amongst other nasties, free chlorine. Ozone is a form of oxygen with three instead of the usual two atoms in its molecules. Free chlorine cracks the ozone molecules apart, leaving ordinary oxygen. Great for breathing, but as much use as an ashtray fitted to a motorbike when it comes to UV solar radiation. Since each free chlorine molecule can destroy up to fifty ozone molecules on average, the international decision to phase out chlorine-containing solvents has come none too soon – if CFC use was stopped tomorrow, it would still take more than a century to undo the damage already done to the ozone layer.

While environmentally benign solvents such as isopropanol can be used in the workshop for small cleaning jobs, they are generally too inflammable and too expensive for large-scale workshop and manufacturing use. It's against this background that water-based cleaning agents such as Electrolube's Safewash 2000 range have been developed.

Types of Contamination

Domestic contamination is usually water soluble. It includes such delights as coffee, Coke and beer (favourites in computer keyboards), baby drool in remote

control units, and the corrosive crud from leaky batteries and electrolytic capacitors. In passing, while on the subject of corrosives, check the contents of the next can of cola you buy. Like as not the ingredients will include phosphoric acid, which is commonly found in rust remover! Phosphoric acid has a healthy appetite for copper when it gets on to PCBs and keyboard membranes.

Insoluble contamination tends to be found more in industrial and commercial environments. It usually involves oil, fat or grease, or unpleasant combinations of these.

While plain water makes a reasonable job of cleaning soluble deposits, it needs a helping hand to deal with greasy muck. These helping hands come in the form of detergents such as soap and washing-up liquids, and emulsifiers such as Gunk and Jizer.

Effective cleaning of PCBs, electronic components and precision mechanical parts calls for a combination of detergent and solvent properties, something that's by no means easy to formulate. While conventional solder fluxes need a fairly aggressive solvent and/or detergent action, most of the solder pastes used for surface-mounted assembly work leave a water-soluble residue. For small mechanical assemblies, such as the innards of a VCR, a dual action is required to remove, for example, grease and nicotine deposits without dissolving plastic bits and pieces. To its credit, Electrolube seems to have pulled the rabbit out of the hat with its Safewash range.

The Safewash Range

At the time of writing there are five products in the Safewash range. Three of them are readily available to the trade via suppliers such as RS, Farnell and CPC. These are Safewash SWA400H, a foaming mousse packaged in a 400g aerosol can; Safewash J2000, which is a pale blue liquid that's supplied in a five-litre plastic container; and Saferinse 2000, a rinsing solution that's again supplied as an aerosol.

Electrolube recommends use of the aerosols for "low volume and rework cleaning". This would include TV/video servicing. The liquid is intended for cleaning PCBs and metal parts in ultrasonic cleaning baths, and/or spray application in a production plant. As much of my work comes covered with all kinds of industrial grot, I find the aerosols expensive. So I mostly use the J2000 liquid, which I squirt on with a plant-misting bottle and follow with a very thorough brushing. Old toothbrushes are ideal for this job.

Precautions

Before water washing a PCB assembly all items that would be adversely affected by water, such as mains, chopper and line output transformers, must be removed. Don't forget that any paper labels will probably be ruined. Also bear in mind that while small RF inductors won't be harmed by water washing, their characteristics will be miles out until they have dried out completely.

Modern, plastic-encapsulated PCB-mounted components are designed to withstand solvent or water washing by both spraying and immersion. I would not recommend the use of Safewash, or any other type of solvent cleaner for that matter, on vintage electronic or radio gear. Old wax-impregnated paper capacitors (or should that be condensers?!), composition resistors and shellac-impregnated coils and transformers would not take kindly to such treatment.

Use

Use of the SWA400H aerosol is very easy as the can is



An Electrolube SWA400H foaming mousse aerosol being used in a PCB cleaning operation.

fitted with a brush applicator. The foam emerges from the centre of the brush, which is then used to work it into all nooks and crannies. Unless there's a very good reason not to, I always apply the foam to both the print and the component side of the board. I then put the job aside for five-ten minutes, to allow the Safewash to penetrate and loosen deposits. As the millions of bubbles that make up the foam collapse, they impart a mild scrubbing action similar to the cavitation effect with ultrasonic cleaning baths. So the board should ideally be left until most of the foam has gone. The foam version is particularly recommended where there are large chips, as it gets beneath even large surface-mounted devices with ease.

Safewash cleaning prior to repair can be a great help when diagnosing faults. After cleaning, good soldered joints literally sparkle. Dry-joints usually remain a noticeably Prime Ministerial grey. Any copper that has suffered from corrosion, whether print or component leads, takes on the bright pink of freshly exposed, unoxidised copper. While corroded PCB track can be repaired, any components with corroded leads, or corroded PCB links, are best replaced. As previously corroded copper is difficult to solder, even after cleaning, avoid subsequent hair-tearing or teeth-gnashing by taking great care when soldering in any new parts.

If, like me, you would prefer to use the bulk liquid, bear in mind that it's not really intended for small-scale spray application. As previously mentioned, Safewash 2000J comes in a five-litre plastic container which you can use to fill something a bit more manageable. I use a plant mister to apply it, but any small pump-action bottle capable of producing a fine squirt (not a jet!) will do. Avoid spillage when transferring the liquid – at around £4 a litre, Safewash is too pricey to waste.

Squirt a little Safewash liquid on to the board, then use a toothbrush to spread it. Repeat the process until the board is well wetted but not quite dripping. Work up a good foam, paying particular attention to ICs and their pins. (Don't use the same toothbrush for your teeth!) As with the foam version, leave the job for at least five minutes to enable the Safewash to work.

When ready, simply wash the board using a reasonably generous amount of water. Warm water gives the best results and helps the drying. Water washing should continue until all Safewash and grot residues have gone. Incidentally, don't try to wash the smell from the board:

Safewash contains eucalyptus oil, whose not unpleasant odour is very persistent.

Now for the important bit: dry the board (or whatever) thoroughly before reassembling and applying power. This is best done overnight, in a warm place – I usually use the airing cupboard, or sit items on top of the central heating boiler. Don't be fooled by an apparently dry board – moisture could still be lurking beneath ICs etc.

Tap water contains impurities that can leave faint streaking when the board has dried. I can't see that this matters with consumer equipment, but if you are fussy about such things you can use Saferinse after the water wash.

Saferinse is basically a mixture of deionised water and isopropyl alcohol, with a few other bits and bobs. Its use leaves the board almost clinically clean. A Saferinse board also dries quickly. As Saferinse is even more expensive than its cousins however, I usually forgo the luxury.

When you are satisfied that the board or whatever is completely dry, reassemble the equipment and test it. And don't forget that electrical safety test before you put the job on the 'out' rack – take particular care over checking for earth leakage.

The Safewash system has one great advantage over other methods. With the ever-increasing number of static-sensitive MOS devices in modern equipment, you couldn't wish for a better static dissipator than water!

Health and Safety

Saferinse and the two forms of Safewash are classified as

non-hazardous and non-carcinogenic. They are safe to use on all metals and all plastics, with the single exception of polystyrene. So avoid contact with polystyrene capacitors or be prepared to replace them after cleaning.

The entire Safewash range is biodegradable, and the quantities used in a repair workshop can be flushed down the sink. Although they are non-flammable, in keeping with good chemical practice you should not smoke when handling Safewash or Saferinse. Avoid breathing any vapour, especially when using 2000J with a squirter. This is a method I use, but the maker would probably frown on it. I find that the spray mist can make my chest tight, but to be fair I should point out that I suffer from asthma.

Although Safewash is non-hazardous for skin contact, it is a powerful degreasing agent and can thus remove the thin protective fatty acid layer on your skin. Repeated damage to this layer can lead to dermatitis. Where skin contact is unavoidable, use a water-resistant or universal barrier cream if available. Better still, use a pair of Marigold or disposable surgical gloves – this is a good idea when handling any chemicals.

Washing your hands with a good-quality superfatted toilet soap (one with added "cold cream" or moisturisers) will help to replenish your skin's protective layer after using Safewash.

Don't forget that dirty equipment usually comes from a dirty household, and may be a serious health hazard if you handle it with damaged skin. Always wash your hands before handling food. I don't think that Safewash would enhance the taste of your sarnies, and you never know what was in the muck you've just washed off! ■

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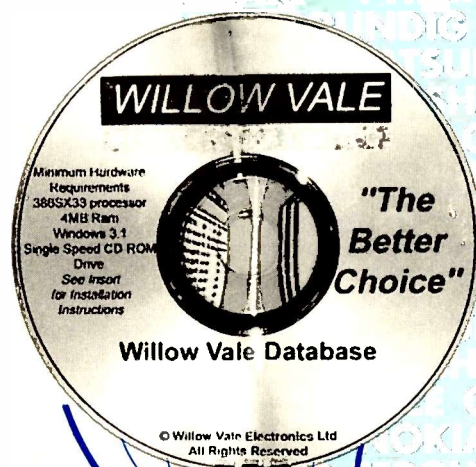
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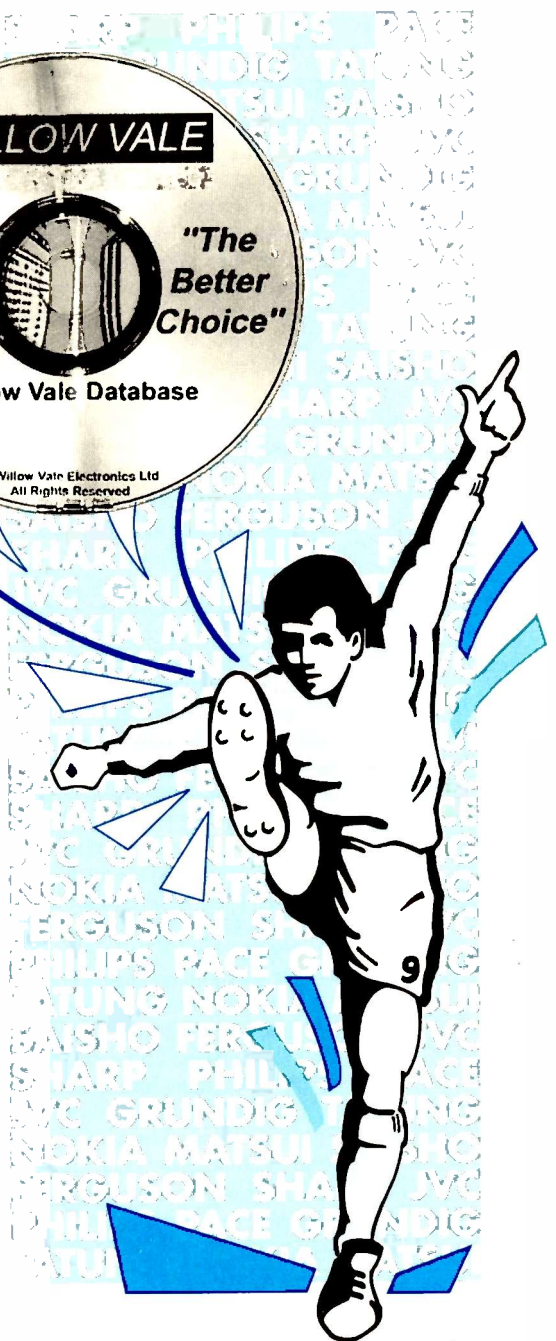
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Going it Alone

John Pitt-Francis' excellent article on Going it Alone (June '96) was so comprehensive that I hesitate to add to it. However, after 20 years of experience as a lone engineer, may I suggest one important omission: rubbish! This trade produces an incredible quantity of the stuff.

Like John, I live in a remote rural area (North Cornwall), and probably like him have the odd barn or two in which to dump it, pending its removal. I recently spent several days filling a seven cubic yard skip with about 50 scrap sets, each of which had to be broken up, tubes removed and smashed, cabinets reduced to flat packs. And it's not cheap at £75 a skip. I expect to need one every few years. These sets come from two main sources: the larger consists of veterans brought in by hopeful customers who abandon them when told they are beyond economical repair, or that spares are no longer available; the other (which I have now stopped) consists of "off the pile" sets for repair and resale.

I can imagine that in an urban situation scrap could be quite a problem. One solution might be to concentrate on VCRs and audio, which are more manageable.

If I had to choose between owning a computer or a photocopier, I would opt for the latter. I copy and file every scrap of servicing information which comes my way – borrowed manuals, customers' user sheets, magazine articles. *Television's* invaluable TV and VCR clinics are photocopied, cut up and sorted into makes and models, pasted up, recopied and filed in loose leaf binders. This way I have an up-to-date fault index with the full information, rather than the scrappy notes found on some computer fault

Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, hand written, or on disc – addressed to the Letters Editor, Room L302, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

files. Selected parts of circuit diagrams can be blown up until they are usable, and on a single sheet instead of an unwieldy book.

Stationery can be printed as and when required at virtually no cost. I also find that being able to provide a photocopying service in a village ten miles from the nearest town brings many local people to my shop and helps me to get known.

One advantage of self employment becomes noticeable as you get older. My first retirement was twenty five years ago, after twenty seven years as an electrical engineer in the Royal Navy. I am now probably approaching my second enforced retirement. The sets get heavier, the technology more difficult, the print smaller. Nevertheless, I can still carry on at my own pace and make my own choices. I have given up house calls, except for local people who cannot come to me. I have also limited my services – no satellite TV, camcorders or CD players. In this way one can drift into semi-retirement, take holidays when one wants and still stay reasonably active in mind and body. If I didn't enjoy it, I wouldn't do it!

Laurie Watkinson,
Holsworthy, Devon.

One point John Pitt-Francis didn't mention was the need for planning consent from the local authority when converting your garage etc. into a workshop. Insurance is another consideration, especially if your garage is attached to the house.

I have been self employed for fourteen years in the brown goods repair industry and, because of cheap new TV sets, videos etc., am finding it increasingly difficult to obtain work. Good luck to anyone starting up a repair business from scratch. You're going to need it.

Paul Byrne,
Denbighshire.

Electricity Supply Problems

A regular feature in this magazine is an article from someone

overseas containing a paragraph or two critical of the local electricity supply. We in the UK sticks do have our problems however.

It was after midnight and, having just put lead boots on my computer by installing a new operating system, I decided to rest before total depression set in. My thoughts turned drowsily to the current weather situation. Just as I looked out through the curtains there was a blinding flash accompanied by a loud explosion. With my usual display of bravado, I was rooted to the spot for several seconds before switching off at the fuse boxes to stop the rapid fluctuation in the power supply to the house. The continuing pyrotechnics from the overhead power lines out in the street indicated the origin of the problem.

The following morning I found that my NEC 380 fax machine had a RAM error indication. NEC directed me to Saxon Distribution who were kindness itself and made sure I was sitting down before telling me the price of a replacement digital board! The electricity supply company is investigating the matter, and I await its verdict. (If you know of an NEC 380 fax or FNK 601705/7 digital board for sale, perhaps you could let me know on (01491) 838 348).

Over a period of several months, various small mains transformers in always-on items such as the answer-phone, VCR, microwave oven and TV standby power supply failed. I monitored the two phases supplying the house, and found that with each of them the supply was consistently below 240V with respect to neutral. I made sure the neutral connections were tight and left it at that. The only shock I received was seeing Philips' listed price (via Willow Vale's COPS) for the small 3VA transformer for the microwave oven – it cost me over £50 including VAT.

A few transformers later, an illness about which I will not elaborate necessitated several nocturnal wanderings. Switching on a normal 100W bulb during one such excursion produced a brilliant 'Photoflood' effect. I immediately measured the

voltage between neutral and local earth and found that it was fluctuating around 200V. The neutral connection to the pole outside the house was renewed the following morning, less than two hours after my telephone call suggesting that it was faulty.

Two phases, with off-peak heaters connected to one of them, created the problem. When the storage heaters cut in for the longer period at night, the defective neutral connection on the pole outside began to heat up and occasionally became open-circuit. Storage heaters (in parallel) then became connected in series with small appliance transformers (in parallel) between the two phases. It was no contest, with 99 per cent of the voltage drop across the small transformers.

Alan Smith,
Wallingford, Oxford.

Amiga

In a letter in your May issue Pete Roberts commented that "it is well nigh impossible to obtain the ASICs used in Amiga machines since Commodore went out of business". The remains of Commodore have been purchased by ESCOM, which now produces the Amiga under a separate company called Amiga Technologies. Several companies advertise spares and repair services in *CU Amiga* magazine.

Frank Hodges,
Bodmin, Cornwall.

Apple Mac Monitors

Has anyone any information on Apple Mac monitors? Apple does not supply spares, suggesting that the monitor should be replaced when adjustment doesn't cure a fault condition. This seems such a waste. Any information regarding clones and badge engineered Apple monitors would be greatly appreciated. Please send this to the Editor, *Television* for forwarding.

I.D. Williams,
Bangor, Gwynedd.

Aerial Rigging

In his article on aerial rigging (July Issue) John Pitt-Francis says that a professional rigger uses a signal strength meter but goes on to say that you can get along without one. As far as the customer is concerned, anyone who charges for aerial installations is a professional rigger, and as such should align the aerial accurately. This is well-nigh impossible without a meter.

Perhaps I shouldn't be grumbling. Aerials rigged without the use of proper test equipment make work for us professionals – even if the customer does have to pay twice.

Bill Wright,
Wright's Aerials, Rotherham.

Videotapes

In the early days several brands of tape of dubious quality were available. With the

current low cost of major branded tapes this is no longer a problem, or is it? More disturbingly, some reputable mail order firms are stocking dubious tape. Some time ago I received a free E180 as part of an order, with the statement "Licensed from the Vic Company of Japan" printed on the box. I made a test recording lasting a couple of minutes and found that the heads were blocked, requiring a clean-up job!

Perhaps I was unlucky, though I don't intend to repeat the experiment! For an excellent tape at a good price I thoroughly recommend JVC's SX type, which is cheaper than most other brands of standard tape yet gives superb picture and sound quality.

Brian Renforth,
Newcastle upon Tyne.

Warranty or Not

Many thanks for publishing my letter on the above subject in your February issue. I am pleased to be able to report that Sony Broadcast has backed the warranty that caused a problem when a wholesaler went out of business. Sony comments that "whilst our dealers have full warranty responsibility for all the products they sell, should the company cease trading the warranty will be backed up by Sony. This applies only where the dealer was a Sony authorised reseller."

Martin Crossman,
E & E Services, Southend-on-Sea.

HELP WANTED

Wanted: Front control panel (4-2264-004900) and display/timer panel for the Fisher FVP-P530 VCR. T.J. Steel, 185 Charter Road, Chippenham, Wilts SN15 2RF. 01249 448 796.

Wanted: Mullard MW22-14, MW22-16 and MW31-74 CRTs for restoration projects. Glen Rosa, Welham, Retford, Notts DN22 0SJ. 01777 702 096 (day).

Wanted: Circuit diagrams (photocopies OK) for the Contec KTN5145 and Crown 600V TVs. Have Ferguson TX10 chassis for disposal free but must be collected. R. Anderson, 33 Broadmanor, North Duffield, Selby, N. Yorkshire YO8 7RZ. 01757 288 660.

Wanted: Service manual or circuit diagram for the Sharp IT-145MZ mono video monitor. R.J. Oram, 4 Hardy Avenue, Duckmore Road, Ashton Gate, Bristol BS3 2BP. 01179 636 981.

Wanted: LOPT (part no. 2431577) for the Hitachi Model CTP203. K. Watson, 42 Heathfield, Greystoke Manor, Sunderland, Tyne and Wear SR2 9EW. 01915 282 974.

Wanted: Button/display PCB for the Amstrad 6100, also the plastic front. Brian Milne, 22 Aldwych Place, Blackburn, Lancs

BB1 9QP. 01254 246 127.

Wanted: Hitachi VT14 service manual – loan will do. Also most copies of *Television* from May 1990 to June 1991. John Pitt-Francis, 6 Mount View, Feniton, Honiton, Devon EX14 0EB. 01404 850 126.

Wanted: Perspex screen for the Panasonic TC4500G Cinemascreen TV. Alan Matson, Dunfermline Repair Centre, 100 Main Street, Townhill, Fife. 01383 737 284.

Wanted: Circuit diagram for the Philips PM3210/3 oscilloscope. George Varga, Hungary. E-mail address is:

BENEDEK@everx.szbk.u-szeged.hu

Wanted: Service manual for the JVC TV Model 7798ME. Harry Dingwall, PO Box 347, Victoria, Mahe, Seychelles.

Wanted: LOPT for the ITT VC200/VC205 chassis. Working second hand OK. Eric Kempshall, 109A Portland Road, Hove, East Sussex BN3 5DP. 01273 382 001.

Wanted: Any information on manufacturer/spares source/circuit diagram for the DP Dual power amplifier Model 100, which was made in Denmark. It's a rack-mounting, twin-channel slave amplifier. Andie Wilkes, 34 Tideswell Road, Great Barr, Birmingham B42 2DT. 01216 050 720 (evenings), 01926 404 935 (daytime).

Wanted: Someone to repair a Telequipment D66 oscilloscope. David Parsons, 50 Bower Lane, Quarry Bank,

Brierley Hill, West Midlands DY5 2DP. 01384 633 273.

Wanted: Main PCB for the Philips G90AE chassis. Must have working power supply. M.B. Wilson, 1 Playwell Court, Glanton, Alnwick NE66 4BL. 01665 578 437.

Wanted: Second-hand working tuner for the Pace SS9200/Grundig GIRD3000 satellite receiver. Also does anyone know of a supplier of spare parts for cordless telephones? M. Shafiq, 4 Leighton Road, Old Trafford, Manchester M16 9NX. 01706 621 015.

