THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

TELEUISION

SERVICING VIDEO SATELLITE DEVELOPMENTS

NOVEMBER 1996 £2.35

Servicing the Panasonic K deck

Pace MSP200 dish positioner

DVD launch latest

Channel 5 reception techniques

Surface-mount failure mechanisms





Fault Reports TVs, VCRs, Camcorders and Satelfite

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The Philips G110 Revisited 18

Richard Newman contributes a follow-up on servicing the Philips G110 chassis, for which an additional repair kit to deal with 'rogue' sets has been introduced.

Surface-mount Failure Mechanisms

Surface mounting imposes additional stress on components that tend to be brittle. Martin T. Pickering, B.Eng. on how failures occur and ways in which they can be avoided.

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Channel 5 Reception 24

Reception of Channel 5 is going to introduce new problems which will vary in different parts of the country. Bill Wright on ways of dealing with them.

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At the DVD Forum

A recent forum in Brussells dealt with the problems that have delayed the launch of the DVD system.

George Cole reports on the current situation.

at Atlanta in Talantaia

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Dish Drive Techniques 54 J. LeJeune describes the control system and circuit

J. LeJeune describes the control system and circuit techniques used in the Pace MPS200 dish positioner, which can be used as a stand-alone unit.

Long-distance TV

DX conditions and receptioon, the satellite scene and news from abroad. Roger Bunney reports. Also a satzappers guide to LNB performance, and a review of Seeing by Wireless, by Ray Herbert, a new book on John Logie Baird's work and achievements.



Servicing the Panasonic K Deck

John Coombes provides a guide to fault conditions that can arise with this deck, which is used in Panasonic NVHD and NVSD series VCRs.

CORRECTIONS

The correct telephone number for HS Publications is 01332 381 699, not as given on page 904 last month beneath the loop aerial photograph.

The fault report on the Sony EVA300UB in Camcorner last month should have appeared in VCR Clinic.



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BC107 BC108	8p 8p	BD434 BD435	30p 31p	BU126 BU128	65p 125p	BUV48AF BUV48C	325p 250p	MJ4502 MJ10012	300p 300p	4N35	50p	LINEAR .		AN6340 AN6341	600p 200p	BA335 BA338	66p 80p	BA7004 BA7007	200p 200p
8C109 BC109C	8p	8D436 BD437	30p 28p	BU133 BU137	125p 150p	BUV50 BUV61	425p 1000p	MJ11015 MJ11016	250p 300p	RECTIFIER		AN203 AN210	210p	AN6342 AN6344	325p	BA340 BA343	75p 60p	BA7021 BA7022	180p 350p
BC140 BC142	20p 20p	BD438 BD439	36p 40p	BU180 BU184	100p 100p	BUV70 BUV90	200p 175p	MJ11032 MJ11033	800p 800p	DIODES BY127	2n	AN211 AN214Q	150p 170p	AN6345 AN6346	400p 350p	BA336 BA401	175p 60p	BA7025L BA7107	100p 475p
BC143 BC147	20p 8p	BD440 BD441	40p 40p	BU204 BU205	85p 70p	BUV93 BUW11A	375p 200p	MJ15003 MJ15004	250p 300p	BY127 BY133 BY164	8p 40p	AN217P AN228	95p 280p	AN6350 AN6352	610p 450p	BA402 BA511	50p 145p	BA7212S BA7252S	200p 150p
BC149 BC159	8p	BD533 BD534	50p 38p	BU206 BU207	100p 150p	BUW11AF BUW12	225p 126p	MJ15015 MJ15016	250p 350p	BY179 :	35p 32p	ANZ52 ANZ59	150p 250p	AN6356 AN6359	300p 500p	BA514 BA516	160p	BA7604N BA7751LS	100p
BC160 BC171	30p 10p	BD535 BD536	38p 38p	BU208 BU208A	70p 75p	BUW12A BUW12F	150p 250p	MJ15022 MJ15023	250p 400p	BY206	11p	AN262 AN271	140p 230p	AN6360 AN6362	320p	BA518 BA521	150p 100p	BA7752 BA7755	250p 150p
BC172 BC177	10p 14p	8D537 8D538	40p 40p	BU208AT BU208B	200p	BUW13A BUW32A	200p 500p	MJ15024 MJ15025	400p 700p	BY227	20p 19p 28o	AN274 AN2778	250p 400p	AN6363 AN6367N	375p	BA524 BA526	240p 180p	BA7767A	350p
BC178 BC179	14p 14p	BD643 BD645	50p 50p	BU208D BU209	130p 90p	BUW48 BUW49	550p 550p	MJE340 MJE350	25p 80p	BY298	15p 18p	AN278 AN301	330p	AN6368 AN6371	275p 350p	BA527 BA532	95p 100p	8A15218 CA3140E	60p 38p
BC182 BC182L	7p 7p	BD647 BD649	50p	BU225 BU226	120p 120p	BUW50 BUW81A	400p 150p	MJE520 MJE2955T	30p 65p	BY329-1200 1	50p 20p	AN302 AN303 AN304	650p 250p 360p	AN6387 AN6550	480p 100p	BA534 BA536	220p 150p	CNX62A CNX82A	80p
BC183 BC183L	7p 7p	8D676 BD676	40p 40p	BU312 BU325	90p 55p	BUW84 BUW85	75p 85p	MJE3055T MJE13004	65p	BYT11	25p 30p	AN315 AN316	210p 350p	AN6551 AN6552	50p 45p	BA546 BA612	160p 120p	CNX83A CX136	80p 600p
BC184 BC184L	7p 7p	BD677 BD678	38p 40p	BU326A BU406	75p 60p	BUX10 BUX11	150p 200p	MJE13005 MJE13007	100p	BYV96E	25p 36p	AN337 AN360	600p 100p	AN6554 AN6555	80p 50p	BA614 BA618	70p 55p	CX139A CX141	750p 750p
BC212 BC212L	7p 7p	BD679 BD680	40p 40p	BU406D BU407	85p 55p	BUX12 BUX20	150p 350p	MJE13009 MJE15028	200p	BYX10	15p 25p	AN362 AN363	140p	AN6605 AN6612	35p 60p	BA631 BA656	280p 110p	CX145 CX150B	725p 325p
BC213L	7p 7p	BD681 BD682	45p 45p	BU407D BU408	75p 60p	BUX21 BUX22	450p 450p	MJE15029 MJE15030	250p	IN4001 IN4002	3p 3p	AN366 AN610	150p 160p	AN6650 AN6651	45p 45p	BA658 BA681A	350p 350p	CX175 CX187	325p 825p
BC214L BC214L	7p 7p	BD705 BD707	50p 50p	BU408D BU409	75p 85p	BUX23 BUX37	900p 220p	MJE15031 MJE18004	125p	IN4003 IN4004	3p 3p	AN3211K AN3215K	375p 350p	AN6652 AN6671K	45p 425p	BA682A BA683A	300p	CX804A CX867	775p 575p
BC237 BC238 BC239	7p 7p	BD709 BD711	50p	BU412 BU413	175p	BUX39 BUX40	450p 210p	MJF18004 MJF18204	350p	IN4005 IN4006	3p 3p	AN3231K AN3236K	300p 450p	AN6676 AN6780S	600p 80p	BA684 BA685	400p 400p	CX868 CX877	525p 300p
BC300 BC301	7p 20p 20p	BD736 BD826 BD828	50p 50p	BU414B BU415A BU426A	250p 170p 70p	BUX41 BUX42 BUX47A	200p 200p	OC28 OC29 OC35	350p 250p	IN4007 IN4148	4p 2p 9p	AN3310K AN3312	325p 350p	AN6870 AN6875	450p 150p	BA715 8A718	45p 45p	CX7925B CX20015A	550p 600p
BC302 BC303	20p 20p	BD839 BD897	50p 55p 50p	BU433 BU500	120p 100p	BUX48A BUX55	220p 150p 800p	OC36 S2000A3	350p 250p 175p	IN5400 IN5401	80	AN3313 AN3320K	300p 450p	AN6878 AN6879 AN6880	65p 225p	BA728 BA806	220p	CX20106A CX20109	140p
BC304 BC327	25p 7p	BD899 BD977	50p 50p	BU500D BU505	225p 90p	BUX80 BUX81	180p 160p	S2000AF S20055A	176p 176p	IN5402 IN5403	8p 8p	AN3331K AN3792	450p 300p	AN6882 AN6884	75p 300p 200p	BA843 BA1310 BA1320	130p 160p 75p	CX20187 CXA1001A CXA1019	700p 9 1600p 9 150p
1 HC328	7p	BDX33 BDX37	80p 100p	BU505D BU505DF	90p 90p	BUX84 BUX85	50p 50p	S2055AF S2530A	200p 100p		8p	AN3794 AN3814K	325p 450p	AN6888 AN6889	350p 100p	BA1330 BA1332	120p 60p	CXA10195 CXA10445	3 225p
BC337 BC338 BC441	7p 28p	BDX44 BDX47	100p 60p	BU506 BU506D	100p	BUX86 BUX87	30p 50p	TIP29 TIP29A	15p 22p	IN5407	12p 12p	AN3821K AN3822K	600p	AN6913 AN700	60p 650p	BA1350 BA1355	130p 125p	CXA10441 CXA1081	3P 475p 275p
BC446 BC477	8p 18p	BDX54C BDX62C	75p 150p	BU506DF BU508A	120p 70p	BUX98A BUZ71	350p 75p	TIP29C TIP29E	25p	RGP10	12p 25p 25p	AN3830K AN3990K	800p 300p	AN7010K AN7025K	250p _90p	BA1356 BA1360	100p	CXA10811 CXA10811	/ 250p
BC516 BC537	22p 25p	BDX63C BDX64C	175p 175p	BU508AF BU508AP	95p	BUZ71AF BUZ72A	100p 100p	TIP30 TIP30C	25p 25p	RGP30	16p 60p	AN3991K AN5010	400p 250p	AN7060 AN7062	175p 300p	BA1404 BA1604	120p 125p	CXA1082A CXA1191	S 1000p
BC546 BC547	8p	BDX65 BDX66C	80p 176p	BU508D BU508DF	90p 115p	BUZ72AF BUZ73A BUZ73AF	100p 150p	TIP31A TIP31C	22p 27p	SAZINI N	ООР	AN5011 AN2020	225p 80p	AN7072 AN7081K	250p 200p	BA2266A BA3306	250p 60p	CSA1209F FT5754M	400p 600p
BC548 BC549	8p 8p	BDX67C BDX71	275p 70p	BU508DR BU508V	130p 110p	BUZ/6A	60p	TIP32 TIP32A	24p 21p	8 PIN		AN5025 AN5033 AN5034	260p 400p 400p	AN7105 AN7106K	170p 135p	BA3308 BA3312	70p 60p	FY5764M HA1124	250p 125p
BC550 BC556 BC557	8p 8p	BDX77 BDX87C	175p 175p	BU508VF BU526	100p 75p	BUZ80 BUZ80AF	200p 200p	TIP32C TIP33	28p 50p	14 PIN 16 PIN	4p 5p	AN5070 AN5071	125p 100p	AN7110 AN7111	75p	BA3402 BA3406A	90p	HA1125 HA1137W	120p
BC558	8p 8p	BDX88C BDW24	150p 55p	BU536 BU546	100p 126p	BUZ90A	200p 180p	TIP33C TIP34	60p 50p	18 PIN	5p 9p 10p	AN5111 AN5132	450p 250p	AN7112 AN7114	45p 120p	BA3416BI BA3422	350p	HA1151 HA1197	175p 130p
BC559 BC560	8p 8p	BDW93 BDW94	50p 60p	BU603 BU605D	125p 225p	BUZ91A BY448	400p 20p	TIP34C TIP35C	65p	22 PIN '	12p 13p	AN5135N AN5138N	K 400p	AN7115 AN7116	110p 90p	BA3505F BA3506A	70p	HA1199 HA1201	130p 225p
BC637 BC639 BC640	20p 20p	BDY29 BDY56	225p 225p	BU608D BU626	120p	BYT11 IRF120	25p 225p	TIP36C TIP41A	65p 20p	28 PIN '	13p 15p	AN5150 AN5151	400p 200p	AN7117 AN7120	65p 100p	BA3516 BA3520	120p 130p	HA1202 HA1319	125p 200p 300p
BCY33 BCY34	200p 200p 200p	BDY58 BDY90 BDY92	500p 125p	BU705 BU706DF	130p 175p 150p	IRF130 IRF140	475p 550p	TIP41C TIP42A TIP42C	22p 20p			AN5210 AN5215	675p	AN7130 AN7131	75p 90p	BA3521 BA3704	225p 200p	HA1338 HA1339A	350p
BCY70 BCY71	16p	BF137 BF167	100p 35p 30p	BU706F BU724A BU801	100p 70p	IRF230 IRF240 IRF250	550p 425p 375p	TIP47 TIP48	40p 40p	2ENER DIODI 400 mWatta	ES	AN5222 AN5250	200p	AN7133N AN7134	325p 300p 170p	BA3706 BA3812L	75p 80p	HA1367 HA1377	300p 120p
BCY72 BD115	16p 30p	BF181 BF183	18p 20p	BU806 BU807	70p 60p	IRF330 IRF340	600p 325p	TIP50 TIP51	60p 80p	2V7 to 39V 1.3 Watta	5p	AN5256 AN5260	150p 300p	AN7140 AN7141 AN7142	70p 80p	BA3822LS BA3824LS BA3920	80p 75p 300p	HA1384 HA1388 HA1389	800p 320p 210p
8D124P 8D131	50p 25p	BF195 BF199	7p 8p	BUS07F BUS08DF	75p 300p	IRF350	750p	TIP52 TIP54	80p	2V7 to 39V	9p	AN5262 AN5265	175p 80p	AN7145 AN7146	195p 210p	BA4110 BA4210	75p 85p	HA1392 HA1394	120p 170p
BD132 BD133	25p 50p	BF200 BF225	18p 30p	BU810 BU824	110p 450p	IRF450 IRF510 IRF520	150p 150p	TIP102 TIP105	70p	VOLTAGE		AN5315 AN5352	600p	AN7147 AN7148	160p 140p	BA4220 BA4234L	60p 70p	HA1396 HA1397	650p 200p
BD135 BD136	20p 20p	BF240 BF245	15p 25p	BU826 BU826A	120p 160p	IRF530 IRF540	300p 300p	TIP106 TIP107	65p	7805	25p	AN5411 AN5421 AN5429	450p 150p	AN7149 AN7154	160p	BA4236L BA4402	110p 45p	HA1398 HA1406	175p 120p
BD137 BD138	20p 20p	BF254 BF255	15p 12p	BU902 BU903	110p	IRF610 IRF611	150p 150p	TIP110 TIP111	40p 40p	7806 7808	25p 25p	AN5431 AN5435	420p 275p 125p	AN7156 AN7158	240p 310p	BA4403 BA4405	220p 80p	HA11123 HA11211	350p 170p 350p
BD139 8D140	20p 20p	BF 256 BF 257	18p	BU910 BU912	80p	IRF620 IRF630	200p 150p	TIP112 TIP112H	35p	7815	25p 25p	AN5436N AN5512	160p 100p	AN7160 AN7161N	350p 375p	BA4412 BA5101	50p 350p	HA11215 HA11219	280p
BD144 BD157	90p 38p	BF259 BF262	18p 25p	BU920 BU922	100p	IRF640 IRF642	400p 200p	TIP115 TIP116	30p 30p	7824	25p 25p	AN5515 AN5520	160p 550p	AN7163 AN7166	175p 350p	BA5102 BA5115	140p 75p	HA11221 HA11225	180p 130p
BD166 8D175 BD177	30p 30p 30p	BF270 BF273	18p 15p	BU930 BU932	130p 175p	IRF650 IRF710	200p 150p	TIP117 TIP120	30p 37p	7906	25p 30p	AN5521 AN5560	100p 350p	AN7168 AN7169	200p 225p	BA5115L BA5204	75p 200p	HA11235 HA11244	100p 375p
BD179 BD181	32p 45p	BF311 BF336 BF337	21p 20p 20p	BU941 BU250BA BU250BAI	250p 130p 130p	IRF720 IRF730 IRF740	150p 175p 400p	TIP121 TIP122 TIP125	35p 30p 30p	7912	30p	AN5601K AN5612	750p 200p	AN7170 AN7171K AN7172K	260p 400p	BA5208AI BA5402 BA5406	180p	HA11247 HA11251	375p 120p
BD182 BD184	60p	BF338 BF362	20p 30p	8U2508D BU2508D	130p	IRF820 IRF830	150p 225p	TIP126 TIP127	40p 35p	7918 3	30p 30p 30p	AN5613 AN5615	200p 300p	AN7172K AN7173K AN7177	325p 450p 376p	BA5406 BA5408 BA5413	180p 180p 225p	HA11412 HA11414 HA11423	600p 300p 110p
BD187 BD201	30p 33p	BF367 BF371	13p 17p	BU2520AI BU2520DI	225p	IRF840 IRF9140	200p 1000p	TIP130 TIP131	30p 30p		24p	AN5620 AN5622	250p 275p	AN7178 AN7205	180p 35p	BA6104 BA6109	250p	HA11440 HA114858	250p N 400p
BD202 BD203	38p	BF421 BF422	18p 21p	BU2525A BU2525A	325p 325p	IRF9510 IRF9511	150p 150p	TIP132 TIP136	30p 40p 65p	78L12 78L15	24p 24p	AN5625 AN5630 AN5633	375p 350p	AN7213 AN7216	40p 175p	BA6110 BA6125	225p 75p	HA11702 HA11703	330p 400p
BD204 BD222	42p 31p	BF423 BF455	25p 12p	BU2527AI BUF405A	400p 200p	IRF9520 IRF9530	150p 400p	TIP137 TIP162	110p	78L18 2	24p 24p	AN5635N AN5640	330p 500p	AN7218 AN7220	60p 85p	BA6137 BA6138	55p 130p	HA11706 HA11710	280p 500p
BD225 BD232	31p 31p	BF458 BF462	19p 50p	BUH315 BUH315D	200p 175p	IRF9531 IRF9540	200p 300p	TIP141 TIP142	68p 75p	79L05 79L08	35p 35p	AN5700 AN5701	90p 150p	AN7222 AN7223	75p 105p	BA6146 BA6149LS		HA11713 HA11715	250p 250p
BD234 BD234	30p 32p	BF471 BF472	28p 28p	BUH515D	200p	IRF9541 IRF9610	200p 200p	TIP145 TIP146	50p 70p	79L15 :	35p 35p	AN5710 AN5712	100p 180p	AN7224 AN7225	75p 1 75 p	BA6154 BA6208	60p 176p	HA11716 HA11718	480p 700p
BD235 BD236 BD237	28p 30p	BF494 BF495	30p 16p	BUH517 BUH517D	275p 175p	IRF9620 IRF9622 IRF9630	225p 200p	TIP147 TIP150	80p 90p	LM317T 10	00p	AN5720 AN5722	70p 140p	AN7254 AN7256	150p 250p	BA6218	85p 85p	HA11724 HA11741	
BD238 BD239	21p 24p 30p	BF595 BF596	16p 16p 16p	BUH715 BUT11A BUT11AF	425p 55p 55p	IRF9630 IRF9640 IRFD9220	325p 378p 100p	TIP151 TIP2955 TIP3055	60p 50p 50p	78H08KC 80	50p 00p	AN5730 AN5732	160p 120p	AN7273 AN7310	75p 60p 90p	BA6220 BA6222 BA6227	130p	HA11744 HA11745 HA11749	330p 330p
BD240 BD241A	40p 40p	BF615 BF617	30p 30p	BUT12 BUT13	80p 310p	IRFBC30 IRFBC40	200p 400p	TIPL760 TIPL762A	100p 200p		00p 00p	AN5750 AN5753	75p	AN7311 AN7312 AN7315	70p 40p	BA6227 BA6229 BA6235	50p 130p 50p	HA11751 HA11752	350p 1500p
BD243A BD244	50p 60p	BF760 BF763	40p 40p	BUT18 BUT18AF	80p 80p	IRFP140 IRFP150	250p 300p	TIPL763A TIPL791A	200p	LED:		AN5763 AN5790	250p 240p	AN7330 AN7362	110p 200p	BA6238A BA6239A	130p 130p	HA118391 HA11847	325p 700p
BD245 BD246A	50p 50p	BF870 BF871	22p 22p	BUT30V BUT56A	1700p	IRFP240 IRFP250	300p 400p	2N2369 2N2646	15p 40p	3mm		AN5791 AN5836	225p 450p	AN7363 AN7410	225p 150p	BA6247 BA6248	150p	HA12002 HA12003	220p
BD265 BD267	45p 45p	BF960 BF961	38p 35p	BUT76A BUT90	80p 1300p	IRFP350 IRFP450	325p 400p	2N2904 2N2905	20p 20p	YELLOW	5p 8p	AN5862K AN5900	225p 130p	AN7411 AN7414	50p 275p	BA6259 BA6280AI	170p 300p	HA12005 HA12010	180p 300p
BD269 BD278	45p 50p	BF964 BFQ232	38p	BUT92 BUV18	1200p 650p	IRFP460 IRFP9140	775p 1450p	2N2906 2N2907	18p 18p	GREEN 5mm	8p	AN608P AN620	125p 250p	AN7415 AN7470	70p	BA6290A BA6294	200p 250p	HA12016 HA12017	120p 100p
BD311 BD314	100p 100p	BFQ252A BFR90	60p 85p	BUV20 BUV21	650p 400p	IRFP9240 IRFPC50	500p 600p	2N3019 2N3053	28p	RED YELLOW	5p 8p	AN6130 AN6135	130p 120p	AN8053 AN8275	200p 250p	BA6302A BA6304	150p	HA12026 HA12038N	125p
BD315 BD317	150p 150p	BFR91 BR100	99p 14p	BUV23 BUV24	475p 350p	IRFRC20 IRFZ20	250p 65p	2N3054 2N3055	18p 40p 38p	GREEN	8p	AN6209 AN6250 AN6247	350p 50p 200p	AN8370 AN8377	1000p 400p	BA6305 BA6321	140p 250p	HA12044 HA12045	350p 280p
BD331 BD332	40p	BR103 BR303	37p 85p	BUV25 BUV26	110p 150p	IRFZ42 IRFZ44	275p 275p	2N3055H 2N3440	50p	RECTANGUL	AR	AN6247 AN6270 AN6300	400p 600p	BA222	350p 65p	BA6338 BA6334	250p 75p	HA12047 HA12058	450p 320p
BD361 BD362	60p 60p	BU105 BU108	80p 100p	BUV27 BUV28	125p 110p	MJ2501 MJ2955	100p 55p	2N3441 2N3442	175p 85p	LEDs		AN6306 AN6310	380p 200p	BA225 BA314	100p 40p	BA6410 BA6411	220p 250p	HA12088 HA12116	375p
BD370 BD371	30p	BU109 BU110	90p	BUV46A	175p	MJ3000 MJ3001	100p	2N3771 2N3772	85p 90p	Smm x 2.5mm RED YELLOW	5p	AN6320 AN6326N	180p 250p	BA301 BA311	55p 80p	BA6418N BA6435S	100p 425p	HA12411 HA12412	175p 175p
BD410 BD433	50p. 28p	BU111 BU124	100p 60p	BUV47 BUV48A	120p 175p	MJ4032 MJ4035	175p 176p	2N3773 2N3819	100p 29p	GREEN	8p 8p	AN6332	320p	BA313 BA333	60p 80p	BA6993 BA7001	150p 150p	HA12413 HA12430	70p 200p
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	LINEAR ICs																		
Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
HA13001 HA13002 HA13006	110p 200p 400p	LA2211 LA2800 LA3120	350p 360p 200p	LA7054 LA7060 LA7096	350p 150p 200p	LC7881B LC7881M LF347	135p 325p 110p	MC1455 MC1488 MC1489	45p 35p 35p	SAB2022 SAB3012 SAB3013	676p 200p	STK2250 STK3041 STK3042	550p 370p 375p	STK5488 STK5471 STK5472	300p 330p 375p	STR7001 STR9005 STR9012	600p 400p 450p	TA7267B TA7269 TA7270	260p
HA13007 HA13108 HA13117	300p 280p 176p	LA3150 LA3160 LA3161	200p 120p 40p	LA7113 LA7116 LA7123	275p 125p 1300p	LF353 LF355 LF357	48p 60p 70p	MC1496 MC3302 MC3401	65p 50p 45p	SAB3017 SAB3021 SAB3029	320p 450p 525p	STK3044 STK3062 STK3082	500p 500p 550p	STK5473 STK5474 STK5476	480p 600p 350p	STR1000 STR1100 STR1200	6 400p	TA7271 TA7272 TA7273	220p 260p 300p
HA13118 HA13119 HA13127	140p 140p 350p	LA3210 LA3226 LA3246	65p 60p 75p	LA7210 LA7212 LA7214	60p 150p 160p	LF398 LH2426S LM301	300p 600p 26p	MC34231 MC3488/ MC34063	AP 250p	SAB3035 SAB3036 SAB3037	600p 725p 700p	STK3102 STK3106 STK3122	2500p	STK5477 STK5478 STK5479	450p 380p 300p	STR1300 STR1500 STR1600	6 500p	TA7274 TA7279P TA7280	210p 325p 190p
HA13128 HA13130 HA13135	400p 450p 500p	LA3300 LA3301 LA3361	140p 110p 100p	LA7220 LA7222 LA7224	125p 110p 150p	LM311 LM319 LM324	35p 165p 30p	MN1220 MN1226 MN1228	600p 450p 600p	SAB3042 SAB3064 SAB3209	825p 130p 225p	STK3152 STK3156 STK4017		STK5481 STK5482 STK5483	520p 285p 440p	STR1700 STR2000 STR2001	6 500p 5 450p	TA7281 TA7282 TA7210	200p 160p 200p
HA13139 HA13150	600p	LA3365 LA3370 LA3373	70p 70p 70p	LA7225 LA7292 LA7294	250p 275p 200p	LM3352 LM339 LM348	120p 35p 60p	MN1276 MN1280 MN3004	1300p 70p 600p	SAB3210 SAB6456 SAB8048	250p 125p	STK4019 STK4021 STK4024	480p 380p	STK5486 STK5487 STK5488	450p 525p 480p	STR2001 STR3011 STR3011	5 460p 0 330p	TA7283 TA7284P TA7288	200p 400p 220p
HA13151 HA13403 HA13406	W 400p	LA3375 LA3376 LA3380	300p 80p	LA7295 LA7297 LA7305A	160p	LM358 LM380 LM381	45p 80p 150p	MN3005 MN3011 MN3101	2000p 4000p 110p	SAB8051 SDA2003 SDA2004	AP 700p	STK4025 STK4026 STK4028	530p 480p 550p	STK5490 STK5632 STK5720	450p 450p 400p	STR3012 STR3012 STR3012	0 400p 3 450p	TA7291P TA7292P TA7294P	200p 325p 450p
HA13408 HA13412 HA13426	350p 600p 500p	LA3390 LA3400 LA3401	300p 260p 250p 90p	LA7308 LA7311	350p 70p 200p 120p	LM382 LM386 LM387	130p 60p 100p	MN3102 MN3207 MN3208	110p 375p 950p	SDA2005 SDA2007 SDA2008	700p 300p	STK4032 STK4034 STK4036	Ⅱ 510p X 925p	STK5725 STK5730 STK6316	450p 450p 300p	STR3013 STR4009 STR4011	0 250p 0 350p	TA7299 TA7302P TA7303	200p 75p 70p
HA13432 HA13441 HA17524	400p 450p 250p	LA3410 LA3430	150p	LA7320 LA7323 LA7330	325p 350p	LM389N LM393	105p 45p	MN5030- MN6163. MTA001	350p A 700p	SDA2112 SDA2120 SDA2131	450p 200p	STK4038 STK4040 STK4042	680p	STK6324B STK6327 STK6328A	500p 1200p	STR4109 STR4311 STR4411	0 400p 1 950p	TA7307 TA7310 TA7312	100p 100p 120p
KA2102 KA2130 HA2131	160p 150p 110p	LA3600 LA3605 LA3607	60p 100p 126p	LA7331 LA7332 LA7340	250p 225p 300p	LM431 LM710 LM723	60p 45p 40p	NE555 NE556	20p 40p	SDA2208 SDA4212	450p 776p	STK4044 STK4046 STK4048	800p	STK6431 STK6607	850p 400p 725p	STR4511 STR5002 STR5009	1 550p 0 450p	TA7313 TA7314 TA7315	70p 176p 200p
KA2206 KA2209 KA2210	150p 125p 230p	LA4030 LA4031 LA4032	180p 140p 140p	LA7376 LA7391 LA7520	150p 550p 200p	LM741DII LM741MI LM747	55p	NE558 NE565 NE567	80p 110p 115p	SDA5241 SDA5243 SDA5343	2 450p	STK4050 STK4060	II 1600p	STK6722 STK6732 STK6822	900p	STR5010 STR5011	3A 260p 3 500 p	TA7317P TA7320P	120p 200p
KA2212 KA2213 KA2214	65p 130p 100p	LA4100 LA4101	160p 85p 80p	LA7530 LA7535 LA7545	200p 175p 160p	LM1017 LM1035N LM1040N	650p	NE571 NE592 NE5532F	290p 85p 140p	SDA5840 SDA5642 SGSF444	450p 500p	STK4065 STK4101 STK4111	650p 500p 500p	STK6922 STK6932 STK6962	500p 525p 276p	STR5011 STR5104 STR5021	1 500p 3 500p	TA7322 TA7323 TA7234	130p 80p 75p
KA2224 KA2244 KA2261	50p 75p 100p	LA4102 LA4110 LA4120	100p 120p 270p	LA7550 LA7555 LA7620	275p 150p 500p	LM1203 LM1203A LM1875T	330p	SAA1000 SAA1000 SAA1000	650p	SGFS465 SLA4031 SLA7020	750p M 450p	STK4142 STK4121 STK4122	500p 480p 660p	STK6972 STK6981B STK6982	600p	STR5304 STR5404 STR5504	1 350p	TA7325 TA7326 TA7328	90p 200p 110p
KA2283 KA2284 KA2284	100p 100p 75p	LA4138 LA4140 LA4142	105p 60p 65p	LA7680 LA7681 LA7710	675p 650p 250p	LM1881N LM1886 LM1889	250p 300p	SAA1006 SAA1006 SAA1016	450p 400p	STA301A STA341N STA401A	180p	STK4131 STK4132 STK4133	11 750p	STK6982H STK7216 STK7217	420p	STR5604 STR5804 STR5904	1 325p 1 350p	TA7330P TA7331P TA7333	80p 80p 100p
KA2309 KA2401 KA2412	175p 160p 225p	LA4145 LA4160 LA4162	65p 100p 110p	LA7800 LA7801 LA7802	90p 100p 300p	LM1894N LM1895N LM2901N	275p	SAA1024 SAA1025	250p 400p	STA403A STA405A STA431A	280p	STK4141 STK4142 STK4147	530p 1450p	STK7225 STK7226 STK7251	500p 600p 500p	STR6000 STR8014 STR8114	5 476p 5 450p	TA7335 TA7336 TA7337P	85p 180p 175p
KA2912 KA2913A KA2914A	125p 175p 200p	LA4178 LA4180 LA4182	150p 150p 180p	LA7806 LA7808 LA 7820	260p 250p 100p	LM2902N LM2903N LM3900	40p	SAA1021 SAA1021 SAA1041	150p 325p	STA432A STA434A STA435A	270p	STK4151 STK4152 STK4161	660p	STK7253 STK7308 STK7309	450p 350p 400p	STR9012 STRD120 STRD140	6 500p	TA7339P TA7341 TA7342P	175p 250p 70p
KA22427 KIA62135 KIA6210	100p 60p	LA4190 LA4192 LA4200	300p 140p 130p	LA7823 LA7824 LA7830	200p 130p 200p	LM3909 LM3911N LM3914	160p	SAA104 SAA104 SAA105	400p	STA4410 STA4510 STA4560	280p	STK4162 STK4164 STK4171	900p	STK7310 STK7348 STK7356	470p 400p 425p	STRD170 STRD180 STRD181	6 400p	TA7343 TA7347P TA7348P	120p 120p 125p
KIA6281H KIA6283H KIA6299H	1 250p	LA4201 LA4260 LA4261	120p 230p 300p	LA7831 LA7832 LA7835	175p 130p 150p	LM3915 LM3916 LM8363	160p 270p 320p	SAA1051 SAA1060 SAA1060	375p 225p	STA471 STA901N STK0025		STK4172 STK4181 STK4182	680p	STK7358 STK7402 STK7404	440p 560p 400p	STRD190 STRD44	35 300p	TA7349P TA7354P TA7357	175p 65p 340p
KIA72270 KIA7313 L149V		LA4265 LA4270 LA4282	125p 300p 350p	LA7837 LA7838 LA7850	150p 200p 225p	LM8560 LM13600 LM13700	175p 150p 125p	SAA106 SAA106 SAA106	250p	STK0029 STK0039 STK0040	360p 600p	STK4191 STK4192 STK4211	700p	STK7408 STK7408 STK7410	650p 675p 1500p	STRD44	0 560p	TA7358 TA7359P TA7361	85p 90p 125p
1.165V 1.200 1.272	250p 200p 200p	LA4420 LA4422 LM4425	140p 130p	LA7851 LA7910 LA7913	200p 150p 90p	LM18293 M491BB1 M494B1	500p	SAA107 SAA107	275p 550p	STK0049 STK0050 STK0059	510p 440p 620p	STK4211 STK4221 STK4231	V 800p	STK7458 STK7554 STK7561	1250p 600p 650p	STRD554 STRD600 STRD600	11 450p 28 575p	TA7362 TA7364P TA7366P	150p 175p 65p
L272M L2908 L291B	110p 225p 300p	LA4440 LA4445	130p 200p 200p	LA7930 LA7940 LA7953	350p 200p 300p	M5265P M50115P M50117P	200p	SAA108 SAA108	350p	STK0060 STK0070 STK0080	820p	STK4241 STK4241 STK4272	1050p V 1250p	STK7562 STK7563 STK7573	1000p 800p 400p	STRD660 STRD660	18 450p 12 475p	TA7368P TA7373F CTA7374	35p 150p 175p
1,292 1,293B 1,293C	750p 225p 325p	LA4446 LA4460 LA4461	170p 120p 120p	LA9200 LB1205 LB1216	300p 170p 150p	M50119P M50422P M50461	525p	SAA110 SAA1124 SAA113	700p	STK011 STK015 STK016	330p 440p 760p	STK4273 STK4301 STK4311	550p 500p 650p	STK7576 STK7703 STK8050	1500p 1000p 750p	STRM65 STRM65 STRM65	45 900p 46 900p	TA7376P TA7378P	100p 60p 250p
1293D 1293E 1294	225p 250p 475p	LA4466 LA4470 LA4475	225p 300p 225p	LB1258 LB1268 LB1274	100p 70p 85p	M50784 M50786 M50790	300p 500p 600p	SAA125 SAA125 SAA127	280p	STK025 STK050 STK077	650p 1600p 520p	STK4332 STK4352 STK4362	365p	STK8250 STK8260 STK8280	500p 1200p 1860p	STRS574 STRS594 STRS630	11 800p	TA7402P TA7403 TA7404	200p 325p 150p
L295 L297	450p 625p	LA4476 LA4480 LA4485	225p 225p	LB1290 LB1292	120p 110p 70p	M51014L M51143A M51161	120p	SAA127 SAA129 SAA129	280p	STK078 STK080 STK082	580p 550p 540p	STK4372 STK4392 STK4412	490p	STK73405 STK73410 STK7340	11 550p 350p	STRS630 STRS630 STRS670	9 600p	TA7405P TA7411A TA7415P	200p P 150p
.455A	400p 625p 400p	LA4495 LA4496	300p 260p 250p	LB1405 LB1407 LB1409	130p 200p	M51161P M51162P	250p 250p	SAA129- SAA130	200p	STK084 STK085 STK086	600p 900p 800p	STK4432 STK4773 STK4793	600p 820p 800p	STK73605 STK73907 STK78617	375p 700p	STRS670 TA7054 TA7061		TA7417A TA7521P TA7607	
497B 1792B 172N	525p 400p 325p	LA4498 LA4500 LA4505	275p 200p 220p	LB1412 LB1415 LB1416	300p 100p 85p	M51164A M51166P M51182L	300p 110p	SAA1310 SAA1350 SAA135	275p	STK0100 STK0100	900p	STK4803 STK4813	640p 800p	STR370 STR371 STR380	300p 400p 350p	TA7062 TA7066 TA7075F	200p 120p	TA7608 TA7609 TA7611	360p 170p 210p
1,2720 _2722 _4960	150p 175p 325p	LA4508 LA4510 LA4520	200p 100p 170p	LB1426 LB1450 LB1615	125p 110p 270p	M51191L M51231P M51308S	P 550p	SAA300- SAA300-	400p 3P 225p	STK420 STK430 STK433	500p 400p	STK4833 STK4843 STK4853 STK4863	720p	STR381 STR383	390p 410p	TA7089 TA7102F	300p	TA7612 TA7613A TA7614	300p
L5203 L5210 L521AS	600p 250p 300p	LA4550 LA4555 LA4557	200p 120p 150p	LB1620 LB1622 LB1630	210p 220p 80p	M51310A M51316P M51320	300p 200p	SAA300 SAA301 SAA301	P 200p	STK435 STK436 STK437	375p 430p 460p	STK4873 STK4893	850p 1000p	STR384 STR440 STR441 STR442	350p 800p 1200p	TA7120 TA7124 TA7130F	55p 250p	TA7616 TA7621 TA7622	300p 300p 420p
LA1130 LA1135	300p 240p 120p	LA4571	125p 130p 175p	LB1641	300p 150p 75p	M51356P M51358P M51365P	150p 350p	SAA302 SAA304 SAA470	P 550p 425p	STK443	500p 680p 700p	STK4913 STK5314 STK5315	475p 500p	STR450A STR451	1600p 700p 800p	TA7137	60p 100p 826p	TA7628 TA7629 TA7630	110p 220p 200p
EA1145 EA1170	200p 150p 90p	LA4581 LA4597 LA4820	175p 125p 400p	LB1645 LB1648	150p 100p 200p	M51366P M51381P M51384A	200p P 750p	SAA500 SAA501 SAA501	220p 400p	STK457 STK459 STK480	470p 560p 660p	STK5322 STK5323 STK5324	600p 450p	STR452 STR453 STR454	600p 500p 1300p	TA7150F TA7157	250p 100p	TA7632 TA7640	400p 90p 140p
EAT177 LA1190 EA1195	130p 75p 150p	LA4830 LA4700 LA4705	325p 350p 400p	LB1649 LB3500 LC4966	190p 125p 65p	M51367F M51392F M51393A	300p P 350p	SAA502 SAA503 SAA504	A 280p	STK461 STK463 STK465	950p 720p	STK5325 STK5326 STK5330	750p 860p	STR455 STR456 STR457	470p 600p	TA7172F TA7193 TA7200	320p 200p	TA76448 TA76545	P 480p
EA1201 EA1205	35p 75p 75p	LA5005 LA5112 LA5511	90p 200p 50p	LC7011 LC7060 LC7120	500p 600p 350p	M513954 M513974 M51436P	9 425p 350p	SAA504 SAA504 SAA504	1 550p 2 425p	STK501 STK561 STK563	550p 450p 415p	STK5331 STK5332 STK5333	300p 180p 1000p	STR470 STR1096 STR1195	400p 275p 350p	TA7205 TA7207 TA7208	150p 150p 125p	TA7558 TA7659P TA7660P	325p
EATZXI LATZZZ	120p 140p 80p	LA5512 LA5522 LA5523	50p 45p 150p	LC7131 LC7132	300p 260p 400p	M51496F M51533 M51544	300p 150p	SAA505 SAA505 SAA505	1 400p	STK760 STK770	500p 600p 400p	STK5335 STK5336 STK5337	350p 500p	STR1229 STR2005 STR2012	325p 400p 400p	TA7214 TA7217	200p 220p 145p	TA7668 TA7672	100p 400p
(A1236 (A1246 (A1246 (A1246	130p 130p 80p	LA5524 LA5527 LA5530	80p 160p 65p	LC7137 LC7181 LC7185	450p 350p 350p	M51848 M54523F M54563F	2000	SAA505 SAA523 SAA523	850p	STK772 STK7728 STK780	575p	STK5338 STK5339 STK5340	400p 350p	STR2013 STR2015 STR2024	300p 550p 575p	TA7220 TA7222 TA7223	90p 210p	TA7676 TA7679 TA7680A	475p P 200p
EAUS EAUS LATE	110p 75p 75p	LA5531 LA5637 LA5665	65p 45p 175p	LC7191 LC7207 LC7215	300p 275p 160p	M58484 M51516 M51518	500p 260p 200p	SAA524 SAA524 SAA524	3PE 800p	STK795 STK1039 STK1040	640p	STK5342 STK5343 STK5353	380p 400p	STR2105 STR2124 STR3105	600p 675p 525p	TA7225 TA7226 TA7227	300p 290p 170p	TA7681A TA7687A TA7688	P 100p 150p
以 10年 以 10年 以 10年	125p 130p 150p	LA5658 LA5665 LA5667	225p 250p 200p	LC7217 LC7218 LC7230	350p 250p 700p	M51995F M51977F M52307F	250p 300p 900p	SAA524 SAA524 SAA525	6AP 950p 6P 750p 0P 750p	STK1049 STK1050 STK1060	700p 650p 700p	STK5361 STK5362 STK5372	375p 400p 260p	STR3113 STR3115 STR3123	225p 400p 400p	TA7230 TA7232 TA7233	100p 95p 120p	TA7698 TA7699 TA7705	400p 600p 300p
LA1354 LA1363 LA1364	225p 90p 200p	LA5700 LA5339 . A5365	300p 35p 50p	LC7257 LC7351 LC7364	550p 200p	M54646A MB3708 MB3712	400p 275p 140p	SAA535 SAA700 SAA702	375p 550p 600p	STK1070 STK1080 STK2025	850p 940p 620p	STK5373 STK5391 STK5392	375p 375p 500p	STR3125 STR3130 STR3135	480p 500p 250p	TA7237 TA7238 TA7240	300p 400p 160p	TA7709P TA7719P TA7727P	150p 200p 125p
LA TEST	120p 220p 230p	LASS19 LASS15	150p 150p 175e	LC7522 LC7522	200p 425p 350p 300p	MB3713 MB3714 MB3715	130p 225p 260p	SAA721 SAA722 SAA727	OP 1300p		500p 480p	STK5421 STK5422 STK5431	375p	STR3212 STR3214 STR3215	275p 275p 275p	TA7241 TA7242 TA7243	165p 190p 320p	TA7750 TA7757 TA7769	200p 200p 130p
LATES LATES LATES	170p 120p 175p	LA6520 LA6531 LA7007 LA7011	250p 400p 220p	LC7537A	N 400p	MB3722 MB3730 MB3731	200p 350p 220p	SAA728 SAA905 SAA905	GP 1450p 0 450p	STK2038	700p 950p	STK5434 STK5436 STK5441	570p 500p	STR3315 STR4090/ STR4142	275p		225p 3PO 200p	TA7772F TA7784 TA7792F	150p 250p
LATERS	130p 300p	LA7018	45p 100p 130p	LC7585 LC75825 LC7806	300p	MB3732 MB3735 MB3756	240p 400p 160p	SAB060 SAB060 SAB060	600p	STK2101 STK2110 STK2125	1050p	STK5443 STK5446 STK5451	576p 350p	STR4211 STR4512 STR5015	370p 400p 500p	TA72501 TA72511 TA7256	325p 3P 325p	TA7796F TA8101N TA8105N	75p
LAZZIO	150p 200p 270p	LA/MAZ	400p 280p	LC75158	1 175p 280p	MB3759 MB3771	200p 110p	SAB100 SAB101 SAB104	9BP 225p 6 600p	STK2129 STK2139	750p	STK5461 STK5462 STK5464	500p	STR5100 STR5214	550p 475p	TA72591 TA72621 TA72631	225p 400p	TA8110A TA8119F TA8122A	110p
EA2290 A7225	150p 190p 150p	LA7046 LA7051 EA7053	300p 130p 130p	LC7921N	325p 250p 160p	MB3773 MB8719 MC1391	110p 360p 120p		5P 525p	STK2155 STK2230 STK2240	470p	STK5466 STK5466	500p	STR5315 STR5412 STR6020	575p 350p 325p	TA7265/ TA7267	AP 300p 220p	TA81271 TA8132	√ 100p

