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AC175	22p	BD315	150p	BSX20	15p	MJE340	25p	2N2222	23p	15.0	180p	2A/200V	43p	6809	500p	AN7311	90p	KA2130	150p
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AD149	60p	BD332	40p	BT109	90p	MPB112	45p	2N2646	40p	BR36	44p	6821	130p	AY3-1270	800p	AY3-1270	800p	KA2210	230p
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AF139	30p	BD362	60p	BT146	95p	MPSA08	15p	2N2906	20p	BR62	80p	6845	200p	AY3-8910	360p	AY3-8910	360p	KA2213	130p
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BC143	20p	BD440	40p	BU204	65p	OC29	250p	2N3704	9p	7912	30p	8257	220p	BA521	100p	BA521	100p	LA1150	150p
BC147	20p	BD441	40p	BU205	70p	OC35	350p	2N3705	9p	7918	30p	8271	3400p	BA524	240p	BA524	240p	LA1185	150p
BC149	8p	BD533	30p	BU206	100p	OC36	250p	2N3705	9p	7918	30p	8279	270p	BA526	180p	BA526	180p	LA1201	75p
BC159	8p	BD534	38p	BU208	70p	OC45	50p	2N3707	9p	7924	30p	8283	400p	BA527	95p	BA527	95p	LA1210	140p
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BC171	10p	BD536	38p	BU208AT	200p	R2008B	100p	2N3711	12p	78L08	24p	8287	260p	BA534	220p	BA534	220p	LA1230	130p
BC172	10p	BD537	40p	BU208B	130p	R2010B	100p	2N3771	85p	78L12	24p	8297	220p	BA536	200p	BA536	200p	LA1250	200p
BC177	14p	BD538	40p	BU209	90p	S2000A3	175p	2N3772	90p	78L15	24p	8248	700p	BA546	160p	BA546	160p	LA1365	120p
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BC213	7p	BD681	40p	BU408D	75p	TIP30C	25p	2N5192	50p	78L08K	600p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC213L	7p	BD682	45p	BU409	75p	TIP30C	25p	2N5192	50p	79H12KC	700p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC214	7p	BD705	50p	BU426A	70p	TIP31A	22p	2N5241	50p	79H12KC	700p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC214L	7p	BD707	50p	BU500	100p	TIP32	24p	2N5294	45p	79H12KC	800p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
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BC238	7p	BD711	50p	BU505D	90p	TIP32B	21p	2N5296	30p	DAF56	100p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC239	7p	BD736	50p	BU505DF	90p	TIP32C	21p	2N5296	30p	DY87	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
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BC304	25p	BD899	55p	BU508AF	135p	TIP35D	65p			ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC304L	25p	BD900	55p	BU508B	70p	TIP35E	65p			ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC327	7p	BD977	55p	BU508D	90p	TIP41A	20p			ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC328	7p	BDX33	60p	BU508DF	115p	TIP41C	20p			ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC337	7p	BDX65	60p	BU508V	110p	TIP42A	20p	BY127	8p	ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC338	7p	BDW24	55p	BU508VF	100p	TIP42C	22p	BY133	8p	ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
BC441	28p	BDW83	50p	BU526	75p	TIP47	40p	BY184	8p	ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
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BC547	8p	BF183	20p	BU705DF	175p	TIP105	65p	BY229	23p	ECH84	90p	8932	200p	BA686	400p	BA686	400p	LA2100	1900p
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LM3900	40p	STK501	550p	STK5464	300p	STR45111	550p	TA8718N	550p	TDA1675	250p	TDA3653	150p	TD48191	425p	UPC1198H	200p	2SA954	30p
LM3909	10p	STK561	450p	STK5466	500p	STR50020	450p	TA8550	25p	TDA1701	300p	TDA3654	90p	TD48192	275p	UPC1222	130p	2SA958	60p
LM3914	160p	STK563	415p	STK5467	400p	STR50092	550p	TBA120S	400p	TDA1717	250p	TDA3710	300p	TD48196	150p	UPC1225H	220p	2SA963	120p
LM3915	160p	STK565	500p	STK5468	300p	STR5013A	280p	TBA298	70p	TDA1870A	200p	TDA3720	175p	TD48214B	225p	UPC1230	200p	2SA965	40p
LM3916	270p	STK567	600p	STK5471	300p	STR50113	500p	TBA520	100p	TDA1872A	180p	TDA3724	275p	TD48215B	300p	UPC1232H	120p	2SA966	35p
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M50117P	500p	STK1040	640p	STK5481	520p	STR56041	350p	TBA810AS	40p	TDA1940	180p	TD43760	350p	TD48341	250p	UPC1288V	230p	2SA985	60p
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M50784	300p	STK1050	650p	STK5483	440p	STR56041	550p	TBA820M	35p	TDA1950	175p	TD43791	300p	TD48390A	650p	UPC1318	300p	2SA992	30p
M50786	500p	STK1060	700p	STK5486	450p	STR58041	325p	TBA920	100p	TD4202	50p	TD43800	350p	TD48405	550p	UPC1335V	320p	2SA993	50p
M50790	600p	STK1070	850p	STK5488	480p	STR59041	450p	TBA950	100p	TD4203	65p	TD43803A	500p	TD48415	650p	UPC1350	115p	2SA999	30p
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M54523P	200p	STK2048	950p	STK6324B	600p	STRD1406	600p	TC9134	750p	TD4209	160p	TD43856	400p	TD48440	300p	UPC1373	85p	2SA1012	85p
M54523P	200p	STK2110	550p	STK6431	850p	STRD1706	450p	TC9142	320p	TD4210	150p	TD43857	350p	TD48442	200p	UPC1377C	200p	2SA1013	100p
M5484	200p	STK2125	580p	STK6722	725p	STRD1806	400p	TC9143	300p	TD4210	120p	TD43950	225p	TD48443	350p	UPC1378	180p	2SA1015	15p
M51516	260p	STK2129	750p	STK6732	1000p	STRD1816	400p	TC9145	150p	TD4212	140p	TD44050	150p	TD48445	400p	UPC1382	110p	2SA1016	30p
M51518	200p	STK2139	675p	STK6822	900p	STRD3035	300p	TC9148	200p	TD4240	140p	TD44092	350p	TD48452	200p	UPC1384	420p	2SA1018	100p
M51518	200p	STK2139	675p	STK6822	900p	STRD3035	300p	TC9148	200p	TD4240	140p	TD44092	350p	TD48452	200p	UPC1387C	250p	2SA1020	35p
M53712	140p	STK2155	900p	STK6922	500p	STRD4412	500p	TC149	425p	TD42048	600p	TD44100	225p	TD48453	350p	UPC1394	120p	2SA1021	35p
M53713	130p	STK2230	470p	STK6922	525p	STRD4512	400p	TC9150	225p	TD42054M	110p	TD44180	145p	TD48490	350p	UPC1397	350p	2SA1023	60p
M53714	270p	STK2240	740p	STK6962	275p	TA7054	190p	TC9152	425p	TD42107	250p	TD44190	180p	TD48702	275p	UPC1399	350p	2SA1023	60p
M53715	280p	STK2301	740p	STK6961B	600p	TA7061	115p	TC9153	300p	TD42148	350p	TD44200	360p	TD48703	500p	UPC1403CA	650p	2SA1026	90p
M53722	280p	STK3041	370p	STK6961B	600p	TA7066	120p	TC9156	300p	TD42151	200p	TD44281	300p	TD48709	320p	UPC1421CA	650p	2SA1029	60p
M53730	160p	STK3042	375p	STK6962	620p	TA7089	300p	TC9163	375p	TD42170	260p	TD44282	360p	TD48732	400p	UPC1421CA	650p	2SA1031	60p
M53731	220p	STK3044	500p	STK7216	420p	TA7119	150p	TC9164	400p	TD42220	200p	TD44294	200p	TD49045	400p	UPC1423CA	550p	2SA1037	50p
M53756	160p	STK3062	500p	STK7217	400p	TA7120	55p	TC9172P	300p	TD42270	250p	TD44400	175p	TD49080	550p	UPC1470	200p	2SA1038	40p
M53759	200p	STK3082	550p	STK7225	500p	TA7137	60p	TC9A990	100p	TD42320	80p	TD44420	150p	TD49083	180p	UPC1488H	150p	2SA1048	25p
M53789	360p	STK3097	500p	STK7225	500p	TA7140	105p	TC9B100	100p	TD42351	200p	TD44421	300p	TD49503	150p	UPC1505C	400p	2SA1051	300p
MC1455	65p	STK31521	900p	STK7251	500p	TA7157	100p	TC9D308AP	200p	TD42503	200p	TD44426	170p	TD49513	320p	UPC1515CA	200p	2SA1060	120p
MC1496	45p	STK3156	900p	STK7308	350p	TA7193	320p	TD62382	200p	TD42504	200p	TD44427	200p	TEA1002	650p	UPC1515CA	200p	2SA1061	75p
MC3401	45p	STK4017	400p	STK7309	400p	TA7200	200p	TD62506	200p	TD42505	300p	TD44431	150p	TEA1007	120p	UPC1520CA	250p	2SA1076	230p
NE555	20p	STK4019	480p	STK7310	470p	TA7205	110p	TD62705	250p	TD42506	500p	TD44437	300p	TEA1009	100p	UPC1536C	550p	2SA1077	300p
NE556	40p	STK4021	600p	STK7348	400p	TA7207	150p	TD6304P	300p	TD42510	450p	TD44439	220p	TEA1017	280p	ZN423	100p	2SA1081	80p
NE558	80p	STK4024H	500p	STK7349	400p	TA7220	85p	TD63062	350p	TD42514A	500p	TD44444	180p	TEA1019	130p	ZN424	100p	2SA1082	80p
NE558	110p	STK4025	530p	STK7358	440p	TA7214	220p	TD6350P	200p	TD42515	400p	TD44445	240p	TEA1025	240p	ZN425	150p	2SA1084	100p
NE567	115p	STK4026	680p	STK7402	560p	TA7217	145p	TD6359P	300p	TD42530	450p	TD44443	250p	TEA1045	300p	ZN426	260p	2SA1085	100p
NE571	290p	STK4028	550p	STK7404	400p	TA7220	220p	TD64001	200p	TD42532	120p	TD44445	220p	TEA1060	225p	ZN427	560p	2SA1091	100p
NE592	85p	STK4032H	510p	STK7406	650p	TA7222	90p	TD64002	200p	TD42540	85p	TD44450	225p	TEA1067	150p	ZN429	215p	2SA1094	190p
NE592P	140p	STK4036	470p	STK7408	675p	TA7223	210p	TD64003	150p	TD42541	120p	TD44452	250p	TEA1080P	170p	ZN459	190p	2SA1095	300p
SAA1006	300p	STK4038	680p	STK7410	600p	TA7225	290p	TD64004	175p	TD42542	225p	TD44453	275p	TEA1087	400p	ZN460	640p	2SA1096	80p
SAA1008	450p	STK4040H	650p	STK7554	800p	TA7226	290p	TD64005	200p	TD42543	210p	TD44480	280p	TEA1101	425p	ZN461	215p	2SA1098	180p
SAA1010	450p	STK4042H	800p	STK7561	650p	TA7227	170p	TD64006	200p	TD42545	120p	TD44482	350p	TEA1130	85p	ZN462	215p	2SA1103	130p
SAA1024	250p	STK4044	800p	STK7562	1000p	TA7230	100p	TD64007	200p	TD42546A	200p	TD44500	300p	TEA1151	150p	ZN463	215p	2SA1104	140p
SAA1025	250p	STK4046	900p	STK7563	800p	TA7232	95p	TD64008	200p	TD42549	300p	TD44501	400p	TEA2000	275p	ZN464	215p	2SA1105	250p
SAA1075	120p	STK4048	1280p	STK7564	700p	TA7233	120p	TD64009	200p	TD42555	175p	TD445							

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	2SD1289	250p	2SD1843	300p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2767	300p	2SC3282	600p	2SC3900	250p	2SD841	110p	2SD1291	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	500p	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	480p	2SD1308	80p	2SD1877	175p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2298	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD868	250p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	130p	2SC3996	1200p	2SD868	250p	2SD1310	140p	2SD1879	270p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2791	500p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1313	1000p	2SD1884	400p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC4020	280p	2SD866	120p	2SD1326	200p	2SD1886	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4023	325p	2SD866A	140p	2SD1328	60p	2SD1887	300p
2SB546	45p	2SC1106	180p	2SC1815	100p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4056	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	350p	2SC3323	480p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB561	50p	2SC1116	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	120p	2SC4124	250p	2SD879	60p	2SD1376	150p	2SD1929	60p
2SB566	90p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	25p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB566	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2825	900p	2SC3335	100p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	500p
2SB566	30p	2SC1162	30p	2SC1834	50p	2SC2334	80p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD892A	75p	2SD1384	50p	2SD1959	280p
2SB568	500p	2SC1164	600p	2SC1844	50p	2SC2335	75p	2SC2827	200p	2SC3353	280p	2SC4242	650p	2SD894	35p	2SD1390	35p	2SD1961	50p
2SB568	40p	2SC1165	750p	2SC1845	15p	2SC2336	150p	2SC2832	200p	2SC3355	50p	2SC4301	550p	2SD895	100p	2SD1391	250p	2SD1978	50p
2SB568	20p	2SC1170	180p	2SC1847	45p	2SC2344	150p	2SC2833	120p	2SC3356	120p	2SC4372	275p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB568	45p	2SC1173	150p	2SC1855	85p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	300p	2SD900	400p	2SD1395	150p	2SD2012	50p
2SB568	35p	2SC1173	40p	2SC1856	25p	2SC2360	120p	2SC2839	120p	2SC3361	50p	2SD198	140p	2SD906	450p	2SD1396	120p	2SD2125	225p
2SB703	90p	2SC1195	210p	2SC1865	700p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	19p	2SD916	130p	2SD1397	120p	2SD2333	200p
2SB705	200p	2SC1213	35p	2SC1870	700p	2SC2362	50p	2SC2877	120p	2SC3377	120p	2SD200	180p	2SD917	300p	2SD1398	120p	2SJ48	425p
2SB707	20p	2SC1214	15p	2SC1875	220p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD921	320p	2SD1399	300p	2SJ49	425p
2SB716	20p	2SC1215	15p	2SC1881	70p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD257	19p	2SD923	360p	2SD1400	280p	2SJ50	425p
2SB718	60p	2SC1216	200p	2SC1890	15p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD313	25p	2SD946	120p	2SD1402	150p	2SJ56	700p
2SB727	200p	2SC1222	20p	2SC1904	125p	2SC2373	210p	2SC2898	200p	2SC3393	80p	2SD315	75p	2SD947	100p	2SD1406	60p	2SJ74	600p
2SB754	80p	2SC1226	15p	2SC1906	15p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SD325	30p	2SD950	300p	2SD1407	60p	2SJ75	280p
2SB755	310p	2SC1252	850p	2SC1907	20p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD330	65p	2SD951	290p	2SD1408	125p	2SJ76	220p
2SB772	25p	2SC1278	110p	2SC1909	250p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD348	300p	2SD957A	520p	2SD1409	170p	2SJ77	350p
2SB774	50p	2SC1279	30p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD358	40p	2SD958	60p	2SD1412	75p	2SJ79	225p
2SB775	100p	2SC1306	90p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SD358	40p	2SD965	35p	2SD1413	60p	2SJ103	75p
2SB791	280p	2SC1308K	350p	2SC1923	100p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD970	170p	2SD1415	190p	2SJ108	60p
2SB796	60p	2SC1312	40p	2SC1929	180p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD973	60p	2SD1417	125p	2SJ115	525p
2SB825	135p	2SC1317	40p	2SC1941	110p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD381	50p	2SD973A	70p	2SD1426	260p	2SJ117	550p
2SB861	110p	2SC1318	40p	2SC1942	27p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD985	120p	2SD1426	160p	2SJ119	700p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD986	120p	2SD1427	180p	2SJ161	650p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD1012	40p	2SD1428	220p	2SK162	680p
2SB895	180p	2SC1328	15p	2SC1946	1500p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD1020	40p	2SD1429	410p	2SK19	45p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD1021	120p	2SD1430	280p	2SK40	50p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	75p	2SD1022	400p	2SD1431	250p	2SK49	50p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD1024	130p	2SD1432	400p	2SK55	100p
2SB1109	55p	2SC1358	270p	2SC1967	1300p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	160p	2SD1030	75p	2SD1433	750p	2SK68	700p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD1031	70p	2SD1438	140p	2SK73	100p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2502	200p	2SC2988	150p	2SC3460	130p	2SD438	35p	2SD1046	200p	2SD1439	165p	2SK106	40p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD467	15p	2SD1047	180p	2SD1441	280p	2SK107	40p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD1051	130p	2SD1445	200p	2SK118	50p
2SC398A	60p	2SC1384	20p	2SC1973	150p	2SC2530	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD1056	130p	2SD1450	60p	2SK125	100p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD1062	150p	2SD1451	260p	2SK133	650p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD1063	200p	2SD1452	350p	2SK134	415p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2540	1900p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD1064	250p	2SD1453	140p	2SK135	415p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2542	300p	2SC3026	550p	2SC3502	100p	2SD549	120p	2SD1065	160p	2SD1455	250p	2SK147	160p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2545	55p	2SC3030	300p	2SC3503	50p	2SD551	300p	2SD1069	150p	2SD1457	165p	2SK150	150p
2SC461	15p	2SC1407	50p	2SC2002	15p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD555	500p	2SD1071	450p	2SD1459	120p	2SK163	40p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD560	50p	2SD1073	350p	2SD1468	60p	2SK168	40p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD571	20p	2SD1088	150p	2SD1479	200p	2SK176	800p
2SC497	85p	2SC1429	50p	2SC2021	10p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD1094	520p	2SD1487	225p	2SK192	45p
2SC515	100p	2SC1444	275p	2SC2022	110p	2SC2552	60p												

Broadcasting Turmoil

It has been uproar time again in the world of TV broadcasting, something that tends to break out at each year's Edinburgh International Television Festival. The BBC's director-general John Birt presented the case for an increase in the TV licence fee, the first real increase (as opposed to an inflation catch-up) for ten years. At the same time he has been putting forward reorganisation proposals that could seriously demoralise those at the BBC while being of questionable effectiveness. On another front, suggestions that Channel 4 should be privatised, an idea put forward by the Treasury as a way of reducing taxes of all things, have been vehemently opposed by the channel's chief executive Michael Grade. There is a link between these two cases: Channel 4 was set up with a special remit to cater for minority tastes, i.e. like the BBC it has a public service function.

The case for the BBC's increase is not hard to make. It faces growing competition in an era when the technology is advancing fast, with the result that investment is essential for survival. If it is starved of funds, it could well end up being marginalised. There are those who have a great antipathy to the very idea of the BBC. But, in this age of spin doctors, tainted news and a vast media manipulation industry, the existence of a broadcaster whose main purpose is to be independent is vital. Many in other countries have good reason to recognise the importance of the BBC's role in providing an unbiased source of information and comment even if some in the UK, smitten by the privatise everything regardless bug, can't. Most of us do however appreciate the BBC's role, and

recognise that public funding is required to sustain it.

Whether the BBC makes the best use of the funds at its disposal is a quite separate matter, though it tends to get confused with the basic issue of the purpose of the BBC. I guess that most of us would be happy with a certain amount of inefficiency and fat at the BBC if this was the small price required to guarantee its independent status. The basic question here is what should the BBC be doing? Should it be a broadcaster in the full sense, with its own studios and facilities, or should it be reduced to a basic core which buys services as required?

At its start in the Twenties, the BBC had to be able to do everything. And that's how it has largely remained. You could argue that running its own transmitters and distribution system is no longer essential. But how far should such paring down of activities go? The BBC is not simply a collection of functions to be run at optimum efficiency. A live broadcaster has traditions and a culture: ways of doing things, links forged between people and departments to keep the creation of programmes going. Treat this with too heavy a hand and you could easily kill off the creativity that is the life and blood of a broadcasting operation. There is no good reason to introduce the sort of 'inner market' that has been attempted, with highly questionable results, in the NHS. Look at the way in which things are done by all means: traditions can often hide ossification. But the sort of 'chuck everything in the air and see how it falls' approach to management is simply unhelpful. Nor is it helpful to try to weld a buying and selling approach on to a

basically creative operation. Some financial discipline is of course essential. So too perhaps is a little internal tension to ensure that this is not forgotten and sharpen the creative edge. The danger is in allowing this to go too far. The old saw "if it ain't broke, don't mend it" is a sure guide in this sort of situation.

The question of the BBC's role in a rapidly changing TV environment is also a separate one. The important thing in this connection is that the BBC is there, and in a healthy state. It doesn't have to run 200 channels or link up with the Internet. Keeping pace with change is of course necessary, but what's important here is thoughtful evolution. One wonders about all this talk of 200, 300, 500 TV channels. However many there are, very few will play a significant part in the nation's viewing. This is where the BBC has to be able to maintain itself. Those hundreds of channels may compete more with VCR use, succeeding if they can offer a cheaper or more convenient alternative. This is narrowcasting rather than broadcasting.

As for the idea of selling off Channel 4 to provide funds to reduce taxation, this could come only from some faceless wonder with the heart and mind of a pocket calculator. But unfortunately such people exist and exert influence. They are the sort of lunatics who think up different ways of adding up prison sentences and common-sense defying ways of applying taxation (standby for the start of self assessment).

Television is a part of our culture. It is programmes first, a business secondly. Forget that and you might as well switch off. Full marks to Michael Grade on his stand.

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Binders that hold twelve issues of *Television* are available for £5.50 each from Television Binders, 78 Whalley Road, Wilpshire, Blackburn BB1 9LF. Make cheques payable to "Television Binders".

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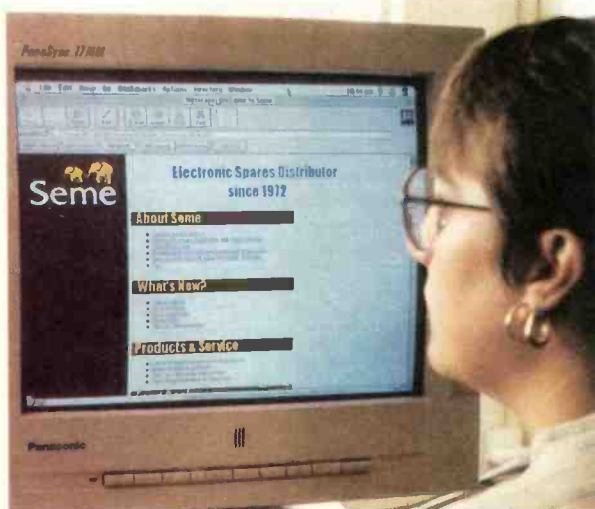
TELETOPICS

BSkyB's Success

BSkyB has been doing very well and has interesting plans for rapid development of its services. In the year 1995-6 (to end June) BSKyB achieved a record pre-tax profit of £257.4m, a 66 per cent increase on the previous year. Over the last five years the company has gone from a loss of £187.9 in 1992 to the present profit figure, showing a steady year-by-year improvement. The company claims a 900,000 increase in the number of its subscribers (dish and cable) over the year, to a total of 5.5m in the UK and Ireland. Annual revenue topped £1bn for the first time. BSKyB's success is based on popular programming which not only increases the number of its subscribers but also enables higher subscription rates to be charged. There seems to be no doubt about it: BSKyB has got the satellite broadcasting formula right.

The company says that it is on track to launch 200-300 TV channels in the UK before the end of next year. Some 60 channels are to be devoted to pay-per-view movies and sport. Not only that, subscribers are also to be offered access to the Internet and home shopping and banking. The aim is to develop a set-top digital TV decoder box with the power of a PC and in effect a very fast modem. Building in these extra features could give BSKyB, once again, the opportunity to establish its technology as a de facto standard. A confidential specification for the decoder boxes has been sent to manufacturers.

Two separate Internet services are planned. The most popular sites will be broadcast on a regular basis. In addition, it will be possible to use the modem and telephone for access to more specialist Internet sites.



SEME on the Internet

SEME Ltd. has started to issue information on products and services via the Internet. It appears to be the first company in this industry to make use of the new technology. The company points out that it is becoming increasingly difficult to use printed matter to keep customers up-to-date with new products etc. Information to be provided includes: how to find SEME, opening an account etc.; product information, data sheets and updates, with a quarterly newsletter and monthly special offer sheet; a parts and products index; and a customer feedback link.

DVD Latest

Sony and Philips have decided to offer their own licensing system for the DVD patents they own, regardless of the owners of the other patents involved. The move appears to be an attempt to break the present impasse between the computer and consumer electronics industries over issues such as copy protection.

The music industry has put forward recommendations for a new audio DVD format. These include: (1) a new copyright system that enables rights holders to authorise the use of their sound recordings and receive royalties; (2) the discs should all carry a Source Identification Code (SID) so that the pressing plant where they were manufactured can be ascertained; (3) compact discs should be playable by DVD players and vice versa – this presumes that discs are encoded with both conventional CD and higher-resolution DVD data; (4) audio DVD discs should also be able to carry video and data signals; (5) there should be an ability to offer multi-channel sound; (6) no conditional access should be used.

PDC Tests

The PDC (Programme Delivery Control) tests transmitted by BBC-2 have revealed several problems, the result being that wrong codes have been transmitted at times. The

problems relate to the flexibility built into the PDC specification, which runs to 60 pages, and the way in which broadcasters and consumer electronics manufacturers interpret them. Discussions are being held by the BBC, ITV and BREMA to resolve the difficulties. The BBC will be launching a full PDC service on BBC-1 once the problems have been resolved.

Digital TV

The two major German media companies Kirch Group and Bertelsmann have agreed to a common digital decoder standard.

A new organisation, DigiTAG (Digital Terrestrial TV Action Group) has been set up to promote and coordinate digital terrestrial TV in Europe. It will be open to broadcasters (public, private and commercial), manufacturers of ICs, equipment and consumer products, network transmission operators, broadcasting regulators and spectrum administrators.

Sony is to manufacture digital receiver-decoders for Canal Plus. Philips is supplying CLT Multimedia with a digital compression system for eight transponders aboard Astra: the MPEG2/DVB system will provide 56 video channels.

Dolby Transmissions

A number of TV programmes are due to be broadcast with Dolby Surround sound this autumn. They include BSkyB's Premier League football matches, basketball, fishing and boxing; the nine-hour drama

Rhodes and Crocodile Shoes II from the BBC; and Prime Suspect V and a Cracker special from Granada. New Dolby productions to be broadcast in 1997 include Moll Flanders, The Chest and Cold Feet.

Video Products

The latest releases from Sharp include the VL-E3411 camcorder, which is claimed to be the most compact model yet. It measures 188 x 121 x 92mm and weighs 730g. Features include a 3in. TFT active-matrix LCD and Optical Picture Control (OPC), which automatically adjusts the LCD's brightness level to compensate for variations in the surrounding ambient light conditions. Suggested price is around £600. There are also three new Nicam TV sets, which include a 40-channel auto-installation tuning system, black matrix FS tubes and front-mounted AV sockets, and the VCM64HM, a four-head Nicam VCR that features Sharp's Super Picture system. This is claimed to

improve the HF performance without increasing the noise level. Recommended price is around £330.

Bush is marketing a Dolby Pro-Logic kit, Model PRO250, which is designed for use with Nicam TV sets, VCRs and satellite receivers that have scart sockets. It consists of an amplifier/decoder and five speakers. Cost is around £200.

Canon has launched a new camcorder, Model UC-X30Hi, which has a x20 optical zoom, a x40 digital zoom, an optical image stabilisation system, a 180,000-pixel colour LCD viewfinder and the company's eye control technology. Other features include a built-in editor with RC time code and digital effects. All for £1,100.

VGA/PAL Conversion Chip

Raytheon Semiconductor has released in the UK its new TMC2360 chip, a video output processor that forms part of a computer VGA to NTSC or PAL conversion system. The system uses software so that part of the standards conversion is carried out on the main computer PCB. To assist with interlace conversion

the TMC2360 includes a proprietary flicker filter with three selective operating modes. There are also horizontal and vertical image controls. The chip is housed in an 80-lead MQF pack. We plan to include an article on the system in a later issue. For further details phone 01705 665 555.



Chemtronics, the leading US manufacturer of speciality service, repair and chemical products for the electronics and electrical industries, has launched its range in the UK. There are over 150 products, including desoldering braids, flux removers and lubricants. Our photo shows the Flux-Off II BrushClean system in use. For further details of the range contact Rocol Ltd., Rocol House, Swillington, Leeds LS26 (01132 322 625).

CPC Expands

CPC of Preston is expanding to meet the demands of its increasing customer base and product range. Over 17,000 new products have been added, necessitating the construction of a mezzanine floor which increases warehouse capacity to 80,000 sq. ft. Space for a further 35 people has been created in the sales office. The company now has over 38,000 live accounts.

NEXT MONTH IN TELEVISION on sale October 16

Servicing the Panasonic K Deck

The Panasonic K deck mechanism is used in NVSD and NVHD series VCRs. It's a centre-mounted arrangement with design improvements to reduce the number of components and adjustments required. John Coombes on servicing aspects and experiences.

Ch 5 Reception Techniques

Good Channel 5 reception will present different problems in different parts of the country. Some will be lucky. In others various problems such as co-channel interference will occur. Bill Wright looks at the situation and offers recommendations and suggestions.

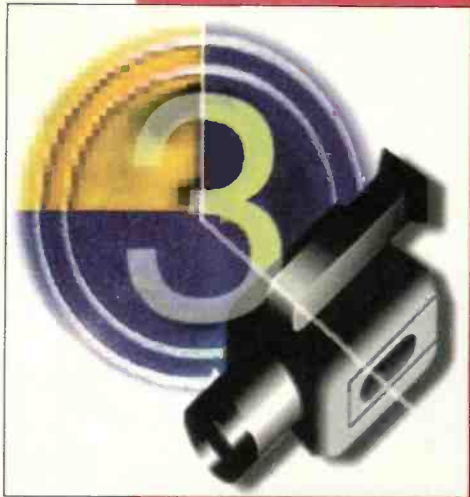
The Philips G110 Revisited

Richard Newman takes another look at the problems that can arise with this chassis, for which Philips has introduced an extra power supply repair kit to deal with 'rogue' sets.

Surface-mount Reliability

Unless the problems are understood, components used in surface-mounted assemblies can suffer fracture because of stress. Martin Pickering, B.Eng., on the causes and consequences of stress and the design solutions possible.

PLUS ALL THE REGULAR FEATURES



**Reports from
Adrian Spriddell and
David C. Woodnott**

Panasonic NVMC20B

The cause of intermittent zoom operation has been traced to excessive drag in the zoom motor gearbox. Several weeks ago we tried lubricating one with Tri-flow as an alternative to replacing the unit. Correct operation was restored, with no adverse side effects noted so far. **A.S.**

Sony CCDF500

The complaint with this camcorder was "no eject". In fact it wouldn't perform any mechanical functions. We noticed that when eject was requested the head failed to rotate: it twitched, then the unit went into the caution mode and shut down.

We suspected the drum drive chip IC004 on board SS93P, but a replacement made no difference. The culprits were C069, C070, C071, C072, C073 and C074, which were all either leaky or of changed value. Replacing them restored normal operation.

Interesting to note that in the fault condition the head could be made to rotate by giving it a prod, with normal operation until the head was stopped. **D.C.W.**

Canon E90E

This elderly unit suffered from erratic drum rotation, which led to no operation. We cured the fault by replacing C439, C440 and C441 (all 10 μ F, 16V) on the main PCB. They form part of the head drum commutation unit.

On test we then found that normal shut down was marred by failure of the viewfinder picture to extinguish

Camcorner

itself for at least five seconds. The cause of this was C2931 (47 μ F, 16V) on the grip PCB – it was leaky. The viewfinder behaved correctly when a replacement had been fitted. **D.C.W.**

Sanyo VMD3P

This model is well known for leaky capacitor problems, mainly on the video and syscon PCBs. The symptom with this one was absence of the camera E-E picture. We traced the cause to C9146, a 3.3 μ F capacitor on board CA1. It's not an electrolytic, and was short-circuit! No other damage had occurred, and a replacement cured the fault. We also replaced the usual twenty or so capacitors previously mentioned in this column. **D.C.W.**

Sony CCDFX300

The usual cause of intermittent operation in either the VTR or the camera mode is a faulty CAM/VTR switch. This comes as no surprise, as it's the same one that is used in most of the F range. **D.C.W.**

Canon UC1000E

There was no E-E or record sound. Otherwise the unit worked normally. A faulty microphone was the slightly unexpected cause of the fault. **D.C.W.**

JVC AA-V2EK (AC Adaptor)

Failure of the 150°C 3A thermal fuse TF4 is a common failure with this unit. A replacement is available from RS (part no. 417-076). **D.C.W.**

Sony EVA300UB

This camcorder tended to chew tapes in the rewind search mode. Rewind itself was OK, and the unit worked correctly in every other respect. A slightly worn pinch roller assembly was the cause of the trouble. As this item is expensive, we tried cleaning it. Unfortunately this didn't work and a replacement had to be fitted. **D.C.W.**

Canon E50E

When the lens assembly in these camcorders is subject to impact an

internal mounting bracket is often damaged and a few electrolytic capacitors can be detached from the main PCB, adjacent to the lens.