Wanted: Circuit diagram for the Casio TV400 hand-held colour TV. Adrian Goodall, Media Services, Kingston University, Penrhyn Road, Kingston Upon Thames KT1 2EE. 0181 547 7103.

Wanted: Circuit diagram for the Amstrad SRD500 satellite receiver and the Xerox telecopier/fax transceiver X295. D. Williams, 16 Heal Elli, Llanelli, Carmarthen SA15 1LX. 01554 759 035.

Wanted: Syscon PCB for the Sanyo VHR1100E. George Mayo, Carlton, Broad Lane, Markfield, Leics LE67 9TB. 01530 242 378.

Wanted: Operating instructions for the Siemens HF2021 fax machine (photocopy will do). W.L. Harling, Cleveleys TV Co., 2 Bispham Road, Cleveleys FY5 1DG. 01253 854 211.

DMM with 20MHz counter

In addition to frequency measurement to 20MHz – and a full complement of DMM features – the Maxcom MX620 hand-held DMM measures capacitance and transistor gain. It even has a logic-level checker indicating true TTL levels.

Further key features of this 3 1/2 digit meter are data hold, peak hold and a 20A dc capability. It also has automatic shutdown to extend battery life, and full overload protection.

Vann Draper is offering this full-feature digital multimeter to Television readers at 15% discount on its already low retail price. Normally retailing at over £70, the MX620 is available to Television readers at just £59 – including VAT, postage packaging, rubber holster, probes and instructions.



Digital multimeter reads not only voltage, current, and resistance but also capacitance to 200µF, frequency to 20MHz and transistor h_{FE} – all for just £59.

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*Overseas readers can also obtain this discount but details vary according to country. Please ring, write or fax to Vann Draper Electronics.

Maxcom MX620 specifications

Function	Range	Resolution	Accuracy	
Volts DC	200mV	100µV	±0.25% of rdg+2dgt	
	2V	1mV	±0.6% of rdg ±4dgt	
	20V	10mV		
	200V	100mV		
	1000V	1V	±0.8% of rdg+4dgt	
Volts AC	200mV	100µV	±1.2% of rdg+3dgt	
	2V	1mV		
	20V	10mV		
	200V	100mV		
	750V	1V	±1.5% of rdg+5dgt	
Current, DC	20µA	10nA	±0.8% of rdg+4dgt	
	200µA	100nA		
	2mA	1µA		
	20mA	10µA		
	200mA	100µA	±1% of rdg+5dgt	
	20A	10mA		
Current, AC	20µA	10nA	±1.2% of rdg+3dgt	
	200µA	100nA		
	2mA	1µA		
	20mA	10µA		
	200mA	100µA	±1.5% of rdg+5dgt	
	20A	10mA	±2% of rdg+5dgt	
Resistance	200Ω	100mΩ	±0.8% of rdg+4dgt	
	2kΩ	1Ω		
	20kΩ	10Ω		
	200kΩ	100Ω		
	2MΩ	1kΩ	±1.5% of rdg+5dgt	
	20MΩ	10kΩ	±3% of rdg+10dgt	
	200MΩ	1MΩ	±10% of rdg+10dgt	
	Frequency	2kHz	1Hz	±1% of rdg+5dgt
		20kHz	10Hz	
		200kHz	100Hz	
2MHz		1kHz		
20MHz		10kHz		
Capacitance $V_{test}=120mV$ $f_{test}=400Hz$		2nF	1pF	
	20nF	10pF		
	200nF	100pF		
	2µF	1nF		
	20µF	10nF		
	200µF	100nF	±3% of rdg+3dgt	
Logic test	1	2.4V±0.2V	Response 20MHz	
	0	0.7V±0.2V		
Transistor h_{FE}	NPN/PNP to 1999, test conditions 10µA, 2.8V			
Continuity	Threshold 30Ω, response time <100ms, 2.5kHz beep			
Diode test	Reads forward resistance in kΩ at $I_{test}=1.5mA$			

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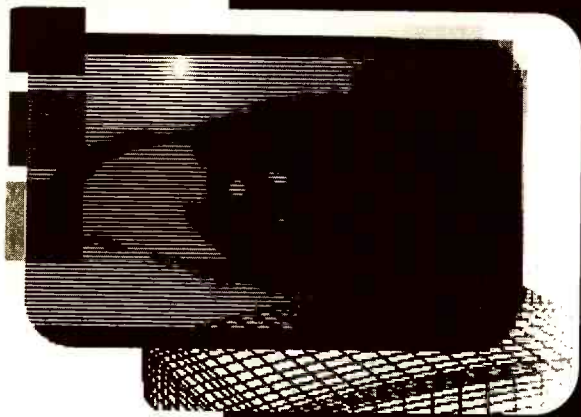
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Toshiba 2500TB

Should the chopper transistor Q802 fail, check whether R810 (330k Ω) is open-circuit. Its part no. is 24377334.

Note that the text in the manual states that the +B voltage is 120V. This is incorrect for the 2500TB, in which the +B voltage should be set at 145V, measured across C451. R851 is the set +B control. P.B.

Grundig C8400 (CUC70KT Chassis)

"Tuning fault" was the complaint with this set. Sometimes the screen would display just noise when the channel was changed. At other times the picture would be there when the same channel was selected. If the programme/channel switch was turned when the station was lost, the channel contents were 00. Fortunately I'd noticed another odd symptom with this set.

With older Grundig sets, if the mains switch is left in and the set is then plugged into the mains supply it will come on in standby. This set came straight on to programme 1 however, indicating that there was a problem with the on/off switch's standby (momentary) contact. A new on/off switch cured both faults.

Problems with the standby contact can also cause problems such as inability to change from programme

TV Fault Finding

1 and loss of sound. With some models these faults occur when the switch is leaky: the leak can be of the order to 20M Ω . P.B.

Sharp DV3751

If there's no AFC action, check R214 visually for damage. It is by the tuner, next to where the back cover's grooves grip the PCB. R214 can be damaged when the set is dropped. P.B.

Philips 3A Chassis

This set was dead with the power supply squealing. Voltage checks at the gate of THY6698 showed that this protection thyristor was firing. Various diodes etc. that feed the thyristor were next checked. This brought me to transistor Tr7499, which senses the 26V, 200V, EHT and DC protection. I then found that the 200V supply was missing at D6638 (which is fed from the LOPT), because fusible resistors R3638/9 were open-circuit.

Some of these sets differ in the way the 200V supply is protected. This one had two 27 Ω resistors in parallel (part no. 4822 052 10279). Others have different value resistors or a Wickman fuse. A common cause of the fusible devices blowing is dry-joints at the LOPT. P.B.

Ferguson TX100 Chassis

This fault could well be familiar to those who handle these sets regularly but was new to me. When the set was switched on a single click could be heard from the relay in the power supply. As a new LOPT had recently been fitted, this possibility was ruled out. I checked the HT and found that it was low at 74V. After a few minutes it had risen to 79V. A capacitor close to the relay looked somewhat distressed. It was hot to touch and obviously the culprit. The offending item was the 47 μ F, 160V HT reservoir capacitor C121. A

replacement restored the HT and normal operation of the set. M.L.

Matsui 1403

If the relay clicks but the set refuses to come out of the standby mode, check R652 (390k Ω) in the power supply. G.P.

Saisho CM250R

This Samsung clone came to me after the engineers at another repair shop had attempted to fix the sound buzz. They'd replaced every major item in the IF strip – the chip, the SAWF and the ceramic filters. They had even tried to adjust the coils, all to no avail. I checked the work and found that all the replacement parts were correct. No matter how carefully IF adjustment was tried, it was impossible to delete the sound buzz. So I replaced the tuner. That cured the fault. M.M.

Seleco 22ZA577GB

This set appeared to be dead, though its power supply was working. I found that D88 was short-circuit and the associated fusible resistor R158 open-circuit. Replacements restored normal operation. M.M.

Grundig CUC720 Chassis

There was a black band at the bottom of the screen while heads were elongated at the top. To help matters, the fault was intermittent. One thing that does help however is that you can plug the timebase (and other) subpanels into the back of the mother board to work on them. After checking several capacitors in the field timebase I replaced the 100k Ω field linearity potentiometer R2757. It was going open-circuit intermittently. M.M.

Philips 2A Chassis

The picture displayed by this set looked like a mosaic. As there's nothing digital here, I suspected and

replaced the TDA3561 colour decoder chip. Fortunately this cured the fault. I've since had the same problem with an Hitachi set that uses the same chip. **M.M.**

Sony K VX2521

Another dealer had tackled the intermittently dead symptom with this set. He'd resoldered all the joints on the chopper transformer and the regulator chip that's mounted on the heatsink. The problem now was a constant, high-pitched buzz from the right-hand speaker. A pity he hadn't checked the connections to the audio chip. Most were dry-jointed. Resoldering them cured the trouble. **M.M.**

Finlux 1000 Series

One of these sets was brought in because it was dead. Fortunately the cause was simple. The BY299 diode Du20, which is the rectifier for the 17.5V supply on the secondary side of the chopper transformer, was dry-jointed at both ends. Resoldering it brought the set back to life. **M.M.**

Philips 2A Chassis

Intermittent tripping was the complaint with this set. As checks on the HT voltage were inconclusive I replaced the optocoupler in the power supply. This cured the fault – proved by a long soak test. **M.M.**

Toshiba 2939DB

If there's intermittent loss of field sync when changing from teletext to the TV mode, replace the TA8783N chip IC501 on the main PCB. Part no. is B0383970. Toshiba recommends that the four mode settings in the service mode are checked as these can be responsible for such problems. **G.P.**

Mitsubishi CT21553STX

This set had no teletext display. When text was selected it was impossible to change channels, which indicated that the set was in the teletext mode but not producing a display. A check on the 5V supply to the text PCB showed that the voltage was slightly low at about 4.5V. This was low enough to stop the text being shown however. The faulty component was C923 (100µF, 16V) in the 5V regulator circuit. **M.O.**

Mitsubishi CT2125TX

This receiver wouldn't remember any of the analogue levels set, or the last channel and standby state

before switching off. Channels previously stored were OK. With this symptom it pays to try tuning in a new channel. When this was done the set wouldn't store the channel. Voltage checks showed that the -30V supply was low at -25V. The cause of the fault was C962 (100µF, 50V) in the power supply. **M.O.**

Akura CX35

Along with "it's my round!" the phrase "sorry, we don't do these" is alien to Pete's vocabulary. Hence we found a very tired looking Akura set "that only needs a mains switch" on the bench. The power supply was working, but even when unloaded produced only 60V. Capacitors on the primary side of the circuit often cause this problem, but not this time.

With a dummy load connected the voltage remained stable and could be adjusted up to about 80V. After a lot of checks I eventually found that R840 (47kΩ) in the comparator stage was open-circuit. Its replacement, plus a new mains switch, restored normal operation.

It's worth noting that with this and other digital chassis a set will appear to be dead unless the power supply is working at full voltage. **G.D.**

Philips CP90 Chassis

We've had two remote-control sets with the same fault symptom – the set appeared to be totally dead but the 95V HT supply was present. The 5V supply was missing however, as the standby thyristor was switched off. The cause of the trouble was in both cases lack of line drive, in one set because the reservoir capacitor (C2691, 330µF) in the 19V supply had dried out and in the other set because the TDA2579 timebase generator chip in the IF can was faulty.

It's easy to be fooled into thinking that the cause of this trouble is a fault in the power supply or microcontroller circuit. A quick test is to shunt a diode across the standby thyristor Thy6726 – the display should work and show an error code. **G.D.**

Nikkai TLG1433

"It's the switch." Well no, it wasn't! The set would start up only after several minutes, and when it did it produced an oversized picture. Replacing C909 (47µF, 25V) with a high-temperature type brought the HT back to the correct level, but the set took even longer to come on. I discovered that the relay wasn't getting enough voltage to energise

it. C916 (220µF, 35V) in the 18V supply was leaky. **G.D.**

Ferguson TX90 Chassis

This was a 20in. set with remote control. After routine repairs to cracked joints the set refused to respond to either its front controls or the remote control unit, though this was working. In addition the sound was muted, but came up briefly when the set was turned off. We were led to the cause of the trouble when we found incorrect voltages in the TR910 area of the auxiliary PCB: the momentary contacts in the mains switch were stuck closed. A new switch restored normality. **G.C.**

Bush 1557NTX

This Nicam/teletext portable had no picture or sound and its power supply was whistling strongly. The 2SD1554 line output transistor was dead short. Fortunately we remembered to fit a 40W buffer load lamp at its collector before testing the new one. The 112V HT supply rose to 270V! There are two small electrolytics in the discrete component chopper circuit: C909 (47µF, 25V) was the cause of the excess voltage even though it measured OK.

With the HT correct and the lamp removed there was still no picture or sound. When the setting of the first anode control was advanced a blank raster appeared. The set has two 12V regulators, an IC at the front and a zener diode at the back. The chip was OK, but the zener diode was short-circuit and its feed resistor open-circuit. This stabiliser runs the receiver. As it's fed from the line output transformer it needs only a small control range. The source impedance is high, at 20Ω, so the feed resistor is only 10Ω (2W). Two 18Ω, 1W resistors in parallel make a suitable replacement – with a 1.3W, 12V zener diode.

To restore standby operation we had to replace the 2SC2335 HT switch transistor Q907. Why this 500V device had failed wasn't clear. A BUT11A or BU406 is a suitable replacement. **G.C.**

Matsui 1436XA

Field collapse was the problem with this portable. The voltages were all about right, but we found that there was no drive from IC301 to the field output chip IC701. As replacing IC301 made no difference I had to take a closer look. While checking voltages I noticed a poor

connection to C706. When this was resoldered the field drive returned. Perlick! T.L.

GoldStar CIT9902F

This set was rather lifeless. It came on but there was no picture (EHT) or sound. The line output stage wasn't shorted, but there was no 110V HT feed to it. Tracing this back brought me to a dry-joint at diode D803S. Resoldering it restored plenty of life. T.L.

Matsui 1436XA

The trouble with this set was a field twitch. It was caused by a dodgy preset, VR702, in the field timebase circuit. Replacing it cured the problem. T.L.

Philips 14GR1227

The power supply output was being dragged down by a fault in the line output stage. We found that the line output transformer was the cause of the trouble. These transformers seem to be just a bit unreliable. Fortunately a quick reading to chassis will prove the diagnosis. A new transformer restored normal operation. T.L.

Matsui 14R1

There was no sound or picture and it was soon obvious that a fault in the line output stage was dragging down the output from the power supply. As a short-circuit reading was obtained at the line output transformer I suspected this item, but the short remained when the transformer was isolated. Without a circuit diagram I had to start checking around and eventually found that D301 was short-circuit. A replacement put matters right. T.L.

Ferguson TX100 Chassis

This set was dead. The mains rectifier was producing a 330V supply but there were no outputs from the chopper circuit. HT was present at the collector of the chopper transistor TR6, and there were voltages at the pins of IC7 – but they were not as shown on the circuit diagram. A check at the anode of SCR1, the thyristor in the start-up circuit, produced a reading of only 49V instead of 115V. Replacing IC7 and SCR1 made no difference. The cause of the trouble was eventually traced to C117 (100 μ F) which couples the drive to the base of TR6. O.G.

Tatung 161 Chassis

This set was dead with the supply to the line output stage high at 400V.

The ZTX651 12V regulator transistor Q501 and the associated 12V zener diode D503 were the cause of the trouble.

To improve AV operation, reduce the value of R117 to 1.2k Ω and C111 to 0.22 μ F. O.G.

Fidelity CTM2000R

This set produced a good picture at switch on, but after a few minutes there was loss of line sync. Replacing the TDA8180 sync/timebase generator chip appeared to improve matters, but the real culprit turned out to be the 33 μ F, 250V HT reservoir capacitor C100 – even though the HT was correct at 119V. O.G.

Matsui 2080/Saisho CT149TX

This set suffered from various intermittent fault symptoms. There might be a blank raster, a rolling picture, loud audio or sometimes the set would power up with scrambled text information across the picture. These symptoms would appear at switch on. If the set came on all right in the morning, it would stay all right throughout the rest of the day.

A search for dry-joints and numerous voltage checks failed to reveal anything amiss. Eventually the cause of the trouble turned out to be capacitor C426 (1 μ F, 160V) which smooths the supply to the line driver transformer. Hardly the most obvious place to look for the cause of the fault! Occasionally careful observation of the symptoms fails to help find the cure. C.N.

Panasonic Z1 Chassis

No colour was the complaint with this set. It transpired that the chroma delay line DL601 was faulty. A replacement brought up nice colourful pictures. C.N.

Sharp DV1600

This set produced a blank white raster about ten by three inches in size. The cause of the fault was the line output transformer. Its cost is quite high, so check with the customer before ordering. C.N.

Sharp CV2133H

The customer said that this nasty fault had been present from new. The set would intermittently produce a blank white raster with no audio. If the IF PCB was flexed when the fault was present it would sometimes disappear. But you couldn't make the fault appear in

this way. Board resoldering made no difference.

The next step I tried was to squeeze each coil gently. This revealed the culprit, which was T207. It had an intermittent internal earth short: squeezing it gently made the fault come and go. When I examined the coil with a magnifying glass I could see a badly wound part of the coil resting against the outer screening can. C.N.

Sanyo CTP6133

This set would change channels on its own. In the workshop it ran perfectly for about an hour before misbehaving, but I noticed that a slight hum bar moved vertically down the the screen. This led me to the culprit, the mains rectifier's reservoir capacitor. C.N.

Nikkai Baby 10

At last a fault other than the 12V regulator! The set would shut down intermittently. I found that the line output transistor's emitter leg was dry-jointed. C.N.

ITT TX2613 (Compact 80/R DST Chassis)

Fine lines that ran across the picture from left to right were the main problem with this receiver. We also noticed that the contrast was poor. These symptoms all disappeared when teletext was selected. A new TDA3561 colour decoder chip cured the fault. M.Dr.

Panasonic TX25T2 (Alpha 2 Chassis)

If the problem is field collapse, check at pins 3 and 7 of the AN5521 field output chip, where the voltage should be about 25V. If pin 3 is at zero, R848 will probably be open-circuit. It's a small component that looks like a wirewound resistor but is actually an 800mA ceramic fuse. It is also hard to find. Look behind the two large capacitors at the back of the field output chip's heatsink. M.Dr.

Samsung CI338

Intermittent sound is quite a common fault with these sets. It's caused by dry-joints at pins 2, 3, 4 and 5 of the LA7520 IF chip IC101. To avoid further problems it's best to resolder all thirty pins as the chip gets quite hot. M.Dr.

Grundig CUC41 Chassis

Very poor contrast was the complaint with this set. We suspected that the beam limiter was in operation, but disconnecting

transistor T2526 made no difference. The DC contrast control voltage at pin 11 of the video module varied, but the picture didn't.

Luckily we had an identical set in for repair. So we swapped over the video module. Again no difference! When we scoped the video input at pin 5 of the module we found that it was of very low amplitude indeed. Tracing back to the combined tuner/IF block brought us to the BC338 video buffer transistor T2251, one of whose leadouts has a ferrite bead. The securing glue had covered all three legs. Removing the glue, which had become conductive, cured the fault. **M.Dr.**

Toshiba 3327DB

It simply said "dead" on the job card, but when I checked the set on the bench I found that it wouldn't come out of standby. The 12V supply was missing. Further tests revealed that fuse link ZP82 was open-circuit because the Surround sound output chip ICS01 had failed. Diodes DS01 and DS02 were also short-circuit. After replacing all four components I

switched on. Bang went the new chip, taking the other new components with it.

Before replacing them again I decided to carry out some further checks and eventually discovered that the HT was at 188V instead of 125V. It appeared across the LED in the feedback optocoupler Q826, which was clearly open-circuit. When Q826 had been replaced the HT was low at 49V – the over-current/voltage switch Q828 was short-circuit. A replacement rewarded us with the correct HT voltage, and after replacing the original four components the set worked normally.

When the happy customer came to collect his set he asked "why couldn't the other people do that?" **R.F.**

Panasonic TX24A1 (Alpha 2W Chassis)

At switch on this set would power up fully for just over a second then shut down, though the LED indicator still displayed the programme number. The power supply incorporates an optocoupler which is used for standby

switching. When the primary side of this was shorted out the set came to life, with no signs of overloading, funny smells etc.

We decided to start by checking the various supplies to control board M. The 12V supply at pin 4 of plug M2 was absent. The cause was simply an open-circuit coil, L303 (10 μ H). A replacement restored normal operation. **R.F.**

Ferguson TX90 Chassis

This set produced a blank raster with no sound apart from a slight vision buzz when the local relay was tuned in. After eliminating the tuner our suspicions fell on the multipurpose TDA4500 chip, which amongst other things incorporates the IF strip. A replacement put matters right. **K.E.**

Hitachi CPT1476 (NP84CQ4 Chassis)

The job ticket attached to this ageing portable said "field collapse". Careful examination of the field output chip's terminations revealed a number of suspect looking joints. Resoldering them restored the field scan. **K.E.**

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Servicing the

Amstrad TVR2/3 TV/video units

These combined TV/VCR units sold in large numbers and have proved to be popular with their owners. Servicing is fairly predictable, as Chris Watton reports

These are combined TV/VCR units. The TVR2 is a 14in. version with a single tuner unit, which means that it can record only the channel being viewed. This is something that hasn't changed over the years, being a limitation with the current small-screen models on the market. The TVR3 is a 20in. version which has something closer to a separate VCR built into the same cabinet as the TV section.

The video side is based on the Amstrad VCR4600 which, though noisy and not very highly specified, was very popular in its day. Apart from a few common faults it's quite reliable and easy to repair.

The two sections, video and TV, cannot work without each other as power for the TV section's standby circuit comes from the VCR. The remote control information also comes via this route.