LINEAF	R ICs/J	APANI	ESE T	RANSI	STO	RS		
Part Price Part Price Part Price	THE RESERVE TO SHARE	Part Price	Part Price	Part Price	Part Pric		Price Part	Price
TAB164P 100p TDA1180 120p TDA2760 400p TAB184P 350p TDA1185A 190p TDA2780 600p	TDA4670 475p	TDA8391 675p TDA8395 450p TDA8405 550p	ÚPC1004C 130p UPC1009 950p UPC1018 170p	2SA771 90p 2SA773 50p 2SA777 35p	2SA1177 28 2SA1179 20 2SA1182 20	D 1 2SB562	30p 2SC73 20p 2SC73 15p 2SC76	9 160p
TA8189P 130p TDA1190 80p TDA2791 275 TA8200AH 325p TDA1200B 80p TDA2795 200 TA8201AK 300p TDA1220 75p TDA2822M 600	TDA4685 475p TDA4700A 750p	TDA8415 650p TDA8416 625p TDA8417 550p	UPC1020 200p UPC1023 60p UPC1024H 2 75p	2SA778 100p 2SA781 150p 2SA786 25p	2SA1184 126 2SA1185 206 2SA1186 506	p 2SB566 p 2SB596	90p 2SC76 50p 2SC78 30p 2SC79	2 150p 3 85p
TAB205 250p TDA1235 300p TDA2824 85; TAB207K 175p TDA1238 240p TDA2840 200; TAB210 300p TDA1251 150p TDA3047 100;	TDA4716C 450p TDA4718A 500p	TDA8421 500p TDA8425 500p TDA8432 550p	UPC1025 230p UPC1026 95p UPC1028 90p	2SA794 50p 2SA798 30p 2SA812 15p	2SA1198 44 2SA1201 44 2SA1202 25	2SB600 2SB601	500p 2SC79 60p 2SC80 25p 2SC82	2 380p 5 225p
TAB211AH 2009 TDA1270 1509 TDA3048 1300 TAB214K 2609 TDA1327 2009 TDA3082 2000 TAB215 3009 TDA1405 509 TDA3083 2000 TDA308	TDA4800 350p TDA4810 250p	TDA8433 600p TDA8440 300p TDA8442 200p	UPC1031H 150p UPC1032 60p UPC1035C 110p	2SA814 60p 2SA816 70p 2SA817 20p	2SA1204 225 2SA1206 66 2SA1207 21	2SB631 2SB632	40p 2SC82 46p 2SC83 80p 2SC86	9 15p 9 20p
TA8216H 300p TDA1410 220p TDA3190 100p TA8217P 120p TDA1412 35p TDA3301B 280p TDA320AH 500p TDA1506 275p TDA3310 120p TDA320AH 500p TDA1506 275p TDA3310 120p TDA320AH 500p TDA1506 275p TDA3310 120p TDA320AH 500p TDA1506	TDA4850 475p TDA4851 400p	TDA8443 350p TDA8444 200p TDA8451 400p	UPC1043C 125p UPC1156H 70p UPC1161 110p	2SA825 20p 2SA836 20p 2SA837 200p	2\$A1208 76 2\$A1209 100 2\$A1210 120	p 2SB641 p 2SB647	12p 2SC87 20p 2SC89 45p 2SC90	0 100p 7 175p
TA8221AH 600p TDA1508 175p TDA3410 150p TA8225H 475p TDA1510 170p TDA3420 200p TA8225L 475p TDA1512 180p TDA3501 340p TA8227 250p TDA1514A 450p TDA3502 450p	TDA4860 200p TDA4866 325p	TDA8452 200p TDA8453 360p TDA8461 950p	UPC1167 125p UPC1170 150p UPC1173 200p	2SA839 110p 2SA841 20p 2SA844 20p	2\$A1215 600 2\$A1216 550 2\$A1217 100	p 2SB649 p 2SB673	36p 2SC93 100p 2SC93 85p 2SC94	0 15p 6 300p
TA8227K 250p TDA1514A 450p TDA3502 450, TA8229K 200p TDA1515A 200p TDA3504 300, TA8400P 200p TDA1516Q 350p TDA3505 275, TA8410K 200p TDA1517 250p TDA3506 260,	TDA4935 300p TDA4940 325p	**TDA8490 350p TDA8540 250p TDA8702 275p	UPC1176C 120p UPC1178H 250p UPC1180C 200p	2SA847 25p 2SA854 30p 2SA861 45p	2SA1220 79 2SA1221 70	p 258688	90p 2SC94 90p 2SC94 200p 2SC95	4 140p
TAB4310P 200p TDA1519 200p TDA3507 4501 TAB432 200p TDA1519 200p TDA3507 350 TDA3507 350 TDA3500 350 TDA3500 8600	TDA4944 250p TDA4950 120p	TDA8703 500p TDA8708 900p TDA8730 225p	UPC185H2 400p UPC1186 80p UPC1187 150p	2SA872 25p 2SA872A 50p 2SA879 30p	2SA1226 25 2SA1227 254 2SA1232 186	p 2SB707 2SB716 2SB718	200p 2SC98 20p 2SC98 60p 2SC98	9 225p 0 40p 2 20p
TA8606N 350p TDA1521 250p TDA3530 350p TA8807P 320p TDA1522 110p TDA3540 200p TDA3541 175	TDA5140A 250p TDA5330T 300p	TDA8732 400p TDA8735 175p TDA8740 625p	UPC1188H 350p UPC1191 300p UPC1197 140p	2SA884 100p 2SA885 35p 2SA886 45p	2SA1238 30 2SA1239 30	p 258727 258733 2p 258734	75p 2SC10 35p 2SC10	00 20p 01 960p
TA8615N 480p TDA1526 225p TDA3560 260p TDA3561 300p TDA1524 2000p TDA3561 300p TDA3561A 300p TDA3561A 300p	TDA5332T 150p TDA5500 400p	TDA8741 550p TDA8808T 325p TDA8809T 350p	UPC1198H 200p UPC1210 150p UPC1215V 125p	2SA887 20p 2SA893 15p 2SA896 25p	2SA1242 B4 2SA1244 120	p 2SB737 2SB739 2SB744	20p 2SC10 22p 2SC10 55p 2SC10	10 225p 12 75p
TA8632N 550p TDA1541 750p TDA3562 2600 TA8644N 425p TDA1542 250p TDA3582TF 300 TA8646 375p TDA1543 300p TDA3563 350	TDA5700 200p TDA5701 200p	TDA9045 400p TDA9080 550p TDA9102C 250p	UPC1222 130p UPC1225H 220p UPC1227V 225p	2SA899 40p 2SA900 45p 2SA904 20p	2SA124B 35	2SB753 2SB754	80p 2SC10 100p 2SC10 80p 2SC10	14 140p 30 150p
TAB653N 1500p TDA1552Q 350p TDA3664 326 TAB659AN 900p TDA1553AQ 375p TDA3565 275 TAB690N 700p TDA1555Q 375p TDA3565 280	TDA5709 450p TDA5800 600p	TDA9403 180p TDA9500 750p TDA9503 150p	UPC1228HA 45p UPC1230 200p UPC1237HA 70p	2SA907 650p 2SA909 500p 2SA912 70p	2SA1253 3	Op 2SB765 Op 2SB772	30p 2SC10 70p 2SC10 25p 2SC10 50p 2SC10	47 20p 50 280 p
TA8891N 450p TDA1557Q 350p TDA3567 350 TA8701AN 275p TDA1558Q 350p TDA3589 300 TA8718N 550p TDA1568Q 675p TDA3570 375	TDA5832 200p TDA5850 175p	TDA9513 300p TDA9800 300p TDA9821 250p	UPC1238 120p UPC1241H 150p UPC1242H 150p	2SA913 100p 2SA914 90p 2SA915 30p 2SA916 30p	2SA1257 3	Op 258774 Op 258775 Op 258776 Op 258788	100p 2SC10 110p 2SC10 35p 2SC10	61 86p 69 175p
TA8720 525p TDA1571 300p TDA3580 400 TA8739P 450p TDA1572 175p TDA3588 750 TA8872N 480p TDA1574 125p TDA3590 300	TDA6100Q 150p	TEA0652 150p TEA0653T 80p TEA0655 300p	UPC1245V 130p UPC1270H 260p UPC1274V 250p UPC1277 240p	2SA921 40p 2SA928A 25p	2SA1262 110 2SA1263 286	op 2S8791 op 2S8794	130p 2SC10 40p 2SC10 45p 2SC10	79 300p 80 225p
TAÁS50 25p TDA1576 170p TDA3591 360 TBA120S 40p TDA1578A 210p TDA3592A 350 TBA396 70p TDA1579 200p TDA35010 375 TBA520 120p TDA1599 275p TDA3602 225	TDA6200 750p TDA6600-2 700p	TEA0665 300p TEA1002 650p TEA1007 120p TEA1009 100p	UPC1277 240p UPC1278 240p UPC1288V 230p UPC1297CA 325p	1 2SA934 30p	2SA1265 200 2SA1283 50 2SA1284 60	Op 2SB810 Op 2SB818 Op 2SB817	15p 2SC10 160p 2SC11 175p 2SC11	98 120p
TBA530 100p TDA1591 275p TDA3607 250 TBA540 90p TDA1591 275p TDA3611 450 TBA560 80p TDA1598 250p TDA3644 350	TDA6612-2 900p TDA7000 170p	TEA1015P 110p TEA1017 280p TEA1019 130p	UPC1298 320p UPC1313H A 100p UPC1316C 70p	2SA939 140p	2SA1286 6	Op 2SB819 Op 2SB822	60p 2SC11 40p 2SC11 60p 2SC11	15 280p 16 290p 24 270p
TBA800 40p TDA1600 278p TDA3651 200 TBA810AS 40p TDA1602 400p TDA3652 500 TBA820 55p TDA1670A 230p TDA3652-TX10800	TDA7020T 176p TDA7021T 200p	TEA1024 150p TEA1035 200p TEA1039 180p	UPC1318 300p UPC1330HA 80p UPC1335V 320p	2SA949 70p	2SA1293 11: 2SA1294 45: 2SA1295 50:	Op 2SB825 Op 2SB826	135p 2SC11 75p 2SC11 200p 2SC11	61 110p 62 30p 64 600p
TBA820M 35p TDA1675 250p TDA3653 150 TBA920 100p TDA1701 300p TDA3654 90 TBA950 100p TDA1771 250p TDA3654Q 120	TDA7052 120p TDA7053 200p	TEA1045 300p TEA1060 225p TEA1061 175p	UPC1350 115p UPC1352C 450p UPC1360C 200p	2SA952 30p 2SA953 60p 2SA954 30p	2SA1301 26 2SA1302 30 2SA1303 40	Op 258829 Op 258835	200p 2SC11 200p 2SC11 75p 2SC11	66 100p 70 180p
TBA990 80p TDA1870A 200p TDA3710 300 TC5020 200p TDA1872A 275p TDA3720 175 TC50814P 80p TDA1904 80p TDA3724 500	TDA7057Q 225p TDA7072 175p	TEA1062 250p TEA1064 250p TEA1067 150p	UPC1362C 250p UPC1363 190p UPC1363C 300p	2SA957 185p 2SA958 60p 2SA963 120p	2SA1306 41 2SA1306 41 2SA1307 10	Op 258861 Op 258863	80p 2SC11 110p 2SC11 220p 2SC11	73 33p 95 210p
TC5082P 170p TDA1905 80p TDA3725 500 TC5090A 230p TDA1908A 90p TDA3730 400 TC91258P 410p TDA1910 225p TDA3740 480	TDA7211 15 Op TDA7220 10 Op TDA7222 20 Op	TEA1068 350p TEA1080P 170p TEA1087 40p	UPC1364C 350p UPC1365 250p UPC1366C 130p	2SA966 25p 2SA968 55p	2SA1315 10 2SA1317 3	Op 2SB885	25p 2SC12 180p 2SC12 45p 2SC12	13 10p
TC9130P 150p TDA1940 180p TDA3750 400 TC9134 750p TDA1941 300p TDA3755 425 TC9135P 125p TDA1950 175p TDA3760 350	TDA7231A 80p	TEA1101 425p TEA1330 65p TEA1511 150p	UPC1370C 300p UPC1373 85p UPC1377C 200p	2SA979 35p 2SA984 25p	2SA1319 2 2SA1320 4	Op 2SB891 5p 2SB892 5p 2SB895	35p 2SC12 25p 2SC12 60p 2SC12	16 200p 22 15p
TC9137P 5000 TDA2002 500 TDA3785V 225 TC9138AP 1800 TDA2003 650 TDA3771 4800 TC9142 3200 TDA2004 1800 TDA3780 400	TDA7241 250p TDA7245 300p	TEA2000 500p TEA2014A 80p TEA2018A 200p	UPC1378 180p UPC1379C 170p UPC1382 110p	2SA988 25p 2SA991 30p	2SA1327 13 2SA1329 20	Op 25B941	70p 2SC12 30p 2SC12 60p 2SC12 180p 2SC12	37 250p 47A 35p
TC9143 300p TDA2005 150p TDA3791 300 TC9145 150p TDA2006 70p TDA3800 350 TC9148 200p TDA2007 120p TDA3803A 500	TDA7255 500p TDA7256 600p	TEA2019 200p TEA2025B 75p TEA2028 325p TEA2028B 375p	UPC1384 425p UPC1387C 250p UPC1394 120p UPC1397 350p	2SA993 60p 2SA995 60p	2SA1348 4 2SA1352 10	5p 2SB951 0p 2SB953	190p 25C12 90p 25C12 100p 25C13	78 110p 79 30p
TC9149 225p TDA2008 100p TDA3810 200 TC9150 425p TDA2009 160p TDA3825 225 TC9151P 425p TDA2010 150p TDA3827 200 TC9152 425p TDA2020 120p TDA3827 300	TDA7272 170p TDA7273 80p	TEA2029A 650p TEA2029C 350p TEA2031A 125p	UPC1403CA 650p UPC1406HA 70p UPC1420CA 450p	2SA1005 25p 2SA1006 90p	2SA1356 10 2SA1357 6		30p 2SC13 40p 2SC13	112 40p 118 10p 125 400p
TC9154AP 225p TDA2030 80p TDA3842 400 TC9154AP 225p TDA2030H 100p TDA3843 200 TDA9156 300p TDA2040 140p TDA3845 325	DA7275 75p TDA7282 50p	TEA2037 200p TEA2114 200p	UPC1421CA 850p UPC1423CA 550p UPC1470 200p	2SA1009 200p 2SA1010 225p	2SA1359 4 2SA1360 4	5p 2SB1010 5p 2SB1012 5p 2SB1015	25p 2SC13 55p 2SC13 50p 2SC13	127 20p 128 1 5p 142 15p
TC9158P 450p TDA2048 600p TDA3856 400 TC9162 275p TDA2051V 450p TDA3857 350 TC9163 375p TDA2052V 525p TDA3950 225	TDA7302 450p TDA7310 800p TDA7313 650p	TEA2130 350p TEA2164 175p TEA2260 225p	UPC1474HA 75p UPC1484CA 300p UPC1488H 150p	2SA1012 85p 2SA1013 100p	2SA1370 5 2SA1371 10 2SA1376 3	Op 2581016 Op 2581017 Op 2581018	40p 2SC13	45 15p
TC9164 400p TDA2054M 110p TDA4001 325 TC9167P 100p TDA2107 250p TDA4050 150 TC9177P 300p TDA2148 350p TDA4052 500	DA7318 550p DA7330A 700p D TDA7350 6500	TEA2261 225p TEA2262 276p TEA3717DP 150o	UPC1498H 200p UPC1505C 400p UPC1513HA 70p	2SA1016 30p 2SA1018 100p 2SA1020 30p	2SA1380 7 2SA1381 10 2SA1382 12		65p 2SC13 40p 2SC13	159 15p 160 70p
TC9174P 326p TDA2151 375p TDA4060 500 TC9176P 500p TDA2170 260p TDA4092 350 TC9177P 225p TDA2220 200p TDA4100 225	p TDA7360 700p p TDA7361 175p	TEA5030 135p TEA5040 650p	UPC1514CA 200p UPC1515CA 250p UPC1520CA 250p	2SA1023 80p 2SA1026 90p	2SA1386 40 2SA1387 7	5p 2SB1098	180p 2SC13 80p 2SC13	368 75p 382 40p
TCEP100 100p TDA2270 250p TDA4173AF 325 TCEP100 100p TDA2320 Bop TDA4180 145 TDB2308AP 200p TDA2501 400p TDA4180 180	TDA7374V 600p TDA7770 225p	TEA5101A 175p TEA5110 175p TEA5114A 200p TEA5115 220p	UPC1521HA 120p UPC1536C 550p 2SA329 75p	2SA1036 60p 2SA1037 50p	2SA1399 2 2SA1400 15	Бр 2SB1109 Ор 2SB1123	40p 2SC13 50p 2SC13	384 20p 393 20p
TD62382 200p TDA2502 175p TDA4200 360 TD62506 200p TDA2503 200p TDA4210 250 TD62705 250p TDA2504 200p TDA4260 250 TD6304AP 300p TDA2505 300p TDA4280 320	p TDA8115 200p p TDA8116 350p	TEA5115 220p TEA5116 220p TEA5170 200p TEA5500 325p	2SA467 40p 2SA473 29p 2SA483 90p 2SA484 80p	2SA1048 25p 2SA1051 300p	2SA1428 3 2SA1441 11	5p 2SB1134	65p 2SC13	98 55p 99 100p 2
TD6306P 350p TDA2506 600p TDA4282 360 TD6350P 200p TDA2507 450p TDA42831 450 TD6359P 300p TDA2507T 450p TDA4290 200	DA8124 250p	TEA5501 225p TEA5550 150p TEA5560 130p	2SA489 50p 2SA490 45p 2SA493 25p	2SA1060 120p 2SA1061 300p	2SA1443 13 2SA1450 3	Op 2581143 Op 258115 Op 2581162	75p 2SC14	107 50m
TDA1001 2006 TDA2510 4506 TDA4400 178 TDA1002 2006 TDA2514A 5006 TDA4420 120 TDA1003 1506 TDA2515 4506 TDA4421 300	D TDA8136 225p	TEA5570 85p TEA5580 166p TEA5581 200p	2SA495 40p 2SA496 30p 2SA505 120p	2SA1073 375p 2SA1076 230p 2SA1077 300p	2SA1462 2 2SA1469 10 2SA1475 9	5p 2581163 0p 2581168 5p 2581183	50p 2SC14	26 700p
TDA1005A 175p TDA2530 450p TDA4426 170 TDA1010A 80p TDA2532 120p TDA4427 200 TDA1011 75p TDA2540 85p TDA4431 150	p TDA8138A 200p p TDA8138B 200p p TDA8139 200p	TEA5591 200p TEA5620 300p TEA5630 228p	2SA509 35p 2SA537 170p 2SA539 20p	2SA1081 80p 2SA1082 80p	2SA1489 30 2SA1490 22	Op 2581189 Op 2581202 5p 2581203	45p 2SC14	144 275p 145 350p
TDA1012 120p TDA2541 120p TDA4433 150 TDA1013A 110p TDA2542 110p TDA4437 300 TDA1015 85p TDA2543 210p TDA4439 220	p TDA8143 160p p TDA8145 120p	TEA5840E 750p TEA5701 850p TEA6000 400p	2SA544 650g 2SA550 150g 2SA562 30g	2SA1084 100p 2SA1085 75p	2SA1492 26 2SA1493 50		40p 2SC14	147 706 III
TDA1016	DA8160 125p	TEA6200 225p	2SA564 15; 2SA571 650; 2SA603 100; 2SA606 200;	2SA1093 180p 2SA1094 190p	2SA1516 28 2SA1519 2	Op 2SB1274 Op 2SB1284 Sp 2SB1318	40p 2SC14 300p 2SC14	154 250p 170 120p
TDA1024 160p TDA2549 300p TDA4450 225 TDA1025 320p TDA2555 175p TDA4452 250	P TDA8173 280p D TDA8174 300p	TEA6414A 425p TEA6415B 525p	2SA508 150 2SA614 150 2SA628 20	2SA1096 80p 2SA1102 130p	2SA1535 17 2SA1538 6	5p 2SB1375 5p 2SB1382 0p 2SB1468	45p 2SC14	173 15p 174 45p
TDA1028 1759 TDA2556 230p TDA4453 275 TDA1029 200p TDA2557 225p TDA4480 225 TDA1035 160p TDA2558 500p TDA4481 360 TDA1038 500p TDA2574V 350p TDA4482 350	p TDA8178 400p p TDA8179S 750c	TEA8172 125p TL431 45p	2SA534 50; 2SA636 50; 2SA639 50;	2SA1104 140p 2SA1105 250p	2SA1598 22 2SA1599 22	Op 25C182 Op 25C372 Op 25C380	75p 2SC15 25p 2SC15 10p 2SC15	505 55p 507 45p
TDA1041E 250p TDA2575A 100p TDA4500 300 TDA1041P 180p TDA2577A 200p TDA4501 400 TDA1044 110p TDA2578A 200p TDA4502 550	P TDA8190 200p P TDA8191 425p	TLO61 40p TLO64 80p TLO71 38p	2SA640 60; 2SA642 50; 2SA643 25;	2SA1111 90p 2SA1112 150p 2SA1115 30p	2SA1601 20 2SA1625 4 2SA1626 9	Op 25C388/ Op 25C394 Op 25C403	60p 2SC18	514 35p 515 50p
TDA1047 200p TDA2579A 250p TDA4503 30c TDA1048 200p TDA2582 130p TDA4505A 30c TDA3652 170p TDA4505A 30c	p TDA8196 150p p TDA8205 1250p TDA8213 2750	TLO74 80p TLO83 55p TLO84 70p	2SA677 35; 2SA678 26	2SA1120 40p 2SA1123 40p 2SA1124 60p	2SA1640 10 2SA1652 7 2SA1667 17	Op 2SC454 Op 2SC458 5p 2SC460	10p 2SC1	545 120p
TDA1054 180p TDA2591 110p TDA4505K 450 TDA1057 60p TDA25910 150p TDA4505M 500 TDA10598 40p TDA2593 110p TDA4510 270	p TDA82148 225p p TDA8215H 300p p TDA8217 225p	TPU2732 1200p TPU2735 900p	2SA683 25 2SA684 25 2SA699 100 2SA705 700	2SA1133 120p	2SA1671 31 2SA1673 42	Op 2SC495 Sp 2SC496 Op 2SC496 Op 2SC497	16p 2SC19 45p 2SC19 25p 2SC19 85p 2SC19	569 55p
TDA1080 140p TDA2594 300p TDA4532 200 TDA1082 140p TDA2595 200p TDA4555 400 TDA1088 75p TDA2500 250p TDA4556 370 TDA1072 150p TDA2501 100p TDA4557 450	p TDA8304 600p	UC3842N 125p UC3843 125p	2SA705 709 2SA706 1409 2SA708 509 2SA711 2809	2SA1142 100p 2SA1143 15p	2SA1680 4 2SA1706 2 2SB175 4 2SB324 4	5p 2SC515 5p 2SC535 0p 2SC536	100p 2SC1 30p 2SC1 20p 2SC1	573 25p 576 550 p
TDA1074 280p TDA2616 250p TDA4560 270 TDA1077 250p TDA2630 300p TDA4565 200	p TDA8341 250p p TDA8349A 350p	UPC20C 220p UPC554 130p	2SA715 500 2SA719 500 2SA720 200	2SA1146 200p 2SA1151 30p	2SB337 15 2SB474 25	Op 2SC605 Op 2SC619 Op 2SC641	100p 2SC1	583 25p 586 540 p
TDA1082 275p TDA2640 220p TDA4566 328 TDA1083 95p TDA26534 225p TDA4568 328 TDA1085 170p TDA2654 200p TDA4570 300 TDA1087 60p TDA2658 300p TDA4580 650	p TDA8351 225p p TDA8360N3 800p	UPC556H 80p	2SA725 80 2SA726 20 2SA733 15	2SA1153 30p 2SA1154 22p 2SA1156 90p	2SB511 6 2SB525 6 2SB527 13	5p 2SC644 5p 2SC647 0p 2SC681	300p 2SC10 250p 2SC10	623 50p 624 60p
TDA1092 100p TDA2670 150p TDA4600 200 TDA1097 475p TDA2690 100p TDA4500II 180 TDA1151 40p TDA2710-1 400p TDA4601I 120	p TDA8362AN 1200p p TDA8362N3 1200p p TDA8366N2 1500p	UPC575C2 90p UPC577 84p UPC592 95p	2\$A740 90 2\$A742 450 2\$A747A 425	2SA1162 30p 2SA1163 15p 2SA1169 500p	2SB531 40 2SB536 8 2SB537 5	Op 2SC683 Op 2SC708 Op 2SC710	35p 2SC10 100p 2SC10 15p 2SC10	626 55p 627 15p 628 75p
TDA1154 50p TDA2721 200p TDA4605 220 TDA1170 85p TDA2730 200p TDA4610 370 TDA1170N 85p TDA2740 300p TDA4650 428	p TDA8372A 450p p TDA8380 200p p TDA8385 275p	UPC596 190p UPC1001 220p	2SA748 601 2SA764 2001 2SA769 801	2SA1170 600p 2SA1173 80p 2SA1174 25p	2S8544 2S8546 2S8549	2p 2SC711 15p 2SC730 10p 2SC732	15p 2SC1 350p 2SC1 40p 2SC1 40p 2SC1	634 60p 667 450p 669 100p
TDA1175 175p TDA2750 350p TDA4660 370		UPC1004C 130p	2SA770 200	2SA1175 30p	2SB560 2	25p 2SC735	40p 25C1	774 10p