After repairs and capacitor replacement you may find that the unit powers down almost instantly after powering up. This is nothing to do with the impact: the cause is leakage from the capacitors just mentioned (C605, C616 etc.). But the area of the board affected is at the opposite side, where the electrolyte will have seeped around IC605, IC606 etc. These are regulator and reset devices associated with the main microcontroller chip IC601. Cleaning the PCB in this area should cure the fault. **D.C.W.**

JVC GRAX2

All functions were OK but there was no viewfinder picture. We found that a circuit protector (SOC250) had failed. On test no other circuit fault or excessive current demand was apparent and a replacement CP put matters right. The trade price of £8 plus VAT comes as a bit of a shock – other SOC type fuses normally cost around £2. **D.C.W.**

Canon A1HiE

We'd not seen one of these camcorders previously. So it came as a surprise when we received three of them within a week from different sources. All suffered from similar problems, which ranged from uncontrollable drum speed to knocking noises from the drum motor and intermittent operation. As service information is no longer available, an educated guess seemed to be in order. We replaced all twenty two electrolytic capacitors on the MDA board.

The reason for this possible 'overkill' was our previous experience with leaky capacitors generally – and the fact that the MDA board takes some getting at in this model! All three machines are now happily back with their owners. Our only slight worry is that there are several other similar capacitors on other PCBs. **D.C.W.**

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3V29/3V30
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BLAUPUNKT 8667	1600p	LOT26
ITT COMPACT 81	1450p	LOT27
ITT CT3326 MUL	1500p	LOT28
ITT D068/37 EQ	1600p	LOT29
ITT 3546 EQ	1500p	LOT30
LUXOR 5810110	1600p	LOT31
SABA 849380920	1600p	LOT32
HITACHI 2434141 CP	1450p	LOT33
FE TX100 110 D	1700p	LOT34
HANTAREX 28021	1600p	LOT35
SHARP C3790 EQ	1600p	LOT36
HITACHI 2432981 CP	1500p	LOT37
FERGUSON 00D3-508-002	1650p	LOT38
Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3, 41H3, 41H2, 51K3		
PANASONIC TLF14567F	1850p	LOT39
Used On: TC2043, TC2243, TX300		
PANASONIC TLF14568F	£15.00	LOT40
Used On: TX2231, TX2244		
PANASONIC TLF14584F	2350p	LOT41
Used On: TC2210, TC2160, TX1752, TX2112		
TX2112, TX2162, TXC22		
PANASONIC TLF14586F	£18.00	LOT42
TC1851, TC2051, TC2061, TC2253, TC2263, TX5600		
HINARI	1600p	LOT43
Used On: CT15		
HITACHI 2434274	1250p	LOT44
CPT2174, CPT2176, CPT2178, 2434274		

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PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585, VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000	4600p
	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
	SLV3E3UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL PANASONIC	NVG20, NVG21, NVG22, NVG25, NVG26, NVG28, NVG200, NVG48 PART NO: VEH 0343	3000p
	NVG33, NVG45, NVG46, NVL23, NVL25, NVL28 PART NO: VEH 0417	2900p
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130 PART NO: VEH 0416	2700p

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Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI V52, 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, BONDSSTEC, 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	625p
VBR 0125		625p

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Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
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GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	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	2800p
	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 PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	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	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	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	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55, V57	CH01	2800p
	V65, V66	CH02	2800p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	160p
SWITCH CLEANER	176ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SP08	310p
AERO DUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	230p
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	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
ORIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

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CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S	2200p

Cassette DC Motors

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

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AUTO REVERSE HEAD	200p

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15 WATT 240 VAC (XS15W 240V)	S102	900p
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15 WATT SPARE ELEMENT	S104	450p
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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 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3768	80p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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REMOTE CONTROLS

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GRUNDIG					
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TP400	RC 401	675p	KT3 TEXT	RC 5301	750p
TP590-600	RC 600	750p	RC5352	RC 5352	750p
TP390, TP610	RC 610	750p	RC5375	RC 5375	750p
TP621	RC 621	800p	RC5 STANDARD	RC 5534	850p
TP630, TP650	RC 650	750p	RC5901	RC 5901	850p
TP660	RC 660	750p	RC5903	RC 5903	700p
TP661	RC 661	750p	SABA		
HITACHI					
CLE800-CLE830	RC 140M	700p	T6772	RC 149	900p
A617402/655602	RC 192	800p	TC319-320	RC 328	800p
A512120/230	RC 900	750p	TC356	RC 356	800p
A514790	RC 901	750p	TC358	RC 358	800p
A5088470	RC 902	800p	TC360	RC 360	750p
A518612	RC903	750p	TC365	RC 365	750p
SCL002	RC904	750p	SALORA		
C2096	RC 905	800p	SERIES L	RC 190	750p
A511940	RC 906	750p	86173	RC 882	750p
655602H	RC 907	800p	SANYO		
ITT					
IFB13, 14, 15	RC 143	800p	RC218, RC222, RC228, RC238	RC 140M	700p
FS4	RC 148	750p	JXGE	RC 878	800p
RG305	RC 305	675p	JXDE	RC 884	750p
RG306	RC 306	750p	VHR2300	RC 890	750p
FS9/1-10/1	RC 307	750p	RC628	RC 865	900p
VS5 RUK	RC 308	750p	SHARP		
VS4-1	RC 310	750p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
MULTICONTROL (17C20)	RC 311	750p	SIEMENS		
KORTING					
18279, 18396, 18460, 18521 SE	RC 108	750p	FC616	RC 130	850p
40540 VTS	RC 108	750p	FC631	RC 132	750p
LOEWE					
DC11	RC 146	800p	FC742	RC 164	750p
MATSUI					
010270601	RC 889	750p	SONY		
VX770	RC 892	750p	RM604, RM605, RM606	RC 140	700p
METZ					
JAVA COLOR (6890)	RC 166	800p	32 CHANNEL	RC 140M	700p
COLOR (7156)	RC 183	800p	RM613	RC 141	750p
JAVA (7180)	RC 184	800p	RM632, RM636	RC 160	675p
MITSUBISHI					
939P/03607, 939P/03609	RC 140M	850p	TATUNG		
NOKIA					
SATELLITE	RC 550	750p	FXA	RC 877	750p
NORDMENDE					
TC2336	RC 351N	750p	RC70	RC 883	750p
CMC1, TC3519	RC 356	800p	FX70 FASTTEXT	RC 894	750p
OCEANIC					
390C9500	RC 339	750p	TELEFUNKEN		
ORION					
RC53	RC 892	750p	FB632	RC 632 ST	750p
PANASONIC					
EUR51200	RC 200	800p	FB639	RC 639 ST	750p
TC2200	RC 201	850p	THORN/FERGUSON		
VSQ0357/NV730	RC 202	750p	3V35-42	RC 342	650p
TN01621	RC 203	750p	3V31-32	RC 344	750p
PHILCO					
CARVEL, CONCORDE,	RC 108	750p	3V57-58	RC 628	750p
MERCURY, TELESTAR			TX10 TEXT	RC 732	575p
TC10	RC 152	900p	TX10 STEREO TEXT	RC 738	575p
PHILIPS					
RC5002, 5154	RC 134	750p	TX9-90-100	RC 740	675p
KT3 NON TEXT	RC 135	750p	3V55, FV11	RC 783	750p
69117032-	RC 178	800p	TX100 FASTTEXT	RC 785	650p
69117194	RC 180	750p	TX100 STEREO FASTTEXT	RC 789	650p
RC5991-UNIV	RC 300	580p	PROFESSIONAL	RC 790	650p

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315mA	FUSE03	75P	FUSE19	60P
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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

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13A	FUSE35	100P
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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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ICPF20	ICPF75	ICPN20	ICPN75
ICPF25	ICPN5	ICPN25	

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Amstrad Original No: 153154
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 Also fits: Antitech, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguant, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Uniersum

Order Code: AH02 Price: £14.50

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The photo above shows the Manhattan 9000 satellite receiver's PCB

The Cambridge RD480 receiver seems to have been given a new lease of life – it's been available on the second-hand market at ridiculously low prices. It usually comes without a user handbook however. This leads to the question (even from dealers) "how do I get the on-screen menu?" You don't – this model doesn't produce one. It's limited to the front-panel display only. And since this doesn't show the frequency, you can't easily tell which programme you are watching.

The receiver is more versatile than it appears however. Channels 01-16 cover Astra 1A, channels 17-32 Astra 1B, channels 33-48 Astra 1C and channels 49-54 Telecom 1C. Channels 55-99 cover the range 950-1,710MHz in 20MHz steps. These are factory-set to horizontal, so you will need a remote control handset to change the polarisation to vertical for some of them. Channels 55-99 are ideal for Hot Bird or for radio programmes.

Note that all the channels are fixed (pre-tuned), only fine tuning being possible. Channels P1-8 are 'favourites': you can set these to mirror any of the other 99. The

WORKSHOP

programming is not too straightforward. To help, a user guide is available for £6.95 from SatCure (01270 753 311). This comprehensive booklet includes channel frequency listings for both standard (10GHz) and enhanced (9.75GHz) LNBs, as well as channel settings when an ADX Plus is used. A special two-LNB switching box (type μ VH7) is also available. The RD480 sends a special pulsed code up the LNB cable for each channel. The switching box recognises the code and selects the appropriate LNB. Cambridge developed this system long before 22kHz tone switching was considered. It works very well.

Philips STU824

I've mentioned before that this receiver is susceptible to some sort of microcontroller 'lock-up' which prevents it responding to remote control commands. Apart from the obvious need to press 'SAT' instead of 'TV' on the remote control unit, various solutions have been found to work some of the time. One is to replace the microcontroller chip with a Pace PRDXXX type, then put the original back (or, as one enterprising dealer suggested, leave the Pace device in, supply a Pace remote control unit then sell the Philips remote control unit at a profit!).

Alternatively, fit a new, blank EEPROM.

You will be interested to know that a secret button sequence was written into the firmware to force the receiver to ignore the remote control unit (don't ask me why!). Hold 'Standby' and '+' while applying mains power. You will see P10 in the display and the remote control unit will now be ignored. To reverse the process, hold 'Standby' and '-' while applying mains power. This time you will see P8 in the display and the remote control unit will now work. Obvious, really!

Pace SS9000

Although this model is not Astra 1D compatible many people still use it and are happy to pay for repairs. A fault that's becoming increasingly common is the demise of C21

(2,200 μ F, 25V) and C25 (2,200 μ F, 16V) at the front of the power supply. Amongst other things, failure of C25 results in streaks on decoded pictures. Failure of C21 reduces the 5V supply. A common symptom is that the receiver remains in standby until it has warmed up, after which it may work but with sparkly pictures and tuning drift. I now replace these two capacitors as a matter of routine.

You often find dry-jointed chopper transformer pins (T2). Common symptoms are factory reset at power-on, or intermittent loss of the picture. I've even seen one that flashed its LEDs in a random sequence before it went off completely. Customers' fault reports often include the comments "when tapped" or "loses memory". Look out for this.

The Uniden UST7007

In its day this was a wonderful machine. Nothing has changed except the public's perception. It has 999 tunable channels, with polariser control, and superb picture quality. The drawback is that the tuning range is limited, so an ADX is required to receive Astra 1D. It has no built-in decoder, and a simple wiring modification is required to enable it to work with an external one. The UST7007 makes an excellent basis for a motorised system, and can be obtained for a song. Remote control units are not available, but you don't really need one.

Reliability is generally good, but a few faults occur regularly. The following notes cover most eventualities. If there's no LNB supply, check the switch position! Check the fuses and replace as necessary. Remove the base plate and resolder all the connector pins beneath the rectifier board. For picture problems, replace the electrolytic capacitors inside the tuner – note their orientation before removal, because this is not shown in the tuner. There are two 1 μ F electrolytics towards the rear, left side of the board, one at each side of an IC. I forget their designations, but find them and replace if necessary. Low video level is the symptom when they fail.

The tracks around the scart sockets are very fragile, and intermittent connections to the decoder are common. Bear in mind that the wiring modification enables an external decoder to be plugged into the VCR socket: the decoded picture appears at the RF output but not at the TV scart socket.

Amstrad SRD510

I sometimes wonder about hygiene when I lift the cover off a receiver and look inside. *This one seemed to have been used as a vacuum cleaner!* The complaint was "audio but no picture", which was not surprising since everything inside looked black. After cleaning out the dust, fluff and dog hairs, I scraped away the black carbon that had once been glue then replaced C54 and R80, which invariably fail. As this made no difference I resorted to using the scope. It's sometimes quicker than guessing! The base-band signal from the tuner reached the C-band switch but got no farther.

Failure of this slide switch is very unusual. I shorted it out and traced the signal as far as R9, where it again stopped. (C1 and C6 also fail sometimes, but were OK this time). When R9 (470Ω) had been replaced the signal got as far as TR1, but the output from its emitter to the

decoder was very weak. The voltage at the junction of R4/5 was 0V instead of 2V. Replacing R5 (12kΩ) finally produced a picture from the decoder scart, but not from the TV scart or the RF modulator. The final fault was a dry-joint at C55. After resoldering this the receiver worked perfectly. I can't believe that all these faults occurred simultaneously!

The power supply components looked very blackened. I wondered *whether the receiver would last for the guarantee period before failing.* In the end my conscience won and I replaced the suspect components before returning the unit to its owner.

Manhattan 9000

This receiver, with a built-in positioner, is based on the Winersat. It was developed by the Eurosat group a couple of years ago. The owner of one of them had disconnected it and, on a wet and windy day following a thunderstorm, brought it into my workshop.

"I've checked the fuse" he said, "so it's going to be expensive. But let me have an estimate if it's going to cost more than fifty quid."

He left the unit. As I had nothing better to do, I removed the cover and rummaged inside. The receiver

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:

jackarm@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.

was in good condition: it hadn't become obviously hot, and no one else had been inside. In fact I suspected that the fuse the owner had checked had been the one in the mains plug, because there are several inside the 9000. I checked each one in turn and found that E301 (630mA) was open-circuit. With a replacement fitted I stood well back and switched the mains power on. The receiver lit up, and subsequent tests showed that it was working perfectly.

The customer was delighted when I told him that the cost of the repair was within budget. I had no pangs of conscience: I have to make a living!

Test Case 406

We haven't mentioned Techno-supersleuth for many years now. Not since he left the Test Case workshop to open his own sales and service operation in King's Road, on the other side of town, where he's experienced mixed fortunes. He certainly hasn't got rich, as he had hoped when he departed. In fact he reappeared recently looking for 'contract' work.

Ironically, he brought with him a VCR for repair, one on which he'd given up. Make and model details are unimportant, as the struggle to be recounted could have applied with many (but not all) domestic VCRs. The symptom was relatively simple: failure of the erase system, with the result that pictures recorded on any tape other than a brand new one suffered, on playback, from floating coloured blobs and lines – the effect produced by unerased chroma from the previous recording. More often than not this trouble is accompanied by an audio problem, the sound track from the previous recording being heard, still there because it hasn't been erased. In this case however the correct sound did come through when a recording was played back.

Failure to erase a tape would suggest that the full-erase head isn't working, which is quite a common fault. It's often caused by defective connections at the full-erase head. In this machine the connections are made via a push-on plug/socket link. At an early stage TS had cut off the flying socket and soldered the wires directly to the head's pins. A subsequent test recording showed that this had not cured the fault. So TS brought out his oscilloscope to check the amplitude and frequency of the erase feed to the head. It turned out to be correct, a pure sine wave at about 70kHz with a peak-to-peak amplitude of 50V (few manufacturers seem to quote

these parameters in their service manuals). TS had appreciated the need to carry out this test at the head's pin connections.

So the erase signal was apparently reaching the head but not the tape. For the first time it occurred to TS to try cleaning the head, though he'd never heard of any problems being caused by a dirty one. Doing this made no difference at all. Perhaps the head was open-circuit internally? Not according to his ohmmeter, which he connected across the flying socket after withdrawing it from the plug at the PCB end. By this stage TS was running out of ideas.

In a last-ditch attempt to cure the fault he found and fitted a complete audio bias/erase oscillator block. Once more this made no difference. What to do now? It was at this stage that TS phoned us, to ask whether we had in stock a full-erase head for the particular model. We hadn't, because we'd never had one fail. Nor was there an identical VCR in our scrap pile to cannibalise. TS's estimate of thirty pounds including VAT, based on the expectation of a quick solder up and clean, was – it seemed – going to be wildly exceeded in terms of diagnostic time alone.

Sage, who had been listening to the whole sorry tale, put the recalcitrant machine on his bench and gazed at its deck. He switched to record and watched the tape lace up. His eyes widened, and he fixed TS with a broad grin as he pointed out where the cause of the trouble lay. No electrical tests, no meters or oscilloscopes were required. After a few minutes he had the machine fully operational in its record mode, erasing the tape properly on its way to the head drum. There was no charge to an old friend, and TS took the machine back to his battered car. What had Sage spotted? For the solution, see page 907.

Retuning for Channel 5

The Channel 5 retuning programme is now in full swing. Eugene Trundle on what is involved and some of the problems that could lie ahead

Britain's newest terrestrial TV service, Channel 5, is due to start scheduled transmissions on January 1st 1997. Nine of the thirty three transmitters will use ch. 37, which is in the gap between broadcast Bands IV and V. Channels 35, 36 and 37 have been used for aeronautical radar, with ch. 38 reserved as a 'quiet' channel for radio-astronomy purposes. France and Ireland both use channels 35 and 37 for broadcasting.

Channel Plan

The forty four channels currently available for UHF TV broadcasting in the UK are heavily used for BBC-1, BBC-2, ITV and Channel 4 transmissions – each is used up to a hundred times throughout the country, the allocations being based on a complex geographical, channel spacing and polarisation plan to ensure that – except during times when the barometric pressure is high – co- and adjacent-channel interference are minimised. There are some 'spare' channel allocations within this plan, but these offer a population coverage of only 30 per cent. As this is insufficient for a viable commercial service, the

government gave approval for the use of ch. 37, enabling the new service to reach about 74 per cent (forty million people) of the population. Channel 5 Broadcasting (C5B) has applied for the use of ch. 35 at selected sites to increase its coverage to approximately 80 per cent – a further 3.7 million people.

The ch. 37 transmitters to be used for C5 broadcasting are at Black Hill (South Scotland), Black Mountain (Northern Ireland), Cambret Hill (SW Scotland), Croydon (London), Emley Moor (Yorkshire), Litchfield (Midlands), Mendip (West of England), Presely (West Wales) and Redruth (Cornwall). It is in the service areas of these main transmitters that the retuning operation is currently taking place. The areas affected are shown in red in the map on the next page, with the C5 coverage areas where retuning should not be necessary shown in pink. The coverage gaps in the south and east of England are there to prevent interference with TV reception on the Continent.

Need for Retuning

A condition of the broadcasting licence granted to C5B is that its transmissions must not cause interference to

existing services and domestic installations, also that at least 90 per cent of the homes at risk (interestingly, not commercial premises) should be visited, with retuning as necessary, before the start of scheduled transmissions.

The problem is that the links between most VCRs, satellite receivers and TV games and the sets with which they work are at RF, generally operating within the ch. 36-38 spectrum. As a result, with C5 transmissions added there would be beating between the carriers and severe herringbone interference and other effects whenever the VCR, satellite receiver etc. was in use.

The Retuning Operation

The retuning operation required consists of connecting a black-box caption generator to the equipment concerned, to simulate a ch. 37 C5B transmitter, adjusting the RF output from the VCR/sat box to a clear spot in the UHF spectrum, where no mutual interference is experienced, then finally adjusting one spare TV receiver tuning button to the C5 frequency and the 'AV' button to the newly set VCR/sat tuner output frequency. No equipment will be dismantled or removed from the home by the C5 retuners. The retuning operation is a massive and complex one that will, it's estimated, cost around £60 million. To comply with the licence conditions, about 9.6 million homes have to be visited, checked and retuning carried out where necessary during the five month period between August and December 1996. Retuning is free of charge to the public, and C5B's main concern is with the security aspect.

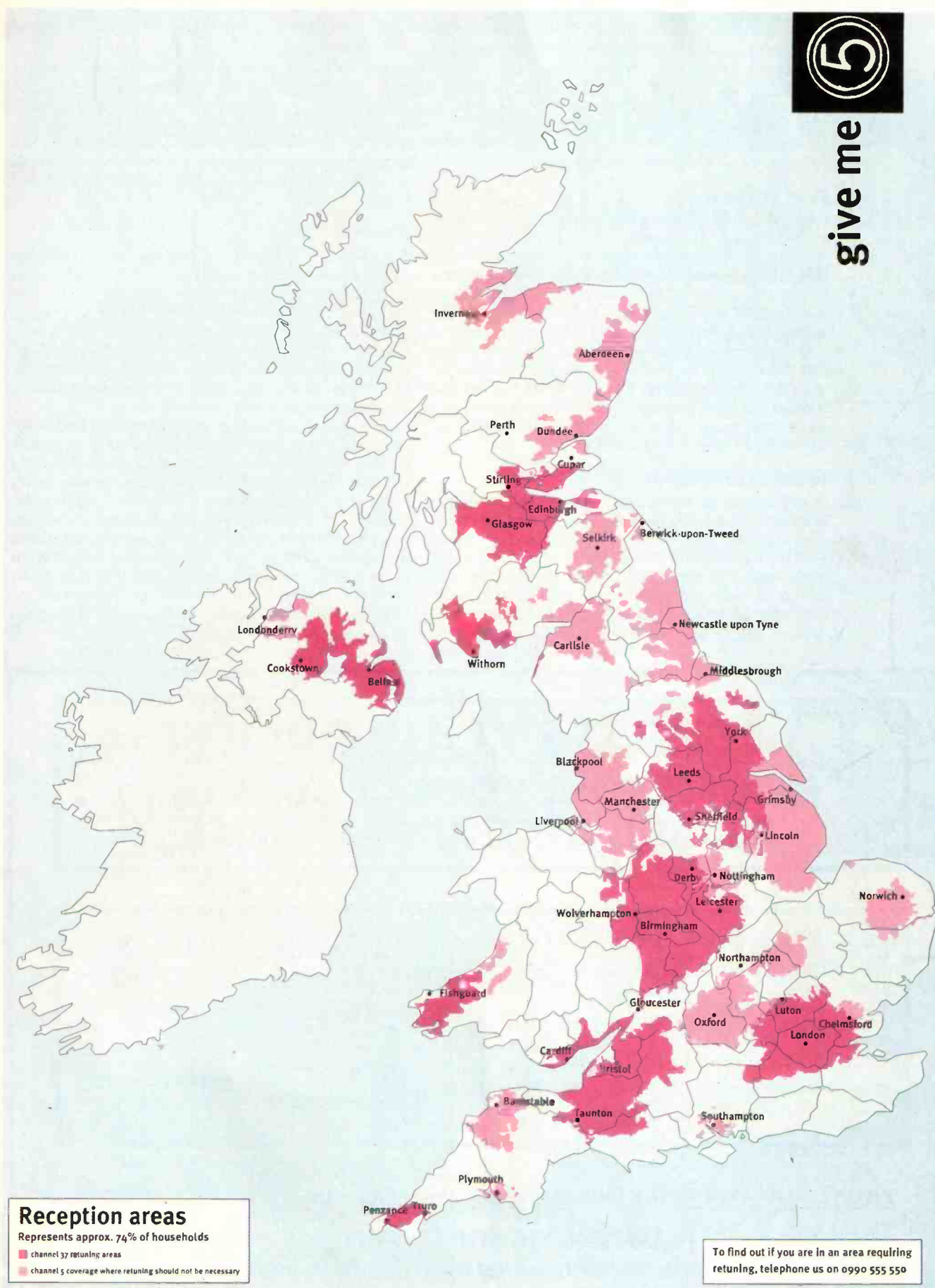
Some 7,000 retuners have been recruited. They are all over 25 years of age and will have been checked against police and other files for criminal records and debt judgements. After one day's intensive training on customer care, and two on the practical and technical aspects of the job, they are provided with a distinctive 'Give me 5' uniform, a twiddler, a signal-generator box and a photo-identity card then sent on their rounds. The identity cards will be linked to a unique password which can be checked using a freecall phone number. Each household will receive an advance, personalised letter with an individual security code which must be matched by the retuner before entry is allowed.

The whole operation is being controlled and co-ordinated at three telephone call centres which are being manned by 1,200 operators. About four million calls are expected during the five-month retuning period, with nearly 90,000 appointments per week. The service is expected to continue for about three months after the start of transmissions, to deal with any additional problems that arise and to visit any homes missed during the initial calls.





give me



Predicted Channel 5 coverage. The map also shows the areas that will be affected by the need for ch. 37 retuning.

C5B has entered into agreements with Granada Services and Thorn Homeserve (Radio Rentals) to implement and support the retuning programme: they will carry out retuning for their subscribers, provide a training service and provide publicity for the new channel in their shops. Other dealers are not to be paid to deal with their own rentals. All that they have been given is an assurance by C5B that they will be kept "well informed".

Pilot Scheme

A pilot retuning operation was carried out this summer, at Wallington in Surrey. The ITV Association commissioned a survey which suggested that it was fraught with problems: according to the survey less than 60 per cent of the 10,000 households involved were contacted by the retuners, with retuning carried out successfully at less than half of the homes visited.

At a recent press briefing a C5B spokesman admitted that there had been problems with productivity, the technical aspect and paperwork during the test run, but claimed that many lessons had been learnt and that as a result the main retuning programme would go smoothly.

Technical Problems

Where retuning problems appear to be insurmountable, a blocking filter is being fitted to notch out the C5B carrier altogether: this situation is most likely to occur when a VCR and a satellite receiver are daisy-chained in the aerial link. The extent of interference problems will become apparent only when transmissions start. It has been widely predicted that they will be many and difficult: see, for instance, Harold Peters' comprehensive

analysis of the situation in the July 1992 issue of *Television* (page 656).

Since that article was written, some partial solutions have emerged. A number of more recent VCRs, for example those in the Ferguson range, have RF modulators that produce an output in the region of ch. 60. Others have a facility to switch off the modulator. Some satellite receivers have a programmable HF modulator that can be set to any channel within the UHF band: it works on the frequency-synthesis principle.

General Points

A big Channel 5 publicity campaign has been in operation since August, an important part of it being an information pack that's being sent to every home in connection with the retuning programme. Further backing is being provided by 3,000 posters nationwide, by promotional material in nearly 1,500 High Street outlets (mainly those belonging to the Granada, Radio Rentals and Blockbuster video-hire chains) and by information packs being distributed to schools, libraries, etc.

There is little information at the time of writing about Channel 5's programmes and schedules, primarily because of the competitive nature of the TV broadcasting industry. The new service will be free to viewers, being financed by advertising revenue. It's to be a "modern and mainstream" channel with mass appeal, featuring entertainment, drama, sport, news and current affairs, films and children's programmes. Channel 5 will originate at least 60 per cent of its output, and there is to be no more than 15 per cent repeat content in the first year.

Next January should be an interesting time for those in the Channel 5 coverage areas! ■

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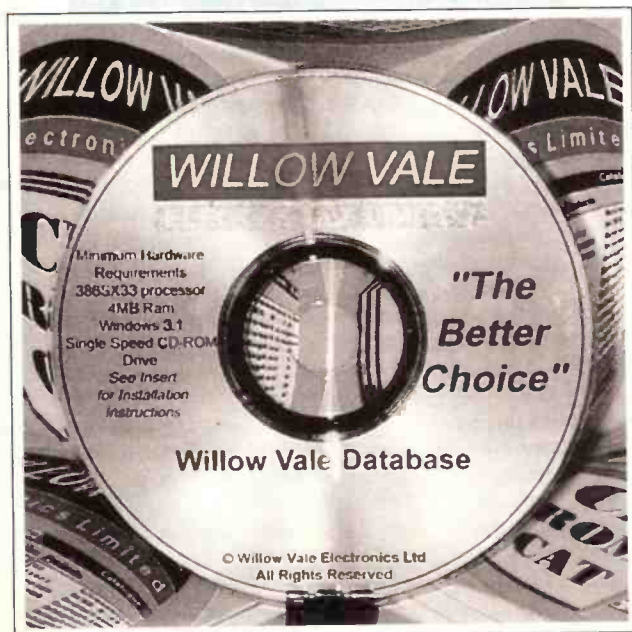
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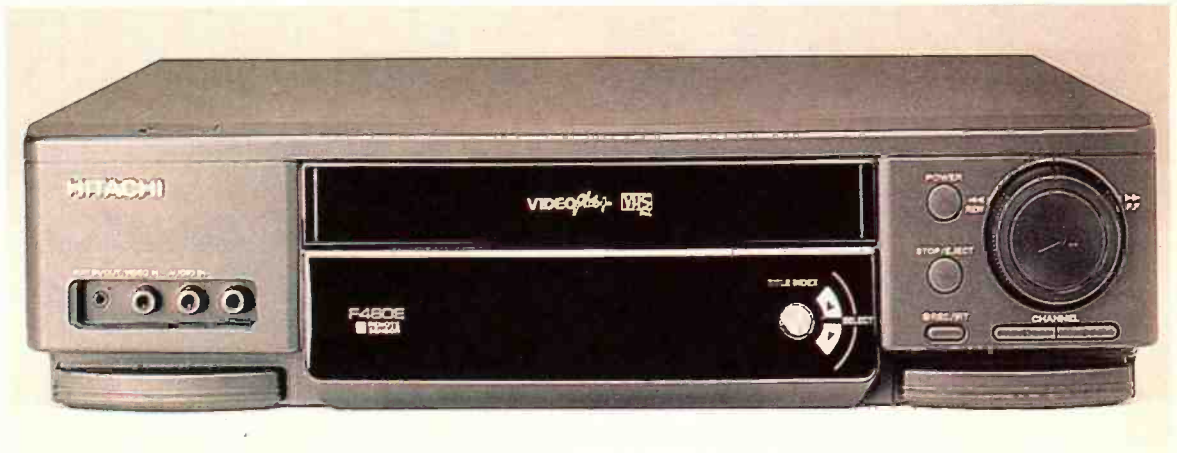
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Centre-mounted Madness

Is the centre-mounted VCR mechanism a sales fad? It certainly doesn't help with servicing or reliability. Jeff Herbert argues that the traditional layout has advantages all round

The first centre-mounted VCR mechanisms appeared over ten years ago. Remember the Ferguson Models 3V23 and 3V32? They were followed by a return to the more familiar layout, with the mechanism on the left and the cassette slot offset in the front of the cabinet. This format was used in scores of models. As technology progressed, the PCBs became smaller and fewer. Mechanisms also developed, becoming more compact, lighter and simpler. The use of plastic parts helped with this.

The offset design provides excellent access for servicing. Removal of the cabinet top and bottom enables both sides of the mechanism, and often the PCBs, to be viewed. Fault finding can thus proceed without it being necessary to dismantle the unit.

The Change

During the last two years however all current VCR manufacturers have changed over to the centre-mounted arrangement. To quote that over-used phrase from the TV programme *Eastenders*, "what's going on?" Why did nearly all production change to the centre-mount approach, with the need for redesign and consequent servicing difficulties?

My personal view is that the design change was made for sales reasons, to make the familiar left-hand cassette slot appear old-fashioned and persuade consumers to update their equipment. There is a production advantage however: time is saved by the use of a mechanism that plugs into the PCB directly.

One manufacturer boasts about a more balanced picture output, easier tape insertion and more stable tape running. Such claims may perhaps help to make a sale. But in practice if the picture is compared with that produced by an offset mechanism even the most discerning user would see no difference at all. There's no improvement in tape insertion: it's just as easy to insert a tape in an offset slot!

