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Inside the Panasonic Alpha 4 Chassis

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the Pace PRD800/900**

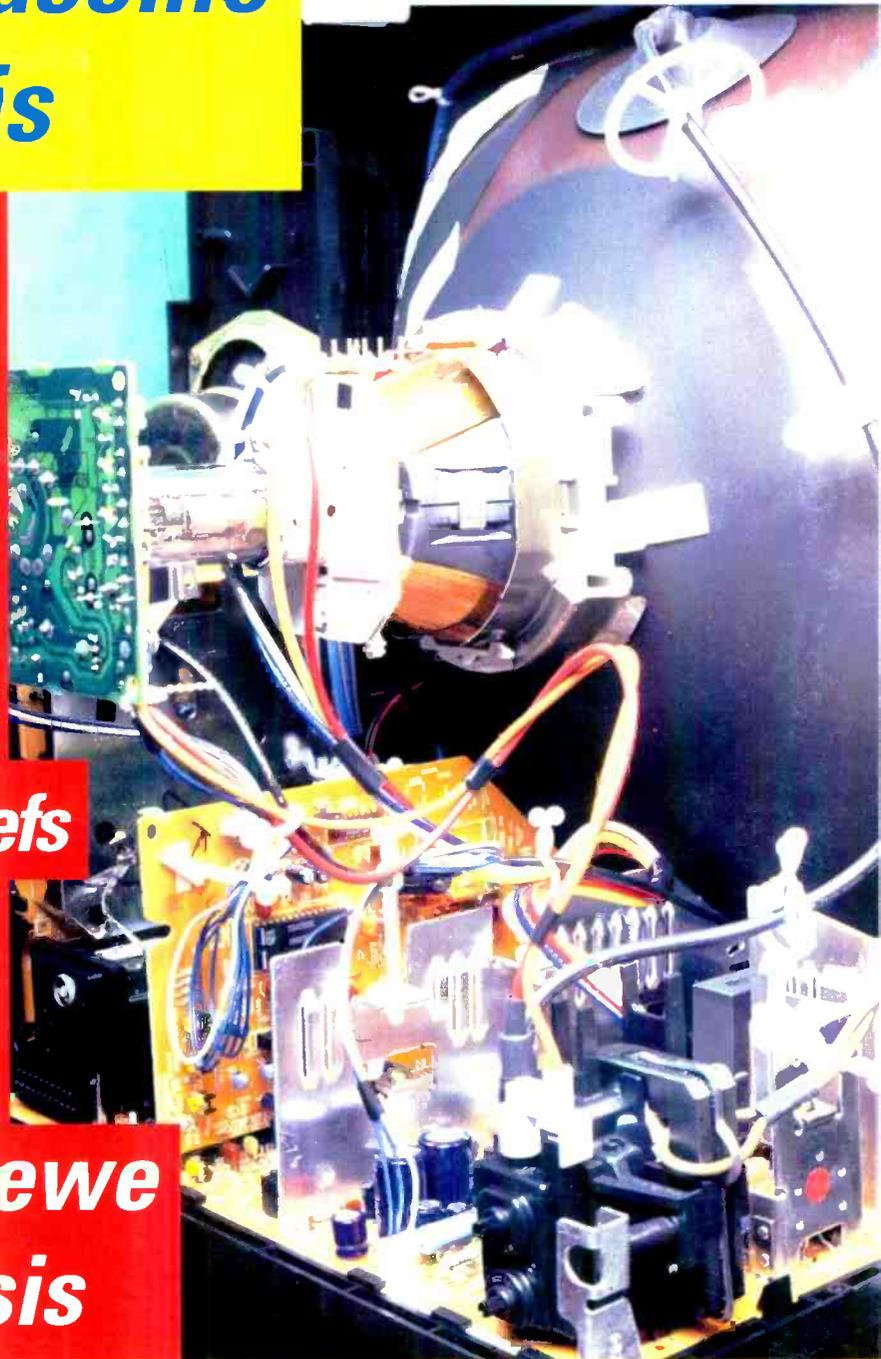
Digital VHS

**Service Notes on
the JVC HRD530**

Ferguson Service Briefs

**The Philips/Sony
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**Servicing the Loewe
C8001 CTV Chassis**



CABLE & SATELLITE SHOW REPORT



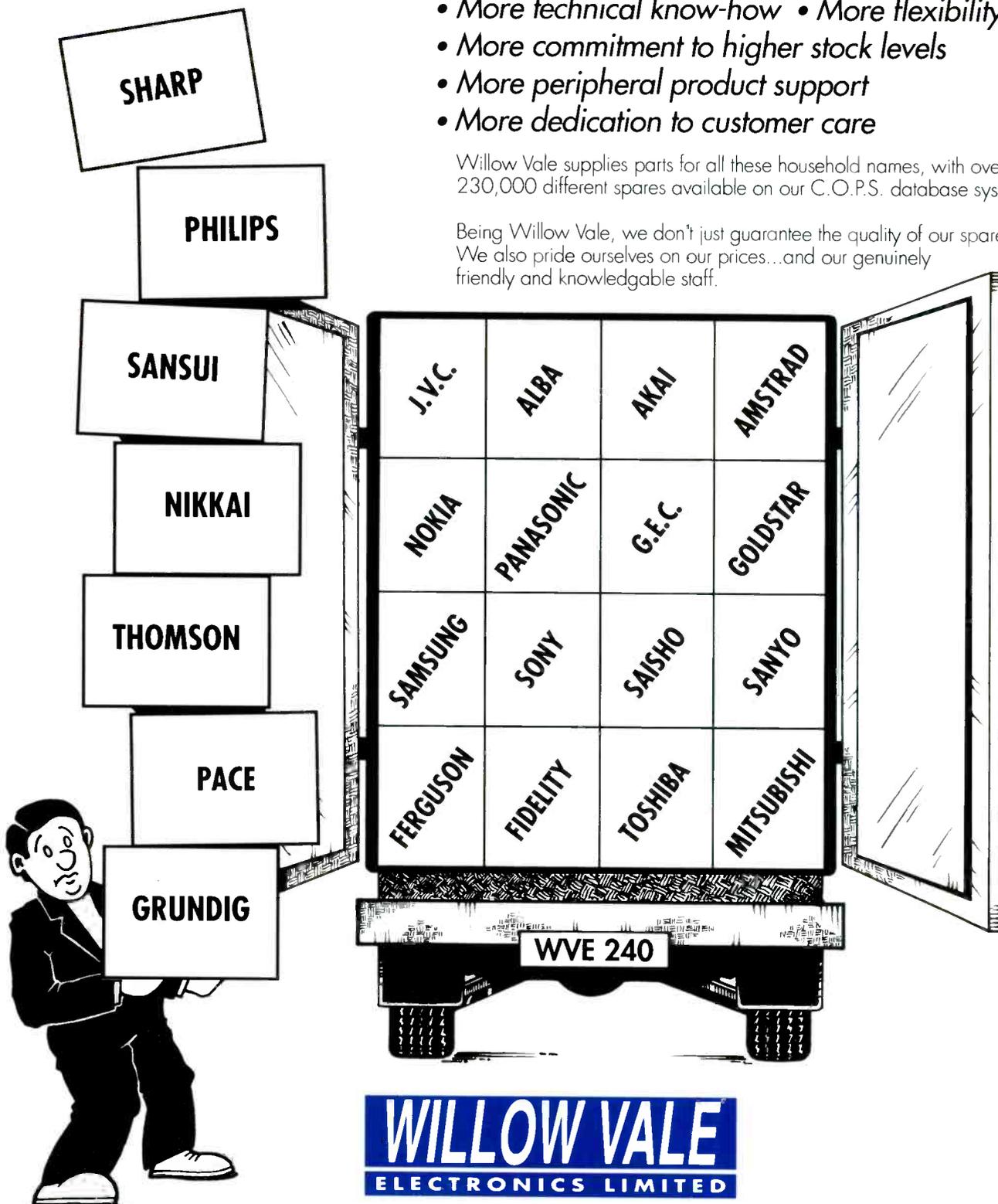
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On Sale
May 17th

Vol. 45, No. 8

Issue 536

542 Ferguson Service Briefs

Servicing know-how on recent Ferguson products, in particular the ICC9 TV chassis.

544 The Philips/Sony High Density CD Format Owen Exeter

Technical details of this new CD format which can be used for digital video discs.

548 Inside the Panasonic Alpha 4 Chassis, Part 1 Ray Meadows

Features of the chassis, the chip complement and the operation of the power supply circuitry.

551 CD Fault Finding

Fault reports of CD players.

557 VHS Goes Digital George Cole

Details of the latest VHS format, for digital/data recording, also other new developments – the dynamic drum system, the 3D AI Super Colour system and BES tuning to optimise performance with different types of tape.

560 Servicing the Loewe-Opta C8001 Chassis Chris Watton

A run-down on the chassis and the faults most frequently encountered.

566 Servicing the Pace PRD800/PRD900 Jack Armstrong

How to tackle faults experienced with this series of satellite receivers.

574 Installing a CD-ROM Drive, Part 2 David Botto

Mainly the sound card, its software and uses.

578 JVC HRD530 Fault Guide John Coombes

A guide to faults encountered with this VCR, which was also distributed as the Ferguson FV14T.

580 At Cable and Satellite '95 Peter Brough

New ranges and products showed at the 1995 Olympia cable and satellite exhibition.

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The July issue will be published on June 21st

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BC141	20p	BD438	36p	BU180	100p	MR856	35p	2N3442	85p	7905	25p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC142	20p	BD439	40p	BU184	100p	OC28	35p	2N3702	9p	7908	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC143	20p	BD440	40p	BU204	65p	OC29	35p	2N3704	9p	7912	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC147	8p	BD441	40p	BU205	70p	OC35	250p	2N3705	9p	7915	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC149	8p	BD533	30p	BU206	100p	OC36	250p	2N3707	9p	7918	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC159	8p	BD534	30p	BU208	70p	OC45	50p	2N3710	12p	7924	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC160	30p	BD535	38p	BU208A	75p	OC200	180p	2N3711	12p	7924	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
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BC172	10p	BD537	40p	BU209	90p	R2008B	100p	2N3711	12p	7924	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC177	14p	BD538	40p	BU209	90p	S2000A3	175p	2N3712	12p	7924	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
BC178	14p	BD539	40p	BU225	120p	S2000AF	175p	2N3713	100p	7924	30p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
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BC213L	7p	BD682	45p	BU409	85p	TIP31A	22p	2N5241	50p	79H12KC	70p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
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BC238	7p	BD711	50p	BU505D	90p	TIP32C	28p	2N5241	50p	79H12KC	70p	BR62	80p	6850	90p	BA301	55p	KA2261	100p
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M51518	200p	STK1049	700p	STK5482	285p	STR60145	550p	TA8228	250p	TDA1592	250p	TDA3607	350p	TDA8189	300p	UPC1278	240p	2SA984	25p
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M51381P	200p	STK2025	620p	STK5492	450p	STR69041	475p	TA8233	250p	TDA1597	150p	TDA3612	350p	TDA8194	300p	UPC1350	115p	2SA999	30p
M51387P	200p	STK2028	500p	STK5493	450p	STR69041	475p	TA8234	250p	TDA1598	150p	TDA3613	350p	TDA8195	300p	UPC1363C	300p	2SA1008	125p
M51544	150p	STK2029	480p	STK5495	450p	STR69041	475p	TA8235	250p	TDA1599	150p	TDA3614	350p	TDA8196	300p	UPC1364C	350p	2SA1009	200p
M51848	150p	STK2038	480p	STK5497	450p	STR69041	475p	TA8236	250p	TDA1600	275p	TDA3615	350p	TDA8197	300p	UPC1385	250p	2SA1010	225p
M54523P	200p	STK2048	950p	STK6324B	500p	STRD1206	600p	TA8237	250p	TDA1600A	275p	TDA3616	350p	TDA8198	300p	UPC1370C	300p	2SA1011	80p
M54563P	200p	STK2110	550p	STK6431	850p	STRD1406	600p	TA8238	250p	TDA1601	250p	TDA3617	350p	TDA8199	300p	UPC1373	85p	2SA1012	85p
M54848	200p	STK2125	580p	STK6722	725p	STRD1806	400p	TA8239	250p	TDA1602	250p	TDA3618	350p	TDA8200	200p	UPC1377C	200p	2SA1013	100p
M51516	260p	STK2129	610p	STK6732	1000p	STRD1806	400p	TA8240	250p	TDA1603	250p	TDA3619	350p	TDA8201	200p	UPC1378	180p	2SA1015	15p
M51518	200p	STK2138	975p	STK6822	900p	STRD3035	300p	TA8241	250p	TDA1604	140p	TDA3620	350p	TDA8202	200p	UPC1382	110p	2SA1016	30p
MB3712	140p	STK2155	900p	STK6822	900p	STRD4412	500p	TA8242	250p	TDA1605	140p	TDA3621	350p	TDA8203	200p	UPC1384	425p	2SA1018	100p
MB3713	130p	STK2230	470p	STK6932	525p	STRD4512	400p	TA8243	250p	TDA1606	140p	TDA3622	350p	TDA8204	200p	UPC1387C	250p	2SA1020	30p
MB3714	200p	STK2240	740p	STK6932	525p	TA7054	190p	TA8244	250p	TDA1607	140p	TDA3623	350p	TDA8205	200p	UPC1394	120p	2SA1021	35p
MB3715	250p	STK2250	650p	STK6932	525p	TA7066	120p	TA8245	250p	TDA1608	140p	TDA3624	350p	TDA8206	200p	UPC1397	350p	2SA1023	60p
MB3722	280p	STK3041	370p	STK6932B	600p	TA7066	120p	TA8246	250p	TDA1609	140p	TDA3625	350p	TDA8207	200p	UPC1403CA	350p	2SA1026	90p
MB3730	160p	STK3042	375p	STK6982	600p	TA7089	300p	TA8247	250p	TDA1610	140p	TDA3626	350p	TDA8208	200p	UPC1420CA	450p	2SA1029	60p
MB3731	220p	STK3044	500p	STK7216	420p	TA7119	150p	TA8248	250p	TDA1611	140p	TDA3627	350p	TDA8209	200p	UPC1421CA	650p	2SA1036	60p
MB3756	200p	STK3062	500p	STK7217	400p	TA7120	150p	TA8249	250p	TDA1612	140p	TDA3628	350p	TDA8210	200p	UPC1423CA	550p	2SA1037	50p
MB3759	200p	STK3082	550p	STK7225	500p	TA7137	60p	TA8250	250p	TDA1613	140p	TDA3629	350p	TDA8211	200p	UPC1470	200p	2SA1038	40p
MB8719	360p	STK3102H	530p	STK7226	600p	TA7140	100p	TA8251	250p	TDA1614	140p	TDA3630	350p	TDA8212	200p	UPC1488H	150p	2SA1048	40p
MC1455	45p	STK3126H	900p	STK7251	500p	TA7157	100p	TA8252	250p	TDA1615	140p	TDA3631	350p	TDA8213	200p	UPC1490C	150p	2SA1051	30p
MC1496	65p	STK3156	480p	STK7252	440p	TA7157	100p	TA8253	250p	TDA1616	140p	TDA3632	350p	TDA8214	200p	UPC1513CA	200p	2SA1060	120p
MC3401	45p	STK4017	400p	STK7309	400p	TA7200	320p	TA8254	250p	TDA1617	140p	TDA3633	350p	TDA8215	200p	UPC1515CA	250p	2SA1069	150p
NE555	20p	STK4019	480p	STK7310	470p	TA7205	110p	TA8255	250p	TDA1618	140p	TDA3634	350p	TDA8216	200p	UPC1520CA	250p	2SA1076	230p
NE556	40p	STK4021	380p	STK7348	400p	TA7207	150p	TA8256	250p	TDA1619	140p	TDA3635	350p	TDA8217	200p	UPC1536C	550p	2SA1077	300p
NE558	80p	STK4024H	550p	STK7356	425p	TA7208	125p	TA8257	250p	TDA1620	140p	TDA3636	350p	TDA8218	200p	ZN423	100p	2SA1082	80p
NE565	110p	STK4025	530p	STK7358	440p	TA7214	220p	TA8258	250p	TDA1621	140p	TDA3637	350p	TDA8219	200p	ZN424	130p	2SA1084	100p
NE567	110p	STK4026	530p	STK7359	440p	TA7217	145p	TA8259	250p	TDA1622	140p	TDA3638	350p	TDA8220	200p	ZN425	320p	2SA1085	75p
NE571	290p	STK4028	550p	STK7404	400p	TA7220	220p	TA8260	250p	TDA1623	140p	TDA3639	350p	TDA8221	200p	ZN426	260p	2SA1091	100p
NE592	85p	STK4032H	510p	STK7406	650p	TA7222	90p	TA8261	250p	TDA1624	140p	TDA3640	350p	TDA8222	200p	ZN427	215p	2SA1094	190p
NE593P	140p	STK4036	470p	STK7408	675p	TA7223	210p	TA8262	250p	TDA1625	140p	TDA3641	350p	TDA8223	200p	ZN428	560p	2SA1095	300p
SAA1006	300p	STK4038	680p	STK7410	900p	TA7225	300p	TA8263	250p	TDA1626	140p	TDA3642	350p	TDA8224	200p	ZN429	215p	2SA1096	80p
SAA1008	450p	STK4040H	650p	STK7454	600p	TA7226	290p	TA8264	250p	TDA1627	140p	TDA3643	350p	TDA8225	200p	ZN430	400p	2SA1098	60p
SAA1010	450p	STK4042H	650p	STK7461	600p	TA7227	170p	TA8265	250p	TDA1628	140p	TDA3644	350p	TDA8226	200p	ZN431	400p	2SA1102	130p
SAA1024	250p	STK4044	800p	STK7562	1000p	TA7228	100p	TA8266	250p	TDA1629	140p	TDA3645	350p	TDA8227	200p	ZN432	400p	2SA1103	130p
SAA1025	250p	STK4046	950p	STK7563	800p	TA7232	95p	TA8267	250p	TDA1630	140p	TDA3646	350p	TDA8228	200p	ZN433	400p	2SA1104	140p
SAA1075	350p	STK4048	1280p	STK8050	750p	TA7233	120p	TA8268	250p	TDA1631	140p	TDA3647	350p	TDA8229	200p	ZN434	400p	2SA1105	250p
SAA1124	200p	STK																	

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	100p
2SA1382	120p	2SC1013	170p	2SC1740	10p	2SC2275	50p	2SC2753	50p	2SC3284	600p	2SC3907	250p	2SD841	110p	2SD1291	400p	2SD1846	350p
2SA1385	180p	2SC1014	140p	2SC1741	35p	2SC2278	70p	2SC2759	40p	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	48p	2SD1308	80p	2SD1877	250p
2SA1491	300p	2SC1060	70p	2SC1775	10p	2SC2798	35p	2SC2786	20p	2SC3303	100p	2SC3987	220p	2SD858	250p	2SD1309	140p	2SD1878	230p
2SA1493	500p	2SC1061	85p	2SC1781	20p	2SC2307	300p	2SC2787	10p	2SC3306	100p	2SC3996	1200p	2SD863	23p	2SD1310	140p	2SD1879	275p
2SA1516	280p	2SC1070	65p	2SC1789	100p	2SC2308	10p	2SC2788	10p	2SC3307	600p	2SC4006	100p	2SD864	200p	2SD1311	1000p	2SD1884	300p
2SA1535	175p	2SC1096	40p	2SC1809	40p	2SC2312	300p	2SC2792	220p	2SC3309	150p	2SC4023	325p	2SD866A	140p	2SD1328	60p	2SD1887	450p
2SB324	40p	2SC1098	120p	2SC1810	250p	2SC2314	70p	2SC2793	700p	2SC3316	280p	2SC4026	350p	2SD868	260p	2SD1347	70p	2SD1910	280p
2SB546	45p	2SC1108	180p	2SC1815	10p	2SC2316	150p	2SC2808	40p	2SC3317	350p	2SC4106	200p	2SD870	190p	2SD1348	65p	2SD1911	300p
2SB560	25p	2SC1114	415p	2SC1819	70p	2SC2320	10p	2SC2810	360p	2SC3323	480p	2SC4123	450p	2SD871	300p	2SD1350	150p	2SD1913	50p
2SB561	50p	2SC1115	280p	2SC1826	60p	2SC2324	120p	2SC2812	40p	2SC3327	60p	2SC4124	250p	2SD879	60p	2SD1376	125p	2SD1929	60p
2SB562	25p	2SC1116	290p	2SC1827	60p	2SC2329	480p	2SC2814	40p	2SC3331	25p	2SC4169	60p	2SD880	40p	2SD1379	100p	2SD1939	75p
2SB566	90p	2SC1124	270p	2SC1829	500p	2SC2331	50p	2SC2824	75p	2SC3333	120p	2SC4236	550p	2SD882	25p	2SD1380	100p	2SD1941	50p
2SB595	55p	2SC1161	110p	2SC1833	40p	2SC2333	200p	2SC2826	200p	2SC3335	200p	2SC4237	650p	2SD882A	100p	2SD1384	50p	2SD1959	280p
2SB596	50p	2SC1162	30p	2SC1834	50p	2SC2334	80p	2SC2827	200p	2SC3345	100p	2SC4242	170p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB598	30p	2SC1164	600p	2SC1844	50p	2SC2335	15p	2SC2828	200p	2SC3352	280p	2SC4243	650p	2SD895	200p	2SD1391	250p	2SD1978	50p
2SB600	500p	2SC1165	750p	2SC1845	15p	2SC2336	120p	2SC2830	400p	2SC3353	280p	2SC4244	170p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB646	40p	2SC1166	100p	2SC1846	35p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD899	400p	2SD1395	150p	2SD2012	50p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4742	275p	2SD900	200p	2SD1397	120p	2SD2123	225p
2SB648	45p	2SC1172	150p	2SC1855	85p	2SC2353	120p	2SC2837	250p	2SC3368	50p	2SC4769	300p	2SD901	400p	2SD1398	120p	2SD2125	225p
2SB649	35p	2SC1173	140p	2SC1856	25p	2SC2360	120p	2SC2839	40p	2SC3369	50p	2SC4905	450p	2SD905	450p	2SD1399	120p	2SD2133	300p
2SB688	90p	2SC1195	210p	2SC1865	700p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SC4919	195p	2SD916	130p	2SD1399	120p	2SD2135	225p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2362	50p	2SC2857	120p	2SC3377	120p	2SC4920	180p	2SD917	300p	2SD1399	120p	2SD2136	225p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SC4921	260p	2SD921	320p	2SD1399	300p	2SD2137	425p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SC4925	195p	2SD923	360p	2SD1400	280p	2SD2138	425p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SC4933	25p	2SD924	120p	2SD1402	150p	2SD2139	425p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2373	210p	2SC2888	200p	2SC3393	80p	2SC4935	75p	2SD947	100p	2SD1406	60p	2SD2140	700p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SC4939	80p	2SD947	100p	2SD1406	60p	2SD2141	60p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SC4940	35p	2SD951	30p	2SD1407	60p	2SD2142	280p
2SB755	310p	2SC1252	850p	2SC1909	250p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SC4948	65p	2SD957A	290p	2SD1408	125p	2SD2143	250p
2SB772	25p	2SC1278	110p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SC4957	40p	2SD958	60p	2SD1412	75p	2SD2144	225p
2SB774	50p	2SC1279	30p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3409	400p	2SC4958	40p	2SD965	35p	2SD1413	60p	2SD2145	75p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SC4971	240p	2SD970	170p	2SD1415	190p	2SD2146	60p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SC4973	60p	2SD973	60p	2SD1417	125p	2SD2147	525p
2SB795	60p	2SC1312	40p	2SC1940	110p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SC4974	60p	2SD973A	70p	2SD1425	260p	2SD2148	550p
2SB825	135p	2SC1317	15p	2SC1941	27p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SC4988	150p	2SD985	120p	2SD1426	160p	2SD2149	700p
2SB861	110p	2SC1318	10p	2SC1942	350p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SC4989	60p	2SD986	120p	2SD1427	180p	2SD2150	650p
2SB882	180p	2SC1325	400p	2SC1944	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SC4990	14p	2SD1012	40p	2SD1428	220p	2SD2151	680p
2SB886	90p	2SC1327	20p	2SC1945	350p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SC4991	50p	2SD1020	40p	2SD1429	410p	2SD2152	45p
2SB950	180p	2SC1328	15p	2SC1946	1500p	2SC2484	185p	2SC2944	300p	2SC3426	150p	2SC4992	120p	2SD1021	120p	2SD1430	280p	2SD2153	50p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2489	200p	2SC2958	50p	2SC3447	200p	2SC4993	55p	2SD1022	400p	2SD1431	400p	2SD2154	50p
2SB1007	110p	2SC1345	15p	2SC1957	70p	2SC2491	200p	2SC2962	800p	2SC3456	200p	2SC4994	350p	2SD1024	130p	2SD1432	400p	2SD2155	50p
2SB1079	180p	2SC1346	100p	2SC1959	10p	2SC2495	1900p	2SC2967	800p	2SC3457	200p	2SC4995	200p	2SD1024	350p	2SD1432	400p	2SD2156	50p
2SB1109	100p	2SC1358	270p	2SC1967	1300p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SC4996	75p	2SD1030	75p	2SD1433	750p	2SD2157	100p
2SC182	75p	2SC1359	15p	2SC1969	160p	2SC2500	25p	2SC2987	160p	2SC3458	180p	2SC4997	150p	2SD1031	70p	2SD1438	140p	2SD2158	75p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SC4998	35p	2SD1046	200p	2SD1439	165p	2SD2159	40p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2519	60p	2SC2995	50p	2SC3461	350p	2SC4999	130p	2SD1047	150p	2SD1441	280p	2SD2160	40p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2527	300p	2SC3001	1400p	2SC3468	70p	2SC5001	20p	2SD1051	130p	2SD1445	200p	2SD2161	50p
2SC386A	60p	2SC1384	20p	2SC1973	600p	2SC2534	150p	2SC3009	300p	2SC3481	300p	2SC5025	50p	2SD1062	150p	2SD1451	260p	2SD2162	100p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2535	300p	2SC3012	300p	2SC3482	275p	2SC5026	70p	2SD1063	200p	2SD1452	350p	2SD2163	415p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2538	100p	2SC3019	320p	2SC3483	275p	2SC5045	18p	2SD1064	250p	2SD1453	140p	2SD2164	415p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2540	1900p	2SC3025	500p	2SC3484	275p	2SC5049	120p	2SD1065	160p	2SD1455	250p	2SD2165	160p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2542	300p	2SC3026	550p	2SC3485	275p	2SC5051	500p	2SD1069	150p	2SD1457	165p	2SD2166	150p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2545	55p	2SC3030	300p	2SC3486	120p	2SC5055	500p	2SD1071	450p	2SD1458	120p	2SD2167	40p
2SC461	15p	2SC1407	500p	2SC2002	15p	2SC2546	25p	2SC3037	125p	2SC3502	240p	2SC5056	50p	2SD1073	350p	2SD1459	120p	2SD2168	40p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2547	65p	2SC3038	125p	2SC3504	250p	2SC5057	50p	2SD1074	450p	2SD1460	120p	2SD2169	

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model	Price	Model	Price	Model	Price	Model	Price
HRD520, 600, 620, 637, 641, 650, 830	95p	VR6010, VR9010	70p	Mcdels & Description	Order Code	Price	
HRD540, 550, 580, 660, 860, 960,	130p	VR6020, VR6022, VR6023, VR6028,	75p	UNIVERSAL VIDEO LAMP 9V	VL01	25p	
KENWOOD		VR6024	75p	8cmV (310mm WIRES)			
KV901	70p	VR6520, VR6540, VR6560	90p	PANASONIC VIDEO LAMPS	VL02	35p	
KV903	90p	VR6710, VR6720, VR6735, VR6720	130p	SHARP VIDEO LAMPS	VL02	35p	
LOEWE		VR6720, VR6730, VR6760, VR6775,	160p	HITACHI 5381682 (VT63, VT64)	VL04	135p	
OC11, OC40	95p	SAISHO		VIDEO LAMPS			
OC410, OC420, OC440, OC460	130p	VR2300, VHL3	90p	A/WA, AKAI, ALBA, AMSTRAD,	VL05	150p	
OC50, OC55, OC60, OC65, OC70,	120p	VR3800	75p	BLAUPUNKT, FERGUSON,			
LOGIK		SALORA		FIDELITY, FISHER, FUJITSU,			
VR955	180p	SV6500	100p	FUNAI, G.E.C., GOLDSTAR,			
LUXOR		SV6600	150p	GRANADA, GRUNDIG, HINARI,			
9245, 9251	130p	SV8000	120p	HITACHI, ITT, JVC (HRD			
9252	140p	SV8100	60p	SERIES), MATSUI, MITSUBISHI,			
9253	140p	SV8500, SV8520, SV9500	150p	NEC, ORION, NATIONAL,			
9254	100p	SV7400, SV8400, SV8420, SV8550	120p	PHILIPS, SAISHO, SALORA,			
9255	130p	SV6700, SV8710, SV8750, SV9700	120p	SAMSUNG, SANYO, SHARP,			
9256	130p	SV6800, 6900, 8810, 8820, 8870, 8910,	95p	SIEMEN, SONY, TELEFUNKEN,			
9270, 9271, 9273, 9274	115p	8920, 8970	95p	THOMSON, TOSHIBA			
9272, 9280	140p	SV8600, 8620, 8700, 8720, 8830, 9600,	130p				
9281, 9284, 9285, 9292, VR3701, 3721,	95p	9810	130p				
3761, 3761, 3781		SAMSUNG					
MATSUI		SV716, 717, V1616, V1621, V1626, VX616,	85p				
VX850	75p	VX617, VX619, VX626, VX627, VX629	85p				
MITSUBISHI		VB520, 510, 610, 616, 617, 619, 620, 628,	85p				
HS200	200p	627, 629, V1510, 520, 611, 616, 621, 626,	100p				
HS300, 301, 302, 307, 310, 337, 338, 347,	150p	VX510, 520	100p				
348, 411, 412, 421, HSB10, 20, 30, HSE10,	150p	VB900, VB910, V1900, V1910	110p				
20, 30, 70		PK900, 981, 982, SE9001, SV9001,					
HS303, HS304, HS306, HS307, HS330,	150p	SVX307, 319, 322, VB770, 8220, 8225,					
HS400, HS700	150p	V1770, 790, 8220, 8225, VK8220, VPK31,					
HS318, HS319, HS410	130p	VX750, VX790, 8220, 8225	135p				
N.E.C.		SVX301, 303, 305, SX7301, VB710, 971,					
N830, N831, N832, N833	100p	V1730, 710, VX712, VX720, 730, 970, 971,					
N895	80p	972	230p				
PVC2300, PVC2400	180p	VX9800	110p				
DX1000, 1600, 2000, 3000, N9012, 9013,		SANYO					
9014, 9016, 9033, 9034, 9053, 9054, 9055,		VTC5000, 5150, 6000, 6500, VTCM10, 11,					
9066, 9110, 9120, 9510, 9520, 9530,	95p	20, 21, 30, 31, 50	75p				
9610		VTC5300, VTC5350, VTC5400,					
NATIONAL PANASONIC		VRP5800	100p				
NV300, NV332, NV333, NV340,		VTC5500	95p				
NV365	125p	VTC9100, VTC9300	220p				
NV777, NV788	100p	VTC1100, 1300, 1500, 1100, 1150, 1200,					
NV2000, NV2010, NV3000	130p	1300, 1500	90p				
NV7000, NV7200, NV7800	95p	VHR2100, VHR2300, VHR2500,					
NV8600, NV8610, NV8620	145p	VHR2700	150p				
NV720, 250, 280, 430, 431, 433, 450, 460,		VR83100, 3300, 3310, 3400, 3700, 3800,					
465, 470, 730, 770, 810, 870, 890, AG	125p	VHRD500, 700	110p				
1050		VHR4100, 4150, 4200, 4300, 4350, 4770,					
NV370, NV380, NV480, NV630, NV780,	100p	5100, 5200, 5300, 5350, 5700, 7100, 7200,					
NV830, NV850	100p	7500, 7530, 7540, 7800, 7810, 8100, 8200,					
NV600, NV668, AG6010, AG6015	110p	8250, 8500, VHRD4400, 4410, 4500, 4600,					
NV77, 10, 12, 14, 15, 18, 30, 130, 400,		4610, 4710, 4890, 6700	90p				
NV770	70p	SHARP					
NOROMENDE		VC200, 384, 385, 386, 388, 390, 9300,					
V100, V140	70p	9500, 9700	100p				
V1000M, 1005M, 1205, 1215, 1235, 1245,		VC7300, VC7700, VC7750, VC7800,					
1305, 1403, 1405, V1500P, 1503, 1505K,		VC8000	150p				
1805K, 2000D, 2405, 2500H, 3000H,		VC8300	80p				
3304GH, 3105, 4405H, 5000, 8005, 900,		VC8300, 387, 471, 473, 481, 482, 483, 485,					
905	85p	488, 496, 8481	80p				
V1001, 1005, 1015, 1025, 1035, 1041,		VC402, 500, 571, 573, 581, 582, 583, 584,					
1055, 1065, 1105, 3005, 304, 5005, 502,		585, VCSF3	80p				
503	80p	VC600, 651, 682, 684, 685, 693, 783,					
V101, V102, V103, V112, V141, V142,		VC6F3, VC6V3	70				
V301, V302	90p	VC772, 779, 781, 782, 785, 786, 793, 800,					
V110, V333	110p	7810, 7822, VCA100, VCA102, 104, 131,					
V1500T, V2000B, V2000P, V400H	95p	140, 170, 202, 203, 234, 501, 602, 5011,					
V250, V460, V5460, V20035542,		VCD806, 810, 815, VCH80, 885, 910,					
V20035543	130p	VC51000, VCT310, 410, VCT1314,					
V300, V303, V380	75p	VCT312	115p				
V500	75p	SIEMENS					
ORION		FM350, FM352, FM355	60p				
COMBI15000, 16000, NEVHM, TYP230RC,		FM454	55p				
9000VH1012, VH1030, 1040, 1060, 1070,		FM381, FM392, FM394, FM462	100p				
1100, 1120, 1440, 1500, 1650, 1800, 2150,		FM481, FM464, FM468, FM561	150p				
2308, 2400, 2500, 2600, 2700, 2960, 300,		FM361, FM362, FM363, FM364	120p				
358, 380, 362, 4010, 4015, 4016, 4020,		SONY					
4300, 5010, 6015, 530, 535, 536, 630, 635,		SLC6, SLJ10, SLT6ME	140p				
640, 730, 735, VP220, 225, 245, VR1032,		SLC5, SLC7, SLJ7, SLJ9	70p				
2966, 2980, 821, 925, VXL25	30p	SLC9, SL8000, SL8080, SLT5	165p				
NEVHL, VCP, VH1204, 2004, 2204, 3050,		SL8000E, SL8080E, SL8200, SL8600	175p				
3060, 4008, 400, 4012, 412, 512, 600, 666,		SLV255	95p				
744, 774, 7905, 800, 820, 900, 974, VP200,		TELEFUNKEN					
VR7949, 2966, 2957, VXL20	90p	VR400, VR410, VR440, VR449	130p				
VC150, 180, VH1000, 200, 201, 205, 212,		VR450, VR450, VR459, VR640	70p				
250, 254, 288, 300, 303, 3030, 312, 33,		VR520, VR529, VR620, VR920	70p				
3312, 404, 555, 700, 704, 708, 712, 770,		VR930, VR935, VR939, VR950, VR630,					
780, 844, 900, VHF2, VHS	80p	VR650	75p				
VH1, VH2A	150p	A940, VR1925, 1930, 1940, 1950, 2960,					
PHILIPS		925, 930, 940, 950	90p				
VR640, VR6920	170p	A920, VR1970, 1980, 2920, 2925, 2930,					
VR6540	100p	2970, 7921, 7926, 7931, 7970, 7971, 7980,					
DV186, 286, 291, 292, 488, 471, 562, 571,		970, 7981, 975, 980	65p				
781, VR201, 202, VR200V1, 200V2,		A1200, 930, 932, 935, 960, 980, 990,					
20R77, 25B01, 25B02, 302, 303, 305,		VR2931, 2935, 2941, 2971, 3935, 3945,					
VR30DV2, 35B02, 35B03, 635B7, 715B4,		3950, 3965, 3975, 4935, 4940, 4942, 4945,					
715B5, 715B8, VR865B2, 915B2, 925B3,		496, 5VR4970, 6000, 7932, 7959, 7979	65p				
VR6180, 6185, 6285, 6290, 6291, 6293,		VR1935	100p				
6367, 6390, 6391, 6393, 6467, 6468, 6470,		VR2915	90p				
6561, 6570, 6581, 8670, 6676, 6760,	85p	THOMSON					
VR85B4, 865B1, 925B3	70p	SV1000, V410, 430, 450, 510, 520, 530,					
VR6442, VR6542	100p	540, 620, 630, 640, 4240, SV5540	65p				
VR2025, VR2580	100p	TX8000, V309, V357, VK411	75p				
VR445B9, BR445B920, VR445B922,		TX8500, V342, 343, 351, 352, 353, 360,					
BR6543	100p	364, 368, 4210, 4230, 4260, 4400, 5500,					
VR6548, VR6648, VR495B620,		6000, 8564	90p				
VR644869S	110p	V320, V321, V323, V326, V4200,					
SABA		V4300	90p				
VR6420, 6435, 6440, 6460, 6480, 6620,		V333	100p				
6770, 7200, 8420, 2A10, 70, 2B20, 3B20,		V340	90p				
4A10, 4B20, 6A10, 6A70, 6B20, 8B20	85p	V4100, VK308, VK309, VK410	120p				
VR6064, 6065, 6011, 6014, 7004, 7011,		VK300, VK301, VK302, VK303, VK305,					
7014, 8011, 8014, BERLIN	90p	VK312	135p				
VR2000, VR6000, VR6012, VR7000,		TOSHIBA					
VR7720, PVR6068	130p	V55, V57	85p				
VR5005, VHR7000	135p	V33, V31, V51, V53, V9600, V9680	85p				
VR6066, 6007, 6008, 6009, 6015, 9016,		V61, V63, V65, V66, V67	150p				
9018, 6038, 7006, 7007, 7016, 7018,		DV808, DV800, V71, 73, 74, 75, 81, 83, 85,					
9006	65p	86	120p				
		V108, V109, V199, V209, V609	120p				
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HR7600.7610/7650/7655
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3V35.36.38.39/49
HRD110.111/120.121/225
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3V29.3V30
HR7200.7300.7350
Contents
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Replaces Philips Part No's: 138-10229, 2.4V - 90mAh 180p

REPLACEMENT FERGUSON NI-CAD BACKUP BATTERIES
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Used on: 3V35, 3V56, 3V58, 3V65 200p

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SABA 49007182	1500p	LOT05	
FE TX90 WHITE	1650p	LOT06	
ITT D307/37 EO	1600p	LOT07	
BLAUPUNKT 210	1600p	LOT08	
GRUNDIG 2922010	1500p	LOT09	
ITT CV800/173	1600p	LOT10	
ITT D218/37 EO	1600p	LOT11	
NORMENDE 5255	1600p	LOT12	
SABA 81000 200	1600p	LOT13	
SALORA 1236 EO	1650p	LOT14	
SABA 811-50-24	1600p	LOT15	
SABA 770223500	1600p	LOT16	
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NORMENDE 5255	1600p	LOT20	
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ITT COMPACT 81	1450p	LOT27	
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ITT D066/37 EO	1600p	LOT29	
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HANTAREX 28021	1600p	LOT35	
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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	1850p	LOT40	
Used On: TX2231, TX2244			
PANASONIC TLF14584F	2350p	LOT41	
Used On: TC2210, TC2160, TX1752, TX2112			
TX2112, TX2162, TXC22			
PANASONIC TLF14586F	2350p	LOT42	
TC1651, TC2051, TC2061, TC2253, TC2263, TX5500			
HINARI	1600p	LOT43	
Used On: CT15			
HITCHI 2434274	1250p	LOT44	
CPT2174, CPT2176, CPT2178, 2434274			

We stock line output transformers for over 100 different models. Please ring 0181-900 2329 for more information.