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Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
2SC1675 2SC1678	90p 80p	2SC2258 2SC2259	30p 60p	2SC2710 2SC2712 2SC2714	50p 20p	2SC3244 2SC3246 2SC3259	45p 50p 350p	2SC3781 2SC3782 2SC3783	150p 75p 300p	2SD287 2SD291 2SD313	250p 250p 25p	2SD879 2SD880 2SD882	60p 40p 25p	2SD1311 2SD1313 2SD1326	85p 1000p 200p	2SD1756 2SD1758 2SD1760	275p 76p 80p	2SK240 2SK241 2SK246	140p 30p 30p
2SC1683 2SC1684 2SC1685	100p 30p 30p	2SC2261 2SC2267 2SC2270	700p 90p 60p	2SC2716 2SC2719	20p 50p 25p	2SC3260 2SC3261	220p 230p	2SC3787 2SC3788	100p 60p	2SD315 2SD325	75p 30p	2SD889 2SD892A	35p 75p	2SD1327 2SD1328	150p 60p	2SD1761 2SD1762	60p 50p	2SK300 2SK301	25p 40p
2SC1729 2SC1730 2SC1735	900p 10p 70p	2SC2271 2SC2274 2SC2275	25p 15p 50p	2SC2721 2SC2724 2SC2738	120p 15p 200p	2SC3262 2SC3263 2SC3264	280p 280p 390p	2SC3789 2SC3790 2SC3795	75p 120p 140p	2SD330 2SD348 2SD350	66p 300p 320p	2SD894 2SD895 2SD896	35p 100p 200p	2SD1330 2SD1347 2SD1348	50p 70p 65p	2SD1763A 2SD1764 2SD1765	70p 70p	2SK303 2SK304 2SK312	40p 25p 750p
2SC1740 2SC1741	10p 35p	2SC2278 2SC2283	70p 700p	2SC2749 2SC2750	350p 300p	2SC3259 2SC3270	50p 50p	2SC3798 2SC3807	220p 120p	2SD357 2SD358	40p 40p	2SD898B 2SD900	225p 400p	2SD1350 2SD1376	150p 60p	2SD1769 2SD1773	110p 160p	2SK315 2SK320	70p 120p
2SC1755 2SC1756 2SC1758	90p 35p 30p	2SC2290 2SC2291 2SC2298	1800p 40p 35p	2SC2751 2SC2752 2SC2767	270p 75p 300p	2SC3271 2SC3277 2SC3279	75p 280p 30p	2SC3808 2SC3811 2SC3831	70p 80p 250p	2SD359 2SD361 2SD362	50p 100p 100p	2SD905 2SD916 2SD917	450p 130p 300p	2SD1378 2SD1379 2SD1380	100p 100p	2SD1776 2SD1783 2SD1785	70p 100p 160p	2SK323 2SK332 2SK359	130p 175p 40p
2SC1760 2SC1775	70p	2SC2307 2SC2308	300p 10p	2SC2769 2SC2773	400p 700p	2SC3280 2SC3281	200p 200p	2SC3832 2SC3833	135p 250p	2SD371 2SD380	240p 550p	2\$D921 2\$D923	320p 360p	2SD1382 2SD1384	60p 50p	2SD1789 2SD1796	210p 180p	25K363 25K364	60p 40p
2SC1781 2SC1789 2SC1809	20p 100p 40p	2SC2312 2SC2314 2SC2316	300p 70p 150p	2SC2774 2SC2785 2SC2786	500p 40p 20p	2SC3284 2SC3293 2SC3298	600p 85p 50p	2SC3851 2SC3852 2SC3853	100p 180p 220p	2SD381 2SD382 2SD386	50p 75p 70p	2SD946 2SD947 2SD950	120p 100p 300p	2SD1390 2SD1391 2SD1392	350p 250p 86p	2SD1802 2SD1806 2SD1812	75p 75p 60p	2SK367 2SK369 2SK373	40p 30p 40p
2SC1810 2SC1815	250p 10p	2SC2320 2SC2324	10p 120p	2SC2787 2SC2791	10p 500p	2SC3299 2SC3300	120p 400p	2SC3855 2SC3857 2SC3858	220p 500p 550p	2SD388 2SD389 2SD400	160p 60p 14p	2SD951 2SD957A 2SD958	200p 520p 60p	2SD1395 2SD1396 2SD1397	80p 120p 100p	2SD1815 2SD1825 2SD1827	100p 60p 120p	25K374 25K386	45p 600p
2SC1819 2SC1826 2SC1827	70p 50p 60p	2SC2328/ 2SC2310 2SC2315	A 50p 25p 175p	2SC2792 2SC2793 2SC2808	220p 700p 40p	2SC3303 2SC3306 2SC3307	100p 130p 600p	2SC3866 2SC3868	275p 100p	2SD401 2SD402	50p 120p	2SD965 2SD970	35p 170p	2SD1398 2SD1399	120p 30 0p	2SD1843 2SD1846	100p 350p	2SK389 2SK400 2SK405	115p 700p
2SC1829 2SC1833 2SC1834	500p 27p 50p	2SC2329 2SC2230 2SC2331	480p 300p 50p	2SC2810 2SC2812 2SC2814	350p 40p 40p	2SC3309 2SC3310 2SC3316	150p 125p 280p	2SC3870 2SC3883 2SC38844	200p 210p 200p	2SD414 2SD415 2SD424	45p 56p 350p	2SD972 2SD973 2SD973A	40p 60p 70p	2SD1400 2SD1402 2SD1403	280p 120p 225p	2SD1847 2SD1849 2SD1850	350p 280p 325p	2SK414 2SK415	450p 650p 500p
2\$C1841 2\$C1844	12p 50p	2SC2333 2SC2334	200p 80p	2SC2824 2SC2825	75p 900p	2SC3317 2SC3326	350p 50p	2SC3885 2SC38854	250p 290p	2SD426 2SD427	150p 350p	2SD982 2SD985	90p 120p	2SD1405 2SD1406	80p 60p	2SD1853 2SD1856	40p	2\$K423 2\$K427	75p 50p
2SC1845 2SC1846 2SC1847	15p 35p 45p	2SC2335 2SC2336/ 2SC2344	55p A 125p 150p	2SC2826 2SC2827 2SC2832	200p 130p 300p	2SC3327 2SC3328 2SC3330	60p 50p 20p	2SC3886/ 2SC3890 2SC3892/	150p	2SD438 2SD467 2SD468	35p 15p 15p	2\$D986 2\$D998 2\$D1010	120p 70p 40p	2SD1407 2SD1408 2SD1409	60p 125p 170p	2SD1857 2SD1858 2SD1863	75p 40p 35p	25K430 25K511 25K513	200p 450p 325p
2SC1855 2SC1856	85p 25p	2SC2347 2SC2353	35p 120p	2SC2834 2SC2837	280p 250p	2SC3331 2SC3333	25p 120p	2SC3893 2SC3895	225p 400p	2SD471 2SD476	20p 100p	2SD1012 2SD1020	40p 40p	2SD1411 2SD1412	85p 76p	2SD1864 2SD1877	85p 175p	2SK526 2SK531	160p 350p
2SC1865 2SC1870 2SC1871	700p 700p 425p	2SC2360 2SC2361 2SC2362	120p 150p 50p	2SC2839 2SC2853 2SC2873	40p 70p 60p	2SC3345 2SC3346 2SC3352	100p 130p 200p	2\$C3896 2\$C3897 2\$C3907	400p 400p 250p	2SD525 2SD526 2SD545	50p 70p 18p	2SD1021 2SD1022 2SD1024		2SD1413 2SD1415 2SD1417	60p 190p 125p	2SD1878 2SD1879 2SD1880	160p 275p 360p	2SK534 2SK537 2SK538	700p 900p 360p
2SC1875 2SC1881	220p 70p	2SC2365 2SC2369	280p 100p	2SC2877 2SC2878	120p 20p	2SC3353 2SC3355	280p 50p	2SC3927 2SC3940	250p 40p	2SD549 2SD551	120p 300p	2SD1027 2SD1030 2SD1031	850p 75p 70p	2SD1425 2SD1426 2SD1427	260p 135p 160p	2SD1881 2SD1884 2SD1886	350p 300p 450p	2SK539 2SK544	1100p 30p
2SC1890 2SC1895 2SC1904	15p 500p 125p	2SC2371 2SC2373 2SC2383	25p 210p 50p	2SC2879 2SC2882 2SC2883	3200p 60p 60p	2SC3356 2SC3358 2SC3378	120p 60p 300p	2\$C3943 2\$C3944 2\$C3950	75p 80p 120p	2SD554 2SD555 2SD556	225p 500p 225p	2SD1036 2SD1046		2SD1428 2SD1430	180p 280p	2SD1887 2SD1894	300p 300p	2SK552 2SK553 2SK555	250p 225p 320p
2SC1906 2SC1907	15p 20p	2SC2389 2SC2407	45p 110p	2SC2898 2SC2899	200p 50p	2SC3377 2SC3378	50p 120p	2SC3953 2SC3955	60p 70p 100p	2SD558 2SD560 2SD571	200p 50p 20p	2SD1047 2SD1051 2SD1055	180p 130p 60p	2SD1431 2SD1432 2SD1433	200p 400p 400p	2SD1895 2SD1910 2SD1911	225p 280p 300p	2SK556 2SK557	500p 400p
2SC1909 2SC1913 2SC1914	250p 90p 30p	2SC2408 2SC24121 2SC2440	120p K 50p 200p	2SC2909 2SC2910 2SC2911	60p 25p 80p	2SC3379 2SC3381 2SC3383	1200p 130p 80p	2SC3964 2SC3972 2SC3973	250p 210p	2SD575 2SD592	530p 25p	2SD1060 2SD1062	130p 150p	2SD1438 2SD1439	100p 165p	2SD1913 2SD1929	50p	2SK559 2SK560 2SK566	600p 580p 475p
2SC1921 2SC1922 2SC1923	15p 175p 10p	2SC2458 2SC2459 2SC2466	10p 50p 55p	2SC2912 2SC2921 2SC2922	120p 550p 480p	2SC3393 2SC3397 2SC3399	80p 20p 50p	2SC3975 2SC3987 2SC3996	210p 220p 800p	2SD596 2SD600 2SD601	25p 30p 40p	2SD1063 2SD1064 2SD1065	250p	2SD1441 2SD1442 2SD1445	220p 80p 200p	2SD1930 2SD1933 2SD1939	50p 75p 75p	2SK606 2SK612	70p 80p
2SC1929 2SC1940	180p 110p	2SC2486 2SC2492	275p 50p	2SC2923 2SC2928	75p 550p	2SC3400 2SC3401	35p 60p	2SC3997 2SC3998	1400p 1000p	2SD602 2SD612	60p 5 0 p	2SD1069 2SD1073	150p 360p	2SD1446 2SD1450	300p 60p	2SD1941 2SD1944	500p 50p	2SK684 2SK685 2SK699	950p 1150p 100p
2SC1941 2SC1942 2SC1944	27p 350p 350p	2SC2470 2SC2481 2SC2482	65p 120p 20p	2SC2929 2SC2934 2SC2937	280p 75p 250p	2\$C3402 2\$C3405 2\$C3409	40p 130p 400p	2SC4006 2SC4020 2SC4023	100p 280p 325p	2SD613 2SD617 2SD633	70p 300p 70p	2SD1088 2SD1094 2SD1110	375p	2SD1451 2SD1452 2SD1453	200p 275p 140p	2SD1958 2SD1959 2SD1978	80p 210p 50p	2SK719 2SK724	300p 500p
2SC1945 2SC1946	350p 1500p	25C2483 25C2484	120p 185p	2SC2939 2SC2944	400p 300p	2SC3416 2SC3417	30p 90p	2SC4029 2SC4043	350p 45p	2SD636 2SD637	10p 15p	2SD1111 2SD1113	20p 225p	2SD1455 2SD1457	250p 165p	2SD1984 2SD1991	450p 50p	2SK725 2SK726 2SK727	550p 425p 475p
2SC1947 2SC1953 2SC1957	450p 45p 70p	2SC2485 2SC2491 2SC2498	400p 200p 50p	2SC2958 2SC2962 2SC2979	50p 800p 160p	2SC3419 2SC3420 2SC3421	120p 80p 45p	2SC4048 2SC4056 2SC4059	40p 350p 550p	2SD638 2SD639 2SD640	15p 20p 350p	2SD1128 2SD1133 2SD1135		2SD1458 2SD1459 2SD1468	50p 80p 40p	2SD1994 2SD1996 2SD2006	300p 45p 75p	2SK739 2SK758	400p 300p
2SC1959 2SC1962	10p 175p	2SC2500 2SC2502	26p 140p	2SC2987 2SC2988	250p 150p	2SC3422 2SC3423	.75p 60p	2SC4084 2SC4106	140p 200p	2SD655 2SD661 2SD666	18p 60p	2SD1138 2SD1140 2SD1142	40p	2SD1487 2SD1494 2SD1496	225p 200p 300p	2SD2010 2SD2011 2SD2012	250p 60p 50p	2SK769 2SK786 2SK787	600p 200p 800p
2SC1967 2SC1969 2SC1970	1300p 160p 100p	2SC2503 2SC2512 2SC2517	600p 20p 120p	2SC2995 2SC2999 2SC3001	50p 1400p	2SC3425 2SC3446 2SC3447	65p 150p 130p	2SC4107 2SC4124 2SC4125	175p 250p 400p	2SD667 2SD669	25p 20p 35p	2SD1145 2SD1148		2SD1497 2SD1497	230p	2SD2018 2SD2033	65p 80p	2SK791 2SK792	225p 300p
2SC1971 2SC1972 2SC1973	400p 600p 150p	2SC2519 2SC2527 2SC2534	60p 300p 150p	2SC3019 2SC3020 2SC3022	320p 1450p 1850p	2SC3456 2SC3457 2SC3459	200p 125p 180p	2SC4137 2SC4138 2SC4157	40p 200p 400p	2SD673 2SD676 2SD717	350p 250p 180p	2SD1153 2SD1159 2SD1160		2SD1505 2SD1506 2SD1508	90p 50p 60p	2SD2061 2SD2066 2SD2125	100p 250p 180p	2SK793 2SK794 2SK796	300p 315p 600p
2SC1975 2SC1980	120p 30p	2SC2535 2SC2538	300p 100p	2SC3025 2SC3026	500p 650p	2SC3460 2SC3461	130p 275p	2SC4159 2SC4161	100p 125p	2SD718 2SD722	85p 240p	2SD1163 2SD1164	A 220p 75p	2SD1509 2SD1511	100p 100p	2SD2138 2SD2144	85p 35p	2SK809 2SK812	850p 150p
2SC1983 2SC1984 2SC1985	75p 150p 100p	2SC2540 2SC2542 2SC2545	1900p 300p 55p	2SC3030 2SC3037 2SC3038	300p 125p 125p	2SC3466 2SC3468 2SC3481	225p 70p 300p	2SC4169 2SC4199 2SC4204	60p 700p 60p	2SD725 2SD726 2SD731	200p 276p 250p	2SD1168 2SD1169 2SD1173	280p	2SD1519 2SD1521 2SD1525	250p 70p 600p	2SD2151 2SD2255 2SD2331	175p 175p 250p	2SK817 2SK851 2SK872	325p 660p 650p
2SC1986 2SC2001	100p 15p	2SC2546 2SC2547	25p 65p	2SC3039 2SC3040	80p 260p	2SC3482 2SC3486	275p 275p	2SC4231 2SC4235	250p 550p	2SD732 2SD734	250p 15p	2SD1185 2SD1186 2SD1189	280p 400p	2SD1526 2SD1541	100p 350p	2SD2333 2SD2340	200p 225p	2SK875 2SK963	475p 500p
2SC2002 2SC2003 2SC2004	15p 20p 20p	2SC2550 2SC2551 2SC2552	50p 70p 60p	2SC3042 2SC3052 2SC3057	300p 30p 150p	2\$C3502 2\$C3503 2\$C3504	100p 50p 120p	2SC4236 2SC4237 2SC4242	550p 650p 120p	2SD741 2SD743 2SD757	120p 130p 120p	2SD1191 2SD1192	120p	2SD1545 2SD1546 2SD1548	275p 350p 400p	2SJ48 2SJ56 2SJ74	425p 700p 60p	2SK904 2SK951 2SK952	500p 275p 275p
2SC2022 2SC2023	110p 180p	2SC2553 2SC2555	200p 120p	2\$C3068 2\$C3070	60p 35p	2SC3505 2SC3506 2SC3507	240p 2 50p 650p	2SC4278 2SC4288 2SC4300	175p 4 650p 200p	2SD760 2SD762 2SD763	70p 100p 140p	2SD1196 2SD1197 2SD1198	150p	2SD1554 2SD1655 2SD1556	170p 170p 300p	2\$J76 2\$J77 2\$J79	220p 350p 225p	2SK955 2SK956	750p 600p
2SC2026 2SC2027 2SC2035	30p 200p 50p	2SC2562 2SC2563 2SC2568	90p 200p 120p	2SC3071 2SC3073 2SC3074	25p 100p 200p	2SC3509 2SC3514	750p 170p	2SC4301 2SC4304	550p 225p	2SD768 2SD772	180p 200p	2SD1207 2SD1210	40p 280p	2SD1565 2SD1571	75p 170p	2SJ103 2SJ109	75p 200p	2SK962 2SK1023 2SK1036	700p 550p 450p
2SC2037 2SC2053 2SC2055	50p 120p 150p	25C2570 25C2571 25C2577	30p 350p 110p	2SC3075 2SC3077 2SC3086	150p 120p 150p	2SC3518 2SC3519 2SC3528	120p 250p 45p	2SC4313 2SC4381 2SC4382	1000p 225p 300p	2SD773 2SD774 2SD777	20p 30p 400p	2SD1211 2SD1213 2SD1218	220p	2SD1572 2SD1575 2SD1576	100p 200p 200p	2SJ113 2SJ114 2SJ116	1050p 1150p 1200p	2SK1057 2SK1058	600p 800p
2SC2058 2SC2060	20p 40p	2SC2578 2SC2579	170p	2SC3089 2SC3101	130p 750p	2SC3528 2SC3531	750p 225p	2SC4386 2SC4387	275p 425p	2SD784 2SD786	660p 100p	2SD1223 2SD1225	75o 70p	2SD1577 2SD1579	250p 120p	2SJ117 2SJ119	550p 700p	2SK1081 2SK1082 2SK1102	700p 450p 375p
2SC2061 2SC2068 2SC2071	75p 60p 140p	2SC2580 2SC2581 2SC2588	175p 225p 600p	2SC3112 2SC3114 2SC3118	35p 40p 75p	2\$C3549 2\$C3552 2\$C3568	200p 270p 200p	2SC4408 2SC4429 2SC4431	50p 275p 90p	2SD787 2SD788 2SD789	20p 30p 20p	2SD1227 2SD1229 2SD1237	250p	2SD1589 2SD1590 2SD1591	60p 100p 310p	2\$J162 2\$J175 2\$J182	680p 200p 150p	25K1117 25K1118	250p
2SC2073 2SC2075	40p 60p	2SC2590 2SC2591	40p 50p	2SC3117 2SC3122	120p 50p	2SC3577 2SC3584	275p 200p	2SC4467 2SC4468	175p 250p	2SD792 2SD794	400p 33p	2SD1238 2SD1244 2SD1246	300p 25p	2SD1593 2SD1595 2SD1508	125p 100p 210p	2SJ200 2SJ307 2SK19	525p 175p 45p	25K1120 25K1190	550p 350p 800p
2SC2078 2SC2085 2SC2086	95p 100p 60p	2SC2592 2SC2603 2SC2610	200p 10p 60p	2SC3148 2SC3149 2SC3150	145p 180p 100p	2SC3591 2SC3595 2SC3597	200p 220p 75p	2SC4517 2SC4517 2SC4531	250p 4 300p 450p	2SD795A 2SD798 2SD799	140p 175p 150p	2SD1247 2SD1251	40p	2SD1609 2SD1632	45p 400p	2SK33 2SK40	40p 50p	2SK1191 2SK1217 2SK1221	700p 200p
2SC2092 2SC2094	100p 1200p	25C2611 2SC2621	30p 70p	2SC3151 2SC3152 2SC3153	175p 130p	2SC3599 2SC3600 2SC3606	140p 175p	2SC4532 2SC4542 2SC4742	1400p 650p 275p	2SD809 2SD811 2SD819	450p 300p	2SD1254 2SD1263 2SD1264	90p	2SD1637 2SD1647 2SD1649	50p 40p 260p	2SK55 2SK68 2SK73	100p 100p 75p	2SK1275 2SK1296	350p
2SC2097 2SC2099 2SC2116	2300p 2500p 1100p	2SC2625 2SC2626 2SC2630	600p	2SC3156 2SC3157	175p 350p 200p	2SC3608	100p 150p 65p	2SC4744 2SC4745	350p 675p	2SD820 2SD821	250p 560p	2SD1265 2SD1266	75p 180p	2SD1650 2SD1651	150p 150p	2\$K97 2\$K106	200p 40p	2SK1299 2SK1317 2SK1338	450p 900p 250p
2SC2120 2SC2122/ 2SC2131	10p A 30 0p 550p	2SC2631 2SC2632 2SC2634	20p 35p 10p	2SC3158 2SC3159 2SC3164	260p 200p 270p	2SC3616 2SC3636 2SC3642	45p 280p 225p	2SC4747 2SC4762 2SC4769	375p 350p 300p	2SD822 2SD826 2SD829	290p 30p 375o	2SD1267 2SD1271 2SD1271	55p	2SD1656 2SD1663 2SD1666	250p 350p 60p	2SK107 2SK109 2SK117	40p 150p 50p	2SK1341 2SK1342	500p 500p
2SC2141 2SC2153	60p 40p	2SC2636 2SC2637	40p 120p	2SC3169 2SC3170	150p 300p	2SC3657 2SC3659	400p 600p	2SC4770 2SC4820	250p 225p	2SD836 2SD8364	50p 50p	2SD1272 2SD1273	200p 50p	2SD1667 2SD1668	120p 120p	2SK118 2SK125	50p 100p	2SK1350 2SK1356 2SK1357	200p 225p 350p
25C2168 25C2168 25C2188	80p 120p 70p	2SC2640 2SC2653 2SC2654	100p	2SC3173 2SC3175 2SC3178	180p 150p 125p	2SC3668 2SC3675 2SC3678	120p 100p 280p	2SC4826 2SC4924 2SC4927	70p 300p 500p	2SD837 2SD838 2SD841	55p 500p 110p	2SD1274 2SD1275 2SD1276	50p 60p	2SD1669 2SD1677 2SD1680	85p 300p 225p	2SK133 2SK147 2SK152	650p 160p 40p	25K1358 25K1377	400p 150p
2SC2200 2SC2209	250p 50p	2SC2655 2SC2656	75p 550p	2SC3179 2SC3180	70p 175p	2SC3679 2SC3680	140p 380p	2SC5002 2SC5003	450p 350p	2SD844 2SD850 2SD856	200p 170p 48p	2SD1277 2SD1279 2SD1288	190p 600p	2SD1883 2SD1684 2SD1706	45p 70p 325p	2SK161 2SK163 2SK168	30p 40p 40p	2SK1400 2SK1404 2SK1461	250p 290p 220p
2SC2215 2SC2221 2SC2228	50p 650p A 60p	2SC2660 2SC2668 2SC2668	200p 10p	2SC3181 2SC3182 2SC3198	30p	2SC3685 2SC3687 2SC3688	450p 300p 550p	2SC5044 2SC5129 2SC5149	250p 500p 400p	2SD858 2SD863	250p 23p	2SD1289 2SD1291	250p 280p	2SD1707 2SD1708	400p 375p	2SK170 2SK184	50p 35p	2SK1462 2SK1487	425p 250p
25C2229 25C2230 2SC2233	15p 80p 100p	2SC2681 2SC2681 2SC2682	100p 170p	2SC3199 2SC3202 2SC3209	40p 25p	2SC3692 2SC3715 2SC3717	150p 480p 120p	2SD188 2SD198 2SD199	350p 140p 195p	2SD864 2SD866 2SD8664	200p 120p 140p	2SD1292 2SD1293 2SD1297	70p	2SD1710 2SD1718 2SD1729	200p 275p 230p	2SK192 2SK193 2SK195	45p 40p 150p	2SK1507 2SK1529 2SK1537	475p 700p 400p
2SC2235 2SC2236	60p 20p	2SC2688 2SC2690	27p 60p	2SC3210 2SC3211	550p 220p	2SC3729 2SC3748	460p 100p	2SD200 2SD201	180p 280p	2SD867 2SD868	350p 260p	2SD1302 2SD1306	20p 45p	2SD1730 2SD1732	275p 325p	2SK197 2SK212	140p 35p	2SK1544 2SK1767	900p 275p
2SC2237 2SC2238 2SC2240	540p 45p 15p	2\$C2694 2SC2705 2SC2706	50p	2SC3225	50p	2\$C3747 2\$C3748 2\$C3752	120p 100p 250p	2SD213 2SD234 2SD257	250p 90p 195p	2SD869 2SD870 2SD871	150p 140p 260p	2SD1308 2SD1309 2SD1310	140p	2SD1739 2SD1740 2SD1748	225p 125p 90p	2SK214 2SK216 2SK223	170p 200p 50p	2SK2038 2SK2039 2SK2134	750p
	ALC: N					SEE SEE					183 C			No.	1000				