The Disadvantages

As the centre-mounted mechanism often plugs into the main – sometimes only – PCB, direct access to the bottom of the mechanism for servicing, and to the PCB components hidden under the metalwork, is not possible. In many models the drum motor has been resited on top of the drum assembly in order to provide clearance for components underneath, and to prevent stray magnetic fields interfering with sensitive signal circuitry.

The types of plugs and sockets used to connect the mechanism to the main PCB vary. They all lock together mechanically, using tabs and slots moulded into the connectors. I've come across several PCBs that have been broken because of inexpert removal of the mechanism.

Once it has been removed, the mechanism can be operated only by using an extension lead kit - Fig. 1 shows an example. Some kits can be used with a number of models. But as four-head and hi-fi models for example require additional interconnections, further lead kits are called for. If you handle a wide range of models from different manufacturers, it can be very expensive to equip yourself with the necessary extension lead kits.

When there is an intermittent mechanical fault, for example occasional loss of drive to the supply spool in the reverse-search mode, it's essential to be able to see the underside of the mechanism in order to find out what is happening. Are the driving gears meshing correctly for example, is the loading motor stopping at the correct point, is the clutch sometimes slipping? These points have to be checked visually when the fault occurs. An extension lead kit is thus essential, to enable the mechanism to be separated and examined whilst running.

With some machines you can gain access to the electronic components on the main PCB by removing the mechanism and the PCB from the plastic frame, plugging the mechanism back into the PCB and then turning the

assembly upside down on the bench. The surface-mounted chips and components can then be seen and scope/meter checks made. But with one current Hitachi machine, Model VTF360, some fourteen screws and seven support brackets have to be removed to get to this stage.

A Retrograde Step

I feel that the centre-mounted design is a retrograde step in VCR technology. Many VCRs with offset mechanisms had PCBs alongside and the power supply perhaps at the back, making them very easy to service. They were also built with reliability in mind.

Accessibility problems make the current ranges of VCRs, from all manufacturers, difficult to service. In addition the mechanisms are full of plastic gears and cams that are susceptible to breakage.

Manufacturers should reconsider their current products, which won't last or be as reliable as the previous ranges. I don't think customers mind in the least whether they insert their cassettes into a centre or an offset slot. They are more concerned about reliability.

Most of the VCRs sold are in the lower price range. If manufacturers don't have a model that sells in the £150-£250 range, they lose sales to their competitors. To this extent customers have had an influence on design. But they won't put up with unreliability. Eventually we shall see prices, reliability and quality rise. It could be a long wait however. ■

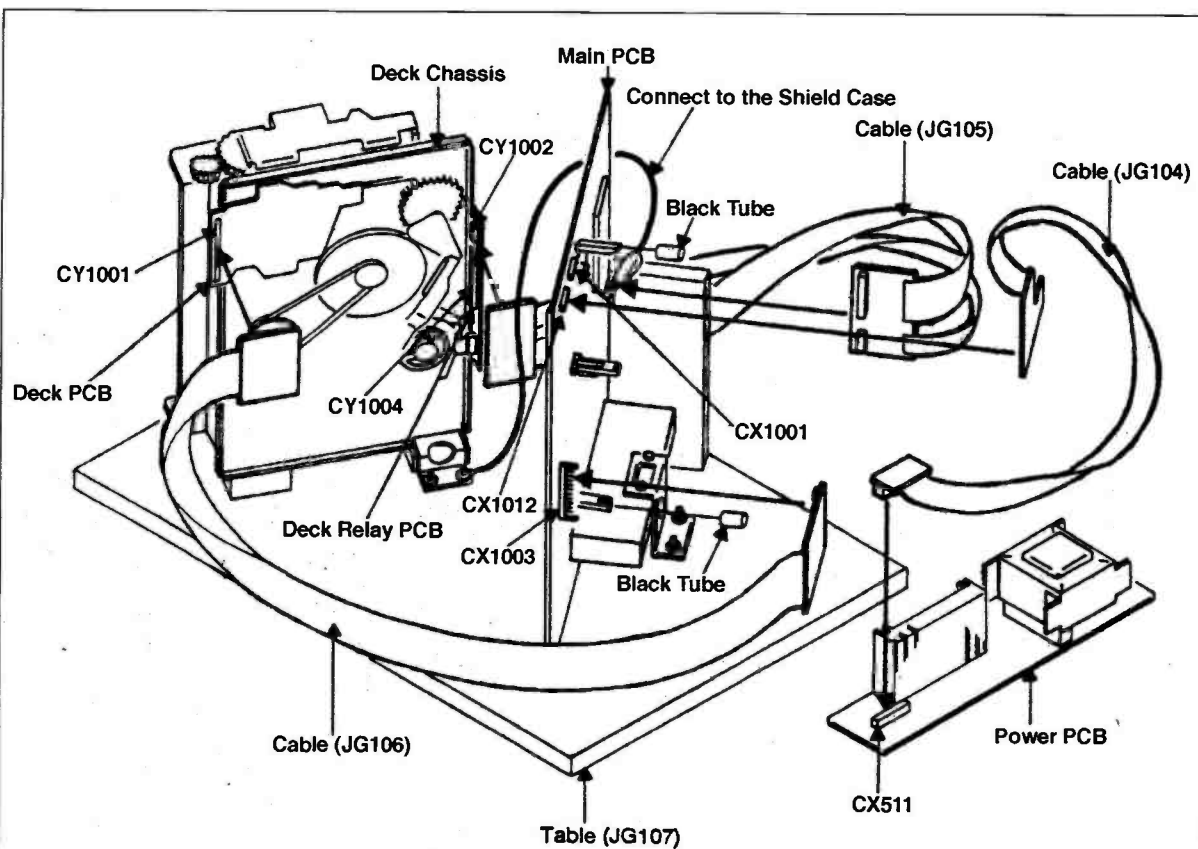


Fig. 1: An example of the dismantling and interconnecting required to service a centre-mounted VCR mechanism that plugs directly into the main PCB. It was so much simpler before!



Dish Drive Techniques

J. LeJeune describes basic methods of providing motor-controlled dish drive and the arrangements used in the Pace MSS501P dish-positioner module

There comes a day when a fixed satellite dish user has scanned through all the channels and finds that there is nothing to tempt him or her to linger on any of them. Thoughts may then turn to a steerable dish for multi-satellite reception. The Astra cluster's supremacy has been eroded by the growing number of competitors such as Eutelsat. There are nowadays interesting transmissions from a number of satellites, the majority of which can be received using relatively inexpensive equipment.

Although a dish actuator and polar mount appear to be a rather daunting arrangement, they are robust and very reliable in operation – provided they receive occasional maintenance. The job of mounting a dish and setting up the actuator and positioner can be learnt by the average satellite equipment installer in a very short time, and the trade has its shortcuts that reduce what was once a four-hour job to something under an hour on a good day. But it's still a job for the professional, not the layman – have you ever seen a dish that has been neatly folded in half by an actuator whose mechanical travel limits have not been set?

There are two parts of a dish-positioning system, the controller and actuator. The controller can be one of three types: either built into the satellite receiver, or a separate free-standing box which is connected to the receiver and obtains commands from it, or an independent unit that's separately controlled by infra-red signals or front-panel switches.

A multi-wire cable connects the controller module to the

actuator at the dish. One pair of wires, usually of a heavy gauge, feeds 36V DC to the motor. The other wires connect a feedback signal from the actuator to the controller to let it know the amount of dish movement, providing a precise position check. Fig. 1 shows a typical arrangement.

The Actuator

Fig. 2 shows a typical actuator system. All currently available models are very similar. It consists of a DC permanent magnet motor coupled to a gearbox that rotates

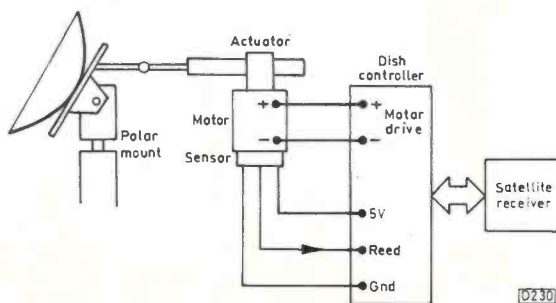


Fig. 1: A typical satellite dish drive arrangement.

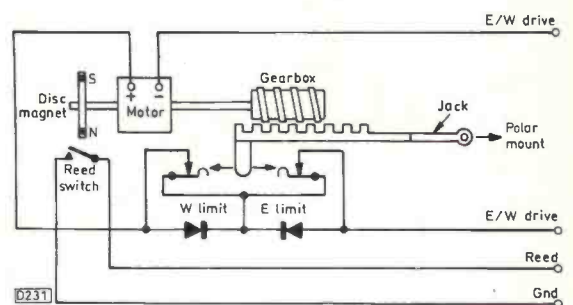


Fig. 2: A typical actuator arrangement with a disc magnet and reed switch to provide pulse feedback.

a worm drive on the push-pull arm or 'jack'. A permanent magnet motor is used because it is efficient and can be moved forwards/backwards simply by reversing its DC supply.

When the actuator is in operation a small pulse generator within the motor/gearbox housing sends a signal, which consists of a stream of pulses, back to the controller. In this example the pulse generator consists of a disc magnet and reed switch. The magnet is mounted on a rotating part of the mechanism: it closes the reed switch once per revolution. There are also two limit switches within the housing. They are set to open when the dish is close to the end of its permissible travel in one or the other direction.

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An alternative type of pulse generator generates the signal by opto-mechanical means, see Fig. 3. In this arrangement an opaque plastic disc with two holes in it replaces the rotating disc magnet. Light from a LED passes through the holes twice per revolution and is detected by the photodiode. This type of sensor requires a 5V supply: a fifth wire in the cable is used to supply this voltage. The photo-interruptor type of pulse generator is much less common.

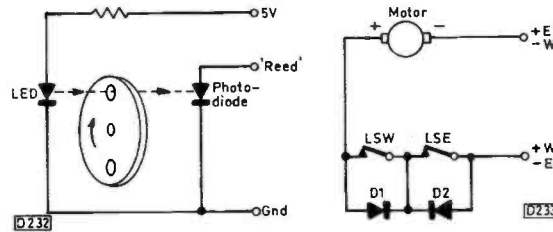


Fig. 3 (left): This alternative method of generating feedback pulses uses a LED and photodiode.

Fig. 4 shows the limit-switch arrangement. The diodes (D1 and D2) enable simple microswitches to be used, allowing motor rotation in one direction or the other when the supply current is reversed. Both switches are closed when the dish is in any position between its limits. This is the normal condition. If the dish is moving to the west and reaches its maximum permitted position, limit switch LSW will open. As diode D1 is now reverse biased, the motor will stop. When the supply polarity is reversed, D1 will be forward biased and the dish will start to move in an easterly direction. Should it reach its maximum permitted eastwards position, limit switch LSE will open, reverse biasing D2. The system is now ready for westward movement when the supply polarity is again reversed.

Fig. 4 (right): Basic east and west limit switch arrangement.

Note that with the dish off limits the two switches will be closed, allowing normal bi-directional movement of the dish. Once the actuator has been set up, the limit switches will probably be used only rarely.

This last type can be used with any satellite receiver, whereas the other two will operate only with a compatible receiver chassis. The MSP200 can also operate as a completely independent unit however.

The Controller

We will now look at the operation of the MSS501IP. A second article will deal with the MSP200.

As mentioned earlier, the controller can be one of three basic types. All three are very similar, differing only in the way in which they are integrated with the receiver set-up. The first type is the integral controller which is within the receiver and is powered by the receiver's supply. An example is the Pace MSS501IP. The second type is the stand-alone version which has its own power supply and takes its instructions from the satellite receiver, usually via a scart lead. An example is the Pace MSP200. Lastly there's the completely separate controller, which is operated either by remote control or front panel switches.

The Pace MSS501IP

Pace calls the MSS501IP an internal dish positioner, so we'll follow this convention here. Fig. 5 shows a block diagram of the module, which has four sections: a microcontroller, an autofocus system, the motor drive and polariser drives.

The microcontroller (U4) is based on the famed Z8 microprocessor. It runs at a clock frequency of 12MHz, set by a crystal that's connected between pins 9 and 10. The receiver tells U4 which satellite has been requested, by using an identification number, the relevant data for correct dish positioning and polariser skew angle adjustment being held in the non-volatile EEPROM U2. In the positioner's initial setting up procedure the electronic E/W limits are set first: they are very slightly inside the mechanical limits set at the actuator.

The easterly limit is permanently set as position 000. The westerly limit has its position memorised as part of

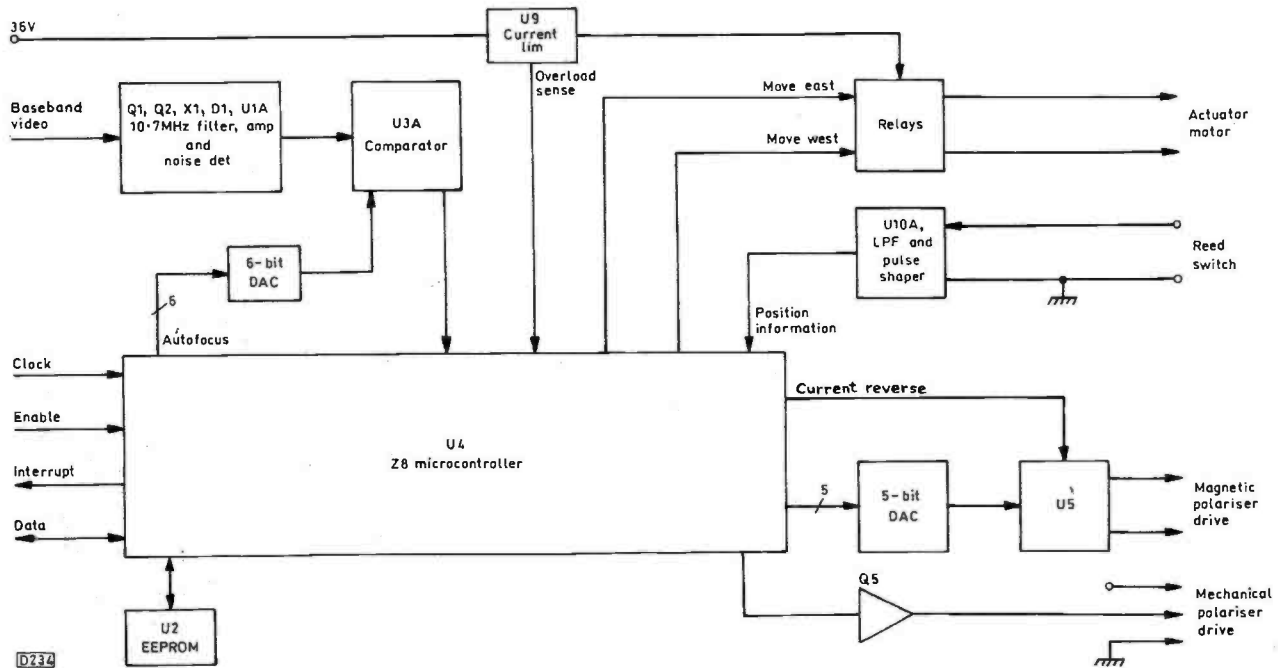


Fig. 5: Block diagram of the Pace MSS501IP dish positioner module.

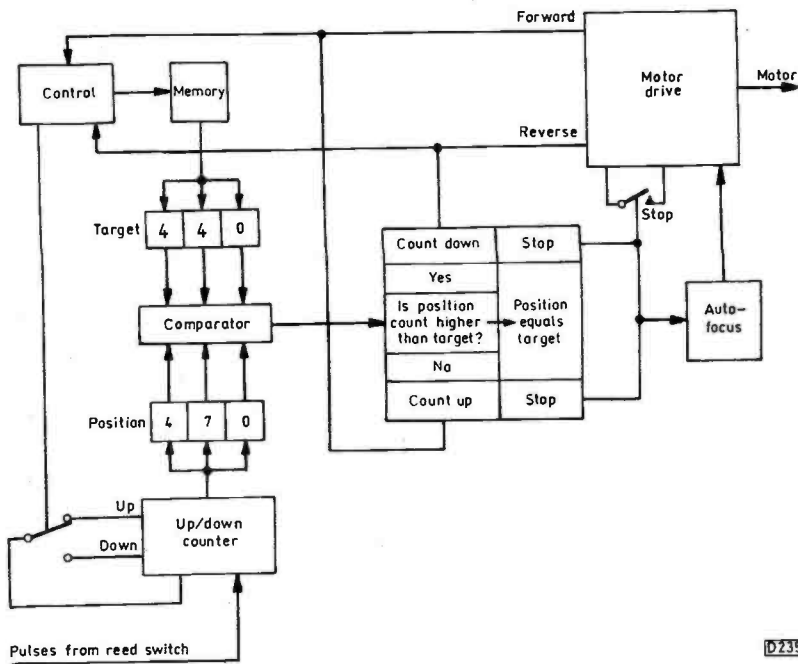
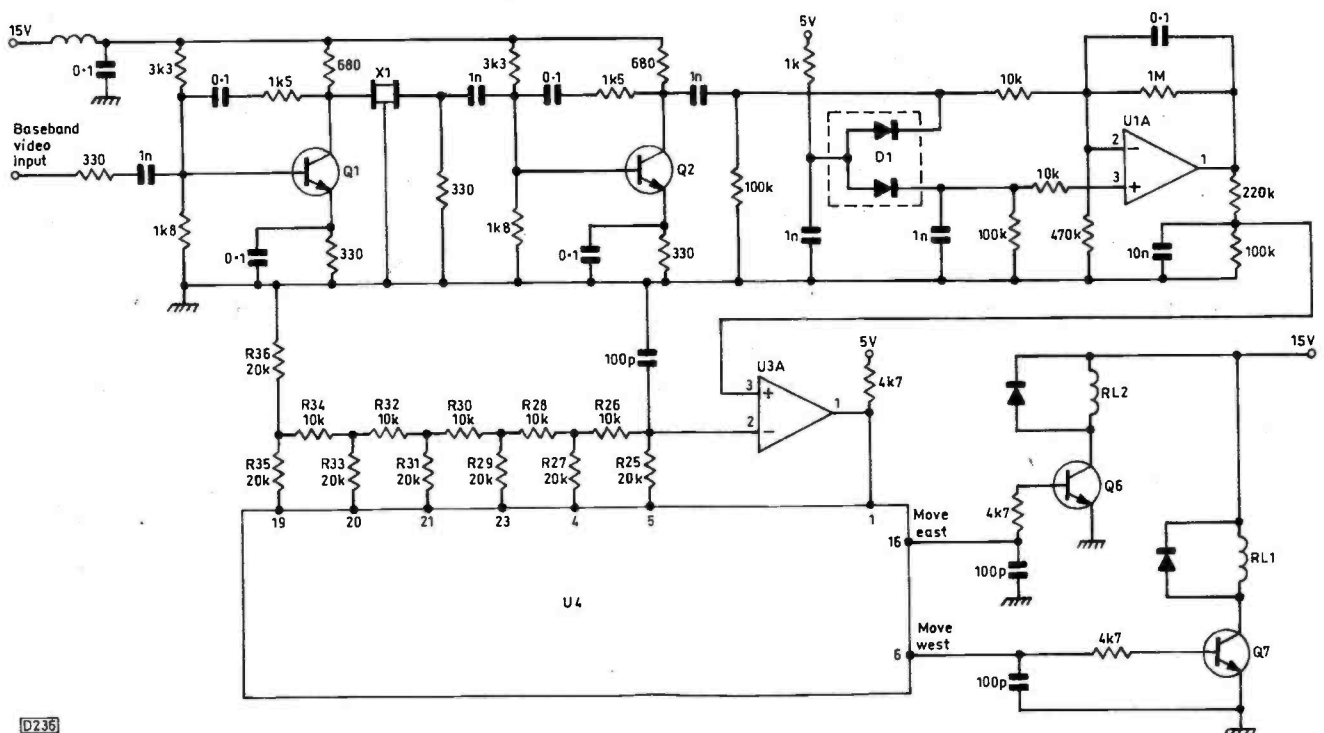


Fig. 6: Dish positioning logic.

the set-up process. Let's say it is 875. Thus all satellites within the span of the dish will have a reference position somewhere between 000 and 875. Suppose that the first satellite group to be set up is Astra at 19.2°E. The dish is moved from its starting position, say 000, to Astra. The signal is peaked by moving the dish back and forth while observing the pictures received. Once this has been optimised the position reference is read out as, say, 440. This number is then stored in U2 against the receiver's satellite identification number for Astra, say 1.

Subsequently whenever an Astra channel is called up at the satellite receiver the dish motor drive circuit will be given the instruction "go to 440". The movement of the dish is noted by the pulses received from the reed switch sensor in the actuator housing. Thus all the microcontroller has to do is to count the number of pulses

Fig. 7: The autofocusing circuit.



D235

required to get the dish from its initial position to 440. But this is the clever bit: it counts up if the position reference number is below 440 and down if it's above 440. Not only that – it also sets the motor drive voltage polarity so that the dish moves in the right direction.

The Astra cluster at 19.2°E has been given the satellite identification number 1, which cross-references to 440 in U2 and to any figure entered for skew angle when a polariser is used. It's not actually necessary to use a separate polariser for skew adjustment with a polar mount, because modern LNBS have built-in selection of vertical/horizontal polarisation and, as the dish tilts either side of its true south position, the LNB is also tilted. Thus a tilt or skew angle adjustment is generally not necessary. Purists will add that a magnetic polariser is frequency sensitive, so that the skew angle needs to be trimmed for different downlink frequencies, but with a good, low-noise LNB and a 1m dish the improvement provided by a separate polariser is offset by its insertion loss.

When Astra has been chosen, the target position of 440 is fed to a comparator circuit. Fig. 6 shows, again in block diagram form, what's involved here. If the initial dish position has a reference number above 440, the motor drive voltage polarity is reversed and the position counter is set to count down. If the initial dish position has a reference number below 440, the motor drive circuit is set for forward movement and the counter counts up. When the target position reference and the dish position reference coincide, the motor drive is removed. The dish stops, then the autofocus circuit takes over.

Autofocusing

The autofocus circuit (see Fig. 7) measures the out-of-band noise from the LNB to give it an indication that the satellite signal has peaked. When the motor-drive circuit enters the autofocus mode it sweeps the dish back and forth through the satellite position by feeding a low-amplitude sawtooth voltage to the motor. As the satellite signal rises and falls, the receiver's AGC system adjusts the tuner's gain to keep the IF input to the demodulator within prescribed limits. Out-of-band noise present in the signal from the LNB via the tuner is filtered out by the

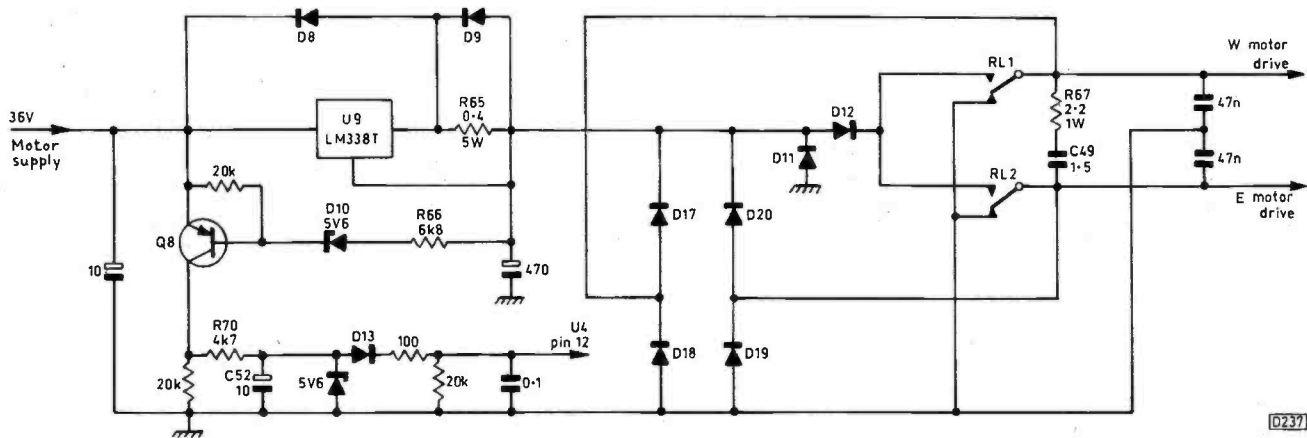


Fig. 8: The actuator motor drive circuit.

10.7MHz ceramic filter X1, which has a bandwidth of 150kHz, and is then detected by D1 and U1A.

The noise in the system rises and falls in opposite sense to the signal. Thus when the signal peaks, the noise is at minimum. The detector circuit senses the minimum noise point and stops the motor.

U4 produces a digital ramp signal at pins 4, 5, 19, 20, 21 and 23. This is converted to an analogue sawtooth voltage by the resistor network R25-R36 and coupled to pin 2 of U3A. Pin 3 of U3A receives the output from U1A: this is a DC output that's proportional to the strength of the received signal, i.e. inversely proportional to the receiver system noise. U3A's output is fed to pin 1 of U4. The circuit uses the output from U3A and software in U4 to detect the minimum noise condition. Thus the motor is stopped at the maximum signal point. The motor drive outputs from U4 are at pins 6 and 16.

Actuator Drive Circuit

Fig. 8 shows the motor drive circuit, which incorporates current limiting. Q8, D10 and R66 sense the voltage across U9 and R65. Should this exceed 6V, Q8 switches on, sending a motor overload signal to pin 12 of U4. When this happens U4 removes the power to the coils of relays RL1 (west) and RL2 (east). The relay driver transistors are Q7 and Q6 respectively (see Fig. 7). R70 and C52 in the feed to pin 12 of U4 form a time-constant to prevent circuit operation on transients.

U9 is arranged as a foldback current limiter, which is set to 3A. It's included for three reasons. First to provide short-circuit protection: in the event of a short in the motor, wiring or connections the current is limited to 1A. Secondly to provide thermal overload shutdown (at 150°C). And thirdly to provide fast current limiting (3A): this prevents receiver shutdown during motor start-up, particularly with a large motor.

The circuit is protected against motor back-EMF transients by diodes D8, D9, D11 and D12. D17, D18, D19, D20 and the network R67, C49 reduce arcing at the relay contacts and remove the effects of contact bounce. The easterly drive is controlled by pin 16 of U4 while westerly drive is controlled by pin 6, as indicated in Fig. 7. When they are not operated the relays earth the motor's supply lines. This action provides some dynamic braking when the motor drive is removed, minimising the chance of an overrun.

Position Sensing

The most common method of providing pulses for

position sensing is to use a reed switch, as previously described. In the MSS501IP the reed switch is connected between the 'reed in' input and chassis, see Fig. 9. With the switch open, this input is held at 5V via R80. Thus operation of the switch produces a negative-going input for the following pulse-shaper circuit. D15 and D16 clip the pulses, which are then filtered by C55 and R78 to

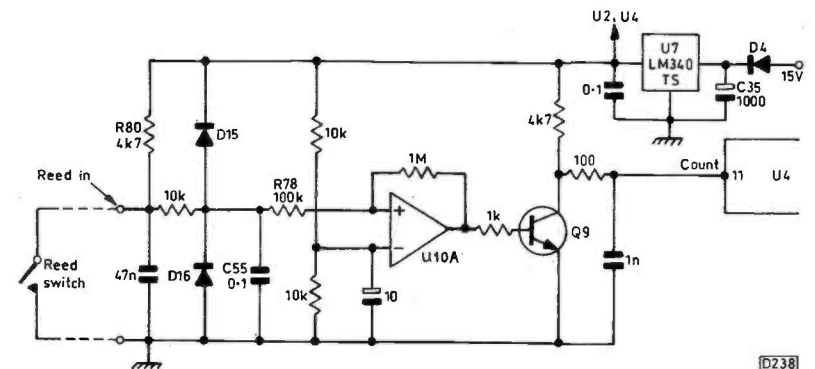


Fig. 9: The dish position pulse shaper circuit, with 'keep-alive' power supply.

remove motor noise and other unwanted spikes caused by contact bounce and fields from external sources. U10A is a limiting amplifier which squares the filtered signal. Q9 inverts the pulses for feeding to the count input pin (11) of U4.

A three-second keep-alive circuit ensures that position information is not lost in the event of a power failure while the dish is moving. C35 is charged from the 15V rail via diode D4. Should power be lost, D4 will be reverse biased but C35 is of sufficient capacitance value to keep U4, U2 and U10 in operation as the motor stops. Thus the position count is stored in U2. Normal operation resumes when the power is restored. U4, U2 and U10 are fed from U7's output, which is referred to as the +5VU supply.

Polariser Drives

The MSP501IP incorporates provision to drive either a magnetic or a mechanical polariser.

The magnetic polariser requires a ±100mA variable current source, see Fig. 10. Pin 15 of U4 sets the output

Toshiba Service Briefs

The following notes are based on issues CDH60 and CDH61 of the Toshiba Service Bulletin

TELEVISION

Model 155R8B

Low sound output: The cause can be QV11 (BC557A), the power-off muting transistor on the AV board. If faulty, it can activate the muting circuit. Check and if necessary replace it. The part no. is 23114691.

Model 219T9B

Audio output IC (Q602) is damaged at switch on: The cause is capacitor C866 (47 μ F, 50V) on the power supply panel going open-circuit. As a result, the 12.5V supply to Q602 rises to around 20V, with damage to the chip.

Model 1440TB

Note that the connections between the text module and the main PCB are shown incorrectly in the official circuit diagram for this model. The circuit diagram for Model 1722TB gives the correct text module connections.

Models 1510RTB/TBT

Dead set: If the main HT supply is low at say 32-72V with a 60W bulb connected as the load, and the chopper transformer T802 is getting hot, the transformer has a low resistance between pins 10 and 12. The normal winding resistance between these pins is 5.4 Ω . Replace the transformer, part no. 23217078.

Model 2141TB

Tuning drift: This can be caused by the 1N4148 diode (D111) between the 5V supply and the AFT line being leaky. Its part no. is 23115599.

Models 2539DB, 2939DB, 3339DB

Intermittent field roll in the text mode: This fault can be caused by a defective TA8775 RGB switching chip (ICX50) on the RGB module. Its part no. is B0383933.

Models 2857DB and 3357DB

The microcontroller and memory chips ICA01 and ICA02 are now available only as a pair, as kit part no. 40569174 for the 2857DB and 40569174A for the 3357DB. They must always be replaced together.

When the built-in self-diagnostic system in these receivers is being used, as described on page 14 of the service manual (part no. 030-9515), item (4) BUS CONT will display H002 N/G for normal bus operation, not OK. This is not a fault condition and doesn't affect the operation of the self-diagnostic function in these receivers.

VCRs

Models V204B, V205B, V254B

Video head switching line shows on screen and cannot be adjusted: The video head switching adjustment is stored in the ST24C04/CB1 EEPROM chip IT003. Failure of this chip can cause various symptoms, including loss of the head switching adjustment. Its part no. is 70011892.

Models V204B, V254B, V404B, V454B, V804B, V854B

No playback chroma: Cause can be failure of the 15nF, 50V capacitor that's connected to pin 21 of the YC processing chip, which is IV001 in Models V204B-V454B and IC201 in Models V804B/V854B. The capacitor's circuit reference number is CV021 in Models V204B-V454B and C404 in Models V804/V854B. The part no. is 70041655.

Models V703B and V813B

Poor playback sound, no E-E and no scart switching: The PQ12RF1 12V regulator IC834 on PIF PCB U001 is faulty. Replace it - part no. is 23319871.

Dim fluorescent display: Capacitors C810 (15 μ F, 10V) and C813 (47 μ F, 16V) on the power control panel U803 have dried up and are open-circuit. Replace them: because of its unusual value, C810 is available under part no. 24090022.

Machine is dead with IC803 (STRD6202) short-circuit and fuse F801 blown: This condition will arise when the fault above has occurred and the VCR has been unplugged. This destroys IC803. Fit replacement service kit part no. 70904175. In addition, check IC804 and IC821 which may be short-circuit.

Models V804B and V854B

Prerecorded tapes play back OK but no remaining time is displayed and the tape will only half unload before the machine goes into the standby mode: The supply reel sensor's output has fallen to about 4V peak-to-peak (should be 8V p-p). Replace the sensor (Z102, part no. 70011793).

CNI AND AUTOTUNING

Models V255B, V425B, V825B, V855B: As mentioned in the last Toshiba Briefs feature (page 655, July) the BBC's CNI (County, Network Identification) code changes, which will affect autotuning, will not be implemented until 1998. This will enable all new products with autotune functions to have the new codes added to their software and work correctly. Models already in customers' homes however will be unable to recognise the new BBC codes when returned to a different transmitter, i.e. should the user move to a new location. These users will have to tune in BBC-1 and BBC-2 manually.