IDLERS & PULLEYS REPLACEMENT

AKAI					
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p		
VS3, 6, 12, 56, 58	T-UP IDLER	BV327815	500p		
VS1-2, VS4-5, VS15	IDLER	BR321979	600p		
VS3, 6, 12, 58, 59	T-UP IDLER	MZ36696J2	900p		
V9700	IDLER				
VS125, 126, 156	IDLER ASSY				
VS165, 240, 244, 245, 247, 248, 250, 512, 515, 516	IDLER				
VS22, 38, 105, 112, 115, 116, 205, 220	T-UP IDLER	PU47752	£4.50		
V7100, VS9300	IDLER				
VS9500, VS9800	UNLOADING IDLER	PU46381	£4.00		
V7100, VS9300	IDLER				
VS9500, VS9800	REW IDLER	PU46380	500p		
VPS8	IDLER	BV336067	£5.00		
VS1, 3, 4, 9, 12	REEL TABLE	BR347731	450p		
VS15, 58	CLUTCH	ML373043	1100p		
VS23, 35, 37, 53, 55	FF IDLER	BV321781	£3.20		
VS66, 75, VSA77	REW IDLER	VW321762	£4.25		
VS9700					
VS9700					
AMSTRAD					
VCR7000	IDLER	150280	£1.50		
VCR4600, VCR5200, VCR9000	CLUTCH	150873	£3.75		
VTR1, VCR4500	GEAR HOLDER	151284	£3.50		
VCR4600, VCR5200, VCR9000	REF CLUTCH		£3.50		
VCR6200	CLUTCH	153202	£3.80		
VCR6000, VCR6100	CLUTCH		£4.00		
VCR4500, VCR9000	CLUTCH		£4.00		
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p		
VCR4700					
MOD KIT TAPE CREASING FOR AMSTRAD			£3.00		
VCR4500, 4600, 4700					
FERGUSON					
3V00, 3V01, 3V16	T-UP IDLER	PU47752	£4.50		
3V22, 3V22, 8900, 8901, 8904, 8906	T-UP IDLER	PU49280	£5.50		
3V16, 3V22	T-UP IDLER				
8903, 8909, 8912, 8922	REEL IDLER	PU48967	175p		
3V23, 3V29, 3V30	REEL IDLER	PU49042A	350p		
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	T-UP IDLER	PU51380	100p		
3V23, 3V31	ROLLER ASSY	51402	200p		
3V29, 3V30, 3V31	T-UP IDLER	PU56374	200p		
3V32, 3V35, 3V38, 3V39, 3V49, 8930, 8931, 8940, 8941, 8942	T-UP CLUTCH	PU56373	150p		
3V23, 3V30, 3V31	T-UP CLUTCH	PU56373	150p		
3V32, 8930, 8931, 8940, 8941, 8942	IDLER ARM	PU56645	£2.25		
3V35, 3V36, 3V38	REEL IDLER				
3V39, 3V49, 8943, 8944	T-UP CLUTCH				
3V35, 3V38, 3V39	T-UP CLUTCH				
3V38, 3V49, 8943, 8944	IDLER ARM				
3V58, 3V59, 3V64	IDLER ARM				
3V65, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26	CLUTCH ASSY	PU56822	1200p		
FV30, FV32, FV33, 8950, VCI141	CLUTCH ASSY	PU57658	1050p		
3V43, 3V44, 3V45	CLUTCH ASSY				
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	T-UP CLUTCH	PU56043-1.4	240p		
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1.5	160p		
3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	LOADING IDLER	PU43681	£4.00		
3V00, 3V01, 3V16	REW IDLER	PU46380	500p		
3V22, 3V22, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922	IDLER	PU49281	£1.70		
3V00, 3V01, 3V16	REW IDLER	PU46380	500p		
3V22, 8900, 8901, 8904, 8906	IDLER	PU49281	£1.70		
3V16, 3V22, 8902	IDLER				
8909, 8912, 8922	IDLER				
FISHER					
FVHP420, 520, 530	FF-REW PULLEY	H1638531	80p		
FVHP615, 618, 620	COMP IDLER ASSY	F11430420400300	£220p		
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830	REEL T-UP ASSY	F11430410400300	£5.50		
FVHP940, 905, 906, FVHP908, 910, 911, FVHP915, 916, 918	GEAR IDLER ASSY	F11430490400900	380p		
FVHP615, 618, 620	GEAR IDLER ASSY				
FVHP622, 710, 711, FVHP720, 721, 722	REEL T-UP ASSY				
FVHP725, 730, 830, FVHP840	REEL T-UP ASSY	F11430410400300	£5.50		
FVHP615, 618, 620	REEL T-UP ASSY				
FVHP622, 710, 711, FVHP720, 721, 722	REEL T-UP ASSY				
FVHP725, 730, 830, FVHP840	REEL T-UP ASSY				
FVHP905, 906, 908	GEAR IDLER ASSY	F114304904002400	275p		
FVHP910, 911, 915, FVHP916, 918	IDLER	F114304204007000	300p		
FVHP975, 980, 990	IDLER				
FVHP995, 5000, 5005	IDLER				
FVHP905, 5075, 5100	REEL DRIVE ROLLER				
FVHD40, 55, 140	REEL DRIVE ROLLER				
FVHP1, 10, 20	CLUTCH	F12430510404200	£9.50		
FVHP75, 980, 990	IDLER				
FVHP420, 520, 530	TAKE UP IDLER				
FVHP420, 520, 530	LOADING GEAR				
FVHP990	REEL DRIVE PULLEY				
VBS3500	REW IDLER				
VBS7000	REW IDLER				
GOLDSTAR					
GHV1221, 1232, 1240	CLUTCH GEAR	435038A	£2.50		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000	CLUTCH GEAR				
GHV8200, 8210, 8215, GHVPS1, VCPA100, 4130	CLUTCH GEAR				
GHV1221, 1232, 1240	CLUTCH GEAR				
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8000	CLUTCH GEAR				
GHV8200, 8210, 8215, GHVPS1, VCPA100, 4130	CLUTCH GEAR				
HINARI					
VXL3, VXL20	REEL IDLER	40000000	110p		
VXL2	IDLER		110p		
VXL4, VXL25	IDLER		£2.75		
VXL4, VXL25	CLUTCH		£2.75		
VXL4, VXL12, VXL25	LIMITER POST		£1.50		
VXL30, VXL35, VTV300	CLUTCH		£3.75		
VXL5, VXL6	CLUTCH		£3.50		
VXL5, VXL6	GEAR HOLDER		£3.80		
VXL7, VXL8, VXL9	CLUTCH		£3.80		
HITACHI					
VT11-33, VT63-64	CLUTCH ASSY	6879515	£7.50		
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61, 62, 65, 85, 86, 90, 940, VT16S	CLUTCH ASSY	6886624	£7.50		
VT120, 220, 100, 110	CLUTCH ASSY	6886972			
111, 113, 115, 118, 200					
125, 128, 130, 135, 138, 145					
255, 258, 750, VT130					
VT8000, 8300, 7000	FF-REW IDLER	6413663	£2.80		
VT8500, 8700	PLAY IDLER	6414221	290p		
VT8000, 8300, 7000	PLAY IDLER	6383531	80p		
VT8500, 8700	FF-REW PULLEY	6383531	80p		
VT9300, 9500, 6500	FF-REW IDLER	8681471	250p		
VT680, 4800, 3700, 3900	PLAY IDLER	6861482	230p		
VT9300, 9500, 6500	PLAY IDLER	6861481	230p		
VT680, 6800, 3700	PLAY IDLER	6861482	230p		
VT 9000	IDLER	681505	230p		
VT9300, 9500, 9700	IDLER	687043	£3.80		
VT11-33, VT63-64	FF-REW IDLER	6886971	£2.80		
VT14, 15, 17, 19, 34, VT35, 38, 39, 52, 61, 62, VT65, 85, 86, 88, 330, 640	FF-REW ARM	6886752	240p		
VT1000, 110, 111, 113	FF-REW ARM				
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150	FF-REW ARM				
VT120, 220, 225, 250, 255, 258	FF-REW ARM	6897094	£1.30		
VT400, 405, 410, 413	FF-REW ARM				
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	FF-REW ARM				
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	FF-REW ARM				
VT540, 545, 546, 548, 570, 575, 576, 580, 585	FF-REW ARM				
VT588, VT1825, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH BASE	6896951	£3.25		
VT600, 405, 410, 413	CLUTCH BASE				
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH BASE				
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH BASE				
VT540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH BASE				
VT588, VT1825, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	T-UP IDLER (LARGE)		£4.50		
VT3000	REW IDLER		£6.00		
VT3000	REW IDLER		£6.00		
FS-BRAKE					
VT690, 6500, 6800	FS-BRAKE	6861505	230p		
VT9700, 9600	FS-BRAKE				
HITACHI TV					
OUTPUT MODULE HM 6251			£5.50		
OUTPUT MODULE HM 6232			£8		
JVC					
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£5.50		
HR7200, 7600, 7650	T-UP CLUTCH	PU53462A	220p		
HR7655, 7300, 7350, 7610	REEL IDLER	PU48967	175p		
HR7200, 7300, 7350	T-UP IDLER				
HR7600, 7610, 7650, 7655, 7700	ROLLER ASSY	PU49042A	350p		
HR7600, 7610, 7650	ROLLER ASSY				
HR7655, 7700	ROLLER ASSY	PU49042A	350p		
HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50		
HR7200, 7600, 7650	T-UP IDLER	PU51402A	100p		
HR7655, HRD110, HRD111	HR7300, 7350, 7610, HRD120, 121, 225	PU55373	150p		
HRD110, HRD120-121	T-UP CLUTCH				
HRD225, HRD111	T-UP CLUTCH	PU55374-3-8	200p		
HRD110, HRD120, 121	IDLER ARM				
HRD225, HRD111	IDLER ARM				
HRD110, 180, 210, 230	IDLER ARM	PU58465	£2.25		
HRD320, 370, 400, 430, 470, 530, 700, 750, 950, 3000	HR55000 HR55500				
HR55000 HR55500	CLUTCH MECH	PU55882	1200p		
HRD455, HRD725	CLUTCH MECH	PU57658	1050p		
HRD140, 150, 167, 158	CLUTCH MECH				
HRD160, 250, 257, 565, 566, 755, HRP50	REW IDLER	PU46380	500p		
HR3300, HR3330	REW IDLER				
HR5650, HR4100	REW IDLER	PU56043-1	240p		
HRD140, 150, 157, 158	TAKE UP CLUTCH				
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50	TAKE UP CLUTCH	PU56044-1-6	160p		
HRD140, 150, 157, 158	TAKE UP CLUTCH				
HRD160, 250, 257, 455, 565, 566, 725, 755, HRP50	TAKE UP CLUTCH				
MATSUI					
VX730, 735, 750, 755	CLUTCH	850A00005	420p		
VX820, 850, 880, 990	CLUTCH				
VX730, 735, 750, 755	LIMITED POST LEVER ASSY		£1.30		
VX770, 800, 810, 880	LIMITED POST LEVER ASSY				
VX990	REEL REEL		£1.50		
VX800A, VX900	REEL UNIT CLUTCH		280p		
MITSUBISHI					

REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	800p
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301	750p
TP400	RC 401	800p	RC5352	RC 5352	800p
TP590-600	RC 600	850p	RC5375	RC 5375	850p
TP390, TP610	RC 610	850p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	850p	RC5901	RC 5901	850p
TP630, TP650	RC 650	850p	RC5903	RC 5903	800p
TP660	RC 660	850p	SABA		
TP661	RC 661	850p	T6772	RC 149	900p
HITACHI			TC319-320	RC 328	875p
CLE800-CLE830	RC 140M	850p	TC356	RC 356	875p
A617402/655602	RC 192	875p	TC358	RC 358	850p
A512120/230	RC 900	800p	TC360	RC 360	800p
A514790	RC 901	850p	TC365	RC 365	800p
A5088470	RC 902	800p	SALORA		
A518612	RC903	900p	SERIES L	RC 190	875p
SCL002	RC904	850p	86173	RC 882	850p
C2096	RC905	850p	SANYO		
A511940	RC 906	800p	RC218, RC222, RC228, RC238	RC 140M	850p
655602H	RC 907	850p	JXGE	RC 878	850p
ITT			JXDE	RC 884	850p
IFB13, 14, 15	RC 143	875p	VHR2300	RC 890	850p
FS4	RC 148	850p	RC628	RC 865	900p
RG305	RC 305	825p	SHARP		
RG306	RC 306	825p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
FS9/1-10/1	RC 307	850p	SIEMENS		
VS5 RUK	RC 308	825p	FC616	RC 130	850p
VS4-1	RC 310	850p	FC631	RC 132	850p
MULTICONTROL (17C20)	RC 311	800p	FC742	RC 164	900p
KORTING			SONY		
18279, 18396, 18460, 18521 SE	RC 108	850p	RM604, RM605, RM606	RC 140	850p
40540 VTS	RC 108	900p	32 CHANNEL	RC 140M	850p
LOEWE			RM613	RC 141	850p
DC11	RC 146	850p	RM632, RM636	RC 160	850p
MATSUI			TATUNG		
010270601	RC 889	850p	FXA	RC 877	850p
VX770	RC 892	850p	RC70	RC 883	750p
METZ			FX70 FASTTEXT	RC 894	850p
JAVA COLOR (6890)	RC 166	850p	TELEFUNKEN		
COLOR (7156)	RC 183	850p	FB632	RC 632 ST	850p
JAVA (7180)	RC 184	850p	FB639	RC 639 ST	850p
MITSUBISHI			THORN/FERGUSON		
939P/03607, 939P/03609	RC 140M	850p	3V35-42	RC 342	750p
NOKIA			3V31-32	RC 344	800p
SATELLITE	RC 550	850p	3V57-58	RC 628	800p
NORDMENDE			TX10 TEXT	RC 732	650p
TC2336	RC 351N	850p	TX10 STEREO TEXT	RC 738	650p
CMC1, TC3519	RC 356	875p	TX9-90-100	RC 740	700p
OCEANIC			3V55, FV11	RC 783	900p
390C9500	RC 339	900p	TX100 FASTTEXT	RC 785	700p
ORION			TX100 STEREO FASTTEXT	RC 789	700p
RC53	RC 892	850p	PROFESSIONAL	RC 790	700p
PANASONIC			TOSHIBA		
EUR51200	RC 200	800p	CT937	RC 950	850p
TC2200	RC 201	850p	CT9117	RC 951	800p
VSQ0357/NV730	RC 202	875p	201R4B	RC 952	800p
TN01621	RC 203	900p			
PHILCO			UNIVERSAL PROGRAMMABLE REMOTE CONTROL		
CARVEL, CONCORDE,	RC 108	850p	Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (need original remote control TC program)		
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TC10	RC 152	900p	We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.		
PHILIPS					
RC5002,5154	RC 134	850p			
KT3 NON TEXT	RC 135	825p			
69117032	RC 178	875p			
69117194	RC 180	875p			
RC5991-UNIV	RC 300	700p			

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CONTAINS:

- SET OF 7 HEAD & TAPE PATH ALIGNERS
- RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL
- RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS
- RCA TYPE BACK TENSION TOOL
- TENSION ADJUSTMENT TOOL FOR VARIOUS USES
- VCR ADJUSTMENT TOOL

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- 1.27mm
- 1.50mm
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3 Reversible Screwdrivers
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VCR Head Extractor

Order Code: TOOL10 Price: 2900p

FUSES

Value	TIME LAG (20mm)		QUICK BLOW (20mm)	
	Order Code	Price	Order Code	Price
160mA	FUSE01	75P	FUSE17	60P
250mA	FUSE02	75P	FUSE18	60P
315mA	FUSE03	75P	FUSE19	60P
400mA	FUSE04	75P	FUSE20	60P
500mA	FUSE05	75P	FUSE21	60P
630mA	FUSE06	75P	FUSE22	60P
800mA	FUSE07	60P	FUSE23	60P
1A	FUSE08	60P	FUSE24	60P
1.25A	FUSE09	60P	FUSE25	60P
1.6A	FUSE10	60P	FUSE26	60P
2A	FUSE11	50P	FUSE27	60P
2.5A	FUSE12	50P	FUSE28	60P
3.15A	FUSE13	55P	FUSE29	50P
4A	FUSE14	55P	FUSE30	50P
5A	FUSE15	60P	FUSE31	50P
6.3A	FUSE16	60P	FUSE32	50P

FUSES

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

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

I.C. PROTECTOR

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

Price: Only 30p each

AUDIO CONTROL HEAD
Amstrad Original No: 150751
Used on Amstrad TVR1.2.3, VCR4600, 4600MII, 4700
Funai V2S, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: Fidelity, Funai, Hinari, Proline, Schneider, Towada, Ultravox

Order Code: AH01 Price: £13.50

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

Order Code: AH02 Price: £14.50

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Satellite PSU Repair Kits

Experience shows that 50% of all receiver power supplies 'bounce' unless the correct precautionary measures are taken when being serviced. A kit of all the recommended parts is supplied for the 4 most popular models, which when fitted should overcome this.

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	650p
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 & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL	NVFS200, NVFS90, NVV8000	4600p
PANASONIC	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4600p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSPE	4800p

Original Video Heads

MAKE	MODELS	PRICE
NATIONAL	NVG20, NVG21, NVG22, NVG25	3000p
PANASONIC	NVG25, NVG28, NVG200, NVD48	
	PART NO: VEH 0343	
	NVG33, NVG45, NVG46, NVL23, NVL25, NVL28	2900p
	PART NO: VEH 0417	
	NVJ30, NVHJ33, NVL20, NVL21, NVG30, NVG31, NVG40, NVG130	2700p
	PART NO: VEH 0416	

Audio Control Head

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

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DO8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

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GRANADA	VHSDP1	CH05	1100p
	VHSYJ2	CH01	2600p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 200010, 200510, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1244, 1244, 1246, 1248, GHV8003, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2600p
	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	2600p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CH03	2600p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD190, HRD370	CH04	2600p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV67H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2600p
	VR3916, 3926, 3946, 3948, 3976, 3966, 3995, 3997, 6948	CH02	2600p
	VR3916, 3926, 3946, 3948, 3976, 3966, 3995, 3997, 6948	CH02	2600p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2600p
	N895	CH02	2600p
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
	49S86	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GV, 254GV	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT1212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2600p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2600p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2600p
TOSHIBA	V55, V57	CH01	2600p
	V65, V66	CH02	2600p

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FREEZE IT	400ML	SP16	350p
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AEROKLEANE	135ML	SP07	140p
AERO DUSTER	150ML	SP08	200p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	160p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
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13.2 CCW MOTOR	290p

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HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
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L272	200p	TMP 47C434N	1250p	2SK 1342	750p
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TELEVISION



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Pricing Policy

Despite the fact that Rumbelows has gone out of business, Clydesdale into receivership, Comet has been running up substantial losses, four of the main regional electricity companies have pulled out of retailing, more than 600 High Street stores have been either closed or converted to other uses and most consumer electronics manufacturers are barely profitable, the director-general of the Office of Fair Trading (OFT), Sir Bryan Carsberg, has decided to ask the Monopolies and Mergers Commission (MMC) to carry out an investigation because he believes that consumers may be paying too much for their electrical goods. Both the white and brown goods markets are to be investigated, but it seems that the brown goods sector is to be the main subject of the enquiry.

There is, as everyone knows, no monopoly in either brown goods manufacture or retailing. Dixons, the largest UK brown goods retailer, has just under sixteen per cent of the market. But the OFT/MMC has a strange idea of what constitutes a monopoly: all manufacturers that supply more than three per cent of any of the markets concerned will be included in the investigation. According to Sir Bryan, OFT information "indicates that some manufacturers, accounting for well over 25 per cent of the supply of specified goods in the UK, have been engaging in practices designed to support retail price levels". Very few individual manufacturers have anything like that percentage of any of these markets.

Where, you might wonder, have the complaints come from? They have come in particular from the warehouse clubs, Cargo Club which made a hash of its efforts to get

into the market and pulled out, and Costco which has two warehouses. Such companies should appreciate that manufacturers don't have to sell to them: manufacturers are entitled to stick out for economic prices and to take into consideration the consumer services offered. If the warehouse clubs aren't satisfied they can go to the Far East for product, as plenty of other retailers have. Maybe they can't be bothered to set up the necessary sourcing arrangements.

The MMC's investigation is likely to take many months, during which the industry will have to live with uncertainty about the outcome and the cost of complying with it. As we go to press, the Consumers' Association is about to issue a report that accuses manufacturers of price fixing. This is the same Association that jumps in quickly should there be any doubts about the safety and quality of goods.

It has been pointed out that there is not much variation in the prices asked for particular models. This could be seen as support for the charge of price fixing, but is more likely to reflect the fact that competition in the retail industry is intense, with wafer-thin margins, and that no retailer dare appear to be expensive. There is perhaps more weight in the suggestion that manufacturers with well-known brand names are trying to maintain recommended prices. But in any field it is expensive to establish a leading brand name and maintain the reputation that goes with and supports it. We expect to pay a bit extra for a well-known name, on the assumption that it is a guarantee of quality backed by after-sales care. Nothing wrong with that. But the warehouse clubs want to sell such

products at 15-20 per cent discount with minimal sales support. What this overlooks is the complexity and sophistication of much of the consumer electronics industry's output today. There have been more than enough complaints about consumers' inability to make full or even correct use of their purchases.

Branded VCRs at around £200, satellite receivers at under £100, small-screen CTV sets at £100-£150 – what has anyone to complain about, except those in the trade who have to care for customers and deal with any problems that arise out of their meagre margins? Would that such bargains were available in other fields!

Let us suppose for a moment that the MMC decides there has been pressure from manufacturers to maintain price levels, and that discounters gain a greater share of an already troubled market. The ironical consequence would be a much slimmed down retail trade with less opportunity for the public to shop and obtain service at its convenience. And of course the fewer the retail outlets, the greater the opportunity to get prices back up again. Is this what the OFT would wish to see?

It is also ironical that revised, five-year anti-dumping duties have just been imposed by the European Commission on CTV sets from Korea, China, Thailand, Malaysia and Singapore, and that the Commission has been asked to launch an investigation into allegations that VCRs from East Asia are being dumped in the European market.

Maybe the OFT, the MMC and the Commission should have a word or two with each other.

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COVER PHOTO

This month's cover photograph shows the Panasonic Alpha 4 chassis. A new series looking at the design of this chassis and its circuitry starts on page 548.

Ferguson

Service Briefs

ICC9 TV Chassis

Microcontroller software and teletext board compatibility: If you have to replace the microcontroller chip IR01 or the teletext panel and the results are no teletext operation, no remote control operation, receiver is stuck in the standby mode, there's a tripping fault, it's likely that the cause of the problem is incompatibility between the software version used in the microcontroller chip and the teletext PCB. The following compatibility table will enable you to avoid this situation:

Software	Main chassis	Text PCB type
C9-20	ICC9 280	DVT9002
C9-20	ICC9 777	DVT9002
C9-20	ICC9 270	DVT9002
C9F-25	All	DVT9003

The microcontroller software version can be identified by the last four digits after the i.c.'s part number, e.g. 10177300-C9-20. The teletext PCB type number is printed on a white label that's normally stuck on the component side of the PCB. The main chassis identification is silk-screen printed on the component side along the front edge of the PCB, to the left of the chopper power supply circuit.

Static protection for the multi-function chip IV01: Failure of the STV2160 chip has been noted during c.r.t. flashover life tests carried out by Ferguson. The damage occurs in the internal circuitry connected to pin 39, i.e. the beam current cut-off control circuitry. To protect IV01 against flashovers a resistor has been added in series with pin 39. Earlier receivers without this resistor should be modified as follows: remove the surface-mounted jumper lead reference JV56 and fit in its place a 4-7k Ω surface-mounted resistor. The Ferguson part no. for the resistor is 60079900.

Failure of the TEA5101A RGB output chip IB01: Additional static protection has been introduced to improve the reliability of IB01. Three BAV21 diodes have been added between pins 7, 10 and 13 respectively and the 13V supply, with their anodes connected to the latter. Circuit reference numbers are DB32, DB52 and DB72. The Ferguson part no. for the diode is 16007470.

Ferguson recommends the addition of this safety measure should IB01 have to be replaced. The diodes must be mounted on the copper side of the PCB, and there must be adequate insulation between the diodes and the surrounding circuitry to prevent short-circuits occurring during reassembly.

Random line output transistor failure: Random failure of the line output transistor TL19 can be caused by intermittent failure of the 1N4001 diode DL61, which is in series with the 7.5V feed to the line driver stage. DL61 can suffer from mechanical stress during production, as a result of which it may go open-circuit or high forward resistance intermit-

tently. In the event of either of these conditions the supply to the line driver stage will be incorrect, which in turn means that the drive waveform at the base of TL19 will be incorrect.

This is a difficult fault to detect. The official recommendation is to replace DL61 as a matter of course in the interests of safety and improved reliability.

Picture disturbance with off-air reception: The symptom can be described as a flicker or flutter, or a noisy and poor picture. The cause of the fault lies in the clamping of the luminance signal at pin 2 of the STV2160 chip IV01 – it does not occur with external video inputs. To overcome the problem the value of CV51 has been increased from 100nF to 680nF. The Ferguson part no. for the capacitor is 10140560.

Set is locked in the standby mode, or there's no red standby LED indication: Under certain circumstances the set can't be brought out of standby by using either the set's control panel or the remote control unit. To overcome this condition the following modifications should be carried out:

(1) Reduce the value of RV06 from 1-2k Ω to 680 Ω . This resistor is connected between the collector and the base of the 7-8V regulator transistor TV06. It's a surface-mounted component. The Ferguson part no. of the revised value resistor is 15008970.

Warning: Whilst on the subject of the 7-8V regulator circuit (TV06/IV01), note that care must be taken when carrying out checks at pin 13 of IV01: failure of the line timebase and chopper supply circuits could be the result if pin 14 is inadvertently touched while the receiver is operating.

(2) Change diode DP84 to type 1N5817, Ferguson part no. 16008270, and increase the value of CP84 (the decoupler at its anode side) from 100nF to 220nF, Ferguson part no. 40432850. These changes increase the 10V standby voltage by 0.3V.

(3) To make doubly sure that the receiver switches out of standby it's recommended that the 30V zener diode DP58 and the surface-mounted LL4148 diode DP59 are removed. The two are connected in series and are in the trip circuit on the secondary side of the chopper power supply, i.e. in TP77's base circuit.

VCR Model FV70

Failure to erase the previous audio sound track can be overcome by increasing the value of feedback capacitor C002 in the audio bias oscillator circuit from 1nF to 2.7nF. The Ferguson part no. for the revised value capacitor is 20136340.

When dealing with this circuit the connections to the oscillator transformer LO01 should be carefully checked and resoldered as necessary.

VCR Models FV67HV, FV68TX and FV77HV

White sparkles that disturb the LP playback picture intermittently can be a problem with these VCRs. The cause is failure of the BA157 diode DP54 in the power supply circuit. Its performance affects the power supply loading conditions in the LP mode. An MUR115 diode is now fitted in this position in production. It cures the problem: the Ferguson part no. is 44073604.

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Crosshatch	*	*	*	*With castellations around edges
Red Purity	*	*	*	
Black Burst	*	*	*	Sync and colour bursts
Multi-Burst	*	*	*	1.175MHz and 3.5MHz
Dots	*	*	*	
White purity	*	*	*	
VIDEO OUTPUTS				
Composite Video	*	*	*	75Ω 1Vp-p
S-Video	*	*	*	75Ω 1Vp-p (luma) 0.3Vp-p (chroma)
RF Video	*	*	*	75Ω channels 32-39 (tuneable)
VIDEO CONNECTORS				
Phono Socket	*	*	*	Composite video
BNC Socket	*	*	*	Composite video
Co-Axial Socket	*	*	*	RF (PAL I = Socket, PAL G = Plug)
4-pin Din Socket	*	*	*	S VHS, Hi-8 etc (S-Connector)
AUDIO SINE WAVES				
1KHz	*	*	*	
10KHz	*	*	*	
AUDIO OUTPUTS				
Line Out	*	*	*	1KΩ 1Vp-p
Balanced Line Out	*	*	*	600Ω 0dBm (0.775V rms)
RF Audio	*	*	*	(PAL I = 6MHz, PAL G = 5.5MHz)
AUDIO CONNECTORS				
Phono Socket	*	*	*	Line out
XLR Socket	*	*	*	Balanced line out
Co-Axial Socket	*	*	*	RF out
POWER				
Battery Powered	*	*	*	9V PP3 Alkaline (not included)
Low Power Facility	*	*	*	Audio only mode
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Mains Adapter	*	*	*	3-pin UK, 2-pin Euro or Lead style
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The Philips/Sony High Density CD Format

Owen Exeter

The compact disc has come a long way from its original role as a means of storing pulse-code modulated (PCM) digital audio. Nowadays CDs are used for data storage (the CD-ROM), for interactive video (the CDi) and for films (Video CD). There are also recordable CDs, which offer the user a write once then read many times facility, and soon there will be erasable CDs that can be used and re-used like magnetic tape. But the biggest recent development is the High Density CD, which can store around ten times as much data as an existing CD.

Philips and Sony, who jointly developed the original CD, have proposed a system that's officially known as the High Density Multimedia CD. It could spawn a family of discs for computer, games and consumer electronics applications. One of these is the Digital Video Disc (DVD), which is designed for movie storage.

CD Basics

The audio compact disc conforms with the Red Book standard. This uses a 12cm diameter disc which is read by an optical system. Data is imposed on the surface by pressing, and takes the form of a series of pits (in reality bumps) that are scanned by a laser beam. The Red Book standard provides for 74 minutes of 16-bit digital audio to be stored on the disc, though improved mastering and production techniques have resulted in some CDs holding almost 80 minutes of audio.

A CD-ROM stores around 650Mbytes of data, which may provide text, pictures, sound or even video. Video CDs store around 74 minutes of MPEG-1 encoded video.

When the CD-ROM first appeared many people wondered how they would fill a store that held the equivalent of 1,000 single-density floppy discs. Today however the compact disc is struggling to hold enough data for applications such as films and multimedia programs. Video CD can store only an hour of video by compressing it by a factor of 100. Even then, most films require the use of a double or triple disc set. Multimedia developers often have to compromise between offering lots of video at the expense of high-quality audio or graphics. So the time was right for a longer-playing CD.

The DVD

Much of the impetus for developing longer-playing CDs came from the film industry. The Motion Picture Studio Advisory Committee, representing the film industry, drew up a list of features that it would like to see offered by a new CD format. These included: ability to store a feature-length film on a single disc; superior picture quality; Surround Sound; multilingual sound tracks; multiple teletext; multiple aspect ratios (how this could be achieved is uncertain); copy protection; and a parental lock-out system to prevent children watching a scene or disc. All in all a tall order!

The Philips/Sony System

Philips and Sony have proposed a system that stores up to 7.4Gbytes of data on a single-sided CD. There would be two types of disc, single- and dual-layer. The single-layer disc holds up to 3.7Gbytes of data, enough to provide 135 minutes of

MPEG-2 encoded video with sound. The storage capacity is used as follows: 3.04Gbytes for video; 0.4Gbytes for three stereo sound channels (this could be stereo with Dolby Surround or a 5.1 digital Surround Sound format); and 0.04Gbytes for four teletext channels.