REPLACEMENT VIDEO HEADS

Model P	rice
AKAI VS105, 112, 115, 116, 120, 125,	126,
VS105, 112, 115, 116, 120, 125, 201, 202, 205, 220, 240, 244, 24 248, 250, 301, 303, 304, VSP8, VSP82	1000a i
VSP82 VP7100, VS9300, VS9500 VP7200, VS9700, VS9800 VS1	650p 1200p 1250p
V\$1 V\$2 V\$3 V\$10	1200p
	1350p 2100p 3,55,
VS33,35, 37, 38, 38EOG MKII, 9 66, 766, 766, 767, 768, 865, 867 VSF30, 33, 4, 400, 410, 420, 431 441, 450, 455, 480, 490, 497, VSG51, 54, 55, VXS450,	0, 440,
VSG51, 54, 55, VXS450, VXS470	2260p 2250p
VS512, VS515, VS516 VS482, 485, 487, 487EOG2, VS 15EK, 15EOH, 300, 301, 310, VSF320, 330, 340, 350, VSG30,	F12,
VSF320, 330, 340, 350, VSG30, 33, 34, 35 VS11, VS12 VS6, VS8, VS9	2300p
VSA9	2400p 2250p 10,
VSX9 VSX9 VSX100, 1110, 650, VSF500, 5 550, 560, 580, 590, 600, 650, VSG60, 54, 65, VSG70, 73, 74, VSX560, 580 VS155, VS165 VS20, 22, 23, 24, 25, 26, 27, 42	75. 3600p
VS155, VS165 VS20, 22, 23, 24, 25, 26, 27, 42,	2300p 2, 425.
VSF200, 210, 220, 221, 222, 23 280, 261, 262, 265, 270, 275, 28	0, 240,
206, VSG21, 211, 212, 215, VSG217EOG , 23, 24, 25, 405,	411,
VSMS60, S80 VS155, VS165 VS20, 22, 23, 24, 25, 26, 27, 42 426, 427, 485, VSF10, 11, 180, VSF200, 210, 220, 221, 222, 23 80, 281, 282, 285, 276, 275, 28 VSF290, 510, 550, VSG20, 204, 206, VSG21, 211, 212, 215, VSG217EOG, 23, 24, 25, 405, 415, 417, VSF 100, 100EM, 110 VSF88, 88KC, 8111, VSF9, VSF 100EDG, 100EM, 110, VSX400 VSR9 VS 109, VS603, VS506, VS607	100, 1250p
100EDG, 100EM, 110, VSX400 VSR9 VS 109, VS603, VS606, VS607 VS75 VS965, VC967	1300p 2500p 2500p
VS75 VS965, VC967 VSF400, 410, 420, 430, 440, 441 450, 455, 480, 490, 497, VSX45 470 VSG20, 204, 204, 205, 206, 20, 212, 215, 217, 225, 23, 24, 25.	3450p
470 VSG20, 204, 204, 205, 206, 20,	2850p 21, 211,
VSP100, 110, 88, VSR100, 110,	
VSG415, VSG415EA, VSG425 VS75, VSA77 VSF1000, VSF1030, VSF1030	1950p 2800p 3500p 5800p
ALBA VDR3000, VCR4000, VCR5000,	1650p
VTV10 VCR7000, 7800, 8000, 8800	1000p 1100p
AMSTRAD VCR4500, VCR5200, VCR9000, TVR1	900p
VCR7000	10000
VCR1000, 2000, 6000, 61000, 6 8600, 8602, 8700, 9005, DD890 DD8904, TVR4 TVR2, TVR3, VCR4600, VCR46 VCR400	1100p 00 MKII,
VCR400 VCR8800, VCR8804, VCR9340 VCR8803, VCR8804, VCR8704, VCR9140, VCR9142 VCR9140, VCR9142 VCR9244	1100p 2100p
VCR8714 VCR9140, VCR9142 VCR9340	1350p 2550p 3650p
VCR9244 UF020, 22, VCR3000, 3002, 9500	3450p 1750p
FIGUED	
FVHP420, 510, 520, 530, 615, 6 822, 710, 711, 715, 716, 720, FVHP721, 722, 730, 830, 905, 5 908, 910, 911, 915, 916, 918, FVHP5000, 5001, 5005, 5050,	06, 907,
50/5	11000
VBS3500, 7100, 7500, 7600, 950 VBS7000, VBS7100, VBS9000 FVHP500, 711, 715, 721, 722, 7 5100, FVHD720 FVHP725, FVHP830, FVHP980 FVHP990	1800p 2000p 30, 830,
5100, FVHD720 FVHP725, FVHP830, FVHP980 FVHP990	1100p 2500p 2700p
FVHP975 FVHD407, FVHD140, FVHP1, F FVHP20	2400p
FVHP20 FVHD230, FVHP1100, 1200, 13 1410, 2000, 200, 210, 300, FVHP310, 410, 420	10, 1340,
FVHP310, 410, 420 FVHD250, 270, 370, FVHP1500 FVHP250 FVHP132, 1400, 1440, 320,	1800p 2700p
FVHP470S, FVHP475HV	3660p 4800p
440, 445 FVHP470S, FVHP475HV FVHP1250, FVHP430S GOLDSTAR BODD SHSSDB CHV421 BO2	1950p
FVHP1250, FVNP430S GOLDSTAR 6000 3HS3DD, GHV121, RC22 Z031, 2051 GVH51, GVH122, VCP4000, VVCP4200 GHV1232, 1233, 1241, 1242, 1 1244, 1245, 1246, 1266, 1290, GHV1295, 1296, 1891, 8210, 8 1221, 1240, 1241, 1247, 1248, VCP400, VCP4130, 4300, 4301, 4315, 4315, 4315, VCP4320, 4321, 4325, 4326, VCP4320, 4321, 4325, 4326, VCP4320, 4321, 4325, 4326, VCP4320, 521PQ, 129310, 1289PQ, 129310, 1289PQ, 129310, 1289PQ, 129310, 1289PQ, 129310, 1289PQ, 129310, 1289PQ, 129310, 1280PQ, 1280PQ	1900p CP4100,
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RG20, RG2001, RQ20, RQ204HP, RQ241, VCP100P,	nG)1P,
	1600p
RC405P GSEQ121, RQ2011, RQ2031,	2350p
RQ2051 G.E.C. 4000H, 4001H, 4002H	1950p 1200p
4000H, 4001H, 4002H V4001H, V4004, V4100 V4005H	1200p 1200p 1500p
GRANADA CSI, DS2 VHSAH1	1600p 1100p
VHSAH3	2400p

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Mode	1	Pr	ice	
VHSAN3 VHSAY3	100		800p 1200p	
VHSBP1	SCH1		2100p 850p 2600p	
VHSD52 VHSEH2, VH	SDH2		1600p 1600p 1400p	
VHSBY3 VHSD52 VHSEH2, VH VHSEY1, VH VHSFS1, VH VHSFB3 VHSFB3	ISFS2 ISFG4, VF	ISF63	1300p	
VHSFB3 VHSTJ1, VH VHSYJ2	ISTJ2. VH	STJ3, VHS	1300p WJ3, 700p	
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8945			700p 2400p	
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640, 650 HR4100 HRD750, H			2000p 1000p 3300p	
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HRD250, HRD257	2300p 2200p
HRD250, HRD257 3V32, 8942, HR7655 HRD180, 190, 230, 610, 3V FV208, 26, 30, 32, 33, VC1 HRD370, HRD430, HRD470	59, FV12L, 41L 2050p
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HRFC100, SR3300MS, FV4 HRD950, HRD960, HRD980	4L 2100p
FV46 HRS5000, HRS5500, 5800,	9000
HRS5000, HRS5500, 5800, FV395.BRS600, SRS368E FV22L	5550p 1400p
FV42 VR182LV, VR202LV FV67HV, FV68TX, FV77 R2000 SERIES	1400p 2600p 1950p 3800p
R2000 SERIES FV61LV, FV62LV, FV67HV FV42L	4500p 4000p £101.00p
FV42L VP160L, VR172L	£101.00p 1960p
VP160L, VR172L HRJ200, HRJ205 HRJ600EG, HRJ600EK, HR HRJ605UK, HRJ610EK	3300p RJ605EG.
HRJ300, HRJ305, HRJ315, HRJ316FG HRJ318F	3750p
HRJ615, HRJ715, HRJ815 HRJ400, HRJ405, HRJ4071	9200p MS, HRJ41
OEK, HRJ415, HRJ416 MATSUI	5850p
HRJ600EG, HRJ600EK, HF HRJ605UK, HRJ610EK HRJ300, HRJ305, HRJ315, HRJ316EG, HRJ313E HRJ615, HRJ715, HRJ815 HRJ400, HRJ405, HRJ4071 OEK, HRJ415, HRJ415 MATSUI VX500E, 800A, 810A, 820, 773B VCRL3, VX730, VX750	80A, 770B, 1200p
VX735, VX755, VX990 VX735A VX765, VX850	1500n
VCRL3, VX730, VX750 VX735, VX755, VX990 VX735A, VX765, VX850 VX600 VX900	1750p 1100p 2650p
MITSUBISHI HS303, HS304, HS320, HS	700 1400p
MITSUBISHI HS303, HS304, HS320, HS HS306, HS318, HS710 HS307 HS319 HS330 HS400	1400p 2300p
HS330 HS400	1900p 2300p 2800p
HS400 HS349, HSE27, 31, 32, HS 31, 32, HSM33, 34, 35, 370 HS411 HSE30, HSB30 HS238	B27, 3 21500
HS411 HSE30, HSB30	2150p 1900p 2000p
HS338 HSE10, HSE11, HSE20, HS	1900p SE21,
HSE30, HSB30 HS338 HS210, HSE11, HSE20, HS HSE410, HSB20 HS300, HS301, HS302, HS HS273, HS550Q HS200 HS200 HS200 HS201 HS201 HS212, HS247 HS812, HSE12, HSE22, HS 23, 25, 30, MX1 HS411EZ, HS411GZ HSB11, HS821 HSB22, HSS0, S2G, HSM 55, 57, 58, 60 HSE61	2100p
HS273, HS550Q HS200	1350p 650p
HS337, HS347 HSB12, HSE12, HSE22, HS	1400p 5M16G, 18,
HS411EZ, HS411GZ HSR11, HSR21	2500p 2000p
HS852, HSE50, 52G, HSM 55, 57, 58, 60	38, 50, 54, 3300p
HSE51 HS410	3000p 3250p
HS5300, HS5424, HS5600	3050p
HSM40 HSM59, HSM68E	2850p 8050p
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HSM40 HSM59, HSM68E NV300, 322, 332, 333, 340 2010, 3000, 7000, 7200.75 7850, 8170, 8200, 8400, 86 8620 NV777, NV330 NV8050, NV8051	625p
1440000, 14400001	Z G G G B
NATIONAL PANASONI AG1000, 1050, NV250, 264 460, 485, 470, 480, 650 AG6010, AG6015 AG6840	0, 280, 450, 1600p
AG6010, AG6015 AG6840 NV100, NV200, NV370, N NV630	2500p 2400p
NV100, NV200, NV370, NV NV630 NVD80, NVH65	775n
ACTION ACTORS AUTOR	NVH75, 3200p
NVH77 NVF51 NVG19	4200p 2300p 20. NVL21,
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AG2100, AG2200 NV430, NV431, NV433, N	VSD2
NV730, NV730F, NV770 4 HEAD	3 1000p 1450p
NV366 NV21 HQ, NV 180, NVD48	1850p
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NVG20, 21, 22, 25, 28, 200 NVD48	1700p
NVG20, 21, 22, 25, 28, 200 NVD48 NVG50, NVG300 NVG45 NVH70	2000p 1450p
NVH70 NV688 NV600	
NV688 NV600 AG6800, AH6810, AG6820 AG6100, AG6200, AG6300 NVG7, NVG9, NV230 NV780	2600p
NVG7, NVG9, NV230 NV780 NVG 15, NVG400	
AG8100, AG8200, AG8300 NVG7, NVG9, NV230 NV780 NVG 15, NVG400 NVM7, NVMC20 NVF70 NV145, NVJ47	3800p 5200p
NVJ45, NVJ47 NVSD40 NVF75, NVF77	2000p 2250p 4750p
	4000p
NVF\$200, NVFS88, NV\$F NW8000 NVHD90, NVHD 100, NV	4600p HD 101.
ABULIE 100	9100-
NVSD1 AG7330, AG7350, AG735 AG7450	5. 5000 p
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N.E.C. N9011, 9012, 9013E, 9	1014E, 9014G,	TLS1100 VHR120, 130, 1-151, 15, 16, 171 VHR310, 330, 4-4300, 4400, 450 VHR5200, 5600, 7250, 7300, 807 VHR7800, 7810, VHR0400, 441 VHRD4510, 670 TLS2000 VHR5300, VHR8
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41DV2, 4SB11BVR412 6490,	2, 415, 6485,	VC473, VC785, VC699, VCA501 VC585, VC685 VC90ET VF8815
6880	1600p 4850p	VC585, VC685 VC90ET
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49SB6, VR6548, VR66 VR6843 SAISHO	2750p	SLT20ME, 30M DSR-43R FOR S
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VR3800 X, VR3600 X, VR3800 VR3200, VR3500 VR3500, VR3500 VR3500 VR35000 X VR56000 A	1400p 2660p	SLK95, SLT50N SLV275, SLV37
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SALORA 6500, 6600 SV7300, SV8200, SV8 SV9200 SV7400, SV8400 SV8100 SV800, SV9900	1600p	DSR49R, SLHF: SLHF100JB SLV656, SLV71 SLV777, SLV53UB CCDF340E, CCD CCDV95E, CCD SLV301, SLV30 SLV310, SLV31 SLV335 SLV210, SLV21 SLV285, SLV30 SLV125, 213, 2: SLVX1, 20, 3 SLV353, SLV36
SV7400, SV8400 SV8100	1500p 1600p 1200p	SLV353UB CCDF340E, CCI
SV601, SV611, SV691	0 1500p	SLV801, SLV80
\$V800, \$V810 \$V8700, \$V8710, \$V8 623N, \$V6800, \$V690 \$V8870, \$V8970 \$V88110, \$V8910 823N, \$V8920	2800p 3750 1500p	SLV335 SLV210, SLV21
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SV8600, SV8700 SV8420 SV8620	1550p 2400p 2100p	SLVX1, 20, 3 SLVX53, SLV41 SLVX55 SLVX75, SLVX3 SLV282, SLVX3 SLHF100P, SLF SLVE7, SLVE8,
SV9300 SV8830 SV8720	2500p 2200p	SLHF100P, SLH SLVE7, SLVE8,
SV8520	2250p 1900p	SLVE90 SLV615, SLV62 SLVE800
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3300, 3400, 3310, VH VHR1500, VHR2500, VHR2700	RD500 1500p VHR3330 2100p 2450p	District St.
VHR7900	3000p	GRAN
		Tel: 01
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TLS1100	
	3100p
VHR120, 130, 14, 141, 143G, 14	ISP,
TLS1100 VHR120, 130, 14, 141, 143G, 14 151, 15, 16, 171, 220, 23, 244, 2 VHR310, 330, 4100, 4105, 4206 4300, 4400, 4500, 5506, 5100, VHR5200, 5600, 6550, 7100, 72 7250, 7300, 8970, 8100, 8101, 8 VHRD4400, 4410, 4500, 4500, VHRD4510, 4410, 4500, 4500, VHRD4510, 6700, 4800 VHRD4510, 6700, 4800 VHRD4510, 6700, 4800 VHRD4510, 6700, 4800	430.
4300, 4400, 4500, 5080, 5100,	
VHR5200, 5600, 6850, 7100, 72	00,
VHR7800, 7810, 8000SP, 88015	SP.
VHRD4400, 4410, 4500, 4600,	12.00
VHRD4510, 6700, 4800	3100p
TLS2000 VHR5300, VHR6500, VHR7400 VHR3500EX VHR18, 235, 335E, 4150, 4160, 7250, 7260, 8250 VTC3000	4250p
VHR3500EX	2150p
VHR16, 235, 335E, 4150, 4160,	4350,
7250, 7260, 8250	1950p
V1C3000	1400p
VC200 VC202 VC405	2750p
VC488	4200p
VC779 VC789, VC790	1800p 2900p
VC789, VC790	2900p
396 387 388 471 477 481 48	2.
VC483, 486, 3300, 8381, 9100, 1	9300,
9400, 9500, 9600, 9700	1100p
VC108, 208, 382, 402, 405, 408,	. 500,
VC5W20E, 600, 651, 674, 681,	584.
6V3, 750, 780, 781, 683, 684, 40)2,
VC500, 571, 573, 580, 584, 600,	682,
933, 700, 772, 7810, 782, 7822, 9481 8581 VCA10 100 102 1	03
1031, 103, 104, 105, 106,	00,
VC488 VC779 VC789, VC790 VC700, 220, 300, 381, 383, 384, 386, 387, 388, 471, 477, 481, 48, VC483, 486, 3300, 3381, 9100, 19400, 9500, 9600, 9700 VC108, 208, 382, 402, 405, 408 550, 571, 573, 581, 582, 583, VC5W20E, 600, 681, 674, 681, 6V3, 750, 780, 781, 683, 684, 4V VC500, 571, 573, 580, 584, 600, 833, 700, 772, 7810, 782, 7822, 8481, 8831, VCA10, 100, 102, 1 1031, 103, 104, 105, 106, VCA111, 113, 116, 131, 140, 20 VC1113, 234, 224, 255, 30, VC811, 132, VC811, 132, VC811, 200, VCT510, 72 VC1134, VCTS313, VC500, 3300, 7300, 7700, 750, 8000, 8300 VC373, VC785, VC786 VC589, VC786, VC786 VC589, VC6851, VCA602 VC585, VC6851, VCA602 VC585, VC6851, VCA602 VC585, VC6851, VCA602 VC589, VC6851, VCA602 VC590, VC4861, VC4602 VC590, VC4861, VC4602 VC	2, 203,
211, 234, 244, 254, 255, 30, 35,	VCA40,
VCT212, 310, 410, VCT510, 72	CIVI73,
VCT1314, VCTS313	1100p
VC6000, 6200, 6300, 7300,	1000
VC793	3000p
VC473, VC785, VC786	22000
VC699, VCA501, VCA602	2800p
VC585, VC685	2000p
VC90ET VFH815	3900p
VCH882	2700p
VCH80, VCH81, VFH815 VCA33, VCA36, VCA43, VCA44	2800p
VCA49 VCA55, VCA63 VC570	1500p
VCA55, VCA63	1500p 2200p 2800p
SONY	∡eo∪p
DSR-19R FOR SL-T 9MF	3100p
DSR-21 R FOR SLC 8-C9	2600p
DSR-35R FORC20, C30, C40, S	LF1UB,
SIFIT 30PE 25 AARS SIVE	4, 4475,
SLT20ME, 30ME, SL100	1500p
DSR-43R FOR SLC7 RANGE, S	L5000,
SL5100, SL3000 1 PIN, SLC6E,	1200-
S130ES, SL37E S13000 S18000 S18080 SLC5	F
4.5	
SL17ME	1600p
SONY DSR-19Ř FOR SL-T 9ME DSR-21 R FOR SLC 8-C9 DSR-35Ř FORCXD, C30, C40, S SLF162 PIN, SLC24FS, 33É, 34 SLF10, 30MÉ, SL, 100 DSR-43Ř FOR SL-T RANGE, S SL5100, S13000 1 PIN, SLC5É, SL36ES, SL37E SL3000, SL600, SLC5 SLT7MÉ SLY201, SLY202	1800p 2000p
SL17ME SLV201, SLV202 SLK95, SLT50ME SLV275 SLV273VR SLV410	1600p 2000p 2900p
SL17ME SLV201, SLV202 SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474	1600p 2000p 2900p 2200p
SLT7ME SLY201, SLY202 SLK95, SLT50ME SLY275, SLY373VB, SLY410. SLY412, SLY427, SLY474 DSR49R, SLHF100P,	1800p 2000p 2900p 2200p
SL17ME SLY201, SLV202 SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P, SLHF100UB SLV556, SLV715, 725, 727, 752	1800p 2000p 2900p 2200p 3850p
SL17ME SLV201, SLV202 SLV95, SLT50ME SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474 DSR49R, SLHF100P, SLHF100UB SLV656, SLV715, 725, 727, 757 SLV777, SLV915, SLV925	1800p 2000p 2900p 2200p 3850p 4600p
SLI7ME SLV201, SLV202 SLV95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV715, 725, 727, 757 SLV777, SLV915, SLV25 SLV353UB	1800p 2000p 2900p 2200p 3850p 4600p
SLI7ME SLV201, SLV202 SLV35, SLT50ME SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV715, 725, 727, 757 SLV777, SLV815, SLV825 SLV353UB CCDP340E, CCDF500E, CCDV9 CCDV98E, CCDS95E	1600p 2000p 2900p 2200p 3850p 4600p 2600p 06.
SLI7ME SLV201, SLV202 SLV95, SLT50ME SLV275, SLV373VB, SLV410, SLV412, SLV427, SLV474 DSR49R, SLHF100P, SLHF100UB SLV656, SLV715, 725, 727, 757 SLV777, SLV815, SLV825 SLV333UB CCDF340E, CCDF500E, CCDV9 CCDV95E, CCDSP5E SLV301, SLV802	1800p 2000p 2900p 2200p 3850p 4600p 0E. 4800p 3550p
SLI7ME SLV201, SLV202 SLV95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV373VB, SLV410. SLH6100, SLH6100, SLH6100, SLH6100, SLV353LS, SLV315, SLV25 SLV353UB, CCDF500E, CCDV9 CCDV95E, CCDSP5E SLV301, SLV915, SLV325, SLV310, SLV915, SLV325,	1800p 2000p 2900p 2200p 3850p 4600p 2600p 0E. 4800p 3550p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV555, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV353UB CCDF340E, CCDF500E, CCDV9 CCDV9SE, CCDSP5E SLV301, SLV902, SLV315, SLV325,	2900p 2200p 3850p 4600p 06. 4800p 3550p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV555, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV353UB CCDF340E, CCDF500E, CCDV9 CCDV9SE, CCDSP5E SLV301, SLV902, SLV315, SLV325,	2900p 2200p 3850p 4600p 06. 4800p 3550p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV555, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV353UB CCDF340E, CCDF500E, CCDV9 CCDV9SE, CCDSP5E SLV301, SLV902, SLV315, SLV325,	2900p 2200p 3850p 4600p 06. 4800p 3550p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV555, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV353UB CCDF340E, CCDF500E, CCDV9 CCDV9SE, CCDSP5E SLV301, SLV902, SLV315, SLV325,	2900p 2200p 3850p 4600p 06. 4800p 3550p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV315, 725, 727, 75; SLV777, SLV915, SLV925 SLV330B, CCDF500E, CCDV9 CCDV98E, CCDSPSE SLV301, SLV915, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV270, SLV SLV285, SLV301, SLV212, SLV270, SLV SLV128, SLV310, SLV212, SLV270, SLV SLV310, SLV315, SLV355, SLV315,	2900p 2200p 3850p 4600p 2600p 0E. 4800p 3550p 1600p 273, 1150p 2, 280, 1750p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV315, 725, 727, 75; SLV777, SLV915, SLV925 SLV330B, CCDF500E, CCDV9 CCDV98E, CCDSPSE SLV301, SLV915, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV270, SLV SLV285, SLV301, SLV212, SLV270, SLV SLV128, SLV310, SLV212, SLV270, SLV SLV310, SLV315, SLV355, SLV315,	2900p 2200p 3850p 4600p 2600p 06. 4800p 3550p 1600p 273, 1150p 2,280, 1750p 2750p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV3306, CCDP500E, CCDV9 CCDV95E, CCDSP5E SLV301, SLV915, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV326, SLV316, SLV326, SLV326, SLV316, SLV326, SLV326, SLV336, SLVX56, SLVX75, SLV330, SLVX36, SLVX75, SLV330, SLVX36, SLVX75, SLV330, SLVX36	2200p 2200p 3850p 4600p 2600p 0E 4800p 3550p 1600p 273, 1150p 2,280, 1750p 2750p 3000p 2025p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV715, 725, 727, 75; SLV777, SLV915, SLV925 SLV3306, CCDP500E, CCDV9 CCDV95E, CCDSP5E SLV301, SLV915, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV326, SLV316, SLV326, SLV326, SLV316, SLV326, SLV326, SLV336, SLVX56, SLVX75, SLV330, SLVX36, SLVX75, SLV330, SLVX36, SLVX75, SLV330, SLVX36	2200p 2200p 3850p 4600p 2600p 0E 4800p 3550p 1150p 2, 280, 1750p 2750p 2025p 3850p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV477, SLV474 DSR49R, SLHF100P, SLHF100UB SLV565, SLV715, 725, 727, 757 SLV777, SLV915, SLV725, SLV353UB CCDP340E, CCDF500E, CCDV95 CCDV95E, CCDSP5E SLV401, SLV910, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV312, SLV270, SLV SLV285, SLV300, SLV270, SLV SLV125, SLV310, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV365, SLV360, SLV365, SLV360, SLV365, SLV360, SLV365, SLV476,	2900p 2200p 3850p 4600p 2600p 0E. 4800p 3550p 1600p 273, 1150p 2,280, 1750p 2025p 3850p 5160p 5160p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV477, SLV474 DSR49R, SLHF100P, SLHF100UB SLV565, SLV715, 725, 727, 757 SLV777, SLV915, SLV725, SLV353UB CCDP340E, CCDF500E, CCDV95 CCDV95E, CCDSP5E SLV401, SLV910, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV312, SLV270, SLV SLV285, SLV300, SLV270, SLV SLV125, SLV310, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV365, SLV360, SLV365, SLV360, SLV365, SLV360, SLV365, SLV476,	2200p 2200p 3850p 4600p 2600p 06. 4800p 3550p 1600p 273, 1750p 2750p 3000p 2025p 3850p 5150p 5150p VE700,
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV115, 725, 727, 75; SLV777, SLV915, SLV25 SLV350JB CCDP340E, CCDF500E, CCDV9 CCDV95E, CCDSP5E SLV310, SLV315, SLV325, SLV326, SLV300, SLV125, 213, 225, 252, 255, 26 SLXX1, 20, 3 SLV363, SLV416, SLVX50, SLVX55, SLV30, SLVX95 SLV262, SLVX90, SLVX95 SLV267, SLV58, SLV59 SLV578, SLV58, SLV59 SLV518, SLV59, SLV5600, SL SLV518, SLV526, SLV5600, SL SLV518, SLV526, SLV5600, SL SLV5800	2900p 2200p 3850p 4600p 2600p 0E. 4800p 3550p 1600p 273, 1150p 2,280, 1750p 2025p 3850p 5160p 5160p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV477, SLV474 DSR49R, SLHF100P, SLHF100UB SLV565, SLV715, 725, 727, 757 SLV777, SLV915, SLV725, SLV353UB CCDP340E, CCDF500E, CCDV95 CCDV95E, CCDSP5E SLV401, SLV910, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV312, SLV270, SLV SLV285, SLV300, SLV270, SLV SLV125, SLV310, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV350, SLV365, SLV360, SLV365, SLV360, SLV365, SLV360, SLV365, SLV476,	2900p 2200p 3850p 4600p 2600p 06. 4800p 3550p 1600p 273, 1150p 2750p 3000p 2750p 3000p 6160p 5150p 5150p 5150p 2025p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV25 SLV350, SLV215, SLV25 SLV310, SLV915, SLV325, SLV310, SLV915, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV315, SLV325, SLV315, SLV325, S	2900p 2200p 3850p 4600p 2600p 06 4800p 3550p 1600p 273 1150p 2,280 1750p 2,750p 3000p 6160p 5150p 5150p 2025p 3850p 4800p 2025p 3850p 1600p 1600p 1600p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P, SLHF100UB SLV565, SLV151, 725, 727, 75, SLV777, SLV815, SLV825 SLV353UB CCDF500E, CCDV9 CCDV95E, CCDSP5E SLV310, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV285, SLV300, SLV325, SLV326, SLV316, SLV350, SLVX15, SLV30, SLVX35 SLV363, SLV361, SLV350, SLVX55 SLV367, SLV30, SLVX35 SLV363, SLV361, SLV350, SLV755 SLV769, SLV769, SLV700 SLV515, SLV525, SLV530 SLV5250 SLV5250, SLV530, SLV530 SLV5250, SLV530	2900p 2200p 3850p 4600p 2600p 0600p 1800p 1150p 2, 280, 1750p 3000p 2025p 9850p 1150p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100P, SLHF100UB SLV565, SLV151, 725, 727, 75, SLV777, SLV815, SLV825 SLV353UB CCDF500E, CCDV9 CCDV95E, CCDSP5E SLV310, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV285, SLV300, SLV325, SLV326, SLV316, SLV350, SLVX15, SLV30, SLVX35 SLV363, SLV361, SLV350, SLVX55 SLV367, SLV30, SLVX35 SLV363, SLV361, SLV350, SLV755 SLV769, SLV769, SLV700 SLV515, SLV525, SLV530 SLV5250 SLV5250, SLV530, SLV530 SLV5250, SLV530	2900p 2200p 3850p 4600p 2600p 06 4800p 3550p 1600p 273 1150p 2,280 1750p 2,750p 3000p 6160p 5150p 5150p 2025p 3850p 4800p 2025p 3850p 1600p 1600p 1600p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV330, SLV215, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV315, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV315, SLV315, SLV325, SLV325, SLV315, SLV315, SLV325, SLV	2900p 2200p 3850p 4600p 2600p 06 4800p 2750p 1150p 2750p 3000p 2750p 3000p 2025p 1150p 3000p 3000p 3000p 3000p 3000p 3000p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV330, SLV215, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV315, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV315, SLV315, SLV325, SLV325, SLV315, SLV315, SLV325, SLV	2900p 2200p 3850p 4600p 2600p 06 4800p 2750p 1150p 2750p 3000p 2750p 3000p 2025p 1150p 3000p 3000p 3000p 3000p 3000p 3000p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV330, SLV215, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV315, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV315, SLV315, SLV325, SLV325, SLV315, SLV315, SLV325, SLV	2900p 2200p 3850p 4600p 2600p 06 4800p 2750p 1150p 2750p 3000p 2750p 3000p 2025p 1150p 3000p 3000p 3000p 3000p 3000p 3000p
SLK95, SLT50ME SLV275, SLV373WB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV330, SLV212, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV315, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV315, SLV315, SLV325, SLV325, SLV315, SLV315, SLV325, SLV	2900p 2200p 3850p 4600p 2600p 2600p 06 48800p 3550p 1600p 273, 1150p 273, 1150p 273, 1750p 3000p 5150p 2025p 3850p 5150p
SLK95, SLT50ME SLV275, SLV373WB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV330, SLV212, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV315, SLV315, SLV325, SLV310, SLV212, SLV270, SLV SLV315, SLV315, SLV325, SLV325, SLV315, SLV315, SLV325, SLV	2900p 2200p 3850p 4600p 2600p 2600p 06 48800p 3550p 1600p 273, 1150p 273, 1150p 273, 1750p 3000p 5150p 2025p 3850p 5150p
SLK95, SLT50ME SLV275, SLV373VB, SLV410. SLV412, SLV477, SLV474 DSR49R, SLHF100P SLHF100UB SLV565, SLV515, 725, 727, 757 SLV777, SLV915, SLV25 SLV330, SLV216, CCDSP5E SLV301, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV310, SLV315, SLV325, SLV315, SLV310, SLV315, SLV315, SLV300, SLV315, SLV300, SLV315, SLV315, SLV300, SLVX95 SLVX125, SLVX90, SLVX95 SLVX125, SLVX90, SLVX95 SLV315, SLV216, SLV25 SLV315, SLV210, SLV315 SLV315, SLV310, SLV315 SLV310, SLV315, SLV315 SLV310, SLV310, SLV315 SLV311, SLV310, SLV315 SLV310, SLV31	2900p 2200p 3850p 4600p 2600p 2600p 06 48800p 3550p 1600p 273, 1150p 273, 1150p 273, 1750p 2025p 3850p 5150p 2025p 3850p 5150p 2025p 3800p 5150p 400p 3000p 1500p 3400p 3000p 1500p
SLK95, SLT50ME SLV275, SLV373WB, SLV410. SLV412, SLV427, SLV474 DSR49R, SLHF100VP SLHF100UB SLV565, SLV515, 725, 727, 75; SLV777, SLV915, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV825 SLV310, SLV915, SLV325, SLV310, SLV315, SLV325, SLV323, SLV325,	2900p 2200p 3850p 4600p 2600p 2600p 06 48800p 3550p 1600p 273, 1150p 273, 1150p 273, 1750p 2025p 3850p 5150p 2025p 3850p 5150p 2025p 3800p 5150p 400p 3000p 1500p 3400p 3000p 1500p
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The Thomson Saga