The Philips VR231

There seems to be a problem with the Philips VR231/05. We've sold and rented a good number of these machines, many of which have exhibited the symptoms of poor tracking. The cause is a worn video head. Unfortunately replacement is not always the cure: the lower drum may also need to be replaced, either because it is worn or, as regularly happens, because the new head will not fit the lower drum spindle.

The cost of the head and lower drum is £92.14. With a modest labour charge of say £35 and VAT at £22.25, the total is £149.39. This comes as a great shock to the customer, who rightly complains that it is not reasonable for a machine just out of its one-year guarantee.

I've stopped repairing my stock machines, as the cost is prohibitive, but will repair customers' machines on a parts only basis. Even so the cost causes resentment. I would be interested to know how many other dealers are in this position?

D.C. Margison, Sound & Vision, Elland, W. Yorkshire.

A Warning

Several component suppliers are offering power supply repair kits for satellite TV receivers. These do not appear to use components obtained from the original manufacturers. Some manufacturers supply their own approved kits, which are sometimes cheaper than non-genuine alternatives.

My experience with 'pattern' kits is that they don't work and can cause more damage. Use manufacturers' kits where they are available, or order original parts

Letters

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

from the manufacturer. Most of us in the trade know the problems caused by pattern video spares, especially idlers. The same applies with satellite TV repair kits. The time you might have to spend sorting out the problems caused by these kits could well be spent more profitably. You have been warned!
Michael Maurice, Wembley, Middx.

Philips Anubis A Chassis

Donald Bullock's column is always interesting and fun. Pity that he didn't check with our catalogue when he wanted a line output transformer for a set fitted with the Philips Anubis A chassis (August, page 743). He would have found it listed at £16.12.

Ron Blyth, Wizard Distributors, Empress Mill, Empress Street, Manchester M16 9EN.

Good Design

Isn't it nice to meet a chassis which has been designed with the engineer as well as the consumer in mind? I came across one the other day, in a Samsung CI3312Z portable. It has most of what I consider to be plus points from the servicing aspect:

(1) An easily removed, one piece chassis incorporating everything except the loudspeaker. No long-reach screwdrivers required to get to the front panel. A single catch held the chassis in free-running grooves, with a label telling you what to do. No bundles of knitting tucked into innumerable plastic catches.

(2) Long enough leads to the CRT and speaker to enable the chassis to be powered at any angle, without danger of it falling against the CRT base. Ribbon leads reinforced at the point of entry and soldered in – not bared wires pushed into connectors so that they can pull out and possibly break.

(3) A well laid out chassis sectioned by function and marked with boundary lines. All components on one side – no sprinkling of surface mounted components on the reverse side.

(4) A beautifully marked board on

both sides. All controls labelled with their function where appropriate. On the print side, where say ten lines are bunched on a long run each line of print is labelled in case you lose your way or go cross-eyed trying to trace through.

Well done whoever designed it. I get the impression that it must have been someone who has suffered as a repairer. My only slight criticism is that ICs are soldered in. It would have been even nicer if they had been removable.

Laurie Watkinson, Holsworthy, Devon.

Matsui CTV Manual

Requiring a service manual for a Matsui colour portable I recently approached Partmaster (ex Mastercare). The price quoted was £17.50, but I was stuck because I required part numbers and you can't order from Partmaster without them. When the manual came it was a poor photocopy. This really is a bit of a cheek. Come on Partmaster, get your act together!

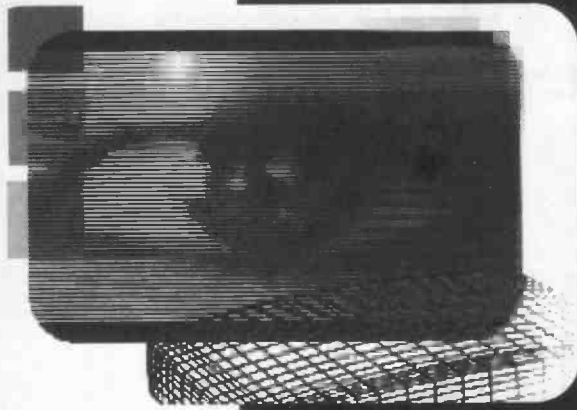
Paul Byrne, Denbighshire.

For disposal

I have for disposal a working 26in. Decca hybrid colour TV receiver (30 series chassis) housed in a large wooden cabinet which is unmarked apart from household grime. There are various possibilities, i.e. to boost the tube, fit a regunned one or, as I had intended, to fit a modern 26in. PIL chassis with remote control, teletext and stereo sound. But because of illness I cannot do this and must pass the set on, free of charge (prospective owner to collect).

The beauty of a wooden cabinet is that in addition to its good looks you can, if the CRT mounting blocks are in the wrong place for a modern tube, remove and refit them as necessary. Try that with a moulded plastic cabinet!

M.K. Hayter, 24A St. Albans Road, Moseley, Birmingham B13 9AS. 01214 495 508.



Reports from Philip Blundell, AMIEEIE, Michael Dranfield, Adrian Farnborough, Chris Watton, Paul Hardy, Graham Colebourn Blair McEwan, Terry Lamoon, V.W. Cox, Bob McClenning, J.R. Trimmer and Giles Pilbrow

Ferguson TX10 Chassis

The line output transistor had failed. The set worked when a replacement was fitted, but a check on the line drive seemed a sensible idea. A good job I did check it: the waveform was much too large. D743 (BY588) was open-circuit. Check it by replacement. Note that this was the version of the chassis fitted with the PC1560 main board. With other versions D743 is type BT188B or BY226. P.B.

Philips FL1.0AA Chassis

There was no off-air sound, either Nicam or FM, though sound was present with a scart input. Checks on the FQ844 tuner/IF module showed that there was no audio output at pin 25 and no Nicam IF signal (should be 0.5V p-p) at pin 22. A new TDA3856 chip in the tuner/IF module restored the sound. P.B.

Grundig CUC5835 Chassis

One of these sets went to standby after it was switched on. This can happen if the microcontroller chip senses a field fault. When the field module was removed it was obvious that this was the case: R7021 (4.7Ω) was burnt up and the field output chip IC7020 was short-circuit.

TV Fault Finding

Replacing these two items, also the 220μF, 35V field flyback capacitor C7027, restored the picture. Note that the field output chip type varies with the production date and the part number of the module fitted. P.B.

Solavox 141/Nikkai TLG99

For lack of height, check whether the 12V supply is low. In a recent case I found that R104 (3.3Ω, 1W) had gone high in value. P.B.

Philips G90 Chassis

Should the sound be low or intermittent, check the 20V supply at pin 18 of the TDA8191 chip IC7220. If it's missing, check diodes D6272 and D6278 (both type BAS32) which can go open-circuit. P.B.

Ferguson TX9 and teletext

The fault from which this set (a Model 16A3) suffered was mentioned in the old Ferguson field engineers' pocket book. The symptom was poor line lock, which was more noticeable if the tuning was adjusted off station then brought back again. With remote control and teletext sets line lock is OK on the AV channel.

The cause of the trouble is low voltage at pin 9 of the line generator chip IC54 because of a leaky diode. This is D117 on the remote control PCB with teletext sets, or D916 on the U725 module with remote control only sets. P.B.

Grundig Cinema 9050

There was a convergence problem with this projection set. The unusual thing was that the convergence error constantly changed. A check on the supplies to the convergence circuitry showed that the -12V line was high, with ripple. The cause of the fault was IC6078, which is type UA79L12. P.B.

Bush 2114T

When we pressed the teletext button the picture remained but the TV channel couldn't be changed. Although the set was in the teletext mode, text couldn't be displayed. The first thing to do in this situation is to check at pin 22 of the DPU2540 chip IC903. If the 5V field pulse is missing, resolder all twelve through-the-board links on the double-sided print text PCB. M.Dr.

Ferguson B14R (TX90E Chassis)

A word of warning on these sets. The mains bridge rectifier's reservoir capacitor remains charged for a long time after the set has been switched off. Recently we found that there was still 100V across the capacitor despite the set having been off for seventeen hours. M.Dr.

Philips G90AE Chassis

This set led us a dance. The EHT was low and the line output transformer was making a fizzing noise. Needless to say a new transformer made no difference. Scope checks on the supply lines showed that they all seemed to be noisy or oscillating. We then found that if pin 2 of the line output transformer was disconnected the fizzing stopped and the CRT heaters lit up. Pin 2 is the source of the 14V supply. Various paths were disconnected. We eventually lifted pin 10 of the TDA2579A timebase generator chip IC7470. This brought the set on. A new TDA2579A chip put matters right. M.Dr.

Mitsubishi 21MITX

A very loud whistle, similar to that from a 405-line output transformer, came from this set. We tried impregnating the chopper transformer T901 with shellac, but this made no difference. Scope checks then showed that the

chopper power supply was running at a very low frequency. The slow-start transistor Q902 was the cause.

Incidentally all the supplies produced at the secondary side of the chopper transformer were correct when the circuit was operating in this LF mode and producing the awful noise. A.F.

Mitsubishi 25M5 Series

To avoid or rectify line output stage and power supply failure, sets with early serial numbers need to be modified using the AVM5 kit available from Mitsubishi. You may however find that there is also a lack of EW correction because IC551 has failed. There might be a large chunk blown from it. A.F.

Toshiba 2852DB

This set produced no teletext - just the header. After checks for good, smooth DC and clock operation failed to reveal anything amiss we decided to condemn the SAA5281P/E text chip QF02. Fortunately a replacement put matters right. A.F.

GoldStar CIT2175

This set was intermittently dead, with motorboating when it was first switched on. The usual troubles in the TDA4601-type power supply were the cause - replace all the small electrolytic capacitors in the primary side of the circuit.

A problem with this chassis however is that a large area of the power supply is covered with glue. If you have any problems in this area, remove the glue. This is not as difficult as it might seem. Remove the heatsink, chip and chopper transistor, then spray a good amount of freezer on to the glue. This makes it crack, after which it can be broken away in large lumps. The 4-7k Ω set-HT potentiometer VR801 may break when this is done. Once the PCB is clean, reassemble everything and the set should work. C.W.

Solavox 140

The picture produced by this 14in. colour portable was marred by severely crinkled verticals. On investigation we found that C116 (1 μ F, 63V) and C117 (4.7 μ F, 63V) had both fallen in value. Replacements straightened the picture. C.W.

ITT Monoprint B Chassis

There was no picture or sound, though the EHT was present and the tube's heaters were alight. The audio output was OK when a

screwdriver was applied to pin 1 of the scart socket. This indicated that the set was in the AV mode. Pin 32 (AV select) of the microcontroller chip operates the AV/TV switching via the BC238 transistor T1415. This was short-circuit base-to-emitter. C.W.

Akura CX1400T

The complaint with this modern set was that it took a long time to come on. When it did come on the picture might be rolling, or random teletext characters might appear. The power supply seemed to be a logical place to start.

When we checked the 7V rail, at the cathode of the relevant rectifier diode, we found that the voltage was low at only 5.5V. Once the set had managed to start, the voltage had risen to 6.4V. The reservoir capacitor for this supply is C841 (470 μ F, 16V). A replacement restored the correct voltage conditions, curing the various symptoms. As the capacitor looked a bit small for the job we decided to fit a 25V, 105 $^{\circ}$ C type. C.W.

Salora K Chassis

If one of these sets comes on then intermittently goes dead, working all right when switched off and on again, check the mains on/off switch. We've found a number of these to be intermittent. C.W.

Telefunken 615A Chassis

There was a narrow, concave picture, with foldovers about an inch apart. Checks on the scan coils and in the EW correction circuit proved fruitless. What we did eventually discover was that the line scan coupling capacitor C184 (0.235 μ F, 250V) was open-circuit. C.W.

Matsui 1440A

This set produced a very bright and very poor picture. A check showed that the 180V supply to the RGB output stages was low. The culprit was the supply's reservoir capacitor C431 (4.7 μ F, 250V). A replacement restored the voltage and the picture quality. C.W.

Ferguson 59J7 (TX100 Chassis)

Intermittent corruption of the front panel display, along with loss of remote control operation, was the complaint with this set. The front panel controls usually worked however. Powering the set off and on would restore correct operation for a while.

Someone had obviously had a go at the set before. There were a lot of badly soldered joints which I rectified, but the set still failed after a soak test lasting several days. Eventually, during one fault-finding session, I heard a faint 'tink' come from around the tube base area. Thinking that the tube base might be arcing internally, I lifted the earth off the focus spark gap. Further soak testing showed that the fault had now disappeared. A replacement tube base completed the repair. P.H.

Hitachi CPT1646R (NP84CQ Chassis)

The picture produced by this set would roll. On test I found that the EHT trip thyristor would operate and remove the line drive. So I disconnected the trip and ran the set up using a variac. This showed that the HT was high at 113V instead of 103V. The HT could be set up correctly, but the control was at the end of its range. Further checks showed that R908 in the regulator circuit had risen in value from 22k Ω to 27.5k Ω . Replacing this, readjusting the HT and reconnecting the trip completed the repair. The fault could also occur with Models CPT1444 and CPT1446. P.H.

Toshiba 140R4B

The customer complained that the tuning would jump. In fact the symptoms looked more like an AGC or AFC fault: the picture was dark, with erratic diagonal lines, as though the signal was crushed or off tune. I also found that the search tuning wouldn't stop with a strong signal, though it would with a weak one. If a strong signal was attenuated it could be locked on to and stored, but the same picture conditions were present when the attenuation was removed.

Sync tip detection is used in this set to stop the search tuning. As both faults seemed to have a common cause, I worked my way back through the video circuitry but could find nothing obviously wrong. In the end a slight tweak of the detector coil L103 cured the fault. P.H.

Ferguson TX90 Chassis

"Intermittently dead" the report said. The fault responded to tapping, and I eventually found that the line driver transformer was very sensitive to pressure. Its primary winding was going open-circuit at the base, where the fine wire is

wrapped around one of the mounting pins.

After fixing this I was left with poor audio quality, which varied with the volume setting – the higher the volume, the worse the distortion. This was caused by a faulty TDA4500 chip. As the volume increased, the negative-going half of the audio waveform gradually disappeared. P.H.

ITT ST3876 (Digi 3 Chassis)

There were three alternative fault symptoms with this large set: intermittent line jitter, or loss of line sync with no colour, or the set failing to run at all. We found that mechanical disturbance produced interference dots on the picture.

There turned out to be two faults. A cracked joint at one of the primary winding pins of the standby transformer produced the no go or interference problems. The sync problems were caused by C209, one of the small electrolytic capacitors in the receiver module. We replaced all the electrolytics in this module and resoldered the usual array of joints that routinely crack. G.C.

Panasonic Euro 1 Chassis

When this set was switched on it would produce normal sound for about ten seconds then shut down in the standby mode. It would restart briefly when a channel button was pressed, and whilst running would change channels. We carried out a series of these brief running tests in order to make some measurements, and after a few we noticed that the CRT's heaters were glowing. So the line output stage was in operation, though no picture appeared on the screen.

The cause of the trouble was field collapse. We found that the 27V supply to the TDA8175 field output chip IC561 was missing because R561 (1.5Ω) was open-circuit. The chip and the fusible resistor had to be replaced. Part no. for the resistor is ERQ12HJ1R5. G.C.

Nokia FX5532 (Euromono 2 Chassis)

For lack of height from cold (about an inch), clearing gradually, replace 6C10 (220μF, 35V) in the flyback boost voltage generator network associated with the TDA8170 field output chip 6IC02. The capacitor develops leakage, and a slight bulge can be seen. B.McE.

Minoka CX1400T

For no green or no red, check the

150kΩ resistors R507/3. They tend to go open-circuit. B.McE.

Sharp DV5103H

These sets sometimes come in dead with the 2A fuse and the 8-2Ω, 7W surge limiter resistor open-circuit. The cause can be a short-circuit in the chopper transformer, between the primary winding and earth. B.McE.

Finlux 3024

There was intermittent loss of line and field sync. The fault was very intermittent – the set could run for a week without the fault putting in an appearance. It would show up when the signal/IF panel was flexed however. After a long, hard look for dry-joints, or even a hairline crack, I found that one end of both Ra13 and Ra17 had never been soldered. Putting this right cured the problem. B.McE.

Sanyo CBP3012 (A3-A14 Chassis)

If the picture blanks out intermittently, check for dry-joints at transistor Q241 (2SA1015) which is in the luminance signal feed between the LA7680 jungle chip and the tube's base panel. It is included to provide line blanking. B.McE.

Nikkai TLG99

There was very weak, distorted sound. As R153 was open-circuit there was no bias voltage at the base of Q103, the lower transistor in the class A push-pull output stage. B.McE.

Sharp DV5132

No power was the complaint with this set. On closer investigation I soon realised that the HT was coming up but the set was then shutting down. I quickly checked the state of R612, which was open-circuit. A replacement restored normal operation – this is becoming quite a common fault. T.L.

Matsui 1436XA

Be warned with these portables: if you get intermittent field problems or line frequency problems, check the small presets. Their rivets become loose. Crimping the rivets can provide a cure, but replacement is best for long-term reliability. T.L.

Matsui 14R1

One of these small portables produced a green screen at switch on. A quick check on the CRT base

panel, around TR901 and TR904, soon revealed the cause of the fault. Replacing TR901 restored the picture.

Another of these sets had no sound. There was no LT supply to the sound output chip because the fusible 4-7Ω resistor in the feed was open-circuit. A replacement got the set going with plenty of sound. T.L.

Hitachi 2574TN

This set was tripping. It's advisable to check the field and sound output stages in these sets as they can be the cause of tripping. In this case the sound output chip IC4451 was short-circuit. The chip usually fails because the customer has shorted the speaker leads, so advise the owner on this point when installing the set – otherwise it will be back! T.L.

NEI 2151 (Indiana 100 Chassis)

One of these sets came on with a bright raster and flyback lines. R731 on the CRT base panel was open-circuit, removing the supply to the RGB output stages. Be warned, with this fault you sometimes have to replace the colour decoder chip as well.

If the trouble with one of these sets is intermittent power, check for dry-joints at the diode in the chopper transistor's base drive circuit. Resoldering should cure the problem. T.L.

Matsui 1422

Field collapse was the problem with this set. Some quick checks showed that the field output stage's 56V supply, which is derived from the line output transformer, was missing because fusible resistor R306 (10Ω) was open-circuit. Replacing this item restored a full picture. T.L.

Goodmans 145TTA

This set came in dead. We found that there was zero voltage at pin 2 of the STR50103 regulator chip. Replacing R502 (330kΩ) restored normal operation. V.W.C.

Philips GR1-AX Chassis

Intermittently dead was the complaint with one of these sets. The cause of this nasty fault turned out to be a small coil, L5524, which filters the supply to the line driver stage. It was going open-circuit intermittently. B.McC.

Alba CTV840

There was no tuning although the set displayed tuning drive. We

found that R125 (47Ω) was open-circuit because C127 (470μF, 16V) was short-circuit. These components form a filter in the 9-25V supply to the TA8701M IF chip IC101. **B.McC.**

Ferguson D14R (TX805 Chassis)

This set was dead apart from light from a red LED at the front. After a long time spent chasing around the circuit and getting more and more confused as to how the set obtained its initial set-up supply, I discovered that the input to the 5V regulator was low at only 7V. Strangely, this comes from the red LED marked LED1 input, LED2 output. It had gone high-resistance. A replacement restored the set to life. **J.R.T.**

Tatung 180 Chassis

This set's picture was brighter at the right-hand side. The usual cause of such problems is the reservoir capacitor for the HT supply to the RGB output stages (C426 in the 180 chassis), but this turned out to be OK. By carrying out scope checks we traced the cause of the fault to C508 (0.1μF), which couples the

luminance signal to pin 8 of the TDA3562A colour decoder chip. It was virtually open-circuit. **G.P.**

Matsui 1476

The picture took a very long time to appear and would then blank, either partially or completely, depending on the picture content. Once the set had fully warmed up the picture would remain. The cause of the trouble was R411 (4.7kΩ) which had risen slightly in value. **G.P.**

Sony AE1 Chassis

The cause of intermittent loss of the luminance signal was traced to the delay line (DL332) on PCB B. Its part no. is 1-236-062-11. **G.P.**

Panasonic Alpha 2 Chassis

This set had no picture because the brightness control voltage was missing at pin 20 of the TDA3505 video processor chip IC602. The decoupling capacitor C309 (10μF, 50V) was leaky. **G.P.**

Matsui 6091

This set kept on blowing its 2.5A fuse because of a heavy load in the

line output stage. D407, the rectifier diode which produces the supply for the field output stage, was found to be short-circuit. A BY210 proved to be a suitable replacement. **G.P.**

Sony KV2060UB (XE3 Chassis)

This set was dead with no drive at pin 7 of the chopper control chip IC601, despite the fact that its supply was present and the internal oscillator was working. The cause of the problem was R632 (2.2MΩ), which is connected to pin 4 of IC601 and is used for standby switching. The circuit diagram shows pin 4 as not being connected. **G.P.**

Grundig CUC3400 Chassis

This set displayed a blue raster with flyback lines. The cause of the trouble was the TDA3505 video processor chip IC9531 on the chroma panel. **G.P.**

Sony AE1 Chassis

The cause of intermittent teletext contrast variations was traced to a dry-joint at the emitter of Q02 on board V. **G.P.**

- AN 3320K = 750
- AN 5135 = 585
- AN 5790 = 240
- AN 7320 = 100
- BA 514 = 150
- BA 4232AL = 190
- BA 7767 = 180
- CXA 1044P = 1485
- HA 11381 = 250
- HA 11714 = 380
- HA 13119 = 315
- KIA 8210 = 425
- LA 3210 = 060
- LA 3350 = 199
- LA 4282 = 350
- LA 4500 = 200
- LA 7294 = 150
- LM 317T = 150
- LM 1203 = 499
- M 710B1 = 610
- M 190B1 = 495
- M 51393 = 595
- M 54519 = 499
- M 54564 = 115
- MC 1377P = 425
- MC 3357P = 095
- MDA 2062 = 450
- ME4 2901 = 300
- SAA 1026 = 450
- SAA 1061 = 375
- SAA 1294 = 850
- SAA 3004P = 315
- SAA 3028 = 845
- SAA 5231 = 895
- SAA 5241P/A = 1000
- SAA 7000 = 899
- SAA 7274 = 650
- SAB 3021 = 399
- SAB 3035P = 545
- SAB 3209 = 450
- STK 050 = 1599
- STK 0029 = 300

- STK 0049 = 500
- STK 0050/2 = 899
- STK 436 = 399
- STK 463 = 850
- STK 1050/2 = 800
- STK 2048/2 = 1299
- STK 2155 = 895
- STK 2240 = 650
- STK 3042/3 = 500
- STK 3082/2 = 725
- STK 4038/2 = 695
- STK 4131/2 = 650
- STK 4141/V = 750
- STK 4162/2 = 515
- STK 4211/V = 1200
- STK 4362 = 450
- STK 4773 = 820
- STR 4853 = 699
- STK 5322H = 450
- STK 5331 = 300
- STK 5337 = 485
- STK 5467 = 650
- STK 5490 = 450
- STK 7348 = 400
- STK 8050 = 750
- STK 736051 = 300
- STR 441 = 1899
- STR 451 = 2999
- STR 454 = 1499
- STR 5412 = 400
- STR 50092 = 550
- STR 50103A = 385
- STR 54041 = 350
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- STRD 1816 = 399
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- TA 8210 = 300
- TA 8205 = 300
- TA 8200 = 350
- TA 8207 = 165
- TA 8216 = 390
- TA 8644 = 499
- TAA 550 = 030

- TBA 1205 = 030
- TBA 120T = 030
- TBA 1013A = 299
- TDA 1022 = 530
- TDA 1060 = 325
- TDA 11705 = 135
- TDA 1520B = 330
- TDA 1540 = 420
- TDA 1600 = 360
- TDA 2009 = 250
- TDA 2170 = 1999
- TDA 2506 = 500
- TDA 2545 = 130
- TDA 2577 = 1299
- TDA 2577A = 200
- TDA 2579A = 250
- TDA 2600 = 425
- TDA 3300B = 2475
- TDA 3561A = 410
- TDA 3576B = 915
- TDA 3654 = 090
- TDA 4500 = 310
- TDA 4504B = 790
- TDA 5850 = 375
- TDA 7050T = 170
- TDA 8153 = 1599
- TDA 81795 = 999
- TDA 8180 = 1815
- TDA 8390 = 850
- TEA 1039 = 175
- TEA 2018A = 150
- TEA 2164 = 325
- TEA 6300 = 685
- UC 3842 = 150
- UC 3844 = 150
- UPC 1168 = 360
- UPC 1216V2 = 110
- UPC 4558C = 050
- 2SA 839 = 140
- 2SA 1232 = 250
- 2SA 1302 = 300
- 2SB 618 = 305
- 2SB 1292 = 150

- 2SC 901A = 350
- 2SC 1577 = 600
- 2SC 2200 = 250
- 2SC 3427 = 340
- 2SD 1391 = 300
- 2SD 1577 = 480
- 2SD 1887 = 435
- 2SD 2125 = 415
- BU 500 = 265
- BU 508A-PHIL = 80
- BU 508AF-PHIL = 125
- BU 5080D-PHIL = 110
- BU 2508AF = 250
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A Look at the Panasonic Z5

In this concluding instalment in his series Ray Meadows deals with the timebases and the beam limiting system

The line output stage is the really interesting part of the Z5 chassis, not because it uses any radically new circuit techniques but because of the way in which the circuit is split between the live and mains-isolated sides of the power supply.

Previous Panasonic designs have used either an isolated chassis (all the Alpha series, the Euro series and the Z4) or a live chassis (the Z3). Although a live chassis is simpler and cheaper in its basic form, it becomes more expensive when you start to add features. A single AV input for example will require opto-isolators at both the audio and video input sockets. If a headphone, or even a

scart connector, is added the cost of the opto-isolator chips and the aerial isolator transformer starts to mount up. They will probably outweigh the cost of a more expensive chopper transformer that provides mains isolation. There are generally extras with this latter arrangement however. It may be necessary to provide mains-isolated connections between the secondary and the primary side of the circuit for regulation feedback and standby control. The standby power supply system may also require isolation, though there's a clever way of avoiding this – by arranging that the main power supply has separate operating and standby modes. This is done in the Z5 chassis.

A hybrid arrangement is used in the Z5 chassis, which is partly isolated. The isolation split involves the chopper transformer, the line driver and output transformers and the scan coils. Basically, everything after the line driver transformer is live, though the parts of the line output transformer that generate the EHT and other secondary voltages remain mains-isolated.

Thus the live section of the chassis includes the line scan coils. Because of its design, the deflection yoke presents a relatively easy isolation split. But the cost effectiveness of the various ways of providing mains isolation is a complex matter. It depends to some extent on the intended use of the chassis – maybe as a monitor as well as for basic TV purposes.

The service manual describes the Z5 as a live chassis. This is probably wise, as an isolation transformer should always be used for servicing.

The Timebase Generators

The line and field generator and sync circuits are contained in the multi-function TDA8361 chip IC601. Fig. 1 shows the relevant arrangements in block diagram form.

The line oscillator is crystal controlled, the crystal (X601) being connected to pin 35. There are the usual two phase control circuits. One compares the line oscillator and line sync pulse frequencies, pulling the oscillator into sync with the transmitted signal. The second phase detector is fed with flyback pulses from the line output transformer, buffered by Q504 then fed into the chip at pin 38, and the synchronised output from the line

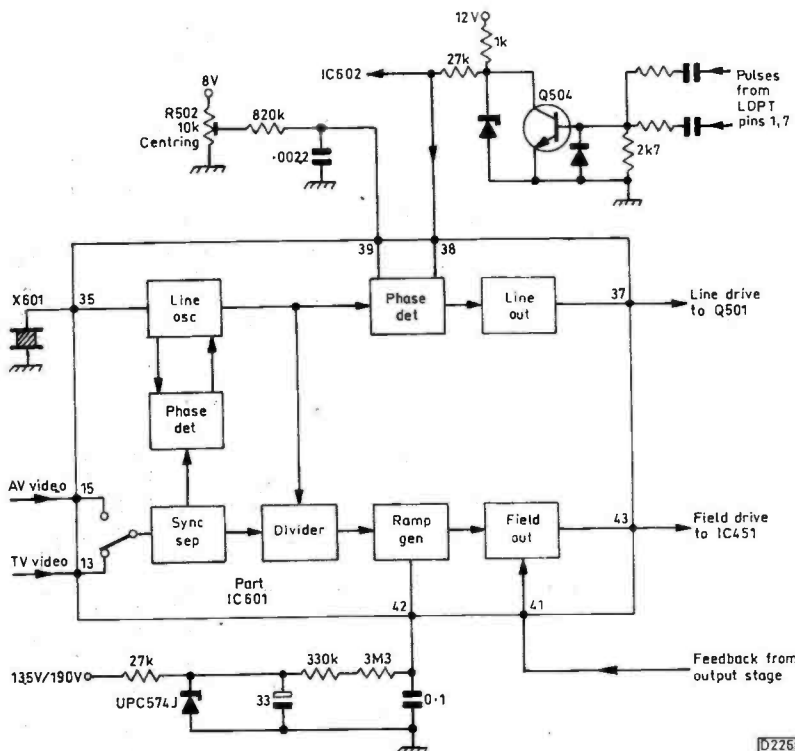


Fig. 1: Block diagram of the timebase generator system.

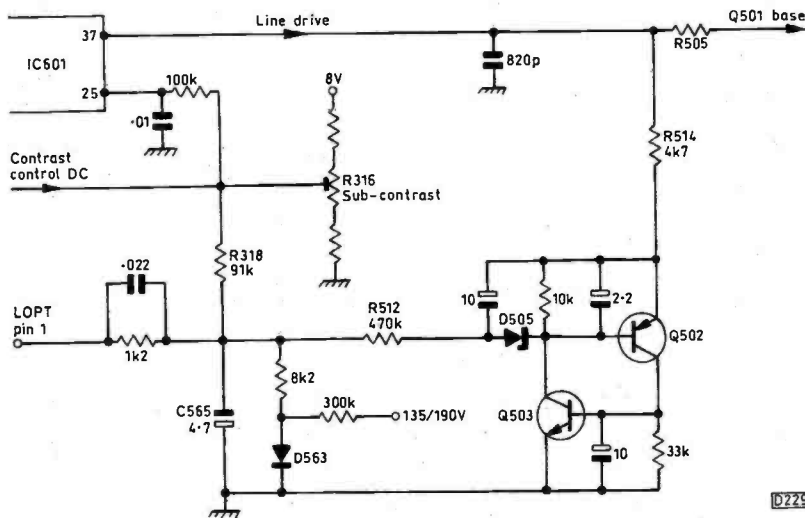


Fig. 4: The beam limiting system.

gives IC601 the impression that the field output stage is out of action. The protection circuitry in IC601 is then brought into operation, shutting down the field drive and

RGB outputs. Small RGB drive voltages remain however – sufficient to illuminate the collapsed scan for cut-off adjustment purposes.

Beam Current Limiting

The beam current limiting circuit is shown in Fig. 4. It monitors the current at the earthy end of the line output transformer's diode-split EHT system, i.e. at pin 1 of the transformer. The beam current produces a negative voltage across C565. A rise in beam current will increase this voltage. Since C565 is connected via R318 to the contrast control line from IC1202, increases in beam current reduce the contrast control voltage and thus the overall beam current.

Should a fault result in the beam current exceeding 1.1mA, zener diode D505 will conduct and Q502 will switch on. Q503 in turn conducts, and the two transistors latch on. Since the emitter of Q502 is linked to the base of the line driver transistor via R514 this removes the line drive, shutting down the line output stage.

In Conclusion

This concludes our description of the technology used in the Z5 chassis. The next article in this series will start to look at Panasonic's latest digital TV chassis, the Euro 2.