Both versions have remote control, a programmable timer and a two-speed deck. The picture doesn't have very high definition in the LP mode, especially when viewed on the larger-screen model. The budget-quality picture search and still frame modes are not really of much use. Despite all this these machines are still held in high regard by their owners. In particular the small-screen version commands a high price in the second-hand market.

A Word of Warning

Before I begin on the video unit I should point out that a certain amount of dismantling is required when servicing these machines. It's very annoying when you have to take them apart again. The answer to this is not to take any short cuts you might be tempted to take to shorten the time required to complete a repair. In my experience, if any machine will make you pay for such rashness it's one that is hard to take to bits again.

To this end I recommend the use of genuine rather than pattern parts. Apart from the remote control unit and the video heads they cost very little extra. Spares are available from CPC of Preston, Lancashire (01772 654 455). If you don't have an account you can order by credit card.

Access

Removing the back gives access to the video unit. After unplugging the multiway connectors and mains plug, removing the two screws at either side of the cabinet and the one that goes into the TV chassis, then taking off the aluminium screen, the video unit can be slid forwards out of the front of the unit.

When the video unit is placed at the back of the set the leads are just long enough to enable the deck to be worked on whilst connected.

Make sure that the metal cover is on when you replace the deck. Otherwise there will be a lot of interference on the playback picture.

VCR Deck Servicing

The most common fault is probably tape creasing at the bottom edge, as the tape re-enters the cassette. There's a modification to cure this. The kit consists of a pinch roller and a spring and clutch gear. These items are easy to fit and do cure the trouble, which is caused by the take-up drive being too strong. As a result it tries to pull the tape from the capstan faster than the tape is being supplied.

The new type pinch roller should be fitted even if the old one looks OK. You will often find that the screw in the pinch roller is very tight. Support the base of the arm, and use the correct screwdriver – otherwise the arm may be damaged. This will also cause tape damage, or at least poor sound and control pulse pick-up.

Before doing this job, clean and lubricate the deck. This should include removing the capstan and re-oiling its bushes. Fit new belts, and ensure that the face of the audio/control head is clean. I find that the audio/control head has often been adjusted but is dirty. It therefore needs to be cleaned and reset. I think this is caused by an engineer trying to service a machine without dismantling it.

Intermittent poor audio and loss of control, where the customer complains about rhythmic loss of tracking, is frequently caused by a worn audio/control head.

The third thing that frequently causes problems on the top of the deck is the take-up/counter opto device

beneath the take-up reel disc. It can be either dirty or faulty. The result will be intermittent stopping in any mode. When checking this you may notice that the tape counter is erratic. It's also common to find that the underside of the reel disc is very dirty. This also causes poor rotation strobe action. Make sure that it's clean.

The main source of trouble on the underside of the deck is the mode switch. It can cause various deck faults, with eventual switching to standby when any tape function is attempted. It should be replaced rather than cleaned.

When replacing the switch, first make sure that the deck is in the stop position. If not, turn the loading motor by hand until the two larger holes in the loading gears are in line. Put something in the holes, e.g. a screw, to prevent the loading arms getting out of step. The entire loading block can then be removed, and as long as the lever doesn't get bent the new switch will not require any alignment when fitted.

The switch can be checked using a scope and component tester. Any raggedness between modes will be seen.

Once all this has been attended to the deck should work reliably. Test it for compatibility and set-up before putting it back in the cabinet. Retest it after putting it back.

VCR Faults - Electrical

With small-screen models the electrical section of the video unit tends to suffer from dry-joints in the servo section. This often results in the motors taking off, or one motor stopping.

The cause of various mode faults, also intermittent colour, has been traced to the rectifiers in the power supply. Loss of colour is usually caused by failure of the 1812422 hybrid chip HIC1.

If the machine is either stopping or won't start up, check the deck sensors. This can be done at the inputs to IC400. They are as follows:

Pin	Function
6	Record safety
7	Load A. See below
8	Load B
9	Load C
18	Start sensor
19	End sensor
21	Reel pulse. See below
26	Front load B. See below
27	Front load A
28	Front load C
29	Dew sensor

Loading switch logic levels are:

Stop mode A = 0, B = 0, C = 1
 Play mode A = 0, B = 1, C = 0

The reel pulses at pin 21 are amplified and squared in hybrid chip HIC300.

Various other useful test points are:

TP5	FM envelope
TP9	Switching point
TP13	RF switching
TP14	Control pulses
The audio socket for audio out	

The switching point is adjusted by R301, the control pulses by R300. Both these presets are on the main PCB.

Back Tension

The back tension adjustment is worth mentioning. To carry this out, load a transparent test cassette or similar then select play. Two adjustments can be made: the tension on the spring and the static position of the tension arm.

When the arm is in the play position with no tape, its tip should be parallel with the line marked on the left edge of the deck (approximately 5mm). The screw at the other end of the band enables its position to be altered. This can be a tedious adjustment, as the screw has a fairly coarse thread and a small movement causes quite a large variation in position. The arm also swivels about its pin, which doesn't help.

Once the tension arm position has been set the spring tension adjustment, just below the arm, can be carried out. The tension can be altered by loosening the locking screw and sliding the spring retainer back and forth as required. The tension should be 24g/cm.

Part Numbers

The following are some frequently required numbers for genuine parts:

Aerial socket	152607
A/C head	150751
Handset	152525
Mod kit	150768/A
Mode switch	151498
Pinch roller	150768
Tension arm	151276
Head drum	151633

Power Supply Faults

The TV section is reasonably reliable. With both models the power supply, which is virtually the same (see Fig. 1), can cause picture width jittering when the HT voltage fluctuates rapidly. The culprit is the STK7348 chopper chip IC301.

If the TV section is dead but the VCR clock is OK, check the 10Ω, 3W surge limiter resistor R301. If you find that it's open-circuit, check for shorted bridge rectifier diodes (D302-5). If these are OK, replace R301 and try again. In most cases this will work - the resistor usually fails of its own accord. It's just possible that IC301 has shorted internally.

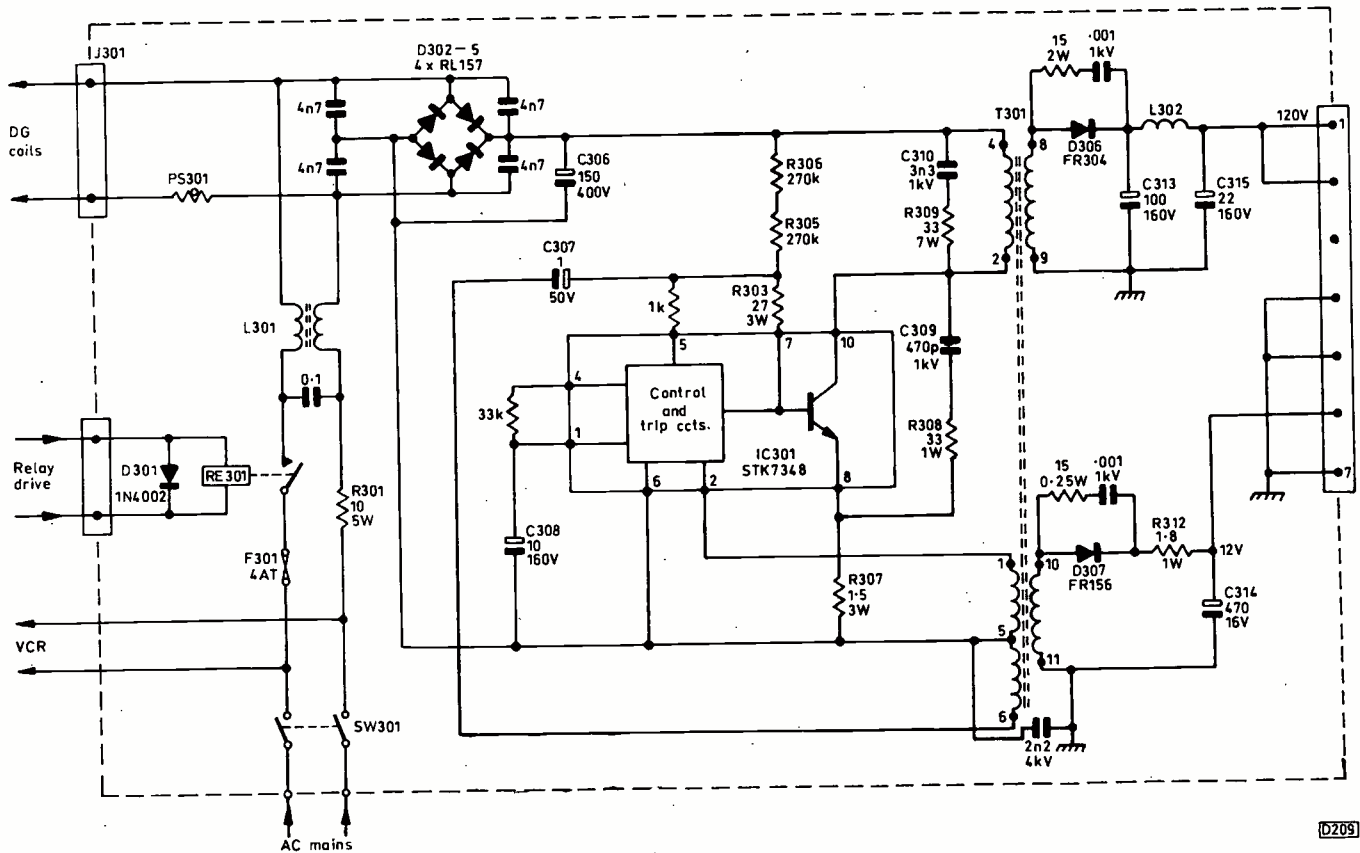
If the TV section won't come on but the relay clicks when the operate button is pressed, check C1507 which should be 1μF, 63V. In some models an 0.47μF capacitor may be found in this position. Fit a 1μF, 63V replacement. Failure of this capacitor, whatever its value, is the most common fault with these models. The symptom may be a dead set or one that's slow to start.

The two 270kΩ resistors R305 and R306 can also be responsible for poor starting.

If the relay doesn't click, check the 24V and 5V supplies in the VCR section. The relay is driven by the 14DN379/MN14381 chip. If this is suspect, check its 500kHz oscillator first.

Another component that can cause trouble is the 3,300pF, 1kV ceramic disc capacitor C310. It usually makes the power supply whine, and you will often find that there is a black line down its case.

If the TV section is dead and you want to run it



D209

without the video section in place you can short out the relay contacts. The TV section will then be powered all the time. There will be no tuning or signals and no remote control however.

Tuning Problems

We'll now move to the signals section. If you are unable to store any channels it's likely that the MN1220 memory chip is faulty. If there is no tuning, with no on-screen graphics, the 14DN379 chip is usually to blame. When dealing with the 14in. version don't rule out, as with most portable equipment, the possibility of cracked print. The voltages around the memory chip IC3 should be as follows: pin 1 0V; pin 2 0V; pin 4 0V; pin 5 0V; pin 6 0V; pin 7 5V; pin 8 5V; pin 9 -26V; pin 10 -5V; pin 11 0V; pin 13 0V; pin 14 0V; pin 16 0V. If there's no memory, check that the -26V supply is present at pin 9 before replacing the chip. This voltage comes from the VCR section, at pin 6 of connector CN2.

The Line Output Stage

The 200V supply for the RGB output stages is obtained from a rectifier (D14, type FR156) which is fed from pin 3 of the line output transformer. The reservoir capacitor is C82 (4.7 μ F, 250V). When this capacitor fails the screen will be brighter at one side than the other and the picture will be very poor.

Pin 9 of the LOPT feeds rectifier D12 (FR156) via the 2-2 Ω , 1W resistor R80. The reservoir capacitor here is C81 (100 μ F, 25V). This supply feeds the 78M12 12V regulator IC9, whose output is used by the tuner, the IF strip, the audio output stage and the video/audio switching chip. (The tuning and control section of the set is supplied with 5V from the VCR unit.)

The other supply derived from the LOPT is 24V for the field output chip. This comes from pin 6, via R81

(2-2 Ω , 1W) and D13 (FR156) with C80 (330 μ F, 35V) as the reservoir capacitor. Replace this capacitor in the event of field collapse.

The FR156 diodes can all be replaced with type BYD33J.

Still in this area, C79 (1 μ F, 250V) at the earthy end of the EHT section of the transformer can cause a ragged picture. The HT smoothing capacitor C315 (22 μ F, 160V) in the power supply can also be responsible for this symptom.

The 2SD1398 line output transistor Q12 can be replaced with type BU508D. The usual causes of its failure are dry-joints at the driver transformer T4 or cracked print around the LOPT.

Grey-scale Adjustment

The focus and first anode controls are incorporated in the LOPT. To set up the first anode voltage, the set-white switch should be in the service position, the tube drive presets at mid travel, the background presets at one third clockwise from fully anticlockwise, the preset brightness control at mid travel and the customer settings at minimum. Turn the first anode control to minimum, the set-white switch to on then increase the control's setting until a line is visible. Peak the two adjustable colour drives to obtain a white or neutral line, then return the set-white switch to normal and adjust the brightness and contrast for a correct display. If the highlights are coloured, adjust the drive presets.

Miscellaneous Faults

The μ PC1420CA chip IC10 contains the colour decoder and timebase generator circuits. It can obviously be responsible for no colour or loss of one colour. If there's no sync, check R102 which is connected to pin 37 of IC10. Its value should be either 120k Ω or 150k Ω . ■

Fig. 1: The chopper power supply circuit used in the TV section of the unit.

Satellite Notebook

Reports from **Hugh Cocks** and **John Coombes**

Pace SS9200 – Astra 1D Reception

Be careful when you fit an Astra 1D LNB (9.75GHz local oscillator frequency) to a Pace SS9200 receiver. Although the graphics show that tuning takes place at the higher frequencies used by Astra 1D, the tuner may not be very keen on its new tuning range.

The later Sharp tuner is worse in this respect than the earlier Hitachi one. With every Sharp tuner I've come across, the gain drops dramatically above about 1,860MHz, i.e. the Disney channel can be good at around 1,850MHz but CNN is very sparkly. Adding an IF line amplifier doesn't improve the situation at all.

If the customer requires CNN but not ARTE, which is right at the bottom of the band, the LNB's local oscillator can be adjusted (turn the oscillator screw in a fraction) to lower the IF slightly.

The Hitachi tuner may physically cease to tune at around the CMTV/Disney IF, though the tuning numbers carry on up the band – to confuse the situation, some tuners will reach CNN. To make the tuner reach CNN, remove its cover and set the IF display at 11,877MHz. Then open the turns of L401 (below IC401) gently. The tuner will go up to CNN but no farther. **H.C.**

Alignment

We have quite a large Dutch clientele. They avidly watch RTL4, RTL5, Veronica and SBS6 via Astra 1D. A problem is that the two channels with horizontal polarisation, Veronica and SBS6, are much weaker than their vertically polarised companions. Reception of Veronica is fractionally worse than SBS6.

For good reception of the horizontal channels a dish with a diameter of at least 1m is required, with the LNB's skew exact – otherwise cross-polar interference from the vertical channels rapidly degrades the horizontal ones. I use the MSS138 for new Dutch

installations. Its features include wide/narrow bandwidth selection. Narrow helps to clean up the weaker channels on bad days – we are right on the edge of the footprint of the 1D horizontals in southern Portugal, and if there is any satellite beam pointing wobble, by even a fraction of a degree, it's visible with these marginal signals.

On occasions Dutch clients bring with them a receiver and an 80-85cm dish. I'm happy to install the equipment, but have to tell them about the picture limitations with the weaker channels, RTL4/5 being fine. The results can be variable. Where possible I take the top off the receiver – usually an unknown 'special' from the Far East – and locate the AFC preset. If a Luxcrypt encoded signal isn't centred exactly, awful streaking/lines occur as the video clamp in the decoder gets confused by heavy black sparklies. It copes all right with even black and white sparklies!

The tuner can often be tweaked to achieve improved reception. One receiver I came across recently had what appeared to be an AGC preset next to the 479.5MHz IF demodulator coil (complete with ferrite core). Slight IF drive reduction and demodulator coil adjustment produced a significant reduction in sparklies. If you overdo the tweaking however the result will be streaking with strong signals. It's fairly easy to achieve a compromise setting, and the whole operation takes only a few minutes. The customer appreciates the effort, often showing off the results to disbelieving friends who watch dreadful quality pictures with a similar sized dish. **H.C.**

Pace MSS138 Contrast Difficulties

One of these receivers (the non-IRD MSS100) was being used for reception of Eutelsat (13°E). It could be connected to the TV set only via the UHF modulator. Now some of the Eutelsat channels are much 'brighter' than the others, and this was causing problems via the

modulator. Scenes with peak white produced excess drive, accompanied by sound buzz. Reception of the 'dimmer' channels was OK. Tests on the 'brighter' channels with a scart lead connection also produced good results. The modulator was obviously being overdriven, and unfortunately the receiver has no contrast presettings.

A check with the manual showed that R214/5 attenuate the video input to the modulator. Slightly more attenuation seemed to be required. These components are identical in the MSS100.

R216 (1kΩ) provides a link from the TV scart socket area via a small filter circuit that consists of L202 and C213/4. These come before R214/5, which are both 470Ω. In the set I had L202 consisted on a board link, adjacent to the intercarrier sound coil L200. So I inserted an 820Ω resistor in the L202 position. This gave perfect results with the bright channels and the darker ones were not too dim.

The effect doesn't seem to be as bad with the MSS100, and seems to vary from set to set with the MSS138. It becomes critical only with a non-scart Eutelsat installation.

It's a pity that Eutelsat can't standardise its transmission format like Astra. What would be useful with the MSS series would be a low/high contrast setting for each channel. The various Eutelsat audio settings are nowadays catered for – once again standardisation is lacking. The ability to even out the Eutelsat video levels is really an essential feature. **H.C.**

Pace PRD800

If the problem is still no results after fitting the usual repair kit, check whether R2 (100kΩ, 2W) is open-circuit. If this resistor is OK, check the BYV960D diodes D5 and D6 in the snubber network for leakage. If they are faulty it may be necessary to replace the BUT11A chopper transistor even though a new one has already been fitted. **J.C.**

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CT2750	1480D	16.99	AN720	2.99	M54546L	4.25	STR3125	6.99	TD41558	7.00
CT2750	1480E	16.99	AN721	2.99	M54547L	4.50	STR4211	5.50	TD41559	7.00
CT2750	1480F	16.99	AN722	2.99	M54548L	4.50	STR5015	4.50	TD41560	7.00
CT2750	1480G	16.99	AN723	2.99	M54549L	4.50	STR6020	4.50	TD42003	1.00
CT2750	1480H	16.99	AN724	2.99	M54550L	4.50	STR6020	4.50	TD42005	1.30
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CT2750	1480L	16.99	AN728	2.99	M54554L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480M	16.99	AN729	2.99	M54555L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480N	16.99	AN730	2.99	M54556L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480O	16.99	AN731	2.99	M54557L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480P	16.99	AN732	2.99	M54558L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480S	16.99	AN735	2.99	M54561L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480W	16.99	AN739	2.99	M54565L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480AE	16.99	AN747	2.99	M54573L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480BI	16.99	AN777	2.99	M54603L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480BJ	16.99	AN778	2.99	M54604L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480BK	16.99	AN779	2.99	M54605L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480BX	16.99	AN792	2.99	M54618L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480BY	16.99	AN793	2.99	M54619L	4.50	STR6020	4.50	TD42035	1.30
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CT2750	1480CC	16.99	AN797	2.99	M54623L	4.50	STR6020	4.50	TD42035	1.30
CT2750	1480CD	16.99	AN798	2.99	M54624L	4.50	STR6020	4.50	TD42035	1.30
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Inside the Pace MSS1000 Satellite Receiver

In this concluding instalment J. LeJeune describes the complex sound selection and processing arrangements in the receiver, including the Dolby system. The MSS1000 can be used as a separate Dolby Pro-Logic Surround sound decoder

The audio processing circuitry incorporated in the MSS1000 satellite receiver is quite complex. In particular the switching and routing systems require some explanation.

Audio from an external source, including the TV receiver, can be routed through the MSS1000's Dolby Pro-Logic processors to add a touch of realism. Broadcasts with Dolby Pro-Logic Surround sound are becoming more common on all the terrestrial TV channels, while some hi-fi video recordings now have this feature.

Three- and Four-channel Sound

Dolby Surround sound is recorded using ordinary stereo sound tracks, the two being labelled 'left total' and 'right total' for Dolby purposes. There are four possible sound sources, left, centre, right and surround. The first three are 'up-front', the surround being at the rear.

When a monophonic audio signal is passed through a two-channel stereo system it will produce a centre image, giving the impression that there is a single speaker placed between the two stereo ones. The exact effect depends largely on the position of the listener. Deviation from a line that's central between the speakers will degrade the sound – just as it will degrade the effect with stereo signals. To overcome this problem a centre speaker can be added to the system. The ideal situation is to have a third, independent channel to feed this speaker, as this will reproduce the correct phase relationships between the signals more accurately. An economy installation can however make use of the summed left and right channel signals to drive a centre speaker.

A three-channel system works fine, but the sound is still all up-front. To obtain more realistic conditions, the sound should come from all round. In fact it should surround one as it does in normal life. A fourth channel to provide the surround effect is easy to arrange: the left and right audio signals are simply phase-shifted and matrixed to provide the required signal. This single channel is used to drive both Surround speakers (left and right). A Pro-Logic processor will add to the realism, but even without this additional enhancement the surround effects are often startling.