How do Philips and Sony manage to cram so much data on to a CD? A number of technical tricks are required. These include the use of smaller pits that are read by a shorter-wavelength (635nm) red laser operating with an optical system which has a numerical aperture of 0.52; the use of a closer track pitch; and the use of a variable-bit encoding system. The latter varies the bit rate in accordance with the picture content. For example a fast-moving scene requires a greater bit rate than a still image of say a face. Despite its complexity, the proposed new disc uses a similar error-correction system to the conventional CD and doesn't require a protective caddy. The following table compares the main CD and HD-CD optical and mechanical parameters:

Parameter	CD	HD-CD
Disc diameter	120mm	120mm
Disc thickness	1.2mm	1.2mm
Programme area	25-58mm	23-58mm
Laser wavelength	780nm	635nm
Numerical aperture	0.45	0.52
Track pitch	1.6µ	0.84µ
Shortest pit	0.8µ	0.45µ
Pit length increment	0.26µ	0.15µ
Physical density	1	3.5
Ref. speed	1.2m/sec	4m/sec

The Philips/Sony system varies the bit rate between 1-10Mbits/sec, the average rate being 3Mbits/sec. This offers picture quality that's similar to the CCIR 601 standard (D1 digital format). Before a film is encoded, its video content is assessed and given a difficulty rating. After selecting the sound track type and the number of languages and teletext subtitles, the total bit capacity available can be calculated. Philips and Sony say that 97 per cent of films are of less than 135 minutes in length and can thus be catered for by the basic HD-CD standard. But a dual-layer disc has been announced to double the storage capacity.

The Dual-layer Option

Longer running discs could be used for the occasional film that lasts longer than 135 minutes, as well as providing scope for storing high-definition images (you could, for example, store 135 minutes of video that has an average bit rate of 6Mbits/sec). They could also be used for sophisticated computer games with lots of video, and for multimedia programmes that use lots of sound, video and photographic images – encyclopaedias for example.

The system that adds an extra data layer to the Philips/Sony HD-CD was developed by 3M. It's known as the 2P (PhotoPolymerisation) process. The technology is quite old, having been used in 1977 to produce the first dual-layer Laser Discs. But the fact that these discs never went on sale suggests

that the 2P process is not easy to implement.

The dual-layer disc starts off as a moulded polycarbonate substrate. A stamper is used to impress the first information on the surface. This is covered by a semi-reflective layer (reflectivity 20-40 per cent) which is sputtered on. A liquid resin layer is then applied, and a stamper that contains the pit pattern for the second information layer is brought down on to it. UV radiation is used at this stage to harden the resin. After removal of the stamper, aluminium is sputtered on to form the second, standard reflective layer. Finally a protective resin layer, hardened by UV radiation, is added. The layers are read by a laser that can focus on one information layer and then the next.

Philips and Sony point out that the system requires little modification to existing CD manufacturing processes, and is thus less expensive than a double-sided disc would be. The dual-layer process would add around 40-50 per cent to the cost of producing a CD, which suggests that each disc would cost about £1.05 to press (compared with about 70p for a conventional CD). Philips and Sony also claim that the 2P process has already been used successfully for magneto-optical and LaserDisc systems, with production yields of over 90 per cent. They add that their system can be made compatible with existing CD formats. Philips has demonstrated a dual-layer audio CD, using a modified CDi player, but there has been no public demonstration of a dual-layer video disc.

Alternatives

The Philips/Sony disc is an elegant solution to the problem of obtaining increased CD playing time, but its success is uncertain. This is because Toshiba and Time Warner have developed a rival and incompatible format called DVD-SD (for Super Density). It uses similar laser technology to the Philips/Sony format, but there is one important difference: the DVD-SD

format uses a dual-sided disc. This is produced by bonding two discs together. Each disc is just 0.6mm thick, so the final disc is of the same thickness as a conventional CD. The DVD-SD disc can store 5Gbytes of data on each side, which translates as roughly 142 minutes of MPEG-2 video per side, i.e. a total of 284 minutes per disc.

Doubts have been expressed about the difficulty of joining two very thin discs together and maintaining a flat profile. There are also questions about DVD-SD's production costs and compatibility with single-sided CDs. To date Toshiba and Time Warner have not given a public demonstration of their system. But they have gained a lot of industry support – for example from Matsushita, Hitachi, Thomson, Pioneer, Samsung, Zenith, MCA and MGM/UA studios.

Philips and Sony have decided to press ahead, and it seems that both formats will be launched, in opposition, next year. Sony and Philips are looking for support in other sectors, including the computer industry – Microsoft and IBM have been suggested as showing interest.

Does the development of the DVD mean that Video CD is already an obsolete format? Not so says Philips. To decode MPEG-1 video, a Video CD player requires 4Mbits of DRAM. More memory is required for MPEG-2 decoding (a 16Mbit DRAM chip set), and a DVD player also requires a variable storage buffer. All this pushes up the cost. According to Philips, the first DVD players will probably cost around £800 each. DVD discs will probably be at LaserDisc prices. This is hardly mass-market pricing. It could be around the turn of the century before the price of DVD players falls significantly. Whatever happens to the price of hardware, DVD software is likely to remain at a much higher price than audio CDs and VHS tapes.

Our thanks to Simon Turner, group leader, Interactive Systems, at Philips Research Laboratories, Redhill for his help with this article.

Test Case 390

It seems that very few customers read the instruction books that come with their equipment: if a service call is requested within a few days or weeks of a purchase, it generally means incorrect hook-up or operation or that the owner simply hasn't bothered to read the user's manual. It always means a free-of-charge house call as well, which eats into the slender profit produced by the sale.

So it was that Cathode Ray was booked to call on Mrs Wild for a check on her new Toshiba V854 VCR. She said that it caused poor TV reception when it was switched on but not when it was switched off, and that there was a buzz on sound on BBC-1 and Channel 4, but only with the set in the kitchen when no tape was being played. Wow! There was no talking our way out of this one on the phone.

When Ray arrived at the house he found that the new Toshiba VCR was connected to a large-screen TV set via a scart lead and that its r.f. output socket was wired to a two-way splitter, one output from this going to the main TV set's aerial socket and the other to a 14in. colour set in the kitchen. The r.f. hook-up had been in satisfactory operation with the old VCR, which had now been discarded, but the scart link was new. The idea of the r.f. loop-through to the kitchen was to enable video tape playback to be watched there. Fair enough.

Mrs Wild was certainly right about the virtual loss of TV reception whenever the VCR was switched out of standby. The biggest problem was in viewing one channel while recording another one – the snowy, almost non-existent picture suggested that the r.f. loop-through amplifier was being switched off as soon as the VCR was switched on. Nothing like that had

happened with the old machine, which had also been a Toshiba product. Yet it seemed very unlikely that the new machine had a fault.

Still wondering about that, Ray checked out the second reported fault, the business of the buzz on only two channels. It transpired that this happened only with the set in the kitchen, and then only when the VCR was switched on and was being used as a tuner, in the E-E mode. The reason for tuning the kitchen TV set to the VCR's output channel and using the VCR's remote control unit (which they beamed through a conveniently-placed hatch in the wall!) for programme selection was not very clear: by turning off the VCR they could have selected programmes in the normal way with the small-screen set. E-E sound was o.k. with the main TV set, but here the link was via the scart socket. In fact when the large-screen set was switched to r.f. from the VCR the same fault showed up: a rough buzz on reception via the VCR's tuner, barely noticeable on BBC-2 and ITV, worse on BBC-1 and Channel 4.

The strange thing was that tape playback via the r.f. link, even of programmes recorded by the new machine, was completely free of buzz – this included those programmes recorded with an f.m. audio carrier as well as Nicam. That, and the absence of buzz on E-E via the scart link, seemed to exonerate the VCR's receiver section. But if its E-E amplifier or r.f. modulator was faulty, why was tape playback at r.f. o.k. and why were some broadcast channels worse affected than others? Ray picked up one clue: the picture contrast with the VCR's r.f. output channel selected was a little to high.

What was the cause of this fault, and how about the r.f. loop-through block described earlier? The solutions will be found on page 576. But don't go straight there – Ray had to work it out!

Camcorner

Reports from David C. Woodnott

Sanyo VMD66P

Failure to eject cassettes was the fault with this machine. It uses a Sony U mechanism, which is where the cause of the trouble lay: the supply coaster was detached from its correct position and flopped about as it wished. Some deck dismantling was required to enable the loading gear (part no. 374410901) and the gear assembly drive (X37288421) to be replaced. We also replaced the coaster leaf spring (373648501). **D.C.W.**

Sony CCDV100E

This old-timer came in dead. A check on the power supply PCB revealed that the main fuse was shattered. As it's a glass, 3.15A type this suggested the presence of a serious overload. Things were not as bad as they might have been however as the other fuses (CPs) in the power supply were all intact. So the cause of the trouble wasn't far off. In fact the composition block assembly was short-circuit to chassis at pin 2. This is the only section that could cause failure of the main fuse while leaving the CPs intact. A new composition block assembly and service restored the machine to good health. **D.C.W.**

Panasonic NVMS70

This nice S-VHS-C, hi-fi unit had been dropped on its rear end, causing damage to the VCR function PCB. Thus no functions were available to the user. Repairs to the print on this board restored some functions: record was available, also fast forward and rewind, but there was no playback picture, just snow. Audio, both linear and hi-fi, was o.k. Checks showed that the playback 5V supply was missing at the head amplifier circuit: L5007 had broken from the PCB and Q5009 was defective. Replacing these items restored the playback picture, but we were not quite out of the woods yet!

While the unit was on test after being re-cased we noticed that during playback of its own recordings a faint pattern would sometimes drift across the picture. This didn't happen with a test tape. Autotracking on playback, with a switch to provide manual tracking if required, is a feature of this machine. With the machine switched to manual tracking while playing one of its own recordings we found that adjustment of the tracking control produced an almost perfect second picture that had been previously recorded by another machine. So two playback pictures were available simply by adjusting the tracking control!

The reason for this unusual symptom was simply that the ribbon cable which supplies the drive to the full erase head had been damaged. So the erase head didn't function. As this machine uses its LP heads for SP mode recordings, a guard-band is left between recorded tracks. Thus with the full erase head inoperative a new recording over a previous one made with normal track width left bands of the original recording. A new ribbon cable restored normal operation. **D.C.W.**

Canon E60E

The E-E colour was o.k. but there was no colour with playback pictures. This was another case of a leaky electrolytic,

the culprit being C313, a 10 μ F, 16V can type (aren't they always?!) on the main PCB. It had leaked over the track to pin 13 of IC301. **D.C.W.**

Sony CCDTR55E

There were two reported faults with this handycam. During the first few minutes of operation there was no E-E or recorded sound, though the playback sound was o.k. All was well after this initial problem until the unit had been left for a while, when the symptom would return. Its cause was the CXA1237AR chip IC401 on the audio PCB.

The second fault was that although all functions worked normally, with good recording and playback, if the tape was wound to either end 'caution' would be displayed in the EVF and the functions would then shut down. This was cured by replacing the GL453S cassette LED. **D.C.W.**

Canon E70E

The mechanism would sometimes jam when loading or unloading was attempted. Being put under a severe strain, the loading motor would stall and initiate a shut-down sequence. A Sony O type mechanism, which does not normally suffer from this type of problem, is used in the E70E.

With the mechanism removed and the mode box connected it seemed at first that the coaster assemblies were sticking. But this proved to be the symptom rather than the cause of the trouble. In this mechanism the LS assembly is attached to the main deck by four brass pillar fixings, with slots to allow the loading/unloading movement. These brass fixings are rivetted to the main deck. One of them had become loose and was moving in the direction of travel of the LS assembly. As a result there was a tightening of the sliding section clearance. The only remedy was to replace the main deck, which of course entails the transfer of all the motors, gears, guide rails etc. All was well when this had been done, with no deck operation jamming. **D.C.W.**

Samsung VPE405

This neat handycam-type unit had a Sony look about it – until it was opened up. There the similarity stopped dead! The reason for its visit to the workshop was loss of the E-E picture, although clock data etc. was present. The cause of the fault was simply that a small screw had become lodged in the iris mechanism. All was well when it had been removed and returned to its proper home. **D.C.W.**

Canon E110E

This camcorder had been dropped. All the functions worked but there was no viewfinder picture because the c.r.t. had fractured. When a replacement was fitted there was still no picture. We checked the video signal path and found that the MA110 diode D2902 was faulty, a replacement putting matters right. The diode in this position in Canon units always seems to fail when the viewfinder c.r.t. is fractured. **D.C.W.**

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Inside the Panasonic Alpha 4 Chassis

Part 1

Ray Meadows

The Alpha 4 chassis was introduced in 1992 and is still in production. It was intended as a replacement for both the Alpha 2 and the Alpha 3 chassis, offering high-quality performance at a lower cost than its predecessors, thanks in part to simplified construction.

The first set to be fitted with this chassis was Model TX21V2, which became Panasonic's smallest Nicam stereo receiver. It replaced the Alpha 2 based TX21V1, sharing many of the same features. Other models have appeared since then, including the X1 and X2 series and the latest C1 series.

Features

Basic features include an isolated switch-mode power supply and a diode-split line output transformer. The chassis is designed to drive both 90° and 110° tubes; EW correction is added with 110° models, the chassis then being designated type 4H. Various different black-matrix c.r.t.s have been used, of Matsushita, Philips, Thomson and Toshiba manufacture. On the signals side voltage synthesis tuning is used, with a Matsushita microcontroller chip. The Nicam decoder and IVT teletext decoder are of Philips manufacture. Much of the circuitry will be familiar to those who handle Panasonic sets, having been used in previous chassis. There are in particular similarities with the small-screen Z4 chassis, which we covered in a series of articles starting with last September's issue of *Television*.

From the customer's point of view there are three AV

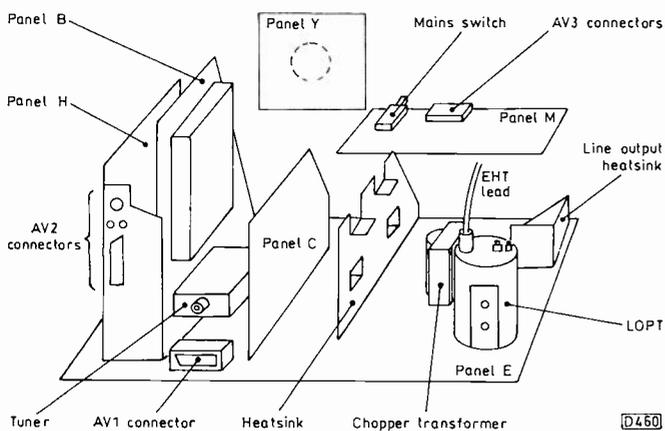


Fig. 1: Basic chassis layout, Model TX21V2.

inputs, allowing a range of composite video, RGB and S-video connections to be made, and a 50-channel tuner. In addition to PAL reception, the chassis can handle modified NTSC signals such as those produced by a VCR or a LaserDisc player. Pure NTSC signals will provide only monochrome reproduction however, which is a disadvantage. There is a good range of on-screen displays, though some of the more esoteric Z4 chassis features have been

omitted. Models 25X1DP and 28X1DP, which incorporate Dolby Pro Logic functions, make great use of the on-screen displays to set up the sound parameters.

Stereo sound is provided via a pair of Panasonic dome (X1 and X2 models) or mini-dome (V2 models) speakers. These are similar to the ones used in A2 models (Alpha 3 chassis) except that they are open-backed. A more conventional speaker arrangement is used in the new C1 series. Most models provide 10W (music power) per channel, though X1DP sets have four additional amplifiers for the Surround sound outputs. These Pro Logic models are supplied with four extension speakers for the left, right and two rear channels, the integrated stereo pair of speakers being used together as the centre channel.

Several cost-reduction measures have been introduced during the life of the chassis. These include a redesigned colour decoder. Although the chips themselves are not interchangeable, the B panel on which this circuit is arranged is interchangeable.

Servicing

From the servicing point of view access to the chassis is very easy. Most of the components are mounted on the main E panel. Three other panels, B, C and H, plug into the E panel: their size is much smaller than in previous Panasonic chassis and, more importantly, there are fewer interconnecting wires. As a result it's much easier to lift the chassis into the service position, which as usual is at the rear of the left speaker enclosure. Extension lead service kits are available, part no. TZS2EL000, to enable work to be carried out on the plug-in panels while the set is working.

To remove the chassis, release two snap-down catches at the top of the back cover, then take out the two screws inside them plus two more at the bottom of the cover and one close to connector AV2. Go to the front of the set, open the control door panel, and remove the two screws above connector AV3. The complete chassis can then be pulled back and hung in the service position.

In this position it's easy to identify the main panels (see Fig. 1). Control panel M and the additional audio panels vary according to model specification. The panels and their functions are as follows:

- E:** Power supply, timebases, RGB switching, main microcontroller, audio amplifier, AV1 input.
- B:** Tuner, vision and sound i.f., Nicam decoder.
- C:** Video processing.
- H:** AV2 input, AV switching, ambience, teletext decoder.
- M:** AV3 input, user controls, IR receiver, mains switch and filter (V2 sets).
- P:** Mains switch and filter (X1, X2 sets).
- Y:** Tube base panel.

Dobly Surround sound equipped models have three addi-

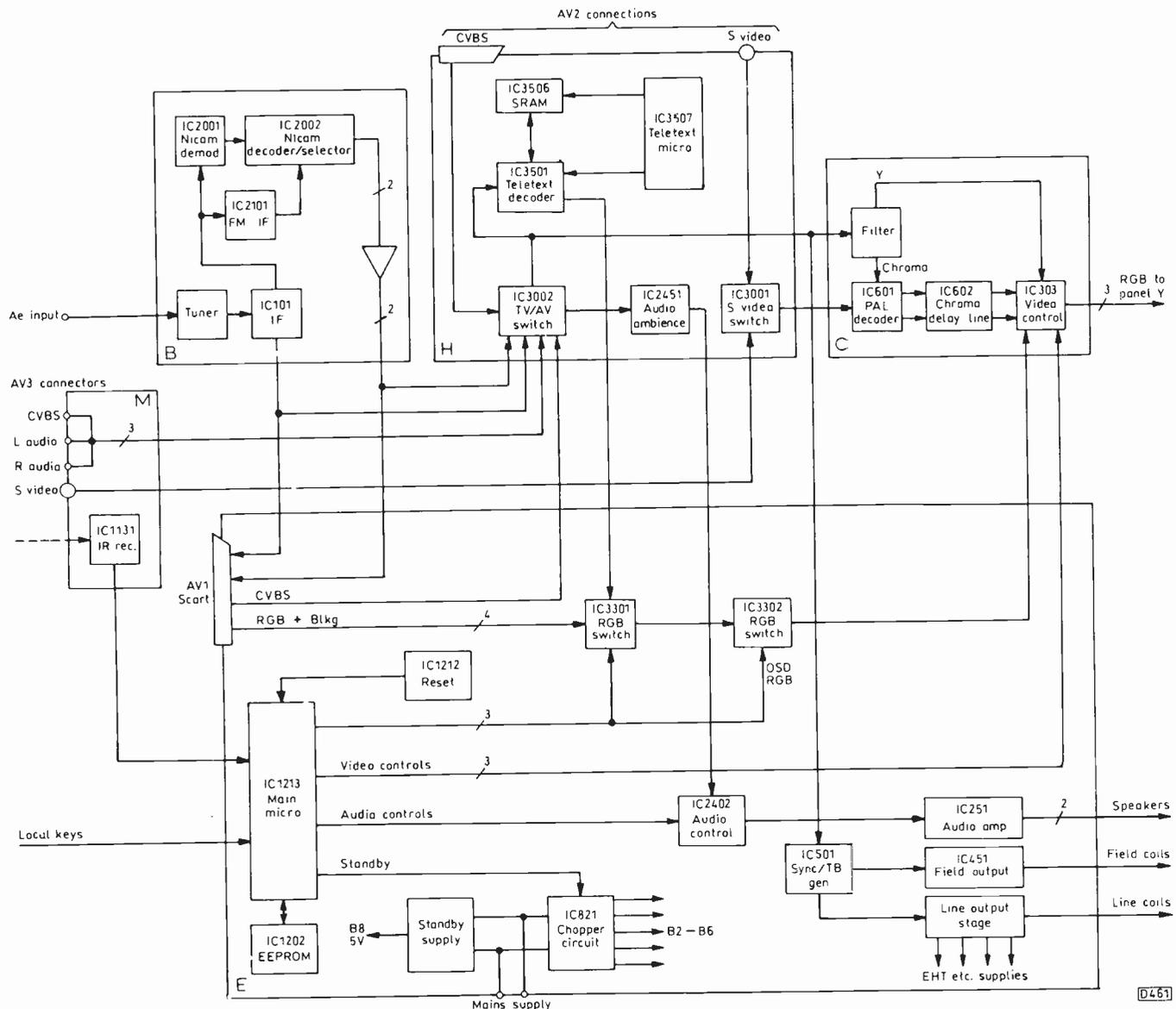


Fig. 2: Simplified block diagram of the Alpha 4 chassis.

tional panels as follows:

- I:** Audio switching.
- K:** Pro Logic decoder and amplifiers.
- X:** Power supply for panel K.

Fig. 2 shows the chassis arrangement in block diagram form. The chips used on the main panels are as follows:

IC101	M52301SP	Vision and sound i.f.
IC251	LA4280TV	Audio amplifier
IC303	TDA3505	Video processor, early models
	TDA3504	Video processor, later models
IC451	TDA3653C	Field output, 90° models
	TDA3654	Field output, 110° models
IC501	TDA2579B	Sync and timebase generators
IC601	TDA4510	Colour decoder
IC602	TDA4661V2	Chroma delay line
IC701	TDA4950	EW correction (110° models only)
IC821	STR54041M	Chopper
IC1131	SBX1620-46	Infra-red receiver
IC1202	ST24C02A	EEPROM
IC1212	MN1280R	Reset generator

IC1213	MN1872432TMC MN18P773233	Main microcontroller Main microcontroller, X1DP models
IC2001	TDA8732	Nicam demodulator
IC2002	SAA7282ZPM3	Nicam decoder, DAC and sound selection
IC2004	BA4558	Dual audio preamplifier
IC2101	AN5215	Intercarrier sound
IC2402	CXA1279AS	Audio control
IC2451	TDA3810	Audio processing (ambience)
IC3001	LA7222TV	S video switch
IC3002	M52472P	TV/AV switch
IC3301	AN5860	RGB switch
IC3302	AN5862K	RGB switch
IC3501	SAA5246APEM6	Teletext decoder
IC3506	61C65-70	Page memory (8Kbyte SRAM)
IC3507	MAB8461PW216	Teletext microcontroller
IC3508	4066BP	Quad bilateral switch (control system)

Extra i.c.s used in the X1DP Dolby Pro Logic models are as follows:

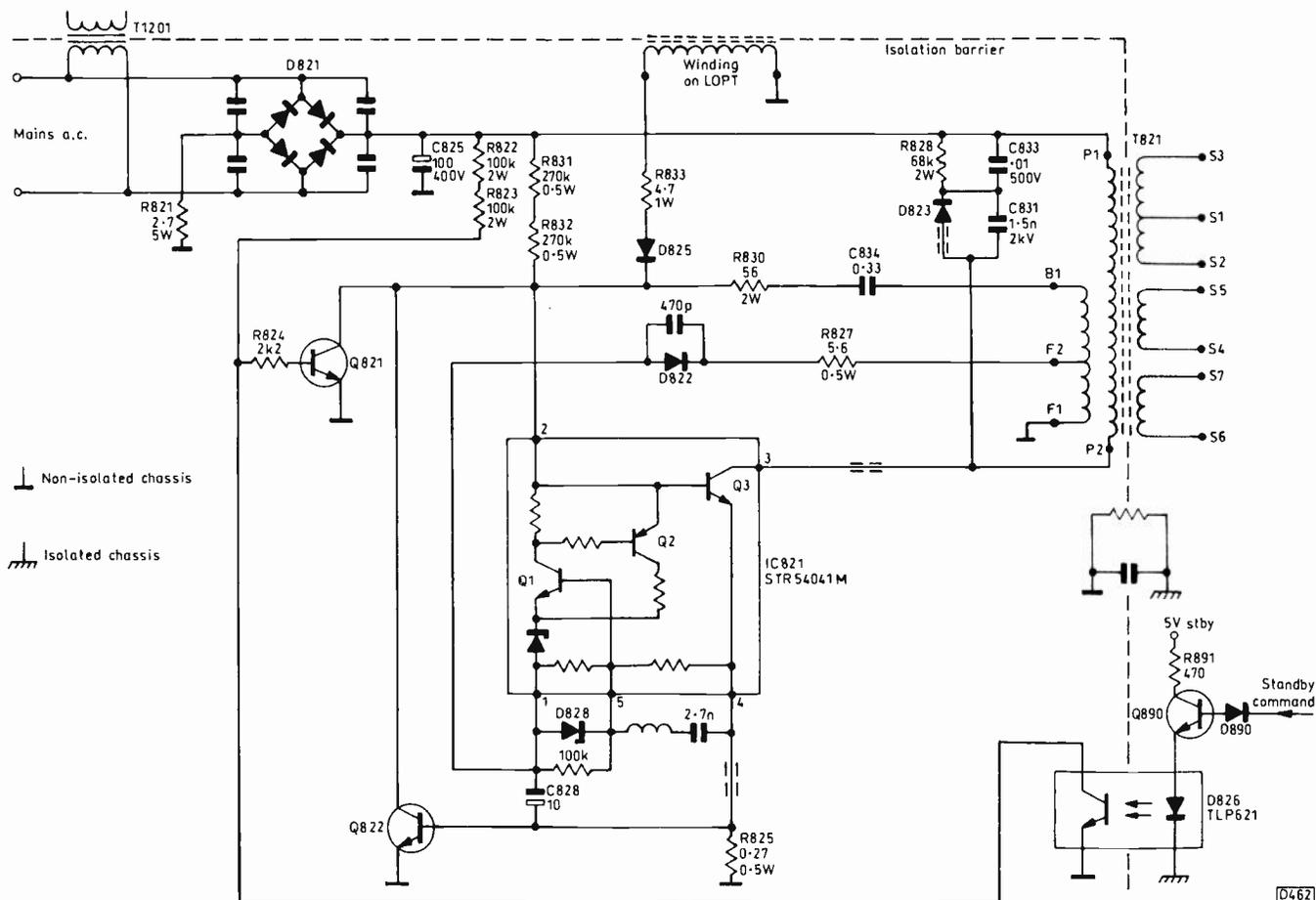


Fig. 3: The chopper power supply circuit, non-isolated side.

U1, 5, 7, 8	TL084	Operational amplifiers
U2	4053	CMOS switch
U3	1025601	SRAM
U4	VSS215	Audio digital signal processor
U6, 9	TEA6330T	Volume control attenuators
U10	74HC4316	CMOS switch
U11, 12	LA4280TV	Audio amplifiers

All models produced for the UK market are equipped with Nicam stereo sound and teletext. Some Continental versions of the chassis have different i.f., sound, colour or text systems. The following different or additional i.c.s may be included:

IC101	M51362SP	Vision and sound i.f.
IC301	CX20125	Black level expander
IC601	TDA4650V4	PAL/Secam decoder
IC2102	AN5215	Zwitone sound i.f.
IC2201	TDA8417	Zwitone stereo sound decoder
IC3507	PCB83C654022	Toptext microcontroller

So much for the chip complement. We'll now start our survey of the circuitry, starting with the power supply.

Power Supply Circuitry

The mains input is first taken to the on/off switch on panel M. After filtering there are feeds to the degaussing thermistor and panel E, where the input is taken to the standby supply transformer T1201 and the bridge rectifier D821. This produces, across its reservoir capacitor C825, a

d.c. supply of some 300V for the chopper circuit. Fig. 3 shows the circuitry on the primary side of the chopper transformer T821. It's virtually the same as that used in the Z4 chassis (see *Television* September 1994). Some of the component values differ however, and all the component reference numbers have been changed. So we'll provide a brief description of the circuit's operation.

The hot end of the chopper transformer's primary winding, terminal P1, is connected to the 300V supply. The other end, terminal P2, is connected to pin 3 of the Sanken STR54041M chopper chip IC821. This pin goes to the collector of the integrated chopper transistor Q3. The base of this transistor receives a positive bias via resistors R831 and R832. Thus at switch on it will conduct, and current will flow through the chopper transformer's primary winding.

The circuit is basically a blocking oscillator. Feedback to the base of Q3 from winding F1-B1, via C834 and R830, rapidly drives Q3 to saturation. At this point there is no change in the primary current flow. Thus the positive feedback ceases and the charge across C834 reverses. With a negative voltage at its base, Q3 switches off. C834 will then discharge and when the voltage at pin 2 is sufficiently positive Q3 will switch on again and the cycle will be repeated.

Regulation is achieved by feedback from winding F1-F2. This is rectified by D822 to produce across C828 a voltage that's proportional to the load and input voltage conditions. It's applied via pin 1 of IC821 to the base of Q1, which with Q2 controls the d.c. conditions at the base of Q3. In this way the point at which Q3 switches on is controlled. The process is automatic, stabilising the outputs produced by the chopper circuit when mains voltage and load demand variations occur.

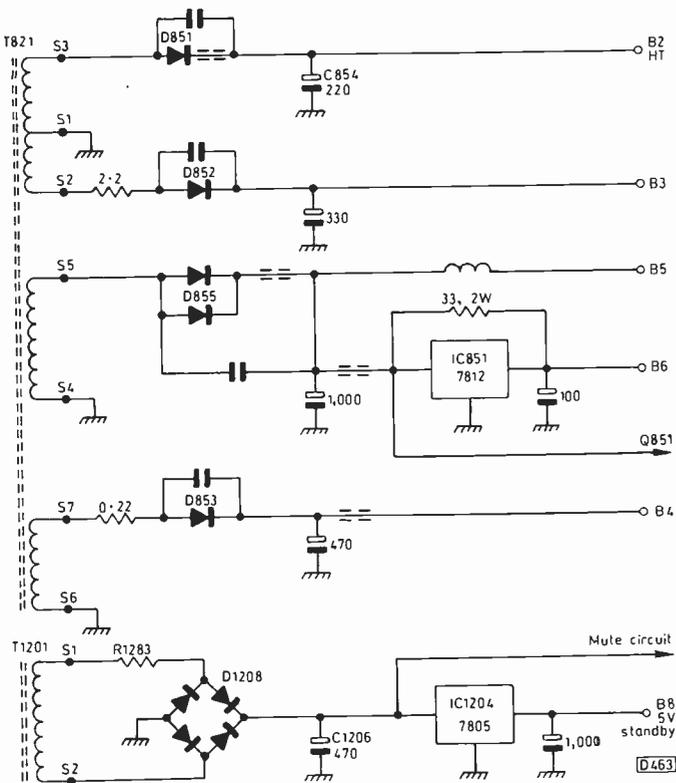


Fig. 4: Supplies produced on the secondary side of the mains isolating transformers.

Excess current monitoring is provided by R825, which is in series with Q3. If the voltage across R825 rises sufficiently Q822 switches on, linking pin 2 of IC821 to chassis. Q3 is thus left without drive. The system provides protection in the event of overloads or an excessive rise in the mains input voltage.

The operation of the chopper circuit is synchronised with that of the line output stage by feeding flyback pulses from an isolated winding on the line output transformer via R833 and D825 to pin 2 of IC821. The advantages of this are maximum power output and minimum switching interference.

Standby operation is provided by Q890, optoisolator D826, Q821 and their associated components. With the set

working normally the state of the standby output from the main microcontroller chip is high. So Q890 and the light-emitting diode in D826 are on. The light output switches on the phototransistor in D826, linking the junction of R823 and R824 to chassis. This removes Q821's base bias. When standby is selected, Q890 and D826 switch off and Q821, now forward biased, switches on, linking pin 2 of IC821 to chassis. As in the overload trip state, Q3 is now without drive.

Fig. 4 shows the mains-isolated side of the power supply. The 5V standby supply (B8) is produced by T1201, D1208, C1206 and IC1204. This is used by the main microcontroller. Several supplies are produced by rectifiers fed from the secondary side of the chopper transformer. These vary to some extent with the features of particular models. For the 21V2 (Alpha 4) and 28X1 (Alpha 4H) they are as follows:

B2	126V 150V	H.T. to the line output stage (A4). H.T. to the line output stage (A4H).
B3	30V 12V	Line driver and field output supplies (A4). Line driver, field output and EW supplies (A4H).
B4	32V	Audio output supply.
B5	16V	Protection circuit supply. Also to regulators on panel B to provide 12V for the i.f. circuits and 5V for the Nicam circuits.
B6	12V	Used by the signal processing circuitry.

As usual, other supplies are derived from the line output transformer. As well as the e.h.t., focus, first anode and tube heater voltages, supplies are produced for the RGB output stages, the protection circuits and the teletext decoder.

Models 25X1DP and 28X1DP have an additional chopper supply, mounted on the Eldon designed X panel, to power the Dolby Pro Logic audio circuits.

Next Month

We'll continue next month with the signals, Nicam and AV paths.

CD Fault Finding

Hitachi DA50

If you receive one of these units without the rest of the system, the CD player won't come out of standby unless +5V is applied to the centre pin of the single phono socket at the rear. We think it's marked 'control', but because of the scratched condition of this unit it was difficult to tell.

A replacement loading belt completed the repair. **G.T.**

Dennon DCD700

This machine had an intermittent fault. The spindle would sometimes rotate at very high speed, with the result that the disc couldn't be read. It would sometimes do this with no disc inserted. The cause of the problem was traced to incorrect drive from the digital signal processing PCB that's soldered edgewise on to the main PCB, though the d.c. conditions in the spindle motor drive circuit were correct.

This was another case of dry-joint trouble – there were a number on the edge-soldered PCB. **N.B.**

Pioneer PDS301

This player wouldn't register discs – it wasn't focusing. The cause of the fault was a break in the flexible connector to the laser unit. It tends to break where it's folded at the laser end. **N.B.**

Sony CDP35

The complaint with this machine was skipping. I initially thought that the laser output was low but found that the unit could be made to skip wildly if the PCB around the tracking/traverse drive circuitry was flexed. The cause of the problem was a collection of dry-joints along one side of the surface-mounted CX20108 servo chip IC601. **N.B.**

Reports from Graham Thompson and Nick Beer

Teletopics

DVD-SD/CD COMPATIBILITY

Although the Toshiba DVD-SD digital video disc and the standard audio CD are both 1.2mm thick, there has to date been a compatibility problem. Because the DVD-SD disc consists of two 0.6mm sections bonded together back-to-back, the distance between the track being played and the optical system differs from the distance with an audio CD. In addition, the pit sizes differ. Thus the two types of disc cannot be read using a single-focus optical system. To overcome the problem Matsushita has come up with a dual-focus pickup that enables both types of disc to be read. It uses some clever optics to produce a beam with two focal points.

The Matsushita optical system places a hologram near the centre of the laser beam. It diffracts part of the beam to form the CD focus spot (longer focal length), the portion of the beam that is not diffracted forming the DVD-SD focus spot (shorter focal length). The special aspherical glass lens used for this purpose has an integrated hologram at the centre: it consists of a sawtooth section with between several dozen and several hundred micron-pitch concentric circles. Matsushita has applied for seventeen domestic and four overseas patents to cover the technology, and plans to start selling combined DVD/CD players using the system by the end of next year.

Incidentally, our apologies for the error in our note on the DVD in the April issue (page 390). The two disc sections that are bonded together are 0.6mm thick, not 0.6mm in diameter. The diameter, as with all these discs, is 12cm.