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1N4002	0.07	2SC2655	0.31	AN5435	1.48	BC558C	0.06	BRX49	0.43	CD4017	0.47	RC4558	0.55	TDA1015	1.37	TDA4601	1.46
1N4004	0.04	2SC3153	2.65	AN5512	1.76	BC636	0.14	BRYS5	0.28	CD4049	0.35	REGBABY10	15.90	TDA1035T	4.27	TDA4601D	4.02
1N4005	0.07	2SC3182	1.20	AN5515	2.79	BC637	0.11	BSX20	0.35	CD4053	0.54	RGP10G	0.26	TDA1044	1.43	TDA4605	4.10
1N4006	0.04	2SC3225	0.80	AN5521	1.66	BC639	0.21	BT139600	1.29	CD4093	0.32	RGP15J	0.17	TDA1060	1.08	TDA4950	1.78
1N4007	0.06	2SC3330	0.52	AN6610	0.94	BC640	0.11	BT151500R	1.12	CNK62A	1.29	RGP15M	0.44	TDA1085C	2.74	TDA7052	1.70
1N4148	0.06	2SC3502	0.45	AN7171K	5.56	BC8488	0.28	BT151800R	1.15	CNK82A	2.10	RGP30M	0.30	TDA1170	1.82	TDA7240A	2.57
1N5062	0.26	2SC3795	2.09	BA157	0.09	BC848C	0.18	BU208A	1.46	CNK83A	2.55	S2000A3	1.54	TDA1170N	2.57	TDA8138	1.97
1N5400	0.11	2SC3795B	2.21	BA158	0.07	BC858B	0.24	BU208D	1.61	CNY75B	0.52	S2000AF	1.71	TDA1170S	2.05	TDA8140	4.62
1N5401	0.14	2SC3807	0.91	BA159	0.11	BC858C	0.19	BU326A	1.36	DTA114ES	0.31	S2055AF	3.74	TDA1180P	1.68	TDA8145	1.97
1N5402	0.12	2SC3885A	6.02	BA39108	6.99	BC875	0.33	BU406	0.69	DTA124ES	0.19	SAA129302	10.37	TDA1515A	3.16	TDA8153	16.24
1N5408	0.14	2SC3892A	6.02	BA5406	2.14	BD131	0.26	BU426A	1.29	DTG124E	0.19	SA45012	3.34	TDA1516Q	3.59	TDA8170	4.70
1N6263	0.20	2SC4204	0.60	BA5412	2.48	BD132	0.26	BU4500	1.41	DTG124ES	0.77	SAB3035	1.71	TDA15170S	4.27	TDA8172	2.65
1N914	0.04	2SC4242	2.31	BA6109	1.85	BD135	0.33	BU500S	0.35	DTG144ES	0.19	SDA2516	2.89	TDA1519	4.27	TDA8175	6.41
1S1555	0.07	2SC4517	4.70	BA6209	1.46	BD136	0.20	BU500B	1.29	FXT749	0.43	SGSIF344	10.70	TDA1520A	2.48	TDA8178FS	3.98
2N2222A	0.23	2SC4517A	2.52	BA6209N	1.27	BD137	0.46	BU508AF	1.32	HA13001	3.85	SL1430	1.92	TDA1524A	2.99	TDA8180	4.87
2N2369A	0.19	2SC458	0.12	BA6219B	1.76	BD138	0.29	BU508D	1.56	HA13108	2.57	SL1431	2.02	TDA1524A	4.79	TDA8190	3.59
2N3055	0.50	2SC4742	5.11	BA6222	1.78	BD139	0.31	BU508DF	1.88	HA13117	2.85	SL1432	10.17	TDA1554Q	8.12	TDA8380	2.53
2N3773	1.52	2SC536	0.30	BA6238A	2.91	BD140	0.24	BU508V	1.42	HA13118	1.00	ST4441C	3.06	TDA1557Q	4.23	TDA9503	2.13
2N3904	0.32	2SC8050	0.52	BA6247	1.95	BD233	0.23	BU806	1.03	HA13119	2.05	STK4132H	10.00	TDA1558Q	7.69	TEA1039	2.11
2N4123	0.30	2SC945	0.12	BA718	1.08	BD234	0.24	BU807	1.51	HA13151	13.20	STK4141H	10.23	TDA1670A	2.98	TEA2018A	2.29
2SA1013	0.35	2SD1207	0.57	BA755	0.96	BD237	0.31	BU908	1.68	HA51338SP3	7.69	STK4142H	9.40	TDA1675A	3.85	TEA2018A	7.94
2SA1015	0.11	2SD1266	0.82	BAV21	0.21	BD238	0.24	BUK444500B	2.57	HM6251	14.32	STK4152H	10.68	TDA1904	1.83	TEA2031A	4.26
2SA10156R	0.11	2SD1275	1.41	BAW76	0.83	BD239	0.33	BUK454600C	2.99	KAZ263	0.55	STK463	11.49	TDA1908A	2.14	TEA2164	3.40
2SA1020	0.44	2SD1292	0.64	BAX14	0.17	BD243C	0.44	BUK454800A	4.99	KBL08	2.54	STK5331	2.87	TDA2004	2.57	TEA2165A	9.58
2SA1175	0.26	2SD1397	2.31	BC107B	0.20	BD244A	0.34	BUK455600B	2.54	KA6210AH	1.42	STK5332	2.82	TDA2005	1.83	TEA2209C	2.48
2SA1286	0.60	2SD1398	2.14	BC108	0.24	BD244C	0.42	BUK455600B	2.54	LA1230	1.95	STK5333	15.00	TDA2006	1.06	TEA2261	3.68
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2SA608	0.24	2SD1441	5.98	BC141	0.36	BD437	0.20	BU712A	0.91	LA4445	3.45	STK5421	9.52	TDA2040H	4.34	TEC106D	0.82
2SA673	0.10	2SD1453	3.85	BC147A	0.24	BD438	0.38	BU712AF	1.37	LA4700	4.27	STK5471	4.87	TDA2050	4.58	TEC225M	1.02
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2SA769	1.29	2SD1541	4.96	BC157	0.13	BD839	0.57	BU756A	1.19	LA6510	2.94	STK5482	5.52	TDA2270	9.60	TP102	0.86
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2SB641	0.21	2SD1878	2.83	BC213L	0.84	BF240	0.11	BU271A	1.83	LED3Y	0.10	STR54041	10.52	TDA2582	3.85	TP3055	0.93
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2SB686	2.05	2SD1887	3.56	BC238	0.11	BF245A	0.19	BU290A	0.41	LM324N	1.48	STR58041	3.42	TDA2595	3.19	TP31C	0.00
2SB698	0.35	2SD1911	5.98	BC238C	0.07	BF245B	0.87	BY127	0.10	LM339N	0.50	STR59041	0.11	TDA2600	7.69	TP32A	0.45
2SB716	0.43	2SD1950A	1.87	BC307	0.80	BF256A	0.23	BY179	0.77	LM358N	0.52	STR6020	6.87	TDA2611A	0.64	TP32C	0.40
2SB764	0.30	2SD400	0.34	BC307B	0.15	BF258	0.04	BY227	0.13	M494B1	11.85	STR61001	10.86	TDA2611AQ	1.32	TP35C	1.82
2SB772	0.50	2SD401A	0.77	BC308	0.09	BF324	0.10	BY228	0.26	M5218L	0.69	STRD1816	7.89	TDA2653A	4.70	TP36C	2.14
2SB774	1.61	2SD468	0.28	BC308B	0.19	BF391	0.10	BY2291000	1.31	M54544L	2.84	STRD4420	11.49	TDA3301B	6.75	TP41C	0.65
2SB891	0.60	2SD669A	0.84	BC309C	0.14	BF420	0.21	BY229800	1.88	M63555P	4.96	T9053V	1.35	TDA3505	2.40	TP42C	0.50
2SB892	0.35	2SD716	1.83	BC327	0.10	BF421	0.24	BY255	0.14	MC13002P	7.69	T9064V	1.87	TDA3560	3.86	TP4760A	2.57
2SC1213	0.14	2SD756	0.47	BC328	0.14	BF422	0.19	BY299	0.10	MC140668P	0.21	TA7205AP	2.87	TDA3561A	5.30	TP4761A	1.85
2SC124	0.48	2SD837B	1.12	BC337	0.14	BF423	0.14	BY398	0.10	MC14426P	1.29	TA7227P	2.29	TDA3562A	3.90	TP4791A	1.25
2SC1318	0.19	2SD856	0.79	BC338	0.06	BF458	0.31	BY399	0.12	MDA2062	13.74	TA7270P	2.72	TDA3562AF	8.77	TL072	0.00
2SC1573	0.35	2SD898B	6.41	BC368	0.10	BF459	0.43	BY448	0.30	MJ2955	0.98	TA7271P	2.70	TDA3565	2.94	TL082CP	0.21
2SC1740	0.16	2SD965	0.87	BC369	0.10	BF460	0.42	BYD14J	0.35	MJ2955	3.34	TA7274P	4.93	TDA3566	6.41	TPM47C432AP8189	15.19
2SC1815	0.17	2SK1118	3.48	BC372	0.40	BF469	0.34	BYD33D	0.12	MJ802	2.91	TA7280P	2.74	TDA3576B	10.31	TPM47C434N3555	18.83
2SC1827	0.98	7406	0.69	BC517	0.16	BF470	0.38	BYD33J	0.16	ME13005	0.86	TA7281P	3.20	TDA3592A	4.27	TPU2732	10.05
2SC1959	0.10	7407	0.69	BC546A	0.11	BF471	0.37	BYD33M	0.26	ME18004	2.05	TA7698AP	5.97	TDA3640	5.98	U2829B	2.48
2SC2001	0.23	74HC04	0.34	BC546B	0.12	BF487	0.57	BYD40	2.55	MJ3055T	0.74	TA8201	3.93	TDA3650	12.02	UC3842	1.46
2SC2023	3.10	7805	0.78	BC547	0.11	BF759	0.38	BYE95B	0.21	ME340	0.45	TA8205AH	4.58	TDA3650H	1.54	UC3844	1.20
2SC2060	0.30	7808	0.72	BC547A	0.84	BF763	0.23	BYE95C	0.21	MF18004	2.05	TA8207	2.74	TDA3653C	2.55	UC3844N	1.91
2SC2078	1.00	7809	0.89	BC547B	0.11	BF788	0.52	BYE96D	0.21	MN650	3.30	TA8210AH	4.10	TDA3653CQ	2.57	UPC1230H	3.40
2SC2120	0.23	7812	0.52	BC548	0.06	BF869	0.25	BYE96E	0.53	MPS406	0.35	TA8210H	4.79	TDA3654Q	1.88	UPC1318AV	3.85
2SC2230	0.55	7815	0.82	BC548A	0.11	BF869S	0.48	BYE96F	0.31	MPS442	0.23	TA8215H	4.96	TDA3654Q	2.82	UPC1365C	1.78
2SC2235	0.38	7810S	0.35	BC548B	0.06	BF871	0.41	BYE96G	0.21	MPS456	0.23	TA8220H	9.82	TDA4500	6.66	UPC1378H	1.68
2SC2236	0.36	7912	0.35	BC548C	0.09	BF959	0.18	BYE96H	0.48	MPS492	0.10	TA8221H	7.26	TDA4501H	5.95	UPC1394C	

Television Test Equipment

Gearing up for the 21st Century

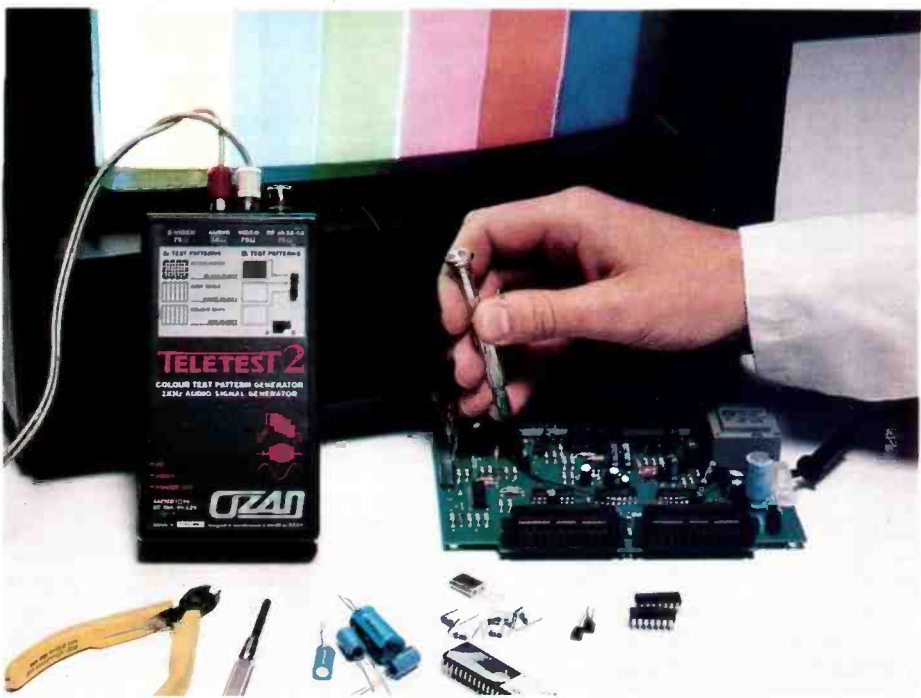
TV, video and allied equipment is becoming more complex with each new design. As a result, its repair and servicing have become an increasingly challenging and specialised business. While this has been happening, the price of home entertainment gear has been steadily falling in real terms. These factors make it more important than ever that fault diagnosis and repair are carried out quickly and efficiently. Otherwise, servicing will cease to be viable.

The start of digital TV broadcasting from terrestrial and satellite transmitters is not far off. It will present new challenges and opportunities for the forward-looking technician. A vital element in the current and future servicing set-up is sophisticated, accurate and reliable test and measurement gear. There have been tremendous advances in test equipment design and applications in recent years, also refinement of traditional instruments.

Oscilloscopes

The demands made on oscilloscopes have increased steadily over the years. Many scopes in current workshop use are becoming rapidly outdated. High-sensitivity, wideband instruments are the requirement today, and are available from a number of manufacturers. Hameg and Kenwood spring to mind as well established and trusted brands.

Three- and four-channel scopes like the Kenwood CS5230 offer eight or ten simultaneous trace displays, while analogue/digital instruments such as the Hameg HM1007 offer, at a relatively modest price, a sampling rate of 40Msamples/sec and 2Kbit storage per channel. This provides storage of previously acquired data for



comparison with current waveforms – the two can be overlaid if required. GoldStar also offers a wide range of scopes, the star in this range being the OS3060, a 60MHz digital storage model.

A comparatively recent innovation in oscilloscope technology is the use of a high-density liquid-crystal display in a high-specification wideband instrument. The Fluke Scopemaster combines this with a DMM as a hand-held instrument for field servicing. For bench use, the Promax Poliscopes integrates this approach with a DMM, a frequency counter and an eight-channel logic analyser. LCD scopes are smaller, lighter and more versatile than conventional types, and consume less energy. These are important factors for some applications.

The Ozan Teletest 2 pattern generator being used to provide a colour-bar display.

Autoranging DMMs have been around for many years. There's now an autoranging oscilloscope, the Sencore SC3100 auto-tracker, which enables you to move from one test point to another without need to adjust knobs or select menus. The Y gain and sweep speed are both selected automatically to suit the input signal.

Hameg pioneered the incorporation of component testers in TV servicing scopes. There are now also stand-alone component checkers, such as the Hameg HZ65 and Huntron Tracker 2000, which provide 'signature' displays – these are unique to

Supplement text and research by Eugene Trundle

each type of semiconductor device and passive component.

Meters

The multimeter is perhaps the most widely used instrument for general servicing and fault finding. Some technicians still find that the analogue type has advantages. Many are still available, at prices that range from ten pounds to several hundred.

For accuracy and ruggedness however the digital type with an LCD readout cannot be beaten. Again there is a huge range of models at widely varying prices. There is enormous competition in this field.

In addition to excellent accuracy (up to ± 0.05 per cent), higher class instruments can offer resistance, capacitance, frequency and temperature measurement, diode and transistor checks, autoranging, audible continuity testing and analogue bargraph displays. Amongst the hand-held models the Maxcom MX620 and Metex M3850 are good examples. Black Star and Kenwood make excellent digital measurement systems for bench use.

Pattern Generators

Pattern and 'test-card' generators represent some of the biggest advances in test equipment technology in recent years. The use of purpose-designed chips and precision

crystals makes them more versatile and accurate than ever before, also cheaper in real terms.

There are now several 'pocket' pattern sources, such as the Teletest and Teletest Pro from Ozan, the Philex CG200P and the Promax CG918. With prices that range from £100 to £212, some of these can generate circle patterns as well as the more usual colour bar and crosshatch displays, and can present them in composite video, S video and modulated RF form.

The Teletest 2 at £149.95 offers good value, providing six displays – a crosshatch with border castellations, grey scale, colour bars, plus red, white and black rasters – a 1kHz audio tone and outputs in composite video, S video and RF form.

At the other end of the scale come sophisticated bench pattern generators that provide scores of patterns which vary in complexity up to a complete composite test card, and an RF generator able to synthesise any channel – VHF, cable and UHF – at the touch of a button. A shining example here is the Promax GV498, which in addition to the features just mentioned provides teletext and Nicam outputs. It's price is far below that of similar instruments from other manufacturers.

Between these two extremes there are many good value bench instruments such as the Black Star Orion, which provides

composite video, RF and baseband video outputs and three sound carrier choices (5.5, 6 and 6.6MHz), and the Kenwood CG932 which features interlaced or progressive scanning, an S video facility and a multistandard RF output choice.

Counters

Though not required as often as a meter or scope, a frequency counter is nowadays essential for many diagnostic and setting up jobs. The counter may be combined with another instrument, as previously mentioned, or be in stand-alone form. The latter range from hand-held types such as the Precision Gold M415F and Thandar PFM1300, which are battery powered with an LCD readout, to the full-specification, high-accuracy LED-display models from Black Star, Kenwood and others.

CRT Restorers

CRT rejuvenators have been around since the earliest days of television. They have undergone continual refinement and improvement over the years. Muter is one of the best-known names in this business. Konig has two rejuvenator products, while from the USA comes the new Sencore CR70 'Beam Builder', with five progressive levels of restorer action.

Continued over page

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Gould OS3000 – 40MHz, dual ch.	£250
Gould 1602 – 20MHz Dig storage + printer (cursors)	£1150
Hewlett Packard 1707A, 1707B – 75MHz dual ch.	from £275
Hewlett Packard 1740A, 1741A, 1744A, 100MHz dual ch.	from £350
Hewlett Packard 54501A – 100MHz – 4 Channel digitizing	£1950
Hewlett Packard 54100D – 1GHz digitizing	£4500
Hewlett Packard 54201A – 300MHz digitizing	£1750
Nicolet 3091 – Low freq D.S.O.	£1100
Tektronix 468 – 100MHz D.S.O.	£800
Tektronix 2213 – 60MHz dual ch.	£425
Tektronix 2215 – 60MHz dual ch.	£450
Tektronix 2220 – 60MHz digital storage	£995
Tektronix 2225 – 50MHz dual trace	£450
Tektronix 2235 – 100MHz dual ch. (portable)	£800
Tektronix 2335 – 100MHz dual ch. (portable)	£750
Tektronix 464/466 – 100MHz, storage	from £350
Tektronix 465/465B – 100MHz dual ch.	from £350
Tektronix 7313, 7603, 7613, 7623, 7633 – 100MHz 4 ch.	from £300
Tektronix 7704 – 250MHz 4 ch.	from £650
Tektronix 7904 – 500MHz	from £850
Tektronix 475 – 200MHz dual trace	£475
Tektronix 455 – 50MHz dual trace	£350
Tequipment D68 – 50MHz dual ch.	£200
Tequipment DM63 – 4 channel – 50MHz	£150
Philips 3211, 3217, 3240, 3243, 3261, 3262 – (2 ch. + 4 ch.)	from £125 to £350
Philips PM3295A – 400MHz dual channel	£1950
Philips PM3295 – 350MHz dual channel	£1800
HAMEG 203/203-4/203-5/203-6 – 20MHz dual trace	from £175
Kikushui COS6100 – 100MHz – 5 channel, 12 trace	£475
Hewlett Packard 182C – 100MHz – 4 channel	£350
Hewlett Packard 54200A – 50MHz – digitizing	£995
Intron 2020 – 20MHz dig storage (New)	£750
Meguro MSO1270A – 20MHz dig storage (New)	£750
Kikushui DSS6522 – 20MHz Dig storage	£475
Iwatsu SS5702 – 20MHz dual channel	£175
Tektronix 434 – 25MHz – 2 channel – Bistable storage	£175
Tektronix 454 – 150MHz – 2 channel	£300
Tektronix 2445 – 150MHz – 4 channel	£1350
Tektronix 2445A – 150MHz – 4 channel	£1500
Tektronix 7934 – 500MHz – analogue storage with 7A19/7A16A/7B80/7B85	£1500
Hitachi V650F – 60MHz dual channel	£350
Hitachi VC6265 – 100MHz digital storage (As New)	£2250
Hitachi V212 – 20MHz dual channel	£180
Hitachi V222 – 20MHz dual channel	£200
Panasonic VP5741A – 100MHz dig storage (As New)	£2250
Codsor 3102 – 60MHz dual channel	£250
Watsu SS5121 – 100MHz dual channel	£425
Watsu SS5710 – 60MHz dual channel	£575
Kikushui COS5100 – 100MHz dual channel	£425
Gould OS3351 – 40MHz dual channel	£225
Philips PM3244 – 50MHz 4 channel	£375
Philips PM3263 – 100MHz dual channel & dig counter readout	£400
Gould OS255 – 15MHz dual channel	£150

OTHER SCOPES AVAILABLE TOO

SPECTRUM ANALYSERS

Hewlett Packard 3580A – 5Hz-50KHz	£995
Hewlett Packard 3582A – 25KHz analyser, dual channel	£2500
Hewlett Packard 182T with 8559A – (10MHz-21GHz)	£3750
Hewlett Packard 8590A – 10KHz-1.5GHz	£4250
Hewlett Packard 141T + 8552B + 8555A – (10MHz-18GHz)	£1600
Hewlett Packard 853A with 8559A – (0.01-21GHz)	£4250
Hewlett Packard 8565A – (0.01-22GHz)	£4000
Marconi 2370 – 110MHz	£995
Marconi 2371 – 30Hz-200MHz	£1250
Rohde & Schwarz – SWOB 5 Polyskop 0.1-1300MHz	£2500
Polrad 641-1 – 10MHz-18GHz	£1500
Tektronix 2710 – 10KHz – 1.8GHz spectrum analyser	£4995
Gator/Alltech 757 – 10KHz-22GHz	£2750
Hewlett Packard 141T + 8552B + 8554B – 100KHz-1250MHz)	£1200
Hewlett Packard 8505A – 500KHz-1.3GHz – network analyser	£4000
Hewlett Packard 8754A – 4-1300MHz – network analyser	£3250
Tektronix 7L18 + 7603 – Mainframe 1.5-10GHz	£3000
Meguro MSA4901 – 1MHz-300MHz (As New) ..	£1000
Meguro MSA4912 – 1MHz-1GHz (As New)	£2000
Hewlett Packard 8542A – 50KHz-22GHz portable	£10,000
Hewlett Packard 3562A – Dual channel dynamic signal analyser	£7500

MISCELLANEOUS

E.I.P. 548A – frequency counter (26.5GHz)	£3500
Hewlett Packard 3325A – 21MHz synthesiser/function gen.	£1500
Hewlett Packard 3438A Digital multimeter	£200
Hewlett Packard 3490A Digital multimeter	£250
Hewlett Packard 5316B – Universal counter HP1B	£750
Hewlett Packard 5385A – Frequency counter 1GHz (HP1B) with Opts 001/003/004/005	£995
Hewlett Packard 8640B – AM/FM Signal Gen. (512MHz)	£850
Hewlett Packard 5314A (New) – 100MHz universal counter	£250
Hewlett Packard 8901B – Modulation analyser	£4250
Hewlett Packard 8903B – Audio Analyser	£3250
Hewlett Packard 4342A – 'Q' meter	£995
Hewlett Packard 4261A – LCR meter (digital)	£500
Hewlett Packard 8656A – Synth. sig. gen. (100KHz-990MHz)	£1750
Hewlett Packard 4271B – LCR meter (digital)	£900
Marconi 2019A – 80KHz – 1040MHz synth. sig. gen.	£1950
Marconi 2432A 500MHz digital freq. meter	£200
Marconi 893B A/F power meter	£325
Philips PM5167 10MHz function gen.	£400
Racal 9301A True RMS R/F millivoltmeter	£300
Racal Dana 1992 – 1300MHz frequency counter opts 4B + 55	£800
Racal Dana 9081 – Synth. sig. gen. 520MHz	£550
Racal Dana 9084 – Synth. sig. gen. 104MHz	£450
Racal Dana 9921 – 3GHz frequency counter	£450
Tektronix 576 Curve tracer (with test fixtures)	£1250
Hewlett Packard 8901A – Modulation analyser	£3400
Hewlett Packard 4275A (LCR) – Meter – Multi-frequency	£4250
Hewlett Packard 5335A – 200MHz high perform. systs counter	£600
Hewlett Packard 5270A – 100MHz universal timer/counter	£450

MANY MORE ITEMS AVAILABLE – SEND
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Bench PSUs

Bench power supplies find many uses from powering camcorders and VCR mechanisms for test purposes to biasing tuners and servos and even charging batteries. For precision and versatility, a single or dual type with digital readout of the voltage and current, plus a current-limiting facility, is favourite.

Instek is one manufacturer that makes a wide range of precision PSUs. You can turn to Daiwa on the other hand for heavy metal testing of in-car entertainment gear: the firm makes 3-15V variable power supply units that can provide an output of up to 30A – heavy indeed!

PATs

In all servicing activity safety is a major consideration. Current legislation in fact obliges repairers and sellers of electrical

goods to ensure the integrity of the equipment before its release to the public.

Portable appliance testers (PATs) can check and record all leakage and earth-loop impedance parameters to legal requirements, but have traditionally been expensive. Seaward, one of the best-known manufacturers of PATs, now has available a simple, low-cost instrument. This is the PAC500 at £156. Avo/Megger produce a wide range of insulation testers.

Servicing Monitors and Computers

The servicing and repair of computer monitors is a subject that has received increasing coverage in the pages of *Television* in recent months. It can provide a fruitful new source of income for repair

shops and technicians. Bear in mind that the number of monitors in use is increasing rapidly as computers find ever wider markets. Several manufacturers specialise in the provision of dedicated test, diagnostic and alignment equipment for computer monitors.

Black Star has, amongst its range of many products for monitor alignment and testing, a software program at the very reasonable price of £29: Testcard runs on all IBM-compatible PCs and comes in 3.5 or 5.25in. floppy disc form. It offers all the patterns available from a TV-type pattern generator, including a composite test card.

This company also makes stand-alone monitor pattern generators. Model 1410 can be programmed for eight line-scan and five field-scan rates and will interface with a wide range of monitors.

TEST EQUIPMENT MANUFACTURERS AND DISTRIBUTORS

Note that many items are available from several different sources. The suppliers listed below have been selected because they carry a reasonable range of the named brand of equipment.

Adroit Technology Ltd. Available from CPC.

Alban Electronic Ltd., 6 Caxton Centre, Porters Wood, St Albans, Herts AL3 6XT. 01727 832 266.

Altai. Available from SEME.

Avo/Megger. Avo International, Archcliffe Road, Dover, Kent CT17 9EN. 01304 502 100.

Black Star, 4 Harding Way, St Ives, Huntingdon, Cambs PE17 4WR. 01480 462 440.

CHS, Prospect House, Barmby Road, Pocklington, York YO4 2DP. 01759 303 068.

CPC plc, Component House, Faraday Drive, Fulwood, Preston, Lancs PR2 4PP. 01772 654 455.

Daiwa, Available from SEME.

Euras, Euras House, 51 Bristol Road, Keynsham, Bristol BS18 2BA. 01179 860 900.

Fluke. Available from Willow Vale Electronics.

GoldStar. Available from Maplin.

Hameg. Available from CPC, SEME, Willow Vale Electronics.

Huntron. Available from SEME.

Instek. Available from Maplin.

JVC (UK) Ltd., JVC House, JVC Business Park, Priestley Way, Staples Corner, London NW2 7BA. 0181 450 3282.

Kenwood. Available from SEME.

Konig. Available from CHS, Willow Vale Electronics.

Leader. Available from CPC.

Maplin Electronics plc, PO Box 3, Rayleigh, Essex SS6 2BR. 01702 554 161.

Maxcom. Available from Vann Draper Electronics, Willow Vale Electronics.

Metex. Available from CPC, SEME.

Müter. Available from SEME in the UK, from Donberg Electronics, Ranafast, Co. Donegal (075 48 275) in Ireland.

Ozan, Freepost, Wimborne, Dorset BH21 7BR. Freecall 0500 009 070.

PC Control Systems Ltd., Hamilton House, 66 Palmerstone Road, Northampton NN1 5EX. 01604 601 677.

Philex plc, 110-124 The Broadway, West Hendon, London NW9 7PP. 0181 202 1919.

Precision Gold. Available from Maplin.

Promax. Available from Alban Electronic Ltd.

Sadelta. Available from Willow Vale.

Satellite Solutions (UK) Ltd., 1 Hartburn Close, Crow Lane Industrial Estate, Northampton NN3 9UE. 01604 787 888.

Satfinder. Available from Willow Vale Electronics.

Satlook. Available from Satellite Solutions.

Seaward. Available from CPC, SEME, Willow Vale Electronics.

SEME Ltd., Unit 2, Saxby Road Industrial Estate, Melton Mowbray, Leics LE13 1BS. 01664 481 818.

Sencore. UK agents ITM Ltd., 34 Beaufoyo Avenue, Ferndown, Wimborne, Dorset BH22 9RH. 01202 872 771.

Thandar/Thurlby. Available from Willow Vale Electronics.

Ultra-X Inc. Available from CPC.

Unaohm. Available from Satellite Solutions.

Vann Draper Electronics, Unit 5, Premier Works, Canal Street, South Wigston, Leics LE18 2PL. 01162 771 400. Stocks a wide range.

Willow Vale Electronics Ltd., 11 Arkwright Road, Reading, Berks RG2 0LU. 01734 876 444.

Test gear is also available from:

HRS Electronics Ltd., 100 Great Barr Street, Birmingham B9 4BB. 01217 666 668.

Stewart of Reading, 110 Wykeham Road, Reading, Berks RG6 1PL. 01734 268 041. Also supplies used equipment.

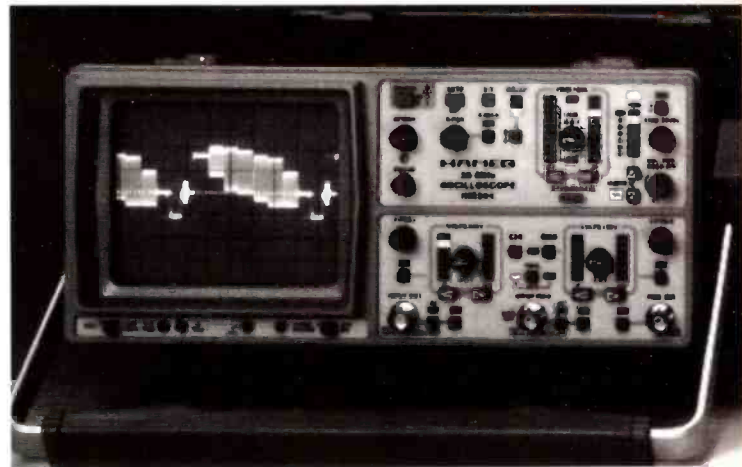
The most affordable monitor test pattern generator is the hand-held, battery-powered Teletest PC from Ozan. Priced at £149.95, it provides six test patterns in VGA and S-VGA sync modes.

Perhaps the most comprehensive range of monitor test equipment comes from Sencore. Currently available in the UK are the CM2125 analyser, CM125 signal generator and EX220 output expander, which are all specifically designed for monitor servicing. The analyser is microcomputer controlled and is programmable for pixel count and scan rates, at up to 2048 x 2048 pixels and storage of up to 70 monitor set-ups. It comes with hook-up adaptors for a wide range of monitors, and is now partnered by the CM2220 which has the facility to download set-up data from the associated computer.

The CM125 signal generator is a lightweight, portable instrument with a bandwidth capability of 125MHz and 100 storage locations for set-up data. Model EX220 provides a video output expander function so that up to ten monitors can be soaked together from a single RGB source.

There are many inexpensive devices for those who intend to repair the associated computers. These include an interface tester from Adroit Technology Ltd.; the MicroPost, QuickPost and QuickTech Pro software and hardware from Ultra X Inc.; and a range of

The Hameg HM304 microcomputer-controlled analogue oscilloscope has an auto-set system with six set-up memories to save and recall complete front-panel configurations. Specification includes 35MHz bandwidth, 1mV/div sensitivity and 0.5s to 10ns/div timebase ranges. A delay timebase, variable hold-off and a built-in component tester are included.



diagnostic software programs from various sources – a good one is Norton Utilities.