The MSS1000 as a Dolby Decoder

The MSS1000 incorporates this audio processing for stereo sound inputs from satellite TV and also Nicam-equipped terrestrial TV sets and VCRs. Since the Dolby Surround sound system makes use of existing two-channel stereo sources, it can be enjoyed simply by adding a 'decoder', a four-channel power amplifier and four speakers. No modifications to existing stereo TV or VCR equipment are required. With terrestrial stereo TV sets and VCRs, the MSS1000 functions as an add-on decoder to great effect.

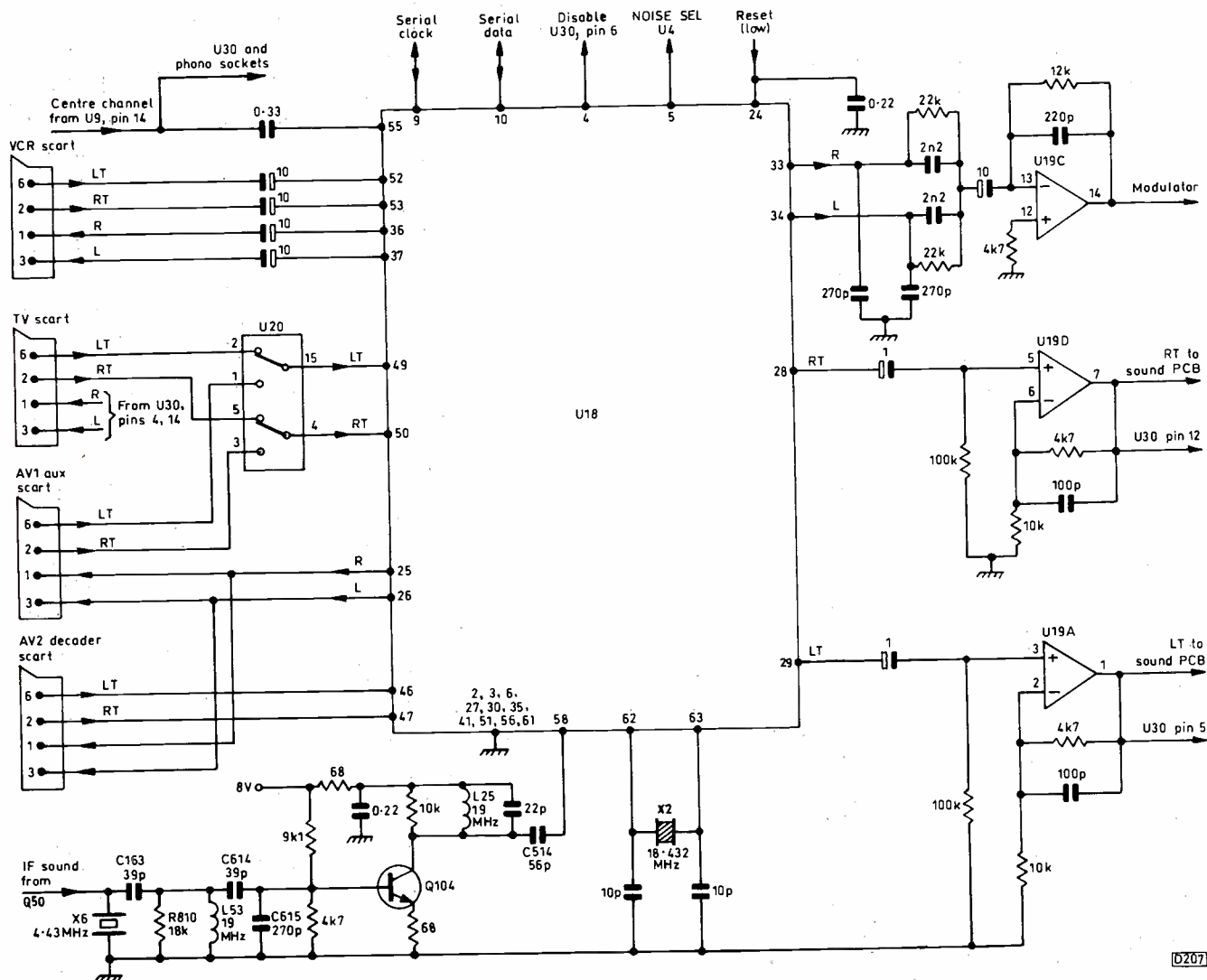
The MSS1000 has four audio power amplifiers that can drive four speakers, one each for the left and right channels and two for Surround sound. The centre channel signal produced by the MSS1000 is passed to the associated TV set, since this is normally in the centre position. It can be fed to the TV set's audio system directly, via the scart connection, or at RF via the UHF modulator. The exception to this is speaker configuration 3, in which one of the surround channels is switched to carry the centre signal.

Basic Sound Processing

Demodulation of the satellite audio subcarriers is the prime function of the MSP3400 (or MSP3410) LSI chip U18 in the MSS1000, see Fig. 15. The baseband signal from pin 13 of the tuner is filtered by C163, L53 and C614, amplified by Q104 then coupled by C514 to pin 58 of U18. The audio carriers are converted to digital form within U18, immediately before independent demodulation – singly or in their appropriate pairs. Selection of the subcarriers is supervised by the main microcontroller chip U22.

U18 also incorporates some audio input selection switching, which in the MSS1000 has been extended by the addition of U20 (see Fig. 10 last month) to cater for the additional AV scart. Between them U18 and U20 can select external audio from four sources – TV, VCR, AV1 and AV2 (decoder). U18 also converts these baseband audio inputs to digital form. U20 is controlled at pins 9 and 10 by the AV AUDIO line from pin 13 of the port expander chip U25, via Q76.

Other functions of U18 are demodulator bandwidth selection, Wegener Panda stereo expansion, de-emphasis



D207

Fig. 15: The audio processor chip U18 and its peripheral circuitry.

and frequency response shaping.

Conversion of all the audio signals to digital form within U18 simplifies response shape and level adjustments, using the minimum number of components. The signals are reconverted to analogue form for feeding to the scart sockets and the Dolby Pro-Logic Surround sound processor U4.

The audio feed to the TV scart connector can be switched from the normal stereo pair to centre channel audio (for speaker configurations 1 and 2). This is done by U30 (see Fig. 11 last month and correction note in box on right) under the control of the Speaker select line which is connected to pins 9 and 11 and comes from pin 24 of the main microcontroller U22. In speaker configuration 3 the TV scart audio is muted by U30, the control signal being applied to pin 6 (from pin 4 of U18).

U18 has its own clock, which is based on the 18.432MHz crystal X2 connected to pins 62 and 63. Serial data and clock signals from U22 are fed to pins 10 and 9 respectively to control U18. Pin 5 controls the noise-sequencing function, which is used for setting the speaker levels at the listening position. Pin 24 is connected to a reset line for power-up initialisation.

A return feed from the Dolby circuit provides U18, at pin 55, with a centre channel signal for use in speaker configurations 1, 2 and 3. In speaker configuration 4 the feed changes to mono (RT + LT). The return feed is passed

to a seven-line baseband audio bypass circuit within U18. This is used for the signals from the scart input selector as these that don't require shape or level processing. The seven lines consist of one pair for each of the three inputs from the scart input selector and the return feed from the Dolby circuit. They go to the scart output selector switch.

Pins 33 and 34 of U18 feed the summing amplifier U19C to provide a mono feed to the UHF modulator. Pins 36 and 37 provide feeds to the VCR scart connector. Pins 28 and 29 provide the RT and LT outputs, which are amplified by U19D and U19A respectively then passed to the Pro-Logic processor chip U4 via U2.

The Dolby Circuitry

The Dolby Pro-Logic Surround sound processor U4, a Yamaha YSS215, is on a separate PCB with the four output amplifiers and further switching and buffering. The RT and LT signals are fed via a ribbon cable from PL4 to PL2 on the sound PCB.

Fig. 16 shows in block diagram form the arrangements on this PCB. The 4053 switching chip U2 selects either the audio inputs or noise for the noise-sequencer operation, feeding U4's input pins. LT is fed to pin 17 and RT to pin 18. These pins are called the 'analogue' inputs. The audio inputs are also passed via low-pass filters (13kHz cut-off point) to pins 8 and 9, which are referred to as the 'digital' inputs. Networks at all four input pins set the bias for the

CORRECTION

In Fig. 11 last month pins 3 and 13 of U30 should have been shown fed directly from U4, pin 14, not U18, pin 55, which is an input. U30 provides stereo or centre outputs at pins 4 and 14. The phono socket connection is an output. See Fig. 15.

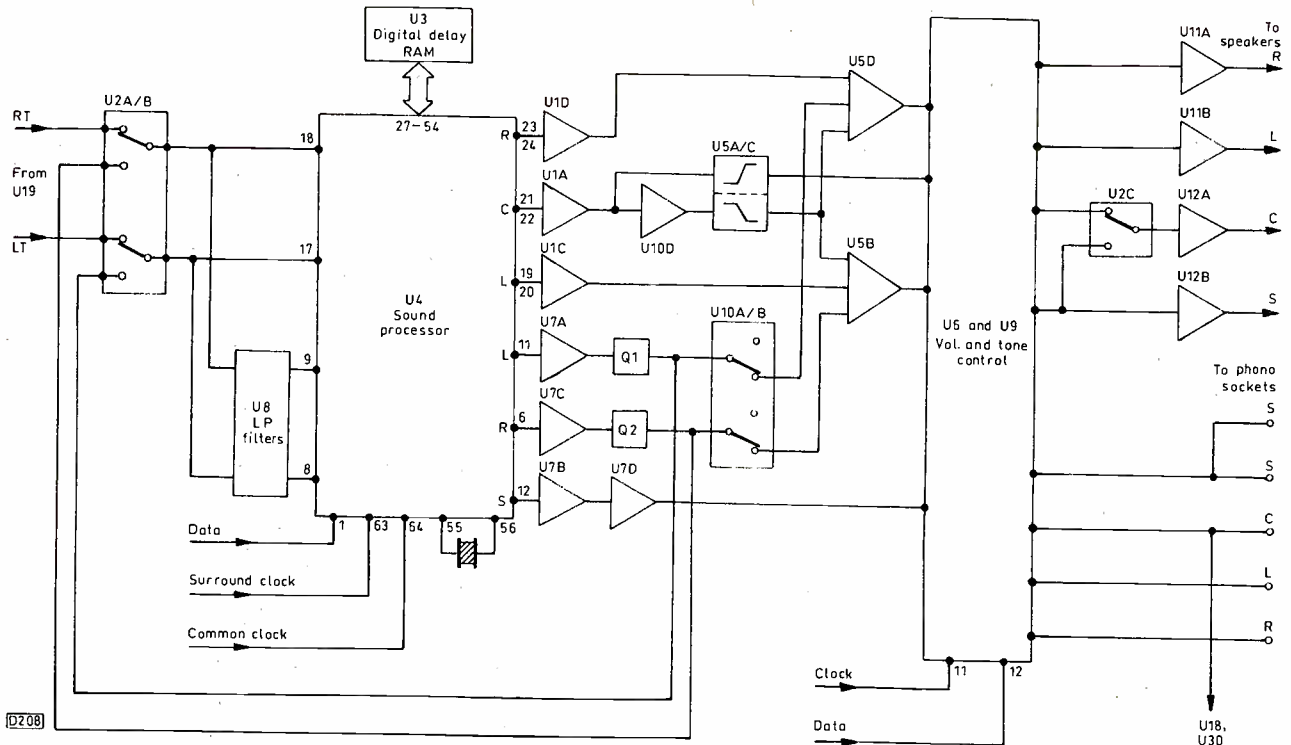


Fig. 16: Block diagram of the circuitry on the sound PCB, where the Dolby processing, audio control and output amplifiers are housed.

internal circuitry and provide protection in the event of excessive audio drive.

The LT and RT signals are decoded to the original left, centre, right and Surround signals within U4. Digital processing is used in order to generate delay (reverberation) and listening-position delay. The reverberation feature is used for special effects, the storage required being provided by the 32K 8-bit pseudo-static RAM U3 which also plays a part in the noise-sequencer mode. The analogue inputs are matrixed to separate the centre and Surround signals.

The original Dolby processing advances the phase of the Surround signal by 90°, reduces its level by 3dB then adds it to the left stereo signal; the Surround signal is also phase retarded by 90°, attenuated by 3dB and added to the right stereo signal. The Surround signal thus has a 180° phase shift with respect to the L and R stereo signals. When a conventional two-channel stereo system is used the Surround audio is heard diffused and at low level.

The centre signal is merely reduced by 3dB and added to the left and right signals. With a two-channel system it reappears at the centre – because it's a mono signal. Try switching your stereo amplifier to mono, or use it to play a mono recording. If you stand on the centre line between the two speakers you will hear sound that's centred between them. The effect will be spoilt if you move too far off centre. Provision of the centre signal reduces this problem, making the stereo sound more realistic. The centre signal is recovered by adding the left and right stereo signals together. To improve the separation between the left, centre and right signals some antiphase cross-coupling is introduced between the L and R channels.

Pro-Logic enhancement is achieved by sensing the direction of the movement of sound within the sound field and adjusting the gains of the four audio amplifiers to exaggerate it slightly. To do this two motion vectors are generated, one by sensing the left-to-right/right-to-left movement of the sound and the other by sensing the front-to-back/back-to-front movement. Differential amplifiers generate these vectors, which are used to adjust the volume

levels of the individual channels – the level is increased in the direction of movement. With very fast movement the system 'changes gear': the response time is reduced and, in addition to increasing the level in the direction of movement, the level is reduced away from it.

This electronic steering of the sound image in the sound field was employed in some early CinemaScope films as an alternative to multitrack prints that provided true stereo. A mono sound track could be used, with pilot control signals added at subsonic frequencies. This enabled the film to be shown in smaller cinemas without stereo equipment. As the audio track was a conventional optical one, no extra processing was required at the film's printing stage.

In a large cinema with suitable filtering and pilot control detection the enhanced mono sound produced by the steering signals could be mistaken for stereo sound – but only by the uninitiated!

The technique is fully exploited, without the need for pilot carriers, by the Dolby Pro-Logic process. This summary is a somewhat simplified explanation of what is a very complex process, involving psychoacoustic principles. Readers who wish to know more should refer to the Dolby Laboratories' publication *Dolby Pro-Logic Surround Decoder – Principles of Operation*, by Roger Dressler.

U4 produces a number of audio outputs. Right analogue appears at pins 23 and 24, centre analogue at pins 21 and 22 and left analogue at pins 19 and 20. The digitally processed signals are reconverted to analogue form and appear at pins 6, 11 and 12. Pin 6 has the right channel signal with reverberation and delay, pin 11 is the left channel counterpart while pin 12 has the Surround sound signal.

In the original Dolby processing the Surround sound signal is filtered to remove frequencies above 7kHz then passed through a modified Dolby B noise-reduction system before being matrixed on to the L and R signals. When it's decoded the Surround sound is expanded to its original volume level but lacks HF and is noise-reduced. This is essential because, whether you are listening in a cinema or

at home, you can be closer to the Surround speakers than the 'up-front' ones. Any noise in this channel would thus be more readily heard.

The digital delay SRAM U3 is connected to pins 27-54 of U4. This device, working with U4, can simulate listening conditions that approximate with a night club, cinema, sports stadium and finally 'cosmos', which resembles some pop recordings of the late Fifties. It also provides a simple delay to control the timing of the Surround sound in order to allow for different domestic viewing/listening distances.

Audio Controls

U4's outputs are buffered to isolate it from more robust circuit conditions. U1 and U7 provide the buffering, while U5 provides two summing amplifiers and an active bass splitter filter.

When no effects are in use, U1D buffers the analogue right audio, passing it to U5D from which it goes to the master tone and balance control systems in U6 then finally to the power amplifier U11A. The analogue left audio is likewise passed via U1C, U5B and U6 to U11B.

The centre signal is passed via U5A and C, which form a high-pass filter to remove frequencies below 100Hz. This prevents excessive LF reaching the often inadequate speakers used in a TV set. Instead, the low frequencies are passed to the left and right channels to create a centre image that has better bass reproduction. Switches U10C and D are not used as the software has no provision for this. They would serve to switch in/out the bass splitting function.

The Surround audio is buffered by U7B and D then goes to master volume and tone circuits in U9. U12A and B are the twin power amplifiers for the Surround sound. Switch

U2C is normally used to drive U12A and B in parallel. The exception is speaker configuration 3, which enables one of the Surround power amplifiers to be used for the centre sound signal. U2C is controlled by the Speaker select line.

Noise sequencing enables the viewer/listener to adjust the relative levels of the sound from his four loudspeakers to obtain the best results in his particular conditions. The noise-sequencing operation is controlled by the main micro U22, the noise source being U4. When this function is selected, U2A and U2B change over and U10A and U10B go open-circuit. Noise is switched in sequence around the four channels. If an adjustment is made to any channel the sequence is halted until the change has been completed.

When the system is in the Surround or simulated Surround effects mode, delay is applied to the Surround channel and echo from the digitally processed left and right signals is added to the main signals by summing amplifiers U5B and D.

Two identical chips, U6 and U9, are used for master tone and volume control. They are controlled by the serial data line from U22. Chip enable for these ICs is by switching on the clock signal.

Audio Outputs

The twin audio power amplifiers U11 and U12 deliver about 8W RMS per channel. Model MSS1000 can be purchased with four Wharfedale Modus Vivendi compact speakers. These give a very good account of themselves and will not overload the output amplifiers. The overall effect of the MSS1000 with the four Wharfedale speakers is quite exhilarating, and much time can be spent exploring the audio menus to see what effects can be achieved. ■

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2SA844	0.26	ZSC4517A	2.52	ANS512	1.01	BD136	0.20	BUI500G	2.31	BZK61930	0.11	LA6510	0.60	RM11C	1.71	TA7609P	2.19	TD1950	4.86	TIP32C	0.40
2SA872	0.35	ZSC4518	0.12	ANS515	1.29	BD137	0.46	BUI500H	1.08	BZK61930	0.11	LA6510	0.60	RM11C	1.71	TA7609P	2.19	TD1950	4.86	TIP32C	0.40
2SA872A	0.35	ZSC4742	4.70	ANS521	1.66	BD139	0.18	BUI500HAPH	1.92	BZK61930	0.11	LA6510	0.60	RM11C	1.71	TA7609P	2.19	TD1950	4.86	TIP32C	0.40
2SA916	1.57	ZSC536	0.30	ANS610	0.84	BD140	0.24	BUI500H	1.92	BZK61930	0.11	LA6510	0.60	RM11C	1.71	TA7609P	2.19	TD1950	4.86	TIP32C	0.40
2SA933	0.00	ZSC639	0.56	ANS716IN	0.47	BD203	0.47	BUI500H	1.92	BZK61930	0.11	LA6510	0.60	RM11C	1.71	TA7609P	2.19	TD1950	4.86	TIP32C	0.40
2SA940	0.82	ZSC710	0.12	ANS717IK	4.74</																

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Philips type 1.2 volt Back up battery	X5	\$4.50			
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Scart - Scart lead 1.5m Fully wired	X2	\$2.90			
3V29 etc. Belt kit	X5	\$4.50			
3V33/36 etc. Belt kit	X5	\$4.25			
V711E etc. Belt kit	X5	\$5.50			
Standard video sensor lamp	X10	\$2.50			
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Thom TX9/10 Remote control	each	\$7.49			
Thom TX10 Green spot LOPTX	each	\$14.95			

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A look at the Panasonic Z5 Chassis

In this first article on Panasonic's current small-screen chassis Ray Meadows describes the power supply and its operation, the microcontroller system and the signal switching arrangements

The Panasonic Z5 chassis was introduced in 1993 as a lower-cost replacement for the Z4 chassis in small-screen, monophonic sound sets. Whereas the Z4 had been designed to drive the more expensive Invar-mask FST picture tubes, the Z5 can drive cheaper iron-mask non-FST displays.

The chassis was mainly developed by Panasonic's Cardiff design team. It employs a significant feature that's new for a non-Japanese Panasonic chassis, a 'hot' line output stage. This, in conjunction with a 'cold' field deflection circuit, means that an isolation split is required in the yoke. In fact the chopper, line driver and output transformers and the scan coils all have to provide mains isolation. Thus while the line scan circuit is hot, the EHT system and the field scan circuit remain cold. Obviously the picture-tube, or at least the deflection coils, can't be replaced with a conventional non-isolated type.

Other innovations include a linear transformerless remote-control standby circuit and a simple teletext option mounted on a small subpanel. This features four-page text storage with both FLOF and TOP text.

Initially only 21in. models were equipped with CATS (Contrast Auto Tracking System), an automatic contrast control system that employs a light-dependent resistor to sense the ambient light level. This feature was subsequently added to all UK models. The rather exotic on-screen calendar/calculator/'mood light' used in the Z4 chassis was dropped however.

A single AV input is provided, via both scart and phono sockets, with no S video connector. Unlike the Z4, NTSC playback is not possible, though continental variants have

Secam and modified NTSC facilities. The scart connector does allow for external RGB signal display however, and has a tuner AV output.

The non-text TC14S1R and TC21S1R and the text TX14S1T and TX21S1T are amongst the more popular models fitted with the chassis. Some models with cosmetic variations have been added – the S2R and S2T versions. There are also cabinet colour variants. Some sets are fitted with Philips tubes (suffix /B) while others have Thomson types (suffix /BH).

Layout and Access

From the servicing point of view the most obvious improvement in the Z5 compared with the Z4 is the reduced number of PCBs. There are usually only two, the main panel E and the CRT base panel Y. When added, the text board T is a daughter board that's soldered directly into panel E. This is the first Panasonic chassis to have so few interconnecting leads!