DIGITAL TV BROADCASTING

In late March the first digital TV transmissions using NTL video compression (System 3000) were carried out by News Datacom via the Astra 1D satellite. They were intended to test signal reception and picture quality under domestic conditions prior to direct-to-home services going digital. Astra 1E is now expected to be in service, with digital TV channels, by October. According to Astra digital satellite receivers will be available in the UK this autumn. Any attempt to predict prices is at present difficult. A guess, based on initial component costs, suggests something like £700. But there could be a quick fall as the production of such receivers is stepped up.

Hyundai Electronics America has developed the first MPEG-2 video decompression chip to integrate the systems, audio and video processing streams on one chip. The HD8211M SAVi (Systems, Audio and Video) decoder chip is designed for cable TV and satellite TV set-top boxes and receivers. It has an MQUAD pack with 208 pins and operates at 5V, the power consumption being 2W. The production quantity price per chip is at present about £40. Other applications include video CD-ROM players, digital Karaoke machines and similar multimedia systems.

NTL is supplying its System 3000 video compression equipment to Shinawatra Group in Thailand for use with the world's first MPEG-2 direct-to-home digital TV service which was due to be on-air in May. The Thaicom 1 and 2 satellites are being used for the service.

Tests carried out by NTL suggest that terrestrial digital TV transmissions in ch. 35 could cause much worse inter-

ference than expected to VCR, satellite TV and games links using this channel. NTL recommends that ch. 35 should be left clear as a home connection frequency.

The first public demonstration of the proposed US digital high-definition TV system took place at the recent National Association of Broadcasters convention in Las Vegas. Official testing of the system has now started, and it's expected that this will lead to FCC approval by the end of the year. Testing is to ensure that the system works to the specifications agreed with the FCC, particularly with regard to compatibility with current analogue TV transmissions. In a parallel step manufacturers have endorsed an HDTV standard for VCRs. This specification was developed by the Advanced Television Working Group of the HD Digital VCR Conference, an alliance with about 55 participants. Digital HD VCRs will also be able to handle analogue signals and in addition provide computing.

TELEPHONE VOD

BT is to carry out further tests of its proposed video-on-demand via telephone services later this year. The company hopes that the service will be in operation by the end of next year. Malcolm Bird, chief executive of VOD supplier Online Media, which is involved in the trials, believes that the high cost of providing a VOD network could delay the introduction of the service. It's generally agreed that the cost of a set-top box to connect to the system would have to be below £200. Online Media is well on the way to achieving this with a second-generation box that uses an ARM7500 video processor and incorporates extended interfaces for transmissions such as digital QAM via satellite and cable ATM.

VIDEOPHONES

A new international standard for videophones that use conventional analogue telephone lines has been adopted by the ITU. Known as H324, it uses a 28.8kbits/sec modem data rate, with 20kbits/sec allocated to compressed video and 5.3/6.3kbits/sec to a new compressed speech standard known as G723.

Following the adoption of this standard GEC-Marconi has ceased development work on its analogue videophone, which BT sells as the Videophone 2000. This is incompatible with the new ITU standard. Sales have been disappointing, and the 14kbits/sec data rate has provided poor picture quality. PC-based digital videophones are being developed elsewhere in the GEC group.

WILLOW VALE TECHLINE

Because of increased demands on and the cost of running it, Willow Vale has changed the telephone number for its popular Techline service to a premium rate 0891 number (calls are charged at 49p per minute). Dialling 0891 615 915 will connect you to an engineer who can solve a wide range of TV, audio and satellite TV service problems through access to carefully researched technical information.

PRODUCT NEWS

Two new items have been released by Philex Plc., Philex House, 110-124 The Broadway, West Hendon, London NW9 7BP (0181 202 1717, fax 0181 202 0014). A video cassette adaptor enables VHS-C cassettes to be played by standard VHS machines. Suggested retail price is £17.99. The Opti-8 pre-programmed remote control unit will replace

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REPRINTS

Reprints of articles from TELEVISION back to 1986 are also available: ordering information is provided with the index, or can be obtained from the address below. Hard copy indexes of TELEVISION are available for Volumes 38 to 44 at £3.50 each.

All the above prices include UK postage and VAT where applicable. Add an extra £1 postage for overseas EC orders, or £5 for non-EC overseas orders. Cheques should be made payable to Video Interface Products. Allow 28 days for delivery (UK).

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up to eight handsets for TV, VCR, satellite and cable TV and hi-fi units. Its learning capability reproduces the key functions of most IR remote control units.

A range of internal, dual-speed CD-ROM drives featuring enhanced IDE interface capabilities is now available from CPC plc., Component House, Faraday Drive, Fulwood, Preston PR2 4PP (01772 654 455, fax 01772 654 466). The GCD-R520B PC compatible drives are manufactured by GoldStar, fit into a standard 5.25in. slot and cost just £94.99. They are supplied with a sound card audio connection cable and software drivers for quick and easy installation.

Jensen Tools, 10-12 Ravens Way, Northampton NN3 9UD (01604 787 060, fax 01604 785 573) has published its 1995 Winter Catalogue. There are 68 pages of quality service products for work on computer, communications and electronics equipment, including test instruments from

Fluke, Tektronix, Microtest, Wavetek and many other leading manufacturers. The catalogue is available free – just call freephone 0800 833 246 or fax the above number.

ICL's PCTV

More details of Fujitsu-ICL's new combined PC and 14in. Nicam TV set have been released. The picture tube has a finer dot pitch than normal for TV purposes to enable computer text and graphics to be displayed: in the PC mode it offers SVGA resolution (1,024 x 728 pixels). The set includes Fastext and has channel barring and Philips' Acoustic Horn speaker technology, providing 12W per channel. On the PC side there's a 486DX2/66 processor, a 350Mbyte hard disc, 4Mbytes of RAM and a two-speed, Photo CD-compatible CD-ROM drive, also a sound card. Pre-installed software is included, all for £1,500.

VCR Clinic

Reports from Philip Blundell, AMIEEIE, David A. Chaplin, Michael Dranfield, R.J. Longhurst, Chris Watton, John Edwards, David Belmont, Eugene Trundle, Nick Beer and Christopher Nunn

Philips Turbodeck VCRs

For poor tracking or slow autotracking operation check that the control head is clean. These and other half-loading decks seem to be prone to dirt build up at this point. **P.B.**

Ferguson 3V43/JVC HRD725

One of these machines failed to read the reel tacho pulses. The amplitude of the TU FG signal was low at pin 41 of IC202 because D248 (1N4148) was leaky. It's fitted on the sub-board, by IC202. **P.B.**

Hinari VXL4/Matsui VX880/Saisho VR1600

Playback was perfect for the first few minutes. Then, as the machine warmed up, the top of the picture began to flicker. This gradually became worse as time went by until the top of the picture became folded over and the colour was lost. We removed and checked the capstan, but it was shiny and clean and didn't appear to be running tight. Nevertheless we lightly oiled the bearing before refitting it. A soak test proved that the fault had been cleared. **D.A.C.**

Hitachi VTM722E

Intermittent play, rewind etc. was the complaint with this machine. We'd lubricated the capstan motor a few months previously, so this wasn't responsible. What we did notice was that the reel drive gear didn't mesh correctly with the teeth on the tape reels. When the clutch assembly had been dismantled we found that a retaining ring had come out of its groove. As a result the pressure spring was free to push the reel drive gear upwards. A new retaining ring restored correct operation. **D.A.C.**

Samsung VI910

The r.f. output from this portable VCR was very weak. A damaged r.f. converter was the cause. The VI920 is sold complete with a cloth carry bag and shoulder strap. The owner was in the habit of leaving the r.f. lead connected to the machine when he carried it. When he lowered the bag to the floor the plug would land first, transferring the force to the r.f. socket which as a result had been pushed in. The PCB was damaged, but a repair was possible using a small iron and fine wire. **D.A.C.**

Ferguson 3V31/JVC HR7650

The cause of intermittent playback, record and E-E colour was traced to the 4-435571MHz crystal X401 being dry-jointed. It's on the colour PWB assembly board. **D.A.C.**

Mitsubishi HSM45

Playback pictures were unstable and appeared to be mistracking. The video heads, control head and tape path were cleaned but this had no effect. As the tape guides were still securely fixed they hadn't moved out of adjustment. We then noticed that the cassette didn't quite load fully on the take-up side. The cassette carriage was disman-

ted and the old grease was cleaned off, then the guide runners were checked, a couple of small burrs were eased and some fresh grease was applied. On test the cassette loaded with a satisfying, positive click and the picture was back to normal. **D.A.C.**

Ferguson 3V30/JVC HR7300 (early models)

If the drum runs at full speed in the wrong direction, i.e. clockwise, check the plug-socket connections to the MDA (motor drive amplifier) panel and the print continuity on the panel itself, especially around Q216. This transistor tends to run quite hot. The MDA panel was mounted vertically behind the function PCB in early models: in later models the MDA circuitry was moved on to the servo panel. **D.A.C.**

Ferguson FV32

This machine would load a tape and both rewind and fast forward were all right. But when play was selected the machine would start to thread then suddenly stop in its tracks, leaving the tape partially loaded. We found that the timer i.c. was supplying a servo stop signal to pin 26 of the system control/servo chip IT01. So a new HD614080S chip was ordered, but when fitted made no difference.

Maybe the machine was entering an alarm/stop mode, though the drum and capstan motors still rotated. We decided to get out the scope to check waveforms and found that there were no drum PG pulses at test point BK02. So we replaced TK25, still to no avail. At this point we decided that it had to be the drum motor. But have you seen the price?!

We carefully dismantled the direct-drive drum motor and found that the PG pick-up consists of two single printed-circuit coils, with a small surface-mounted electrolytic capacitor (C6) connecting one end to the driver chip. This capacitor was open-circuit. Its value is 3.3 μ F, rating 50V. We used a 10 μ F subminiature type from an Amstrad 4600 i.f. can as a replacement. The result was perfect – and a fraction of the cost of a new DD unit. **M.Dr.**

JVC HRD230/Ferguson FV12L

The customer asked us to fit a new drum in this four-head machine. He'd cleaned the heads himself, then come to the conclusion that they were faulty. What he'd actually done was to break all four head tips.

When we'd replaced the upper drum the original fault was apparent. Every time that play was selected, with a known good tape, a portion of the f.m. playback carrier was missing, giving the impression that the heads were clogged. At one point there was so little f.m. signal that the tape might as well not have been wrapped around the drum. Thus a mechanical fault was ruled out. In this model the drum PG and FG signals are combined and leave the drum together at pin 3 of connector CN3. A scope check here showed that the PG pulses were missing. After some careful testing we removed the PG pick-up and found that it was open-circuit. Unfortunately parts for the drum are not available individually. But we found an identical pick-

up in a scrap HRD170, though the motor is different. Fitting it cured the fault.

M.Dr.

JVC HRD170/Ferguson FV11R

This machine worked normally except for the fact that there was no clock display. We found that R4 (220Ω) on the power supply PCB had gone open-circuit. A long soak test after fitting a replacement failed to bring to light any reason for its failure.

M.Dr.

Sharp VCA105

This machine would power on and initialise, then shut down with no functions and no display. We couldn't find any incorrect voltages. Replacing the timer chip IC5001 cured the fault.

A useful tip with a fault like this is to remove all plugs from the front timer PCB and insert a prerecorded tape with the safety tab removed. The machine will accept, load and play this tape, proving that the deck and syscon are o.k.

R.J.L.

Matsui VX755/Saisho VR3600

For intermittent stopping during play, replace the take-up reel sensor.

R.J.L.

Mitsubishi HSB27

Rewind and fast forward were intermittent when this machine was hot, the other functions being o.k. A new mode switch didn't cure the fault: a new loading motor assembly did.

R.J.L.

Samsung VI611

There was a hum bar in the E-E mode only. We found that C4 (47μF, 100V) was open-circuit. As a result the voltage at pin 18 'PRST VTG' was low. It should be 33V (this voltage is not shown in the service manual).

R.J.L.

Ferguson FV11R/JVC HRD170

E-E was o.k. On playback there was sound but only a blank screen (no video). Checks showed that the E-E 5V line was always at 5V. The DTC144W digital transistor Q503 was faulty.

R.J.L.

Panasonic NVG21

There were no functions and no display, just a ticking noise from the power supply. Replacing the STR1006 chip in the power supply restored normal operation.

R.J.L.

Panasonic NV370

The clock and counter displays were very dim. All the other functions worked all right and good pictures were produced. Checks on the outputs from the power supply showed that the voltage on the -50V rail was low at -30V. Replacing C1104 (100μF, 63V) restored the correct voltage and display.

C.W.

Saisho VR3800 with Teletext

The customer complained about an intermittent yellow picture when on the video channel. We brought the machine

in and ran it for some time in the E-E mode. Eventually we got a blank screen – not yellow, but blank. The sound remained o.k., and the channels could be changed. If play was selected the picture would sometimes appear, but not always. Then the picture might reappear in all modes, the machine working all right for some time.

I scoped the video signal at the input to the teletext panel while the machine was faulty in the E-E mode. The signal was present here but didn't come out of the board again. Although the fault couldn't be instigated by heating, cooling or thrashing, I still decided on a good solder up around the various chips and the through-the-board links. This didn't provide a cure. We were fortunate to have a circuit of the text unit in our U-View set of manuals. I found that the voltage at pin 17 of IC8502 was slightly high. The pin is labelled 'brank' (surely blank?). After much searching and checking I noticed that the 1kΩ surface-mounted pull-up resistor R8524 had a scummy film on it. When this was cleaned off the picture returned. It was obviously pulling the blanking line high.

C.W.

Ferguson FV37H

Although the tuning mode could be set and the channel numbers appeared correctly the channels couldn't be tuned in. A look at the tuner PCB revealed that Q2 had obviously been struggling – the board around it was discoloured and the solder had a very shabby look. On test Q2 was found to be open-circuit. Various checks were made, but no other fault could be found. A replacement transistor restored the tuning but was pretty warm after only a few seconds. A long soak test proved that the transistor was all right, so maybe it just does run warm.

C.W.

Akai VS25

There were horizontal dark lines across the entire screen, more noticeable during playback and in the E-E mode with the aerial disconnected, i.e. the picture muted. C6 (220μF, 10V) and C7 (100μF, 10V) on the power supply board were responsible for this. Over 300mV of spikey noise was measured across C6. Both capacitors measured o.k. when checked with a capacitance meter, but when they were compared with a known good capacitor using the scope's component tester function a marked difference was displayed. I'm very impressed with this facility on the scope, and find it much more accurate and trustworthy than the majority of separate component testers.

J.E.

Hitachi VT33

The display and the E-E mode were o.k., but this machine wouldn't accept a tape. When a tape had been inserted manually there were still no deck functions. Checks showed that the switched 9V supply was missing, because the SKT5421 regulator had failed. A replacement restored normal operation.

J.E.

Ferguson 3V35/JVC HRD120

The deck modes would all go to stop after a few seconds. All was well when the take-up reel optocoupler had been replaced.

J.E.

Ferguson 3V65/JVC HRD170

There was no reel motor operation, the cause being failure of the M54644AL drive chip. As I've had this fault before, I

gave an estimate based on replacing the chip. Unfortunately for me when the replacement was obtained and fitted the reel motor still refused to do anything and the chip burnt up. Yes, you've guessed it, the reel motor was the cause of the fault. There were then some problems with the customer, but that's another story!

J.E.

Samsung SI1260

This machine made a loud noise in the rewind mode and would shut down in play. The cure is to remove the take-up spool and push the two halves together.

D.B.

Ferguson FV71LV

This machine was dead. Fortunately replacing IP01, TP01, RP18 and RP21 in the power supply restored operation without the blow-ups you usually get with switch-mode power supplies of this type.

D.B.

Hitachi VTM822

This machine wouldn't accept tapes, and when you could manage to load one the tape would be chewed. Checks around the microcontroller chip IC901 revealed evidence of liquid spillage. A clean up here restored normal operation.

D.B.

Amstrad UF40

This machine would eject tapes, but not when it was in the service mode. By blanking off the sensors (not easy) we found that when a cassette was inserted the tape would be wound forwards slowly then stop, followed by ejection. Checks showed that the voltage at the take-up sensor was permanently low. The cause was a 3kΩ leak to chassis at pin 46 of the microcontroller chip IC6001. Replacing IC6001 restored normal operation.

D.B.

Panasonic NVJ35

The capstan jerked round, the picture wobbled and the sound had lots of wow on it. So we checked at pin 13 of the capstan drive chip and found that there was 2V of ripple on the 5V supply. There was ripple on the other supplies as well. Replacing most of the capacitors in the power supply restored normal operation.

D.B.

Amstrad DD8900

The top deck would stop after a couple of seconds. The cause of this was the reel sensor, which is not available separately. It comes with the plate sensor, part no. 250827.

D.B.

Hitachi VTF860

No go or intermittent failure to perk up from cold is generally caused by the kick-start capacitor C6 (1μF, 250V) in the power supply having dried out or being partially open-circuit. The fault doesn't put in an appearance with normal use in the home – unless the machine is deprived of mains power for any reason. It crops up when the machine is on the bench for diagnosis of the cause of some other fault – or when the customer gets it back home again!

E.T.

Philips VR6462

We've had a couple of cases of loss of sound (E-E and play-back) with this model. Both times the cause was C2007

going short-circuit. It's a 330μF, 16V electrolytic mounted on panel P502.

E.T.

Sony SLV315

This fault is usually intermittent to start with, then becomes permanent to aid diagnosis! The symptoms are no sound, multiple mistracking bars on the picture and tape damage when the cassette is ejected. Look no farther than the half-wheeling arm, which becomes tight on its shaft. The cure is to give the shaft and the arm bearing a good clean followed by a small drop of thin oil.

E.T.

Panasonic NVSD40B

Intermittent loss of r.f. loop-through was the complaint with this machine. The cause was loss of the unswitched 12V supply to the amplifier section of the tuner because L7005, a surface-mounted 47μH choke, was going open-circuit intermittently. It's fitted in the UK version only.

N.B.

Samsung VIK346

This brand new machine worked perfectly apart from the fact that there was no display. Checks showed that the voltages at G1-10 were all low because of a leak within the digitron display (DT701). When it was removed a crack was seen in the back.

N.B.

Panasonic NVSD25B

There was no full erase with this brand new budget VCR simply because P4001, the feed to the full-erase head, had never been plugged in!

N.B.

Salora SV8400/Mitsubishi HS308

We've had two of these machines in recently. With the first one there was severe patterning over the r.f. through the machine because C912 (330μF) was open-circuit. The second one was dead except for the clock, which flashed on when the switch was closed from standby but then went off again. The cause was C911 (47μF) in the 12V power supply – it had gone very low in value.

N.B.

Matsui VX1000Y

This machine wouldn't tune in signals. I found that the voltage at tuner pin BT was virtually zero wherever the unit was tuned. The voltage at the 33V regulator was correct but R45, a tiny 33kΩ resistor, was open-circuit.

N.B.

Sharp VCH88HM

This machine wouldn't accept remote control commands. Scope checks showed that the IR receiver was sending rubbish to the microcontroller chip. A new infra-red receiver put matters right.

C.N.

Hitachi VT530

This machine kept coming back to the workshop because the cassette housing needed to be retimed to the main deck. When this had been done it would work perfectly, but it would return with the same problem about three months later. We finally traced the cause of the trouble to the start and end sensors on the cassette housing and replaced the IR emitter.

C.N.

VHS Goes Digital

George Cole

A number of new VHS format developments were announced by JVC in April. The biggest news is the forthcoming arrival of Digital Data VHS (D-VHS). This will enable either analogue or digital signals to be recorded. There are also plans to launch a dynamic drum system, which will offer a number of new VHS deck features. In addition new colour processing and tape optimising systems have been announced.

To put these developments in perspective, we'll start by outlining the history of the VHS system to date.

The VHS Format to Date

The VHS format was first launched by JVC in Japan in 1976. It reached Europe a couple of years later, and has come a long way since then. One of the most striking changes has been the improved picture quality. Early VHS decks struggled to provide pictures with a horizontal resolution of about 240 lines. Many of today's machines nudge the 260-line mark. Today's VHS pictures are also crisper, clearer, cleaner and have better colour reproduction.

In 1985 JVC introduced VHS HQ (for High Quality). It involves several different processes that enhance VHS picture quality while retaining compatibility with non-HQ VHS machines. The NTSC version of VHS HQ uses up to four extra processes. Most PAL VHS decks use two of them – a twenty per cent increase in the luminance (Y) signal clip level and the application of non-linear emphasis to the recorded signal to improve detail.

A number of companies have developed proprietary systems that enhance VHS format performance. These include Akai's Intelligent HQ, Nokia's ASO (Active Sideband Optimum) and Sanyo/Mitsubishi's IPC (Intelligent Picture Control). In the late Eighties Toshiba introduced several VCRs that feature HQ Pro: this is essentially the HQ system with some additional filtering. At about the same time Thomson proposed VHS SQ (Super Quality), which used Super VHS tape and Y/C signal processing via a scart connector, but the format never reached the market.

JVC announced Super VHS (S-VHS) in 1987. It greatly improves VHS picture quality, offering a horizontal resolution of 400 plus lines. This is achieved by increasing the f.m. carrier deviation from 3.8-4.8MHz to 5.4-7MHz. In addition the luminance white and dark clip levels were increased, cross-colour effects are avoided by removing the overlap between the sidebands of the recorded colour and luminance signals, and non-linear sub-emphasis was applied. High-coercivity ferric-oxide tape is used for S-VHS. Indeed much of the improvement in VHS picture quality has been made possible by developments in tape technology. But despite its advantages S-VHS has remained a niche format, accounting for less than one per cent of VCR sales in the UK (the figure is around twenty per cent in Japan). This is partly because S-VHS decks are relatively expensive, and partly because the format is only partially compatible with basic VHS – S-VHS decks can play and record VHS tapes, but VHS decks cannot play S-VHS recordings, though they can use blank S-VHS tape.

In 1990 a number of decks began to offer Quasi-VHS. This system enables VHS decks to play S-VHS tapes,

though with reduced picture quality. The format was designed primarily for S-VHS camcorder owners, enabling them to play their recordings via a VHS deck.

In 1993 JVC launched the HR-W1 deck in Japan. It was the first W-VHS machine, designed for use with the Japanese HiVision analogue HDTV system. The W-VHS system uses metal-powder tape and offers three recording modes: HD for HiVision signals, SD for NTSC recordings and SD2 for simultaneous two-channel NTSC recordings. JVC showed the HR-W1 at the 1994 brown goods show. The pictures looked great, but the system is unlikely to be launched outside Japan. Even there it's a specialist format.

VHS is no stranger to digital recording. In 1990 JVC launched the first VCR in Japan to feature depth-multiplexed signal recording, a system that records 16-bit PCM (pulse-code modulated) sound along with f.m. stereo and linear mono sound tracks. Now VHS is about to offer digital video recording.

Why D-VHS?

On April 6th JVC hosted a large press conference, with live video links between London, Germany and Japan, to launch the D-VHS system. When JVC was asked whether D-VHS stands for Digital or Data VHS the answer was both! But JVC said the shorter Data VHS is acceptable. Many people were wondering why D-VHS? In answer, JVC pointed out that there are over 500 million VHS decks in use worldwide, with the number of prerecorded VHS tapes around ten billion. The number of blank tapes in use for domestic recordings is probably at least ten times that number. Around sixty five million VHS decks were produced last year, and use of the format is still growing in places such as China and South America. While the consumer electronics world is moving towards digital technology, the transition period from analogue to digital formats is likely, according to JVC, to last for around 15-20 years. In other words no one is going junk VHS recorders and tapes just yet. D-VHS is designed to bridge the gap between the analogue and digital worlds and take VHS into the twenty first century.

Another question is why tape? – especially as the computer and consumer electronics industries are moving towards disc-based systems. JVC points out that tape offers very high data capacity and is more cost effective. Here are the comparisons:

System	Capacity	Cost*
D-VHS	45Gbytes	1
DVC	50Gbytes	5
DAT	1.3Gbytes	30
Hard disc	1Gbyte	350
MiniDisc	140Mbytes	2,500
Floppy disc	1.44Mbytes	3,000

*Relative cost of storing 1Mbyte of data.

JVC also questions whether video-on-demand systems will make time-shifting obsolete. The company points out

that such systems will be hard pressed to meet viewers' demands, especially as fifty per cent of movie viewing takes place during the final quarter of the day.

The D-VHS Format

JVC describes D-VHS as "a multimedia server for the home". It's best seen as a digital bolt-on for existing VHS and S-VHS decks. The basic specification is almost the same as for standard VHS, with the same mechanics, head drum size and drum speed (1,800 r.p.m. for NTSC, 1,500 r.p.m. for PAL). D-VHS recordings are made on S-VHS tape. Despite this JVC has taken out forty patents covering the new format.

D-VHS decks will play analogue VHS tapes (the more expensive decks will also play S-VHS tapes) and will make recordings from analogue sources such as terrestrial TV broadcasts. They will record digital information from a number of sources, such as digital TV broadcasts, computers, games, video phones and interactive shopping systems.

D-VHS uses a system known as bit-stream recording for digital information. This means that it records the data in whatever form it comes, compressed or not, encrypted or clear, copy protected or not. To play the data back, a D-VHS deck has to be connected to a set-top decoder, TV set, PC or some other form of equipment that incorporates decoding and conversion chip sets. Although this simplifies D-VHS decks and makes them cheaper to produce, it means that they cannot be used on their own to convert analogue signals for recording in digital form. D-VHS will add about £250 to the price of a VHS machine.

At present JVC has no plans to launch D-VHS decks with a built-in MPEG-2 chip set. But such decks could appear at a later date. Nor does JVC have plans for prerecorded D-VHS tapes, camcorders of D-VHS-C tapes. D-VHS could be used as a tape back-up system for PCs or computer games. Users could store large amounts of data on tape cost effectively, transferring it to disc for faster access and transfer rates.

There are three D-VHS recording modes, standard (STD), HD and LP. In the STD mode it takes five hours to record 31.7Gbytes of information, at a rate of 19.1Mbits/sec. If thin tape is used, the recording capacity is increased to 44.7Gbytes, taking seven hours. The STD mode has a sync block length of 112 bytes and a maximum input data rate of 14.1Mbits/sec. The HD mode is designed for high-definition images. A maximum input data rate of 28.2Mbits/sec gives a recording time of two and a half hours (three and a half with thin tape). The LP mode provides a recording time of up to 49 hours at a maximum input data rate of 2Mbits/sec. It would give MPEG-1 (i.e. VHS) quality video. This slower rate is likely to be used by video security systems. D-VHS can also record up to six digital video channels simultaneously, provided they are multiplexed before recording.

Compatibility with Other Systems

A number of application interfaces will have to be developed for D-VHS to work with other equipment. Hitachi and Thomson are developing an interface to go with the RCA/Thomson DSS (digital satellite broadcasting) system that was launched in the USA last year. JVC is developing an interface for Echostar, which plans to start a digital satellite service in the USA next year. There are at present no plans to develop interfaces for European DVB (Digital Video Broadcasting) services, but JVC could not confirm

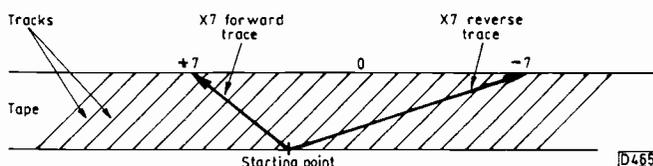


Fig 1: Head traces at seven times normal speed in forward/reverse play with a conventional stationary drum.

whether the first European digital satellite receivers would be D-VHS compatible.

Support and Competition

Matsushita and Philips have provided technical advice for D-VHS, and the system is supported by a wide range of companies including Samsung, Mitsubishi, Sanyo, Sony, Thomson, Toshiba, BASF, Fuji and TDK. This is no guarantee of its success however. It faces competition from the Digital Video Cassette (DVC) system, which can store several hours of video on an audio-sized cassette. The first consumer DVC camcorders are expected next year – along with Digital Video Disc systems. Consumers already have the DAT, DCC and MiniDisc digital audio formats to choose from: it looks as if the same thing is about to happen in the video field.

The Dynamic Drum System

Two days before the D-VHS announcement, JVC gave a demonstration of its Dynamic Drum System (DDS) and other new technology. DDS was mentioned in last month's Teletopics. It consists of a lower drum which is separated from the base: this enables the angle of the lower drum and thus the heads to be altered, making it possible to remove the noise bars caused by mistracking when the VCR is in a trick-play mode such as slow motion or picture search.

DDS makes a number of other features possible, including high-density recording with narrow tracks (JVC is currently testing with recorded tracks of less than ten microns width), track-by-track frame recording, and endless

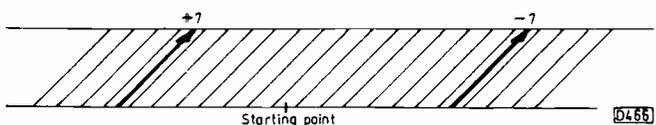


Fig. 2: Head traces obtained at seven times normal speed in forward/reverse play with the DD system.

recording (when the end of the tape is reached the VCR automatically continues to record in the reverse direction – this feature could be used by video security systems that don't need to keep a tape record).

JVC flew two engineers from Japan to demonstrate the system. They began by showing how DDS improves trick play performance. Recordings were shown at three, five and seven times normal speed, in both the forward and reverse directions. They were almost as good as those provided by a broadcast VTR. Figs. 1 and 2 show how the system works at seven times normal speed. When this mode is entered with a conventional drum, the heads trace across adjacent tracks (Fig. 1). This produces noise. With the DD system the head angle is adjusted to produce clear pictures (Fig. 2). The technique can also be used to give very accurate time-lapse recordings, and the tape doesn't need to be moved to pre-roll and set up the next recording.

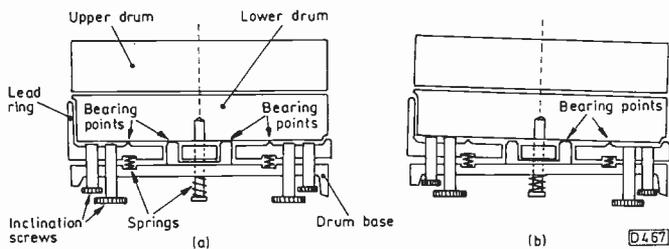


Fig. 3: Operation of the DD system for normal record/play (a) and fast forward operation (b). For reverse play the drum angle is tilted in the opposite direction.

Another trick was to show how the sound track can be heard in the forward and reverse modes. The system is similar to Sanyo's Digital ViewScan: the audio data is fed into a DRAM at high speed then read out at normal speed.

Fig. 3 shows the dynamic drum mechanism. The lower drum is supported by eight spring-loaded bearing points. During normal recording and playback the drum is pressed firmly against the bearing points to prevent unwanted move-

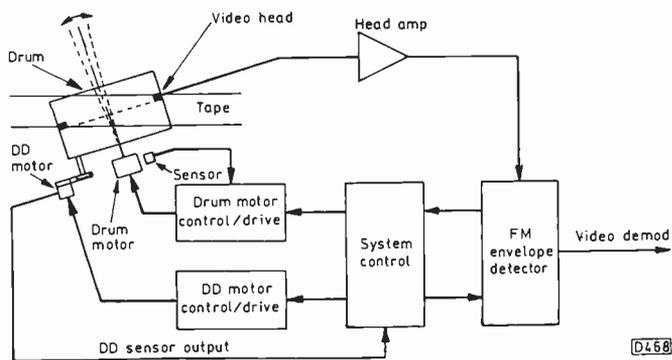


Fig. 4: Block diagram showing DD system control.

ment. In a trick-play mode a motor and gearing system mounted beneath the base of the drum alters the height of the inclination push-screws and thus the angle of the heads. For smooth operation and minimum tape path distortion each inclination push-screw is separately driven. Because the drums are pressed down by springs, there's no instability.

Fig. 4 is a simplified block diagram to show how the system works. Just one of the inclination push-screw drives is shown. The operation of the DD motor, the drum inclination and data on the video signal level are analysed by a

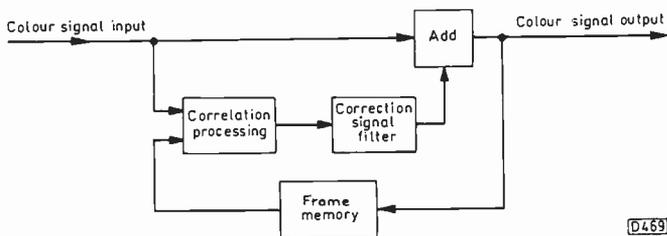


Fig. 5: Block diagram to show how the 3D AI Super Colour system works.

microcontroller chip which produces the output to control the DD motor.

Noise-free tracking systems are not new. Philips used DTF (Dynamic Track Following) with the V2000 system over ten years ago. But JVC says that its system is more accurate and easier to set up for mass production. The DD system would

initially add about £60 to the price of a VCR, though this would fall as production increased. The system could also be used for camcorders: there are however no immediate plans to develop a compact version of the DDS. The first machines with DDS should appear in Europe next year.

3D AI Super Colour

The 3-Dimensional AI Super Colour System is designed to improve S-VHS colour performance. It works by analysing the colour signals from pairs of frames then generating compensation signals which are added to the next frame. This reduces colour noise and blurring at boundaries. The basic system is shown in block diagram form in Fig. 5.

The BES Tuning System

BES stands for Best Equalised Signal. The BES system is designed to obtain optimum performance from the various types of VHS tape on the market. It works in both the record and playback modes. The idea isn't new – Akai's IHQ system is based on the same basic principle – but JVC's approach is novel and, judging by the demonstration I saw, very effective. It works by analysing the condition of both the tape and the heads.

When a tape is inserted a single track is erased and a test signal is recorded. Unlike Akai's system, this doesn't involve tape movement. Instead, the video drum rotates and records the test signal, which is then played back and erased. The process is repeated three times. Each time the recording current is varied to find the optimum level. The record circuits are then adjusted for best performance. High-quality tape provides greater f.m. reproduction, so detail

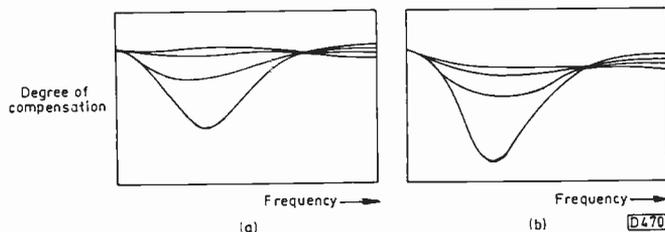


Fig. 6: Noise-reduction circuit characteristics during playback, (a) with high-quality tape, (b) with standard tape.

enhancement is added. With standard tape there is less f.m. output and no detail enhancement is added. The process takes about a second.

During playback the head output level is analysed and the operation of the noise reduction circuit is automatically adjusted to provide optimum performance. The adjustment is for optimum detail reproduction with high-quality tape and best signal-to-noise ratio (noise reduction) with standard tape – see Fig. 6.

PAL machines with BES will appear next year.

In Conclusion

These various developments show that there is still plenty of life left in the VHS format. It looks as if it will be a long time before VHS is replaced as the standard domestic video recording and playback system.

My thanks to Hiroki Shimizu, Kazuo Kohda, Gen-Ichiro Miyazaki and Yasuomi Namiki, the DD system inventor, of JVC for their help with this article.

Servicing the Loewe-Opta C8001 Chassis

Chris Watton

This chassis was used in quite a few different models, including the MS56, M24, ME122, ME126 and later stereo versions of the ART 1 series. Some models have remote control, teletext and scart in/out facilities. The chassis can be used to drive 90° and 110° tubes, both standard and FST types. There's frequency-synthesis tuning, and the chopper power supply provides mains isolation.

Access and Basic Adjustments

The chassis has two service positions. For one you simply remove two screws then pull the chassis back. This gives access to the preset adjustments and the upper side of the PCB. The second is with the chassis removed from the slides: a slot in the left-hand heatsink fits on to a pin on the right-hand chassis holder, with the control assembly now facing the rear.