Satellite Servicing

An inexpensive item from Promax is a great help for satellite receiver installation and servicing. The ST240 at £125 simulates an SHF satellite transmission, squirting it at an LNB to provide a complete system check. The instrument also provides an LED indication of the 13V and 17V LNB supply line voltages and the presence of a 22kHz switching tone.

Many makers supply simple 'peaking'

meters, at prices as low as £30, to aid dish alignment. The Satfinder is a good example. Some incorporate an audio tone generator for eyes-off pointing with great accuracy. These inexpensive indicators don't discriminate between carrier frequencies however, and give no indication of relative signal strength. Thus for dual-feed and multi-satellite installations something more elaborate is required.

A spectrum monitor for satellite TV use incorporates a tuner, demodulator and monochrome monitor. It can thus display pictures and reproduce sound. In the sweep

The Only Complete Line Of Computer Monitor Test Instruments!

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- Circuit Analyzers
- Colour Analyzers
- Component Testers
- Training Programs



SENCORE

CM2220/2125 New Computer Monitor Troubleshooter & Colour Analyzer

Provide all the facilities to test, troubleshoot and align even the most complex high bandwidth workstation monitors. The CM2220 provides a full 220 MHz video bandwidth RGB generator and an integrated colour analyzer. Fully programmable format set-ups match exact requirements of monitors under test including frequencies, timings, and patterns. The CM2125 incorporates a 125 MHz, fully protected RGB video and sync generator, sync locked signal substitutor, patented "Ringer" test, and 2,000 DCV and PPV meter. Compatible with TTL, analog, and ECL video types.

CM125 "Pix Pak" Computer Monitor Signal Generator

An easy-to-use, programmable, portable and lightweight RGB generator. Full 125 MHz video bandwidth and 2048 x 2048 pixel resolution. Horizontal and vertical frequencies, sync, pixel, and blanking times are fully programmable. Compatible with TTL, analog, and ECL video types.

LC102 "AUTO-Z" Dynamic Capacitor/Inductor Analyzer

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mode it enables the satellite band to be swept continuously at 50Hz, displaying the signals detected in graphic form on the screen. Thus the relative amplitudes and positions of the carriers present can be seen and measured accurately.

The most affordable spectrum monitor is the Satlook, at £383. More sophisticated models, with digital frequency synthesis, an 80dB measuring range, multistandard operation and a printer interface output are available from Unaohm and Promax. The Unaohm model has a polariser driver, while the Promax MC877 features a colour LCD screen.

Satellite signal generators – the equivalent of a TV pattern generator – are also now available, with colour and monochrome patterns, energy-dispersal waveform generators, an audio facility and LNB load simulation. The Promax GV264 operates in the 1,500MHz range, with band-end markers at 950 and 2,050MHz. It's useful for MATV and cable distribution checks as well as receiver testing.

Terrestrial Transmissions

Channel 5 transmissions are now almost upon us. In many areas a new aerial or an upgrade/service of the existing aerial will be required to ensure good reception of the new channel and freedom from interference to the existing services. A good UHF signal indicator or analyser is needed for this application. The Sadelta TC402D and Promax MC277 respectively meet these requirements. The latter also has a satellite facility.

Audio Servicing

The test equipment used for audio servicing has a long life. Much of what's sitting on the shelves and benches of service departments



The Catek CM3900A digital multimeter, one of a new range available from Philex. This workshop model has an enlarged display. A feature of all models in the range is an auto-standby mode, which comes in to save battery power when the meter is left switched on but unused for a period of time.

is ageing and perhaps not sufficiently accurate to be able to deal with today's high-specification consumer equipment.

The Altai TE220 at £90 is typical of the traditional, inexpensive type of audio generator. The Leader 17A is specifically designed for radio work, with coverage at up to 450MHz and spot frequency outputs at 455kHz and 10.7MHz. At the top end, the Kenwood SG series of AM/FM frequency-synthesis signal generators are computer-controlled programmable instruments with multi-digital readout and stereo capability. Kenwood is strong in this field, with instruments to measure distortion (the HM250) and wow/flutter (the FL180A/FL140). The company's signal and function generator range has a competitor in

Black Star, whose Jupiter range offers good value.

The current trend in audio test equipment is for many functions to be integrated into a single 'measurement centre'. This approach, represented in their different ways by the Promax AA930 audio analyser and the Maxcom MX9300, offers a huge saving over the cost of buying separate instruments.

A laser power meter is essential for CD player servicing. Konig has just introduced Model LPM5673, a three-range type with 5 per cent accuracy. The company also makes reference and test cassettes and CDs.

Camcorder Servicing

Camcorder repair has always been a highly specialist branch of the service industry. This will be increasingly so now that the digital (DVC) format has been launched. Even with conventional formats and techniques, in-depth product knowledge and expensive, dedicated test equipment are required for efficient and successful diagnosis and setting up. For some years a PC with product-specific software and interfacing has been required for work with both VHS and Video 8 camcorders.

In addition to this and many of the general-purpose instruments mentioned above, the camcorder service section needs a vectorscope for checking and setting up chroma and burst amplitudes and phases. Several companies make vectorscopes, but often at prices that are inappropriate for retail servicing. The Kenwood CV1255 is relatively inexpensive (!) and is well suited to camcorder work. But at over £2,000 it represents a large investment.

Other essential but expensive requirements for camcorder servicing have been test charts, light boxes and spacing jigs for optical and electrical system adjustment. A recent JVC innovation eliminates this need, also the difficulty (in the workshop) of focusing on a subject at infinity – or in practice say 200m. It consists of an infinity adjustment (collimator) lens barrel, a simple light box and a range of tiny precision charts: focus, grey scale, colour bars, white balance and skin tone. The lens is type YTU92001B. Everything else is available separately. The outfit can be used with other makes of video cameras and camcorders.

Computers as Tools

We've already touched on computers, in connection with their repair, monitor servicing and as a diagnostic and alignment tool for camcorder servicing. Many other instruments and processes are designed for use with a PC: car radio security decoding is perhaps the first to spring to mind, using software and interfacing provided by specialist companies.

Some conventional instruments incorporate PC hook-up facilities, generally via an RS232 interface. Examples are the Fluke Scopemeter, which can provide screen printouts as required; GoldStar and Metex DMMs



Viewdata ordering from Panasonic. Photo courtesy Clerview of Seaford, East Sussex.

that come with an interfacing lead and a 3.5in. disc program; and some Seaward PATs that can download safety record software and show test results on a monitor, store them in memory or print them out via an RS232 link. Analogue satellite receiver programming and memory manipulation can also be carried out using a PC.

Most of these features do not use the computer's abilities to the full, or exploit its tremendous capacity for data manipulation. This is set to change completely when domestic digital TV equipment arrives on service benches. It's likely that production receivers will have some self-diagnostic software built in, but the probability is that most fault diagnosis, setting up and programming will be carried out using a PC, with software and interfacing provided (at a subsidised price, hopefully) by the equipment manufacturer.

This opens the way to using a modem and telephone data link between the workbench and the setmaker's service department – for data exchange, program downloading and even remote fault diagnosis. This approach need not be in the distant future: the technology is already available. The PC required for this role will need to have a fast and wide processor and a great deal of memory.

Meanwhile the PC can fulfil the more

modest workshop roles of keeping rental accounts and fault records, storing complete spares catalogues from wholesalers such as Willow Vale, storing fault databases from information providers such as Euras and PC Control Systems, providing direct order links to spares suppliers, holding and presenting satellite installation data and many other things. There is little doubt that as we go into the twenty first century a multi-task computer will play a central role in all service workshops which deal with state-of-the-art consumer electronic equipment.

Ancillary Equipment

The need for freezer, lubricants, soldering equipment etc., will of course remain. Products will always require a power supply, and this is where most faults will continue to arise.

For soldering, the Manzan Magnum 2004 is a full-specification soldering station that offers the same features as the Weller EC2100A at a lower cost. It uses a Magnum or Weller element and will take a full range of Magnum or Weller tips.

The Future

For many years it has been possible to get by with a minimum of test gear, much of that of ancient (but usually honourable) origin. The situation is now rapidly changing, to the

point where a lot of the consumer electronic equipment currently on the drawing board, even some on shop shelves, is beyond the capabilities of the diagnostic and alignment tools at present available in most service workshops.

Finance is of course a major problem when it comes to equipping a service operation. There remains the fact that what you can charge is related to the cost of new products in the shops. Some of the equipment mentioned above has price tags in the four-figure range, which is difficult to reconcile with what your customers are likely to be willing to pay. Even so, it's way below the price level of test gear aimed at broadcast and industrial users. There is unfortunately no simple answer to this one, even when the capital cost is tax deductible!

The use of new and sophisticated test gear should however speed throughput, increase diagnostic accuracy, ease the technician's task – and perhaps impress the customer! Good test equipment is always a sound investment, and it seems to have a long life – part of the reason why grey and cream boxes from the Seventies and Eighties still adorn the shelves and benches in so many repair shops.

Geared up with the new tools of your trade however, you can face the new century with confidence. . . ■

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As well as measuring from picofarads up to 20,000 μ F, the MX800 digital capacitance meter handles voltage, current and resistance. Normally, this high-performance hand-held meter retails for £69.33 without delivery, but Vann Draper is making the instrument available exclusively to *Television* readers for £59 – fully inclusive of VAT, postage and packing.

To receive your MX800 capacitance meter, simply fill in the coupon on the right and send it, together with payment, to Vann Draper Electronics at Unit 5, Premier Works, Canal Street, South Wigston, Leicester LE18 2PL. Alternatively fax credit card details with order on 0116 2773945 or telephone on 0116 2771400. Address orders and all correspondence relating to this order to Vann Draper Electronics.

MX800 specifications

Capacitance

Range	Resolution	Accuracy
200pF	0.1pF	$\pm 3\% \pm 3$ dgts
2nF	1pF	
20nF	10pF	
200nF	100pF	
2 μ F	1nF	
20 μ F	10nF	
200 μ F	100nF	
2000 μ F	1 μ F	
20mF	10 μ F	

Voltage DC and AC

Ranges 200mV, 2V, 20V, 200V, 1kV (750V AC)
 $\pm 0.25\%$ of rdg, ± 2 dgts on 200mV DC range,
 $\pm 1.2\%$ of rdg, ± 3 dgts on 200mV AC range.

Current DC and AC

Ranges 20 μ A, 200 μ A, 2mA, 20mA, 200mA, 2A
 $\pm 0.8\%$ of rdg, ± 4 dgts on 20 μ A DC range
 $\pm 1.2\%$ of rdg, ± 3 dgts on 20 μ A AC range.

Resistance

Ranges 200 Ω , 2k Ω , 20k Ω , 200k Ω , 2M Ω ,
20M Ω , 200M Ω , 2000M Ω
 $\pm 0.8\%$ of rdg, ± 4 dgts on 200 Ω range

Continuity

Threshold 30 Ω

Diode forward R test

Test current 1.5mA

Unlike multimeters with a capacitance range added, the no-compromise MX800 multi-function capacitance meter measures to 20,000 μ F. This 3.5-digit meter is available to Television readers for just £59 – fully inclusive.

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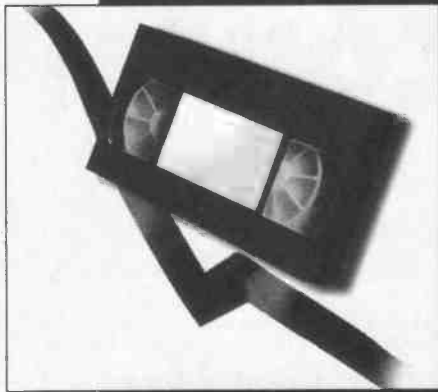
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Panasonic NVL25

Severe wow on sound was the complaint with this machine. It was terrible with prerecorded tapes, even worse with playback of its own recordings. The wow rate was 3-4Hz, and there were strange corresponding waveforms at pins 2 and 20 of the BA6435S capstan drive chip IC2101. A new BA6435S cleared the trouble. **E.T.**

Akai VS467

Intermittent deck shutdown and intermittent refusal to accept a cassette have been the symptoms with two of these machines we've had in. On both occasions we found that the cassette LED on the underdeck sensor PCB was dry-jointed. In fact there are two LEDs, one facing each way. They are connected in series with R1 (62Ω) and fed from the IDL5V line. **E.T.**

Panasonic NVSD40

At very rare and erratic intervals this machine would fail to record the picture. The effect on playback was a screenful of snow, with the sound continuing normally. Surface-mounted transistor Q3007

VCR Clinic

turned out to be the culprit: it had an intermittently open-circuit base-emitter junction. Its job is to switch the operating voltage to the video record amplifier. **E.T.**

Amstrad VCR9500

We hadn't encountered this model before, and as a result made fools of ourselves! If a fully rewound tape was inserted it would be ejected. If a part-wound tape was inserted the machine would rewind then eject it. The light pipe was missing from the start sensor optics at the left of the cassette cradle. **E.T.**

Grundig VS400

When fast forward was selected the FF symbol showed in the display but rewind was what you got. Play, rewind and forward search were all OK. This ruled out problems with the end sensors. A new mode switch was tried, solving the problem. **P.B.**

Hitachi VT428

There was a faint, stationary hum bar on the screen in the E-E mode while playback of a known good recording was marred by random horizontal black streaks. Playback of the machine's own recordings gave the impression that the heads were worn. In addition there was line tearing, as if the head speed was wrong – though it wasn't! The smell of something hot drew me to the IF module, where the chip was cooking nicely. Its 12V supply was at just under 20V – as were the 12V outputs at pins 1 and 3 of the STK5372H regulator chip. A replacement regulator chip put matters right. **J.E.**

Philips VR1541

This machine chewed the tape when play was selected and wouldn't wind fast forwards or rewind. As

the circlip that holds the swinging idler parts together had fallen off there was no reel rotation. The circlip was nowhere to be seen. The idler assembly is cheap and is easy to fit once the carriage has been removed. So we ordered a replacement – a lot less bother than trying to obtain and fit a circlip with the idler assembly in situ. **J.E.**

Samsung SI7230

Although there wasn't a tape in this machine it continuously tried to eject the carriage, which would have spent the rest of its life going in and out if it hadn't been for the carriage lock hook. This kept the carriage in the eject position. All deck functions worked normally when a tape was inserted and loaded by hand – until eject was selected. We then had a repeat performance.

The cause of the trouble was the tape-in leaf switch that's mounted on top of the carriage. There was 5V at both connections irrespective of the position of the contacts. Closer inspection revealed that one of the contacts was slightly twisted and was thus permanently closed. We were able to untwist the contact, using small, long-nose pliers. This restored correct switch and machine operation. **J.E.**

JVC HRD820

Tape damage was the complaint with this machine. When a dummy tape was inserted and play was selected the take-up spool carrier was seen to rotate in a jerky stop-go manner. Rewind and fast forward were sluggish and noisy. Suspecting a clutch problem, I removed the bottom cover. A small toothed pulley mounted on the capstan flywheel drives the clutch via a toothed belt. It had become loose,

and a crack was evident down its side. Non-JVC account holders can obtain the pulley from Willow Vale – part no. 87660PG. **J.E.**

Matsui VX900

If the heads seem to be faulty don't immediately order and fit a new drum, as I did. Instead, lower the bottom main board to gain access to the head amplifier screening can. Then use a switch cleaning aerosol to clean the contacts of the head switching relay. The chances are that this will save you a lot of money! **J.E.**

Ferguson 3V42/JVC HRD455

This machine came in for the routine job of fitting a new carriage assembly. It didn't take long to do this, but my heart sank when I tested the machine and saw the playback picture. It was a complete mess, consisting of two very wide horizontal dark bands that resembled hum bars, with a colourless, spotty picture in between – and not a straight vertical line in sight. The display was so ragged that I had to check the tape's label to find out what I was supposed to be looking at.

"Don't panic" I told myself, "go for the power supply". As the E-E picture was normal, a scope check on the switched playback 6V rail (test point TP2 on the regulator board) seemed to be a good idea. The display consisted of a 2V squarewave sitting on 4V DC. The likely culprit was C23 (2,200µF, 16V), which measured open-circuit. A replacement restored normal playback. Naturally as far as the customer was concerned playback had been perfect before the carriage broke! **J.E.**

Lloyd LV400/Amstrad VCR7000

This Orion machine had a partly laced-up tape in it. No functions worked. The cause of the trouble was an open-circuit N20 circuit protector on the power board. It doesn't seem to have a circuit reference number. The only other problem was a loose (slipping) loading belt. **R.B.**

Ferguson FV26D

The half loading arm was very sticky, to the extent that most of the time during play it was outside the tape path. At other times the loading sequence would be aborted because the arm jammed with the guide poles. When the cam gears were

stripped down I found that the grease was hardening. So a complete clean and relubrication was carried out. After this the machine played faultlessly. Unfortunately the audio/control head was so badly adjusted that the machine would play only its own recordings. It's OK now, but there's a pile of tapes that are of no use! **R.B.**

Grundig VS200

The owner of this machine said that it wouldn't record. He was more used to Far Eastern models. All that was wrong was that he didn't select an input before pressing record. **R.B.**

Ferguson 3V29 etc

Repairing broken 'hinges' on the front panel function switch operating pads has probably taxed the ingenuity and patience of us all. This latest machine to come my way had obviously led a hard life. The fast forward pad was completely detached, with very little left of the hinges following earlier repairs. I was therefore forced to try a new approach.

What I eventually did was to cut thin strips from a washing-up liquid bottle, then superglue them in place to form new hinges. When set, I cut V-shaped grooves across the strips so that they would flex rather than attempt to become detached under pressure. So far the repair has proved to be satisfactory. **R.B.**

Panasonic NVFS90

Dark smearing to the right of any black image during playback was the complaint with this machine. The main cause of picture distortion in these S-VHS machines is the 1H delay CCD pack on the sub-luminance and chrominance board. Scope checks in this area led me to C3506, in the 9V supply to IC3504. It was open-circuit. A new 10µF capacitor restored an excellent picture. **B.S.**

Panasonic NVFS90

This machine produced bad drop-outs: when any tape was played back there were excessive flashing black and white lines. We eventually traced the cause of the fault to C3311 (10µF) in the HQ pack – it was open-circuit. After fitting a replacement the picture was clear. **B.S.**

Samsung VI611

This machine would stop intermittently. On investigation we

found that the take-up reel pulses were weak or absent. A new reel sensor cleared the fault. **R.C.M.**

GoldStar GSEQ201

This machine would sometimes eject the tape of its own accord. The cause was found to be a dirty mode switch. Cleaning it cured the problem. **R.C.M.**

Philips VR727

If the problem with one of these machines is poor load or eject, it's worth checking the long pulley shaft that drives the main cam. The small end cog splits then slips when torque is applied. Replace it and check the other gears for damage: this should cure the problem. The pulley shaft doesn't seem to be up to the job. **T.L.**

Ferguson FV61LV

Because the strength of the erase bias varied, bits of the previous track were left superimposed on bits of fresh recordings. The cause of the fault was the BC337-40 transistor TL01, which is mounted on the PCB beneath the deck. Replacement set everything to rights. We discovered that the transistor's gain was varying – it was in fact heat sensitive. **B.McC.**

Bush VCR161

Field roll and apparent picture overloading were the symptoms with this machine. They could be cured by tapping the modulator. When this was opened up we found that the earth joints were poor. A good solder up put an end to the problem. **R.N.**

Matsui VCP100

This old playback-only machine chewed tapes. The cause was not difficult to see: the reel idler's rubber tyre had split and was lying in the bottom of the deck! As the customer was short of cash, I used a suitable tyre from a bag of assorted sizes. When this had been fitted the machine produced very good pictures, but there was no wind and no rewind. Dirty mode switch contacts turned out to be the cause. Cleaning and adjusting put matters right. **R.N.**

Samsung SI3260

The customer had levered a tape out of this machine. Fortunately the carriage was intact, but its timing was wrong. When this had been corrected the machine wouldn't thread up. An external DC voltage fed to the loading motor with the

carriage removed proved that the mechanism was partly jammed. The only solution was to retime the machine – the main cam was almost 180° out. Once the timing had been reset everything worked well. **R.N.**

Saisho VRS4400

This teletext machine suffered from what looked like severe video overloading. It could run perfectly for hours then, with no warning, the picture would almost go negative. As I didn't have a circuit diagram, I spent a bit of time working my way around the machine. With the VCR displaying a faulty picture, I scoped the waveform at the video output socket and found that it was very crushed. Working my way back along the print, I next found myself at pin 6 of socket CT8503 which connects with the teletext PCB. The video was again crushed. Obviously there had to be a video input to the panel. This turned out to be at pin 6 of CT8502, the other socket linked to the text PCB, where the video was perfect. When the text board was removed the crushed waveform disappeared, the perfect waveform remaining at pin 6 of CT8502. So I left the text PCB out and linked pin 6 of CT8502 to pin 6 of CT8503. The machine now worked perfectly.

So the cause of the fault was on the text PCB. A few days later a friend sent me a photocopy of the text board circuit. The video input goes to a clamp in the BA7606 chip IC8507. Scope checks confirmed that this chip was the cause of the trouble, a replacement putting matters right. I was somewhat puzzled by the signal fed to pin 7: it's marked "brank". This is connected to pin 17 of the SAA5243 CCT chip, where it says "branking" . . . A branking pulse?! **R.N.**

Philips VR6185

This machine came in with a cassette loaded but the tape not threaded up, the complaint being that the cassette couldn't be ejected and the machine would shut down. It seemed to initialise when reconnected to the mains supply, then the cassette ejected all right. I thought that the deck microcontroller had become corrupted, but the machine then again failed to eject. The problem was that the fault would occur only every so often, while in all other respects the machine worked perfectly.

The service mode suggested that the threading mechanism might be too heavy. As I've had threading motor failure quite often with these

machines I fitted a replacement. Unfortunately this made no difference. I eventually cured the fault by replacing the L293 loading motor driver chip IC7001, after discovering that pins 11 and 14 were sometimes both at 4-5V in the eject mode (alternate pins should go low during threading or unthreading). Oddly, the cassette loading was never affected. **R.N.**

JVC HR7300/Ferg 3V30

This machine's recordings were marred by a black flashing line. The cause was traced to the 12-5V supply being too high: we found that the 1kΩ set-up potentiometer R5 was open-circuit. A replacement enabled the 12-5V supply to be set up correctly, restoring normal operation. **P.M.**

Panasonic NVFS200

This S-VHS machine suffered from very intermittent picture break up with its own recordings, but only for the first ten minutes after switch on. While checking the supplies associated with the TV demodulator module we noticed that it was microphonic. This was the cause of the symptoms. When we removed the module for inspection we found that there were several suspect joints. After resoldering these and reassembling the unit the microphonic effects has gone and the machine worked correctly from switch on. **P.M.**

Sony SLVE8

The complaint was no rewind. Previous repair shop engineers had replaced the beginning and end of tape sensors and had ordered a microcontroller chip. The machine came to me because they didn't have the equipment to deal with flatpack chips.

I thought it unlikely that the chip was responsible. On test the machine worked faultlessly in play and fast forward, but when either rewind or reverse search was selected the tape would start to rewind then, within a fraction of a second, stop. This was the clue. I put the machine in fast forward and scoped the output from the two sensors. One was clearly low. These sensors are a common cause of trouble with this series of VCRs. I replaced them both for good measure, clearing the fault. **M.M.**

Toshiba V813

The power supply had been dead with the STRD6202 chopper chip IC803 split in two. After fitting a

new STRD6202 without success the first dealer had replaced both optocouplers, had changed R802 from 75kΩ to 39Ω, had fitted a BY133 diode in position D802 and had replaced the the mains bridge rectifier D804 with a standard 800V type! When this didn't work he gave up and the machine came to me.

A label stuck on the power supply said check the value of R802 (75kΩ was right). Toshiba's excellent technical advice service then told me that the following should be replaced: IC803 (STRD6202); the optocoupler IC804 (TLP721); the adjustable zener IC821 (μPC1093J); the small power control PCB U803 and R805 (0-56Ω). When these had been replaced, along with IC801 (the other optocoupler), R802 (correct value), D802 and D804, the machine powered up, bringing a sigh of relief from me. A full function check then showed that all was well.

According to Toshiba it's no use replacing parts one by one in the power supply to find out which is the culprit. Replace the those listed in one go. **M.M.**

Akai VS767

In this and a number of other Akai machines the display filament supply is obtained from a small transformer and a couple of diodes and capacitors. There's a modification kit. You replace the diodes and capacitors and alter a connection to the coil. This had already been done, but there was still no display. The transformer itself had burnt out. **M.M.**

JVC HRJ205

The complaint with this machine was of a double image. Playback of a tape with vertical lines in the display showed this up. The fault was also intermittent. We traced the cause to dry-joints at the delay line. When this item was removed from the video processing board we found that there was a crack in the print to its earth pin. Remaking the print and resoldering cured the fault. **M.M.**

Matsui VX6600

This machine would tune in but not store channels. The cause of the fault was the little UPD6525C memory chip on the operation/display PCB. Take care when ordering: it's advisable to quote the Matsui part no. or obtain it from Partmaster. **M.M.**

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What a Life!

What is it about people when it comes to paying for TV/video repairs? As Donald Bullock recounts, even pleasant, sensible folk can become difficult

When I first got a toe-hold in this trade my customers were folks I'd got to know in the course of my daily life. One used to fix my car, another was a fishing mate and a third our postman. Then there was Mrs Poltroon, who kept the local shop. All were pleasant and sensible people, folks you could have a laugh with and who would do you a favour.

But I soon learnt that each had a Jekyll and Hyde aspect. And what switched them from one to the other lay within their radio and TV sets. Mrs Poltroon became funny with me when Mullard reduced the prices of its rebuilt tubes by a fiver. Four months earlier I'd replaced the Mazda tube in her set. Because she was waiting to see "how it settled down" before paying me, she'd still not payed her bill when Mullard made its move. No words of mine could overcome her conviction that she'd been done, and I was grateful when she finally paid me her bill less a fiver – which was a lot of money then.

Tuning Problem

The garage man was no better. He brought his huge wireless set to me

because it wouldn't tune. Its dial-drive cord had perished and become mangled on the pulleys and springs. Its shredded remains lay on the dusty floor of the set.

His attempts to remove it had resulted in his jamming a spring into the exposed aluminium vanes of the tuning gang. To compensate for this foolishness he'd "tightened up" all the RF trimmers and IF cores in the set. Needless to say he didn't say a word about this. I found out the hard way. When I finally mentioned it to him he scoffed and blamed the manufacturers.

"Fancy leaving the screws half undone" he said.

Those open tuning gangs were terrible once they'd been disturbed. Time and time again I would think I'd cured one, only to find that it grated and died at a particular spot. And clearing that often only moved the trouble.

I had no signal generator – we didn't all run to such things in those days – and while I could face a misaligned IF strip, or even a bit of RF misalignment, a combination of both in the same set was daunting.

Any veteran of this trade will tell you that broken dial drives were pure hell. In fact the curse of the trade. You could spend hours, or even days, trying to work them out. One would sometimes reluctantly shell out for a manual only to find that it contained no answer to the problem. Philips alone could be relied upon to provide a detailed drawing, together with the cord length and stringing procedure. I finally obtained a manual, but it didn't help.

I wore out yards of dial drive in my experiments, and was exhausted when I'd finally wound my two yards of drive cord around the gang

drum and its succession of pulleys. But I felt victorious and went to bed contented. Next morning I noticed that the cursor ran backwards along the dial glass. The Light Programme seemed to be coming from Luxembourg . . .

When I eventually won I charged him a pound and lost his friendship for life.

"A pound for slipping a bit of string around a couple of pulleys?" he gasped.

Loss of Signals

One Sunday, while we were eeling by the Severn, my mate mentioned that his TV picture had faded away. We had a pint or two on the way to his place, then took the set to my deserted workshop. It was the awful Philips monochrome set with the angled metal chassis that swung out like a gate – the one with a pad of megohm value presets which imprisoned half-watt megohm fixed resistors that used to go high in value together.

After taking enough pulse voltage from the line timebase valves to ward of rheumatism for life, I replaced the video output valve and restored the picture.

A couple of weeks later his wife complained that the sound had failed. I rolled up at the house and replaced one of the dreaded PCL83 valves to restore it. But she wasn't going to pay because, she said, I'd "weakened the set in doing the last repair". That was my fault, not hers.

Next week I fished alone.

Duff Tube

Our postman, who'd already had the frighteners from another dealer before he brought his set to me, sucked in six gallons of air when I confirmed that his tube's heater was open-circuit.

Mrs Poltroon turned out to be another of my Jekyll and Hyde customers.



"You'm no better than that other lot" he pronounced.

"Do I look sappy or summat? That's what the other rogues said. But I knows better. Faulty tubes puts a line across the picture. Mine just won't come on. It's the switch. Anyone knows that."

It wasn't long before I decided to straighten out customers who talked such nonsense to me. The result was a series of spectacular rows, and I never changed anything. Today people seem to be even worse.

An Ancient VCR

Albert, a neighbour who works in a nearby town, asked me to look at his ancient Panasonic VCR recently. It had become intermittent, then died.

Steven put it on the bench, and found an open-circuit fusible resistor on the power panel. The faulty resistor wasn't immediately apparent, because it was enclosed in a woven, asbestos-type cover. A replacement brought the machine back to life, but only intermittently.

We then found that a fuse on the power panel was making only intermittent contact, though it looked all right. We studied it more carefully and found a dry-joint where the wire joined the metal cap.

When we'd replaced the fuse the machine stayed on, but it wouldn't operate and the clock was haywire. We unplugged it from the mains, then plugged it back in again. The clock came right and the recorder now worked, but only for a while. Then the clock went haywire again and it was sometimes necessary to unplug and plug back the machine several times before we struck happy and had both the clock and the machine's operation right.

I suspected the main microcontroller chip, and recalled that a colleague of ours in the town where Albert works had an identical scrap Panasonic. I phoned him and he offered it to us free of charge, provided we collect it. I decided to charge Albert a tenner for the work we'd done and to offer to fit the microcontroller chip at no further charge if he'd pick up the scrap machine.

So I popped over to make the offer, explaining that a new microcontroller chip would be costly but that we could use one from a scrap machine if he would pick it up. As soon as I got to the bit about a new chip being expensive, Albert cut in.

"A tenner's as much as I want to spend on it" he said.

I tried again. "But Albert, this machine works only when it wants

to. Now this friend of mine has . . ."

It was no good. I was cut off again. So I shut up.

A few days later Greeneyes and I saw his wife at a local shop. "Ta for making our recorder go" she said. "Pity that the rest of the trouble was too expensive to put right."

"But we were prepared to do it for nothing" I said.

"Oh no, that wouldn't have been possible" she replied, "we called Snoddies along. They charged us £25 to come and told us the job would cost £75 and wasn't worth doing."

It was nice knowing you, Albert.

Just a Blur

The customer who brought in a Saisho CT141X said that all he could see on the screen were a few patches of blurred colour. We switched it on and a few patches of defocused chroma appeared. When we took the back off we saw that the 48-pin UPC1420CA chip IC401 was sitting in a patch of damp green mould.

We removed the chip, cleaned the chassis carefully and fitted a replacement. Up came a picture with chroma and luminance, but it was still completely defocused. Tracking on the tube base was the cause of this final problem. After fitting a replacement the set produced a good picture.

Field Collapse

I felt sorry for the chap who came to mend our grandfather clock. He was a straightforward and careful craftsman who wasn't happy until he'd got it right. Before leaving he offered to give me a fairly new Hitachi colour set which, he said, was dangerous. It had field collapse and couldn't be repaired, so he'd now bought a new set.

"When it went wrong I called the cheap chap with the answering machine. He doesn't give his address. He made it go and charged me twenty quid, but it failed when he left and he would't ring back. Then I took it to Crubbs Foodstore. They wanted eighty pounds and said I had to get them a manual. So I took it along to Snoddies. They charged only fifty quid, but it went again next day. The second time they kept it for four months then asked me to collect it. The tall chap there said the frame chip explodes as soon as you switch on, giving them no time to check on what's wrong. He said the last time it nearly took his fingers off!"

I've often commented that no customer can say anything that's

new to me. But I hadn't heard that one before.

We got the set and put it on the bench. There was nothing wrong with the field output chip, and nothing exploded. The cause of the trouble was a tiny strip of print that earthed pin 1 of the chip. It had been damaged by someone's carelessness, with the result that the chip was floating.