s we all know, foreigners begin at the A English Channel. And there are no stranger foreigners than the first ones you come across, the French. This is borne out by the current Thomson situation. Thomson, a vast company by any reckoning, is a strange beast. It's state controlled, which means that government owns most but not quite all of it and consists of two distinct arms, the defence group Thomson-CFS which is quite profitable, and the consumer electronics group Thomson Multimedia which loses a packet. The government wants to be rid of it, but won't sell the bits separately. It doesn't want to be left with the problem of what to do with Thomson Multimedia.

You might think that no one would be interested in helping the French government. But in fact there are two contenders to take over Thomson, the telecommunications and power group Alcatel Alsthom and the defence and media group Lagardère. They have been engaging in quite a battle over the ownership, and as we go to press the French government is due to decide whose bid to accept. Whoever wins will end up with the profitable defence company - and the problem of Thomson Multimedia (TMM). Lagardère has stated that it would sell TMM to Daewoo of Korea. Alcatel Alsthom has not been quite so specific, but has announced that it would take immediate action to reduce TMM's losses and seek an "Asian partner" that "specialises in consumer electronics". The partner would be expected to take over management of TMM, but Alcatel would like to remain a "minority partner" - it sees prospects in the move to digital TV

technology that will occur during the next decade.

All this gives one a strange feeling of déjà vu. At the time when Thomson took over Ferguson, in June 1987, we mentioned in this column that Thomson is "now on the government's privatisation list". It's taken almost a decade to happen. We also said that "Thomson may be big, but has not been all that successful in the past in the consumer electronics field". Right on! What has happened to Ferguson in the UK illustrates the dismal Thomson effect. From being the local brand leader, with over ten per cent of the market, Ferguson has ended up being an also ran. It's only fair however to mention that Ferguson was making substantial losses when Thom EMI was glad to get £90m for it from Thomson.

Thomson has been able to survive in the consumer electrouics field because it is part of a larger organisation, with those defence profits. It has nevertheless over the years attempted to play a a major role in the international consumer electronics field. keeping up with Philips and the Japanese corporations. From its French origins, it first expanded by picking up various German companies such as NordMende. It added Telefunken, a venerable name if ever there was one in this industry, in the early eighties, then took what was to be a big move into the UK market when it bought Ferguson. It currently uses six brand names in Europe. The largest step however occurred when TMM became a major force in the North American market by taking over General Electric's consumer electronics interests. This also gave it the RCA operation. The idea behind all this seems to have been to

achieve success simply by getting bigger. There was always government finance to back the policy, which in the event has not been a success.

The TMM débâcle is a sad one, since Thomson's research and engineering has had many successes. It has not stinted on R and D work, with laboratories in Los Indianapolis, Strasbourg, Angeles. Hanover, Villingen, Tokyo and Singapore. Much work has been done on HD-TV, digital signal processing and other developments that have kept it in the forefront of the technology. Now, it seems, TMM is likely to be swallowed up by one of the Oriental corporate giants. If there are any lessons to be drawn, they would seem to be that expansion by itself is no guarantee of success, that to spread ones activities and their control across the globe makes management extremely difficult, and that costs are very hard to control in such a context.

Alcatel Alsthom's plans to reduce TMM's losses bear this out. It would close down TMM's US factories, transferring production to the company's modern facilities in Mexico, where wages are much lower. It would rationalise the large collection of brands, possibly adopting RCA as the main one worldwide. And there is a suggestion that the company should be run from the USA, since this is its largest market. But all this would be just initial steps towards ceding majority control. Venerable brand names such as Telefunken, GE and RCA would pass to oriental ownership. This will happen whoever wins, Alcatel Alsthom or Lagardère, which would leave just Philips to carry on Europe's traditions in the consumer electronics field.

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TELETOPICS

Internet via Cable TV

The first Internet service to be provided via fibreoptic TV cable has been launched by @Home in Fremont, California. At 10Mbits/sec the bandwidth of the cable connection is more than three hundred times that of a conventional state-of-the-art telephone connection (28-8kbits/sec), giving far faster access to Internet material – a file that would normally take more

than an hour to download is available in seconds. @Home makes a set-up charge of \$150 with a monthly rental charge of \$35 - the service is at present limited to commercial customers:

There were delays in introducing the service as considerable technical problems had to be solved – the most difficult was design of the Internet/cable TV interface. Capital cost per installation is around \$2,000 at present. Because of this the service, which is to be made available via US cable TV operators, is expected to develop only slowly. In addition to the much faster access time, the increased bandwidth will enable new Internet technologies to be introduced more quickly, vastly increasing the system's potential. It could also make many current technologies, such as ISDN, obsolete.

Channel 5 Latest

The minister for technology has announced that Ch. 5 is to be allowed the use of ch. 35, which will increase its terrestrial coverage to 80 per cent of the population of the UK. But the use is to be restricted to a five-year period, and it could take up to a year to obtain the necessary international permission.

Meanwhile retuning difficulties continue. Telewest, the UK's largest cable TV company, was to undertake this task in its franchise areas but has called off talks with C5B. According to a Telewest source, the price and schedule proposed by C5B were "ridiculous". Following the ch. 35 concession, C5B has decided to recruit a further 1,500 retuners, bringing the total to 8,500. The new service is now likely to start in mid-February or early March rather than the planned January 1st.

In a further move, C5B is holding

discussions with BSkyB. C5B aims to secure satellite transmission for Ch. 5 and undertake joint programme commissioning and cross-promotion with BSkyB.

NTL has announced that it will use both Orion and Intelsat 705 as part of its innovative digital distribution system for Ch. 5. The satellite-based system will provide NTL's terrestrial transmitter network with compressed video in MPEG-2 form. Cable companies will also be able to use the satellite transmissions, further extending Ch. 5's coverage.





Catalogues

CPC's 1997 catalogue is now available. Existing CPC customers will receive the catalogue automatically. Copies can alternatively be obtained by calling 01772 654 455. The 2,000 full-colour pages, divided into sixty clearly indexed product sections, list over 52,000 items that are available from stock. 17,000 products have been added since the last catalogue.

SEME's 1996/7 catalogue is now available. It includes new ranges from Daewoo and Crown along with many new component lines. For further information phone SEME on 0166 465 392 or fax 0166 463 976.

Digital Camcorder Formats

Dissension in the digital video field: Hitachi has condemned the DVC standard as "ridiculous", and has developed a camcorder that instead stores the video signal in MPEG form on a mini hard disc. The company maintains that future video products should be based on MPEG as this is "the common standard for the multimedia world". Hitachi plans to launch its MPEG camcorder next year, at around £1,300, and is seeking partners in the project.

The prototype camera looks like a rotary-head shaver, with a high-resolution optical system at the 'head' end and a colour LCD screen the size of a postage stamp at the back for playback (or connect to a TV set or PC) and to act as a viewfinder. There's a slot in the camera's body for a miniature PCMCIA disc drive of the type used in notebook computers. It can store up to half an hour of moving video with

better than VHS quality, 3,000 indexed still pictures, or four hours of hi-fi sound. The 300,000 or so components required for MPEG coding have been integrated by Hitachi into a single chip that consumes only 600mW and is thus suitable for use in a battery-operated camera. The hard disc gives almost instant access to any part of the recorded material.

Meanwhile JVC is launching a new DVC camcorder in Japan. Model GR-DVM1 incorporates the first high-resolution polycrystalline-silicon TFT LCD colour monitor/viewfinder, which is claimed to give clear viewing outdoors. It has 180,000 pixels and is 2.5in. across. Other features include a 570,000 pixel CCD image sensor, a x10 optical zoom, a x100 digital zoom and weight of just 730g with battery and tape. Price in Japan is the equivalent of some £1,740.

Flat-screen TV

Philips demonstrated a flat-screen, TV set at the CeBIT electronics show held in Hanover during August. The set uses a Fujitsu 42in. gas-plasma display panel which has over 400,000 pixels arranged in an 852 x 480 matrix—the aspect ratio is 16:9. VGA resolution is offered for computer display, and there are 256 grey-scale levels. The viewing angle is 160°.

The Philips set, known as Flat TV, consists of two sections, the display which can be wall hung and the receiver itself. The two are linked via a pair of cables. Features include a multi-system tuner, Dolby Pro-Logic Surround sound and five AV connections. The display section is less than

10cm (4in.) deep. Philips plans to launch the set in Germany next year at the equivalent of about £9,000. Initial sales are expected to be mainly to businesses for multimedia presentations. Further models with screen sizes from 25 to 55in. are planned. Philips estimates that by the year 2000 annual worldwide sales of sets of this type will reach a million.

According to Fujitsu, plasma displays of the type used have a minimum service life of 10,000 hours – about five years' viewing at six hours a day. Failure occurs mainly because of the corrosive behaviour of the ionised gas.

Sony and Sharp have agreed to undertake joint development of flat-screen TV technology that



uses plasma discharges to control a liquid-crystal display. Sony is already producing sets fitted with the Plasmatron display. The basic technology is licensed from Tektronix (see *Television*, September 1995, page 780).

DVD News

JVC has announced plans to start bulk manufacture of DVD discs in the USA next spring. The company's US subsidiary JVC Disc America will produce the discs at its Sacramento and Tuscaloosa plants. Sample production is to start in November. Initial production will be at the rate of 600,000 discs a month.

SGS Thomson has developed an anticopying chip for use in DVD players. It prevents prerecorded material being copied. While broadcasts could be recorded on a blank disc, copies would not be possible.

Thomson Multimedia has decided to join Sony and Philips in licensing its DVD patents.

Sonic Solutions has established the DVD Production Alliance, which IBM and Apple Computers have joined, to get the DVD-ROM market off the ground. The Alliance will use premastering systems developed by Sonic and Daikin Industries. These enable MPEG-2 video and sound encoding and authoring software to be handled, so that DVD-ROM based multimedia titles can be created.

Servicing Aid

US manufacturer Chemtronics has introduced a range of products designed for use where static build-up can cause component damage. The range includes Freez-lt Antistat, which rapidly lowers the temperature to -51°C. Tests have shown that it generates 90 per cent less static than many comparable products. For further information phone 01132 720 111.

MATV Filter-amplifier

Satellite Solutions (1 Hartburn Close, Crow Lane Industrial Park, Northampton NN3 9UE – phone 01604 787 888/fax 01604 787 999) has added to its range the Hirschmann CMU108 eight-channel MATV filter-amplifier. It could be a boon for MATV installations with the advent of Ch. 5. Each of the eight inputs can be separately tuned from ch. 21 to ch. 69, and the gain can be adjusted by 20dB per channel. A built-in meter makes level setting very quick. Almost any

input/output combination can be arranged and correctly filtered and balanced on site.



Internet on TV

Several Japanese setmakers have introduced TV receivers that also provide access to the Internet. They include Mitsubishi, Sanyo and Sony. Sanyo's 28in. widescreen model can produce split-screen displays, showing a TV programme and an Internet page simultaneously side by side. In addition to its WebTV set, Sony plans to launch a set-top box called the WebTV Internet Terminal for

use "with any TV". It will incorporate a 33-6kbits/sec modem and Web-filtering software to prevent unsuitable material being seen by child viewers.

The BBC is entering the Internet server field with BBC Online; which will provide BBC programme material and a general point of access. The aim is to create a service that's "easy to use and easy to enjoy". ICL and BBC

Worldwide are jointly developing the service.

Netscape, the company that markets Navigator – the world's most popular Internet browser – has formed a new company to develop consumer and non-PC devices for access to the Internet. Netscape is working on the project with a number of other companies, including Sony, Nintendo, NEC and IBM.