With 110° models the h.t. at point U142, which is at the cathodes of the parallel-connected h.t. rectifier diodes D651 and D652, is 142V. With 90° sets the h.t. voltage is 110V. The h.t. preset is P636.

To set the line frequency short TP5 to chassis and adjust P518 for a near stationary picture.

Width is set by P586 in 110° sets. In 90° sets the width control is coil L561. The EW control is P584.

The Power Supply

The chopper power supply is the very common TDA4600 type, see Fig. 1. As this type of power supply has been covered in many articles in these pages we'll simply look at the trouble spots here. The outputs are U142, U27, U8 and U8a. Further supplies are generated in the line output stage. In addition to the e.h.t., focus and first anode supplies these are U200, U60, U16, U12 and U27V.

The main causes of problems in the power supply are the electrolytics and the collector current simulation resistor R627 (270kΩ). When this resistor goes high in value the BU508 chopper transistor T623 will go short-circuit. Failure of C638 (1μF, 63V) will result in excessive h.t., so the set trips to standby. When the h.t. reservoir and smoothing capacitors C652 and C653 fall in value the h.t. voltage is low, also the voltages derived from the line output stage, but the other voltages derived from the chopper circuit remain o.k. Fortunately the voltages are clearly marked on the PCB and can easily be checked. The other electrolytics in the chopper circuit can be responsible for poor starting or a dead set.

Transistor T004 is in series with the U8a supply. T003 in its base circuit switches on when the line output stage produces the U12 supply.

The Timebases

The standby command at pin 23 of the microcomputer chip I011 controls the line oscillator in I511 (TDA2579) via T583

(BC547B). In the standby condition T583 switches on, earthing pin 16 of I511.

I511 contains the sync and the line and field generator circuitry. Its line drive output at pin 11 is passed via a BC557B emitter-follower transistor (T536) to the BD139/137 line driver transistor T534. The line output transistor T539 is type BU508D or BU508A depending on tube type.

It's common to find R534 (3.3Ω) in the line driver stage burnt up. It's in series with the 27V feed to the transformer. Several things can cause this, including the associated decoupling capacitor C535 (47μF), the line driver transformer L537, the line driver transistor T534, the line output transistor T539, and the line output transformer L544 because of shorted turns. The PCB beneath R534 may be somewhat scorched. When replacing the resistor I like to use some sort of ceramic insulator to protect the panel in case of future failure.

Failure of the output transistor T539 is the usual fault you find in the line output stage. It fails for a reason, most commonly dry-joints or alternatively the flyback tuning capacitor C538 (value depends on tube type and size), the driver transistor T534 or the line output transformer. If the line output transformer fails and the power supply continues to work you will find that T539's collector waveform is very ragged. The case of the line output transformer is often punctured: this is usually spectacular.

After replacing the line output transformer you may find that the EW correction circuit doesn't work. In this case check R583 (22Ω, safety) and I581 (TDA4950 or TDA8145 depending on tube type).

The field output stage is based on a TDA3654 chip (I561) and is fairly reliable. Its drive comes from pin 1 of I511. The field output chip and EW modulator driver chip are supplied by the U27V line. In the event of failure of I561 the 1,000μF field scan coupling capacitor C577 should be replaced.

Colour Decoder and RGB Output Stages

The chassis uses the popular TDA3562A colour decoder chip (I311). The sandcastle pulse input is at pin 7, while pin 2 receives, via C338 (10μF) and R338 (4.7kΩ), a pulse from the field output stage. Pin 1 is the supply pin (U12), the luminance input is at pin 8, chroma input at pin 4, text on/off at pin 9. The RGB outputs appear at pins 13, 15 and 17. Pin 18 receives feedback from the RGB output stages on the tube base panel for auto grey-scale tracking.

The RGB output stages operate with the U200 and U12 supplies – the latter becomes U12c after passing through L365. They are quite reliable. In the event of failure of one channel I would recommend that all the transistors (four) and diodes (three) in the relevant channel are replaced.

No Raster

If there's no raster and the c.r.t.'s heaters are alight we can assume that the line output stage is working. This will be confirmed if a reading in excess of 400V is obtained at the tube's first anode. The next checks should be on the U12 and U12c supplies on the tube base panel. If these are o.k., check that the sandcastle pulses are present at pin 7 of I311. They come from pin 17 of I511, via R319 (1kΩ). Alternatively advance the setting of the first anode control (Ug2 on the line output transformer). This will produce either a horizontal white line to indicate field collapse or a blank grey raster with flyback lines. In the latter event check that the U12 supply is spot on, as a rise will cut off I311. If the supply and the sandcastle pulses are both present and correct, replace I311. It's seldom the cause of the fault however. If a text panel is fitted it can be disconnected to establish whether the cause of the fault lies here.

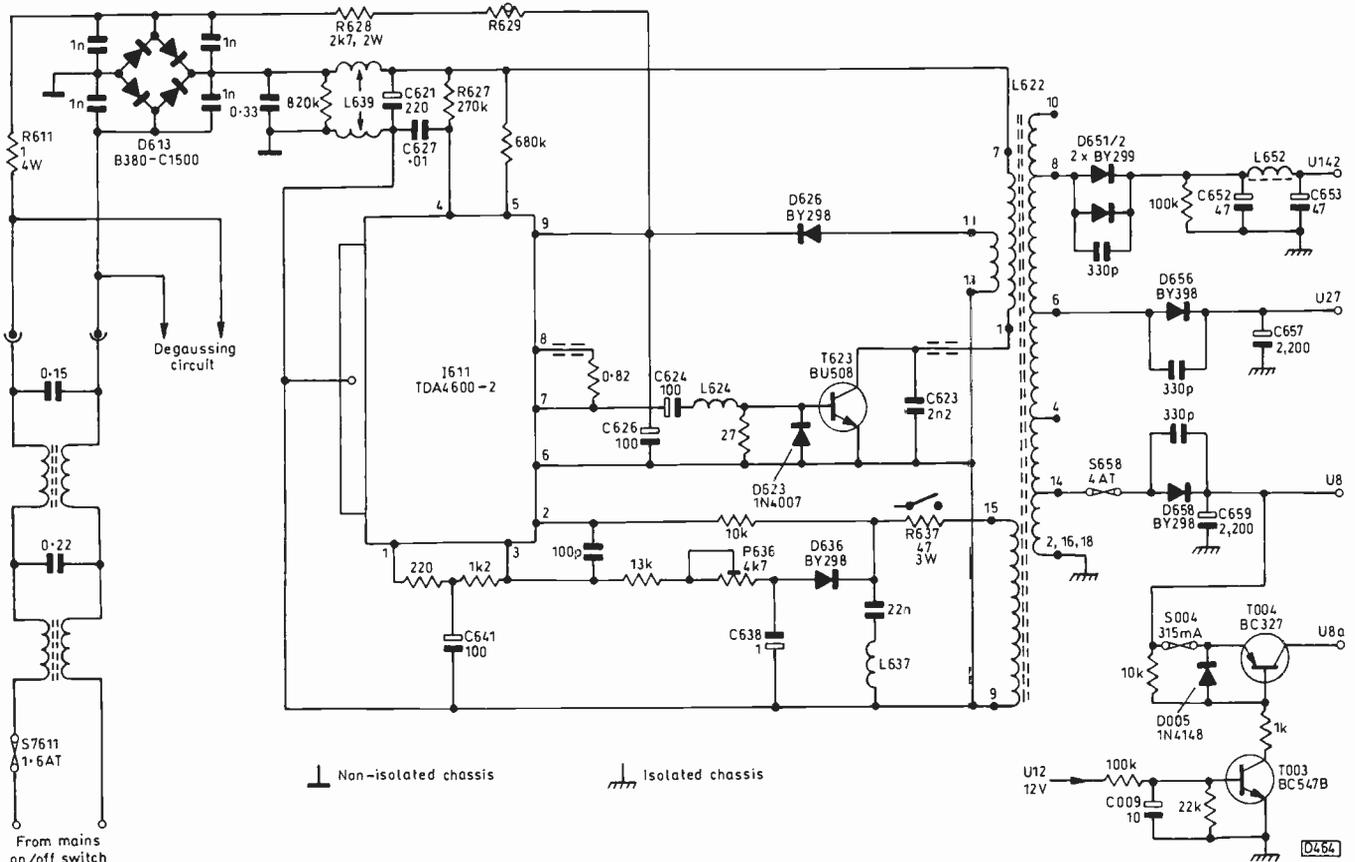


Fig. 1: The chopper power supply circuit used in the Loewe-Opta C8001 chassis.

Audio Stages

Three types of audio output stage may be encountered: mono, stereo with the output stage on the main panel, and stereo using a separate power amplifier panel complete with its own power supply. The latter is found in ART 1 series models.

Tuning and Control

The varicap tuner is controlled in two ways: by band switching and by variable tuning, which is a frequency-synthesis system. Band switching is done by applying a voltage to pin 2, 3 or 4. The latter is the important one for us, as this selects u.h.f. when 12V is applied. The variable tuning voltage connection is at pin 7. Pin 6 is for the 12V supply. Pin 1 of connector St13 receives a 5V input, while pin 2 is the prescaler output to the frequency-synthesis tuning system. This output is fed via T052 to pin 18 of the SAB3034 chip I021, which controls the tuning and provides five analogue control outputs. I021 is in turn under the control of the MAB8049 microcomputer chip I011. Tuning control is via I081 (a dual operational amplifier) which combines the a.f.c. with the tuning action.

I021 provides colour and brightness control outputs at pins 6 and 5 respectively; contrast is adjusted by means of a control on the front panel.

During channel search the a.f.c. is switched off by an output from pin 21 of I011. The search stops when I011 detects a sync pulse, the memory command storing the channel in the separate memory chip I016.

The sound is muted when there are no sync pulses. Volume is controlled by the output from pin 4 of I021. In mono sets this is taken to an attenuator within the TBA120 intercarrier sound chip in the i.f. can. In stereo sets there is a more comprehensive audio control system. I021 provides bass and treble outputs at pins 7 and 8 respectively. These outputs go to I452 (TDA1524). A balance control is provided on the front panel.

Remote Control

The remote control handset is reliable and robust. Faults are usually confined to poor connections. If these can't be repaired, various pattern remote control units are available. Unfortunately they are not a patch on the original, with its buttonless keypad membrane. Most Philips remote control units will operate the set, but not always correctly. The remote control receiver is a discrete component circuit and is reliable.

Teletext Panel

Some models have a teletext panel at the side of the chassis. On it there are an SAA5230 chip, an SAA5240 chip and a memory chip – the type varies with different models. The important pins are as follows. Connector St3: pin 7 5V (U5), pin 3 8V (U8a) and pin 4 12V (U12). Connector St4: RGB outputs at pins 3, 2 and 1, blanking at pin 4.

PCB Note

The upper side of the PCB is copper clad. It's connected to chassis, which is fine until an electrolytic capacitor leaks and rots the insulation between the two sides of the PCB. To deal with this, drill out the panel and insert an insulator in the hole, then wire the component concerned into the circuit. The most common area for this to happen is around the h.t. (U142) reservoir and smoothing capacitors C652/3. The customer will usually complain of a smell before the set went off.

Spares

For technical advice and genuine spares contact Wizard Distributors, Empress Street Works, Empress Street, Manchester M16 9EN (0161 872 5438) whose friendly and experienced team are very helpful.

Long-distance Television

Roger Bunney

There was little terrestrial DX-TV reception as March was succeeded by a warmer and drier April. As far as Band I is concerned Sporadic E propagation was non-existent, though the number of short- to medium-hop meteor scatter (MS) signal pings was perhaps greater than during the previous month. During the final two weeks of March relatively settled high-pressure systems developed over the UK and Western Europe. These produced the hoped-for warnings on local TV here about the possibilities of interference from Continental TV! Signal levels from the nearer French and Benelux Band III/u.h.f. TV stations lifted somewhat, but nothing substantial enough to be called an opening took place. Those monitoring conditions along the east coast found that Dutch stations lifted above the noise but did little more.

Following the indifferent 1994 Sporadic E season and the deadly winter period I feel that the decision to include satellite TV topics in this column was right. Even Ryn Muntjewerff, an expert who has the time available, reports that "TVDX is still dead". Incidentally he has enjoyed considerable media exposure in recent weeks following an item on his DX-TV activities on Dutch TV. Articles followed in Dutch and Belgian newspapers. Ryn is also noted in the horticultural field, having cultivated several new strains of dahlia. A man of many, diverse interests.

A letter from Alex Gordon, now resident in Oslo, provides an update on the NRK Band I transmitter situation. Telenor Network Services, which operates the NRK, TV2 and Radio P4 transmitters, has confirmed that Band I TV broadcasting is to be discontinued and the spectrum allocated to other uses. The speed at which this takes place will depend on u.h.f. transmitter planning and funding arrangements. Three Band I transmitters are due to close this year, but the use of satellites for studio-transmitter links may accelerate the programme. Some Band I transmitters are to

be preserved as museums, and there are thoughts about maintaining a single operational Band I transmitter for European DX viewers and "for old times' sake". Telenor cannot supply a list of closure dates since the phase-out depends on NRK's funding facilities.

Satellite Sightings

Orion 1 at 37.5° is providing interesting material, giving European access to numerous US teleports in the Rockies. It's providing cost-effective backlinks for several European broadcasters, including the BBC and ITV companies. Starbird has a permanent Telecom band lease. On several occasions UK broadcasters have used 12.520/12.585/12.665GHz vertical for OB feeds. The former was used on March 7th for an interesting link to a bridge across the Rhine (Ardennes/Rhineland), the scene of a major battle fifty years ago. Corporate feeds are also common, for example the seventh annual AT+T Quality Conference on the 22nd.

Perhaps the most interesting sales presentation however was via Intelsat K (21.5°W) when Kodak featured new products being developed in conjunction with Hewlett-Packard. These included a camera which could feed a PC or e-mail images. A small 'wardrobe' containing CDs able to store some 500 million images with almost instant access was also shown. "Home imaging is the growth market" was the theme here.

Three cheers to Eutelsat on the successful launch of Hot Bird 1 on March 28th. This launch was carried live via Telecom and Eutelsat craft and, unusually, Astra (in the German Bayern Sace Night programme). Hot Bird testing began in April, with an expected on-air date in early May.

Footage relating to the Romanian Airbus disaster on March 31st was first monitored as off-air news via the Reuters 13°E lease. A French SNG operation was seen that night on Eutelsat Telecom 16°E, providing a late night news programme feed: the facility identified itself as ENG VIDEOHOUS.

Several readers have commented on yet another Billy Graham evangelical mission, which was linked across the Atlantic via both Orion and Intelsat K. It continued over March 14-17th, with sections recorded and later played out: Eutelsat II F4 (7°E) was used for the playouts, which were in clear PAL with various language blocks using four subcarriers.

In the late afternoon of March 15th John Locker (Wirral) received "UKI # 34 SKY-SNG Southampton" via Eutelsat II F3 (16°E) and queried whether I'd seen this local SNG feed on the arrest of Bruce Grobbelaar. For once, yes – the Southampton Civic Centre is only some 100m from my place of work! Interesting that one SNG truck was using a



Left: Suisse 4, on-air from 0600-1800 with Euronews and, in the evenings, sports/TV show repeats, opened on March 1st. Centre: Veteran Dutch TV DXer Ryn Muntjewerff in action. Right: A Dutch teletext information page providing addresses of DX clubs.

conventional prime-focus dish while an adjacent unit used a squarish, offset dish in shallow-mode mount, with the offset arm high above the dish surface.

Roy Carman (Reigate) has queried the morse (CW) signals carried by PAS-1. John Locker checked this out and found that the feed decoded "GE VVES NJ WB" followed by a string of numbers. It's thought that this is a coded weather broadcast originating from New Jersey. Morse has also been noted at times via Orion.

John Adams (Oxford) has supplied an answer to our query on page 184 of the January 1995 issue. The Russian script on the right-hand photograph translates as "Experimental Broadcasting" (top line), "International Federation of Information Broadcasting" (circle) and "Tel/fax (0172) 65-91-01" (bottom line). The area code is not known - it's neither Moscow nor St. Petersburg. Many thanks, John.

We've been through a period of solar outages (signal loss due to the Sun's position relative to the receiving site) recently: those at home during the day have been able to see the effect as the Sun crosses behind the Clarke Belt, giving rise to high noise levels when the sun is in line with dish.

News Items

India: The third Doodarshan TV network (DD3) was given the go-ahead in late March.

Germany: The Sat-1 channel is now transmitted by Saksen (Leipzig) on ch. E26 and by Chemnitz-Geyer on ch. E56, both at 100kW e.r.p. Hamburg 1 now transmits from the Heinrich-Herz Tower on ch. E34, e.r.p. unknown. Our thanks to the BDXC for this information.

Middle East: The State of Ajman (UAE) will open a fourth TV station next year, with two channels (one for Arabic and the other for foreign-language programming). National Television (Sudan) has purchased eight new transmitters to increase the first programme coverage.

Digital Audio Broadcasting (DAB): Alcatel Espace is to start DAB via satellite to three main global areas by early 1998. There will be up to 96 radio channels aimed at Central/South America via Caribstar, Africa/Middle East via Afristar and Asia/Pacific rim via Asiastar. Motorola is developing a portable satellite receiver (Starman) for the project. It will use a small, credit-card sized aerial, operate within the 1,450-1,495MHz band and will also provide conventional LW, MW, SW and f.m. reception. WorldSpace (USA) will operate the system and has already signed up Radio Nederland and the Voice of America.

Modifications to the Echosphere SR50

The manually-tuned Echosphere SR50 receiver is extremely popular with UK sat-zappers, mainly because of its 'DX' features and extensive front panel controls, in particular the large knob for tuning across the 950-1,750MHz i.f. spectrum. It was made by Benjamin Electronics in Taiwan, with a pretty basic design but good reliability. The unit was primarily intended for C band reception in remote regions, where most viewers will have a dish of just sufficient size. Thus good weak-signal performance at a price is required with a receiver that can operate under hot and humid conditions without tuning drift. For DX purposes the receiver offers quick tuning, bandwidth adjustment and instant manual control of numerous functions.

The performance of the basic SR50 can be improved at little cost by carrying out some simple modifications. A couple of more expensive modifications will further enhance its weak-signal performance. The details are as follows, starting with the simple mods. The enthusiast can

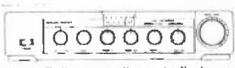
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include what he considers worthwhile.

The first step is to remove the four screws, two each side, that retain the slide-over metal cover. Draw it backwards and upwards carefully to reveal the main PCB and other components.

Heavy a.f.c. is a feature of the basic SR50. As you tune away from a locked channel the tuner clings to the strong signal until the a.f.c. suddenly releases the tuning. The tuner then flicks off to display noise. This makes tuning to a weak signal adjacent to a strong one tiresome. To remove the a.f.c., proceed as follows.

Locate the tuner, a single-conversion type that converts the i.f. band from the LNB to the second, fixed i.f. of 70MHz. Note the tuner's connections. From left-to-right, viewed from above, these are: (1) a phono socket; (2) another phono socket, for the 70MHz i.f. output; (3) four feedthrough pins for, respectively, the tuning voltage, a.g.c., +12V and the 15/18V LNB supply/switching feed. Cut off and trim back the tuning voltage lead.

Cut off and trim back the three wires connected to the tuning potentiometer. Locate U9, an LM7824 24V voltage regulator that's clamped to the heatsink. Take a single lead from its output pin, feed it beneath the PCB and connect it to the right-hand (viewed from behind) tuning potentiometer tag. Run another wire from the wiper (centre tag) to the tuner's tuning voltage feedthrough pin. Add a decoupling capacitor, say 0.1µF, 50V, from the potentiometer's centre tag to chassis. Earth the remaining (left hand) tuning potentiometer tag. You now have a tuning voltage supply without a.f.c.

Since I use three of these receivers, and provide the LNB supply and the polariser control from an outboard unit, I've

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fitted LNB voltage on/off switches to all three of them. Simply drill a small hole in the rear panel near the mains input lead. Fit a small toggle switch and take the LNB supply via this switch. The SR50 has no delicate coil adjustments, so careful drilling will not affect the alignment – take care to avoid the metal drilling debris falling between i.c. pins etc.

Locate U16, a free-standing voltage regulator on the main PCB, adjacent to the heatsink. It runs very hot. Fit a slide-on heatsink, taking care not to contact nearby components.

The receiver has a three-wire mechanical polariser control circuit. If an external interface box is fitted, to provide two-wire ferrite polariser control, the skew may require modification to restore the front control centre peak position. Find R105 (3.3k Ω) which is mounted next to a 100 Ω resistor alongside U14/D5. Add a 1k Ω resistor in parallel with R105.

Two small 1mm sockets can be fitted to the rear of the unit, one connected to chassis and the other to tuner's tuning voltage feedthrough pin. A digital voltmeter connected between these sockets will provide an accurate voltage/frequency indication. Compile a table which will give you accurate tuning by voltage readout.

Now to the more expensive modifications. The receiver is described as "low threshold". This is given as 7dB typical in the specification and is rather high by today's standards. Eurosat, a trade distributor of satellite equipment, offers via dealers a threshold assistance device (TAD) which, when fitted, produces a remarkable improvement, reducing the threshold to 4dB. The small PCB has to be fitted internally. It has a large hole drilled for a 100 Ω tuning potentiometer and a smaller adjacent hole for the in/out switch.

The TAD costs about £80, which is expensive for a

small PCB with a single i.c. and a few other discrete components. To my knowledge however it's the only such board available. It comes with instructions for fitting to the SR50. I've fitted TADs in about a dozen SR50s, all of which have then shown a dramatic improvement in weak-signal reception.

It's inconvenient to have the in/out switch at the rear. So drill a 1/8th inch hole, carefully, between the i.f. bandwidth control and the main tuning knob, level with the top of the knob. You are drilling into soft plastic, so take it easy. Continue to drill into the receiver, to provide a guide hole on the internal metal chassis. This will be drilled out to fit the TAD in/out switch. Now drill 1/8th inch holes above and below the first one, which will later be carefully elongated, using a small flat file, to enable the chassis-mounted switch to appear through the fascia. Remove the front fascia by unscrewing the six cross-headed screws, three at the top and three under the edges of the plastic fascia. Lift off the fascia by carefully pulling it forwards to expose the chassis wall. Drill out the hole for the switch, and connect to the TAD PCB. File out the elongated hole in the fascia and check for switch lever clearance, then refit the fascia.

Before refitting the fascia the following simple modification suggested by Berry Habekotte can be carried out. Replace the 10k Ω user audio bandwidth control, fitting instead a 22k Ω linear potentiometer. This will provide even more bandwidth reduction, to assist with really weak audio carriers.

The final modification is a major though less expensive one, depending on your sources of spares. The tuner in the SR50 converts from the incoming first i.f. of 950-1,750MHz to the second i.f. of 70MHz. With very strong signals, or if you use a large dish, an image frequency signal may appear 140MHz away from the main signal (i.e. 2 x 70MHz = 140MHz lower). The a.g.c. preset at the rear may not be able to remove this interference.

In the earlier manual Echosphere SR1000 the tuner converts from the LNB i.f. to u.h.f. then, via a small soldered-on down-converter, to 70MHz, i.e. a double-conversion system is used. Obtain one of these double-conversion systems. Echosphere may be able to help, or try Sendz or obtain a scrap receiver. I've used the SR1000 type tuner as a service spare, but it costs £27 from the manufacturer – it comes on a PCB package with a prescaler circuit etc. for another type of receiver. If an SR1000 type tuner is obtained, it can be fitted directly as a replacement in the SR50 once the LNB F socket has been lengthened by 0.25in. towards the nearest corner. Wiring is almost identical to the SR50 type tuner except that the a.g.c. and 12V connections are reversed. A 12V feed is necessary at the single feedthrough connection on the 70MHz down-converter box.

Once the new tuner has been fitted, switch on and readjust the a.g.c. potentiometer. You'll find that the selectivity and sparkie performance have been improved and image problems removed. The S meter needle may now travel to full scale. To return to a more gentle life style add an 820 Ω resistor in parallel with R102, which is on the front side of the PCB directly behind the skew potentiometer.

This concludes a range of modifications that greatly improves the performance of this popular DXing receiver.

Satellite News

Intelsat 705 is now in position at 50°W, providing both C and Ku band links across the Atlantic: the extreme west slot relative to the UK makes links with US West Coast and South American teleports a simple one-hop task. Intelsat

704 is now in operation at 66°E, providing high-level (+50dBW) signals across Europe and the UK via one beam and similar-level signals to the Middle East via another one. The latter enables the current 28 Orbit International compressed video channels to be received using small ku-band dishes, essential now that several Middle Eastern governments have made it illegal for people to use large C-band dishes for Orbit reception in Band C via Arabsat facilities. We have reports of good Ku-FSS band reception in eastern UK using smallish dishes. Western UK/Ireland is on the horizon, and with such a low elevation reception will be difficult if not impossible.

Israel's Channel 3 has launched an Arabic-language service, The Peace Channel, with up to five hours of programmes daily.

South Korea's first satellite, Mungunghwa, is due for launch shortly at Cape Canaveral. It will provide TV coverage throughout the country. A second, reserve satellite is to go up around Christmas time.

Zimbabwe is planning to start satellite TV services,

initially so that the first programme Television 1 can reach difficult areas. It's hoped to add a Television 2 channel and a PAY-TV channel by early 1996.

ABC (Australia) intends to launch two satellite DTH services, with nationwide coverage, though no opening date has been announced. Australian Information Media (AIM) will provide a 24-hour news channel and there will be an entertainment channel using material from ABC and Nickelodeon. The services will be available to cable systems, MMD systems and domestic dishes.

The very successful US DirectTV digital TV service is to launch a Latin American version next year. Galaxy Latin America will provide 140 TV and 60 music channels financed by Mexican, Brazilian and Venezuelan interests. Sony and Thomson have landed the contract to supply receivers and dishes in the region.

A new French teleport is being operated by PanAmSat at the Palais des Congres, Paris. Its first contract is to relay the French TV5 service to Montreal via the PAS-1 satellite at 45°W.

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.

Wanted: MM74C922N i.c. or complete push-button panel with this i.c., as used in the Salora Model 1G5M. A.J. Wetherall, 38 Roman Bank, Long Sutton, Lincs PE12 9LA. 01406 362 796.

Wanted: Remote control unit for the Connexions CX8520R receiver/positioner. I have for disposal a Barco professional multi-standard CTV set with a PSU fault. Chris Thorne, 27 Edgcombe Green, St. Austell, Cornwall PL25 5EE. 01726 67 585.

Wanted: Control door for the Solavox 26SR09 TV receiver. Roy Berwick, 493 Romsey Road, Maybush, Southampton SO16 9GN. 01703 787 033.

Wanted: Service manual/circuit diagram (photocopy will do) for the ITT MD120/0R 12in. monochrome TV set. E.T. Plumb, 44 Railway Road, Downham Market, Norfolk PE38 9EB. 01366 384 099.

Wanted: Circuit diagram (photocopy o.k.) of the 6-way touchbutton and neon programme selector board used in the Sony Model KV2020. Nicholas Arnold, 195 Hubert Road, Selly Oak, Birmingham B29 6ES. 0121 415 5452.

Wanted: Circuit diagrams for the Prinzvision TV172 mono TV receiver and for Telecom etc. pushbutton tele-

phones, in particular the PBT131 code 617/1/06606-000-009. Also require two 200+400+100µF multicaps for the Rediffusion Mk 13 mono chassis, and a remote control unit for the Goodmans 20XRT teletext receiver (listed in the manual as E220 - or an equivalent). R.E. Bailey, 22 Grebe Close, Waterlooville, Hants PO9 9UT. 01705 783 811.

Wanted: Reasonably priced LOPT for the Philips CX1150/056 6in. colour portable, new or ex-equipment. Also help with clearing a fault in the digital signal processing circuitry used in the Fidelity Model C20T04. John E. Martin, 161 Francis Close, Ewell, Epsom, Surrey KT19 0JT. 0181 337 9730.

Wanted: Large L-shaped board, marked PM01 YK308V131-4, for the Philips VR6490 VCR. A faulty one would do so long as the tracks are undamaged. Also require a Sony special power supply plug for the Beta portable F100. B. Potter, 10 Holmbury Close, Southgate, Crawley, West Sussex RH11 8TG. 01293 513 787 (evenings).

Wanted: Tuning potentiometer bank for the Philips Model 14C825/15 (KT2 chassis). J. Anthony, 77 Brayfield Road, Littleover, Derby DE23 6GT. 01332 772 361.

Wanted: Working chopper PCB for the Hitachi Model CBP260 (NP9A chassis). Also a type FCG2045AL Samsung LOPT. R. Kusz, 130 McCracken Drive, Viewpark, Uddington, Glasgow G71 5ND.

Wanted: 12V mechanical type VHS VCR, working or not. I have some items for disposal. M. Freeman, 283 Blackburn Road, Haslingden, Rossendale, Lancs BB4 5JG.

Wanted: Circuit diagram for the

Toshiba V212/V212B VCR, or type and function of i.c. IT60 on the print side of the main PCB. Kenneth Cargill, 1 Stradowen Drive, Strathfoyle, Londonderry BT47 1XN. 01504 861 268.

Wanted: Service manuals/data for the Panasonic NV8200 and NV7000EM (multi-standard version) VCRs, the Philips VR2324 VCR and Telequipment D31 scope. Also a timer flap for the NV7000. T. Martini, 122B Cannon Street Road, Shadwell, London E1 2LH. 0171 702 8774 (home), 0171 251 3196 (whorshop).

Wanted: Service manual or circuit diagram for the Hitachi HA5700 amplifier (a photocopy will do). E.T. Plumb, 44 Railway Road, Downham Market, Norfolk PE38 9EB. 01366 384 099.

Wanted: Service manual for the Philips VR6470 VCR, also a copy of the March 1992 issue of *Television*. Antonio Alvoeiro, Av. Afonso Costa, 15B, Paivas-Amora, 2840 Seixal, Portugal.

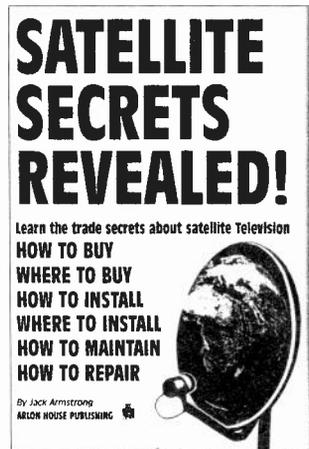
Wanted: Video drum for the Philips N1700/15 VCR. N. Smith, Cherry Hinton, Watermill Lane, Beckley, Nr. Rye, East Sussex TN31 6SH. 01797 252 399.

Wanted: Power supply circuit diagram (usable photocopy would do) for the IBM 515 4002 colour monitor. E. Dicker, 25 York Avenue, Little Lever, Bolton, Lancs BL3 1EU. Fax 0161 703 7270.

Wanted: Information on the Infotec 6510 SAF fax machine. I need to know how to set the telephone number that appears at the top of the page next to the date and time. R. Morris, 24 Wootton Green Lane, Balsall Common, Coventry CV7 7EZ. 01676 533 060.

Servicing the Pace PRD800/900 Series

Jack Armstrong



The Pace PRD800/PRD900 series satellite receivers also appeared in other ranges, notably as the Ferguson SRD5, the Grundig STR1, the Maspro SRE250/S1, the Nokia SAT1600 and the Philips STU802/05M. Later receivers were upgraded to include a 2GHz tuner (refer to the serial number label). Later still the microcontroller chip was changed to provide selection of the LNB's local oscillator frequency. There was finally the PRD PLUS version, with a larger number of channels and other features.

Most faults occur because owners will insist on cooking their receivers by placing them on top of other warm equipment or inside a hi-fi cabinet with the doors shut. As a result the electrolytics dry out, providing a variety of symptoms. Not least of these is a dead receiver.

Power Supply Problems

When a receiver comes in with a dead power supply the first step to take is to replace C7 and C8, which should be 10 μ F, 50V, 105°C, low-ESR radial electrolytics, e.g. type 108-848 from Farnell. When C7 fails the power supply ticks but doesn't start up. C8 produces whistling.

If the fuse has melted or the surge limiter resistor R1 is damaged, don't replace them without replacing other faulty components or you'll make the damage worse. Check the bridge rectifier diodes D1-D4 for shorts and replace as necessary. Measure D1 again. If you get low resistance readings in both directions, remove the chopper transistor Q1 and try again. If D1 still measures low both ways, remove the bridge rectifier's reservoir capacitor C2 (47 μ F, 400V). Failure of the chopper transformer is almost unknown in these receivers.

To improve reliability and limit damage in the event of a mains surge Pace upgraded some power supply components. R1 should be a 10 Ω , 2W non-spiral resistor. Any other type could fail when the mains supply is reconnected. R8 began life as 0.75 Ω but was changed to 1 Ω as it tended to cause start-up failure. The fuse (FS1) was changed from a 1AT type to a 1A fast-blow type. These modifications should all be carried out when a set comes in for repair. It's also a legal requirement to hide the original fuse type on the board with a label that shows the new specification.

Resistor R14 (100 Ω) often goes open-circuit, usually because the 3.9V zener diode D11 has gone short-circuit. If D11 has failed D10 (1N4148) should also be replaced. If, when fitted, the new 1N4148 diode produces too low a forward voltage drop (around 300mV) the TEA2018 chopper control chip U1 has failed.

As the pads and tracks are very easily damaged, don't use a desoldering pump to remove the solder. Use fine copper braid; the solder wick stocked by RS and Farnell is excellent. The replacements for any components that were origi-

nally mounted flat against the board should be fitted in the same way, otherwise the tracks will crack.

Resolder all the transformer pins and the two mains input socket pins – these joints are prone to cracking.

When these matters have been attended to it should be safe to apply the mains supply to the receiver – take the usual precautions. If the power supply goes bang, you missed something mentioned above! If it fails to do anything, U1 may be faulty or there may be cracked tracks. As the cracks can be invisible, measure for continuity. If the power supply still won't start up, listen for a ticking noise which might indicate that there's a short-circuit somewhere on the main board.

If there's a ticking noise with a display segment flashing, check whether C4 is open-circuit. This is a surface-mounted 1-2nF capacitor that's next to U1. A common cause in the PLUS version is the lead of C87, next to the tuner, touching the copper ground plane on the top surface of the board.

A low humming sound from the TV set's speaker, with ripple on the picture, occurs when C2 (47 μ F, 400V) is faulty.

Miscellaneous Faults

A high-pitched hum from the speaker can be caused by overheating of C278 (2,200 μ F, 16V), which is next to REG1's heatsink. In later versions this regulator was moved to the centre of the board. A very high-pitched whistle can be caused by U5 (74LS139) or U11 (TDA6160).

Failure to respond to remote control commands can be caused by dry-joints at the photosensor or a faulty 4MHz crystal (X1).

Causes of no decoder messages are: the contrast level being set to number 1; a broken track to L20 at the front edge of the board; or failure of U20 (SP973T8C). This i.c. can also be responsible for mottling on bright colours.

If the satellite picture rolls, replace C207 (10 μ F, 25V): on revision boards A3 and A5 fit it the opposite way round to avoid reverse biasing.

If the LNB supply is stuck at 13V or 17V check Q2 (FTX749) which is at the front right corner of the PCB.

More on Satellite TV

The above notes are based on information contained in a 256-page book, entitled *Satellite Secrets Revealed!*, that's available from Davenham Satellite Systems, 1 Firths Fields, Davenham, Northwich, Cheshire CW9 8JB (telephone 01606 49 085) at £19.95 inclusive of post and packing. Send two stamps to Davenham Satellite Systems for a list of satellite TV repair kits, components and accessories. Trade enquiries welcome.