The circuitry is arranged as follows:

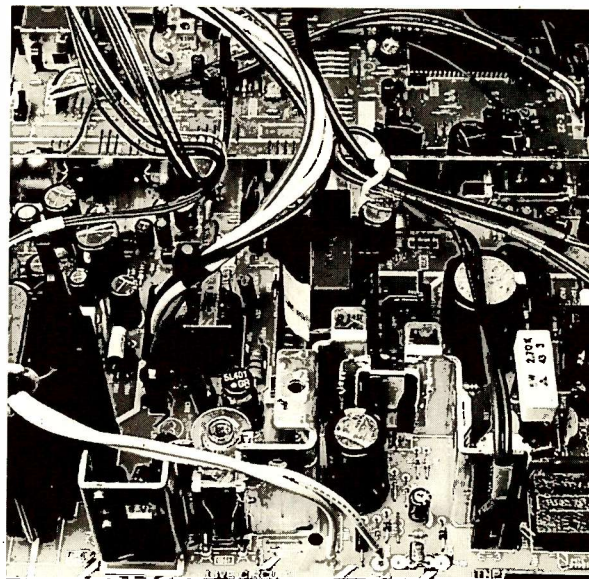
Panel E contains the power supply, the tuner, the IF, vision and sound processing stages, the sync and timebase circuitry, the audio output chip, the microcontroller chip and its associated devices and the AV connectors.

Panel Y contains the RGB output stages and CRT base.

Option panel T contains the teletext decoder and an RGB switch.

Option panel A contains a Secam L decoder (for French models only).

Fig. 1 shows the general layout. Service access is very good. Simply



remove the back cover screws and a front panel retaining screw near the AV connector. Panel E can then be gently pulled up and back. As usual with Panasonic models a 'service position' is provided: panel E can be clipped to the inside vertical side of the cabinet. The set can be operated normally in this condition, with access to both sides of the main PCB.

IC Complement

The accompanying table lists the ICs used in the chassis. The mixture of European and Japanese devices reflects the origins of different parts of the design. There are various differences with continental models, as follows. The TDA3843 in position IC201 is an additional sound IF chip for Secam L and L' sets (French models), which also have a 4053 CMOS switch (IC202). IC601 is type TDA8362 and IC602 type TDA4662 to provide multistandard operation.

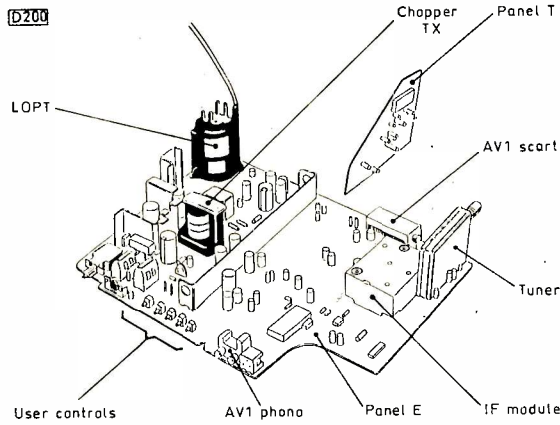


Fig. 1: Basic layout of the Panasonic Z5 chassis.

IC603, type TDA8395, is a Secam chroma delay line used in French models. The text decoder IC3502 is type CF70204NW for Central and Eastern Europe, type CF70209NW for Russian and type CF70210NW for Hebrew.

Fig. 2: Circuitry on the primary (hot) side of the power supply in the Panasonic Z5 chassis.

The Power Supply

The chopper power supply, which operates in synchronism with the line timebase, uses a new Sanken chip. Fig. 2 shows the circuitry on the primary side. A feature of the design is that when the microcontroller chip

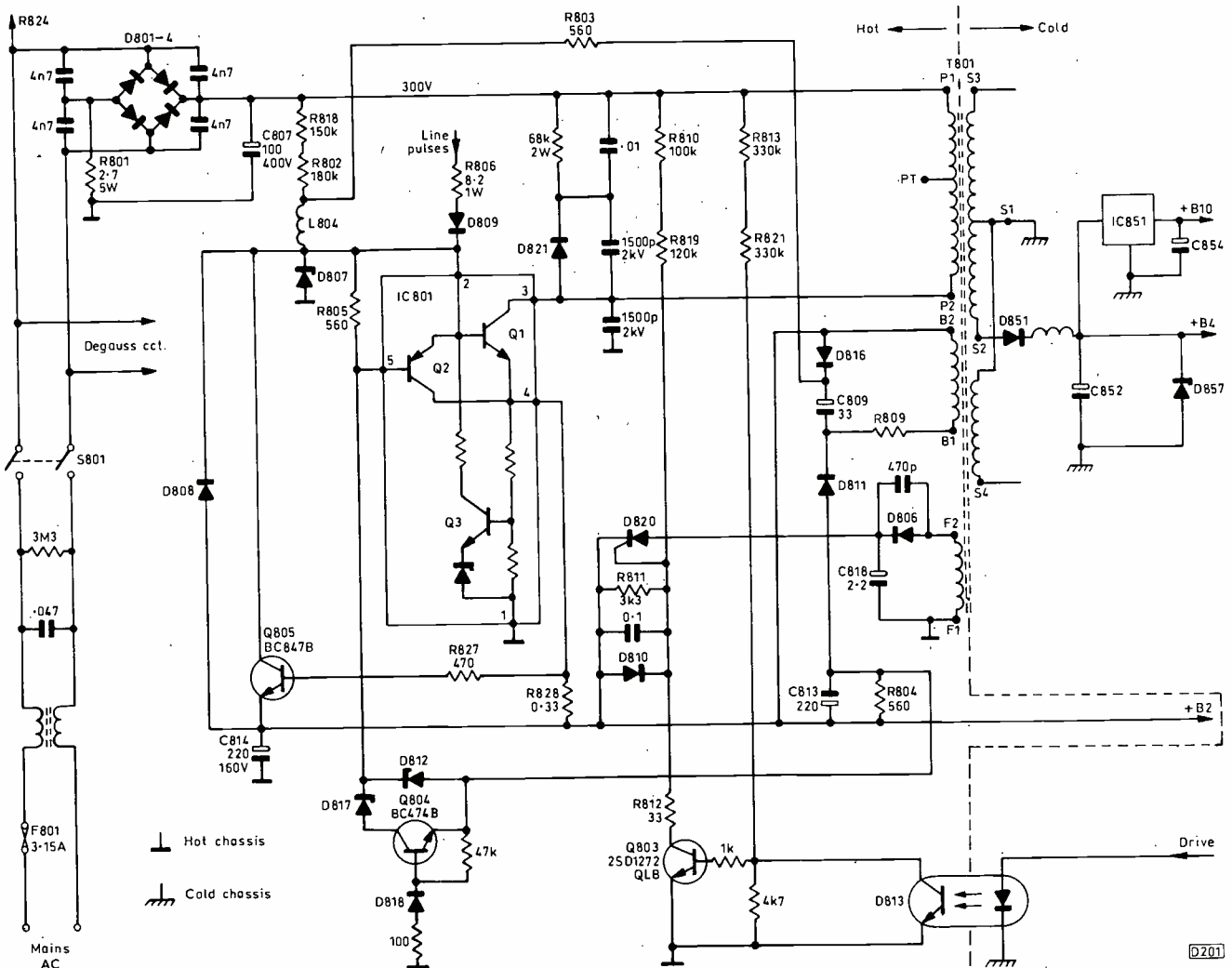
IC Types and Functions

On panel E

IC251	AN5265	Audio amplifier
IC451	TDA3653C	Field driver and-output
IC601	TDA8361	IF, colour-decoder, RGB switching, timebase generators
IC602	TDA4661V2	Chroma delay line
IC801	STR51203M	Chopper (14in. models)
	STR51224M	Chopper (21in. models)
IC851	AN78M05LB1	5V regulator
IC852	AN78M12LB1	12V regulator
IC1202	MN152811XXX	Microcontroller (suffix depends on model)
IC1203	MN1280R	Reset
IC1204	RPM637CBRS	Reimote control receiver
IC1205	ST24C02CB1	EEROM

On panel T

IC3501	CF72306	Video data slicer
IC3502	CF70205ANW	Text decoder
IC3504	LA7222TV	AV switch
IC3505	AN5862K	RGB switch



switches the set to standby the power supply doesn't stop, as with many designs. Instead, its duty cycle is reduced until the output is just sufficient to run the control system but not the other parts of the set. There is thus no need for an extra standby power supply transformer. This has two advantages, reduced cost and lower power consumption in the standby mode.

The power supply has two distinct operating modes therefore, standby and full operation. We'll look at each in turn.

Standby Mode

After passing via the usual fuse, filter and on/off switch the AC mains input is presented to the bridge rectifier D801-4 which charges its reservoir capacitor C807. Approximately 300V DC is developed across this capacitor and is fed via the primary winding (P1-2) on the chopper transformer T801 to the collector of transistor Q1 in the chopper chip IC801 (pin 3).

Q1's base (pin 2) receives a small start-up bias via R818, R802 and L804. As a result it conducts and a voltage appears at pin 4 of the chip. This is fed to the +B2 line via R828. It appears at the collector of the standby switching transistor Q803 via D810 and R812. The standby command optocoupler D813 is off, and Q803's base is forward biased via R813 and R821. Q803 is thus switched on, and the +B2 voltage is held at typically 1V.

The current flowing in T801's primary winding produces a reverse current in winding B1-2. D811 rectifies the voltage at pin B1, charging C813 whose positive terminal is connected to the +B2 line. C813's negative terminal will be at approximately -2V. As a result Q804 and in turn zener diode D817 conduct, clamping the DC voltage at pin 2 of IC801 at around 1V. Chopper transistor Q1 is therefore prevented from being switched to full on. Because of the feedback via D816 and R803, the circuit oscillates. This is the stable standby state.

In the standby mode T801 produces, via rectifier D851 with its reservoir capacitor C852, about 12V on the +B4 rail. The 5V regulator IC851 produces the +B10 supply for the microcontroller chip IC1202.

Fig. 3 shows, somewhat simplified, the secondary side of the chopper power supply circuit. Note that in standby the microcontroller's power on/off output signal is also used to switch off Q851 so that there's no voltage on the +B9 rail. Otherwise the +B4 and +B9 rails would be linked. This prevents the IF/colour decoder/timebase generator chip IC601 being powered.

Operating Mode

When the microcontroller issues a power on command, Q851 and the optocoupler D813 switch on. With D813 conductive, the voltage at the base of Q803 falls to zero and it switches off. The rise in its collector voltage triggers thyristor D820, which switches on. C814 is now able to charge from the 300V supply via R811, R819 and R810. In addition, with D820 conductive the charge (around 90V) developed across C818 in the standby mode is available on the +B2 rail, which is used to power the line output transistor - both are on the hot side of the circuitry.

With Q851 switched on IC601, which contains the line generator, can come into operation. The line timebase starts up, producing flyback pulses. These are coupled via R806 and D809 to pin 2 of IC801, i.e. the base of the chopper transistor Q1. This pulse feed does not require isolation, as it comes from the hot side of the line output transformer.

As the +B2 voltage rises, so the voltage at the negative

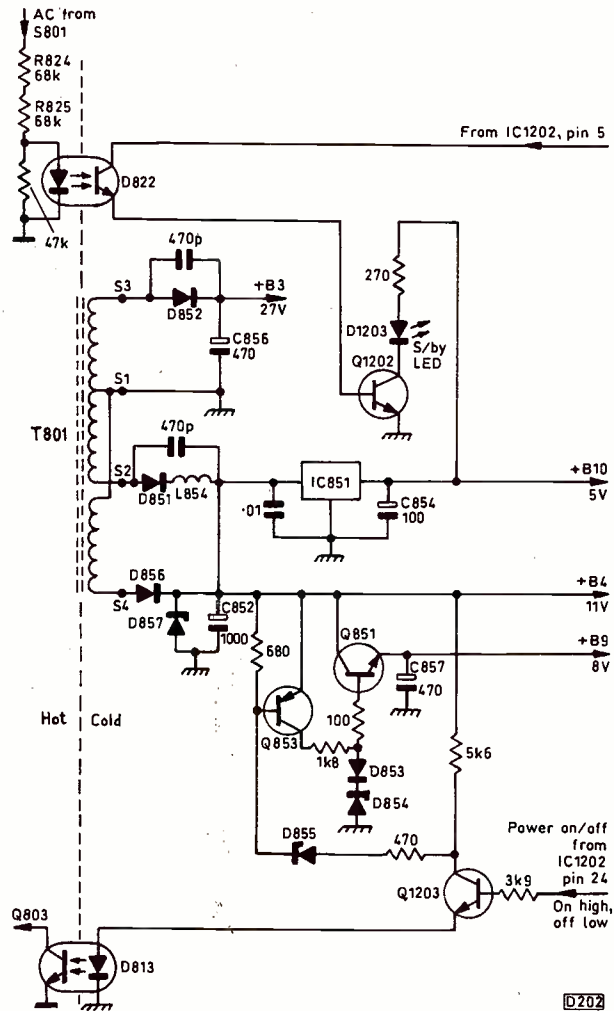


Fig. 3: The cold side of the power supply circuit.

terminal of C813 becomes positive and Q804 switches off. Q2 in IC801 is also switched off, enabling Q1 to be triggered by the line pulses at its base. It is now able to switch on fully, driven by the feedback to its base via D816, R803 and L804. When it saturates, the voltage across winding B1-2 falls and Q1 then switches off until the next line pulse appears. The power supply and the line timebase thus operate synchronously. The efficiency of

Z5 Chassis Supply Lines					
Line	Use	14in. Models		21in. Models	
		Normal	S/by	Normal	S/by
+B1	RGB output stages and tuning	135V	0V	190V	0V
+B2	Line output	103V	1V	124V	1V
+B3	Line driver	27V	0V	31V	0V
+B4	To IC851	11V	8V	11V	8V
+B5	Field output	27V	0V	28V	0V
+B6	Audio output	23V	0V	23V	0V
+B7	Text, +B8	16V	0V	16V	0V
+B8	Main 12V line	12V	0V	12V	0V
+B9	Main 8V line	8V	0V	8V	0V
+B10	Main 5V line	5V	5V	5V	5V
+BT	Tuning voltage	30V	0V	30V	0V

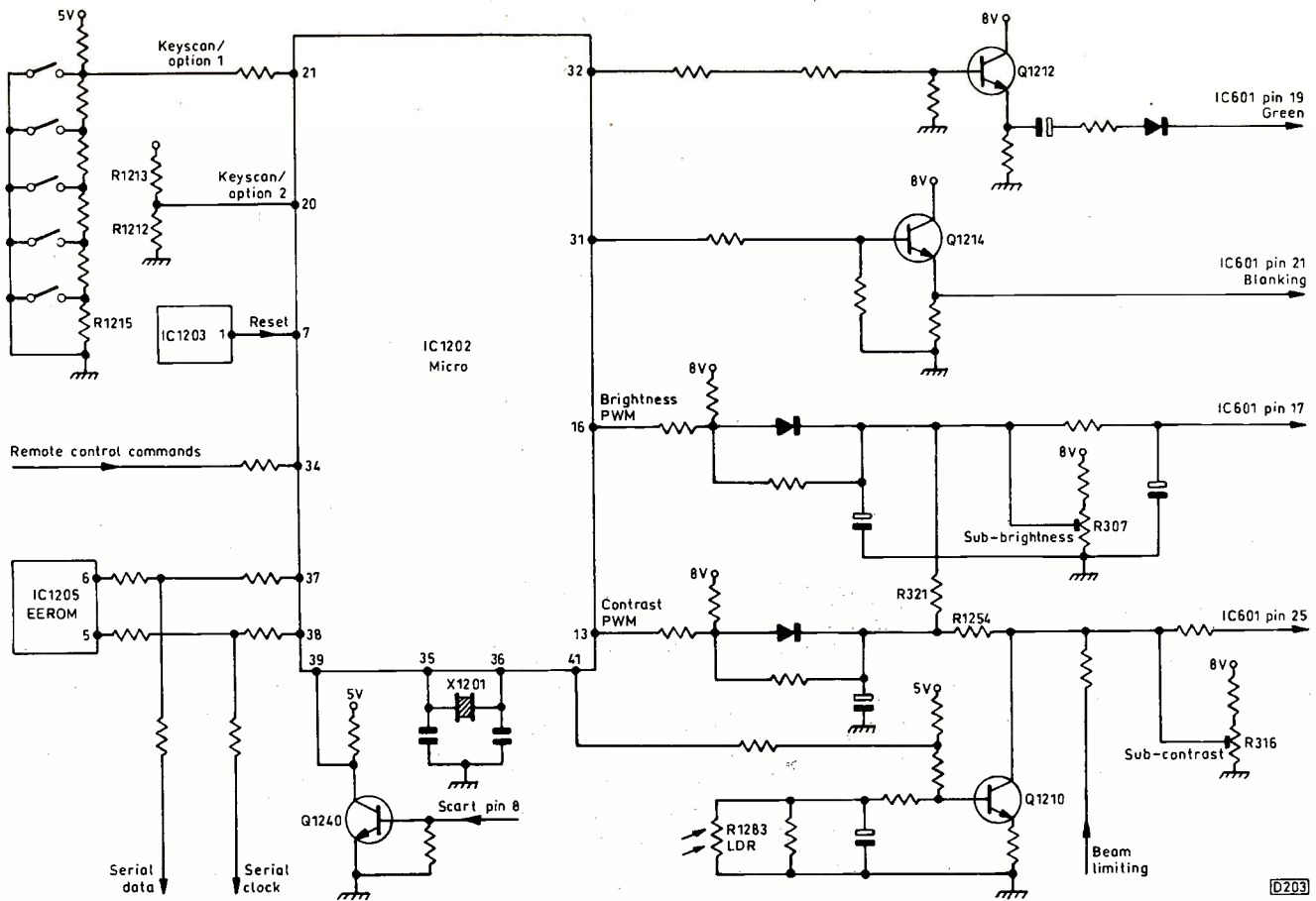


Fig. 4:
Simplified
control system
circuit.

the power supply is increased by charging C814 via D806 and D820 when Q1 switches off. Q3 adjusts the DC conditions at the base of Q1 to provide regulation.

Q805 provides excess current protection by sensing the voltage developed across R828. It switches on under excess-current conditions to remove the drive to Q1. D808 provides overvoltage protection.

The chopper power supply provides several outputs. Others are derived from the line output transformer. Most vary depending on whether the set is in the standby or operational condition. They are listed in the accompanying table.

The Microcontroller

As in all current Panasonic models the microcontroller chip IC1202 is a Matsushita device. It has 42 pins and contains 8K of ROM. Other features include frequency-synthesis tuning, two resistive keyboard scan inputs, a contrast sensor input, 50/60Hz detection and switching, an on-screen display character generator, AV switch control, seven pulse-width modulated control outputs, a self-test mode and I2C bus operation. The use of presettable option pins enables the chip to be set up for text/non-text or UK/continental operation.

Associated devices in the control system are as follows: IC1205, a serial EEROM for storage of the customer settings; the reset generator IC1203; and the remote control receiver IC1204. Fig. 4 shows the basic arrangement.

IC1202's pin functions are listed in the accompanying table. Note that several functions, particularly those related to multi-standard operation, are not used in UK sets. Most of the pins have a 470pF capacitor connected to chassis to provide antistatic protection. These are not shown in the accompanying diagrams.

Some pins may or may not be connected to external circuitry depending on the options in use. Even when connected, some operations function with only certain models. Pins 2 and 12 for example are used with French sets, while pin 41 was initially used with 21in. models only. Pins 3 and 40 are always connected to chassis, as the Z5 chassis does not provide NTSC colour reception or S video operation. Pins 29 and 33 are left open-circuit, as only green OSD characters are displayed. All models now use the scart slow-switch feature (pin 39).

Pins 20 and 21 have dual functions. They operate as keyscan inputs able to sense the value of a resistor or a push-button selected resistor ladder. The residual resistance, when no button is depressed, sets the option mode. As these models have only five user control buttons (TV/AV, up, down, function and store), only keyscan 1 is used. Use is made of both option 1 and 2 however.

The on-board keys are all connected to the resistor ladder. When a button is pressed, a different resistance value and thus voltage at pin 21 is selected. The last resistor in the chain (R1215) is fitted only in teletext models, its presence confirming that a text decoder is fitted (option 1).

The keyscan 2/option 2 input is used to tell IC1202 in which area the set is to be used. This enables the micro to set the correct channel numbers and select the required frequency bands. The values of R1212/3 set the voltage at pin 20: 5V is the UK mode, 2.7V indicates French use and less than 1V continental use.