PINCH ROLLERS/VCR BELT KITS

Model	Price	Model Price	World Prince	THE RESERVE TO STATE OF THE PARTY.	
AKAI		FVHP20 1860	PINCH PALLER ASSESSED VIDART NO		Model Price
V\$10, V\$9300, V\$9500, VP7100, VP77	165p	FVHD140, 40, 55, FVHP1, 10, 25, 30, 40, 4000 FVHS10, 30 1350m	948D020010 HSE11, 12, 16, 17, 21, 22, 27, 31, 32, 41, 51,	VHR2700, 3330, MVR220 165p VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6010, 6500, 9100,	
VS1, VS2, VS3, VS4, VS VS12, VS15	5, VS6, VS8, VS9, 185a	PINCH ROLLER ASSEMBLY GOLDSTAR	52, 5300, 5424, 5600, HSB11, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120,	VTC9300, VTCM10, 20, 11, 21, 30, 31, 40, 50,	SLHF100, 150, 950, SLK85, 95, SLO1700, SLS550, SLT0, 30, 50 300p
VS105, 112, 115, 116, 12 126, 165, 165, 205, 220,	240. 244, 245,	GHV51, 1221, 1232, 1233, 1240, 1241, 1242, 1243, 1244, 1245, 1246,165p	150, HSM16, 170, 18, 190, 210, 23, 25, 250, 27, 30, 33, 34, 35, 36, 37, 370, 38, HSM380.	VPR5800 185p VHR3100.3300, 3310, 3400, 3500, 3700, 3800, VHRD500, 700 165p	ACU DEFL VIIO
VS247, 248, 250, 512, VSVSX9	1650	GHV1247, 1248, 1250, 1266, 1290, 1291, 1295, 1296, 1392, 1393,	40, 45, 450, 50, 84, 65, 955, 57, 58, 59, 60, 68, HSMS2, 9, HSMX1, 18, 19, 2, HSS11, 12, 14,	VTC3000 165p VHR120, 130, 74, 141, 143, 14, 150, 151, 153,	VP7100, VS\$300, VS\$500, V\$\$700, VS\$600
V\$201, 301, 303, 304, 60 V\$P82, VP58, VP82	165p	GHV1891, 1900, 2145, 3000, 3010, 4400, 4410, 51, 8000, 8200, GHV8210, 8215,	15, 17, 19, 21, 25, 5600, HVF125, HVF150, 303, 85, SV8900, 8930 165e	154, 15, 18, 171, 194, 22 0VHR23, 235, 240, 244, 250, 251, 274, 27	120p VS1, VS2, VS3, VS5, VS12, VS15, VP88100p
VS125, VS155, VS165, V VS512 VS22, 23, 25, 35, 37, 38,	1850	1291, GHVP1295, 1296, VCP4000, 4100, 4130,	HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330, HS360,	297, 310, 330, 335, 350, 390, VHR4100, 4105, 4150, 4200, 430, 4300, 4350, 4400, 474, 4770	VS10 85p VSX9, VS105, 112, 115, 116, 120, 125, 126,
426, 427, 482, 465, 467, V\$485, 765, 766, 767, 76		4200, 4300, 4301, 4305, VCP4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 4350,	HS306 HS307 HS318 HS310 HS327	\$080, VHR\$100, 5200, 5300, 5350, 5600, 5700, 6850, 7100, 7200, 7250, VHR7280, 7300	155, 165, 205, 220, VS24, 240, 244, 245, 247, 248, 250, 512, 515,
VSA77, VSA650. VSF10, 11, 12, 15, 180, 1		GSE1290, 1291, 1296, 1298, 1297, 1891, 1910, 20005, 2000 166p	H\$338, H\$347, H\$348, H\$400, H\$410, H\$411, H\$412, H\$421, H\$480, H\$710, H\$B	7400, 7440, 7500, 7520, 7530, 7540, 7700, 774, 780, 0VHR7810, 8000, 8070, 8100, 8200,	516 300p V\$22, V\$23, V\$25, V\$36, V\$37, V\$38, V\$63, V\$55, V\$66 80n
221, 222, 230, 240, 30, 3 VSF330, 4, 500, 550, VSI	3	HITACHI VT7, 17, 14, 16, 17, 18, 19, 33, 34, 36, 350, 38,	_10, HS820, 30, HSE 10, 20,	8250, 8500, 8800, VHRD4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700, VHR\$700165p	VS55, VS86 80p VS4, VS6, VS8, VS9 120p VSA77 140p
VSX400, 450, 470 VSF260, 261, 262, 265, 2	165p	39, 88, 330, 680, 4200, VT5000, 5030, 5500, 6500, 6800, 7000, 8000, 8300, 8500, 8700, 830, VT9500, 9700, 9900,	NATIONAL PANASONIC NV100, 180, 300, 330PX, 332, 333, 340, 366,	VCR100 165p VHR120, 135, 150, 190, 4150, 4160, 4350,	VSS99 106p
290, 340, 350, 410, 420, VSF441, 440, 450, 455, 4	43C	VM600 186p VT8, 52, 57, 61, 62, 83, 64, 66, 86, 86, 88, 100,	600, 688, 777, 788, 3321, AG6010, 8015, 6100, 6200, 6400, 6800,	5200, 5240, 5350, 7200, 7250, 7260, 7700, VHRD4410, 4610, 4710, 4890, 5450, VHRS700 9750	VCR40000 130p VCR5000, VCR5000 106p
560, 580, 590, 599, 600, VSG20, 21, 23, 24, 25, 30		110, 111, 113, 116, 118, VT120, 122, 125, 128, 130, 135, 138, 146, 150,	NV230, 250, 260, 280, 370, 380, 430, 431, 433	VHRS700 975p PTNCH ROLLER ASSEMBLY VHR3100, 3200, 3300, 3310, 3400, 3700,	VCR161, VCR222 100p VCR3000X, VCR4000, VCR4000X 75p
55, 60, 64, 65, 70, 73, 74, VSP110, VSX560, VSX56	90 165p	168, 170, 175, 220, 225. VT250, 265, 258, 280, 400, 405, 410, 413, 414,	450, 460, 485, 470, 480 NV630, 650, 730, 770, 780, 810, 830, 850, 870 890, 2000, 2010, 3000,	3800, VHRD500, 7000 1350p PINCH ROLLER ASSEMBLY	VCR7000, VCR7800, VCR8000, VCR8800110p VTV10 105p
VS17, 20, 22, 23, 24, 25, 55, VSA77	775p	415, 416, 418, 420, 425 VT428, 428, 430, 431, 435, 438, 450, 498, 510,	NV7000, 7200, 7800, 8050, 8150, 8170, 8200	SHARP	AMSTRAD TVR123, VCR4600, VCR4700,
PINCH ROLLER ASSEME VS422, 425, 426, 427, 46	BLY 12, 485, 467, 485, 498,	515, 517, 518, 520, 525, VT526, 530, 535, 536, 540, 545, 546, 548, 570,	NV8610 8620 NVG11 14 16 NVG2 10 12	VC200, 381, 383, 384, 385, 386, 388, 390, 393, 800, 2300, 3300, 6000, VC6200, 6300, 7300, 7700, 7750, 7800, 8300,	VCR5200 110p VCR7000 80p
765, 766, 767, 768, 865, 867, 965, 987, VSA680, V 180, 190, 200, 210, 220,	/SF10, 11, 12, 14, 15,	575, 576, 580, 585, 588 VT640, 830, VTF660, 665, 70, 770, 774, 776,	AG 1000, 1050, 1200, 1500, 2100, 2200, 6500, 6810, 7500, 7510,	838, 9100, 9300, 9400. VC9500, 9600, 9700, 9800 1865p	VCR1000, 2000, 6000, 6100, 6200, 8600, 8602, 8603, 8604,
221, 222, 230, 240, 30, 30 330, 4, 500, 510, 600,	00, 301, 310, 320, 33,	780, 785, 880, 881, 865, VTL30, 1000, 2000, VTLC50, VTM598, 620,	NVH70 166p NVG9, NVG120 166p	VC300, 387, 402, 471, 473, 477, 481, 482, 483, 466, 488, 496, 500, 571,	VCR8700, 8704, 8714, 8800, 8804, 9000, 9005, 9244, 9340,
VSR110, VSX100, 400, 4 PINCH ROLLER ASSEME	50,470 800p	622, 625, 626, 630, 635 VTM636, 640, 645, 646, 720, 722, 726, 726,	AG8840, 6720, 7150, 7330, 7350, 7355, 7650, NVH85, 75, NVJ30,NVL20, 23, 25,	573, 581, 582, 583, 584, 585, 8481, VC5F3, VC5W20E, VCA1031 1850	DD8900, DD8904, TVR4 110p TX3650, UF20, 22 24, VCR3000, 3002, 4000,
VSS99	166p	727, 728, 730, 731, 735, VTM736, 740, 745, 746, 748, 763, 754, 820,	28, NVG300, NVF65, NVF70, NVFS1 NVFS 100, NVG 19, 20, 25, 33, 40, 50,	VC108, 206, 405, 408, 550, 600, 651, 671, 674, 681, 682, 684, 685, 693.	9500 75p VS1004 105p
VCR3000X, VCR4000 VCR6000, VCR6000	165p 165p	821, 822, 825, 830, 831, VTM835, 838, 840, 841, 845, 920, 921, 922, 925, 930, 931, 935,	NVV8000 185p NVD48, NVD80, NVG21 NVG45 165p	VC599, 700, 772, 750, 779, 780, 781, 7610, 782, 782MK2, 7822, 783,	REAUPUNKT RTV100 200p
VCR161, VCR222 VCR7000, VCR7800, VCR	180n	925, 930, 931, 938, VT\$80, 85, 890, 895VM200, 2300, 2380, 3200, 3280, 500, VM\$7200 165e	NVJ700PX 168p NVHD100, NVHD101, NCHD90, NVSD30, NVSD40	VC785, 786, 787, 793, 800, 7810, 7822, VCT72, VC8F3, VC6V3, VCA 100, 102, 104.	RTV200, RTV222, RTV224 90p RTV202, RTX200 160p
VCR8800 VTV10	165p	VT3000 186p VT410, 420, 428, 430, 450, 498, 618, 520, 522,	PINCH ROLLER ASSEMBLY AG5150 8250 5700 8234 NVD29 49 90	131, 140, 170, 202, 203, 211, 234, 303, 501, 502, VCA502, 5011, VCD801, 802, 851, 852,	RTV322, RTV248 100p RTV306, 307, 309, 310, 311, 312, 328, 414,
AMSTRAD VCR1000, 2000, 4500, 46		530, VTF770, 780, VTM598, 622, 722, 740, 748, 753 650e	AG5150, 5250, 5700, 8024, NVD38, 48, 80, NVFS5, 65, 70, 75, 77, NVFS1, 100, 200, 88, 90, NVG 19, 20, 21, 22,	881, 882, VCM73, VCT73, VCT72, VCB361 165p VC220 185p	434, 444, 707 RTV211, RTV214 140p
6100, 6200, 8600, VCR8602, 8603, 8604, 87		PINCH ROLLER ASSEMBLY VTF150, 155, 180, 185, 250, 258, 260, 265,	25, 28, 300, 33, 40, 45, 46, NVG50, NVH65, 75, 77, NVJ30, 33, 35, 37, 40,	VCA10, 30G, 60, 103, 105, 106 111 113 131	RTV324, RTV32565p RTV315, RTV316, RTV319, RTV320, RTV317
8804, 9000, 9005, VCR9244, 9340, DD8900,		280, 286, 350, 351, 355, VTF380, 385, VTM140, 141, 146, 145, 210,	42, 45, 47, NVL20, 23, 25, 28, NVW 1 380p	VCA37, 39, 40, 42, 454, 46, 47, 48, 50, 505, 61, 52, 53, 54, 55, 67, 58, 506,	RTV301, RTV333, RTV338, RTV404,
TVR1, 2, 3, 4 VCR7000	165p	211, 212, 215, 220, 221, VTM230, 231, 235, 284, VTS390 165p	PINCH ROLLER ASSEMBLY N.E.C.	VCA60, 605, 615, 62, 63, 67, 68, 1031, 11613, VCB311, 320, VCBS97, VCD805, 806, 810,	FERGUSON
DD8900, 0D8904, VCR60 8600, 8602, 8603, 8604,		HINARI V20H, VXLS, VXL6, VXL7, 8, 9, 10, 11, 19, 90.	N830, 831, 832, 833, 895 165p PVC2300, 2400, 740, 744, 746, 760, 764,	815, VCH80, 81, 865, 910, VCS 1000, VCT310, VCT410, 610, VCT 1314, 5313, VC790 165p	3292, 3V00, 3V01, 3V16, 3V22, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922 120e
VCR8700, 8800, 900>9, 9 9340	700p	H13V, VTV100, 200 165p VXL2, VXL3 165p	766 165p DX1000, 1600, 1800, 2000, 3000, N9012.	VC780, 790, VCA10, 103, 1031, 106, 106, 211, 244, 254, 255, 30, 35,	8908, 8909, 8912, 8922 120p 3V23, 8923, 8924, 8929 66p 3V29, 3V30, 8930, 8931, 8933,
PINCH ROLLER ASSEMB		VXL4, VXL20, VXL35 VTV100, VXL10, VXL11, VLX9,	9013, 9014, 9016, 9033 N9034, 9063, 9064, 9055, 9066, 9066, 9096,	VCA340, 43, 47, 50, 60, 605, 615, VCD806, 815, VCH80, 81, 83, 85.	8940 75p 3V31, 3V32, 8941, 8942 75p
TX3650, UF20, VCR3000, VCR9500 PINCH ROLLER ASSEMB	300a	VXL90 700p PINCH ROLLER ASSEMBLY	9110, 9120, 9510, 9520, N9530, 9610, PX 1200 165p	VCH865, 87, 910, VCS 1000, VCT212, 310, 410, 510, 610, VCT1314,	3V35, 3V36, 3V38, 3V39, 3V49, 8943, 8944 75p
2564966 DD9900. 9904, TX3650, L		V20H, VXL5, VXL6 MOD KIT 275p J.V.C.	DS6000G, DX4000, N9077 NS7000 165p	PINCH ROLLER ASSEMBLY 525p	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57,
VCR3000, 3002, 9500 VS1004 VS1104	165p 165p	HR2200, 3300, 3330, 3360, 3660, 4100, 7700 165p	ORION VH1, VH2 165p	9AJ9HO VHL3, VR1000, 2000, 2500, 3200, 3300, 3500,	8945, 8947, 8948 55p 3V58, 3V43, 3V44, 3V59, 3V64, 3V55, 8950,
FERGUSON 3V00, 3V01, 3V16, 3V22, ;		HR2650, 7200, 7300, 7350, 7600, 7610, 7650, 7655	VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312,	3600, 3650, 3800, VRS4400, VRS5000 166p VR3400 180p	8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26, FV32, FV39, VC1411, 55p
8900, 8901, 8902, 8903, 8 6912, 8922, 8923, 8924, 8	904, 8906, 8909	HRD110, 111, 120, 121, 140, 141, 142, 143, 150, 152, 156, 157, 158, HRD160, 220, 225, 250, 267, 445, 455, 565,	VH404, 555, 700, 704, 712, 770, 780, 844, 900, 1000, 2948, 3030, 3312 VHF2A, VP2948	SAMSUNG SV718, 717, VB510, 520, 610, 616, 617, 619,	FV31R 110p FV61L, FV62, FV67, FV68, FV70, FV71, FV72
3V29, 3V30, 3V31, 3V32, 3 8933, 8940, 8941, 8942	3V52, 8930, 8931, 186p	566, 725, 755, HRP50, 6P5000, BR7000, BRS611, 811 165p	VHF2A, VP2948 16Bp COMB 15000, 18000, HV03, LVH50, NEVH, NEVHM, NEVHML,	820, 628, 827, 629, 900, V910, V1510, 520, 611, 616, 821, 626, 900,	FV74, FV77 80p FV43H, FV44L, FV46T, FV57H 100p FV37H 80p
3V35, 3V36, 3V38, 3V39, 3 3V45, 3V48, 3V49, 3V53, 3	3V42, 3V43, 3V44,	HRD520, 540, 550, 580, 580, 600, 610, 620, 637, 540, 641, 650, 660,	TVP230RC, VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 418, 512,	910, VX610, 520, 616, VX617, 619, 826, 827, 829 165p	3V52 65p
3V57, 3V58, 3V59, 3V65, I FV14, 8943, 8944, 8945, 8	FV10, FVII, FV12, 947, 8948 165p	HRD670, 720, 730, 740, 770, 820, 830, 840, 860, 870, 880, 910, 960,	VH530, 532, 535, 536, 600, 630, 635, 640, 686, 730, 735, 744, 774, 790	SVX301, 303, 305, 307, 319, 322, VB710, 713, 750, 770, 971, 8220, VB8225, V1710, 730, 750, 770, 790, 8220, 8225, \$70, VX710, 712,	FV41R, FV42L 100p FIDELITY HQS200, VCR1000, 2000, 600, 6000,
3V52 8950, 8951, FV10B, 11R, 1	165p	HRD980, HRDX20, 22, 25, HRJ200, 205, 210, 215, 300, 315, 316, 318	VH800, 820, 850, 888, 893, 900, 930, 940, 942, 974, 1012, 1040, 1050.	770, 750, 8220, 8225, 970, VX710, 712, VX720, 730, 750, 770, 790, 825, 8225, 970, 971, 972, 8220, PX980, 981, 982, SE9000,	6100 180p VCR100 180p
22L, 26D, 31R, 32L,FV33H 50B, 51R, 52L, VC 141L	165p	HRJ400, 405, 407, 410, 411, 416, 416, 507, 600, 605, 610, 615, 718, 815	VH1060, 1070, VH1100, 1120, 1204, 1440, 1500, 1660, 1800, 2004,	9001, SX7120, 7121, 7220, 7221, 7230, SX7301, VK8220,	VTR1000, VTR1001 100p TX3650, VCR3000, VCR3002,
FV37H, FV44L FV46T, FV FV57H	165p	HRJ97, HRS4700, 5800, 5900, 6800, 6900, SR3200, 330, 368 165p	VH2151, 2308, 22042400, 2500, 2600, 2700, VH2960, 2970, 3050,	VPX31 185p VX9880 165p	VCR9500 75p
3V35, 3V36, 3V38, 3V38, 3 8944 PINCH ROLLER ASSEMB	1100p	HRD170, 171, 180, 210, 211, 217, 230, 300, 320, 321, 330, 337, 350,	VH3080, 4000, 4008, 4010, 4012, 4015, 4015, 4020, 4300, 5020,	PX31 H. 32R, PXR30, SV80, SX3230, 3231, 3260, 3261, VS390, VX30, 31, 32, 3560, 3561	VBS7000 245p VBS9000 120p
3V42, 3V43, 3V44, 3V45, 3 3V55, 3V56, 3V57, 8945, 8	3V48, 3V53, 3V54	HRD370, 400, 430, 440, 441, 470, 500, 530, 700, 750, 950, 950, 950, 950, 950, 950, 950, 9	VP 10, 200, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2967, 2966, 2979, 2980, VTV300,	370, 375, 380, VXK300, 301, 306, 307, 320, VXK321, 326, 330, 331, 336, 337, 350, 351,	FVHP520, FVHP530, FVHP420 60p FVHP615, 618, 820, 622, 710, 711, 715, 720,
PINCH ROLLER ASSEMBI FV37, FV57, FV58	LY 350p	HRS5000, 5500, 8000, 9000, BR7030, 7040, 9060, BRS600, 805, 747, 777, 920, 925 188p	VXL20, 25, 30 165p	356 PX990, 991, 992, S11230, 1240, SVX4000,	721, 722, 725, 730, FVHP830, 840 75p
PINCH ROLLER ASSEMBLE FV31R	LY 165p	BRS600, 805, 747, 777, 920, 925 188p HRS10 1895000, HRD110, 111, 120, 220, 225,	VR6460 VR6920 165p VR2020, VR2021, VR2022, VR2023,	503, 504, 600, SX1230, SX1231, 1260, 1261, 1566, V11560, VPK43,	FVHP905, 906, 907, 908, 910, 911, 915, 916, 918
FV41L, FV42L PINCH ROLLER ASSEMBI	925p	PINCH ROLLER ASSEMBLY	VR2024 165p VR6711 165p VR8540 165p	VX1230, 1260, 1261, VX1560, 1561, 1850 186p	VBR330, VBS7500, VBS7600, VBS9900 100p VBS3500 76p
3V58, 3V59, 3V64, 3V65, F 20, 21, 22, 26, 30, 32, 33		HRD140, 141, 142, 143, 150, 152, 157, 168, 160, 565, 566, 725, 766,	VR6540 166p DV856, 586, VR702, 703, 6485, 6585, 6589, 6785, 6880, 6948 165p	SUCS. 6, 7, SL3000, 8000, 8080, 8200, SLJ 10,	FVHD140, FVHD40, FVHD55, FVHP1, FVHP10,
PINCH ROLLER ASSEMBLE		PINCH ROLLER ASSEMBLY	VR445, VR8442, VR8643, VR8843, VR8943, 44SB9 1860	SLT6ME, SLT7ME 165p SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 35, 60, 100,	FVHP20 110p FVHD230, 250, 270, 370, FVHP1100, 1200, 1250, 130, 132,
FV43H, FV44L, FV45X, FV PINCH ROLLER ASSEMBL FV61, FV62, FV67, FV68, F	Y	HRD1520, 510, 520, 521, 522, 526, 527, 580, 600, 610, 620, 637, 641,	DV464, 662, VR2220, 2300, 2324, 2330, 2334, 2340, 2350, 2414, VR2480, 2485, 2486, 2489,	20, 25, 30, 35, 60, 100, SLF200, SLF60PS, SLF90E, SLFH150, 850, SLK88, 95, SLT20ME, SLT30ME,	FVHP1340, 1400, 1410, 1440, 1500, 2000, 200, 210, 250, 3, 300,
FV74, FV77 PINCH ROLLER ASSEMBLE	775p	HRD650, 720, 830, 840, 910, HRJ205, HRS5800 350p PINCH ROLLER ASSEMBLY	2490, 2498, 2840, 6462, 6463, 6464, 6560, VR6660, 6860, 6861, 6862, 6863 165p	SLT50ME 185p 1	310, 320, 2000, 410, 420, 430, 440, 445, 470, 475, FVSD2905 85p
FISHER FVHP420, 520, 530		BR7030, BRS500, HR0180, 170, 171, 180, 190, 210, 211, 217, 227,	N-1700, VR2870 165p VR2025, VR6580, VR6581 165p	SLV201, 202, 301, 302, 401, 402, 801, 802 165p	FVHP5000, 5005, 5050, 5075, 5100, 975, 980, 980 96p
FVHP615, 618, 820, 822, 7 720, 721, 722, 725, 730,	165p 10, 711, 715, 716.	HRD230, 271, 300, 310, 320, 321, 330, 337, 350, 400, 430, 440, 441,	495B6, VR3260, 5349, 6448, 6449, 6548, 6648 165p	SLV210, 270, 273, 275, 300, 353, 373, 410, 415, 474, 656, 715,	G.E.C. 4005 150p
FVHP810, 830, 840 FVHP805, 908, 907, 908, 9	168p	HRD470, 500, 530, 700, 750, 950, HRS5000, 5500, 9000 678p	PRESSURE ROLLER ASSEMBLY PS403-	SLV757, 777 165p SLV255 165p	V4004 100p V4007 50p
918, 970, 975, 980, 990, FV 5050, 5075, 5100	/HP 5000, 5005.	PINCH ROLLER ASSEMBLY HRD540, HRD550, HRD580, HRD660,	DV186, 190, VR211, 2115, 212, 213, 223, 286, 291, 292, 311, 312, 313, VR3210, 3219, 322, 3229, 323, 5358O, 486,	SLV275, 282, 315, 325, 353, 363, 373, 410, 415, 418, 474, 625, 656, SLV715, 725, 727,	GOLDSTAR GHV1221, 1232, 1233, 1240, 1241, 1242,
VBR330, VBS3500, 7000, 7 9000, 9900	7100, 7500, 7600, 165n	PINCH ROLLER ASSEMBLY	471, 562, 582, 571, 761, VR201, 202, VR203, 302, 303, 305, 6180,	757, 777, 815, 825, SLVX30, 50, 55 165p SLV125, 213, 225, 252, 255, 262, SLVXI,	1243, 1244, 1245, GHV1246, 1247, 1248, 1250, 1266, 51, 8000,
FVHD230, 250, 270, 370, 2 250, 300, 310, 1100,	0000, FVHP3, 210.	HRJ600, HRJ605, HRJ815, HRS9200 876p	6182, 6185, 6285, 6290, VR8291, 6293, 6362, 6367, 6390, 6391, 6393.	20, 3 186p SLV215, 216EE, 275, 282, 315, 325, 363, 363EF 373 383 430 416	8200, 8210, 8215, VCP4100, VCP4130 80p
FVHP1200, 1250, 130, 132, 1410, 1440, 1500, 200,		MAYSUR VX6000, 730, 735, 750, 755, 765, 800, 850.	8467, 6468, 6470, 6561 VR6570, 6581VR6670, 6676, 6710, 6760,	3636E, 373, 393, 410, 415, SLV416EE, 474, 494EE, 555UC, 559, 575UC, 579, 585HF, 595HF, SLV60W, 615, 625, 656.	GHV1290, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301, 4301, 4301, 4301, 4301
FVHP320410, 420, 430, 440 FVSP290S, 495, 2905	186p	VS888 VX1000, VX2000, VX2500, VX3000,	6761, 6762, 6870, 6970, VR6975, 8681, 63587, 68584, 71584, 71585,	676UC, 686HF, 896HF, 715, 725, 727, 757, SLV767B, 777, 815, 825, SLVE7, 8,	VCP4305, 4306, 4310, 4311, 4315, 4320, 4321, 4325, 4326 120p
FVHD140, FVHD40, FVHD5	oo, FVHP1, FVHP10.	VX6000A 180p MITSUBISHI	72SB8, 72S88, 92SB31, 20DV1, 20DV2, 20RW7, 21DV1, 21DV2, 2SB01, 2SB02,	9SLVX30AS, SLVX35AF, SLVX50AS, SLVX65DH,	GRANADA VHSH1, VHSAH3 100p
SEE PAGE 0	OO FÓR	HS12, 5300. 5424, 5600, HS811, 12, 16, 21, 27, 31, 32, 41, 51, 52, 82,	25811, 25812, 300V2, 31DVI, 310V2, 31DV335802, 35803,	SLVX658R, SVO140, 160 1250p PINCH ROLLER ASSEMBLY PART NO:	VHSVH4, VHSWH1, VH\$XH1 60p VHSYH2 50p
THE RESIDENCE OF THE PARTY OF T		HSE12, 16, 17, 21, 22, 27, 31, 32, 41, 51, 52, 82, HSM1000, 110, 120, 15	35805 35811 35812 35813 300p VR231, 232, 332, 422, 4229, 512, 5229, 722,	X37277701 SLV210, 212, 270, 273, 275, 285, 300, 310,	VHSBH1, VHSCH 1 150p VHSBP1 135p VHSAN3 110p
MORE GRAI		0, 16, 170, 190, 210, 23, 25, 250, 27, 33, 34, 35, 36, 37, 370, 380, 45, 450, 5	7229, 723 165p VR501 PR38 166p	335, 425, 427 PINCH ROLLER ASSEMBLY	VHSAN3 110p VHSOS2 125p VHSAY3 125p
BARGAI	NS	4, 55, 555, 57, 58, 59, 68, HSMS2, 9, HSS11, 14, 15, 17, 19, 26, 5800, HV	SANYO VHR1100, 1110, 1150, 1200, 1300, 1500,	\$V6700.8750, 9700, VHR3100, 3200, 3300, 3310, 3400, 3700, 3800, VHRD500, 7001350p	VHSBY3 100p VHSEY1, VHSEY2 70p
		F125, 150, 303, 85, SV8900, 8930 B50p	2100, 2300, 2370, 2500,	PINCH ROLLER ASSEMBLY	VHSCC1 100p
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VCR BELT KITS/VIDEO LAMPS & SWITCHES

	VCK	RF
Model	Price	Mode
GRANADA VHSDP1, VHSFV2	80p	323, 535. VF 21DV2, 21D
VHSDP1, VHSFV2 VHSTJ1, VHSTJ2 VHSTJ3	80p 150p 65p	303, 305, 31 35812, 358
VHSWJ1, VHSWJ2 VHSXJ3 VHSYJ2	120p 35p 80p	35803, 635 VR86582, 9
VHSFJ2	140p 130p	6285, 6290V VR6380, 639
WHSFG1, VHSFG2, VHSFG3,	180p	6570, 6581, 6762, 6870, 92\$83
GRUNDIG 1675400, 440, V\$400, 410, 416 450, 456, 460	5, 435, 440, 441,	VR445B9, V 6843, 6843.
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400, 4001, 594002, 400, 401, 4010, 402, 206, 407, 4092, 410, GV411, 4 416, 417, 4192, 4200, 420, 430 GV437, 440, 450, 4592, 460, 4 501, 5050, 5095,	12, 414, 415, , 434, 435,	5, 4469, 447 512, 522, 52
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#2.V.C. HR3300, HR3330, HR3360, HR		21, 30, 31, 1 VTC5300, V VPR5800
HR4100 HR7200, HR7300	130p 70p	VTC5500
HR7350, HR7600, HR7610, HR HR7655 HR7700	75p 75p	VTC1100, 1 1200, 1300
HRD110, 111, 120, 121, 220, 2	225,	VTC1100, 1 1200, 1300 VHR1500, 1 VHR2100, 1
HRD140, 141, 143, 150, 152, 199, 250, 257, 310, HRD455, 5755, HRP50	157, 158. 160, 565, 566, 725, 55p	VHR2700 VHR3100,: 3500, 3700
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WV777, NV788 WV2900, NV2010, NV3000	100p 100p	SONY SLC6, SLJ
9,9800, NV8610, NV862	145p 33, 450, 460, 465	SLCS, SLC SLCS, SLE
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MASSO, NV850, NV480, NV6	30, NV /80.	TOSHIBA
9, 10, 11, 12, 14, 15,	50p	V33, V31, V9680
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92SE	13					850	9
6843	1589, \ , 6843	/R4458 VR684	920, VF 13 18, 6445	445892	12, VR6	443, 1 00 p	H
49SE	1620, 6	448695 VKR685	5, 49SB	6	1	10p 70p	V
VR50	900.1	VKR681	n VKR	8820		10p	A
SE41 237,	23, 24 2479	1, 2410	310, 23 , 2419, 2, 256, 7, 339,	19, 231, 242, 24: 257, 25:	232, 23 3, 245, 3	2469,	E
332. 3469	3329. . 347.	333, 33 3479, 3	7, 339 , 5, 1, 36 2, 4229	3419, 3- 2. 357,	42, 343 356, 42	2,	F
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		747, 83	79, 642 89, 948	9489	22, 122	70p	5
VR20 VR30	000, VI	HL3 200, 331	00, 3500	3600.	3650.	90p	1
VRS-	4400, 1 400	5000				76p 100p	F
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W						85p	-
629, VX5	V1510), 520. \ 1, 520.	V1611, (VT320,	516, 621 5600	. 626.	100р	1
VB9	00, VB 80, 98	910, V1 1, 982,	916, 611, (V1611, (VT320, V1900, V1 SE9001, V70, 82, 20, VPX	1910 , SV900	1, SVX	1 10p 307,	1
V17	10. 730	0. 760. 1	\$E9000, , \$X730 970, VX	710, 71	2, 720,	730.	1
VX9		172				100p 110p 95p	1
SAF VIC	OYN	5150 6	000, 65	00 VTC	M10.1	200	:
21, 3	30, 31,	50	50, VTC			75p	1
VTC	5800 5500					80p 70p	
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			150, 33 VHRD!		0, 3400	100p	1
154, 244,	15, 16, 250,	3, 171, 251, 27	141, 14 VHR19 4, 297, 1 4150, 41 080, 510	4, 220, 2 310, 330	23, 235 VHR3	240. 35.	1
390, 474,	4100, VHR4	4105, 4770, 50	4150, 41 080, 510	200, 430 0, 5200	, 4300. , 5300.	4350, 5350, 7300	
740	0, 750 0, 774	7520 7800	VHR72 , 7530, 7810, 8	7530, VI	HR7540),	
			800, 88 04610,				
VM	D66, V 11000 26010	MD68F				70p 75p	
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VC	5F3, V 108, 40	C8581 95, 498,	550, 60			80p	
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787	, 793, 104,	800,VC 131, 14	VC6F3. 779, 78 7810, 7 0, 170, 111, VC6 2, 882, 1	822, VC 202, 03 ,	A100, 1 VCA2	102, 34,	
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81.	85, 86	5. 910,	VC5100	10.		5312,	
	, VC79	AUE I	_			80p	
SLO	6, SL	J10, SL	T6ME	. SLT7	ME	140p	10
SU	39, \$L 3000E,	8000, S SL808	L8080, OE, SL8	SLT50 200, SL	8600	186p	
20.	3		3, 225, 3	262. SL	/X1,	_95p	
V5	\$HIB. 5, V57 3, V31,		'51, V52	. V53. V	9600	85p	-
V94	80 1. V63	V65. V	66, V67	,		85; 150;	
85,	808, C	V80D,	V71,73	. 74. 75.		80;	
21°	. 220,), 711,	221, 41 880	120, 136 1,V421	, 609, 6	10, 611	659. 1205	
V9 V2	1 G, V 12. 21:	95G	3i2, 32			115; 3. 610,	,
703	9. 813 PB1E					50p	