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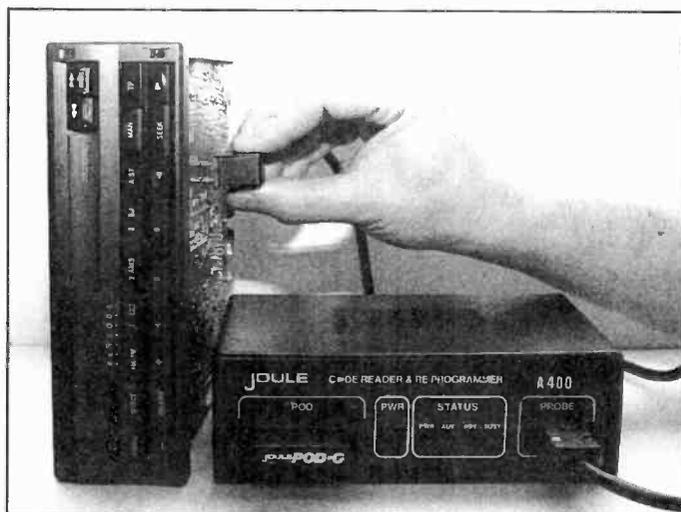
Full technical backup via a telephone helpline is offered to all registered users. There is also a scheme in place where any radios not currently included within the system will be decoded free of charge and a free copy of that software will be supplied.

Decoding a radio is simple – remove the base plate, place the probe on the PCB, press a key and the code is instantly displayed. Changing the code or fully re-programming is just as easy.

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As well as it's ability to decode and recode, the advanced design of the A-400 permits total re-programming of eeproms, lending itself for use in the servicing of television receivers etc.



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15/80H	3.83	ZSC1942	7.48	ZSD401A	0.77	BC149	0.04	B0911	0.41	BUZ80A	2.57	KSR1004	0.14	MPSA56	0.12	STR59041	9.68	TDA1770A	15.01	TEA1039	2.19
15/85R	3.84	ZSC1959	0.18	ZSD438	0.35	BC157	0.13	B0912	0.63	BUZ90	3.90	L200CV	2.19	MPSA92	0.18	STR6020	5.04	TDA1904	2.04	TEA2018A	1.70
1N4001	0.04	ZSC1969	2.48	ZSD468	0.24	BC158B	0.12	B0939F	1.61	BUZ90A	2.55	L4918	1.27	MPSA93	0.11	STR6020M1	15.05	TDA1905	2.12	TEA2029C	5.69
1N4002	0.07	ZSC1983	1.87	ZSD526	0.85	BC161	0.27	BD164C	1.18	BY127	1.16	LA1230	1.95	MR854	0.65	STRD1816	6.78	TDA1908A	1.12	TEA2031A	3.40
1N4003	0.05	ZSC2001	0.23	ZSD555	8.54	BC178B	0.18	BD165C	1.66	BY133	0.08	LA1503	1.29	MR856	0.21	STRD4420	10.15	TDA1950	1.86	TEA2164	2.96
1N4004	0.07	ZSC2060	0.29	ZSD592	0.21	BC182L	0.06	BD182L	0.66	BY164	0.67	LA3161	0.94	NE5458	3.20	TG664V	2.63	TDA2002	1.12	TEA2165	4.27
1N4006	0.06	ZSC2068	0.72	ZSD600	0.64	BC183L	0.09	BF197	0.52	BY179	0.80	LA4140	0.44	NE555N	0.37	TG676V	5.04	TDA2003	0.90	TEA2165A	9.58
1N4007	0.06	ZSC2073	0.77	ZSD613	0.94	BC183LB	0.10	BF199	0.04	BY184	0.42	LA4270	2.73	NE556	0.43	TG9053P	0.93	TDA2004	2.57	TEA2261	3.25
1N4148	0.06	ZSC2078	0.86	ZSD636	0.19	BC184A	0.05	BF240	0.43	BY206	0.20	LA4280	3.12	NE592N	1.91	TG964V	1.44	TDA2005	2.57	TEA5101A	3.95
1N4448	0.06	ZSC2120	0.23	ZSD637	0.16	BC184L	0.06	BF244	0.11	BY210400	0.19	LA4282	4.53	NE646N	4.45	TG9205AP	1.68	TDA2006	1.06	TEA5115	2.91
1N5062	0.51	ZSC2166	1.29	ZSD638	0.41	BC184LC	0.10	BF244A	0.06	BY226	0.16	LA4422	1.36	OA200	0.22	TA7217AP	1.46	TDA2009	2.29	TIC106D	0.82
1N5400	0.07	ZSC2168	3.01	ZSD639	0.60	BC204	0.14	BF245A	0.19	BY227	0.08	LA4440	2.40	OA47	0.25	TA7222	1.28	TDA2030H	1.12	TIC106M	0.75
1N5401	0.14	ZSC2229	0.31	ZSD666	0.43	BC212B	0.06	BF245B	0.41	BY228	0.38	LA4445	2.99	OA90	0.64	TA7222AP	1.87	TDA2030V	1.05	TIC225M	1.02
1N5402	0.12	ZSC2230	0.68	ZSD667	0.38	BC212L	0.08	BF258	0.04	BY2291000	0.38	LA4460	2.02	OC71	1.03	TA7227P	2.29	TDA2040H	2.11	TICP106G	1.95
1N5404	0.13	ZSC2236	0.36	ZSD669A	0.64	BC213	0.11	BF324	0.12	BY229600	0.92	LA4461	2.05	P600A	0.33	TA7233P	1.97	TDA2170	3.25	TIL111	0.64
1N5406	0.12	ZSC2240	0.17	ZSD716	1.46	BC213L	0.04	BF338	0.43	BY2300	1.02	LA4475	3.09	PC814	1.29	TA7240P	2.74	TDA2270	2.45	TIP110	0.36
1N5408	0.12	ZSC2271	0.36	ZSD718	2.21	BC214C	0.08	BF393	0.17	BY238	0.43	LA4476	3.74	PCD8582P	3.54	TA7250	4.07	TDA2530	4.24	TIP112H	0.95
1N914	0.04	ZSC2274	0.35	ZSD734	0.26	BC214E	0.09	BF420	0.21	BY250	0.14	LA4508	2.13	PIC16C57XTS0	6.61	TA7250BP	4.49	TDA2540	1.12	TIP120	0.57
2N2222	0.22	ZSC2278	1.29	ZSD762	1.80	BC237B	0.08	BF421	0.19	BY255	0.14	LA4700	4.27	R2M	0.67	TA7251BP	4.40	TDA2541	1.80	TIP121	0.42
2N2222A	0.23	ZSC2314	0.38	ZSD820	5.06	BC237C	0.08	BF422	0.24	BY258	0.15	LA4512	0.72	R4050	3.04	TA7270P	1.59	TDA2576A	5.95	TIP122	0.42
2N2369A	0.34	ZSC2320	0.19	ZSD837B	1.12	BC238	0.11	BF423	0.14	BY299	0.14	LA6324	0.84	R4051	3.18	TA7271P	2.79	TDA2577A	4.25	TIP125	0.41
2N2907	0.20	ZSC2335	1.56	ZSD856	1.03	BC238A	0.06	BF458	0.31	BY359	1.86	LA6358S	0.82	RB156	2.40	TA7273P	4.10	TDA2578A	4.27	TIP127	0.47
2N3053	0.38	ZSC2458	0.14	ZSD863	0.35	BC238B	0.06	BF459	0.29	BY398	0.18	LA6510	2.94	RC4558	0.48	TA7274P	2.74	TDA2579A	4.97	TIP132	0.65
2N3055	0.86	ZSC2482	0.35	ZSD869	5.18	BC238C	0.07	BF469	0.34	BY399	0.23	LA7520	2.77	REG8ABY10	14.80	TA7280P	2.98	TDA2581	4.27	TIP137	0.48
2N3442	1.00	ZSC2500	0.33	ZSD870	3.81	BC239	0.04	BF470	0.33	BY0141	0.26	LA7800	1.46	RGP10E	0.26	TA7281P	2.98	TDA2581Q	2.99	TIP142	1.14
2N3772	1.24	ZSC2570A	0.30	ZSD871	5.08	BC239C	0.06	BF480	1.10	BY033D	0.14	LA7801	1.41	RGP15G	0.33	TA7283	2.23	TDA2582	2.05	TIP2955	0.83
2N3773	1.01	ZSC2603	0.25	ZSD879	0.35	BC252B	0.07	BF493	0.36	BY033J	0.27	LA7820	2.71	RGP15M	0.24	TA7288P	2.04	TDA2593	0.76	TIP29C	0.31
2N3819	0.55	ZSC2655	0.31	ZSD880	0.36	BC258	0.09	BF494	0.12	BY033M	0.21	LA7830	1.46	RGP15M	0.44	TA7299P	2.65	TDA2594	2.21	TIP29E	0.47
2N3904	0.32	ZSC2660	2.93	ZSD882	0.46	BC261B	0.27	BF758	0.32	BYV10-40	0.38	LA7835	1.63	RGP30M	0.30	TA7317P	0.93	TDA2595	3.17	TIP3055	0.94
2N4123	0.30	ZSC2724	0.19	ZSD898B	6.41	BC300	0.48	BF759	0.32	BYV55B	0.25	LA7837	1.63	RM11C	1.71	TA7609P	2.75	TDA2600	3.74	TIP30C	0.17
2N4401	0.08	ZSC2979	2.74	ZSD965	0.67	BC301	0.28	BF760	0.26	BYV95C	0.21	LA7851	2.82	S2000A	1.98	TA7680AP	4.55	TDA2611A	0.64	TIP31A	0.30
2N5296	0.69	ZSC3117	0.60	ZSD973	0.38	BC303	0.24	BF762	0.30	BYV96G	0.27	LC7132	3.76	S2000A3	2.52	TA7698AP	4.41	TDA2611Q	1.32	TIP31B	0.33
2SA1013	0.35	ZSC3153	2.40	ZSJ115	6.41	BC307	0.06	BF788	0.52	BYV96E	0.52	LED3G	0.10	S2000AF	1.68	TA7705P	1.70	TDA2653A	2.99	TIP32A	0.77
2SA1015	0.11	ZSC3156	6.61	ZSK1117	3.06	BC307B	0.06	BF869	0.25	BYW34	0.36	BYW34	0.10	S2055AF	2.02	TA7769P	3.01	TDA2655B	19.93	TIP32C	0.41
2SA1015GR	0.11	ZSC3199	0.43	ZSK1168	6.41	BC307C	0.15	BF869S	0.38	BYW56	0.42	LF351	0.89	SAA129302	8.69	TA7778P	5.11	TDA3190	1.27	TIP32C	0.40
2SA1020	0.44	ZSC3225	0.50	ZSK68	0.52	BC308	0.11	BF871	0.41	BYW76	0.31	LM1203	10.47	SAA129303	10.25	TA7784P	2.25	TDA3301B	9.40	TIP35C	1.39
2SA1029	0.26	ZSC3242	0.19	ZSK727	8.12	BC308A	0.09	BF959	0.18	BYW95C	0.65	LM1303N	0.88	SAA5012	1.34	TA8200AH	4.95	TDA3330	12.29	TIP36C	1.37
2SA1048	0.19	ZSC3311	0.29	ZSK794	6.41	BC308C	0.06	BF960	0.30	BYW96E	0.94	LM3177	1.29	SAA5243PE	10.87	TA8201	3.93	TDA3505	2.40	TIP41A	0.41
2SA1115	0.18	ZSC3355	0.96	3054	0.62	BC309	0.04	BF966	0.26	BYX5600	0.23	LM324N	1.48	SAB3035	1.71	TA8205	3.93	TDA3541	0.98	TIP42C	0.43
2SA1123	0.59	ZSC3358	0.69	3K888	1.54	BC309C	0.14	BF970	0.30	BYX71600	1.45	LM339N	0.31	SG264A	11.57	TA8205AH	4.10	TDA3560	2.96	TIP42A	0.52
2SA1286	0.60	ZSC3423	0.60	741500	0.21	BC317	0.23	BF934A	0.78	BZV10	1.08	LM340T	0.42	SGSF344	7.28	TA8207	2.74	TDA3561A	4.79	TIP42C	0.43
2SA1301	3.37	ZSC3460	2.80	7415247	0.62	BC327	0.10	BF939	0.43	CD4001	1.21	LM358N	1.40	SL1430	1.53	TA8210H	4.79	TDA3562A	3.90	TIP47	0.51
2SA1306	1.13	ZSC3468	0.60	7805	0.78	BC327B	0.17	BF990	0.69	CD4008	0.31	LM380N	1.03	SL1431	1.70	TA8215H	4.79	TDA3562APH	5.18	TIP761A	1.58
2SA1370	0.43	ZSC3502	0.62	7806	0.60	BC328	0.07	BF990A	0.68	CD4011	0.21	LM386M	0.57	SL1432	8.54	TA8216H	8.01	TDA3562ATF	4.93	TIP791A	1.25
2SA1489	2.40	ZSC3656	1.18	7808	0.72	BC337	0.09	BF991	0.60	CD4013	0.45	LM393	1.63	SL1471	1.70	TA8220H	7.69	TDA3565	2.95	TL062	0.60
2SA1769	0.52	ZSC3679	3.59	7809	0.69	BC337L	0.22	BF991A	0.92	CD4016	0.14	LM393N	1.19	SN76705AN	1.70	TA8221H	6.56	TDA3566	5.98	TLO71	0.69
PSA562	0.17	ZSC3788	0.77	7810	0.52	BC338	0.06	BF996	0.55	CD4017	0.47	M10481	8.54	STA341M	3.35	TA8221L	7.19	TDA3571BQ	9.71	TLO72	1.03
2SA608	0.24	ZSC3795	1.97	7812	0.30	BC368	0.25	BFW16	2.16	CD4024B	0.23	M19281	1.88	STA441C	4.51	TA8410C	4.27	TDA3576B	11.31	TLO72CP	0.53
2SA673	0.12	ZSC3795B	1.64	7815	0.82	BC369	0.17	BFW92A	0.52	CD4047	0.45	M29381	23.49	STK4122H	6.70	TA8691N	7.01	TDA3640	5.92	TLO74	1.15
2SA684	0.60	ZSC3807	0.84	7824	0.31	BC372	0.62	BFY51	0.39	CD4049	0.26	M91	7.94	STK4132H	8.89	TA8550B	0.24	TDA3650	9.91	TLO82CP	0.69
2SA733	0.17	ZSC3853	3.34	7805S	0.26	BC461	0.31	BR100	1.21	CD4053	0.39	M49461	5.65	STK4141H	8.12	TA8550C	0.30	TDA3653	3.90	TMP74C32AP8188	1.88
2SA769	1.29	ZSC3883	5.92	7805O	0.35	BC517	0.14	BR101	1.15	CD4060B	0.76	M51387P	10.68	STK4141V	11.03	TA85120	0.53	TDA3653B	2.57	TIP137C	15.19
2SA794	0.91	ZSC3892A	4.74	7905	0.35	BC546A	0.07	BR103	0.53	CD4066	0.30	M51393AP	1.64	STK4142H	9.40	TA85120B	0.65	TDA3653C	1.37	TMP74C32AP8189	1.88
2SA844	0.26	ZSC3973B	2.57	7915	0.62	BC546B	0.12	BR303	1.22	CD4070	0.21	M52181	4.59	STK4152H	10.68	TA85120S	0.89	TDA3653CQ	2.57	TIP137C	15.19
2SA872A	0.35	ZSC4106	2.05	AA119	0.36	BC547	0.11	BRX44	1.02	CD4093	0.32	M52311	1.36	STK4162H	10.48	TA85120T	0.51	TDA3654	1.34	TMP74C34AN3555	1.88
2SA900	0.67	ZSC4204	0.38	AC126	0.37	BC547A	0.04	BRX46	0.31	CD4094	0.36	M54519P	2.37	STK4171H	13.20	TA85120U	0.40	TDA3654Q	2.23	TIP137C	16.63
2SA916	1.14	ZSC4517	4.70	AC127	0.11	BC547B	0.11	BRX49	0.43												

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TV Fault Finding

Reports from Philip Blundell, AMIEEIE, Chris Watton, Michael Dranfield, Gerald White, Denis Foley, Richard Newman, Tony Ashworth, Glyn Dickinson, Owen Green and Russell J. Fletcher

Toshiba 261T4B

If the line output transistor Q404 has failed and the result on fitting a replacement is no picture, low e.h.t. and the 140V supply low, check whether R481 (2.4Ω safety type, part no. 24983249) is open-circuit. Because of the way in which the combined line output/chopper transformer works, the 140V supply will read approximately 60V when R481 is open-circuit. **P.B.**

Philips KT4 Chassis

The power supply can be tricky to handle, especially if you want to run it disconnected from the load. To test the power supply separately from the rest of the receiver:

(1) Disconnect the mains supply. (2) Unplug all the power supply connectors, noting where they come from. (3) Connect a dummy load (two 60W light bulbs) between pins 1 and 4 of plug N2. (4) Connect a temporary wire between pin 1 of plug N1 and pin 2 of plug N6. (5) Connect a temporary wire between pins 3 and 4 of plug N8. (6) Connect an isolated mains supply to pins 1 and 3 of plug N7.

If the power supply is in working order the bulbs should light. **P.B.**

Hitachi C28-P759

This Salora chassis in disguise had no picture. A burning smell came from inside. We found that C525 (2.2μF, 100V) had a loose leg and was arcing. When C525 was replaced there was a picture but the width was excessive and the verticals were bowed. The BS208 EW driver transistor TB526 was short-circuit. An order for a BS208 to Willow Vale brought a Salora modification sheet and a four-legged f.e.t., type 11005. Fitting this completed the repair. **P.B.**

Grundig M82-495 (CUC3840 Chassis)

This set would intermittently become dead, then come back to life of its own accord. The fault usually occurred after a few hours' use. By leaving a meter connected to each of the power supply lines in turn we found that when the fault occurred the 12V supply went missing. D661 (BYW72) was going open-circuit intermittently. **P.B.**

Granada C16BZ4 (Salora J Chassis)

We've had three of these sets come in dead recently. With the first one the standby LED would light up after a few minutes but the power supply never got started. A check at the collector of TB701, one of the Ipsalo switching transistors, produced a 300V p-p waveform at 5kHz. Pins 2 and 3 of the hybrid Ipsalo control chip HB1 were at 7V but pins 1, 2 and 4 of the TDA2594 sync/line generator chip IC501 were at 7V instead of 11.5V. This chip should produce a line-frequency output (8μsec pulses) at pin 3. These pulses

were missing, a new chip curing the problem.

With the second set there was no waveform at the collector of TB701, so a check was made at the junction of diac DB725 and CB715 where a 15V p-p sawtooth waveform should appear. It didn't, because TB701 was short-circuit base-to-emitter. After replacing the switching transistors TB700 and TB701 (both type MJE13005) and the two 4.7μF input coupling capacitors CB712 and CB726 it was all systems go.

The third set actually produced a very dim display. The waveform at the collector of TB701 was correct and the voltages at pins 2 and 3 of the hybrid chip HB1 were also correct. The voltage at the collector of the line driver transistor TB500 was low at only 3V, while a check on the waveform at the collector of the line output transistor TB501 showed that it was of low amplitude and very messy. In this case the e.h.t. tripler was the cause of the fault. **C.W.**

Matsui 2580

These sets can go dead or into the standby mode intermittently. If the set is dead or apparently dead, with no standby LED indication, the first thing to check is the 145V h.t. voltage – at the scan coil interlock. If it's o.k. or high, check the 8.5V supply at L805. If this is missing, look at the link wire between L805 and R826. It may look o.k. but is often poorly jointed.

With sets that go into standby intermittently, check the fuseholder which may be loose. This can be confirmed by taking a close look at the fuse: if it's loose you will see small burn marks at both ends. Also the fuseholder may not be correctly connected to the PCB – the hole isn't always through the land but to the side of it. The mains input connector can also be to blame, and is often 'sparky' or the print is cracked at the point where the connector is soldered to the panel. **C.W.**

Hitachi CPT2478 (G6P Chassis)

This set was dead. Checks in the power supply showed that there was a low resistance between the base and emitter of the chopper transistor Q901, though it proved to be o.k. when checked separately. An internal short could be measured between pins 5 and 6 of the HM9205 chopper control/drive module CP901. Replacing this item restored normal operation. **C.W.**

Finlux 1000 Series (Early type)

Two types of colour decoder were used in these sets. This was an early version, with a TDA3652A colour decoder chip. The fault was intermittent colour. Tapping the panel, as we do, gave rise to suspicion that there were dry-joints. But after a little probing we found that the reference oscillator's trimmer Ct12 (6-30pF) was noisy. To set this up after replacement, simply link pins 24 and 25 and 1 and 5 of the

i.c. together and adjust Ct12 for near stationary colour. Then remove the links. C.W.

Sharp C1001

This 10in. mains/battery portable, with an orange cabinet, produced an excellent picture apart from a large black thumbprint at the top of the screen and a missing corner. The symptom didn't vary at all. Its cause turned out to be R429 in the blanking circuit. It had gone high in value. C.W.

Hitachi CPT2198 (G8Q Chassis)

The sound was o.k. and the channel indicator was lit but there was no life in the line output stage. A check at the base of the line output transistor showed that there was no drive here. We had to check back to the TDA2579 timebase generator chip whose line drive output at pin 11 was missing. Replacing this i.c. restored normal operation. C.W.

Bush 1452

We've had quite a few of these sets with field collapse and no sound – they appear under various brand names. Replacing the 12V, 1.3W zener diode ZD402 and R425 (10Ω, 2W) cures the fault, but we now believe that the demise of these two components is caused by C909 and C911 (both 47μF, 63V) drying out. The chopper transistor's base coupling capacitor is especially critical: as it dries up the h.t. voltage rises over a period of time from 112V to a very high level. As a result the line output transistor is sometimes damaged. If you get one of these sets my advice is to replace C909 and C911 before checking anything else. Incidentally these sets are made by 'Onwa', the maker of the Baby 10. M.Dr.

Grundig CUC70KT

For bent verticals, worse when the set is switched on from cold, go straight to C2731 (100μF, 25V) on the line/field timebase panel. M.Dr.

Osaki P10R

For field collapse with no sound replace zener diode ZD302 (12V, 1.3W) and the two 51Ω, 2W parallel connected resistors R730 and R731. M.Dr.

ITT Compact 80R Chassis

Intermittent switching to standby is a fairly common fault with these sets. The cure is to change C703 and C713 to 10μF and connect a 1.8Ω, 0.25W resistor in series with D712 (lift the cathode and add it here). G.W.

Sony KV2090 (XE4 Chassis)

For chopper and line output transistor blowing problems, replace D605 and D614 (both type RGP15J) which are connected in series with the chopper transistor and C513 (2,700pF) in the line oscillator circuit. Then resolder the stand-off resistors, using high melting point solder. G.W.

Mitsubishi CT2555

For severe vision patterning which decreases as the set warms up replace C920 (47μF, 35V) and C925 (10μF, 25V). Also check the soldering around IC902. G.W.

GoldStar Models CIT2168 and CIT2180

If the sound is muted and the set switches to standby after about ten minutes, replace the TDA1940 chip IC401 and fit a 1kΩ resistor in place of wire link J8 to improve reliability. G.W.

Mitsubishi CT2965

For no sound or vision replace IC901 which tends to suffer from intermittent shorts and R901 which goes open-circuit. If Q901 (2SD1887) is short-circuit, check whether D909 is short-circuit – it should be removed for testing as there's a low-value resistor in parallel. G.W.

Mitsubishi CT25A2STX

The job card said no sound or vision, which was true enough: when the set was switched on the red standby LED lit, then the green one, then both LEDs went out. Application of heat from a hairdryer in the vicinity of IC901 enabled the set to start up normally. By further heat and freezer testing we discovered that the cause of the trouble was the 4.3V zener diode D909. G.W.

Philips CP90 Chassis

The problem with one of these sets was intermittent failure to switch on from cold. I disconnected the scan coil plug and connected a 60W bulb as a dummy load across C2696. In this condition the h.t. was correct at 95V every time, suggesting a fault in the line output stage. Reference to Richard Newman's article in the March 1993 issue led me to check the overvoltage protection circuit however. It's based around thyristor Thy6696.

As everything seemed to be o.k. on those occasions when the fault didn't appear, I decided that it would be safe to remove zener diodes D6699 and D6700 in turn. When D6700 was removed there was correct start-up every time, though a replacement 15V zener diode failed to cure the fault. I suspect that there was a certain amount of line-frequency ripple at the cathode of D6733, because replacing C2703 (330μF, 25V) cleared the fault. As a check I measured the original component's capacitance, which measured 270μF, then put it back in which restored the original fault. D.F.

Fidelity/Murphy ZX1410 Chassis

This set came in with a washed out picture, the contrast control having very little effect. Someone had already changed the colour decoder chip so I carried out some meter checks around the contrast control. All seemed to be well here. I eventually found that C96 (0.1μF, 50V) had gone open-circuit. It's a microscopic component in the beam-limiter circuit, mounted between a heatsink and the line output transformer. I used a Philips component rated at 250V as a replacement and then had an excellent picture. R.N.

Philips CTX-E Chassis

I thought I knew these sets but was caught out by this one. It came in dead and checks showed that the BU508AF line output transistor Tr7562 was short-circuit. A replacement was fitted and some dry-joints around the line output transformer were attended to. After that the set was working again. But a week later it was back, with Tr7562 once more short-circuit. Very unusual for these sets.

As there were no obvious faults I replaced the BU508AF transistor, also the flyback tuning capacitor (C2567), and resoldered the chopper and chopper driver transformers. When I tentatively switched on all was well. The waveforms were all correct, and Tr7562 ran only slightly warm. But I was not convinced.

When I switched the set on from cold next morning there was a scream from the line output stage and all went dead. I disconnected the line output transistor, which was again short-circuit, and connected a 60W bulb across C2330b, along with a digital meter set to the peak storage mode. At switch-on the lamp lit quite brightly for a few seconds then settled down with a soft glow. The digital meter showed that the peak voltage had been around 220V, so excess voltage was doing the damage.

There's a soft-start network, consisting of C2351 (4.7 μ F) and R3351 (220 Ω), in the chopper transistor's base circuit. When checked C2351 produced a low reading of 2 μ F. A replacement allowed the power supply to start up normally. Then a new BU508AF and a long soak test proved that the fault had been cleared. **R.N.**

Hitachi C14-P216 (G7P Mk 2 Chassis)

This set was dead with just the standby LED on. A check on the 82k Ω resistors R902 and R903 in the start-up network showed that they had increased in value to several hundred k Ω . Fitting replacements got the set going again. **R.N.**

Sunkyong SCT1045R

This little 4.5in. colour TV/radio combination came in during a very slack period. Its owner said that the radio worked fine but the TV section was dead. I was a bit apprehensive about taking it on, but said that I would have a quick look.

The set was a lot easier to work on than I expected, and the nice people at Sunkyong were able to provide me with a circuit diagram. All that was wrong was that the TV switch had an open-circuit contact. Unfortunately spares are no longer available, but as it's such a neat little set I thought some improvisation might be in order. I removed the switchbank and found that the radio and TV switches are identical. What's more, different sets of contacts are used. I was able to remove both switches from the assembly and swap them over. The open-circuit contact on what was the TV switch is not used in the radio section, so I refitted the modified assembly. On test the set worked a treat, giving a very good account of itself.

I explained to the customer what I'd done. She was pleased and told me that no one else had even been prepared to look at it. A day later she returned with a bottle of wine and said she'd refer all her friends to me. A good end to a quiet week. **R.N.**

Matsui 1436

This set would work for a minute or so then cut out, with h.t. present but no line drive. A voltage check at pin 30 of IC301 showed that the X-ray protection circuit was in operation. The cause was R492 (5.6k Ω) which had risen in value. It's the lower resistor in the potential divider for the X-ray protection circuit. **T.A.**

Sony KVM2131 (BE1 Chassis)

Lines of peak white flashed at random through the picture. Scope checks showed that the video signal entering PCB B was perfect but that by the time it reached pin 15 of the

TDA3505 chip IC302 it was covered with spikes. The cause of this turned out to be transistor Q301 (JC501Q) which acts as a buffer following the luminance delay line. **T.A.**

Loewe ART S35 (66472 Chassis)

A motorboating sound came from the speaker when this set was switched on from cold. We found that the 7.5V supply was low because C671 (1,000 μ F, 16V) had dried up. We also replaced C675. **T.A.**

JVC AV25F1EK (JX Chassis)

The power supply would work for a second or so then shut down. Voltage checks showed that while the power supply worked the h.t. voltage was excessive. The 2SC1815YG transistor Q031 was the cause: it was open-circuit. **T.A.**

Matsui 1422

The problem with this set was lack of height – there was only about an inch of scan. The cause was traced to C308 (2.2 μ F) which is part of the field linearity feedback network. **T.A.**

Akura CX10

This set would come out of standby and there was h.t. at the collector of the line output transistor, but apparently no line drive. A scope check at the base of the line driver transistor showed that there was drive here, but it was at an extremely high frequency. The cause of the trouble was oscillator capacitor C308 (3.3nF, high stability) which was open-circuit. **T.A.**

Sony KVM21TU

The symptoms were a smeary picture with poor luminance. We eventually traced the cause to a dry-joint at T101 in the i.f. can on the signals board. A similar fault can be caused by dry-joints on the text panel. **G.D.**

Logik 4098 (Ferguson TX100 Chassis with Text)

This was a strange fault. The set came from another dealer with the simple (!) complaint that the remote control didn't work. He'd checked the handset on another receiver, and replaced the preamplifier and the SAA5012 decoder chip (twice). I checked the input and found that a train of pulses was present here. A clue was that the channel down button on the front panel changed the channel up. Maybe a leak on the pads was pulling down a data line? No, and neither was the text panel the cause of the problem.

Luckily we found another set and swapped over the whole tuning panel. Still no remote control! Comparative voltage checks between the two sets revealed no significant differences. The only relevant part that hadn't been changed was the mains switch. It couldn't be that, could it? It could, and it was! A very slight leak in the plastic must have confused the micro chip. **G.D.**

Matsui 1480

This set had a dark picture. Adjustment of the first anode and preset brightness controls helped, but something was still wrong with the clamping. In addition a slight hum bar could be seen at the left of the picture. Scope checks showed that there was a 50Hz waveform on the 10V line. This took us to C509 (470 μ F, 16V) which was open-circuit. **A**

replacement produced a surprisingly good picture with the presets returned to their original positions. **G.D.**

Philips K30 Chassis

These sets can still catch us out! The cause of odd screen blanking faults, very intermittent, was traced to C588 (680µF, 35V) in the supply to the field timebase. When the value of this capacitor drops to about half, the lower half of the screen disappears, the condition improving as the set warms up. C588 is mounted below the line output transformer: it usually looks sorry for itself. **G.D.**

Sharp DV5101H

Two sisters each owned one of these sets – and both broke down on the same day! The first one was dead, with a smell of burning. This is not a good sign, as a kit of parts is usually needed. Fortunately I'd already fitted this and the power supply, though in distress, had not blown up. R705, which is now fitted in series with a thermistor, was overheating dramatically. The reason was that D708 was short-circuit. When D708 and R705 had been replaced the set worked normally. Guess what was wrong with the second set! **G.D.**

Ferguson 20C3 (TX100 Chassis)

This model has teletext and sweep tuning. The complaint was of a bad memory: the set had to be retuned after each switch off. Had this before, I thought. Back-up battery. But no, it doesn't use one. So it had to be the chip, which is expensive. A friend who does dozens of TX100s confirmed the diagnosis. So I fitted a new M293B1 chip (IC7) – but no luck! To spare you further suspense, the cause of the fault turned out to be transistor TR2017 (BC307B). It's in the read/modify circuit. **O.G.**

Sony KV2020

The symptom was no red, which is not an unusual condition. But the cause could be a handy one to remember, with other makes as well. As the picture was bright I didn't suspect the tube. Its supply voltages were normal, and there were no dry-joints. A check with the pattern generator showed that red was completely missing from the display. Yet there were correct scope waveforms all the way from the colour decoder chip to the tube's red cathode. When I cleaned the tube neck I noticed that the red gun heater was not alight. As the heaters are wired in parallel inside the tube that was the end of another sad story. **O.G.**

Hitachi CPT2174 (G6P Chassis)

This set came on for about thirty seconds, with a white raster, then tripped. We found that R771 was open-circuit and D763 leaky. These are the surge limiter and rectifier respectively in the h.t. supply to the RGB output transistors. A BY500 works all right in position D763. **R.J.F.**

Sony KV2090

When you find one of these sets dead with the usual dry-joints at R621/622 (which quite often have to be replaced because arcing has eaten the centre leg away) and a failed 2SD1497 chopper transistor (expensive! – use a BU508), don't switch on until you've checked D605 and D614. They can be short-circuit or leaky – take them out to check. **R.J.F.**

Next Month in TELEVISION

SERVICING THE MATSUI 1455

The Matsui 1455 colour portable was sold in large numbers between 1989 and 1991. It has full remote control and AV inputs, and will give good service provided care is taken over any repairs required. Tony Ashworth describes the circuitry and fault-finding procedures. The budget, non-remote control Model 1422 uses much of the same circuitry.

INTRO TO SWITCH-MODE POWER SUPPLIES

This innovative account, full of insight, by Andy Denham relates switch-mode power supply operation to some of the earliest power generation systems – the buzzer and the trembler coil adopted by Henry Ford for spark generation! Takes you from there to the latest technology in just a few paragraphs – with some interesting diagrams to illustrate what it's all about.

SERVICING THE PACE MSS SERIES

Next from Jack Armstrong, how to go about fault finding and repair with the Pace MSS200/300/500/1000 series of satellite receivers.

A CAMCORDER BATTERY DISCHARGER

To maintain a NiCad camcorder battery's full capacity it should be discharged to 0.9V before being recharged. John Cronk, GW3MEO, presents a simple circuit for the purpose based on the 555 timer chip.

COMPUTER COMMUNICATIONS AND MODEMS

Jon Lye provides an introduction to modems and computer communications software, which are likely to become important workshop tools – engineers who do not use on-line services will be at a disadvantage. Modern communications software makes modem setting up, once considered a daunting task, much easier.

MORE ON THE PANASONIC ALPHA 4 CHASSIS

How to find your way around the signals circuitry – tuner, i.f., Nicam, AV switching and teletext.

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Installing a CD-ROM Drive

Part 2

David Botto

In Part 1 we described how to install the CD-ROM drive and set up the software. The next job in the project is to install and set up the Creative Labs SB1600 sound card.

Preparation

Make sure that the PC is switched off, and remove the power plug from the wall socket. Before the sound card is installed its hardware settings must be checked. The 'jumpers' on the card are mainly two-pin types with enabled and disabled positions. Fig. 1 shows the layout of the SB1600 card with its jumpers in their default positions.

The jumpers enable the hardware settings to be defined. They are usually set to the default positions and you prob-

ably won't need to touch them. If you do need to change a setting, pull off the block gently then push it on to appropriate pins.

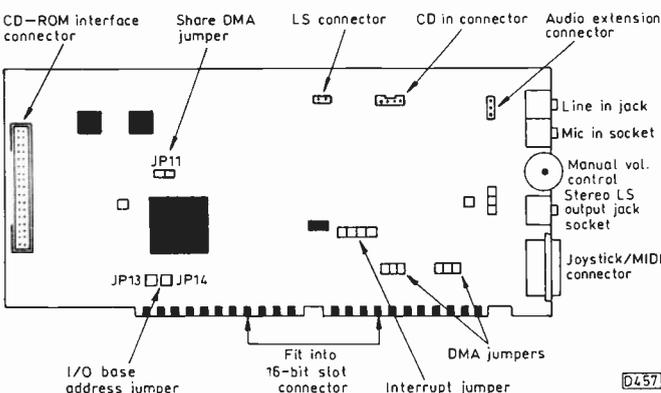


Fig. 1: Layout of the installation/user features on the sound card.

ably won't need to touch them. If you do need to change a setting, pull off the block gently then push it on to appropriate pins.