Self Test and the EEROM

A useful feature is the microcontroller chip's self-test mode. Access to this is obtained by reducing the colour and sharpness settings to minimum then simultaneously

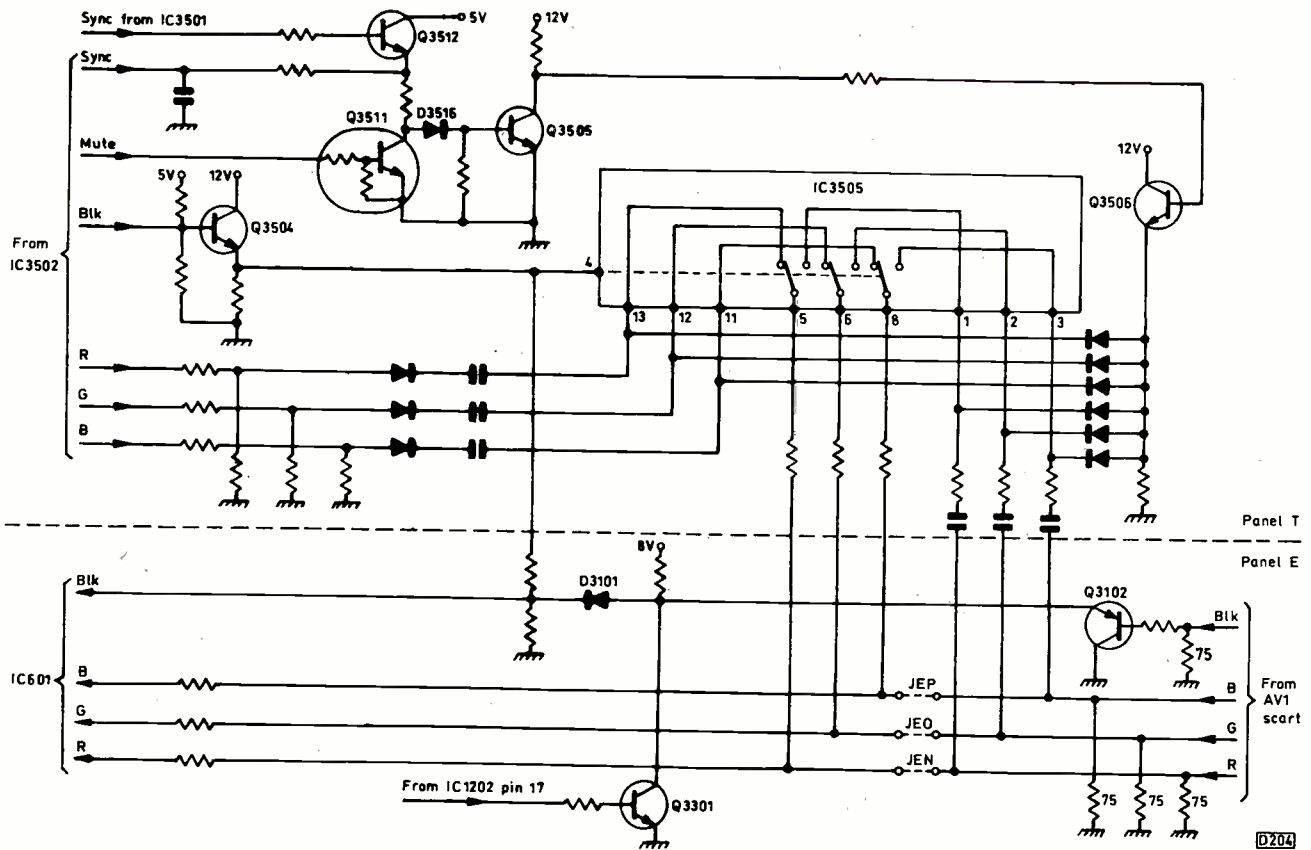


Fig. 5: The RGB switching system.

pressing the set's function button and the remote control unit's off-timer button. This should produce the result CHECK 1+ 2- 3+, representing the tuner, the text processor and the EEROM respectively. If any check fails, there will be a minus instead of a plus symbol. Non-text models will of course show 1+ 2- 3+ when operating correctly.

A second row of self-test display digits indicates the settings of options 1-6. A typical display is 11 47 46. Options 1 and 2 are, as previously mentioned, set by hardware. Options 3-6 can be selected from the self-test

screen. Most of these options will not operate if the respective hardware is not fitted. They enable the text, tuning and audio options to be changed, as well as turning the CATS system on or off. The numbers displayed are decimal values that correspond with six data bits which define each option, including some extra option 1 and 2 bits that are not accessible by means of hardware changes. These values are stored in the EEROM. Further information can be found in the *Panasonic Z5 Technical Guide*.

The EEROM also stores user information, defining the

Microcontroller Pin Functions

Pin	Function
1	5V supply
2	Mute 2 input (from sync)
3	Tint mode select (NTSC only)
4	Mute 1 input (from VIF)
5	Standby/remote LED drive
6	50/60Hz select
7	Reset input
8	Subcarrier select (Secam/Zwitone)
9	TV/text select
10	AV1 select
11	AV2 select
12	Video polarity select (Secam)
13	Contrast control output (PWM)
14	Sharpness control output (PWM)
15	Colour control output (PWM)
16	Brightness control output (PWM)
17	RGB mode select
18	AFC input
19	Mute 1 input
20	Keyscan 2/option 2
21	Keyscan 1/option 1
22	Field pulse for OSD sync
23	Volume control output (PWM)
24	On/standby output
25	Factory test pin
26	50/60Hz detect (field pulse input)
27	Video mute output
28	NTSC tint control output (PWM)
29	OSD blue output
30	Line sync pulse input
31	OSD blanking output
32	OSD green output
33	OSD red output
34	Remote control data input
35	Crystal osc. 2
36	Crystal osc. 1
37	I2C bus clock in/out
38	I2C data bus in/out
39	Scart slow switch input
40	S video select output
41	CATS sensitivity
42	Chassis

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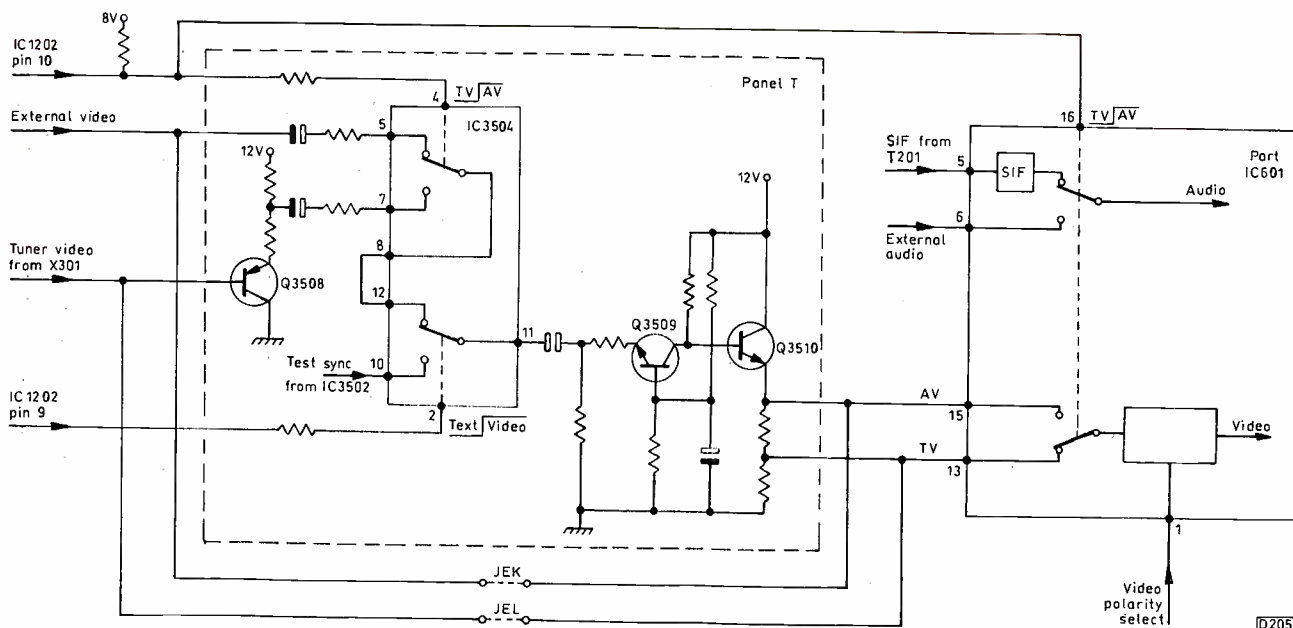


Fig. 6: The AV switching arrangements.

50-channel programme memory, AFC offset and, with non-UK models, the colour system and subcarrier settings. It also retains a 'last memory' of the user control settings. This includes the programme number, all the DAC settings and the last CATS eye value.

Analogue Controls

The analogue control outputs are all provided by 64-step pulse-width modulated output drivers within IC1202. A large mark-space ratio output represents the maximum level, a small mark-space ratio the minimum level. Digital to analogue conversion is achieved by filtering the outputs. As each output is a DC control level, preset levels (such as the factory sub-colour setting) can be obtained by adding a preset potentiometer across the output.

The contrast PWM output at pin 13 is mixed with a control voltage obtained from the CATS circuit. A potential divider network is used to add voltages, a light-dependent resistor forming the bottom section. This item is fitted just behind the set's front panel. Variations in the ambient light level and the CATS sensitivity setting (pin 41, IC1202) alter the voltage at the base of Q1210 and thus its conduction. As the conduction of Q1210 increases, the contrast control voltage falls. There is also a small effect on the brightness, via R1254 and R321.

Pin 41 of IC1202 can be set at chassis potential, open-circuit or high. This changes the CATS sensitivity to off, medium and high respectively.

On-screen Display and RGB Switching

The Z5 chassis uses a simplified on-screen display system. Green OSD signals from pin 32 of IC1202 and composite blanking from pin 31 are buffered by emitter-followers and then mixed directly with the RGB outputs from IC601 as they pass to the output stages on the tube's base panel.

In text sets the external RGB inputs from the scart socket go to panel T, where IC3505 carries out text/AV RGB selection. Fig. 5 shows this. The selected signals go to IC601 on panel E, where they or the video/OSD RGB signals are selected. Jumper leads to bypass panel T are used for the external RGB inputs in non-text models.

AV Switching

Pin 10 of IC1202 sets the mode to TV or AV while pin 9 sets to text or normal. In text equipped sets, external video

from the scart connector or the phono socket and demodulated video from IC601 leave the E panel and pass to the video switching chip IC3504 on panel T. Pin 4 of this device receives the mode select signal from IC1202, low for TV (normal) or high for external AV. A further switch in IC3504 is used to select either the output from the first switch or teletext sync pulses from the text processor chip. The selected signals are buffered on panel T after which they return to panel E where they are fed to pins 13 and 15 of IC601. These pins are the inputs of an internal video mode switch which is not used in text equipped models.

Audio signals are switched within IC601, also under the control of IC1202. IC601 has an internal sound IF filter, so it can accept either the audio from the IF circuit or external (baseband) audio.

Fig. 6 shows the AV switching arrangement. In non-text models without panel T the external and internal video go straight to IC601 for selection, via jumper links JEK and JEL respectively. Audio selection remains as in the text models.

French models have an additional control signal from pin 12 of IC1202. This is used to invert the video polarity when system L signals with positive video modulation are received.

Standby Control

IC1202 sets the receiver to standby by producing a low level output at pin 24 – see Fig. 3. This switches off Q1203, preventing current flow in optocoupler D813. Q803 is thus able to conduct, as previously described. Q1203 also switches Q851 off, via Q853, isolating the 8V line – again as described earlier.

The standby status is indicated by D1203, which is driven by pin 5 of IC1202 via Q1202 and the optocoupler D822. In the standby mode pin 5 is high so D1203, Q1202 and D822 are all conductive.

In normal operation pin 5 of IC1202 is low and the standby LED D1203 is off. When a remote control command is received, the output from pin 5 is modulated. The standby LED thus flickers.

If the mains power is disconnected or the set is switched off, the microcontroller's 5V supply continues for a few seconds. Optocoupler D822 is in this case used to break the circuit to the LED so that it goes out immediately. ■

What a Life!

TV sets contribute mainly to Donald Bullock's tribulations this month, though there was also an errant satellite receiver

Pirate Sky TV cards have long been available in Spain at a fraction of the price of the genuine article. They seem to come from Germany. Originally they worked well then, as the genuine cards were upgraded, the copies became temperamental and were periodically switched off. The boys in Germany would work frantically to overcome the problem. It would usually take them a few days. Having done so, they would store the new decoding system in an EEPROM and send it to Spain. Armed with one of these, a dealer would be able to switch pirate cards on again. It would all take about a week.

I've seen this done. The delinquent card is inserted into a scruffy mass of wires. A switch is then touched, you wait a minute or so and out comes a reformed

character. To prove the point, the dealer pops the card into a decoder-receiver connected to a TV set and up come the encoded channels.

But the German code busters don't seem, as yet, to have managed to crack the code used since the latest card appeared on the scene. I wonder why? Could it be that the current system works on a constantly progressive vectoring system?

Sky has the ability to switch an individual card off on a short-term basis. I recently bumped into a very disgruntled Englishman here. He had brought his Sky card to Spain on holiday and had asked his wife to record a golf match while he was out on the links. His wife didn't succeed with the recording, assumed that the card was at fault and telephoned Sky to get it put right. Sky spotted that she was telephoning from Spain, explained the situation then switched the card off. It was turned on again when they phoned Sky after returning to the UK.

But enough of this. Work continues apace at the English end.

Slow Picture

I pulled a set fitted with the Philips CP110 chassis on to the bench and switched it on. The sound was all right, but there was no picture. The tube's heaters were alight, there was EHT at the tube's final anode and enough voltage at the first anode. What was going on? Then the picture began to appear. Very faintly at first, then a bit brighter by degrees. But it never got bright enough.

Using my formidable mental powers, I concluded that we were up against a temperature-sensitive problem. Now which type of component is most likely to change significantly with temperature? An

electrolytic capacitor of course. I turned my attention to the HT filter circuit and found that smoothing capacitor C2621 (22 μ F, 250V) brought the original fault symptom back when given a burst of freezer. A replacement put an end to the trouble. Out of interest I connected the faulty capacitor to our bridge and gave it another dose of freezer. It's value fell to 19 μ F. But that had been enough to cause the problem.

No Picture

Mr Pyesner parked his car opposite and sidled in with a 20in. Ferguson set - TX90 chassis.

"It's got nothing at all. Absolutely nothing" he breathed in a voice that sounded like Peter Lorre. "But it's funny, I can hear it."

He likes to stay and talk. After I'd raised the job card he lit a cigarette and looked about him for somewhere to perch.

"I think it's the valve" he said.

Someone passing his car stopped to tie a shoelace. "Someone seems to be tampering with your car" I said. That got rid of him.

Pyesner's set had sound but no raster. The tube's heaters were out, the voltage across them being low at 2V. I checked in the line output stage and found that the 22 μ F boost voltage smoothing capacitor C191 had fallen in value to only 4 μ F.

After fitting a replacement I switched on and began to blow on my nails. But a tripping sound intruded. I joined combat again and found that R229 (39k Ω) in the set-HT network had risen in value to 99k Ω . A replacement restored perfect operation, and I boxed the set up quickly before it changed its mind.

Satellite Trouble

Mrs Brawn doesn't mince words. She dumped an Amstrad SRD610



satellite receiver on the bench.

"This sod's gettin' dumped if he won't come right" she said thickly. "It's died on me."

"Er. . . right" I said, stepping back slightly and reaching for my pen. "Can I have your name?"

I don't like satellite receivers much, perhaps because I don't like satellite TV. So I called Steven over.

"It'll be the usual" he said. "Both 47k Ω start-up resistors in the power supply will have gone open-circuit or high in value."

I tested them. One was open-circuit and the value of the other one had crept up to 50k Ω . Replacements brought the set back to life, but with a rolling, juddering picture.

"Er. . . what do you think might be causing this?" I asked.

"Dare say it's a dirty normal/band switch" he said airily. "If you turn the receiver over you'll see it underneath. It should be set to normal."

It was. Touching it with a trimming tool made matters worse. I cleaned it and the trouble went away. The results were perfect.

A Whining Philips

As I put the Amstrad receiver down Walter Wingnut minced in. He was carrying a 14in. Philips set that looked new to me.

"It's like my missus" he said. "Does nothin' but whine."

It was a 14PT155A/05 (Anubis A chassis) and was dead and whining. I checked the HT voltage and found that it was struggling. So I jumped into the line output stage, looking for a short-circuit. As the transistor and the heftier diodes were OK I decided to disconnect the HT feed to the line output stage. When I switched on again the whining had stopped and the HT voltage had come up.

Something was clearly amiss in the line output stage. I switched off and checked various capacitors and diodes, all to no avail. The transformer maybe?

I gave it the nose test and detected a slight smell of resin. After checking and finding that there were no shorts across the secondary outputs I reconnected the HT feed, switched on again and let the set run for a few minutes. Then I felt the transformer. It was warm.

"You swine" I shouted and began thumbing through the catalogues for the best bargain. There weren't any! The only one I could find was in the SEME catalogue, part no. LOPTX 773 at about £25 plus VAT. I

ordered one by telephone and it arrived before I put the telephone down (well, almost). It cured the trouble, and I telephoned the good new to Walter.

"It's ready, Walter."

"Oh good, how much?"

"Forty five quid" I said joyfully.

"Oh god" he said and hung up.

A Blow Up

Phyllis Puke came in and jerked her thumb towards her car. Nice girl.

"In there, Mr Bullthing" she said.

I walked out to her car and collected the Matsui 2092T. This 20in. model worries me to death, since I can't make out the very expensive and blotchy circuit diagram.

"Blew up last night" said Phyllis as she lit up her cigar butt.

"Thought I was being bombed."

I feared the worst and opened her set with trembling hands. The posistor had blown up, sprinkling the chassis with blackened grit. I cleaned it all off and fitted a replacement. It's a square, black device, type 140M. When I switched on again a perfect picture came up.

"Thank you Mr Bill. . . Boll. . . Bullthing" said Phyllis as she forked out. Then she hoisted her set, marched out and smacked it into her boot.

Another Blow Up

The next caller, Bud Bluffer, brought in an Hitachi CPT2198 (G8Q chassis).

"Don't get me wrong, Mr Bullring" he said. "This 'un's dead. You don't have to tell me. Big trouble."

"How do you know?" I asked, drawing up a card.

"The fuse was blackened" he said.

"Don't get me wrong. I fitted another and, whoosh, up it went again."

"Right" I said, and off he went.

I opened the set up. The fuse he'd fitted was rated at 4A instead of 2.5A. It was a tube of soot. Trouble in the power supply I thought, and got stuck in. But the only thing that seemed to be defective was the start-up thermistor TH902. One lead was just making contact and was intermittently open-circuit. When it did make contact the device drew a lot of current and the fuse blew. A replacement cured the problem.

When Bud called back he had a wad of tenners in his hand. "How many?" he asked.

"Two" I said, stopping him in his tracks.

"Cooo" he said. "Thought it would cost a fortune." Then he stopped and pointed a finger at me. "Don't get me wrong" he said.

Wobbly Picture

As I was making the tea, Steven attended to the next customer. I looked over.

"It's my Fergie" she said. "Keeps jumping about like somebody mental. Couldn't be worse."

Steven collected her set, which was a TX10 (1550 series). When it had been on for a few minutes the picture started to wobble and sway – as if a dream sequence was being shown. Then the set tripped and shut down. He switched it off and handed it over to me.

Some sort of spurious waveform seemed to be modulating the line scan. But what could it be? I reckoned that something, somewhere in the line output stage was acting like a spark gap. So I switched the set on, put out the lights, pulled down the blind and gazed intently at the line timebase in the dark. I saw nothing helpful. On with the lights etc.

Then I gazed at the chassis. There didn't seem to be any dry-joints. Hm. . . A capacitor can arc inside, especially when subjected to a pulse waveform. So can a resistor, though I would have expected external signs in this case, like cooking. Diodes can also arc. I looked around at the larger diodes.

D831, which is connected between the base and emitter of the line output transistor as a protection device, seemed to be a likely suspect. It's a bullet-shaped, green BY188B diode. So I connected the scope, via a high-voltage, low-value capacitor, to the base of the line output transistor and switched on. The pretty waveform was perfect when the picture was normal. But a series of sharp pulses appeared and blew the waveform about as the picture began to wave. I took out the diode and checked it while using a soldering iron to warm it. After a minute the readings began to dart about, as I had hoped. A new diode restored normal operation.

For the pedants, in earlier TX10 sets a BY226 diode was fitted in this position. In the later PC1560 series the diode is renumbered D743 and is type BY588. There were also three different line output transistors – BU208B, BU208A and BU508A, some of which have a 47 Ω resistor in parallel with D831/743. ■

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Not all models are shown for each make. A vast range of other makes & models i.e. Akai, Alba, Aiwa, Fidelity, Fisher, Funai, GEC, Goldstar, Granada, Grundig, Hinar, Orion, Philips, Sanyo, Sentra, Proline, Salora, Sony, Samsung, Toshiba & Mitsubishi are available	
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Not all the models are given under each make. Please ask for models & makes not listed.	

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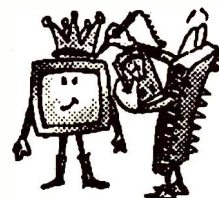
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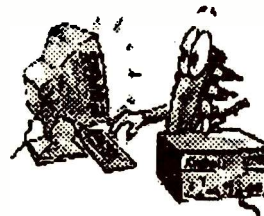
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Long-distance Television

Start of the 1996 SpE season. Latest satellite news and sightings.
Filters and interference problems. **Roger Bunney** reports

The long-awaited 1996 Sporadic E (SpE) season started in mid-May and continued strongly to the end of the month, though there was some decline during the last few days and into June. Reception has been spectacular, with signals at up to 100MHz. Most reception was from the south/south east – Spain, Portugal, Italy, the former Yugoslavian countries and also double-hop signals from the Middle East. Few test cards are seen nowadays, but the increased use of corner logos has helped considerably with signal identification. The collated SpE log is as follows:

9/5/96 TVE (Spain) ch. E2; C+ (Canal Plus, France) L4.
10/5/96 RAI (Italy) IA.
11/5/96 MTV (Hungary) R1.
18/5/96 TVE E2, 3; RTP (Portugal) E3; SLO (Slovenia) E3; RAI IA, B; MOL (Moldova) R2; also a ch. A2 (55.25MHz) vision buzz at 2030.

Eesti TV (Estonia). Not ch. R2 this time but snapped by John Locker via Eutelsat II F4 at 7°E, using an EBU SIS decoder.