VIDEO	LAM	PS	& 5
Model	Price	Mo	del
Models & Desc	ription	Order	Price
UNIVERSAL VIDI		VL01	25p
PANASONIC VID	TOTAL TROUBLE	VL02	30p
SHARP VIDEO LA		VL02	30p
HITACHI 5381682 VIDEO LAMPS	The same of the same of		135p
AIWA, AKAI, ALE BLAUPUNKT, FE FIDELITY FISHEF FUNAI, G.E.C., G GRANADA, GRU HITACHI, ITT, JV SERIES), MATSU NEC, ORION, NA PHILIPS, SAISHO SAMSUNG, SAN SIEMEN, SONY,	RGUSON, R, FUJITSU, OLDSTAR, NDIG, HINAR C (HRD JI, MITSUBISI TIONAL, O, SALORA, IYO, SHARP,	il, HI,	100р
THOMSON, TOSI AKAI, GRANADA HITACHI (VT3001 VRP3833), JVC (I 3330, 3660), MIT (HS200), TELEFL 519, 610), THOM 305, 306, 3301), (3V00, 16, 22, 24 8901, 8902, 8903 8922, 8925)	HIBA A (VHSTJ2), 'V D), ITT (VR391 HR2200, 3300 SUBISHI JINKEN (VR51 SON (VK300, FERGUSON , 3292, 8900,	VL01 2,	25p
BLAUPUNKT,OF NATIONAL (NV2 7000, 8150, 8200 8610, 8620), SH/ 6000, 6200, 6300 8300)	200,2010, 3000 0,8400,8600, ARP (VC2300	0,	30p
AKA! IVS10), GR. (VHSXJ3), TT (V JVC (HR2650, 7 7655), TELEFUN 535, 539, 550, 63 THOMSON (V30 VK309, 411, TX8 FERGUSON (3V	R3993,3994), 600, 7610, 769 KEN (VR530, 30, 650), 99, 316, 357, 000),		40p
AUTHENTIC (NE (VR8300),GRAN WJ1, WJ3), ITT 3963) JVC (HT7: 7700) TELEFUN 520, 529, 540, 5- 1920), THOMSO VK308, 309, 312 FERGUSON (3V 8924, 8929, 893	ADA (VHSTJ: (VR3913, 3914) 200. 7300, 73000, 73000, 73000, 73000, 73000, 73000, 73000000, 73000, 73000, 73000000, 730000000000	3, 4, 50, 920,	40p
(VC200, 381, 38 390, 393, 9300,	4 , 3 85, 3 86, 38		#3h
D	ANASON	uc	

PANASONIC MODE SWITCHES

	NV2000, 2010, 7000, 7200, 7800 (VS500	148)
35p	NV230, 260, 430, 810, 870, 2300, 4300	£3.50
, 83. 80p	(VSS0110)	£2.25
, 210,	NV830 (VSS0091)	£2.10
. 659. 120p	NV300, 333, 340, 366, 688, 777, 778	
115p 3, 610,	(VSS0060	£3.75
50p	NVG21, 25, NVH65, NVD80 (VSS0175A	£2.00

VVIIC	TILO	
Price	Model	Price
	ON/OFF MAIN	
	SWITCHES	
GRUNDIG	20702 20502	1
PART NO: USED ON:	29703, 29102 C7500,C7500TT,C850	10 C9E02
USED ON:	C8712,C8714,C8894,I	0.0200000000000000000000000000000000000
	M68-190/99,M70-195	
	ST66-1602,T55-340,V	
PRICE:	140p	
MATSUI/SAI		
USED ON:	MATSUI-2190, SAISI	HO-
0000 0	PST21 30TX	
PRICE:	140p	
PHILIPS		
USED ON:	K30, K35, K40, KT3, I	KT4
PRICE:	£0.95	
SONY		
PART NO:	(POWER SWITCH + I	REMOTE
	SWITCH)	
USED ON:	KV1612, MK1, KV16	12, MK2,
	KV1614, KV2052, KV	
	KV2062, KV2068, KV	2212,
	KV2216, KV2252, KV	
	KV2704 KV2705,KV2	
	KV2752PE3, KX20PS	51,
	KX20PS2, KX27PS1	
PRICE:	1.50p (POWER SWITCH +	DEMOTE
PART NO:	SWITCH SWITCH +	VEINIOLE
USED ON:	KV2022, KV2024	
PRICE:	200p	
PART NO:	(POWER SWITCH 26	imm)
USED ON-	KV1400, KV1440, KV	2040,
	KV2060	
PRICE:	125p	
PART NO:	(POWER SWITCH 21	mm+
	REMOTE SWITCH)	
USED ON:	KV2020	
PRICE £2.00	A RIN /FLINCTION C	MITCH
PART NO: USED ON:	2 PIN (FUNCTION S' KV1612, MKK, V161	
OSED ON:	KV2052, KV2056, KV	
	KV2215, KV2216, KV	
	KV2256, KV2704, KV	
	KV2706, KV275PE3,	
TO LOCAL DESIGNATION OF THE PARTY OF THE PAR	KV2756PE3	35p
REPLA	CEMENT IDLER TY	RES
AKAI M13277		IT01
	M7366960.12	ITO2

REPLAC	EMENT IDLER TYPE	RES
AKAI M132773	M32773	IT01
	MZ366960J2	IT02
GOLDSTAR	VXP0521	IT17
HITACHI	6861471	IT03
	6861482	IT04
	6886971	1 T 05
JVC/	PU 48967B	IT06
FERGUSON	PU 51380	IT07
	PU 51402A	IT08
	PU 55373	IT09
	PU 55374	IT10
NATIONAL	VXP 0329	IT11
PANASONIC	VXP 0343	IT12
	VXP 0344	IT13
	VXP 0401	IT14
	VXP 0433	1T15
	VXP 0463	IT16
*	VXP 0521	IT17
	VXP 0581	IT18
SANYO	1430662T15620	IT19
SHARP	NIDL005GEZZ	IT20
	NIDL0006GEZZ	IT21
	NPLY0107GEZZ	IT22
PRICE		

16p EACH FOR A PACK OF 5 FOR EACH MODEL 13p EACH FOR A PACK OF 10 FOR EACH MODEL

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VIDEO SERVICE KITS		VIDEO SERVIC	E KITS (Cont	.)	VIDEO SERVIC	E KITS (Cont.)
AMSTRAD VCR700		VT11/VT33 Contents	Economy Kit Contents		SHARP VC381	
Contents BELT SET. PINCH ROLLER. REEL IGLER. VIGEO LAMP Order Code: SK41	£5.50	BELT SET, T/UP REEL TABLE TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER. FF/REW	BELT SET, PINCH ROLLER. FF/REW IOLER TYRE, T/UP I TABLE TYRE, SUPPLY REEL	REEL	Contents BELT SET, PINCH ROLLER. REEL IDLER, TENSION BAND.	Economy Kit Contents BELT SET. PINCH ROLLER REEL IDLER TYRE
FERGUSON & JVC 3V42/43		IDLER. CLUTCH PLATE. TENSION BAND	TABLE TYRE		VIDEO LAMP Order Code: SK47 £8.00	ORDER CODE: SK48 £3.25
HRD455/HRD725		Order Code: SK45 £13.00 VT52/61/62/63/64/65/85/86/640	ORDER CODE: SK46	£3.75	VC500/VC571/VC581/VC582/VC583/VC Contents	
BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BANO BELT SET, PINCH ROLLER SUPPLY CLUTCH, TAKE UP CLUTCH		Contents BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE TENSION BAND	Economy Kit Contents BELT SET, PINCH ROLLER FF/REW IDLER		BELT SET. PINCH ROLLER. REEL IDLER. TENSION BAND	Economy Kit Coments BELT SET. PINCH ROLLER REEL IDLER ORDER CODE: SK61 £5.00
Order Code: SK37 £16.00 ORDER CODE: SK38	£9.00		ORDER CODE: SK50	£3.00	VC781/VC7810/VC7822/VC785/VC786/V VCA100/VCA102/VCA104/VCA202	/C793/VC800/
3V58/59/64/65 HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000		VT400/405/410/13/14/15/18/420/25/26/ 510/520/25/26/530/35/36/540/545/46/4			Contests	Economy Kit Contents BELT SET. PINCH ROLLER
Contents BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND Order Code: SK44	£7.00	Contents TIMING BELT. PINCH ROLLER. FF/RE TENSION BAND Order Code: \$K52	W ARM. CLUTCH BASE.		REEL DRIVE UNIT, TENSION BAND	REEL DRIVE UNIT TYRE ORDER CODE: SK65 £3.75
3V29/3V30 HR7200/7300/7350 Contents		VT100/110/111/113/115/118/120/125/1 175/220/225/250/255/258/260/VTL30	28/130/135/138/145/150/	£9.75		599/VC5F3/VC700 Economy Kit Contents BELT SET. PINCH ROLLER
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SK05	~	Coments BELT SET. PINCH ROLLER, FF/REW A	RM. CLUTCH PLATE.		BAND	REEL ORIVE UNIT TYRE
3V35/36, 38/39/49	£5.00	TENSION BAND Order Code: SK51		£14.00		ORDER COOE: SK63 £5.00
HRD110/111/120/225 Contents		PANASONIC			FOR MORE DETAIL	
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SKO4	£5.00	NV2000/NV2010 Cantents	NV7000/NV7200/NV7800 Contents		PLEASE R	DODGE TO THE REST OF
3V31/3V42		BELT SET. PINCH ROLLER. TENSION BAND, IDLER TYRES	BELT SET, PINCH ROLLER, TENSION BAND, JOLER TYR		0.40///	ATTENNE
HR7600/7610/7650/7655 Contents Economy Kit Contents			ORDER CODE: SK02	£5.00	BACKUP B	
BELT SET, T/U REEL TABLE TYRE PINCH ROLLER, REEL TYRE PINCH ROLLER, REEL TYRE PINCH ROLLER, REEL		NV300/NV330/NV333/NV340/NV366 Contents REIT SET PINCH BOLLED TENELON	DAND IOLSO TOS		REPLACEMENT PHILIPS NI-C Replaces Ferguson Part No:	
IDLER. T/U CLUTCH. T/U IDLER. IOLER TYRE. T/U IDLER TYRE TENSION BAND. VIDEO LAMP T/U CLUTCH		BELT SET. PINCH ROLLER, TENSION Order Code: SKOT	BAND. IOLER TYRE	£5.00	00E6-067-00], used on TX10, L2 Replaces Philips Part Nos:	
Order Code: SK33 £11.00 OROER CODE: SK34	25.00	NV2000/NV2010 Contents	Economy Kit Contents		138-10138, 138-10313, 1.2V = 90 Replaces Philips Part Nos: 138-1229, 2.4V = 90mAh	
3V35/36/38/39/49 HRD110/111/120/121/225		BELT SET. PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION	BELT SET. PINCH ROLLER. IDLER TYRE. PULLEY TYRE		REPLACEMENT FERGUSON N Replaces Ferguson Part Nos:008	
Contents BELT SET. T/U REEL TABLE BELT SET. T/U REEL TABLE		BAND. VIDED LAMP	ORDER CODE: SK14	£3.50	Used on: 3V35, 3V56, 3V58, 3V6	
TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER T/U TYRE PINCH ROLLER T/U		NV7000/NV7200/NV7800			REPLAC	
CLUTCH. T/U IDLER. REEL CLUTCH. T/U IDLER TYRE, RI		BELT SET, PINCH ROLLER,	Economy Kit Contents BELT SET, PINCH ROLLER		LINE OL	
Order Code: SK35 £10.00 ORDER CODE: SK36	£5.50	IDLER UNIT. PLAY IDLER. TENSION BAND	IDLER TYRE. CLUTCH TYRE		TRANSFO	Price Order
3V29/3V30 HR07200/7300/7350 Contents Economy Kit Contents			ORDER CODE: SK12	£3.25	HITACHI 2433752	Code 1500p LOTB1
Contents BELT SET. T/U REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. SUPPLY REEL TABLE TYRE. SUPPLY REEL TABLE		NV300/NV330/NV333/NV340/NV366 Contents BELT SET, PINCH ROLLER,	Economy Kit Contents		ORION 3714002 FIDELITY ZX300	1500p LOT02 1500p LOT03
TYRE. PINCH ROLLER REEL IDLER. TAU CLUTCH. TAU IDLER. IDLE TYRE. PINCH ROLLER. REEL IDLE TYRE. TAU IDLER TYRE.		IDLER UNIT. PLAY IDLER. TENSION BAND	BELT SET, PINCH ROLLER IDLER TYRE. PLAY IDLER		FE TX100 90 DEG SABA 490007182 FE TX90 WHITE	1500p LOT04 1500p LOT05
TENSIDN BAND, VIDEO LAMP T/U CLUTCH Order Code: SK31 £10.00 ORDER CODE: SK32	£5.00		ORDER CODE: SK16	£3.25	ITT D307/37 EQ BLAUPUNKT 210	1650p LOT06 1600p LOT07 1600p LOT08
3V44/45/48/53/54/55/57		NVG7/NVG9/NVG10/NVG11/NVG12/N NVG18/NVG30/NVG120/NVG130/NVG			GRUNDIG 2922010	1600p LOT09 1500p LOT10
HRP50/HRD140/150/158/160 HR0250/257/565/566/755			Economy Kit Contents		ITTD218/37 EQ NORMENDE 5255	1600p LOT11 1600p LOT12
Contents BELT SET. PINCH ROLLER. BELT SET. PINCH ROLLER		BELT. PINCH ROLLER IDLER	LOADING BELT, CAPSTAN BELT, PINCH ROLLER, IDLER.		SABA 81000 200 SALORA T236 EQ	1600p LOT13 1650p LOT14
CLUTCH MECHANISM. TENSION BANO			TYRE ORDER CODE: SK28	£3.00	SABA 811-50-24 SABA 770223500	1600p LOT15 1600p LOT16
Order Code: SK39 £15.00 ORDER CODE: SK40	£9.50	NV332			TELEFUNKEN AT1 TELEFUNKEN EQ SALORA FM0218B	1450p LOT17 1400p LOT18 1600p LOT19
FISHER FVHP905/906/907/908/910/911/916/918 Connection		BELT SET, PINCH ROLLER,	Economy Kit Contents BELT SET, PINCH ROLLER PLAY IDLER TYRE, FF/REW		NORMENDE 5255 ITT CVC 1150/1	1600p LOT19 1600p LOT20 1500p LOT21
Contents BELT SET. PINCH ROLLER. BELT SET. PINCH ROLLER. 10LER. GEAR IOLER UNIT. 10LER TYRE		TENSION BAND, FF/REW TYRE	PLAY IDLER TYRE, FF/REW IOLER TYRE ORDER CODE: SK30	£5.10	FE TX100 GREEN	1500p LOT22 1400p LOT23
TENSION BAND Order Code: SK57 £13.00 ORDER CODE: SK58	€5.00	NV230/250/260/280/430/450/460/470/65		13.10	HINARI CT4/5 5113 SELECO 6320410	1500p LOT24 1600p LOT25
FVHP615/618/620/622/710/711/715/716/720/721/722/725/	£3.00	AG1200PK/AG1500PK	Economy Kit Contents		BLAUPUNKT 8667 ITT COMPACT B1	1600p LOT26 1450p LOT27
730/830/940 Contents Economy Kit Contents		BELT SET, PINCH ROLLER,	BELT SET, PINCH ROLLER IOLER TYRE		ITT CT3326 MUL ITT D066/37 EQ ITT 3546 EQ	1500p LOT28 1600p LOT29 1500p LOT30
BELT SET. PINCH ROLLER. IDLER. GEAR IDLER UNIT. BELT SET. PINCH ROLLER. IDLER TYRE		Order Code: SICZ3 £6.00	ORDER CODE: SK24		LUXOR 5810110 SABA 849380920	1600p LOT31 1600p LOT32
TENSION BAND Order Code: SK68 £11.00 ORDER CODE: SK69	£300		Economy Kit Contents		HITACHI 2434141 CP FE TX100 110 D	1200p LOT33 1500p LOT34
НІТАСНІ		BELT SET, PINCH ROLLER, PLAY IOLER, FF/REW IOLER.	BELT SET, PINCH ROLLER PLAY IOLER TYRE, FF/REW		HANTAREX 28021 SHARP C3700 EQ	1600p LOT35 1600p LOT36
VT11/VT33 Contents			IDLER TYRE Ord er Code: SK2 6		HITACHI 2432981 CP FERGUSON 00D3-508-002	1300p LOT37 1650p LOT38
BELT SET PINCH ROLLER. TENSION BAND. IOLER TYRES Order Code: SK08	£5.00	NV730/NV770	F		Fits Chassis TX99 41cm + 51cm Used On: 51K2, 51J8, 51J7, 41H3 41H3, 41H2, 51K3	
UNIVERSAL TRIPLER		SLOT IN BELT. LOADING BELT PINCH ROLLER. IOLER UNIT.	Economy Kit Contents SLOT IN BELT. LOADING BELT PINCH ROLLER. IDLER TYRE	r.	PANASONIC TLF14567F Used On: TC2043, TC2243, TX30	
Price: £5.00 each	n_	TENSION BAND Order Code: SK19 £5.00	DROER CODE: \$K20	£3.00	PANASONIC TLF14568F Used On: TX2231, TX2244 PANASONIC TLF14584	£15.00 LOT40 2000p LOT41
AMSTRAD MODE KIT Price: £2.75 each		BELT SET, PINCH ROLLER,	2100PK/AG2200PK Economy Kit Contents BELT SET, PINCH ROLLER		Used On: TC2210, TC2160, TX1752, TX2112 TX2112, TX2162, TXC22 PANASONIC TLF14586F	£18.00 LOT42
SEE OTHER PAGES		IDLER. TENSION BAND	DLER TYRE		TC1651, TC2051, TC2061, TC2253, TC2263, TX5500	2.0.00 [0142
FOR MORE		NV777/NV788			HINARI Used On: CT15	1600p LOT43
		BELT SET, PINCH ROLLER,	Economy Kit Contents BELT SET, PINCH ROLLER		HITACHI 2434274 CPT21 74 , CPT2176, CPT2178, 243	
GRANDATA BARGAINS	:		DLER TYRE DRDER CODE: SK18	Ē4.00	We stock line output transform models. Please ring 0181-900 2	ners for over 100 different 329 for more information.