I/O (input/output) addresses are to areas of the PC memory. They enable it to distinguish between the various peripheral devices connected to the system when data is sent or received. Ranges are 220H-207H for the game port, 220H-22FH for the sound interface (220H default) and 388H-38BH for the f.m. music synthesizer.

The IRQ (interrupt) line is used to tell the PC's central processor unit that a device wants to send or receive data. Five is the factory default.

The DMA (direct memory access) line is used to transfer digital data to the PC's memory directly. The default position is one. DMA sharing enables the sound card to share the line with another device - the default position disables the sharing.

If your PC has a joystick port, the sound card's joystick port setting enables it to be disabled. The factory default position enables the joystick port. There's no need to have a

Installing the Sound Card

It's important that you wear an antistatic wrist-strap when carrying out this installation.

Locate an empty 16-bit expansion slot in the PC. Knock the metal endplate from the selected slot and put the screw in a safe place. Align the sound card with the empty slot, then push it firmly into place. Fix it with the screw you took out.

A line out audio connector is supplied with the Mitsumi FX400 CD-ROM drive. Use Fig. 2 to check that the connections are correct. Change them over if necessary.

Set the volume control knob to its half-way position then, the final installation step, insert the 3.5mm jack plug from the stereo loudspeakers into the sound card's speaker output socket.

Reconnect the monitor, printer, keyboard and any other peripherals to the PC. Examine all connections and settings carefully. If all is in order, connect the PC's power card to a 240V wall outlet and switch on. The PC and the CD-ROM drive should now work correctly, but the software for the Creative Labs SB1600 card must be loaded before it will function.

Loading the Software

Full sound and speech require 6Mbytes of hard disc space. To install, use the sound card software back-up discs you made (see Part 1). Insert the sound card installation disc in drive A. Type

A: Install

and press the enter key. You will be offered a choice of custom or full installation. Choose full. The installation adds the following lines automatically to your Autoexec.bat file

```
SET BLASTER=A220 15 DI T4
SET SOUND=C:\SBPRO
C: \SBPRO\SBSET /P
```

and these to your Config.sys file

```
DEVICE=C:\SBPRO\DRV\CTS\SBPRO.SYS /UNIT=0/
Blaster=A420 1.5 D:1
DEVICE=C:\SBPRO\DRV\CTM\MSYS.SYS
```

They ensure an automatic sound set-up whenever the PC is started or rebooted.

DOS and Windows applications are automatically installed on your hard disc. A command is also added to the Windows WIN.INI files to run WINSET.EXE. This creates an audio card group window and the various application icons.

When you've completed the software installation you must restart or reboot your PC so that the new settings can take effect. When you load Windows you'll hear bursts of music and a new Windows audio group should be present.

Testing

The next step is to test the installation. Exit Windows and return to the C: DOS prompt. Type CD\SBPRO and press the enter key, then type DIAGNOSE and press enter. The

program then checks all the interface settings automatically. The DIAGNOSE program has a facility to correct the situation should hardware conflicts arise because two or more peripheral devices try to use the same signal lines.

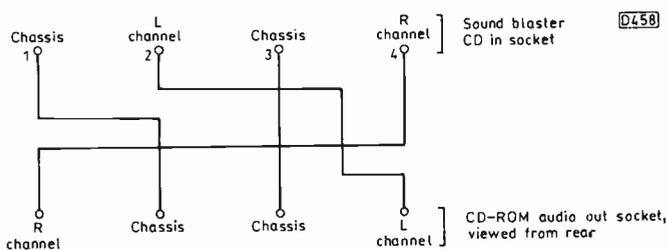


Fig. 2: Audio lead connections between the CD-ROM drive and the sound blaster CD in socket. If the connections are not as shown they must be changed.

To check the sound when the DIAGNOSE program has completed its work, choose 8-bit testing. You will then hear a voice, accompanied by music, saying "8-bit testing". Select the FM SYNTHESIZED MUSIC setting and you should hear stereo music. Leave it playing while you adjust the volume control at the back of the SB1600 card to the required level. The built-in stereo amplifier has an output of 4W per channel: be careful not to overload the speakers.

The Joystick

The joystick plugs into the joystick/MIDI socket on the sound card. It's needed only for games. If it doesn't work, it may be conflicting with an existing joystick port in the system. To correct this, either remove this joystick or disable the SB1600 joystick port by unplugging the jumper block from JP4. If it works intermittently with some programs the PC's speed may be too fast. If there's a CPU speed selection control on the PC's front panel, use this to reduce the speed. Before doing any of these things, check the amount of conventional memory available.

Recovering lost Memory

Exit the DIAGNOSE program and return to the C: DOS prompt. Type MEM. Compare the readings you obtain with the original memory listing you printed out before installing the CD-ROM drive and sound card software. You may find that your basic 640K of conventional memory has decreased considerably. This could cause problems when certain programs that specify a minimum memory figure are run. Fig. 3 shows how conventional memory is allocated in a PC.

If you are using the MSDOS 6 or higher operating system, read the sections on memory in the MSDOS owner's manual then type MEMMAKER at the DOS

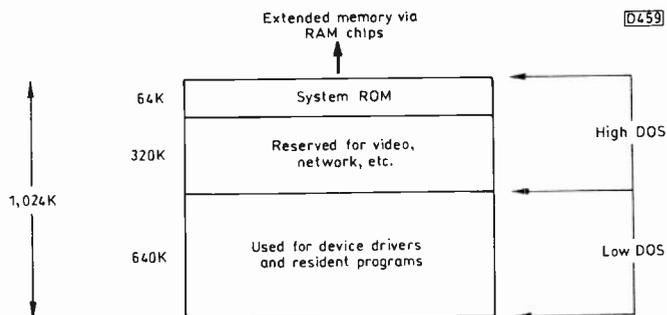


Fig. 3: How the basic 1Mbytes (1,024Kbytes) of memory are allocated in a PC.

prompt and follow the on-screen instructions. Load everything possible, including your operating system, into upper memory. This should recover for you a large chunk of your lost conventional memory. If you are using an earlier version of MSDOS without a memory-manager program it's best to upgrade to the latest version.

If your operating system is DRDOS 6 or higher, use the DRDOS SET UP program to obtain maximum memory. Read the relevant sections of the DRDOS manual first.

Using the CD-ROM Drive

A glance at any CD-ROM catalogue shows the variety of programs available. Software and multimedia encyclopaedias with sound, speech and moving pictures can be obtained at reasonable prices. A multimedia encyclopaedia such as MS ENCARTA enables you to see and hear important events – for example Neil Armstrong landing on the moon and making his famous "one small step for a man" speech.

Always load CD-ROM discs with great care. Never leave the tray in the open position. CD-ROM trays are fragile and easily broken.

Using the Sound Card

Your service department is unlikely to need to use all the SB1600 sound card's facilities. It's nevertheless important to understand each application in order to be able to advise your customers. Table 1 explains some of the terminology used. There is space to mention only a few applications here. The following are some of the Windows applications that come with the sound card software.

Creative WaveStudio: This easy-to-use but powerful application enables the user to record, play and edit wave data and enhance it with special effects. To use it, double-click on the WaveStudio icon in the audio card's group window.

FM Organ: This turns you into an instant musician, enabling you to play music (not just organ music). The PC keyboard becomes a musical keyboard.

Creative Ensemble AV: Enables an assortment of players to be controlled by the on-screen EnsembleRemote, including CD, cassette tape and floppy disc. Start by double-clicking on the EnsembleCD icon in the audio card group.

EnsembleMIDI (Musical Instrument Digital Interface): Does what it says!

Creative Soundo' LE: Plays and records data and supports OLE (object linking and embedding – see Table 1).

Creative Mixer: A powerful Windows application that enables you to combine and manipulate sound from various sources. You can control the sound volume while running sound in other Windows programs. You can use the RECORD command to record from an audio CD to a sound file.

Creative Mosaic: A board game with striking sounds.

Listening to Documents

The sound card can read aloud to you what you have typed out. Study the *Text-to-Speech User's Guide*.

Table 1: Some sound card terminology.

ARPABET: Advanced Research Projects Agency for speech understanding. ASCII letters are used to represent speech phonemes.

Compression: Data compacting for more efficient storage or transmission. Lowers sound quality.

DMA channel: Direct Memory Access channel.

Extended MIDI: Allows MIDI channels 1 to 10 to be used when musical notes are played.

MIDI: Musical Instrument Digital Interface. An international hardware/software standard that specifies the cable/hardware interface to enable several devices/instruments and PCs to interchange music codes.

.MIDI: Extension of files containing music in MIDI format.

OLE: Object Linking and Embedding. Enables sound and video to be incorporated in documents in multimedia applications.

.VOC: File extension for sound data saved in Creative Labs Inc. voice format.

.WAV: File extension for sound data saved in Microsoft wave format.

SBTALKER is a DOS text-to-speech synthesizer program that resides in memory. It uses phoneme codes that consist of computer ASCII characters – known as the ARPABET.

When using your wordprocessor, record your documents on the hard disc (or floppy disc) in ASCII format. Then, in the DOS format, use the following batch file to load SBTALKER. I've named it TALK.

```
C:
CDSBPRO
CDSBTALKER
SBTALK SET-ECHO1000
```

To listen to a document, type READ<C:file name/w. You will then hear the document read out while the text appears simultaneously on the screen. Type REMOVE to take SBTALKER out of memory.

The **Monologue for Windows** program adds speech to almost any Windows application. To check whether it's installed correctly, start Monologue for Windows then click the mouse pointer on the sample button. You should hear the "testing 1, 2, 3" message.

To add sound to a program, plug a microphone into the 3.5mm jack socket at the rear of the sound card.

Another facility, **Talking Scheduler**, provides an audible and visual reminder of any appointments you have made.

Playing CD-ROM Audio

The Sound Blaster Pro SB1600 software enables audio CD-ROMs to be played in stereo through the speakers. Do this either via the **DOS QuickCD** or **Windows EnsembleCD** programs. An external stereo amplifier can be connected if you wish. The screen will show a picture of a CD player with controls that you operate by mouse clicking. You can run your wordprocessor or almost any other program and at the same time listen to soft background CD stereo music. The following batch file loads QuickCD from the C: DOS prompt. I've named it CDMUSIC.

```
C:
CDSBPRO
QCD
```

In Conclusion

You'll find that there are plenty of uses for a CD-ROM drive and sound card. But best of all once you are familiar with them you can undertake profitable installation and servicing work.

My thanks to Mitsumi Electric Co. Ltd. (0127 629 029) and Simply Computers (0181 523 4020) for supplying technical information.

Answer to Test Case 390

– see page 545 –

There's an increasing trend for VCR manufacturers to provide a VTR/TV switching facility, a feature previously seen with some of the earliest VCRs produced during the late Seventies. Apparently the reason for this is to be able to meet tighter radiation and interference regulations. With this particular model it's neces-

sary to use the remote control unit's TV/VCR key to watch one channel while recording another one, though there's a menu-selectable software option (ANTENNA SELECT: MIX/SW) which produces this mode. They hadn't read the book of course!

The second problem would not have been solved by referring to the user's manual. Ray noticed that the picture contrast level was slightly too high with everything that came through the VCR's r.f. modulator. The cause was the fact that the video level preset in the tuner-modulator section had been set a little too high at the factory, the result being slight carrier over-modulation. It was cured by carrying out a very small adjustment inside the module, which incor-

porates the tuner, r.f. booster, u.h.f. modulator and all. I2C control enables a wide range of r.f. output channels to be used and provides booster switching and the usual station tuning for reception.

Why the buzz though, and why on some channels only and not with tape playback? Excessive video modulation was cutting into the sound carrier when sharp peak whites occurred. The 'softer' playback picture didn't produce the effect, while some broadcast channels have higher peak-white levels than others. In this case BBC-1 and Channel 4 had a higher level, though they were still within tolerance. That's a lot to have to consider! There was no charge of course. . .

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JVC HRD530 Fault Guide

John Coombes

This popular SP/LP VCR, with hi-fi sound, was launched in 1988. It also appeared in the UK in the Ferguson and Telefunken ranges, as the FV14T and VR3975 respectively. We'll group the fault conditions we've experienced under the headings mechanical, power supply, electronic and remote control.

Mechanical Faults

The deck is used in a number of JVC models. Some of the mechanical problems can be very intermittent.

Intermittent problems: The mode select switch can be responsible for the no play symptom when this is intermittent. This switch can also be responsible for failure to eject the tape, no loading or unloading, no servo control or no tape slackness operation. In the timer mode the machine may stop then power down.

The machine going into the stop mode is another intermittent problem you can get. Its cause is poor earthing of the PCB beneath the deck. This PCB is earthed by two or sometimes three screws. Remove the screws, resolder the PCB, fit lock-tight washers then replace the screws tightly – but not too tight or the PCB may crack.

No play or chewing tapes: This can be caused by a worn idler assembly. Check that there is drive from the reel motor: if not, check the motor and if necessary its drive circuit. Another cause of this fault is the pole base assemblies, both take-up and supply. The pole base screws can become loose, the results being incorrect loading and tape chewing.

Intermittent loading: Check whether the cam control gear is damaged. If this is o.k., check that the worm gear assembly is free running. The grease can become hard, preventing rotation. Other things to check if necessary are the loading belt and the loading motor.

Take-up spool does not rotate correctly: The spindle should be slightly lubricated. If necessary, lubricate to restore free running. If the problem persists, check that the main take-up brake is operating correctly. It may be worn. If the brake seems to be in good condition, ensure that the plate assembly slides freely and that the grease hasn't gone hard. Remove the plate and clean it to restore normal operation.

Low sound or picture jumping: The audio/control head may be misaligned. Check for wear and ensure that the tape path is set up correctly.

Drum problems: The upper drum can cause lower drum wear. This will result in poor playback/picture jumping and may also affect recordings made by the machine. The lower drum can cause problems when the upper drum has been replaced: it may be impossible to set up the tape path to produce a good f.m. waveform shape.

Before condemning the upper drum, try cleaning the heads and leaving them for a short period. This will enable the fluid to soak in and break down the oxides – this is necessary only when the heads are very dirty.

Another approach is to remove the upper drum and clean all its surfaces. Clean out oxide from the lower drum and under the upper drum surface. Reassemble and check operation.

Half-loading arms unable to eject/remove tape: This fault causes tape chewing and prevents free tape ejection. The cassette becomes statically charged, so that the tape sticks to the cassette lid when it is removed. A new lid guide (PRD43315) cures the problem.

Power Supply Faults

No results: First check whether the 800mA mains input fuse F1 is blown or open-circuit. If it has blown, the 4,700pF mains filter fuse C101 is probably short-circuit. Then check the fuses on the secondary side of the mains transformer. If F2 (2.5A) has blown, check whether D1 or D2 (both type 10E2) or the 0.047 μ F protection capacitor C1 is short-circuit. If F3 (1.6A) has blown, check bridge rectifier DS2 (D5SB10) and if necessary its 3,300 μ F, 16V reservoir capacitor C4 for shorts. If there is no 8V input at the collector of the 2SD1761 switched 5V supply series regulator transistor Q8, check whether DS2 is open-circuit.

No tuning voltage supply: If the 45V supply to the 30V tuning voltage regulator is missing, check whether C5 (47 μ F) is short-circuit or D3 (11E2) or the 10 Ω fusible safety resistor R1 is open-circuit.

No 12V motor supply: Check whether Q7 (2SD1785) is open-circuit and for dry-joints here.

No unswitched 12V supply: If there is no unswitched 12V supply at pin 1 of plug/socket CN1, check whether power transistor Q9 and/or Q10 (both type 2SD1785) is open-circuit and for dry-joints, then if necessary check whether circuit protector CP1 (F25) is open-circuit.

Switched 12V supply: This is derived from the unswitched 12V supply via switching transistor Q5 (2SB1068). It will be missing if Q5 is not switched on at its base by the M50965-351SP microcontroller chip IC601 (pin 6). So IC601 could be the cause. First make sure that the 5V supply is correct. If the switched 12V supply is low, check whether C13 (47 μ F, 16V) is leaky or open-circuit.

Display not alight: The display unit may be faulty but if the 5V a.c. supply at pins 1/2 and 57/58 is missing suspect that the relevant winding on the mains transformer T101 is open-circuit.

Connectors: Plugs/sockets CN1, CN2, CN3, CN4 and

CN5 should be checked for dry-joints or poor connections when power supply faults are experienced.

Electronic Faults

Poor/snowy picture: If the E-E signals and the TV channels are affected the r.f. converter/aerial booster is likely to be faulty. If only the E-E signals are affected the booster or tuner unit could be faulty. Ensure that the tuner is receiving its 12V supply – check whether L13 is open-circuit.

Loss of channels: The M58655P channel memory chip IC3 could be faulty. Before trying a replacement, check its supplies. There should be 5V at pin 1 and –30V at pin 2. If the latter supply is missing, check Q1 (2SB10050/Y) on the regulator board by replacement then, if necessary, check whether Q23 (2SC1740S) on the tuner/i.f. panel is open-circuit.

No signal from the tuner: The cause could be the M50440-394SP tuning chip IC2. Check its d.c. conditions carefully or check it by replacement. If IC2 is faulty Q17 and Q18 may not switch on with the result that the tuner unit doesn't receive its 12V supply. Check L13 if necessary.

I.F. faults: If there is just a blank raster, check the operation of the M51365SP i.f. chip IC1. There should be 8.8V at pins 5 and 21. If this supply is missing, check whether Q15 (2SD1468S) is open-circuit. Alternatively the MTZ10B zener diode D7 could be short-circuit.

If the picture is ringing or there are double images, check around the SAW filter SAW1 for dry-joints. If necessary try a replacement SAWF.

No colour: Ensure that IC301's 5V supply is present at pin 25. Next check crystal X301 which may be dry-jointed or faulty. Check that the VXO preset R328 is set up correctly and the condition of its track. IC301 (PU22046A) could be faulty – check by replacement. A less common cause is IC401 (AN3592K).

If the playback colour is not present at TP304, check whether low-pass filter LPF301 is open-circuit. Alternatively Q301 or Q302 (both type 2SC1740S) could be open-circuit.

Servo faults: These can vary from just stopping to intermittent playback or noise bars on the screen. There may even be tape speed variation. The main cause of these problems is the HD49712ANT servo chip IC1, but check for dry-jointed connections. There will be no operation if the internal clock (pins 58, 59) isn't working. Crystal X1 could be faulty or dry-jointed.

Display faults: Check first that the –30V supply is present. If so, the first suspect is the UPD7538ACU-214 display driver chip IC1. If particular segments don't light up, the display unit FDP1 could be faulty or alternatively IC1 could be the cause.

Stereo L/R normal indicators don't light: Check for dry-joints on the display PCB or a fault in plug/socket CN5 – resolder or remake to restore correct operation.

LH channel level display at full deflection, RH display normal – or the opposite: It's not easy to check for this because IC101's output is scan pulses. Replacing IC101 (MSC1124BRS) should restore normal operation.

RH channel record level full on, no control over the level: Check at pin 4 of CN3 on the f.m. audio PCB. The voltage here should vary as the E-E level potentiometer R34 is adjusted. Check for dry-jointed connections to R34 and the condition of its carbon track.

LH channel record level full on, no control over level: Same as above but check at pin 3 of CN3, the relevant potentiometer being R33.

No hi-fi sound playback: Check for 5V at pin 16 of IC201 on the f.m. audio PCB. If this supply is low, C227 (0.01µF) is probably short-circuit and L203 will be warm, providing a clue. Alternatively IC201 (HA11752) could be faulty. Check by replacement.

Remote Control Unit

With all remote control units the first check must be on the batteries and their connections. No IR output can be caused by crystal X1 (CSB400BIT): it may be dry-jointed or have broken legs. If part segments only light, the display unit and/or IC1 (M50565-016FP) is faulty. If individual channels cannot be obtained, suspect a faulty rubber sheet. A temporary cure may be achieved by cleaning the contacts. If all channels and/or functions are inoperative, IC1 is suspect.

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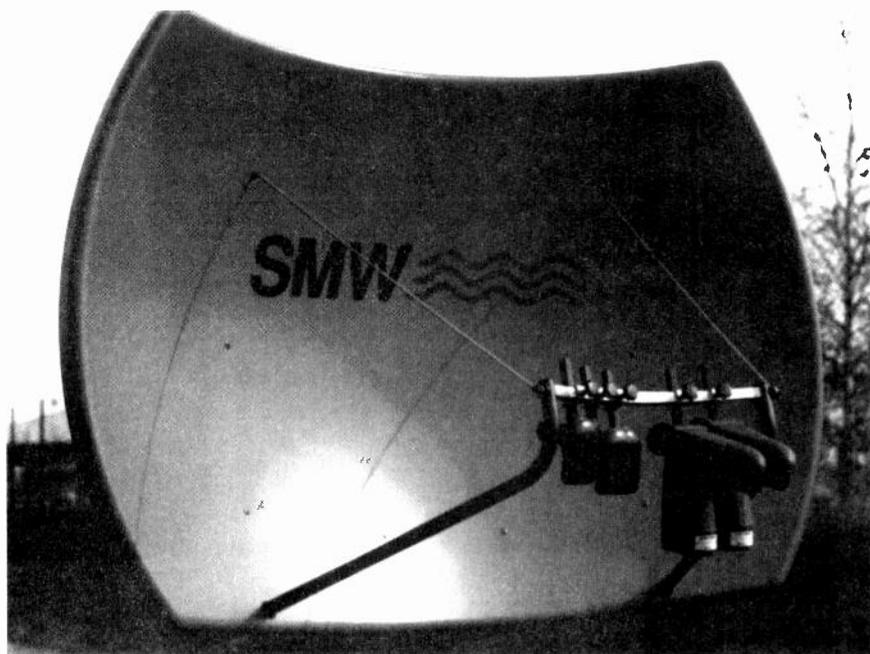
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At Cable and Satellite '95

Peter Brough



Swedish Microwave's OA 1600 multi-focus dish provides reception over a beam width of 26° via up to nine LNBs.

Digital TV was the dominant theme at this year's Cable and Satellite Show, which was held at Olympia during early April. With Astra promising to bring three digital satellites into operation during the next couple of years and Eutelsat's Hot Bird 2 due to offer both analogue and digital services in 1996, the hardware companies and programme makers are having to gear up for what is seen as the next big leap for satellite TV. But there were plenty of new analogue system developments as well.

Digital Developments

Nokia's new DVB9500S digital satellite receiver conforms with the European Digital Video Broadcasting (DVB) standard. It offers a continuously variable i.f. bandwidth (maximum 54MHz) and continuously variable data rates at up to 90Mbits/sec. Connections include an LNB input, TV and VCR scarts, a decoder/satellite scart, audio phono outputs, an IR VCR control interface and several optional interfaces for data transfer. A smart electronic programme guide is included: this is an on-screen display system

that enables the user to select programmes by type (sport, movies for example) or simply scroll through hundreds of channels. The system can also provide background information on programmes, for example a summary of the plot or the main actor's biography, while users can also pre-programme their VCRs in advance for timer recording. The receiver seems to be very user friendly – and useful. There's also a version for cable TV. Model DVB9500C.

Nokia is part of Compression NETWORKs, in collaboration with Fuba and the US company TV/COM. Its aim is to provide a total digital compression, control and communications system for satellite and cable TV services. The group has been given a contract to provide a digital satellite service for the Canadian company Expressvu Inc., which is due to offer 100-plus channels by September. The US satellite TV service Alphastar also plans to use the Compression NETWORKs system for a service that's to start this December.

Philips demonstrated a complete MPEG-2 DVB system, including a video encoder, mixer, professional

and consumer IRDs (integrated receiver-decoders) and a consumer set-top box. The consumer IRD was particularly interesting – it looks just like a CDi deck. Coverage is 950-2,050MHz and the interfaces include twin scart connectors that provide RGB and composite video outputs with 4:3-16:9 signalling, phono audio, high-speed data, ports for an external modem and two smart cards and an IR link to start and stop a variety of VCRs. It's compatible with the Cryptoworks and Eurocrypt conditional access systems and is prepared for pay-per-view, impulse pay-per-view and near video-on-demand systems. There's also an optional RS232 interface.

Thomson Multimedia presented RCA's Digital Satellite Service, which is in use in the USA. Dish size for individual receivers is 18in., and up to 175 channels can be provided. Since the system was launched last June over 900,000 receivers have been delivered.

Thomson and computer company Sun Microsystems have developed OpenTV, an interactive TV operating system. Decoders receive the OpenTV application along with the transmitted video and audio: the application is downloaded into the decoder's memory, and the user can call up an on-screen graphics display which is superimposed on the video. OpenTV can be used to provide programme guides, programme information and programme selection.

Pace showed its MPEG-2 decoder which was developed in conjunction with NTL. The company has won two digital TV contracts in Australia. One is to produce digital IRDs for Galaxy, a pay-TV operator which plans to offer ten digital channels this autumn. The other is for Foxtel, a joint venture with News Corporation and Telstra: it plans to offer twenty digital cable TV channels in October. Pace will provide cable units that incorporate a conditional access system developed by News Corporation.

EchoStar showed an MPEG-2 satellite receiver that displayed test

signals from Astra. The company plans to have its EchoStar I satellite launched this autumn, with EchoStar II to follow next year. They should offer 250 digital TV channels in the USA by mid-1996.

Dishes and LNBs

There are several things to report on the dish front. The development of a 'universal' LNB for its series of satellites was announced by Astra. It will be capable of providing reception over the 10.7-12.75GHz spectrum, covering both the low-band Astra 1A-D frequencies (10.7-11.7GHz) and the high-band Astra 1E-G frequencies (11.7-12.75GHz). In the single output version the local oscillator frequency will be switched for band selection; the twin output version will provide simultaneous reception of the low and high bands. Cambridge Industries was demonstrating a universal LNB with claimed noise figures of 1.5dB maximum for low-band reception and 1.3dB for high-band reception. Philips has also developed a universal LNB, Model ST819TB.

Swedish Microwave (SMW) showed a torus type multi-focus dish, Model OA1600, with a frequency range of 10.7-12.75GHz (see photograph opposite). Up to nine LNBs can be mounted on its LNB support system, the beam width being 26°. SMW describe it as being a combination of an offset parabolic and a spherical dish. Its size is 1.6 x 1m, the gain being the same as that of a 1m spherical dish. Weight is 32kg. SMW has carried out a series of comparative noise tests using a noise figure analyser: these have shown that some dishes don't always attain the manufacturer's claimed noise figure.

Chaparral showed a new very low-noise C band LNB/feedhorn without scalar rings: it provides a trade-off between the LNB's low noise performance and the use of a smaller dish.

Receivers

Pace showed its MSS100 set-top box, with side-mounted card readers. It provides VideoCrypt decoding and Wegener Panda stereo. Other features include IR remote control; 120 programmable channels; on-screen menus; a one-month, eight-event timer; parental lock; a blank-screen radio mode;

and three scart sockets. It will be available in July. No price details were available. Pace also introduced the MSS350, which includes spatial stereo-effect sound processing and offers 250 channels, and the MSS500 which will come factory-equipped with a dish positioner to give viewers the option of multi-satellite reception.

Amstrad showed the SRD2000, a Dolby Pro Logic receiver with four built-in 25W amplifiers and external audio inputs. Other features include a 480MHz i.f. socket for use with future digital decoders; Wegener Panda stereo; 300 channels; an enhanced wideband tuner; a satellite index system; a favourite channel facility; a one-year, eight-event timer; channel naming; dual LNB inputs; and a twin card reader. Suggested price is £350, or alternatively £380 or £400 to include a 60cm or 80cm dish respectively.

Nokia's Sat 800 Plus is an upgraded version of the Sat 800. Features include on-screen displays; PIN-coded parental lock; 18 favourite TV and radio channels; a four-week, four-event timer; 199 pre-programmed channels; a VideoCrypt decoder; Wegener Panda stereo; three scart sockets and phono output sockets. Suggested price is £230.

The new Grundig Model GRD300 has twin LNB inputs, three scart sockets, channel indexing, a four-week, eight-event timer and ten radio channels. The suggested price when it becomes available in September will be £250.

The Philips STU660 is a prototype receiver with a twin tuner and dual LNB inputs, enabling viewers to watch one satellite TV programme while recording another or watch two different programmes on two TV sets. Other features are 400 programmable channels; favourite programme select; a noise reduction system; a one-year, eight-programme timer; and PAL/Secam compatibility. No launch date was suggested.

Interactive TV

General Instrument had a cable TV receiver, Model CF2200, whose operation is based on an Intel 486 microprocessor chip and Microsoft's modular Windows system. It's designed for pay-TV, video on demand, home shopping and interactive TV. GI also demonstrated its Sega hardware channel, which

enables subscribers to select games from a menu of fifty. The company expects to have a system for US cable TV available for delivery in late spring, with a European system soon after.

Online Media, part of Acorn Computer, showed its STB1 and STB2 set-top boxes which are designed for interactive TV use. The company is currently carrying out interactive cable TV trials in the Cambridge area in conjunction with BT. Operation of the STB1 and STB2 is based on an ARM 32-bit RISC processor with 2Mbytes of RAM as standard. The STB1 is designed to handle MPEG-1 video while the STB2 can handle both MPEG-1 and MPEG-2 video.

TV/Video News

Because there was no brown goods show this year, Nokia and Grundig decided to introduce some of their new TV/video models at Cable and Satellite. Nokia's display included a 32in. PALplus TV set, Model SFN8296. It includes Dolby Pro Logic, the Megatext graphics system and digital picture effects, all for £1,500. Nokia also launched, at £229, an add-on PALplus decoder for use with existing wide-screen sets.

Nokia's new VCR range includes the VR3786, which features AIP (Automatic Intelligent Programming) for auto set-up and IS (Intelligent Sort) which enables the TV and VCR to communicate with each other so that channels are synchronised. It has a Nicam decoder, VideoPlus, LP, PDC (without text), ASO Plus and front-mounted AV sockets. The VR3786 is to be launched in September at £400. Model VR3716 offers the features above except for Nicam and four heads. It will be launched in August at £280.

Grundig showed the first TV sets to use the G1000 chassis. This has single PCB construction with fewer than 300 components. All models in the range include IR remote control, 99 channels, a sleep timer and on-screen displays. Prices range from £160 for a 14in. set without teletext to £320 for a 21in. FST set with Fastext.

Next Year

Cable and Satellite '96 is to be held at Earls Court 2, a larger venue. Dates will be April 15-17th 1996.

What a Life!

Donald Bullock

Until a year or two ago things electrical and electronic cost the earth here in Spain. They're cheaper now, often cheaper than in the UK. So we decided to buy a portable colour set in Alicante for our daughter Rebecca's eleventh birthday. Amongst the sets on display there was a Polish Kneissel KN1432. It not only looked nicer than the rest, but also had by far the best picture and an elaborate remote control unit. And its price was around £100.

We bought it, but because Rebecca wanted to see British satellite television the vision-sound spacing had to be changed from 5.5 to 6MHz. The filter was amongst others in a very complex i.f. module which was screened like a tank. As changing the filter didn't produce the sound we decided, instead of playing hit-or-miss, to drop a line to Poland asking for advice – and hoping for a manual. A few days later, at ten to eight in the morning, we received a fax message to tell us that a suitable replacement module was on its way. Two days later it arrived, along with a letter from Pawel Pietrzak of their technical department.

He explained that the set hadn't been produced for the PAL I system. So they'd knocked up a filter unit specially for us in the factory – at no charge. "We've checked it on your satellite and it works well" he wrote, "have a nice watch!"

We fitted the module and it does work well. The parent company is Daewoo. We are grateful to them and to Pawel Pietrzak. It was far more than we expected. Service indeed.

More Good Service

Whilst on this subject I'd like to mention the help we received from two advertisers in *Television* when our children's Fidelity/Amstrad satellite receiver/decoder died on us here in Spain. It's an SRD510 that had become temperamental: it would sometimes fail to come to life, though the mains rectifier's reservoir capacitor charged fully. As we didn't have the manual I faxed an order for one that

evening to Harrison Electronics, with a bank card number. An hour into the next day I received a fax to tell me that the manual had been dispatched, at only £6.50. Good going. I'd never even dealt with Harrison before.

Meanwhile I'd noticed that J.J. Components, that pleasant family firm run by Jay and Lala Poppat, was advertising a repair kit for the SRD510, complete with Idiot Sheet, also at £6.50. At this sort of price I can afford to be a big spender. So I ordered the kit, again by fax.

The manual and the kit arrived two days later. Within an hour we'd repaired the SRD510. Our thanks to both firms for their better than excellent service.

Satellite Radio Reception

Richard, the Bradford TV dealer who has retired to these parts, uses the same Pace receiver that we do. He popped in the other day with a tiny printed panel, scarcely bigger than a cigarette card (does that date me?). "It's an f.m. transmitter" he said. "I've built it from a kit and fitted a scart socket to it. If you plug it into your Pace receiver you can hear the UK radio programmes on any radio about the house and garden. So can next door, if you tell them the spot on the dial."

He was right. The kit, made by Suma Designs of Baxterley, Warks, is priced at £20. It comes with building and setting-up instructions, a layout and circuit diagram. What it does is to take the stereo signal, convert it to mono and transmit it at about 107MHz. This one had a range going on for a hundred yards. The quality is astonishing. Now, when we're in Spain, we can listen to Radios 1, 2, 3 and 4 as easily as in England.

Sideways

Our youngest son called out the other day that his television set was showing the TNT cartoon programme sideways. Then Rebecca said that her's had been doing the same thing for hours.

Now curious, I went and had a look at the sets. The programmes were indeed sideways, as if the yokes had been turned through 90°. Apart from that the vision and sound were normal. I rubbed my eyes, went into the lounge and switched on our set. It was the same. Then, as we watched, the adverts came on – the right way up. An hour later everything was back to normal.

Leaving aside the matter of compe-

tence, I'm wondering what sort of transmission system could bring such a thing about and how come the adverts were correct?

A Microwave

Back at the bench I had a caller – literally – the other day. "Are you the one who does things?" she yelled. "It packs up after three minutes."

"What does?" I asked.

"My microwave. It's a Foodcare Finesse, Model 500". She darted out and brought it in.

When she'd gone I put it on the bench and found that she was right. After three minutes it got so hot that the thermal cut-out disabled the power supply. When I opened it I found that the fan blade assembly had fallen off its shaft. I cleaned it off, washed it in spirit and glued it back with epoxy resin. After that it worked all right. Since then two more have come in with the same trouble.

Glad's VCR

Bulky Gladys Glubb brought in her Goodmans GVR3400 VCR, her complaint being that the programmes wouldn't tune properly. We groaned: we didn't have the manual, and were unsure whether we'd be able to mend it if we got one. But we decided to take a look, and luckily saw the cause of the trouble. There were hairline cracks around the fixing screw holes. After making good the connections we fitted fibre washers and reassembled the unit.

A Sony KVM14U

The chap who brought in this 14in. colour portable said that it was dead. "Makes a thumping noise at switch on, then nothing else" he added. We opened the set and through force of habit checked the line output transistor. As it was all right we moved back to the power supply where the RGP15J h.t. rectifier D604 was short-circuit. We tried another diode with the same published specification: it lasted about thirty seconds before groaning and grumbling to its demise. Then we tried a BYD33D which is still working on the test bench. But knowing Sony sets we've ordered the correct spare.

Fred and the Ferguson 51J8

Fred's a funny chap. I don't know his other name or his address, nor does anyone else I've met. He seems to operate from a couple of towns away and certainly pulls in the customers.

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His little adverts in the *Western Blurter* promise ever such fast repairs for no call-out charge. Just ring 123456, ask for Fred and it all happens.