19/5/96 TVE E2, 3, 4; RTP E2, 3; TVR (Romania) R1, 2, 3; SLO E3, 4; HRT (Croatia) E4; JTV (Jordan) E3; IRIN (Iran) E2 with a second E2 signal beneath, probably Dubai; Syria E2. There was also Arabic FM radio in Band II and a ch. IA shopping programme with a corner logo "M" at the top right.
20/5/96 RAI IA, B; SLO E3; NDR (Germany) E2; TVP (Poland) R1; HRT E3, 4; TVR R2; C+ L2; plus an unidentified Arabic signal in ch. E2, probably Iran.
23/5/96 OK1 (Russia) R1; HRT E3, 4; SLO E3; TVE E2; RAI IA, B; RTSH (Albania) IC.
24/5/96 OK1 R2; HRT E3; NOVA (Czech Republic) R1; MOL R2.
25/5/96 RAI IA, B.
26/5/96 NRK (Norway) E2, 3, 4; RAI IA.
27/5/96 LTV (Latvia) R2; SVT (Sweden) E2, 3, 4; NRK E3; NOVA R1.
28/5/96 RAI IA.

Cyril Willis (King's Lynn) reported the excellent opening on the 19th, with Arabic signals received between 1753-2200 local time. The Syrian ch. E2 reception, with French language news, is strange. My EBU register does not list a Syrian ch. E2 transmitter, but it does list Tele-Liban-3, with French language sound, at Beit Mery in the Lebanon. Could it have been this transmitter (power 1kW)?

Using a Roadstar RC834RB car radio with a two-element aerial Dave Phillpotts (West Looe) received several Norwegian and Swedish FM radio stations in Band II on the 27th, some with excellent stereo and with RDS receivable. George Gaskin

(Gibraltar) reports daily reception from most of Europe and North Africa from about the 15th.

Keep a look out for an Italian station that runs with a video carrier at 47.875MHz, just below ch. E2. I've had several reports of reception from this station. On the 20th, at 1700, Garry Smith (Derby) received a weak, smeary ch. E2 signal with Arabic sound and an announcer in dark clothing. It faded out at 1740 and is thought to have been from Iran. Peter Schubert (Rainham) reports excellent SpE reception during the period, using a simple Band I crossed dipole at only 20 feet.

Overall then an excellent start to the 1996 SpE season. May it continue!

An SpE opening during December/January 1995/6 produced the first ever mid-winter triple-hop propagation between Europe and the US east coast, in ch. E2. Scanner measurements on December 27th produced readings, at 48-242/249/151MHz, peaking S3 between 2000-2100 GMT. Similar results were recorded on January 11th. Thanks to *Six News* for this information

Satellite Sightings etc

While checking Intelsat 601 (27.5°W) on the 29th I found, at 2000 for about one minute, colour bars with the alternating idents "SNG BROADCAST SERVICES LTD" and "FOR EBU BRUSSELS" – I'd obviously missed the news bit! Intelsat 708, now at 1°W, has a Nordic flavour. On the 17th I monitored two feeds to the Oslo NRK Network Centre. One, from 0800 at 11.67GHz (vertical), started with a sailing ship: a pan around the



ocation then revealed the Telenor NG van with dish. More interesting was another harbour OB, this time from the Arctic circle, at 11.543GHz (again vertical). The location "Svolvaer" was seen. A few days later I received from the same satellite, at 10.969GHz horizontal, colour bars with the identification "NOR-9/TOS-6". This was after lunch, for about half an hour. The carrier then switched off. Any ideas?

Now that the trees are out my reception from Eutelsat II F3 (16°E) has ceased, though there has been a lack of analogue signals from this craft recently. On some mornings there were Sky News inserts at the usual 12.537GHz (vertical). On the 14th a chief inspector was shown on the Scarborough sands discussing police cover. Only a four-second identification at the end, then cut and up came a Deutsche SNG feed from the Cannes Film Festival, again for Sky.

Eutelsat carried the Festival (May 9-20th) via II F1 (13°E) at 11.638GHz horizontal from early morning to late evening. The Yugoslavian war crimes hearing at the Hague have been carried via II F3 at 11.634GHz horizontal.

May 10th brought via Orion (37.5°W) at 12.578GHz (vertical) not the usual BBC regional feeds but an intricate dental operation from the Chappel Hill School of Dentistry, University of North Carolina. This was at 2100 as an educational feed to Germany.

Ken Suddes (Welwyn) reports that a new TV channel from Libya has been on test during most afternoons and into the evenings, at 11.08GHz (horizontal) from 16°E. He saw Sky Sports appear via Hispasat (30°W) at 12.709GHz (vertical) with commentary at 7.02/7.2MHz and clean effects at 7.3/7.56MHz: the programme content was Rugby Super League 1996 from Paris.

Another of Ken's sightings was the TeleSatellit Sat-DXers' programme via DFS-2 (28.5°E) on the 10th, at 11.675GHz (horizontal). The programme appears on Friday nights.

Bob French (W. Midlands) had a bad experience recently. After installing a US 3.1m dish for C and Ku band work he found that the Ku band performance resembled that of a 1.5m dish - though OK at 4GHz, the mesh was transparent at 11GHz. Problems have arisen in the States, where Ku band operation is now taking off and people using their large C band dishes find that they are substandard (both mesh and general curve accuracy) at the higher

frequencies. At least one manufacturer is offering retrofit upgrade panels for C/Ku band operation. Bob noted at 3.6635GHz (RH polarisation) from Intelsat 603 (34.5°W) a programme with corner logo "Africa" atop a yellow and green flag, in the MCM feed. Can anyone identify the source?

Julian Redwood (Christchurch) has been more successful with a C/Ku band set up. The 1.8m dish took an hour to assemble and a further hour to obtain accurate Clarke Belt tracking from 53°W to 42°E.

Good news from Bandula Gunasekera (Sri Lanka) who has now obtained a Telecom band LNB for PAS-4 (68.5°E) reception. The Korean made Micro-Lab LNB, bought by his brother in Singapore, covers 12.25-12.75GHz and is intended for use with AsiaSat-2/JCSAT-3/PAS-4/APSTAR-1A/KoreaSat/MeaSat. It cost the equivalent of some £28.

Terrestrial TV

Sunspots: Latest calculations based on statistical predictions suggest that the minimum in the present sunspot cycle occurred in April, when the SSN (smoothed sunspot number) was just six. Cycle 23 will advance slowly to reach a peak SSN of 108 in January 2000. This is a lower number than in cycle 22 - the cycles last ten years or so. Other methods of calculation suggest that cycle 23 will be more active than cycle 22! It's rather like predicting the winning Lottery numbers! Anyway, thanks to *Six News* and to the Space Environment Centre for this information.

UK: Independent Visage Productions operates Silverstone TV to supply signals to portable TV sets in the 800 acre site. Power is relatively low, in chs. E47/49. The SBL (seasonal broadcast licence) from the NTL allows four meetings a year to be covered.

Latvia: LNT has been awarded the licence for the third TV network.

Sweden: Kanal 1 is now SVT-1 while TV-2 is now Kanal 2.

United Arab Emirates: A ch. E26 transmitter has been in operation at Ajman since February. An Arabic 4 is included in the corner logo to indicate that it's the fourth UAE channel (the others are Abu Dhabi, Dubai and Sharjah).

South Korea: The AFKN-TV (US Forces) ch. A2 transmitter closed on May 1st, with a move to ch. A34. It will be a sad loss to Australian DXers, who received it via transequatorial skip etc.




Filters and Interference


Todd Emslie (Ryde, NSW) wrote recently about weak signals, bandpass filters and exalted Band I reception. He's tried various scanners and has found that the Icom R7000 and R7100 are vastly superior to others such as the AR2300 and FRG9000 for DX-TV monitoring. A sweeping statement maybe, but confirmed by reception such as KVZK (American Samoa) at 55.247MHz which was not audible with a standard narrow-band scanner.

NHK Berlin to Tokyo via Paris, seen via Eutelsat II F4 at 7°E. Photo John Locker.

Best seller



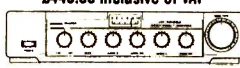
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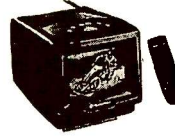
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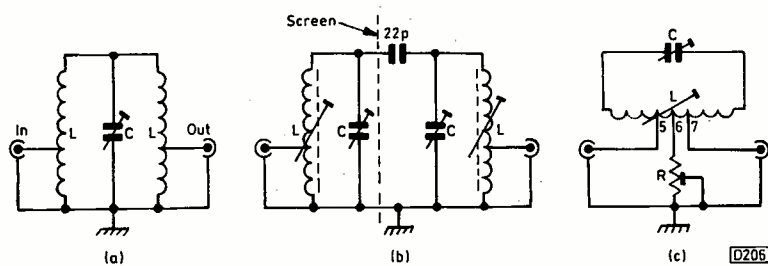


Fig. 1: Bandpass and notch filters. (a) Todd Emslie's bandpass filter. C 2-20pF, L 14 turns 0.25in. diameter 20 swg wire, air cored, tapped at 2-3 turns from chassis (for Band I). (b) Suggested modification for sharper response. L and C as before. Add metal screening between sections. Use compact construction and 0.25in. coil formers with dust cores. (c) Band I notch filter (-45dB notch). C 3-30pF subminiature trimmer, R 470 Ω miniature preset, L 11 turns close-spaced 26 swg enamelled wire on 0.25in. former with dust core, tapped at 5, 6 and 7 turns.

For weak signal work the Icom scanner can be used with 2.4kHz SSB filter. Another success was Tonga ch. A3, a 50W transmitter, over a two-hop 2,000 mile path, again using the SSB filter. Unfortunately the price of these scanners puts them outside bounds for most of us.

He found that the bandpass filter circuit shown in Fig. 1(a) is successful in separating chs. E2 and R1, and Australian ch. 0 (46.25MHz) from NZ ch. 1 (45.25MHz). The circuit was less successful for Band II use. The arrangement shown in Fig. 1(b) might be better but requires more accurate alignment.

The alternative is to use a filter to notch out the unwanted adjacent channel, see Fig. 1(c). Unfortunately a Jackson type aerial trimmer with a maximum value of around 40-50pF now costs nearly £10 - compared with say 50p for a varicap diode. It would not be difficult to use a varicap diode with remote tuning however.

Two days later I received a letter from Garry Smith (Derby) about various interference problems - mainly an unlicensed (pirate) FM transmitter, a 28-day RSL FM operation and the usual 49MHz breakthrough on chs. E2 and R1. He has now installed notch filters in his aerial system prior to the Fringe distribution amplifier and finds that this enables chs. E2 and R1 to be received well. The tried and tested design shown in Fig. 1(c) should again do the trick - I've been using it for about thirty years!

Electronic Band I phaser unit designs to remove co-frequency interference from a wanted signal have been described in past issues. If you can find a copy of the May 1966 *Monitoring Times* (Grove Enterprises Inc., PO Box 98, Brassstown, NC 28902-0098, USA - or try *Short-Wave Magazine*, Poole) you will find

in Doug Demaw's Workshop a simple phaser unit based on the use of three junction FETs. The overall cost to build it would be perhaps £5, using new components. It covers 100kHz-60MHz but could, with slight modification, work at up to 100MHz with slight loss of LF coverage.

I also recommend a study of the excellent EMC article in the June 1996 issue of the RSGB's publication *Radcom*. It covers all manner of interference phenomena and includes an exposé on the less than technically perfect 49MHz baby alarms!

Satellite TV

BBC regional TV is now operating locally-based SNG trucks. I've had several reports of reception via either Orion (37.5°W) transponders 3 and 11 or Eutelsat II F4 (7°E). The uplink modulator runs at 700W which, with a 1.5m squarish offset dish, produces around 70dBW. When used for OBs, a clean feed audio plus studio talkback is uplinked on a 64kbits/sec carrier from the studio. Remote (reverse) talkback from the OB site to the studio isn't used at present. The Plymouth van uses the identification "PLYMOUTH UKI 231", with audio at 6.6/7.2MHz (75 μ sec). The vans will eventually go digital.

Now that Intelsat 708 is established at 1°W, many new Norwegian/Swedish D2-MAC downlinks are available. At the time of writing, Intelsat 702 is on its way to 18.5°W. August 31st should present us with NRK1/NRK2/TV2 in D2MAC Eurocrypt. Full tests start August 1st.

Promax has introduced the PC108 polarisation controller. It provides variable control (vertical, horizontal, skew) for two-wire controlled magnetic polarisers via the LNB's coaxial feeder, with sprung terminal connections. It's ideal for dish upgrades and to fine-tune stand-apart

polarisers. The controller is available for £60 + VAT from Alban Electronics (01727 832 266). Oddly, it has BNC connectors rather than F sockets: this is being queried!

It appears that BSkyB won't be starting digital TV services until early 1998. Reasons for this seem to be a delay in the development of inexpensive digital decoders and a wish to await the results of experience with Star TV (Asia)'s digital subscription services.

The president of Asia Broadcasting and Communication Network (ABCN), owner of LaoStar, recently went to Seoul to discuss frequency co-operation with the KoreaSat group - both satellites have been given the 116°E allocation. KoreaSat is to transmit to DTH and small VSAT terminals in South Korea only while LaoStar aims at DTH across Asia. Future plans include LaoStar-2 at 74°E and other slots that have been registered with the ITU.

Shinawatra Satellite PLC is swapping the Thaicom 1 and 3 slots to avoid trouble with the Chinese Apstar satellite, which is to be positioned at 120°E. Thaicom 1 moves from 78.5°E to 120°E, while the future Thaicom 3 will be positioned at 78.5°E, probably at the end of 1998. Thaicom 2 is also at 78.5°E.

PanAmSat and Orion have announced expansion plans for the next few years. The PanAmSat fleet will be as follows:

- PAS-1 45°W, Atlantic ocean.
- PAS-2 191°W, Pacific ocean.
- PAS-3R 43°W, Atlantic ocean.
- PAS-4 68.2°E, East Indian ocean.
- PAS-5 58°W, Atlantic ocean (early 1997).
- PAS-6 43°W, Atlantic ocean (end 1996)
- PAS-7 72°E, Indian ocean (late 1997).
- PAS-8 194°W, Pacific ocean (late 1997).
- PAS-9 and 10 both 58.5°W, Atlantic ocean (no dates).
- PAS-11 79°W, Atlantic ocean (no date).
- PAS-9, 10 and 11 will have Ka band (28GHz) capacity.

For Orion:

- Orion-1 37.5°W, Atlantic ocean.
- Orion-2 47°W, Atlantic ocean (1998 launch).
- Orion-3-10 at advanced planning stage to provide total global coverage.
- Orion-1-3 use Ku band, Orion-4-9 bands Ku/Ka while Orion-10 at 11°W is to be totally Ka band.

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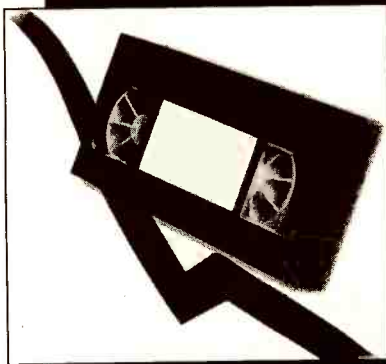
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Sanyo VHR4350

Tape crunching – a loop of tape left hanging from the cassette flap on eject – is an increasing problem with these machines. Capstan brake binding is the cause. Cleaning the brake pad and the periphery of the flywheel solves the problem, but it's perhaps better to clean the flywheel and replace the brake arm. **E.T.**

Akai VSF10

The cause of intermittent deck shut down took us a long time to find – the fault would occur at intervals of hours or days. We eventually discovered that the take-up reel rotation sensing optocoupler was responsible. It comes as two separate components, a LED and a photodiode.

We had a clue in the fact that the tape remained threaded after shut down – with most other faults, including power supply interruptions, the deck unthreads the tape in an 'emergency' mode. **E.T.**

Sanyo VHR150

There was a continuous crackle on sound – like an old telephone system. It was present in record and

VCR Clinic

playback, but only in the LP mode. The cure was replacement of the audio chip IC210 – pin 14 had been pulling the LP/SP switching line to 1.2V (should be 4.9V). **E.T.**

JVC HRD750

If one of these machines has no deck functions, perhaps with a cassette stuck inside, you may well find that circuit protector CP802 has failed. A replacement generally gets the machine going – until CP802 opens again. The root cause of the problem is the capstan motor. **E.T.**

Tatung TVR6122

These VCRs have much in common with contemporary models from the Amstrad stable. A common problem is flutter on sound. The way to cure it is as follows: replace the pinch roller; get the take-up tension down to about 80g/cm by fair means or foul; lubricate both spool spindles and the back-tension pole pivot; fit a new back-tension band and reset the back tension; and clean the entire tape path. **E.T.**

B & O VHS90

Complete loss of audio output from the rear-mounted phono sockets was the problem with one of these machines. Not shown on the circuit diagram, but very much present in the VCR, are a couple of muting transistors at the sockets. They are fed from the /PB12V line, which was high at all times because of a short-circuit between pins 13 and 14 of the EXB341 thick-film module IC1154. **E.T.**

Mitsubishi HS306B

There was no playback or record colour. Virtually all the chroma processing is carried out by the M51452G 39-pin chip IC6A0. I played back a colour-bar tape to

provide a stable chroma signal, and traced this to where it's separated from the luminance signal and fed into IC6A0 at pin 34. A recognisable 626kHz modulated envelope was present here, but the signal that emerged at pin 35 was grossly distorted and of low amplitude. As the supplies were all present, the crystal oscillators were working and the head switching and composite sync pulses were present I pronounced IC6A0 faulty and fitted a replacement. No change! If the input or output pin of the bandpass filter BPF6A1 was lifted (open-circuited), a healthy converted 4.43MHz signal appeared at pin 35 of IC6A0. So the filter was condemned as being internally leaky. Once more a replacement made no difference.

Fortunately another working machine was available, enabling us to carry out comparisons. While checking IC6A0 pin by pin with a scope I found that there was a ragged 150mV field-rate sinewave at pin 26, which is the 9V supply pin. There was no such waveform in the machine that was working correctly. The supplies to the chip's pins are decoupled separately, by a series choke and an electrolytic capacitor. 6C6C (33µF, 16V) had dried up and lost value. When we checked its value the reading was 12µF. A replacement restored the colour.

Though small and easy to miss, the spurious 150mV field-rate signal on the supply had been enough to stop the circuitry within the chroma chip working correctly. The moral to this story is to wind up the Y gain and flick through the timebase steps when checking supply lines with a scope. There may be something lurking there. If, like me, you miss it, you could be in

for several hours of fruitless searching before you return for a recheck. **J.H.**

Panasonic NVJ30

This machine was dead but was restored to life when its power supply was heated with a hairdryer. When it cooled down it returned to the dead condition. There was obviously a faulty reservoir/smoothing capacitor somewhere. It turned out to be C9 (1 μ F, 400V) which, when checked, produced a reading of about 0.03 μ F. Where would we be without tins of freezer and a hairdryer?! **C.N.**

Sanyo VHR5240

When play was pressed the drum failed to rotate and the machine switched off. A check on the SW5V rail showed that it was very low. The 2SC3807 transistor Q5402 was short-circuit base-to-emitter. **R.B.**

Nokia VR3785

This machine left tape out of the spool when the cassette was ejected. A replacement capstan brake (part no. 8681-4167) cured the fault. **R.B.**

Toshiba V611

Noisy fast forward, rewind and play were the complaints with this machine. There was no noise when we checked with a transparent service tape. A replacement take-up guide pole cured the fault. **R.B.**

Sanyo VHR291

Intermittent failure to power up or down and to eject was the complaint with this machine. The cause of the trouble was dry-joints at plug CN712. **R.B.**

Nokia VR3785

In the play, record and fast forward modes this machine would stop after a few seconds. Rewind was OK. Normal operation was restored once we'd cleaned the take-up reel and reel sensor. **R.B.**

Panasonic NV430

This vintage machine didn't produce a clear E-E picture – there were wide black bands and bad distortion. Not surprisingly, we found that one of the capacitors in the power supply had died of old age. The culprit was C1002 (47 μ F) in the 45V supply. **B.S.**

Panasonic NVFS88

This S-VHS machine was totally inoperative. The only signs of life were provided by the timer clock, which flashed three zeros. Except

for the switched ones, all the power supplies were present and correct. Our next move was to check the serial clock and data lines: the serial data line was found to be low. The reason for this was eventually traced to the M34255V1AH microcontroller chip IC7507, which generates the VU display. It had an internal leak. A replacement restored normal operation – it's mounted on the front panel. **B.S.**

Panasonic NVFS1

Intermittent operation was the complaint with this vintage machine. Sure enough we found that it failed to function mechanically when cold. Unfortunately any attempt to take the top off the machine cured the fault! We had it on soak test for many days before discovering that the multi-voltage regulator in the power supply was the cause of the trouble. There were several dry-joints at its pins. **B.S.**

Panasonic NVHD650

Apart from the fact that the drum rotated at high speed this machine was dead. Checks showed that there was a dead short across the system control 5V line. The cause was eventually traced to the BU1201-02 chip IC3904 on the input/output pack. It was short-circuit. **B.S.**

Panasonic NVFS1

When a cassette was inserted it would be accepted, taken into the depths of the machine then quickly spat out again. We checked the mechanism and mode switches for correct alignment, but everything was OK. Attention was next turned to the systems microcontroller chip, where we found that only one of the mode-switch tristate position signals changed state with the mechanism. The other one remained at 5V all the time. R1501 (47k Ω), which is across the mode switch, was open-circuit. **B.S.**

Matsui VX2500

This machine chewed tapes. The pinch roller was OK, but while checking the take-up I noticed that the limiter arm didn't move – the spring had slipped off. I put it back, secured it and gave the machine a good clean. It worked well. **T.L.**

Toshiba V711

The mechanism of this centre-loading machine was jammed. When I stripped it down I found that the main cam and the loading arms were well mauled. After

fitting replacements, also a new mode switch, and realigning the mechanism everything was OK. Alignment is quite straightforward. **T.L.**

Samsung SI1240

This machine would go to standby shortly after a function had been selected. It would shut down in play, rewind, record etc., but the fault seemed to go away when pause was selected. This suggested that the cause of the trouble was to do with the reel pulse sensor or the reel turntable itself. Scope checks at the 2SC945 reel pulse amplifier transistor Q2601 showed that the pulses at its collector were only marginally greater in amplitude than those at its base. A new transistor increased the amplitude of the pulses significantly, but the fault persisted. The output from Q2601 is fed to the TC4021BP chip IC6201, which also had to be replaced. The two faulty components are mounted on a subpanel next to the loading motor. **M.L.**

Hitachi VT120

There was low E-E and record sound. We traced the cause to C08 (4.7 μ F, 35V) in the IF unit. The fault seems to be turning up quite often now that these machines have seen a fair bit of use. **M.L.**

Toshiba V880MS

This beast of a multi-system machine, for which we didn't have a manual, would power up then go completely off. The clock display would flicker for a second before it went out. When an attempt was made to load a tape the capstan motor would start to turn, extremely slowly, before stopping at shut down. I put the machine to one side and returned to it later.