A Monster

At this point Steven went off to do a field call, having failed to persuade me to go. Greeneyes helped me to get a huge Sanyo CBP2558 on to the bench. This monster (the set, not Greeneyes) is fitted with the E3 chassis. It should come to life at switch on. This one did, or didn't, fifty per cent of the time. Even when it did come on it died after five minutes. When the set wouldn't work the channel LEDs nevertheless came on and it changed channels. Otherwise it was dead.

When I withdrew the chassis to check voltages the set refused to fail. I finally phoned Sanyo, which still gives excellent technical advice to us ordinary mortals. I was told to check for the standby 5V supply at pin 1 of plug K3C. I'd already done that, and it was present. The next suggestion was that I check the standby transformer T325 for dry-joints or, less likely, a high-resistance or open-circuit primary winding. I'd also done this. Check the voltage monitoring diodes D310, D312, D318 and D319, also the optocoupler D325, I was told. They were all OK.

I eventually soldered leads to various voltage lines, reassembled the set, and monitored them with the meter outside the cabinet. What eventually transpired was that the 12V supply was unstable, often dropping to 8V or so and sometimes as low as 2V. When the supply was stable at 12V the set would spring to life. When the voltage dropped, the set would fail until it was switched off and on again. The cause of the problem was the 12V regulator IC380, which is a Sanyo device marked 3122V. Its input was OK, but its output varied.

We ordered the replacement from Chas Hyde who handle Sanyo's spares. When I removed the old one I was able to make comparison resistance checks with the new one. This proved the diagnosis. I also noticed that the original mica washer was cracked. The replacement regulator, plus a new mica washer, put matters right.

Satellite Notebook

Reports from Hugh Cocks, Michael Maurice, Pete Haylor and Chris Hawkins

Tone Switch Trouble

We do some Eutelsat additions to Astra systems and normally install a 22kHz tone switch for LNB selection. If the receiver is a new one it will generate a 22kHz switching tone. Older receivers, such as the Pace PRD series, require an external 22kHz tone generator. Until recently we'd used the Global VH6 tone switch, which works well enough, though we had to fit it in a small box to protect it from the weather. Then our supplier sent along a new model, the Global TS22K, which has its own cover and works very well.

With one job recently we came up against a rather confusing problem however. There were two dishes and two receivers, both of which required Astra. Only one receiver was to be switched to Eutelsat at times. After connecting everything up (see Fig. 1) Astra was fine with both receivers. But when Eutelsat was selected by receiver two there were very poor pictures, with Astra in the background. A new switch was tried, but the symptoms were the

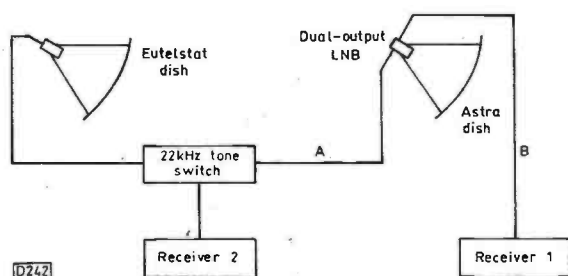


Fig. 1: Two dish installation with a single-output LNB for Eutelsat, a dual-output LNB for Astra, a 22kHz tone switch and two receivers. The dual-output LNB provides separate, independently-switched V/H outputs. If the tone switch has no RF isolation, only DC, receiver two will receive both Astra and Eutelsat inputs when receiver one powers the dual-output LNB via line B. In this situation there will be signal on line A even when no power is present on this line. Thus RF isolation is also required.

Note that a simple DC isolation switch will work well with single-output LNBs, as lack of a DC input removes the RF output.

same as before. When the feeder between receiver one and the dual-output Astra LNB was disconnected, the other receiver's Eutelsat/Astra switching worked perfectly all right.

Unfortunately we'd never been sent the specification for the new switch. This model switches only DC between two LNBs, with no RF isolation. Everything is fine with two single-output LNBs, lack of DC disabling one of them. But when a dual-output LNB is involved, there will be a signal at its second output (provided the first one is powered) even though no power is being fed to the second output. Because it has no RF isolation, the TS22K tone switch obligingly passed the Astra RF (satellite IF) to receiver two. The VH6 has a relay to cut the DC and RF connection.

According to the new product information that eventually arrived the model we required was the TS22K-TB-RF, which does incorporate RF isolation. I haven't tried it yet – I used my very last VH6 to cure the problem. It's interesting that Global do a 60Hz tone switch (the TS60H) as well as the 22kHz type. H.C.

"Only Some Channels"

An anxious phone call one morning indicated that the horizontal channels were no longer available with an Astra installation.

A Cambridge LNB of fairly recent vintage was in use. The polarisation switching voltage came from a Maspro receiver: a quick check showed that it was present. I noticed that the F connector at the LNB end was quite badly tarnished. So a new crimp-on connector was fitted – after cutting back the cable a few centimetres no moisture was present in it. This restored normal H/V switching. I put some self-amalgamating tape on the connector, and a cover over the LNB, to keep the weather out of the system.

A problem with Cambridge LNBs

is reception of only one polarisation, as the internal switching refuses to work. When you open the unit – if it's out of guarantee there is nothing to lose in doing this – you may find some corrosion in places. Water seems to get past the rubber gasket, especially when there has been severe weather. The action to take is as follows.

Unsolder the PCB link to the F connector and remove the PCB. Clean the bottom of the PCB (the ground-plane area) thoroughly. Avoid touching the input probes too much – Gasfets can be damaged by static electricity, and the probes are directly linked to the FET inputs. Also clean the area of the case in contact with the PCB ground plane. Reassemble and test the unit. With luck you will find that normal operation has been restored. H.C.

Pace SS9000 Tuner Replacement

Normally when the tuner fails in one of these five-year old receivers the owner opts for a new receiver. If the receiver has been living on a shelf with the VCR and little ventilation, there will be a certain amount of internal carbonisation.

On this occasion however the receiver was in good condition and a new tuner kit was to hand. With previous kits you had to fit surface-mounted resistors: I was pleased to note that you don't have to do so with this one – anything that makes it less necessary to squint at the underside of these PCBs has to be an improvement!

When I switched on there was a blank screen, with channel ident graphics that slipped sideways (this model doesn't have internal graphics sync). I'd expected to see some noise on the screen at least prior to connecting the LNB, as you did with the old Hitachi tuner. No point in plugging in the dish feed I thought, so I checked the connections to the PCB and the voltages. Everything was OK, and the tuner was running

at what passes for the normal warm operating temperature.

At this point I plugged in the workshop IF feed – and was rewarded with a good picture. All that head scratching for now! The final PRD/PSR tuners are exactly the same in that they blank out any tuner noise until an LNB is connected.

The tuner kit number is 221 2078012 REV AD 5441A6, and you've now been warned! As the kit instructions say, a lot of extra 5V supply decoupling is required with this tuner to prevent vision noise/mess. **H.C.**

MSS300 Display Problem

The owner of a Pace MSS300 receiver complained that there was no front panel display, though it worked normally otherwise. The cause of the problem was pretty obvious once the top had been removed. A small piece of glass on the PCB turned out to be the pip at the end of the display unit, for the vacuum seal. The unit had apparently been posted out to him – and the display "hadn't worked since".

Replacement was fairly straightforward once a new unit had been obtained. But beware of the very fine double-sided print – there are fifty pins to deal with!

It was interesting to see what appeared to be 'gettering' at the top left, similar to CRT and valve manufacture. **H.C.**

Pace SS9000/9200 Decoder Problems

If decoding is intermittent or is reluctant to occur at all, replace C41 (1,000µF) on the decoder board. You will often find that it's discoloured. After enduring a number of years of heat it can cause all manner of odd effects.

The picture can be generally improved by replacing all the high-value electrolytic capacitors in the power supply at the same time.

How much longer it will continue to be economic to carry on repairing overheated 9000 series receivers is open to question. **H.C.**

Pace MSS100

This receiver-decoder had decided to stop working after a number of rapid on/off power cuts. It didn't come back on after the last one. The mains fuse FS1 was intact, and all the other electrical equipment in the house was still working. So hopefully there hadn't been excessive supply voltage.

The prime suspect was the

TOP202 (TO220 case) chopper chip U1, which indeed turned out to have failed. With the negative lead connected to the centre pin, a good one should produce readings of approximately 2.5kΩ at each outer pin. The reverse resistance at both outer pins should be very high. This one was open-circuit between one leg and the centre pin.

Before testing the receiver, ensure that chip resistor R2 (10Ω) and C4 (100µF), which is adjacent to U1, are OK and that the mains bridge rectifier's 47µF, 400V reservoir capacitor C3 is happy. Note that if the TOP device is open-circuit C3 will hold its charge, thereby enabling your unsuspecting finger to prove that it is OK.

The Pace part no. for U1 is 109-0020200. **H.C.**

B & O LX2800

This TV set was fitted with the Beosat LX satellite receiver. The fault was sound but no picture with satellite reception. Everything else was normal.

The set had been modified to take the satellite video through an external decoder. We quickly established that the fault lay in the set rather than the decoder. The modification carried out by the original dealer consisted of breaking into the screened video output cable from the satellite receiver and routing the signal to an unused part of a DIN socket. Twin screened cable had been run from the DIN socket to the video cable, which had been cut and each conductor connected to the twin screened cable.

The cause of the trouble lay here: the joins were crude and unsoldered, with bits of insulating tape separating each wire. The cure was to make up a new cable to each connector, using Molex connectors. We then had neat connections to the DIN plug for the decoder and good satellite pictures. **M.M.**

Dish Trouble

I was called to see an Amstrad SRD400 system, Mr Ali's complaint being "no picture". The 630mA fuse was open-circuit because of a short across the coaxial feeder at the dish. When this was inspected I found that about three 2in. no. 8 screws had been used to hold the dish to the wall and the F connector had been incorrectly fitted. Mr Ali was happy when the dish had been fitted and set up correctly and the fuse had been replaced.

I wish I hadn't started another dish job, for an old customer of mine.

The first part of the job was easy, to remove an 80cm dish and take it to his new house, which I could see from the old one. It was an old, four-storey Victorian mansion. The house next door was even larger and taller, and you can guess which way the dish had to face! When the dish was fitted on a side wall close to the front of the house it could see 10, 13 and 16°E – but not 19.2°E!

The only sites that could see Astra were at the front of the house or at the end of a 100-yard back garden. As there were several small children, the latter option was not available. Much as I dislike doing it, the dish had to be installed at the front. Beware when an old customer phones up about "a little job that will not take you long!" **P.H.**

Maintenance

The folly of overlooking regular maintenance was brought home to us at a local college which had a large, motorised system on the roof. This had been installed some seven-eight years ago, and nothing had been done to it since – until the jackarm stopped moving and a colleague and I were called in to repair it.

When the jackarm had been disconnected the dish wouldn't move. During its whole life it had moved only between 19.2 and 10°E. After several hours' work the dish moved again and the jackarm had been freed off and lubricated. The positioner now operated, and stations lost in time reappeared. Several bolts had to be replaced, and the jackarm bearings were worn, but it will have to do until next year's budget is available.

If a regular maintenance programme had been carried out, the complete system would still have been in fine working order. The components used were all the best of their time, capable of long life, but all needed a service. The next budget will have to cover the cost of a complete new system if a long life is required – with a maintenance plan. **P.H.**

Amstrad SRX320

If there's no power and the 1.25AT fuse FS600 and the MJF18004 chopper transistor TR600 are both OK, check the value of the 100kΩ, 0.5W start-up resistors R602 and R603 – they tend to go high. Also replace C611 (1µF, 50V) and C612 (100µF, 25V).

For no sound check the TDA6160X chip IC2. It's a surface-mounted device on the underside of the main PCB. **C.H.**

VCR Take-up Problems

The items that control tape take-up in a VCR can be responsible for a number of symptoms, whose exact cause is often none too clear. Nick Beer describes various basic arrangements and the problems that can arise

Although the take-up section of a VCR mechanism carries out an apparently simple task, it can give rise to many different problems, from the obvious to the obscure. In this article we'll consider configurations and failures, also the principles involved. Various past articles in this magazine provide complementary reading, in particular my articles on "The Importance of VCR Back Tension" and "More on VCR Back Tension" in the August 1988 and January 1990 issues respectively.

Basics

The tape is pulled along by the pinch roller and capstan. It's a high-torque arrangement, force being required because of the relatively long distance of the tape path between the supply and take-up spools and the friction the tape encounters along the way – from the drum surface, the guides, the rollers and the fixed heads. Some newcomers tend to think that the forward take-up spool drive pulls the tape along. This is not so. If, in most machines, you remove the pinch roller from the capstan in the play or record mode the tape will stop moving: the take-up torque alone is nowhere near enough to pull the tape through the system. But in some early machines it was!

The idea is that the take-up spool has to turn just fast enough to take up the slack as the tape is pulled along by the capstan and pinch roller. Its name gives it away! Thus the take-up torque is generally quite low – tiny in fact in comparison with the fast-wind torque.

There's another basic factor to consider. The take-up spool has to rotate at different speeds to take up the slack

tape effectively with different amounts of tape wound on it, i.e. its speed depends on how far through the tape you are. The length of the tape is also relevant.

Thus the take-up spool cannot be driven directly at a constant torque and speed. The drive is applied via a clutch which, when it is working correctly, slips at a point where the torque exceeds the limit set by the designer. This limit is the threshold between sufficient torque to ensure that the tape is taken up effectively and excessive torque, which leads to various problems discussed later. See Fig. 1.

Measurement of Take-up Torque

Service manuals often don't specify the take-up torque nowadays. A typical figure is 65g/cm however. How do we check it, and when?

There are two simple methods of measuring the torque. A hand-held torque gauge can be fitted over the top of the take-up turntable, but the mechanism then has to be fooled into entering the play mode with no cassette in place. This is often very straightforward, but you can find that you need all hands to do it, with the gauge requiring an extra hand! You may also have to dismantle the carriage to provide access for this type of gauge.

The second method, which most service engineers find far more convenient, is to use a cassette-based gauge. You simply insert it and play: a dial on the take-up spool gives the torque reading. Some cassette gauges can measure the fast-wind torque as well, but because of the magnitude of this (often more than 400g/cm) the two are difficult to combine easily and accurately. Thus the cost of this type of instrument is much greater than that of a hand-held gauge. In one of my earlier articles on back tension I discussed a combined back tension and take-up torque measurement cassette.

Ideally the torques should be checked whenever a machine is in for repair. The mechanism should also be checked for wear, which a reputable engineer would do automatically. Wear is often clearly evident, and a check on this will prevent job bounces. The important thing is to attend to any imminent mechanism failures.

Take-up problems can cause some quite tricky fault symptoms. If you suspect this, a quick check with a torque meter may well give you a clue.

Low Take-up Torque

Loss of or low take-up torque can cause obvious problems, though the exact symptom will vary with deck design. There could be simple failure to play or record,

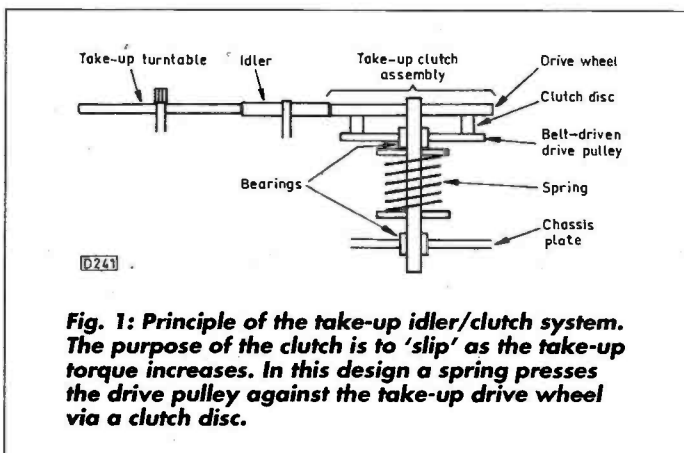


Fig. 1: Principle of the take-up idler/clutch system. The purpose of the clutch is to 'slip' as the take-up torque increases. In this design a spring presses the drive pulley against the take-up drive wheel via a clutch disc.

with the tape seen to be looping out after the capstan and the take-up spool not turning. With low take-up torque these symptoms can be intermittent. For example the fault may occur when the machine has not been used for a while. You may then get the complaint that the machine fails to carry out a timer recording. We tend to disbelieve such complaints, but the problem can occur.

It's helpful to consider the different take-up drive methods that are or have been used. The drive may be simply via a single-reel idler. With this arrangement a fault will probably cause fast-forward trouble as well. If this is not the case, suspect the take-up clutch. An example of this type of mechanism is the Panasonic D1 deck. Take-up only faults are rare.

There may be a dedicated take-up idler, which may in turn be driven by its own belt. Either of these items may be worn. Examples are the JVC HR7200/7300 and the later HRD110/120 and their many clones. In these mechanisms the take-up clutch is again separate. It's sound policy to replace these three items, along with a number of other mechanical parts, when carrying out a service.

Similarly the Panasonic NV7000/7200 have a belt from the reel motor to drive a combined take-up idler/clutch. This belt, part no. VDV0216, quite regularly snaps and can be seen lying across the top of the mechanism, between the spools. This particular design suffers from another problem. The idler/clutch sits in a bronze bearing set in a nylon arm. Because of hardened grease, the bearing gets stuck. As a result the idler seizes up and fails to rotate. Stripping and cleaning usually cures the problem.

What can be overlooked with all reel-drive faults is the turntable. Some just have a shiny edge. Others have treads moulded into them. As these wear there is loss of grip, and loss of take-up can arise. The Hitachi VT11 series is an example.

Older designs had a rubber tyre on the turntable. When this wears, the take-up is reduced or lost. Effective braking is also lost. In either case there is tape spillage and chewing. The Hitachi VT8000/8300 etc. come to mind as examples.

Excessive Take-up Torque

You might think that you can't have too much of a good thing. But the problems caused by excessive take-up torque are frequently underestimated. Many older Amstrad machines prove the point.

It's obvious that if the capstan and pinch roller are pulling the tape along at a fixed rate and the take-up torque is excessive, the latter will be trying to exceed the speed of the former and the tape will be stretched. But you don't come across many VCRs with visibly stretched tapes, because before this happens a more subtle problem arises - tape riding.

Tape riding often goes unnoticed. But it can be spotted long before it starts to crease the edge of the tape. Watch the tape carefully as it passes over the audio/control head and the adjacent post (usually P4). Everything may appear to be OK in play, though there may be vertical meandering. Now put the machine into the cue and then review modes. If there is a fault the tape will move up or down rather than remain in the same plane. If the tape moves sufficiently, it will crease on the bottom or top of the post or head.

Tape riding can be a very difficult problem to sort out. In simple cases pinch roller replacement will provide the solution. But not always, and if you haven't checked the take-up torque a new pinch roller could simply mask the problem.

A seized or sticky clutch is the usual cause of excessive take-up torque. As the clutch doesn't slip readily, excessive torque is applied to the turntable. The solution is clutch replacement. Mention of Amstrad VCRs at the start of this section referred to the VCR4500 series. To cure tape chewing with these machines a modified clutch with significantly less bite has to be fitted, along with a new pinch roller. Pattern modification kits that often still have too much bite are around. In this case you can cut the spring down further to reduce the torque to an acceptable level.

Wow and Flutter

When clutches wear they can become sticky or tight, with a varying effect as they turn. Thus instead of having a uniform slip during their rotation they slip then stick then slip many times. The result is a jerkiness that is not evident when the reel rotation is observed but shows up as wow and flutter on the sound.

A good example of this is the Panasonic G mechanism, in which the take-up clutch (part no. VXP1002) can produce exactly this symptom. Comparison with the operation of a new clutch, turning each with your fingers, is the best demonstration of possible guilt.

In Conclusion

I hope that this brief account of take-up systems and the problems to which they give rise will have alerted you to various fault possibilities. The best advice is always to check mechanical before electrical causes when fault finding, and to give the mechanism a check over no matter what the reason for the VCR's visit to your bench.

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Customer Reliability

One thing will keep us busy for the foreseeable future – the customers themselves. **Brian Storm** presents the case

Continual design improvement and technical development are features to which we have become accustomed with the equipment we sell and service. Add to this its increased reliability and you have three good reasons why the number of electronic units that arrive in our workshops should decrease year by year. There's a good reason to expect many more years of employment in our trade however – the little matter of customer competence.

Very little of the development work being done today is aimed at improving Homo sapiens. This has various consequences. For instance all the technology in the world will fail to give a camcorder a soft landing when its owner neglects to put the shoulder strap around his neck and the machine falls through his grasp. Here are some recent examples.

Exhibit A

The first is a Panasonic palmcorder, Model NVS1. According to my computer records this is its third appearance on my workbench. Not because of a design fault, inferior technology or poor construction, but simply because for the third time it has mimicked Newton's apple and succumbed to the force of gravity – despite the fact that a serviceable safety strap lies neglected in its carrying case.

The angry owner told me that it was dead when he

wanted to use it after it had spent a few weeks dormant in its bag. But there was sufficient evidence within the camcorder to suggest that sudden impact had been the cause of the problem.

The main connecting plug had broken off the operation panel. So a new operation panel assembly (part no. VES0603) had to be fitted. This restored some life, but when a tape was offered there was a grunting noise as the unit powered down and sulked. When a bent piece of chassis frame had been removed from the top of the head drum, the camcorder was able to play the tape. This wasn't the end of the story however. Although there was good tape playback via my monitor, there was no viewfinder picture – just some characters that went across a grey screen.

An hour later, after repairing the print to the viewfinder plug, I was able to present the camcorder to its owner. He was somewhat miffed about the bill, complaining that I had repaired the unit for him a year ago, since when he'd hardly used it.

Tact and diplomacy have never been my strong points, but I've always been at my diplomatic best when presenting a bill. I printed out a copy of his previous invoice. "Replaced cassette housing and side casing assembly, broken because of impact damage. . ." He turned away from the printer and hurriedly wrote out his cheque.

I did suggest that he practise using the strap, but he was away before the ink was dry on his signature. I made a mental reservation for the same time next year.

The Next One

Exhibit B is a Panasonic NVHD100 VCR that came back last month. Its owner was irate and abusive, demanding that I contact Panasonic immediately to get him a replacement. Not only had it refused to play tapes only six months after he'd bought the machine, it had also damaged some brand-new Disney tapes.

As the machine uses the newer K mechanism, which to date has been utterly reliable, I removed the top cover in front of him. I've never seen the wind removed from someone's sails so quickly. A child's eraser was nestling comfortably against the drum. I quickly removed this intruder and tested the machine. Fortunately no lasting damage had been done.

Feeling unfairly wronged, I took up the challenge and told the becalmed owner he was fortunate that the object

That's odd! it was working perfectly when I phoned Margo from home five minutes ago.



had been a soft one. Otherwise he would have needed a new video head drum and, even more expensively, a head drum motor complete. I should really have charged him, and of course the guarantee was in danger of being invalid. But I said I was willing to overlook it this time. He left with the machine, silently.

A Knife

I reached for the morning post, in which some parts for exhibit C had arrived. This was a Panasonic NVJ35 VCR that was on the awaiting spares rack. Its owner had used a large kitchen knife to remove the tape! The knife was of unquestionably strong constitution – in fact it was a glowing tribute to the art of knife making, and was without any signs of damage after prising the cassette holder from the depths of the machine. Unlike the mangled cassette holder, which was bent and buckled and beyond repair.

I'd already tested the VCR without the cassette holder fitted. Miraculously, it had gone through its various mechanical functions without any problems. So all I had to do was to assemble the contents of the bag of spare parts to produce a cassette holder and fit it in the machine, which fortunately worked fine a bit later on.

I couldn't help but wonder why it had been so important to remove that tape. What had been on it, why had been it so urgent – and why risk damaging a perfectly good kitchen knife? Suggestions on a post card, please...

A Computer

I get very few computer repairs in my neck of the woods. But the problem with exhibit D was again entirely the

owner's fault. This neat little Panasonic CF1000 notebook computer (a 386SX25 80MB DD for the technically minded) had been lying serenely on the back seat of its owner's car. Until she braked sharply, that is, throwing the computer into the front instrument console and cracking its display panel.

I checked it out with a colour monitor to see if anything else had been damaged. It worked perfectly, but unfortunately for the owner the display panel costs over six hundred pounds trade. As a result, I had a rather expensive estimate to present to her when she returned. She put it in her handbag. While she had it undone I couldn't help noticing a cordless phone handset in there. So I asked her if she'd brought it in for repair? She said she always carried it around in case her husband wanted to get in touch, but hadn't found it to be very good. She handed it to me for inspection and invited me to make a call on it.

I reflected on the fact that it had been a long day, then settled down to explain to her the fundamental principles of the cordless phone and the inherent advantages of the cell phone.

In Summary

So there we have it m'lud. Add to these exhibits frequent dropped and damaged personal stereos and ghetto blasters, cordless phone handsets with damaged internal or external aerials, camcorders with sand or water damage (if they haven't been dropped), and remote control units of all shapes and sizes in various states of decay. With customers like these, who needs faulty products? I'm sure no jury would sentence me for contempt. ■

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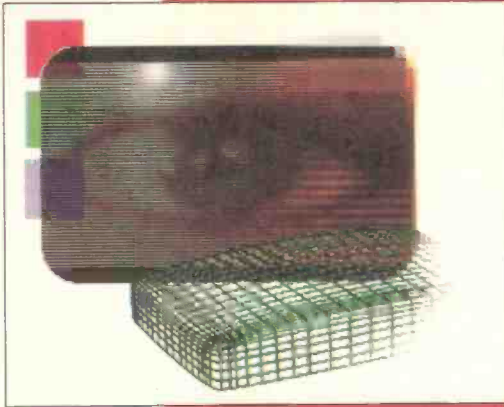
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**Reports from
D.H.E. King,
Graham Thompson,
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Phil Marrison and
Adrian Spriddell**

Elonex MN/009/1

Two of these monitors came in at the same time. The first one was overscanned at the left-hand side, with the width control having no effect on this. We found that C2532 was open-circuit. The second one was virtually dead, with just the pilot light (LED) pulsing every two or three seconds as the chopper power supply tried to start up. D6501 was found to be short-circuit. It's a BY329. Fortunately these faulty components had done no further damage.

I have to say that Elonex was thoroughly unhelpful, giving "commercial confidentiality" as the reason for refusing to supply a circuit diagram or assistance. **D.H.E.K.**

Elbex EXM992

This was an easy fault for a change. There was no audio as the audio-video DIN socket had been damaged by impact. Print repair and a resolder put matters right. **G.T.**

GoldStar CV430

Screeching noises from the power supply and low output voltages on the secondary side of the chopper transformer were cured when C905 (10µF, 100V) was replaced. The STR54041 chopper chip IC901 had survived but R911 (0.68Ω, 0.5W) showed signs of overheating. We replaced this and, for good measure, the KTC2120 current-sensing transistor Q901. **C.H.**

Taxan MV775

When the setting of the first anode control was turned up slightly a horizontal line was displayed. Checks in the power supply showed

Monitors

that the ICP-M75 circuit protector CP1901 in the 24V line was open-circuit. To be on the safe side we also replaced the AN5515 field output chip IC1402. This restored a fully lit screen. **C.H.**

Mitac PWA-M1420

If the BUH515 line output transistor Q403 fails repeatedly, check the two parallel tuning capacitors. They go open-circuit. Note that the BUH515 is a high-resolution line output transistor. A BU508D can be used for test purposes. **C.H.**

Mac Plus 1MB

There was no power supply operation. We found that R55 (33kΩ, 1W) was open-circuit. **C.H.**

Samtron SM430

Dry-joints around the chopper transformer T101 had caused the death of the BUZ77A MOSFET chopper transistor FET101 and the 1A 250V mains fuse F101. To be on the safe side we replaced the TDA4605 chopper control chip IC101, its start-up feed resistor R103 (220kΩ, 0.5W), C106 (1µF, 50V) and C107 (47µF, 25V).

Another of these monitors caused us some perplexity. The customer complained about a dim picture. On test we found that several minutes after switching on a fine horizontal line appeared across half the screen. Our first conclusion was that something was dragging down the supply to the TDA1170 field timebase chip IC301. We unsoldered its supply pins 2 and 5 and checked the unloaded supply. The reading was only 7V. When C106 (1µF, 50V) and C110 (47µF, 25V) were replaced the voltage rose to 10V and we had a bouncing, folded raster. After a lot of resistor checks we decided to replace the 1,000µF, 25V filter capacitors C112 and C114. This restored a healthy display. **C.H.**

Samsung MY2525

There was no EHT, though the line output transistor and the supply to the line output stage were OK. The

TDA1180P sync/line generator chip IC301 had died. **C.H.**

Colorsonic Monitor

This SVGA monitor deserved its name. At switch on flashes of colour and strange noises, together with wild width variations, led us to make a quick check on the HT voltage. It was steady at 90V. After checking several components in the line output stage, including the flyback tuning capacitor, we were forced to the conclusion that the transformer was the cause of the trouble. A replacement put matters right – the original one had been arcing internally. **C.H.**

Supercom SV148

There was a sudden rush of EHT at switch on. It died away just as quickly. This seemed to indicate that the line timebase was working and that the excess voltage protection circuit was coming into operation. A check at pin 8 of the TDA2595 line generator chip showed that the voltage exceeded the correct operating range of 4-8V. Checking back from pin 6 of the line output transformer brought us, via D306, R325 and R326, to the 34V, 1.3W zener diode ZD305. When this and C312 (47µF, 16V) had been replaced the monitor started up correctly.

The same symptoms can occur when the flyback tuning capacitor C319 (4nF, 2kV) goes open-circuit. **C.H.**

Tatung 3401

This SVGA monitor was dead apart from a brief rustle of EHT at switch on. The cause of the problem was loss of HT regulation. We found that there was no feedback to the regulator circuit because R504 (220kΩ, 0.6W) was open-circuit. As a result the EHT overvoltage protection system came into operation. **P.M.**

Puritek PT143D

If the power supply is dead, replace R101, R102, R106 and R108. These are all 150kΩ resistors. **A.S.**

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Long-distance Television

DX conditions and reception. Satellite sightings and news. Also signal pickup assemblies for sat-zapping. Roger Bunney reports

While June was virtually dead so far as Sporadic E propagation is concerned, July produced a welcome lift in conditions. Nothing dramatic, but certainly an improvement. There were also improved tropospheric conditions from about the 10th onwards, thanks to high pressure over the UK. The result was reception of signals from the Benelux countries, France and the nearer west German stations. The best period for tropospheric reception ran from July 17-20th, when many French UHF signals were received in the south and south east of England and as far as the midlands.

SpE propagation was patchy during July, with openings that were followed by days of virtually nothing. The best catch of the month must be the reception by Garry Smith (Derby) and Cyril Willis (King's Lynn) of Syria ch. E2 on the 16th, with 2nd network programming. Video was present when Garry switched on at 0725.

An EBU 'decoder' was used to stabilise this Eurovision feed, received from Eutelsat II F4 at 7°E.



The picture quality was very good throughout the following two-hour period during which reception of the strong, slow-fading signals occurred, averaging P4/5. Garry mentions an optimum aerial direction for reception of weak/medium strength Arabic signals: he now keeps his array directed towards the east south east, which seems to be best for reception of these random Arabic signals.

Cyril's Syria ch. E2 reception started at 1806. Prior to that, at 1748, he received a ch. E3 signal thought to be JTV (Jordan). Graphics of a mosque with an Arabic script overlay were seen. On the same day Garry came across an unlisted channel with the vision carrier at 57.75MHz, the only identification clue being the Russian-language sound. He'd previously received the channel in June last year.

It seems that the ch. E2 TVE-2 station at Santiago has finally closed. There has been no sign of it this season despite frequent short-skip reception from Spain. A second low-power Italian independent station seems to be using ch. E2 – a programme with a top-left corner logo was seen on the 27th, definitely not Video.

The collated SpE log for the month is as follows:

- 6/7/96 SVE (Sweden) chs. E2, 3, 4; NRK (Norway) E3, 4; YLE (Finland) E3; LTV (Lithuania) R2; Video (Italy) E3; RTS (Serbia) E3.
- 7/7/96 RAI (Italy) IA; TVE (Spain) E3; HRT (Croatia) E4; SVT E2; RTS E3.