But Fred seems to upset some of his customers. And when they phone to complain or ask for their money back he can be hard to get. Mabel Mugg had phoned Fred. He instantly appeared, took her Ferguson 51J8 (TX99 chassis) set away, and speedily concluded that its line output transformer had snuffed it. Then he rapidly assessed his charge – over £100. Mabel, who earns a couple of quid an hour from her 6 a.m. cleaning job, said no. Four or five phone calls later her set came back to her. Guess who she called next!

When we switched her set on there was just a tiny, faint dot in the middle of the screen: no line or field scanning. We went straight to the little paxolin panel at the top of the scan coils and found that the line joints were a bit

dry. Worse than that, the printed tracks had been severed with a knife where they joined the solder pins. We made this good, switched on and got a snowy raster with no display or functions. This, said Mabel, was the fault that Fred had been asked to repair.

We found that R334, a fusible 4-7Ω resistor on the TACS board, was open-circuit. It provides the feed to the μPC7805H 5V regulator chip IC242 which in turn supplies the M494F tuning/analogue function memory chip IC241. Replacing the fusible resistor cured the trouble and made Mabel a happier lady.

A Stuck Hitachi

The next set on the bench was an Hitachi C14-P216 (G7P Mk II chassis) which was stuck in standby. Steven dealt with this one and had it working in no time. The start-up resistor R903 (82kΩ) was open-circuit. We've had this before. There were also some dry-

joints around the line output transformer. Some resoldering in this area did the set's reliability a power of good.

Arthur's GoldStar

Arthur's a slow fellow who farms locally. He came in carrying a GoldStar CIT2175X colour receiver. "Sound's there but there's nothing on the front" he said, looking bewildered at this state of affairs.

We marked the position of the first anode preset carefully, then advanced its setting. Up came a milky blank raster. We suspected the TDA4502A i.f./timebase generator chip IC201, but as we didn't have one in stock we decided to check transistors Q201 and Q202 first. After all, they had fewer legs. But they were all right. So we phoned GoldStar's excellent technical people who confirmed our diagnosis. They supplied a new TDA4502A quickly and it did the trick.

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Letters

SATELLITE PROBLEMS

I enjoyed the article on using the Global ADX Plus frequency converter with Pace SS9000 series receivers (April), also Jack Armstrong's article on servicing these receivers (March). Early Pace 9200 receivers have software to tune to 2GHz but use the old (larger) Hitachi tuner. When installing an Astra 1D LNB it's quite common to find that the tuner won't physically tune much beyond 1,800-1,850MHz. This shows as the tuning numbers increasing while the picture remains the same, usually sticking near Country Music TV or Sky Gold – the main missing channel of interest being CNN at around 1,872MHz.

There's a simple solution. Remove the tuner's side cover and set the tuning to around 1,900MHz. Use a plastic tool to stretch the turns on L401 until CNN appears, preferably with some white sparklies. Then program in the proper i.f. of 1,872MHz. Bottom end performance shouldn't be affected, but check Superchannel/Arte above 900MHz. You won't be able to tune much above CNN, but in most cases this will not be of concern to the customer. L401 is situated below the dreaded heat-producing IC401 that causes the demise of C416 (with lines/patterning on the screen).

Some Hitachi tuners may tune to CNN. Others stick on Sky Sports or MTV. The later Sharp tuner (used after mid-1992) tunes quite happily. A few late version 9000s seem to have the 2GHz tuning software. I've never had any problems with the Sharp tuner – yet! When replacing C416 in the Hitachi tuner I fit it on the component side of the board and leave the covers off. The tuner appears to be quite stable like this and the next fault to develop, low gain or just weak snow, is avoided. The ambient summer temperatures here in the Algarve don't help!

I keep a stock of mains transformers. The pink ones seem to fail far more often than the black ones. The two most memorable Pace repairs I've had were as follows.

A 9200 that lived in a bar suffered from the usual no power symptoms. When dismantled it was found to be full of cockroaches, both live and dead, packed around the tuner/power supply. Lovely job cleaning everything up. Needless to say I won't be frequenting the place as a customer!

An elderly cat slept on top of an MRD920 (D2MAC version) for warmth. For some reason it couldn't close its mouth properly whilst kipping. It goes without saying that the power supply didn't appreciate all this and soon blew a fuse. Amongst other things considerable cleaning up had to be done before replacing the inevitable BUT11A etc.

The D2MAC version runs much hotter than the VideoCrypt one. I now fit heatsinks to the decoder chips. This at least gets the heat away from the board and keeps everything running. The first sign of overheating is a whistle on sound plus low output. Unplugging for five minutes provides a brief cure.

On odd occasions the mains supply voltage here rises dramatically, to over 300V, with a wiring fault either just outside or inside the customer's house. The power supply in the 9200 soldiers on regardless until the bridge rectifier's reservoir capacitor C7 (47µF, 400V) decides that it has had enough and explodes. More PCB cleaning! The chopper control chip (U23) usually has to be removed to clear out liquid. It's a remarkably robust chip, and usually survives the explosion!

We were a bit puzzled by a 9200 with the standby light

blinking on and off. No shorts could be found, and the blinking was not accompanied by whistling. We eventually found that a local expert repair artist had replaced the current sensing resistor R13 (0.22Ω) with a 2.2Ω type. The increased voltage drop must have made the power supply trip.

Amstrad SRD510s don't like what passes for the electricity supply here – not much electronic equipment does. When not being subjected to severe under/over voltages the SRD510s are likely to be afflicted by a multitude of spikes. They are no less keen on the summer temperatures than their Pace colleagues.

As well as the usual remote control lockout trouble, a confusing symptom with the SRD510 is muted sound. If you go to the audio menu you get on-screen rubbish or incorrect frequencies. Retuning restores the audio. Another problem is gibberish on the main menu plus loss of store/tuning facilities. Leaving the receiver unplugged for a few days seems to restore things to what passes for normal.

*Hugh Cocks,
Algarve, Portugal.*

GRUNDIG GRD150/250 SATELLITE RECEIVERS

I have been hauled over the coals for what I wrote (May, page 480) about Grundig's satellite receiver warranty, so I'd like to put the record straight.

My view was that of the independent satellite installer – the person who buys a system from a local wholesaler, installs it and then returns to buy another one. His problem arises should the wholesaler fail to honour the Grundig warranty exchange policy. He's left with the option of leaving the unit for possible repair, or exchange "when stock is available", with inevitable customer complaints.

In fairness this is not the fault of Grundig, whose policy is to care for the end user by looking after Grundig approved dealers who guarantee to hold stock of Grundig receivers. They also have access to spare parts and service information, which independents can buy from suppliers such as Wizard or Willow Vale.

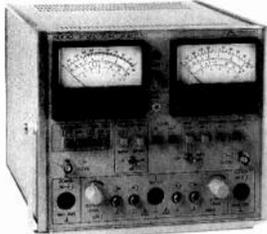
So the best course of action for the owner of a Grundig receiver, in the event of a fault occurring, is to take it to the original Grundig dealer or any Grundig approved dealer.

My article mentioned, but didn't emphasise, the fact that Grundig receivers are extremely reliable. Paul Goldring of Grundig tells me that the recorded failure rate is less than half a per cent. My personal experience confirms this reliability. It compares favourably with other lower-priced brands, whose failure rates seem at times to have been as high as ten per cent.

When I wrote that Grundig's policy is to supply a refurbished receiver in exchange for a faulty one, in fact they have never done this. The exchange has always been a brand new unit. Factory refurbished receivers are available however on a part-exchange basis for customers whose units fall outside the warranty period. These exchange units are 'as new' cosmetically and the circuitry will have been upgraded to the latest specification. In addition, they come with a full six-month warranty. I know of no other company that offers such a deal.

To conclude, whilst it is a fact that Grundig does not, for safety reasons, encourage repairs by unknown dealers, the reliability of the company's satellite receivers is excellent and the one-for-one exchange policy does work, provided you deal with a Grundig authorised reseller.

*Jack Armstrong,
Nantwich, Cheshire.*

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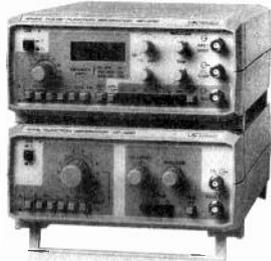
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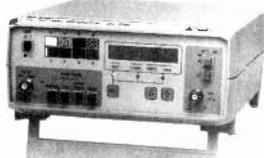
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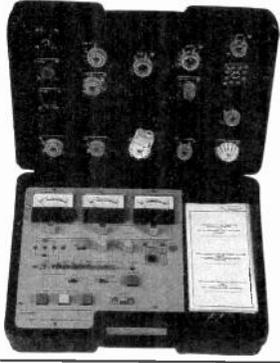


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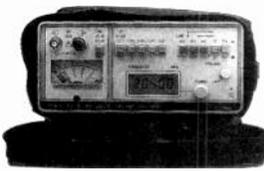
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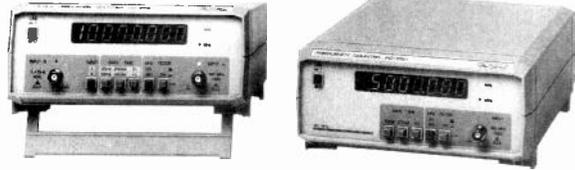


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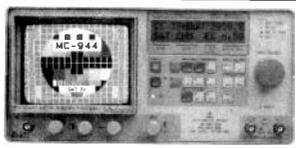
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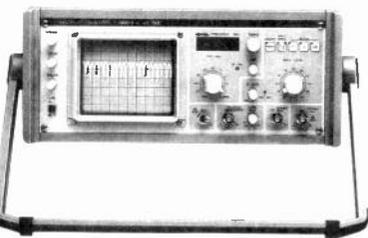
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- 21" 51EAK, 51EAL, 51EAM, 51EAT, 51EBD, 51EBV, 51ECN, 51JAR, 51JCC, 51JFC, 51JRU, 51JKQ, 51JJSY, 51JXH
- 22" 560DYB, 560DZB, 560EUB, 560EYB, 560FZB, 560GAB
- 25" 59EAK, 59EAF, 59EAS, 59ECF, 59ECY, 59EDN, 59JMZ, 59JWC
- 26" 66-120, 66-140, 67-120, 67-701
- 28" 66EAK, 66ECF, 66ECY, 66JMZ

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MARCONI TF2015 AM/FM Sig Gen 10 - 520MHz	£200
MARCONI TF2015 with Synch TF2171 (Lock box)	£350
PHILIPS PM5326 AM/FM Sig Gen 100KHz-100MHz	£300
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IR LAMP KIT Suitable for the above camera enables the camera to be used in total darkness! £5.99 ref EF138.

PASTEL ACCOUNTS SOFTWARE, does everything for all sizes of businesses, includes wordprocessor, report writer, windowing, networkable up to 10 stations, multiple cash books etc. 200 page comprehensive manual. 90 days free technical support (0345-326009 try before you buy!) **Current retail price is £129, ours? just £29** ref EF134. **SAVE £100!!!**

MINI MICRO FANS 12V 1.5" sq just £3.99 each. Ref EF199.

CITOH PRINTERS 80 cpi, 9 pin matrix, serial/parallel, NLQ/draft, 3 mth warranty, good condition, £49 ref EF133.

MICROSOFT TRACKBALL AND MOUSE Combined unit with 4 buttons and trackball, PS2 type connector. Complete with storage bracket. Our price just £11.99 ref EF201.

REUSEABLE HEAT PACKS. Ideal for fishermen, outdoor enthusiasts elderly or infirm, warming food, drinks etc, defrosting pipes etc. reusable up to 10 times, lasts for up to 8 hours per go, 2,000Wh energy, gets up to 90 degC. Price is £12 ref EF129, mp £371

1.44MB 3.5" DISC DRIVES Returns from a top PC manufacturer so they may need attention, bargain price £8.50 ea ref EF203.

1.2MB 6.25" DISC DRIVES Again returns so may need attention, bargain price is £8.50 ref EF204. (1 of each 1.2+1.44 £14.99 ref EF205)

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PC CONTROLLED 4 CHANNEL TIMER Control (on/off times etc) up to 4 items (8A 240v each) with this kit. Complete with software, relays, PCB etc. £25.99 Ref 95/26

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RADIO PAGERS Brand new, UK made pocket pagers clearance price is just £4.99 each 100x40x15mm packed with bits! Ref SEP5.

BULL TENS UNIT Fully built and tested TENS (Transcutaneous Electrical Nerve Stimulation) unit, complete with electrodes and full instructions. TENS is used for the relief of pain etc in up to 70% of sufferers. Drug free pain relief, safe and easy to use, can be used in conjunction with analgesics etc. £49 Ref TEN/1

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OMRON TEMPERATURE CONTROLLERS (E5C2). Brand new controllers, adjustable from 0 deg C to +100 deg C using graduated dial. 2% accuracy, thermocouple input, long life relay output. 3A 240v o/p contacts. Perfect for exactly controlling a temperature. Normal trade £50+, ours £15. Ref E5C2.

ELECTRIC MOTOR BONANZA! 110x60mm. Brand new precision, cap start (or spin to start), virtually silent and features a moving outer case that acts as a flywheel. Because of their unusual design we think that 2 of these in a tube with some homemade fan blades could form the basis for a wind tunnel etc. Clearance price is just £4.99 FOR A PAIR!! (note these will have to be wired in series for 240v operation Ref NOV1.

MOTOR NO 2 BARGAIN 110x90mm. Similar to the above motor but more suitable for mounting vertically (ie turntable etc). Again you will have to wire 2 in series for 240v use. Bargain price is just £4.99 FOR A PAIR!! Ref NOV3.

OMRON ELECTRONIC INTERVAL TIMERS. *****NEW LOW PRICES TO CLEAR!!!!*****

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HY24060M, 240v adjustable from 0-60 mins. £6.99

PC PAL VGA TO TV CONVERTER Converts a colour TV into a basic VGA screen. Complete with built in psu, lead and s/ware. £49.95. Ideal for laptops or a cheap upgrade. We also can supply this in kit form for home assembly at £34.95 ref EF54.

DRINKING BIRD Remember these? hook onto wine glass (supplied) they drink, stand up, drink, stand up etc! £4 each Ref EF1

EMERGENCY LIGHTING UNIT Complete unit with 2 double bulb floodlights, built in charger and auto switch. Fully cased, 6v 8AH

lead acid req'd. (secondhand) £4 ref MAG4P11.

GUIDED MISSILE WIRE. 4,200 metre reel of ultra thin 4 core insulated cable, 28lbs breaking strain, less than 1mm thick! Ideal alarms, intercoms, fishing, dolls house's etc. £14.99 ref MAG15P5

ASTEC SWITCHED MODE PSU BM41012 Gives +5 @ 3.75A, +12 @ 1.5A, -12 @ 4A, 230/110, cased, BM41012. £5.99 ref AUG6P3.

AUTO SUNCHARGER 155x300mm solar panel with diode and 3 metre lead fitted with a cigar plug, 12v 2watt, £9.99 ea ref AUG10P3.

FLOPPY DISCS DSDD Top quality 5.25" discs, these have been written to once and are unused. Pack of 20 is £4 ref AUG4P1.

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24v AC 96WATT Cased power supply. New. £13.99 ref APR14.

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OUTDOOR SOLAR PATH LIGHT Captures sunlight during the day and automatically switches on a built in lamp at dusk. Complete with sealed lead acid battery etc £19.99 ref MAR20P1.

ALARM VERSION Of above unit comes with built in alarm and pir to deter intruders. Good value at just £24.99 ref MAR25P4.

CARETAKER VOLUMETRIC Alarm. Will cover the whole of the ground floor against forced entry. Includes mains power supply and integral battery backup. Powerful internal sander, will take external bell if req'd. Retail £150+, ours? £49.99 ref MAR50P1.

TELEPHONE CABLE White 6 core 100m reel complete with a pack of 100 clips. Ideal 'phone extns etc. £7.99 ref MAR8P3.

MICRODRIVE STRIPPERS Small cased tape drives ideal for stripping, lots of useful goodies including a smart case, and lots of components. £2 each ref JUN2P3. Box of 10 just £9.99 ref EF207.

SOLAR POWER LAB SPECIAL You get TWO 6"x6" 6v 130mA solar cells, 4 LEDs, wire, buzzer, switch plus 1 relay or motor. Superb value kit just £5.99 REF: MAG6P8

BUGGING TAPE RECORDER Small voice activated recorder, uses micro cassette complete with headphones. £28.99 ref MAR29P1.

ULTRAMINI BUGCIM 6mmx3.5mm made by AKG, 5-12v electret condenser. Cost £12 ea, Ours? just four for £9.99 REF MAG10P2.

RGB/CGA/EGATTL COLOUR MONITORS 12" in good condition. Back analysed metal case. £79 each REF JUN79

ANSWER PHONES Returns with 2 faults, we give you the bits for 1 fault, you have to find the other yourself. BT Response 200's £18 ea REF MAG18P1. PSU £5 ref MAG5P12.

SWITCHED MODE PSU ex equip, 60w +5v @ 5A, -5v @ 5A, +12v @ 2A, -12v @ 5A 120/220v cased 245x88x55mm IEC input socket £6.99 REF MAG7P1

PLUG IN PSU 9V 200mA DC £2.99 each REF MAG3P9

PLUG IN ACORN PSU 19v AC 14w, £2.99 REF MAG3P10

POWER SUPPLY fully cased with mains and o/p leads 1v DC 900mA output. Bargain price £5.99 ref MAG6P9

ACORN ARCHIMEDES PSU +5v @ 4.4A, on/off sw uncased, selectable mains input, 145x100x45mm £7 REF MAG7P2

9v DC POWER SUPPLY Standard plug in type 150ma 9v DC with lead and DC power plug. price for two is £2.99 ref AUG3P4.

AA NICAD PACK encapsulated pack of 8 AA nicad batteries (tagged) ex equip, 55x32x32mm. £3 a pack. REF MAG3P11

13.8V 1.9A psu cased with leads. Just £9.99 REF MAG10P3

PPC MODEM CARDS. These are high spec plug in cards made for the Amstrad laptop computers. 2400 baud dial up unit complete with leads. Clearance price is £5 REF: MAG5P1

INFRA RED REMOTE CONTROLLERS Originally made for hi spec satellite equipment but perfect for all sorts of remote control projects. Our clearance price is just £2 REF: MAG2

200 WATT INVERTER Converts 10-15v DC into either 110v or 240v AC. Fully cased 115x36x156mm, complete with heavy duty power lead, cigar plug, AC outlet socket, auto overload shutdown, auto short circuit shut down, auto input over voltage shutdown, auto input under voltage shut down (with audible alarm), auto temp control, unit shuts down if overheated and sounds audible alarm. Fused reversed polarity protected. output frequency within 2% voltage within 10%. A well built unit at a keen price. Just £64.99 ref AUG65.

UNIVERSAL SPEED CONTROLLER KIT Designed by us for the C5 motor but ok for any 12v motor up to 30A. Complete with PCB etc. A heat sink may be required. £17.00 REF: MAG17

MAINS CABLE Precut black 2 core 2 metre lengths ideal for repairs, projects etc. 50 metres for £1.99 ref AUG2P7.

COMPUTER COMMUNICATIONS PACK Kit contains 100m of 6 core cable, 100 cable clips, 2 line drivers with RS232 interfaces and all connectors etc. Ideal low cost method of communicating between PCs over a long distance. Complete kit £8.99.

ELECTRIC MOTOR KIT Comprehensive educational kit includes all you need to build an electric motor. £9.99 ref MAR10P4.

VIEWDATA SYSTEMS made by Phillips, complete with internal 1200/75 modem, keyboard, psu etc RGB and composite outputs, menu driven, autodialler etc. £18 each Ref EF88.

BOOMERANG High tech, patented poly propylene, 34cm wing span. Get out and get some exercise for £4.99 ref EF83

AIR RIFLES. 22As used by the Chinese army for training purposes, so there is a lot about! £39.95 Ref EF78. 500 pellets £4.50 ref EF80.

PLUG IN POWER SUPPLYS Plugs into 13A socket with output lead. three types available, 9vdc 150mA £2 ref EF58, 9vdc 200mA £2.50 ref EF59, 6.5vdc 500mA £3 ref EF61.

VIDEO SENDER UNIT. Transmits both audio and video signals from either a video camera, videorecorder, TV or Computer etc to any standard TV set in a 100' range! (tune TV to a spare channel) 12v DC *SOME OF OUR PRODUCTS MAY BE UNLICENSEABLE IN THE UK

op. Price is £15 REF: MAG15 12v psu is £5 extra REF: MAG5P2

***FM CORDLESS MICROPHONE** Small hand held unit with a 500' range! 2 transmit power levels. Reqs PP3 9v battery. Tuneable to any FM receiver. Price is £15 REF: MAG15P1

LOW COST WALKIE TALKIES Pair of battery operated units with a range of about 200'. Ideal for garden use or as an educational toy. Price is £8 a pair REF: MAG 8P1 2 x PP3 req'd.

***MINIATURE RADIO TRANSCEVERS** A pair of walkie talkies with a range up to 2km in open country. Units measure 22x52x155mm. Including cases and ear/pics. 2xPP3 req'd. £30.00 pr. REF: MAG30

COMPOSITE VIDEO KIT. Converts composite video input to separate H sync, V sync, and video. 12v DC. £8.00 REF: MAG8P2.

LQ3600 PRINTER ASSEMBLIES Made by Amstrad they are entire mechanical printer assemblies including printhead, stepper motors etc etc in fact everything bar the case and electronics, a good steeper! £5 REF: MAG5P3 or 2 for £8 REF: MAG8P3

LED PACK of 100 standard red 5m leds £5 REF MAG5P4

UNIVERSAL PC POWER SUPPLY complete with flyleads, switch, fan etc. 200w at £20 REF: MAG20P3 (265x155x125mm).

GYROSCOPE About 3" high and an excellent educational toy for all ages! Price with instruction booklet £6 Ref EF15.

FUTURE PC POWER SUPPLIES These are 295x135x60mm, 4 drive connectors 1 mother board connector. 150watt, 12v fan, iec inlet and on/off switch. £12 Ref EF6.

VENUS FLY TRAP KIT Grow your own carnivorous plant with this simple kit £3 ref EF34.

PC POWER SUPPLIES (returns) These are 140x150x90mm, of ps are +12, -12, +5 and -5v. Built in 12v fan. These are returns so they may well need repairing! £3.50 each ref EF42.

***FM TRANSMITTER KIT** housed in a standard working 13A adapter! the bug runs directly off the mains so lasts forever! why pay £700? or price is £15 REF: EF62 Transmits to any FM radio. (this is in kit form with full instructions.)

***FM BUG KIT** New design with PCB embedded coil for extra stability. Works to any FM radio. 9v battery req'd. £5 REF: MAG5P5

***FM BUG BUILT AND TESTED** superior design to kit. Supplied to detective agencies. 9v battery req'd. £14 REF: MAG14

TALKING COINBOX STRIPPER originally made to retail at £79 each, these units are designed to convert an ordinary phone into a payphone. The units have the locks missing and sometimes broken hinges. However they can be adapted for their original use or used for something else?? Price is just £3 REF: MAG3P1

TOP QUALITY SPEAKERS Made for Hi Fi televisions these are 10 watt 4R Jap made 4" round with large shielded magnets. Good quality. £2 each REF: MAG2P4 or 4 for £6 REF: MAG6P2

TWEETERS 2" diameter good quality tweeter 140R (ok with the above speaker) 2 for £2 REF: MAG2P5 or 4 for £3 REF: MAG3P4

AT KEYBOARDS Made by Apricot these quality keyboards need just a small mod to run on any AT. They work perfectly but you will have to put up with 1 or 2 foreign keycaps! Price £6 REF: MAG6P3

DOS PACKS Microsoft version 3.3 or higher complete with all manuals or price just £5 REF: MAG5P8 Worth it just for the very comprehensive manual! 5.25" only.

GAS HOBS Brand new made by Optimus, basic three burner suitable for small flat etc bargain price just £29.95 ref EF73.

GAT AIR PISTOL PACK Complete with pistol, darts and pellets £12.95 Ref EF82 extra pellets (500) £4.50 ref EF80.

DOS PACK Microsoft version 6 with manual £9.99 3.5" ref EF209

WINDOWS 3.1 3.5" with manual £24.99 ref EF210.

NOVELL NETWARE LITE (network s/ware) £24.99 ref EF211.

PIR DETECTOR Made by famous UK alarm manufacturer these are hi spec, long range internal units. 12v operation. Slight marks on case and unboxed (although brand new) £8 REF: MAG8P5

MOBILE CARPHONE £6.99 Well almost complete in carphone excluding the box of electronics normally hidden under seat. Can be made to illuminate with 12v also has built in light sensor so display only illuminates when dark. Totally convincing! REF: MAG6P6

6"x12" AMORPHOUS SOLAR PANEL 12v 155x310mm 130mA. Bargain price just £5.99 ea REF MAG6P12.

FIBRE OPTIC CABLE BUMPER PACK 10 metres for £4.99 ref MAG5P13 ideal for experimenters! 30m for £12.99 ref MAG13P1

HEATSINKS (finned) TO220, designed to mount vertically on a pcb 50x40x25mm you can have a pack of 4 for £1 ref JUN1P11.

STROBE LIGHT KIT Adjustable from 1 hz right up to 60hz! (electronic assembly kit with full instructions) £16 ref EF28.

ROCK LIGHTS Unusual things these, two pieces of rock that glow when rubbed together! believed to cause rain! £3 a pair Ref EF29.

AMSTRAD GX4000 games machines, returns, untested, sold as seen. Just £2.99 ref EF186.

NEW HIGH POWER LASERS 15mW, Helium neon, 3 switchable wave lengths 63um, 1.15um, 3.39um (2 of them are infrared) 500:1 polarizer built in so good for holography. Supplied complete with mains power supply. 790x65mm. Use with EXTREME CAUTION AND QUALIFIED GUIDANCE.

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WITH NEW COMPUTER INTERFACE \$59
A Hand held personal Gamma and X Ray detector. This unit contains two Geiger Tubes, has a 4 digit LCD display with a Piezo speaker, giving an audio visual indication. The unit detects high energy electromagnetic quanta with an energy from 30K eV to over 1.2M eV and a measuring range of 5-9999 UR/h or 10-99990 Nr/h. ref NOV18

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FOUR-IN-ONE INSTRUMENT MODEL MX-9000



All in one bench test instrument with frequency counter, autoranging digital multimeter, 3 D.C. power supplies (2 fixed & 1 variable) and function generator, integrated into one compact and lightweight unit with full overload protection. Ideal for use in laboratories, education, production lines or research and development environments with its simple and easy operation.

FREQUENCY COUNTER

Range: 1Hz - 100MHz
Display: 8 Digit LED

FUNCTION GENERATOR

Output Waveforms:
Square, Pulse, Triangle,
Skewed Pulse, Sine,
TTL Level Square
Frequency: 0.02Hz - 2MHz
Output: 0.1Vpp - 20Vpp

Please Note:- It is not possible to list all of this instrument's functions and specifications above. A detailed leaflet is available on request.

Price:
£353.00 + £61.78 V.A.T.

DIGITAL MULTIMETER

3 1/2 Digit LCD Display
Auto/Manual Ranging
Measurement:

DC V: 1000V Max
AC V: 750V Max
DC A: 10A Max
AC A: 10A Max
Resistance: 2MΩ Max

POWER SUPPLY

3 1/2 Digit LCD Display
Triple Output:
0 - 50V Variable, 0.5A Max
15V, 1A (Fixed)
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Full Over Current Protection

Multifunction Meter PC Compatible, Metex M3850



The Metex M3850 is excellent value for money and is packed with so many features that only a few can be included here. The M3850 is an autoranging DMM, but also includes a frequency counter, thermometer, capacitance meter, logic probe, diode check and transistor hFE. Also, the M3850 can communicate with a PC using the software and leads provided. The M3850 is supplied complete with a carry case, test leads and a manual.

DC Volts 0 - 1000V
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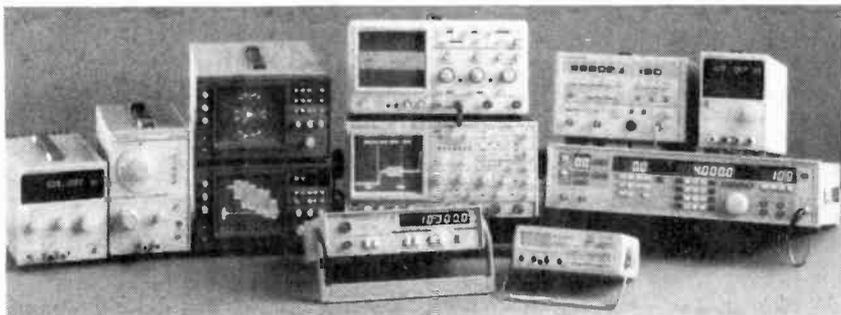
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9 Ranges OpF (with set zero) to 20,000uF ★ Large, 3.5 Digit, 18mm LCD Display
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LCR METER LCR195
3.5 Digit LCD Display ★ 7 Capacitance Ranges 0 - 200uF
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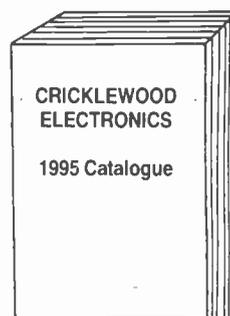
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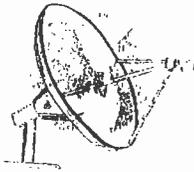
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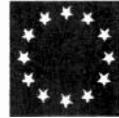
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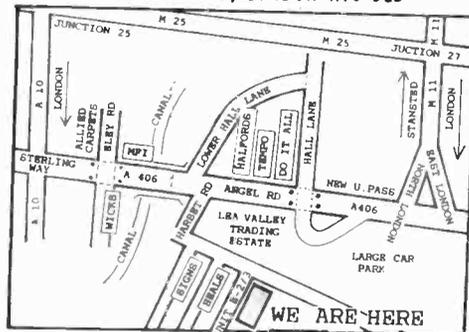
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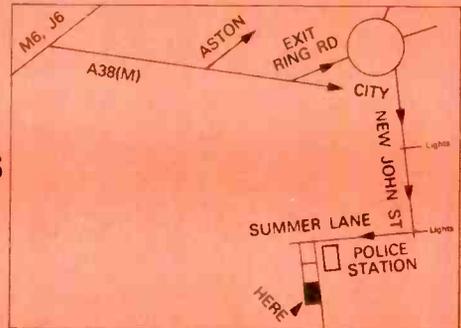
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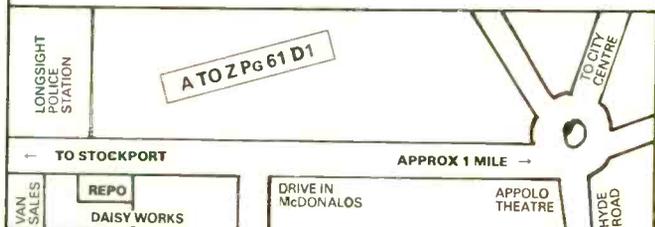
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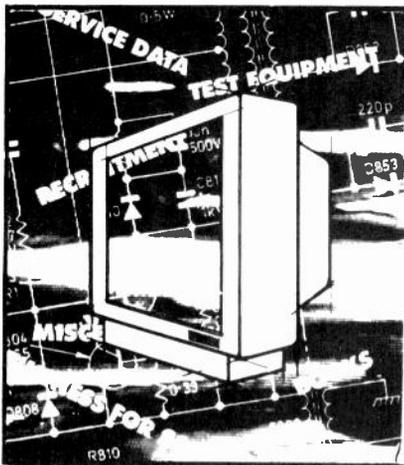
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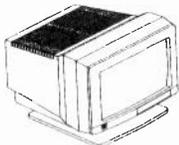
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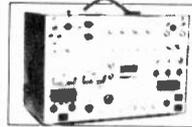
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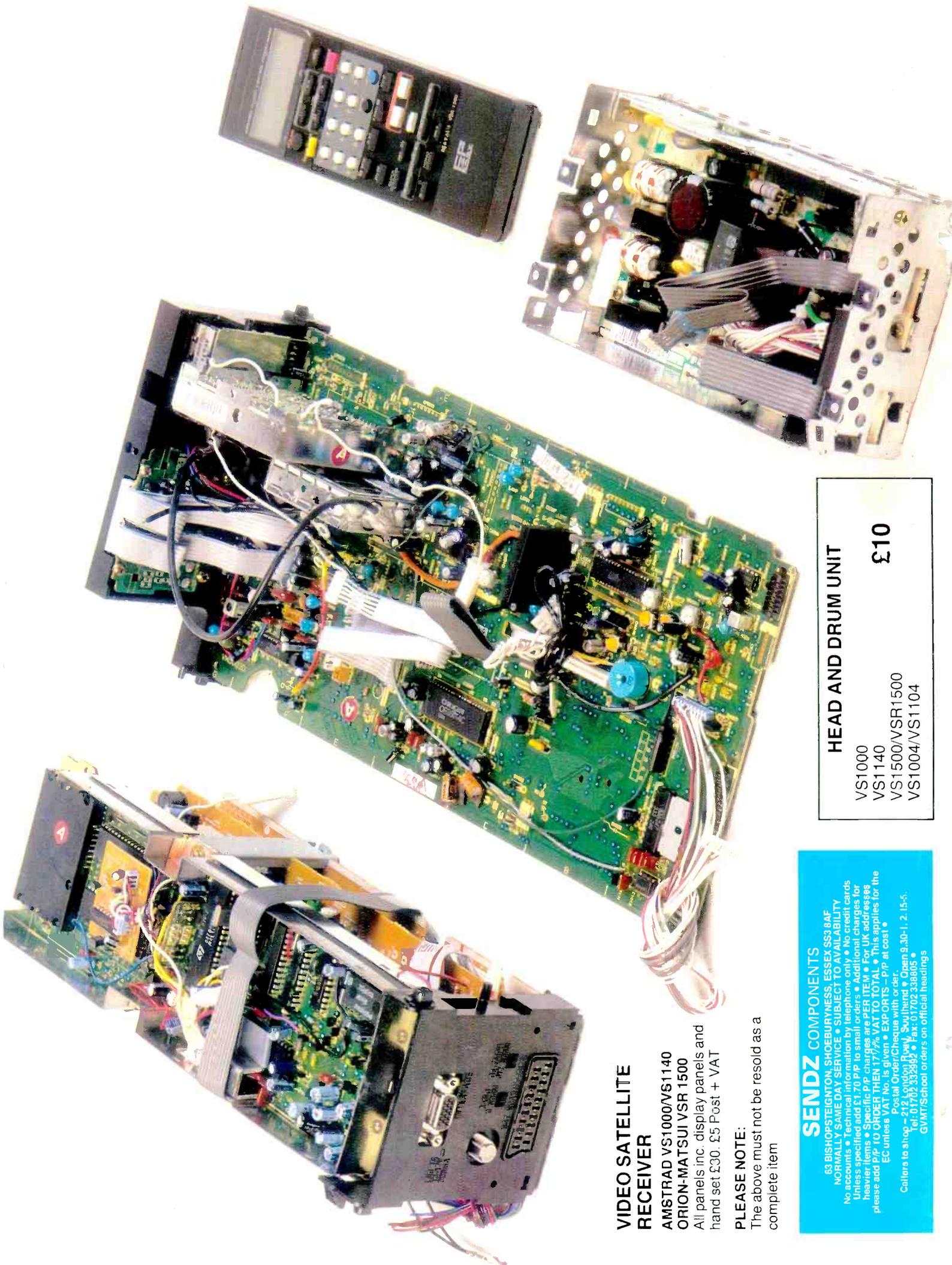
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