When I did so I found that it had powered up by itself and was working. I'd left it plugged in. The cause of the trouble was obviously in the power supply, and after a good old spray around with freezer the culprit turned out to be C809 (10 μ F, 50V). It's on the power supply's small subpanel, inside the can. A replacement brought a sigh of relief! **M.L.**

Akai VS8

This machine had stopped working with a cassette inside. Operation of any of the controls made the buzzer sound: nothing worked – though the main power rails appeared to be OK. As the power and syscon circuit is quite complicated, we had to obtain

a manual. We then found that the STK5325 regulator chip wasn't producing the 12V AL supply. To add to the confusion, the cassette lamp was open-circuit. **O.G.**

Hitachi VT33 + Rediffusion Mk 4 Chassis

Perhaps this one should have been in the TV section. The customer's complaint was about "white spots on VCR playback". Over the phone this sounded like a head cleaning job. When we called we found that the playback picture consisted of white lines all over the screen. The E-E and normal TV pictures were fine. So we took the VCR back to the workshop, where it performed faultlessly.

The cause of the trouble was in the TV set, where 4C16 (3,300pF) was dry-jointed. It forms part of a snubber network across the chopper transistor. At least the customer agreed to have his VCR serviced, which it desperately needed – the belts were about to fall off! **M.M.**

Saisho VR2000

This one was a right pig – and had been got at by someone! Fuse F502 (2.5A) kept on blowing at switch on. It didn't take long to discover that there was a dead short across the AT13 rail. The short was in the drum motor, so I removed its PCB for inspection. There was nothing obviously amiss, and I eventually discovered that the short was between the 13V supply and the body of the motor – but the exact location of the short was impossible to determine.

I was able to get over the problem with some thick insulating plastic, which I cut to size and fitted between the drum motor's PCB and its chassis. This removed the short-circuit, and all was well when I applied power to the machine – until I selected rewind. I then found that in addition to an obvious pattern idler a different screw had been fitted to the bracket over the reel motor's pulley. Fitting the correct screw fixed that, and a soak test proved that everything was now OK. **M.M.**

Philips VR323

This machine produced scrambled text. The cause was the SAA5231 teletext processing chip. **M.M.**

JVC HRDX22

This centre-loading machine jammed when it went into play. I stripped it down and replaced the half-load gear and control cam, but

it still jammed. The cause of the problem was the fact that the control cam's spindle was not seated properly in its plastic moulding. Pushing this down until there was a click provided a complete cure. **M.M.**

Hitachi VT220

Creasing tapes and noisy operation were the complaints with this machine. The problems were caused by a worn pinch roller and a very worn capstan shaft and bearing. They were so worn that there was substantial play in the bearings. Fortunately these parts are available from Hitachi. Replacing them cleared the faults. **M.M.**

Philips VR727

There was no playback or E-E sound. It's not easy to trace the cause of this sort of thing where there is hi-fi, Nicam and linear sound. We eventually found that there was faulty switching within the TDA2518 chip IC7205. **J.C.**

Samsung VI375

No results was the complaint with this one. The 2.7Ω surge limiter resistor R101 was open-circuit and the STR11006 regulator chip IC101 short-circuit. In addition the 22V zener diode ZD101 on the secondary side of the chopper transformer was short-circuit. When these items were replaced and the machine was powered up they all failed again. Further investigation led us to C110 (100μF) which was open-circuit. **J.C.**

Panasonic NVG21

There are several possible causes of the no-results symptom with these VCRs. In this one the STK5338 regulator chip IC1001 failed to produce a 5V output. **J.C.**

JVC HRJ200

Intermittent rewind and tape chewing were the complaints with one of these machines. We noticed that when rewind was selected the VCR would sometimes load then unload slowly, leaving a loop of tape. We also found that this could happen in the play mode.

Replacement of the mode select switch (part no. PU60622-1-2) put matters right. We have had this fault several times now. **J.C.**

Toshiba V254B

Because of a faulty cassette holder assembly this machine wouldn't accept a tape. The plastic piece on the side of the cassette holder had

broken – the bit that releases the cassette flap to enable the tape to drop on to the spools. **J.C.**

Panasonic NVJ35

No results is a very common fault when the mains input has for one reason or another been removed from this model. The auto-selector or power regulator chip can be responsible. Alternatively C1109 (1μF) can, as here, fall in value or go open-circuit. **J.C.**

Panasonic NVJ47

The customer complained about a high-pitched noise in the standby mode. The problem occurs only where the mains voltage is very high – 250V or above. Transformer T1101 then buzzes. During a chat with Panasonic I was told to add an 0.01μF, 50V capacitor across pins 3 and 4 of optocoupler Q1103 in the power supply. There's a part number for this capacitor: ECUM1M103KBN. **J.C.**

Amstrad VCR4600

There was no display and no functions could be selected. The machine would load a tape but not eject it. The cause of the trouble was X502 in the syscon department. **B.L.**

Matsui VX750/Saisho VR3500

This machine would accept a tape but powered down as soon as any function was selected. The N10 circuit protector ICP201 in the 19V supply to the capstan motor was open-circuit. **B.L.**

Ferguson 3V38/JVC HRD110

All sections of the fluorescent display lit but the machine wouldn't power up and there was loss of the loop-through to the TV set. Checks in the power supply produced readings of 0V at pin 1 (ALL 12V) and pins 3 and 4 (16.5V AC) of CN1. The pins had arced and gone open-circuit. Cleaning and resoldering put matters right.

Another of these machines was totally dead because pin 4 of CN1 had failed in the same way. **B.L.**

Ferguson 3V38/JVC HRD110

No recorded picture, the E-E picture being OK, was the complaint with one of these machines. We found that C197 was short-circuit.

Intermittent lockout with a dim operation LED is the symptom when the relay on the power supply board is faulty. Clean or replace it. **R.C.M.**

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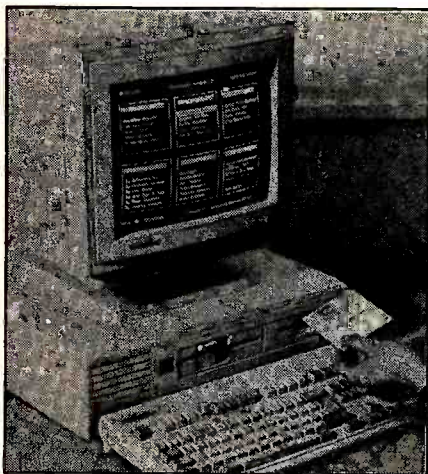
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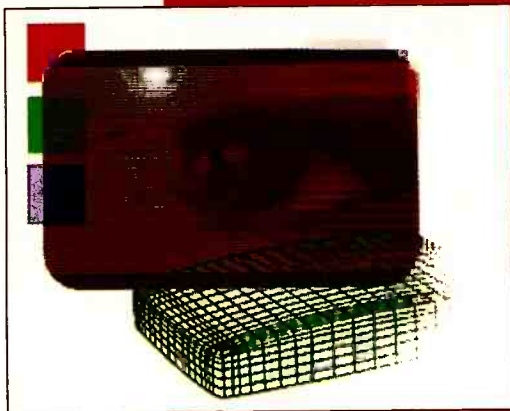
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Advent VGA

We've encountered a couple of common problems with Advent VGA monitors. First the rocker type on/off switch isn't man enough for the job. It spits and arcs most disconcertingly! We replace this item as a matter of course whenever one of these monitors comes in for repair, using an RS type switch, part no. 320-001. It fits perfectly in the monitor's cut-out.

If the customer's complaint is that there's loss of field lock after disconnecting and reconnecting the D plug at the PC, check at pin 3 of the HD74LS86P chip IC201. You will probably find that the reading is only a few ohms above chassis. As the field sync pulses are applied to this pin, they are being shorted out. The cause of the problem is that this chip is damaged by static when the plug is removed and refitted. A readily available SN74LS86AN chip from Maplin works fine. J.E.

Kenitec PX14S

After about half an hour the top 5cm of this 14in. SVGA colour monitor's display would pinch in from the sides. There's an EMI tin plate shield, approximately 10 x 15cm in size, on the print side of the PCB. It has 14 earth connections. All 14 were dry-jointed. What happens is that the EMI shield, which connects isolated earth pads together, warms up during operation because of radiated heat from nearby power transistors. This is

likely to become a stock fault. F.G.

Wang MON 1428

The power supply in this monitor is based on a U3824 chip. If there's no power supply operation, check the two 36k Ω start-up resistors that feed pin 7 of this chip. They tend to go open-circuit. The circuit reference numbers are R102 and R103. P.B.

Samsung CVB4587

When it had been on for an hour or two this monitor would drop into the wrong operating mode. The customer complained that the picture shrank and four pictures appeared side by side. We traced the cause of the trouble to capacitor C223 (1.2nF, 63V). C.W.

Philips CM11342/55G

This monitor was completely dead. A short-circuit could be measured between the collector and emitter of the BU208A line output transistor 7512, but the transistor itself was blameless. The winding between pins 1 and 3 of the line output transformer was shorted.

After fitting a new transformer I was rewarded with an EHT rustle, but only a dim raster could be seen with no information displayed. After a good deal of checking I found that the voltage at pin 19 of the TDA3505 video processor chip IC7640 was low - 1V instead of 4V. This pin seems to be linked to a beam current limiting system. On tracing back I found that the line goes via R3546 to pin 7 of the line output transformer, and that this pin was connected to chassis internally. According to the circuit diagram this is incorrect, so I came to the conclusion that the new transformer was faulty. This was disproved when another transformer was fitted, as the fault condition remained the same.

By cutting the PCB print between pin 7 of the transformer and R3546 I obtained a normal display. Maybe someone can

explain why the replacement transformer was wired differently from the original one? E.B.

National Panasonic WV5470B

This monochrome monitor was dead. The cause was the ICP (circuit protector) in the feed to the line output stage. A check showed that it was open-circuit. There are two ICPs, the other one feeding the line driver stage. They are not shown on the circuit diagram. You will find it necessary to resolder many dry-joints on the PCB. In this particular monitor the bridge rectifier diodes were about to fall off the board. G.T.

Melford Du3 Mk 2-12

This elderly monitor suffered from a severe hum bar. The main smoothing capacitor C1 was faulty. G.T.

GoldStar 1460

This SVGA monitor was dead because the line timebase wasn't working. We found that there was no line drive from IC701 because its 12V supply was missing. D701, a 1N4148 diode, was open-circuit. G.T.

National Panasonic WV5410

Line collapse was the fault with this 14in. monochrome monitor. The cause was traced to C615. Beware - this is a bipolar capacitor. G.T.

Microvitec 14H949GS2

The picture produced by this 14in. SVGA monitor was smeared, with shading on the left-hand side. We found that C924 and C954 on the CRT base panel were faulty. G.T.

Opus CME1414E

Field collapse was the problem with this 14in. SVGA monitor. We had to replace the TDA1675A field output chip along with the boost diode D301 and capacitor C304. G.T.

Answer to Test Case 404

– See page 709 –

What a collection of wallies! But it's easy to be wise with hindsight. Exactly the same 'fault' could crop up with some other models dating from about 1989, when Nicam hi-fi sound was starting to get about.

In those days manufacturers had the idea that in a hi-fi machine the LP mode should be reserved for audio only use, enabling up to eight hours of very high-quality sound to be recorded from any source – primarily via the stereo audio input sockets. The time limitations of a conventional audio recorder would thus be overcome, while providing higher quality sound. Hence the video signal muting, both in and out, in the LP mode. Has any reader tried the effect of disabling this mute action? We didn't try, but it would be interesting to see the effect – the video heads are optimised for SP use.

Mrs Hind was no more aware of the LP facility on her rented machine than she was of the presence of batteries in her zapper, and it wouldn't have occurred to her to try to record in this mode. Her son's habit of recording in the LP mode cost the Workshop a few pounds for not being on the ball! Any recordings he makes for Mum will now be in the SP mode, which is no bad thing.

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Most DMMs that incorporate capacitor testing are unable to check the higher values. To overcome the problem, Ian Rees devised this comparator bridge circuit, which is very useful for quick go/no-go checks. It has three switched test functions: leakage, discharge and compare.

SERVICING THE SAMSUNG V1710

This popular VCR was also sold as the Logik VR922 and the Sentra VX8100. John Coombes presents the know-how he has gained in the course of servicing large numbers of them.

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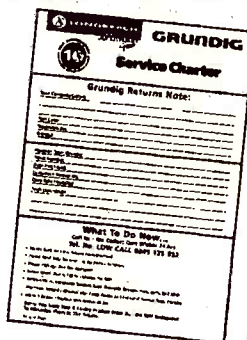
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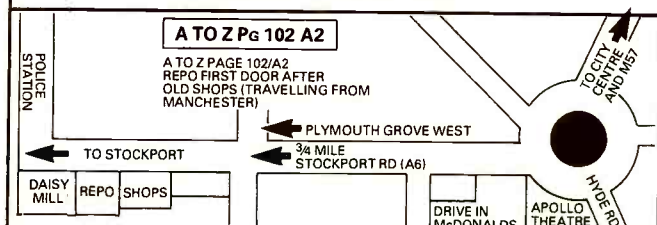
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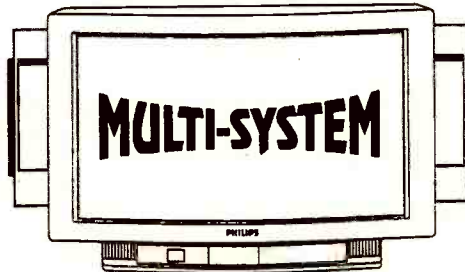
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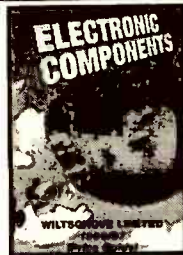
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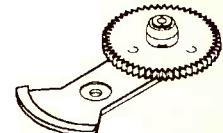
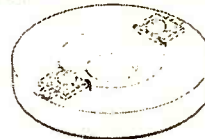
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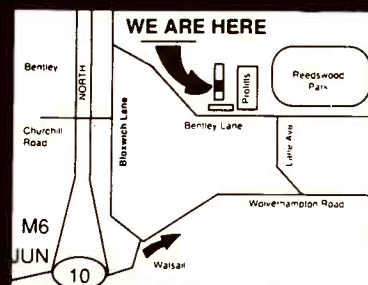
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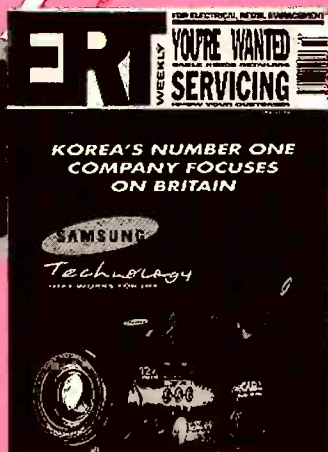
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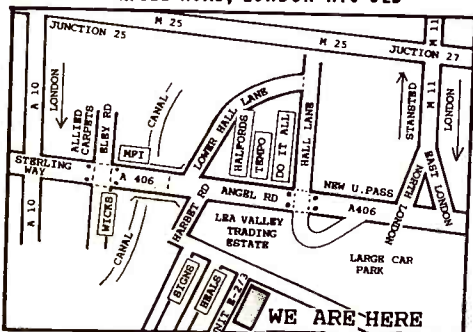
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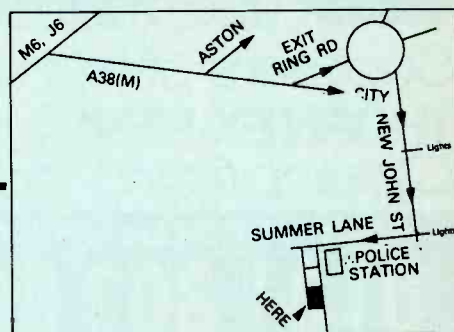
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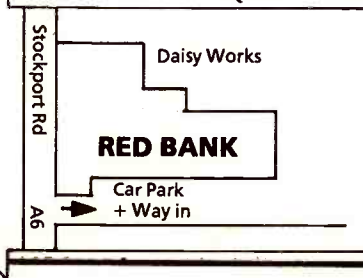
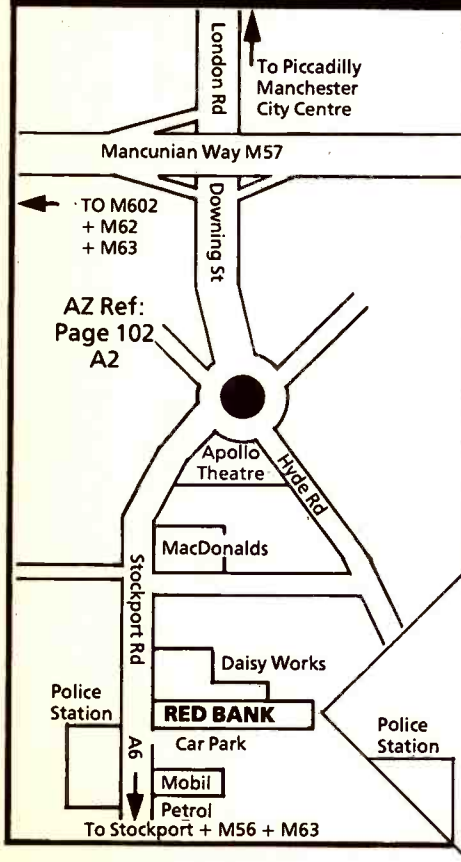
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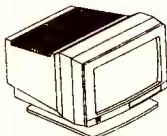
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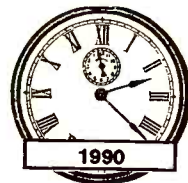
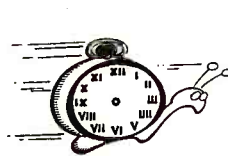
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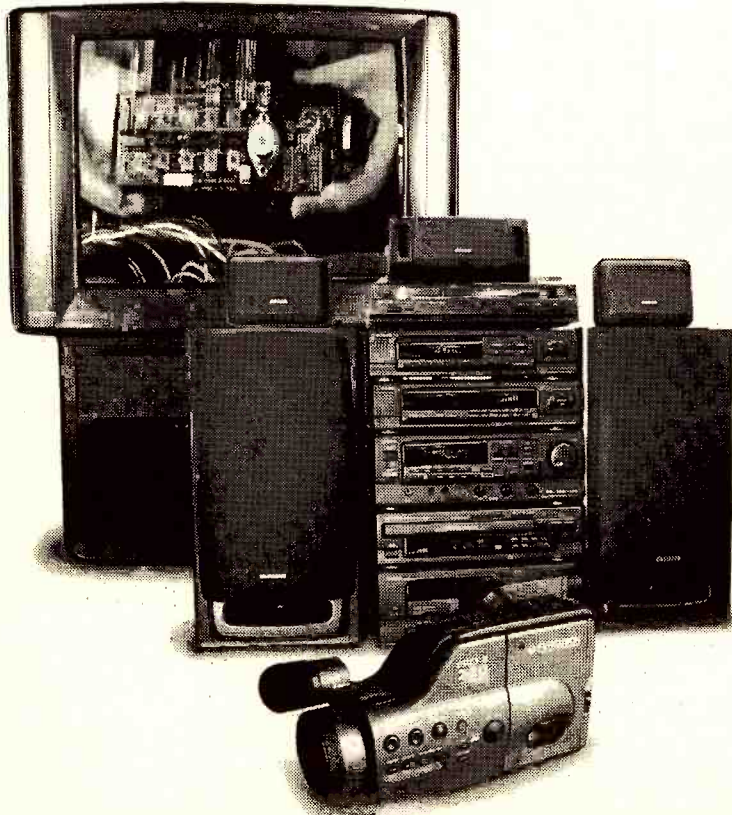
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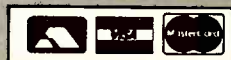
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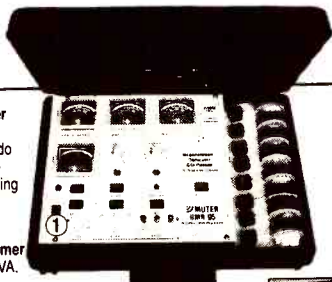
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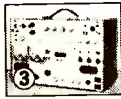
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