- 9/7/96 RAI IA, B; TVE E2, 3, 4; Video E2.
- 10/7/96 TVE E2, 3, 4; RTP (Portugal) E3; YT (Ukraine) R2; SVT E2, 3, 4.
- 11/7/96 RAI IA; RM (Moldova) R2; Video E2.
- 12/7/96 TVE E2, 3; RAI IA; TVA (Italy) IA; Video E2; NRK E2.
- 13/7/96 ET (Estonia) R1; TVE E2; SLO (Slovenia) E3; Video E2.
- 14/7/96 YLE E3, 4; SVT E2; TVE E3; RAI IA.
- 16/7/96 RTP E3, 4 (Azores); TVE E2, 3; RAI IA; Video E2; RTS E3; HRT E4; C+ (France) L2; Syria E2; suspected Jordan E3.
- 18/7/96 RTP E2, 3, 4 (Azores); YT-2 R1.
- 24/7/96 SLO E3; RAI IA.
- 25/7/96 TVE E2, 3, 4; RTP E3; RAI IA; TVA IA; Video E2.
- 27/7/96 RAI IA, B; ET R2; C+ L2; SVE E2, 3, 4; Nova (Czech Republic) R2.
- 28/7/96 RUV (Iceland) E4.

To sum up, a presentable and varied log but with days of nil reception. My thanks to Cyril Willis (King's Lynn), Roger Fussell (Torpoint), Peter Schubert (Rainham, Essex) and Garry Smith (Derby) for sending in reception reports and comments.

Satellite Sightings

The Olympic Games dominated the satellite airwaves during July. Signal feeds were everywhere. Ku band feeds from the USA were noted at 45°, 37.5°, 34°, 30° (Hispasat), 27.5° and 21°W. Further European

distribution then followed via Telecom at 5°W and 3°E and Eutelsat II F4 at 7°E. I'm told that C band (4GHz) was very active.

With the Centennial Park bomb in the early hours of the 27th, the atmosphere changed. The mornings had been quiet, with few live feeds, but the fast-breaking story of the bomb, with live reports, altered that.

Despite PAS-3R at 43°W being on carrier with live shots of the Atlanta skyline (12.705GHz vertical) I never saw any real footage to Europe via this satellite – did you?

The tragic loss of the TWA flight 800 on the 18th was covered via Intelsat K (21.5°W), with an SNG truck reporting from Long Island. Nearer home, the Warrington bus crash was reported by Sky News with a feed via this satellite.

I suspect that the AsiaNet programme via Orion (37.5°W) at 11.595GHz horizontal is another loss to the digital world. It's no longer to be seen, though it did put in a brief appearance via PAS-3R on the 17th, at 11.591GHz horizontal.

Roy Carmen (Sandown) noticed Eutelsat II F2 (10°E) carrying Channel 4 racing from Newmarket on the 10th, at 11.5776GHz vertical. He logged NTSC Olympic feeds via Hispasat (30°W) at 11.539 and 11.497GHz horizontal. Communications are, it seems, to change. Roy watched a corporate feed via PAS-1 (45°W) at 2015 BST on the 16th, demonstrating a new Internet phone that will offer US-UK calls at \$1 for ten minutes – the presentation was opened by Alexander Graham Bell's granddaughter! Reception was at 11.643GHz.

I've had a couple of letters from long-time DX-TV and now satellite enthusiast Dave Hawley in west London – he first wrote to me back in 1971, when we were *Practical Television!* For satellite reception he is using a 1.8m Wineguard dish with Jeager H-H Supermount atop a four-storey house. This gives clear coverage of the Clarke belt from the SE to the SW horizon. The equipment provides C and Ku band reception, via a Chaparral co-rotor. Dave reports that the C band output is excellent, Ku band operation being less efficient. Overall results are promising – even signals from the Spacenet-2 satellite at 69°W, with programming to the USA via spot beams, can be resolved. He uses an SCT/Chaparral Monterey

Classic receiver with all the extras, including a sync inserter board to lock the weakest signals. Inclined orbit tracking is the next project he is considering.

John Neal (Ilford) confirms that the Italian horse/pony-trap racing has moved to Eutelsat II F2 at 10°E (11.162GHz horizontal). While on a caravan holiday near Looe he used a 48cm Lenson Heath dish with clip-on caravan mount, an 0.7dB Cambridge universal LNB and an Alba ISR7000 receiver. He was able to receive signals from Turksat 1B (42°E) round to PAS-1 (45°W) by rotating the dish manually. This proves that you can achieve good sat-zap results with quite basic equipment.

Terrestrial News

DAB: Digital Audio Broadcasting tests in Band III have begun across the Swiss Bernese Oberland, on behalf of broadcasters and the local PTT. Swiss SSR radio and other local broadcasters are providing programmes, while Philips and Grundig have produced test receivers.

Bosnia: A new TV network may be established, with a partnership between the UN and several broadcasters. The free-to-air network, using low- and medium-power transmitters, would have a programme origination base in Sarajevo, with satellite terminal facilities.

Iran: The IRIB TV4 channel recently opened in Tehran, featuring cultural and educational programmes. Nationwide expansion is expected over the next five years.

Spain: Many regional broadcasters are expected to be privatised over the next few years. The TVE-2 service is expected to go the same way after 1999, but with regional opt-outs.

Sri Lanka: Sky News is being transmitted via the ETV network from midnight to 0700 local time.

Italy: The PTT minister has recommended privatisation of RAI, though no time scale has been suggested.

Greece: Filmnet has opened two new pay-TV channels, Supersports and Kids TV. They use leased ERT channels on a shared-time basis. Free decoders are being offered.

South Africa: Rupert Murdoch and Kerry Packer plan to develop commercial TV services. Rupert is in talks with a South African consortium, Free to Air, while Kerry's Nine Network has signed with Moribo Investments to start the first all-black controlled private station. Another Australian group,



Network 7, is considering operations in South Africa.

An impressive RTL identification, received via Intelsat K at 21.5°W.

Satellite News

Now that the Israeli Amos-1 satellite is in operation at its 4°W slot, hopes of Kol Yisrael TV coverage in the UK and Western Europe have faded. The Central European beam is directed at Budapest and does not carry a TV service. Signal levels in the UK are poor at best, even using a 1.8m dish in the SE. A 2.4m dish in the Benelux area offers acceptable,

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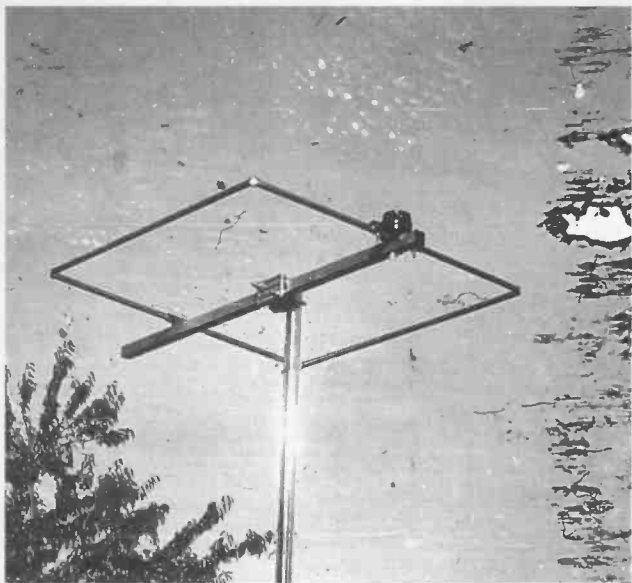
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The HS loop aerial for SpE reception in Band I. It's sides are only 700mm but it provides sharp nulls, giving excellent selectivity. For further details phone HS Publications on 01332 361 699.

entertainment-quality pictures however. Once the TV1/2/3 Israeli services have been proved OK on Amos they will depart from Intelsat at 1°W. Telesat will then redirect the available capacity at 1°W to Norway.

A lot of concern is still being expressed in Australia about reception of "DVB-compliant" MPEG signals from craft such as AsiaSat-2. It has been found difficult to lock the pictures. Complex receiver programming is required, and there is a general lack of information. It has been suggested that the receivers currently available lack technical versatility.

Drake has introduced a new satellite receiver, Model ESR800XT, with a threshold down to -2.5dB, lots of weak-signal aids and even audio threshold extension. The 2,000-operations memory, inclined orbit tracking and variable bandwidths make it an advanced receiver. One that's being used with a 3m dish by an enthusiast in Brazil receives watchable signals from the Eutelsat 13°E and Astra 19.2°E slots!

Those interested in weak signals will be interested to know that the German company NTI has produced an enhanced version of its Digitex (digitally-extended low-threshold demodulator). This small, outboard module accepts a satellite receiver's IF signal (at 70 or 480MHz), processes it, then returns it as a baseband video feed, taking the receiver threshold down to -0.5dB! An example shown illustrates reception of TV-India via Insat-1D in Holland, with a screenful of shash and vague images: add Digitex and you get a display with virtually no sparklies

in full, entertainment-quality colour.

Canal Plus Spain is to launch twenty five channels of digital TV by the end of the year. PRO-7 is to launch sixteen digital channels in Germany during the same period, having provisionally leased three Astra transponders. Its service will use the Kirch D-box decoder-receiver.

Guide to Sat-zapping - 2

A recent letter mentions a problem that can arise with dishes. Large mesh dishes designed for C band operation (4GHz) can be fairly ineffective for Ku band reception. The cause is both surface defects and the actual holes that comprise the mesh. A mesh that is effective at 4GHz can be transparent at 12GHz, allowing the signals through instead of reflecting them.

Large 4GHz dishes generally use petal construction, and as a result have poor surface linearity. You can get away with this at 4GHz, but not at the more demanding 12GHz frequencies. With Ku band TV taking off in the USA, many people have been adding new LNBs to their C band dishes and finding the results less than wonderful. So avoid bargain C band dishes if your main interest is Ku band reception.

The feedhorn/polariser/LNB assembly is mounted at the focal point of the dish. With an offset dish the feedhorn is usually a flared type designed for optimum pickup from the dish with minimum pickup (and hence noise) from beyond the dish area. It matches the signal pickup assembly to the dish: always use the type recommended by the dish manufacturer.

A flared horn may be used with a prime-focus dish, but scalar rings are more common. This arrangement consists of a circular metal disc on which a series of concentric metal rings are mounted. Again this device shapes the feed assembly's pickup response. The scalar feed may be a spun or cast assembly without adjustment: alternatively the ring assembly may slide up and down a plain feed tube, requiring precise adjustment and locking. I have found that adjustment is critical. It's best done at night, with a weak signal and a monitor to view. Slide the ring assembly up and down for peak signal output. Tighten the locking screw at the optimum performance point.

The feed tube delivers the signal collected at the focal point to the polariser. This is an in-line device that discriminates between

vertically or horizontally polarised signals, passing one or the other on to the next unit in line, the LNB. The polariser may be either a current-driven ferrite (magnetic) device, with two-wire control from the receiver (Racal and IRTE are well known makes), or a mechanical type which has a motor-driven probe within the signal path and uses three-wire control. The ferrite polariser has a typical insertion loss of 0-15dB at 11GHz. The mechanical type has a lower loss but is seldom used for Ku band working. It's the norm for C band.

Most receivers offer skew adjustment. This provides polarisation compensation as the dish tracks east or west and 'tilts' the LNB. There will be either a twin-wire feed via a phono socket etc. or, with a manually tuned receiver, a three-wire feed (mechanical polariser). A three-wire to two-wire magnetic interface box is required when a ferrite polariser is to be used with a manually tuned receiver. Budget receivers generally send a switched 13/17V supply up the LNB feeder for non skew adjustable selection of vertical or horizontal polarisation within the LNB. Adjust the mounting with a weak signal is the only advice I can give here.

The LNB usually has a rectangular waveguide input slot (type WR75): the quarter-wave aerial stub can be seen within. The input to the polariser is usually a circular waveguide (type C150) however. Its output may be either C150 or WR75. Obviously the polariser's output flange must match the LNB's input flange. Racal wideband polarisers are available as C150 in, WR75 or C150 out. If you find that you have flange incompatibility, a quarter-wave matching transformer - a thick piece of metal with a circular/rectangular hole - can be fitted in series to optimise the matching. We'll go on to LNBs next month.

I strongly advise that anyone interested in this subject obtains a copy of the *Swedish Microwave AB Catalogue - 96*. It provides details of a massive range of LNBs and dish furniture, all of very high quality. The catalogue is an education in itself, with a four-page LNB tutor. Swedish Microwave's address is Box 230, S-591 23 Motala, Sweden. Send US \$4 to cover postage - you can obtain notes from your bank. Telephone no. is +46 141 21 61 35, fax +46 141 21 52 24.



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HELP WANTED

The help wanted column is intended to assist readers who require a part, circuit etc. that's not generally available. Requests are published at the discretion of the editor. Send them to the editorial department - do not write to or phone the advertisement department about this feature.

For disposal: Aiwa VXT14S2 14in. colour portable incorporating a VCR, VHS but for NTSC only. With full service manual. Not suitable for conversion to UK standards but OK for playing back US tapes. John E. Martin, 161 Francis Close, Ewell, Epsom, Surrey KT19 0JT. 0181 337 9730.

Wanted: Circuit diagram (photocopy OK) for the Eurosonics ES200CB Citizens' Band Tx/Rx, or information on the importer/distributor of Eurosonics equipment. W.A. Young, Foxgloves, Church Lane, Redmire, Nr Leyburn, N. Yorks DL8 4EQ. 01969 622 598.

Wanted: Panasonic VCR with a true NTSC record mode. David Pollard, 60 Knottingley Road, Pontefract, W. Yorks. 01977 702 212/675 448, fax 01977 607 220.

Wanted: Loewe Profit T28 chassis or tuner type U1100. Also help with no step up/down of LED display when adjusting any audio function, with constant distortion. P. Hill, 3 Mayfair Avenue, Halifax HX4 9JH. 01422 370 338 (evenings).

For disposal: Labgear E5180A 405/625 pattern generator; five new boxed faulty Philips VP100 Laservision players plus one second-hand for spares. Offers please. Also free 180 copies of *Television* 1970-90. Michael E. Tye, Chestnut Cottage, 48 Chelworth Road, Cricklade, Wilts SN6 6HD. 01793 751 006.

Wanted: Instruction manual for the Advance Instruments OS300 scope; complete cassette holder for the Hitachi D850 cassette recorder; service manual (photocopy OK) for the BT CF20 fax machine. Martin Edwards, 14 Windsor House, Regency Crescent, Holders Hill Road, London NW4 1NW. 0181 343 3008.

Wanted: Ex-WD airborne Gee receiver type R1355 complete with plug-in RF unit, in original condition. Malcolm George, 42 Butt Lane, Manuden, Nr Bishops Stortford, Herts CM23 1DL. 01279 813 727.

Wanted: One or more Philips observation camera monitors, working or not. Camera Model no. is VK4902/05, monitor Model no. is not available. John Porter, 4 Cromore

Gardens, Creggan Estate, Londonderry BT48 9TF. 01504 266 794.

Wanted: Circuit diagram for the Toshiba V9600 VCR or any other information, particularly on the lacing assembly and mode switch. S.A. Varden, 18 Drayton Way, Nuneaton, Warwickshire CV10 9ER. 01203 393 010.

Wanted: TDA1037 sound output chip for a Sanyo TV. B. Battams, 23 Dudley Drive, South Ruislip, Middx HA4 6QN. 0181 845 5123.

Wanted: Fisher dual-cassette Model CRW77, working or not (for spares); also a Roberts 700 radio, working or not. Write 6 Woodfield Road, Bebington, Wirral, Merseyside L63 3DX or phone 01513 345 109.

Wanted: LOPT for the Matsui MB10 or a scrap chassis. Phone Andy, John or Andrew on 01267 223 955 or write to 22 Bridge Street, Carmarthen, Dyfed SA31 3JS.

Wanted: Circuit diagrams for the Wyse WY50 monitor and IBM 8513 colour display. Also a circuit or any information on bass enhancers, as used with some BBE, SPL, dbx, Aiwa, Sony and Philips models. Lee Archer, 28 Fairholme Avenue, Ashton-in-Makerfield, Wigan, Lancs WN4 8LL.

Wanted: Circuit diagram and spares source for an ICeS CTV2020S 5in. colour portable with radio and tape. It has German markings and is used in Greece. I am particularly interested in obtaining an LOPT with the markings SAMPCO FCA049.43-71-5505. Brian Milne, 22 Aldwych Place, Blackburn BB1 9QP. 01254 246 127.

Wanted: Tuner unit for a Grundig CUC4620 TV set. Doug Carson, 89 Holborn Hill, Millom, Cumbria LA18 5BL. 01229 774 749.

Wanted: Circuit diagram (photocopy OK) for the Samsung CII-3351A colour portable or detailed data on the TDA8362 chip. T.N. Casey, Tallaghan, Edmondstown, Ballaghadereen, Co. Roscommon, Ireland.

Wanted: Control flap for the Pioneer SV2802. C.A. Dyos, 38 Westheath Road, Cove, Farnborough, Hants GU14 8QR. 01252 513 015.

Wanted: Information on mods to the Ferguson SRB1, especially tuning

voltage: Mick Dewing, 15 Adolf Street, Catford, London SE6 3EJ.

For disposal: Two Philips N1700 VCRs (one working) plus service manual, also a G8 and various spare G8 panels and a G11 chassis. Free for collection. R. Wainwright, 2 Minsterley Avenue, Shepperton, Middx TW17 8QT. 01932 784 912.

Wanted: LOPT and on/off knob, new or used, for the Contec KT8135; and a cassette carriage for the Triumph VR9501. B. Branson, 10 Somerdale Close, Weston-Super-Mare, Somerset BS22 8EB.

Wanted: Plug-in remote control subpanel, in working order, for the Bush 2821T. Philip Barry, 6 Cowling Road, Burrill, Bedale, N. Yorks DL8 1RN.

Wanted: Lower drum for the Panasonic NVG25B, also a LOPT and/or manual (photocopy OK) for the Commodore 1084S-D computer monitor. Mervyn Quilter, 23 Bearsdown Close, Egguckland, Plymouth PL6 5TX. 01752 702 247.

Wanted: Service sheet for the Waltham STM70/75 music centre and equivalents for the following transistors: SA634-Y910, SC109-Y912, C184-Y92 and C800-L911. Allan Watson, 2 Masefield Avenue, Padiham, Burnley, Lancs BB12 8SY.

Wanted: Service information (photocopies OK) for the Philips 22DC752/53R and Blaupunkt Bristol 27 car radio-cassette players. H. Wild, 32 Swanage Road, Eccles, Manchester M30 8NJ.

Wanted: Circuit diagram/service information for the Audioline 910 telephone answering machine. Also information on the Sealine II (Demek) marine R/T - identity of power/regulator chip M57710 and C1061 required. Please telephone Don, 01277 822 380 (Don Jannece, 54 Wyatts Green Lane, Brentwood, Essex CM15 0PX).

Wanted: Service/setting up manual (photocopy OK) for the Akai AM43 stereo amplifier. R.E. Norgan, 24 Hankinson Road, Winton, Bournemouth BH9 1HJ. 01202 778 069.

Wanted: Circuit diagrams for the Susumu 2026L and Maspro SRE80 satellite receivers, an original remote control unit for the SRE80 and has

anyone any 2SK133 MOSFETs? D. Benyon, Marshland View, St. Annes Hill, Bude, Cornwall EX23 0LT. 01288 353 373.

Wanted: Service manual for the Solavox Olympic 6000 portable CTV, loan or photocopy OK. James Rattigan, 4 Grosvenor Street, Barrow-in-Furness, Cumbria LA14 4AH.

Wanted: Front black customer control flap for the Panasonic Model TXC22, also a user instruction manual. S.T. Hargreaves, 11 Morris Drive, Weaveringham, Northwich, Cheshire CW8 3LP.

Wanted: Service manual for the Panasonic radio Model RM1350A, part no. T1160XA, as fitted to Honda Goldwing 1200cc motorcycles. Alan Flisher, 3 Chapel Close, Stepside, Mochdre, Newtown, Powys SY16 4LQ. 01686 628 528.

Wanted: Ferguson FV30 operating instructions. *Wireless World* 1935-1950. Information on the Leak PA amplifier circa 1936 - and an amplifier. Push switches Sony part no. 1-552-868-31. Ken Domminney, 7 Chestnut Close, Eastbourne BN22 0SZ, 01323 500 174.

Wanted/for disposal: 7B7, 7C5, 7C6, 7S7 and 7Y4 valves for the Cossor Melody Maker 500 radio receiver. Because of limited space the following CRTs are available free. Mullard A51-570X, A56-500X, A56-540X, A34-514W; Thorn AXT56-001; Mitsubishi 510ZB22A; Philips A37-554X; Barex A44-271X; Toshiba E39164; Samsung 3701B22 and 370NB22. T. Prytherch, 18 Bryn-Gwynt, Amlwch-Port, Anglesey LL68 9HP.

Wanted: Circuit diagrams for the Philips LDH 0402/01 security camera and BT Hawk cordless telephone (1983). Photocopies OK. Peter Ward, Petgra, Forest Corner, Ringwood, Hants BH24 3JW. 01425 475 445.

Wanted: Cabinet parts for a National Panasonic TC800 TV monitor, or a scrap set. Leon Electronics, Crawley RH10 1RS. 01293 520 536.

Wanted: Details of the power supply modification for the Philips 2A chassis (Model 22CE2061/05). There are two components, a 100Ω resistor and what appears to be a 1N4148 diode (unmarked) from the base of

T7687 to the emitter of T7685. A. Jaques, G3PTD, 88 Sandy Lane, Stretford, Manchester M32 9BX. 01618 659 398.

Wanted: Circuit diagram (photocopy OK) of the remote control/tuning PCB used in the Philips Model 16CT2216 (CTX-E chassis). R. Heaton, 22A Glover Street, Avenham, Preston, Lancs PR1 3TJ. 01772 883 837.

Wanted: Service and user manuals for the 28in. Barco Model OCM 2846 RGB multidata monitor and the Commodore 1960 monitor. Mark Knibbs, 25 Rutts Lane, West Lavington, Devizes, Wilts SN10 4LN. 01380 818 023.

Wanted: Can anyone tell me why a JVC HRD520EK goes into fast rewind when search is selected? The fault will clear for about a month, then return. All modes will lock up. Switching the power supply off seems the only way to clear the fault. Please phone 01214 264 471 (Keith Twamley, Birmingham).

Wanted: H-stat unit part no. 1-228-544-11 for the Sony Model 2705UB, also an EHT connector and cap and a remote control unit. P. Smith, 38 Rancliffe Crescent, Leicester LE3 1NQ. 01162 858 246.

Wanted: Service manual for the Grundig SC303 (RDS) car radio cassette player. Can copy and return. Alan T. Plenderleith, Border Electronics, Unit 10, Edenside Workshops, Kelso, Roxburghshire TD5 7JR. 01573 224 864.

Wanted: Help with the Philips K30 chassis, edition 2. The TDA2581 chopper control chip is now hard to obtain. An equivalents book suggests that the TDA2582 could be used, but it doesn't work. Are there any modifications that would enable it to be used? Have for disposal two Hitachi CNP190 CTVs complete. Roy Bailey, 22 Grebe Close, Waterlooville, Hants PO8 9UT. 01705 783 811.

Wanted: Teletext board for the Sony KV21XMTU and a BU2716S chip for the Matsui VX880 VCR. C.B. Johns, 28 Woodland Road, Neath, West Glam. SA11 3AL. 01639 638 629.

Wanted: Nicam PCB for the Nokia 6361 VT Digivision (Compact

ANSWER TO TEST CASE 406

- See page 861 -

What could possibly be wrong with a machine that refuses to erase the signals on a tape when its full-erase head is OK and is being supplied with a perfectly good drive signal? It was nothing electrical but something physical - the head simply wasn't in contact with the tape.

Some decks have a rigidly fixed full-erase head. But with most of them, as in this one, the head is mounted on a sprung, pivoted arm which, during tape threading, is pushed aside by the entry-guide assembly while this is on its way around the left-hand side of the head drum. In this particular machine, which could have been out of use for some time, the FE head arm's pivot had seized solid, holding the head clear of the tape. Hawk-eyed Sage had spotted this straight away, though it's easy to miss something that with hindsight is obvious.

The theory that the machine had not been in use for a while was reinforced when, a day or two later, TS's customer - after paying £30 for what amounted to a few minutes' work - brought it back to the electronic emporium in King's Road because of an unconnected mechanical fault. Most of the drive belts needed replacement and, when they were removed and put on the bench, they sat in exactly the shapes they had taken up during a presumably long period at rest. This subsequent repair didn't call for recourse to the Test Case workshop...

chassis) and instructions/channel set-up procedure for the Hinari VXL5 VCR. Phil Lacey, 12 Chaworth Road, Ottershaw, Chertsey, Surrey KT16 0PE. 01932 872 730.

Wanted: Text PCB for the Hitachi Model CPT2128 (G7P chassis). F. Denny, 67 Four Acres, Withywood, Bristol BS13 8RB. 01179 646 931.

Wanted: For project. Hand-held LCD TV, e.g. Casio/Citizen. Faulty tuner wouldn't matter as only video baseband required. Harvey Benson, 7/3 Rehov Hayididut, Magdiel, Hoh Hasharon, Israel 45297.

Wanted: Circuit diagram for and identification of manufacturer of a radio/cassette recorder made in Japan on licence from Decca for catalogue company. Unit is 15 or more years old and is similar to the Decca CR1200 but with FM/MW/LW/SW tuner. Peter Shepherd, 29 Greenbank Avenue, Plymouth PL4 8PS.

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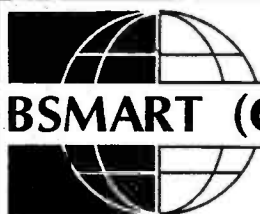
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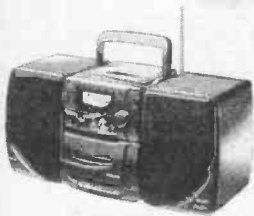
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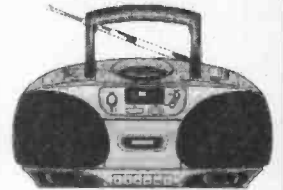


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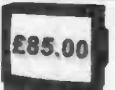
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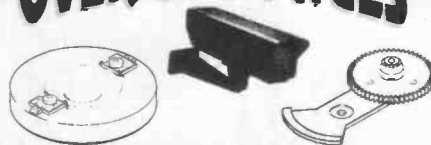


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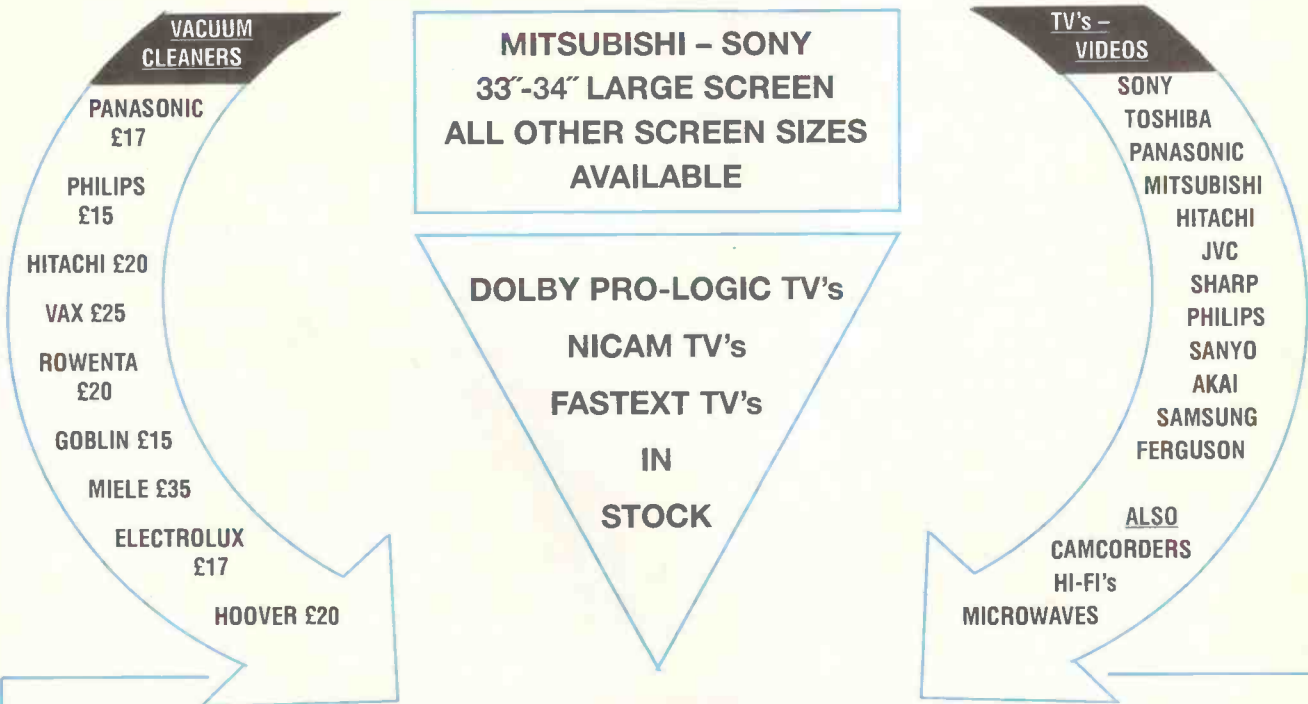
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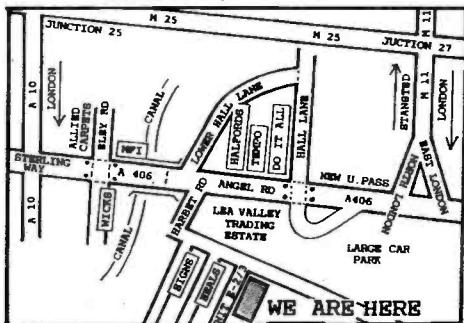
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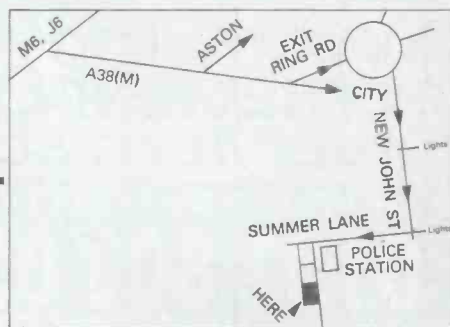
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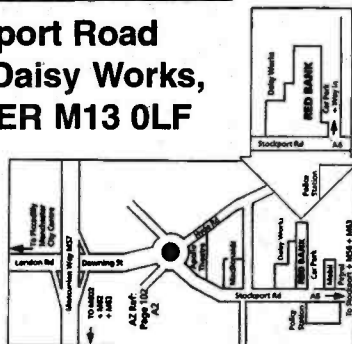
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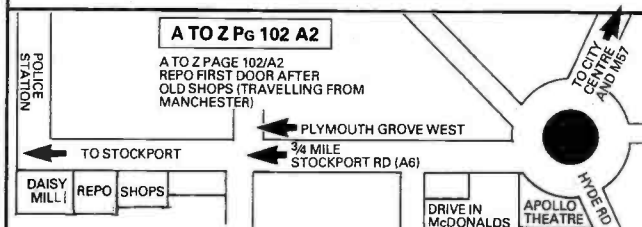
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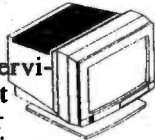
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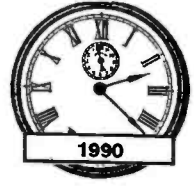
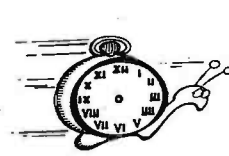
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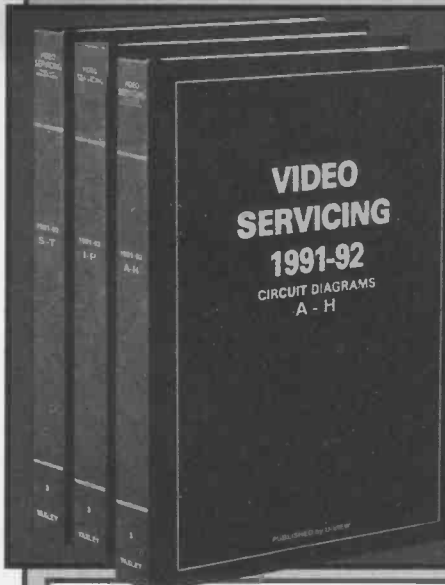
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6 VA RS Encapsulated main transformer 0-120v-0-120v Pri 0-9v-0-9v Sec	
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SRD 3	£1.00	
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