IDI ERS &	PULLEYS REF	PLACEMENT	
AKAI -			
VS1-2 VS4-5, VS15 VS3, 6, 12, 56, 58, 59 VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773 8V327815	400p 500p
			800p
V\$700 V\$125, 126, 155. V\$165, 240, 244, 245, 247 V\$22, 36, 105, 112, 115, 115, 115, 115, 115, 115, 11	IDLER ASSY 7, 248, 250, 512, 515, 61	MZ368960J2 6	9009
VS22, 38, 105, 112, 115, 117, 115, 115, 115, 115, 115, 115	116, 205, 220 T-UP IDLER	PU47752	€4,50
197100, VS9300	UNLOADING	PU46381	€4.00
V=7100, VS9300 VS9500, VS9800	REW IDLER	PU46380	500p
MP98	IOLER REEL TABLE	BV336067 BR347731	€5.00 450p
V\$75, 58 V\$23, 35, 37, 53, 66 V\$86, 75, V\$A77	CLUTCH	ML373043	1100p
VS86, 75, VSA77 VS9700 VS9700	FF IDLER REW IDLER	8V321761 W321762	£3.20 £4.25
AMSTRAD	IDLER	150280	£1,50
TVR1, VCR4500	CLUTCH	150873	€3.75
TVR1, VCR4500 VCR4600, VCR6200, VCR	GEARHOLDER 9000	161284	£3.50
TVR1, VCR4600	REF CLUTCH CLUTCH	153202	€3.80
VCR6000, VCR6100 VCR4500, VCR9000 VCR4500, VCR4600	CLUTCH MOD KIT	(TAPE CREASING)	
MOD KIT TAPE CREASIN			
CR4500, 4600, 4700 FERGUSON			
3/20, 3/01, 3/16 3/22, 3292, 8900, 8904, 9 3/16, 3/22	T-UP IDLER	PU47752	£4,50
2903 8909 8912 BHZZ		PU49280	£5.50
3423, 3V29, 3V30, 3V31, 3V32, 3V35, 8923, 3V23, 3V31	8924, 8929, 8930, 8931, ROLLER ASSY	8940, 8941, 8942 PU49042A	350p
3V29, 3V30, 3V31 3V32, 3V35, 3V36, 3V38,	T-UP IDLER 3V39, 3V49, 8930, 8931	51402 , 8940, 8941, 8942	100p
39/31, 3V32, 3V35, 8923, 3V23, 3V30, 3V31 3V29, 3V30, 3V31 3V32, 3V35, 3V36, 3V38, 3V29, 3V30, 3V31 3V35, 3V36, 3V38 3V39, 3V49, 8943, 8944	T-UP CLUTCH REEL IDLER	PU51380 PU55374	200p 200p
3735, 3749, 8943, 8944 3735, 3736, 3738 3749, 8947, 8944	T-UP CLUTCH	PU55373	150p
37.35, 34736, 3738 3738, 3749, 8943, 8944 3758, 3759, 3764 3758, 3759, 3764 3755, 3740, 7711, 7712, 3757, 3743, 8950, 3742, 3743	IDLER ARM FV13, FV14, FV20, FV2	PU58645 1, FV22, FV26	£2.25
PV30, FV32, FV33, 8950, 3V42, 3V43	VC141L CLUTCH ASSY CLUTCH ASSY	PU55822	1200p
3943, 3V44, 3V45 3V48, 3V53, 3V54, 3V55,	3V57, 8947, 8948	PU67658	1050p
3745, 3V48, 3V53, 3V54,	3V55, 3V56, 3V57, 8947 SUPPORT CLUTCH	, 8948 PU56044-1-5	160p
342, 344, 3445 343, 344, 344, 345, 542, 343, 344 345, 348, 345, 345, 342, 344, 345, 346, 340, 346, 346, 346, 340, 346, 346, 340, 346, 346, 340, 346, 346, 340, 346, 346, 340, 346, 34	3V55, 3V56, 3V57, 8947 LOADING IDLER	, 8948 PU43681	£4.00
₹512. 8922			
3/92, 8900, 8901, 8904, 8 3/16, 3/22, 8902		PU46380 PU49281	600p €1.70
9909, 8912, 8922	IOLEN	. 0.0201	
FISHER FVHP420, 520, 530 FIGURES 518 620	FF-REW PULLEY COMP. IDLER ASSY	HI638531 R1430420400300	80p 220p
FYHP622, 710, 711, FVHI	7720, 721, 722, FVHP72	5, 730, 830 918	
FiHP622, 710, 711, FVH	7720, 721, 722	R1430490400900	380p
PANF725, 730, 830, FVHI FANF815, 618, 620 PANF862, 710, 711, FVHI PVHF725, 730, 830, FVHI PVHF906, 906, 908, RANFSON, 906, 908, RANFSON, 906, 908, RANFSON, 908, 908, RANFSON, PANFSON,	REEL T-UP ASSY	R1430410400900	25.50
PVHP725, 730, 830, FVHI =VHP905, 906, 908,	GEAR IDLER ASSY	R1430490402400	275p
PAN-1975, 980, 990,	P916, 918 IDLER	R1430420400700	300p
PVHP999, 5000, 5005 PVHP5050, 5075, 5100 PVHD40, 55, 140	REEL DRIVE ROLLER		26.00
F##P1, 10, 20 F##P975, 980, 990	Сълтен	F12430510404200	€9.50
FWHF420, 520, 530 FWHF420, 520, 530	TAKE UP IDLER		£2.80 290p
FVHP990 VBS3500 VBS3500	LOADING GEAR REEL DRIVE PULLEY IDLER	£3.20	90p 250p
SOLDSTAR	REWIDLER		95p
SHV1221, 1232, 1240 SHV1241, 1242, 1243 G	CLUTCH GEAR HV1244, 1245, 1246, GH	435038A 5V1247, 1248, 8000	£2.50
SHV1221, 1232, 1240 SHV1241, 1242, 1243, G SHV8200, 8210, 8215, G SHV1221, 1232, 1240	HVP51, VCP4100, 4130 IDLER	,,,,	110p
GHV1221, 1232, 1240 GHV1241, 1242, 1243, G GHV3200, 8210, 8215, G	HV1244, 1245, 1246, GH HVP51, VCP4100, 4130	TV1247, 1248, 6000,	
HENARI 1002.3. VXL20	REEL IDLER	40000009	110p
1002.2 1002.4 VXL35 1002.4 VXL35	IDLER IDLER		110p £2.75 £6.50
100_A, VXL12, VXL26 100_30, VXL35, VTV300	CLUTCH LIMITER POST		£1.30
WALS VXLS	CLUYCH GEAR HOLDER		£3.75
ETACHI	ССССН		€3.80
	CLUTCH ASSY 88, 34, 35, 39, 52, 61	6879515	€7.50
WTM, 17, 19, 38, 57, 86. 55, 55, 330, 640, VT1 WTM, 20, 110	CLUTCH ASSY	6886824	€7.50
113, 220, 100, 110 113, 115, 118, 200 126, 130, 135, 138, 136, 280, VTL30	145, 150, 175, 225 , 250,		
# E506-8700		6413663	£2.80
#\$505-8700 #\$505-8700	PLAY IDLER FF-REW PULLEY	6414221 6383531	290p 80p
=300-8300, 7000 =350-8700 =5300-9500, 6500	FF-REW IDLER	8881471	250p
\$800, 9700, 9900 \$300-9500, 6500		6861482	230p
===00, 9700 ====00, 9700	IDLER	6861481 681505	220-
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15S, 17, 19, 34, V	T35, 38, 39, 52, 61, 62		
118, 119, 120, 17	FF-REW ARM 55, 128, 130, 135, 138, 10 56, 258, 250, VTL30 FF-REW 56, 428, 429, 421, 43	6886792 45, 150	240p
223, 225, 250, 25 410, 413	p, 268, 250, VTL30 FF-REW IS 426, 428, 430, 431, 41	88970904 35	£1.30
#364, 416, 418, 420, 42 #3600, 453, 498, 510, 51 #3600, 546, 545, 546, 54	8, 520, 525, 526, 530, 5: 18, 570, 575, 576, 580, 5	35 85	
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VT588, VTM625, 626, 630 VT400, 405, 410, 413	635, 636, 840, 845, 64 CLUTCH BASE	8, VT\$80,85 6896951	£5,00
VT588, VTM625, 626, 630 VT400, 405, 410, 413 VT414, 415, 418, 420, 425 VT438, 450, 498, 510, 518 VT586, 540, 545, 546, 548 VT588, VTM625, 626, 630 VT3000	, 426, 428, 430, 431, 43 , 520, 525, 526 , 530, 53 , 570, 575 , 576, 580, 58	5	
VT588, VTM625, 626, 630 VT3000	, 635, 636, 640, 645, 64 T-UP IDLER (LARGE)	6, VT\$80, 85 £4.50	
VT3000 VT680, 6500, 6800 VT9700, 9900	FS-BRAKE	6861505	230p
HITACHI TV OUTPUT MODULE HM 6. OUTPUT MODULE HM 6.	232		€6.60 £8
JVC HR330, 3680, 4100 HR7200, 7660, 7650 HR7855, 7300, 7350, 7610 HR7800, 7300, 7350, 7610 HR7600, 7610, 7650, 7655, 7700 HR7600, 7600, 7650, 76	T-UP IDLER SML	PU49280 PU634524	25.50 220p
HR7655, 7300, 7350, 7610	REEL IDLER	PU48967	175p
HR7600, 7610, 7650, 7655 HR7600, 7610, 7650	7700 ROLLER ASSY	PU49042A	350p
HR7655, 7700 HR3300, 3660, 4100	T-UP IDLER LRG	PU47752	£4.50
HR7200, 7600, 7660 HR7655, HRD110, HRD11	T-UP IDLER 1, HR7300, 7350, 7610,	PU51402A HRD120-121, 225	100p
HRD110, HRD120-121, HRD225, HRD111, HRD110, HRD120-121, HRD225, HRD111	IDLER ARM	PU55374-3-8	150p 200p
HRD225, HRD111 HRD170, 180, 210, 230			€2.25
HRD 170, 180, 210, 230 HRD 320, 370, 400, 430, 4 HRS 5000, HRS 5500	70, 530, 700, 750, 950, 1	PU558822	1200p
HRD455, HRD725 HRD140, 150, 167, 158 HRD160, 250, 257, 565, 5	CLUTCH MECH		1050p
HE3300 HE3330	REW IDLER	PU46380	500p
HR3660, HR4100 HR3140, 150, 157, 158 HRD160, 250, 257, 455, 5	TAKE UP CLUTCH 65, 566, 725, 755, HRP5	PU56043-1-4 0	240p
MRD160, 250, 257, 455, 5 HRD140, 150, 157, 158 HRD160, 250, 257, 455, 5	TAKE UP CLUTCH 85, 566, 725, 755, HPRS	PU58044-1-5 0	180p
MATSUI VX730, 735, 750, 755,	CLUTCH	850A00005	420p
VX730, 735, 750, 755, VX810, 820, 850, 880, 990 VX730, 735, 750, 755 VX770, 800, 810, 880	LIMITED POST LEVER		€1.30
VX990 VX800A, VX900 VX800A, VX820	IDLER REEL		£1.60
MITEURICH	REEL UNIT CLUTCH		280p
HS306, 307, 318, 319, HS400, 410, 710 HS337, 338, 347, 349	GEAR ASSY		£6.25
H3411, 412, 421, H5B10,	IDLER HSB20, HSB30, HSE 10	552B01701 , HSE20, HSE30.	325p
HS506, 307, 318, 319 HS400, 410, 710	IOLER		£2.00
HS347, 349, 412 HS810, HS820, HS830, F HHS337, 338, 411, 421	IDLER	522902002 HSE70	€3.00
HHS337, 338, 411, 421 HS200	IDLER TAKE UP IDLER (LARC	552801801 SE)	320p £4.50
HS200 HS200	UNLOADING IDLER REWIND IDLER		£4.00 £6.00
H\$306, 307, 318, 319 H\$400, 410, 710	SUPPLY REEL DISK	522A00101 522C06301	£3.20
H\$320 H\$337, 338, 41, 421 H\$300, 301, 302, 310	REEL DISK REEL DISK PULLEY	522P00601 522C05201	£5.00 £2.25
HS307, 338, 41, 421 HS300, 301, 302, 310 HS306, 307, 318, 319 HS400, 410, 710 HS306, 307, 318, 319 HS400, 410, 710	GEAR WHEEL	641071301	€1.50
HS306, 307, 318, 319 HS400, 410, 710	GEAR WHEEL	641071001	€1.50
NEC	TAKE UP CLUTCH		150p
NR30 NR31 NR32 NR33	TAKE HID IN CO		
N830 N831, N832, N833 N830, N831, N832, N833 N830, N831, N832, N833	REEL IDLER		100p 200p
		L 9066 9110	200p 550p 350p
N895 N911, N915, N918, N917 N9012, 9013, 9014, 9016, N9510, 9520, 9530, 9610	REEL DRIVE PULLEY 9033, 9034, 9054, 9055	5, 9066, 9110	200p 550p
N895 N911, N915, N918, N917 N9012, 9013, 9014, 9016, N9510, 9520, 9530, 9610	REEL DRIVE PULLEY 9033, 9034, 9054, 9055	5, 9066, 9110	200p 550p
N895 N911, N915, N916, N917 N9012, 9013, 9014, 9016, N9510, 9520, 9530, 9610 NATIONAL NV322, NV500, NV688, NV777, NV788, NV332, A NV300, NV333, NV340 NV386	TAKE UP IDLEY SMAL 9033, 9034, 9054, 9055 4DLER UNIT 4G6100, 6200, 6800, 681 1DLER ARM	VXP0463 10 VXL0997	200p 550p 350p
N895 N911, N915, N918, N917 N9012, 9013, 9014, 9016, N9510, 9520, 9530, 9610 NATIONAL NY322, NY600, NY688, NY777, NY788, NY322, A NY300, NY333, NY340 NY366 NY300, NY330, NY333	TAKE UP IDLER SMAL REEL DRIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT G6100, 6200, 6800, 681 IDLER ARM	VXP0463 VXL0997 VXLP0401	200p \$50p 350p 350p £2.75 £3.80 60p
N895 N911, N915, N918, N917 N9012, 9013, 9014, 9018, N9510, 9520, 9530, 9610 NATIONAL NV322, NV500, NV688, NV777, NV788, NV332, NV340 NV340, NV333, NV340 NV340, NV330, NV333 NV340, NV336 NV340, NV366 NV300, NV336, NV835	FARE DRIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER	VXP0463 IO VXL0997 VXP0401 VXP0433	200p 550p 350p 22.75 £2.75 £3.80 60p £2.75
N895 N916, N916, N917, N918, N	FARE DRIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER	VXP0463 IO VXL0997 VXP0401 VXP0433	200p \$50p 350p 350p £2.75 £3.80 60p
N895 N916, N916, N917 N918, N918, N918, N918, N918, N918, N918, S014, S018, S014, S018, S0	TAKE UP IDLER SMAIL REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT IG5100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR IV777, NV788, NV2000, LOADING GEAR	0, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NY2010, 3000, 7000 VXP0325	200p \$50p 350p 350p £2.75 £3.80 60p £2.75 £0.60
N895 N916, N916, N917 N918, N918, N918, N918, N918, N918, N918, S914, S918, S914, S918, S918, S918, S918, N918, N9	TAKE UP IDLER SMAIL REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT IG5100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR IV777, NV788, NV2000, LOADING GEAR	0, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NY2010, 3000, 7000 VXP0325	200p \$50p 350p 350p £2.75 £3.80 60p £2.75 £0.60
N895 N916, N916, N917 N911, N917, N916, N917, N916, N917, N916, N917, N916, N917, N916, N917, N916, N917, N9	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR W7777, NV788, NV2000, CAM GEAR	, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXG017 NV2010, 3000, 7000 VXG0158	200p \$50p 350p 350p £2.75 £3.80 60p £2.75 £0.60 £2.00 £0.65
N895 N916, N916, N917 N911, N917, N916, N917, N916, N917, N916, N917, N916, N917, N916, N917, N916, N917, N9	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR W7777, NV788, NV2000, CAM GEAR	, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXG017 NV2010, 3000, 7000 VXG0158	200p \$50p 350p 350p £2.75 £3.80 60p £2.75 £0.60 £2.00 £0.65
N895 N916, N916, N917 N918, N917 N911, N915, N916, N917 N9510, 920, 9013, 9014, 9016, N917 N9510, 920, 9610 N917 N920, N920, N920, N920, N920, N930, N	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR INTERMEDIATE INT	5, 9066, 9110 VXP0463 10, 00 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXP0325 VXP0321 VXP0521 VXP0521 VXP0521 VXP052N VXP070, NV48 VXP070, NV48 VXP070, NV48 VXP070, NV48 VXP070, NV48 VXP070, NV4870 VXG16, VG16, VG16, VG16, VG16, VG16	200p \$50p 350p 350p £2.75 £3.80 60p £2.75 £0.60 £2.00 £0.65
N895 N916, N916, N917 N916, N917 N9012, 9013, 9014, 9018, 9014, 9018, 9019, 90	TAKE UP IDLER SMAIL REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G5100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR IVT77, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAF IVT77, NV788, NV2000, CAM GEAR IDLER ARM IVASO, NV450, NV450, VV390, NV450, NV450, VC11, NVG12, NV630, VG11, NVG12, NV630, O, AGIZOO, 1500, 1810, 1810, 1810,	5, 9066, 9110 VXP0463 10 VXL0997 VXP0401 VXP04033 VDG0016 NV2010, 3000, 7000 VXF0325 VXF0325 VXF0321 VXP0521	200p \$50p 350p 350p £2.75 £3.80 60p £2.76 £0.60 £2.00 £0.65 £1.00
N895 N916, N916, N917 N916, N917 N9012, 9013, 9014, 9018, 9014, 9018, 9019, 90	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR IV777, NV788, NV2000, CAM GEAR IDLER ARM IV430, NV450, NV450, V611, NV612, NV614, 0, AG1200, 1500, 1810, CAM GEAR	5, 9066, 9110 VXP0463 10 10 10 10 10 10 10 10 10 10 10 10 10	200p 350p 350p 22.76 60p 22.76 60.60 22.00 60.65 £1.00 110p 0 8 £1.20
N895 N916, N916, N917 N918, N917 N911, N915, N916, N916, N917 N9012, 9013, 9014, 9018, N917 N918, N917, N978, N9212, NV600, NV688, NV777, NV788, NV322, NV600, NV333, NV340, NV360, NV333, NV340, NV360, NV333, NV340, NV360, NV36	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR IVT77, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAF IVT77, NV788, NV2000, CAM GEAR IDLER ARM IVASO, NV450, NV450, VG11, NVG12, NVG18, 0, AGI200, 1500, 1810, CAM GEAR IVG10, NVG12, NVG18 10 LER UNIT IDLER UNIT IDLER UNIT IDLER UNIT	5, 9066, 9110 VXP0463 10 10 10 10 10 10 10 10 10 10 10 10 10	200p \$50p 350p £2.75 £3.80 60p £2.75 £0.60 £2.00 £0.85 £1.00 8 £1.20 £2.50 80p £2.75
N895 N916, N916, N917 N918, N917 N911, N915, N916, N916, N917 N9012, 9013, 9014, 9018, N917 N918, N917, N978, N9212, NV600, NV688, NV777, NV788, NV322, NV600, NV333, NV340, NV360, NV333, NV340, NV360, NV333, NV340, NV360, NV36	TAKE UP IDLER YAS REEL DNIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR INTERMEDIATE GEAR INTERMEDIATE GEAR (V777, NV788, NV2000, CAM GEAR IDLER ARM (V430, NV450, NV450, V611, NV612, NV614, 0, AG1200, 1500, 1810, CAM GEAR IDLER UNIT IDLER UNIT	5, 9066, 9110 VXP0463 10 10 10 10 10 10 10 10 10 10 10 10 10	2205 550p 350p 22.75 £1.80 60p £2.76 £0.85 £1.00 110p 0 8 £1.20 22.50 50p 80p £1.20
N895 N916, N916, N917 N916, N917 N9012, 9013, 9014, 9014, 9018, 9014, 9018, 9014, 9018, 9014, 9018, 9014, 9018, 9016, 9018, 90	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAF IV777, NV788, NV2000, CAM GEAR IDLER ARM INASD, NV450, NV450, VG11, NVG12, NV450, VG11, NVG12, NVG14, 0, AG1200, 1500, 1810, CAM GEAR ING10, NVG12, NVG18 IDLER UNIT IDLER UNIT IDLER UNIT IDLER UNIT ICLER UNIT	5, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXP0325 VXP0325 VXP0321 NV455, NV470, NV48 NV465, NV470, NV48 VXP0321 VXP0321 VXP0331 VXP03231 VXP03231 VXP0329 VDG0089	200p \$50p 350p 22.75 £1.80 60p £2.75 £0.60 £2.00 £1.00 110p 0 8 £1.20 80p £2.50 80p £2.75
N895 N916, N916, N917 N916, N917 N9012, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 9013, 9014, 90	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9055 (DLER UNIT (G6100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR (V777, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAF IV777, NV788, NV2000, CAM GEAR IDLER ARM INASD, NV450, NV450, VG11, NVG12, NV450, VG11, NVG12, NVG14, 0, AG1200, 1500, 1810, CAM GEAR ING10, NVG12, NVG18 IDLER UNIT IDLER UNIT IDLER UNIT IDLER UNIT ICLER UNIT	5, 9066, 9110 VXP0463 10 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXP0325 VXP0325 VXP0321 VXP0325 VXP0321 VXP0325 VXP0321 VXP0321 VXP0331 VXP0329 VXP0329 VXP0329 VXP0329 VXP0343	200p \$50p 350p 22.75 £3.80 60p £2.76 £0.65 £1.00 110p 622.50 80p £2.80 80p £2.76 £1.00
N895 N995 N991, N915, N916, N917 N9912, 9013, 9014, 9014, 9018, 9013, 9014, 9018, 90	TAKE UP IDLER YOUNG REEL ONIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER ARM ACTION GEAR NY77, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR NY77, NV788, NV2000, CAM GEAR IDLER ARM IVASO, NV450, NV450, VC11, NVG12, NVG14, IDLER UNIT IDLE	S. 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXR0158 VXP0325 VXP0325 VXP0325 VXP0325 VXP0320 VXP0323 VXP03243 VXP03243 VXP03243 VXP03248	22.76 £2.76 £1.80 60p £2.76 £0.65 £1.00 110p 0 8 £1.20 £1.20 £1.20 8 80p 10.65 £1.20 8 80p 10.65
N895 N911, N915, N916, N917 N9911, 9013, 9014, 9016, N910, 9013, 9014, 9016, N910, N930, N933, N9340, N930, N933, N9340, N930, N933, N9340, N930, N935, N936, N930, N935, N930, N936, N930, N930	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER ARM ACTION GEAR NY77, NV788, NV2000, LOADING GEAR INTERMEDIATE GEAR NY77, NV788, NV2000, CAM GEAR IDLER ARM IVASO, NV450, NV450, VC911, NVG12, NVG18, IDLER UNIT	S. 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0433 VDG0016 NV2010, 3000, 7000 VXP0325 VXP0325 VXP0325 VXP0325 VXP0325 VXP0325 VXP0329 VXP0329 VXP0324 VXP0325 VXP0245 VXP0248 VXP0344 VXP0343 VXP0348	2209 350p 350p 22.76 21.80 60p 22.76 20.65 21.00 110p 0 8 21.20 22.50 80p 22.76 21.00 110p 0 8 21.20 22.50 80p 80p 80p 80p 80p 80p 80p 80
N895 N895 N895 N891, N915, N916, N917 N8911, 29013, 9014, 9016, N917 N8910, 2903, 9014, 9016, N917 N8910, 9013, 9014, 9016, N918 N7910, N920, N933, N9340 N9360, N9333, N9340 N9360, N9333, N9340, N9360, N9330, N9360, N9660, N96	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER RIM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR IDLER ARM NV390, NV310, NV300, CAM GEAR IDLER ARM NV390, NV310, NV300, NV310, NV310, NV310, NV310, NV310, NV310, NV310, NV311, NVG12, NVG11, NVG12, NVG12, NVG11, NVG12, NVG12, NVG12, NVG14, NVG12, NVG14, NVG12, NVG14, NVG12, NVG14, NVG12, NVG14, NV	3, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0403 VXQ016 VXQ016 VXQ017 VXQ010, 3000, 7000 VXG035 VXG0178 VXP0521 VXG0178 VXP0521 VXG0188 VXP0521 VXG0188 VXP0521 VXP0523 VXP0233 VXP0233 VXP0233 VXP0243 VXP0343 VXP0343 VXP0343 VXP0343 VXP0343 VXP0343 VXP0348 VXP0346	22.76 £2.76 £1.80 60p £2.76 £0.65 £1.00 110p 0 8 £1.20 £1.20 £1.20 8 80p 10.65 £1.20 8 80p 10.65
N895 N918, N916, N917 N918, N917 N918, N91	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR IDLER ARM (NV30, NV310, NV311, NVG12, NVG11, NVG12, NVG12, NVG11, NVG12, NVG12, NVG12, NVG12, NVG12, NVG14, NVG12, NVG14, NVG14, NVG14, NVG14, NVG14, NVG15, NVG15, NVG15, NVG16, NVG16, NVG16, NVG16, NVG1730, NVG16, NVG1730, NV	3, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0403 VDQ0016 NV2010, 3000, 7000 VXR0325 VXG0017 NV2010, 3000, 7000 VXG0158 VXP0521 NV465, NV470, NV48 VXP0521 VXP0521 VXP0521 VXP0521 VXP0521 VXP0521 VXP0523 VXP0343 VXP0348 VXP0343 VXP0348 VXP0767 VXP0664 NV770, NV810 VXP0523	220g 250g 350p 22.76 £1.80 60p £2.76 £0.60 £0.85 £1.00 £1.20 80p 27.00 80p 2
N895 N995 N991, N915, N916, N917 N9912, 9013, 9014, 9018, 90	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER RIM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR NY777, NV788, NV2000, CAM GEAR NV770, NV810, NV810, NV820, NV810, NV810, NV820, NV850, NV810, NV811, NV612, NV611, NV612, NV612, NV611, NV612, NV612, NV611, NV612,	3, 9066, 9110 VXP0463 10, VXL0997 VXP0401 VXP0403 VDG0016 VXP0323 VXP0325 VXF0325 VXF0521 VXP0521 VXP05229 VXP0343 VXP0343 VXP0488 VXP0767 VXP0664 VXP05623 VXP05623 VXP05691	22099 3509 3509 22.75 60,80 60,85 £1.00 1109 8 £1.20 8 £1.20 809 809 809 809 809 809 809 809 809 80
N895 N995 N991, N915, N916, N917 N9912, 9013, 9014, 9014, 9018, 9013, 9014, 9018, 9014, 9018, 90	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT GG100, 6200, 6800, 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR NY777, NV788, NV2000, CAM GEAR NV770, NV810, NV820, CAM GEAR VY780, NV810, NV830, VV800, NV810, NV800, VV810, NV810, NV800, VV811, NV612, NV614, 0, AG1200, 1500, 1810. CAM GEAR VV7610, NVG12, NVG18 IDLER UNIT ID	3, 9066, 9110 VXP0463 10, VXL0997 VXP0401 VXP0403 VDG0016 VXP0323 VXP0325 VXF0325 VXF0521 VXP0521 VXP05229 VXP0343 VXP0343 VXP0488 VXP0767 VXP0664 VXP05623 VXP05623 VXP05691	22099 3509 3509 22.75 60,80 60,85 £1.00 1109 8 £1.20 8 £1.20 809 809 809 809 809 809 809 809 809 80
N895 N995 N991, N915, N916, N917 N9912, 9013, 9014, 9016, N916, 9520, 9630, 9610 NATIONAL N9351, 9520, 9530, 9610 NATIONAL N9362, NV690, NV688, NV777, NV788, NV332, NV340 NV390, NV333, NV340 NV390, NV333, NV340 NV390, NV333, NV340 NV390, NV330, NV333, NV340, NV390, NV330, NV390, NV	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6200, 680), 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR IDLER ARM NV390, NV310, NV300, NV310,	3, 9066, 9110 VXP0463 10 VXL0997 VXP0401 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0521 VXP0523 VXP06089 VXP0343 VXP0243 VXP0243 VXP06089 VXP0343 VXP06089 VXP0343 VXP06089 VXP0343 VXP06089	22.75 550p 350p 62.75 63.80 60p 22.76 60.65 22.00 60.85 £1.00 110p 6 £1.20 8 £1.20 8 £1.20 8 £1.20 8 £1.20 8 8 £1.20 8 8 8 8 8 8 8 8 9 9 10.60 8 8 8 8 8 9 10.60 8 8 8 8 9 10.60
N895 N995 N991, N915, N916, N917 N9912, 9013, 9014, 9016, N916, 9520, 9630, 9610 NATIONAL N9351, 9520, 9530, 9610 NATIONAL N9362, NV690, NV688, NV777, NV788, NV332, NV340 NV390, NV333, NV340 NV390, NV333, NV340 NV390, NV333, NV340 NV390, NV330, NV333, NV340, NV390, NV330, NV390, NV	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6200, 680), 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR IDLER ARM NV390, NV310, NV300, NV310,	3, 9066, 9110 VXP0463 10 VXL0997 VXP0401 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0403 VXP0521 VXP0523 VXP06089 VXP0343 VXP0243 VXP0243 VXP06089 VXP0343 VXP06089 VXP0343 VXP06089 VXP0343 VXP06089	22.75 550p 350p 22.75 63.80 60p 62.75 60.60 60.65 61.00 8 61.20 62.50 80p 61.00 75p 300p 61.50 80p 61.50 60.80 61.50
N895 N995 N991, N915, N916, N917 N8911, 9013, 9014, 9014, N917 N8910, 2903, 9014, 9014, N916 N910, 9013, 9014, 9014, N916 N910, 9013, 9014, 9014, N916 N932, NV600, NV688, NV370, NV380, NV333, NV340 NV300, NV333, NV330, NV333, NV330,	TAKE UP IDLER YOUNG PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6200, 680), 681 IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR INTERMEDIATE GEAR IDLER UNIT	3, 9066, 9110 VXP0463 10 VXL0997 VXP0401 VXP0403 VDQ0016 VXP0433 VXQ0016 VXP0325 VXG0017 NY2010, 3000, 7000 VXG0158 VXP0521 VXP0521 VXP0521 VXP0581 VXP0581 VXP0333 VXP0343 VXP0343 VXP0343 VXP0486 VXP0587 VXP0587 VXP0581 VXP0581 VXP0581 VXP0581 VXP0581 VXP0581 VXP0581 VXP0581 VXP0581 VXP0688 VXP078 VXP0688 VXP078 VXP0888 VXP078 VXP0888 VXP078 VXP0888 VXP078 VXP0888 VXP08888 VXP088888 VXP08888 VXP08888 VXP08888 VXP08888 VXP08888 VXP08888 VXP08888 VXP088888 VXP088888 VXP088888 VXP088888 VXP0888888 VXP088888 VXP088888 VXP088888 VXP088888 VXP088888 VXP08888888 VXP0888888 VXP0888888 VXP0888888 VXP08888888 VXP0888888888 VXP08888888888 VXP08888888888888 VXP0888888888888888888888888888888888888	22.75 550p 350p 62.75 63.80 60p 22.76 60.65 22.00 60.65 £1.00 110p 8 £1.20 22.50 80p 80p 80p 80p 1.00 75p 300p 80p 1.00
N895 N895 N895 N891, N915, N916, N917 N8911, 29013, 9014, 9016, N917 N8910, 2903, 9014, 9016, N917 N8910, 2903, 9014, 9016, N918 N7910, N920, N9	TAKE UP IDLER YOUNG REEL DNIVE PULLEY 9033, 9034, 9054, 9054 (DLER UNIT (G5100, 6200, 6800, 681 (IDLER UNIT (G5100, 6200, 6800, 681 (IDLER ARM IDLER UNIT PLAY IDLER ACTION GEAR NY770, NV788, NV2000, LOADING GEAR IDLER ARM (NV39, NV3910, NV390, NV3910, NV	3, 9066, 9110 VXP0463 10 VXL0997 VXL0997 VXP0401 VXP0403 VDG0016 NV2010, 3000, 7000 VXG0158 VXP0521 NV455, NV470, NV480 VXP0521 VXP0523 VXP0648 VXP070, NV810 VXP0623 VXP0623 VXP0623 VXP0623 VXP0520 VXP0520 VXP0520 VXP0520 NV790, NV810 NV90520 NV7905, NV6100 NV970, NV810 NV90520 NV90520 NV905, NV6120 NV970, NV810 NV970, NV810 NV970, NV810 NV90520 NV90520 NV980, NV6120 NV9870, NV6120 NV9870, NV6120 NV9870, NV6800	200p \$50p 350p 22.76 60p 62.76 60.60 22.00 60.65 £1.00 110p 075p 300p 80p 22.50 80p £1.20 22.50 80p £1.20 22.50 80p £1.20 60p £1.20 £1
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SAISHO			
VR605, VR800, VR900 VR1100, 1200, 1600, 250	CLUTCH 0.3200.3300	850A20000	420p
VR3500, 3600, 3800	LIMITER POST		£1.30
VR1100, 1200, 1600, 250	0. 3200, 3300, 3500, 360	00. 3700	
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VTC5000, 5150, 6000	FF-REW IDLER	143-0-741T-20001	250p
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VTC9100, VTC9300	IDLER	143-0-551T-01400	95p
VTC9300	FF ROLLER ASSY	143-0-547T-00200	200p
VTC10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
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VHR2100, 2300, 2500	IDLER	6130374899	300p
VHR2700			
VTC5000, 5150, 6000	PULLEY	143-0-662T-01201	£5.20
VTC6500			
VTCM10, M11, M20, M2	TPULLEY	143-0-662T-10350	£5.50
VTCM30, M31, M50			
VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	350p
VHR3400, 3700, 3800	ROLLER		
VHRD500, VHRD700		143-0-661T-03800	80p
VPR5800, VTC5300 VTC5400	LOADING ROLLER	143-0-6611-03800	вор
VTC3000	FWD LIMITER		€3.50
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	IDLER	NIDL0006GEZZ	110p
VC600, 651, 681, 682	IDLER ASSY	NPLYV0107GEZZ	€6.15
VC684, 685, 693, 699, 70	0. 783. VC6FR. VC6V3		
VC7300, VC7700, 7750	PLAY IDLER KIT	NPLY0041+	
		NDATV007	£7.50

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Specifically designed for video maintenance

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Hand tool designed for extracting hard to remove heads without damage to either the head or the mounting assembly. Adjustable so as to suit various brand heads. PRICE - 600p

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MAKE & MODEL	ORDER CODE	PRICE
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PACE SS9000, 9200, 9010, 9020, 9220	SATPSUZ	850p
AMSTRAD SRD610, SRD620	SATPSU3	850p
AMSTRAD SR0500	SATPSU4	850p



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POWER SUPPLY REGULATOR

ALBA CTV10 TRAVELLER

NIKKAI BABY 10

ORDER CODE: BABY 10

PRICE: 1200p + VAT

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2, 3, VCR4600, 4600MKII, 4700, FUNAI VS2, VCR4600, 4800, 5200, 5600, 6800, VIP3000, 5000
Also fits: FIDELITY, FUNAI, HINARI, PROLINE, SCHNEIDER, TOWADA, UNIVERSUM

ORDER CODE: AH01 PRICE: 1350p

AMSTRAD ORIGINAL NO; 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8602, 8603, VCR3604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANTECH, SONDSTEC, CASIO, CROWN, FIDELITY,
GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX,
SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG,
TOWADA, UNIVERSUM
ORDER CODE: AH02
PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR0050	NV300, NV340 etc	875p
VBR0061	NV777 etc	875p
VBR0103A	NV250, NV450 etc	625p
V8R0125		625p

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NAME	MODELS	CODE	PRICE
AKAI	V\$35, V\$53, V\$56, V\$75	CH18	3200p
GRANADA	VHSOPI	CH05	1100p
	VHSYJ2	CHOI	2800p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 200010, 20051Q VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000p
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV9000, 8200	CH26	2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HHD 110, 111, 120, 121, 225	CH01	2800p.
~	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD 140, 141, 150, 157, 158, 160, 250, HRD 257, 455, 565, 566, 725, 755	CH02	2800p
	8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530	CHD3	2800p
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370	CH04	2800p
	FV31R	CH19	4300p
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2200p
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400p
I.T.T.	VR3605, VR3905	CH01	2800p
	VR3916, 3926, 3946, 3946, 3976, 3966, 3995, 3997, 6948	CH02	2800p
	VR3916, 3928, 3946, 3948, 3978, 3966, 3995, 3997, 6948,	CH02	2800p
NATIONAL PANASONIC	NV730	CHC	430 0p
N.E.C.	N830EG, N831EG, N831EG, N832, N833EG	CH01	2800p
	N895	CH02	,2800p
PHILIPS	CASSETTE LIFT ASSEMBLY (8912096) DV186, 190, 286, 471, 952, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6233, 6362, 6367, 6333, 6467, 6468, 6470, VR6561, 6670, 6780, 6761, 6870, 6970	CH05	1100p
	VR6443	CH22	2900p
	VR6448	CH23	2500p
	49586	CH24	2500p
SHARP	VCA100, VCH851, VCH852	CH22	2900p
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
	VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2800p
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 380, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH02	2800p
TOSHIBA	V55. V57	CH01	2800p

Service Aids			
DESCRIPTION	VOLUME	COOE	PRICE
VIDEO HEAD CLEANER	75PAL	SP01	160p
SWITCH CLEANER	176ML	SP02	170p
SILICONE GREASE	200ML	SP03	210p
FREEZE IT	170ML	SP04	310p
FREEZE IT	400ML	SP16	600p
FOAM CLEANER	400ML	SP05	180p
ANTI-STATIC	150ML	SP06	190p
AEROKLEANE	135ML	SP07	220p
AERO DUSTER	150ML	SPOR	310p
AERO OUSTER	400ML	SP17	550p
PLASTIC SEAL	200ML	SP09	250p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	230p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	210p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUSE HEAT SINK COMPOUND	25 GRAMMES	\$P12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

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SONY OPTICAL PICK UP PART NO: KSS210A SONY CDPC 301M, CDPC 305M 2200p Fits most Sony, Akal & J.V.C. Portable Hi-Fi and Midi Systems

PART ND: KSS2108 USED ON MODELS: CFD100, 105b, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60 CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S

Cassette DC Motors		
MOTOR TYPE		PRICE
6V MOTOR	349	170p
9V MOTOR		170p
12V CW MOTOR		170p
12V CCW MOTOR		170p
13.2 CCW MOTOR		29 0 p
Cassette Tape Heads		
HEAD TYPE	-10-31	PRICE
MONG HEAD		90p
STEREO HEAD		110p
MINI HEAD	-	150p
AUTO REVERSE HEAD		200o
Soldering Accessories	1000	5ta
DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	SIDI	900p
15 WATT 240 VAC (XS15W 240V)	\$102	900p
25 WATT SPARE ELEMENT	\$103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	\$108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	\$110	500p
20 SWG 500 GRAMMES	\$111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		-
SDLDER MOP STANDARD GAUGE 1.2MM x 1.5M	\$107	80p

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SOLDER MOP 1.2MM X 10M

DESOLDERING PUMP

400p 320p

\$105

PEMOTE CONT

ı		REMOTE	C	TNC
ı	Description	Order	Price	Description
ı	GRUNDIG	Code		PHILIPS (
i	TP160E	RC 107	900p	RC38
ı	TP200, TP300	RC 380	750p	KT3 TEXT
ı	TP400	RC 401	675p	RC5352
ı	TP590-600	RC 600 RC 610	750p 750p	RC5375 RC5 STAN
1	TP390, TP610 TP621	RC 621	800p	RC5901
	TP630, TP650	RC 650	750p	RC5903
	TP660	RC 660	750p	SABA
	TP661	RC 661	750p	T6772
	HITACHI			TC319-320
	CLE800-CLE830	RC 140M RC 192	700p 800p	TC356
	A617402/655602 A512120/230	RC 900	750p	TC358
	A514790	RC 901	750p	TC360 TC365
	A5088470	RC 902	800p	10303
	A518612	RC 903	750p	SALORA
	SCL002	RC 904	750p	SERIES L 86173
	C2096 A511940	RC 905 RC 906	800p 750p	
	655602H	RC 907	800p	SANYO
	ITT	110 007	0007	RC218, RC
	IFB13, 14, 15	RC 143	800p	JXGE JXDE
	FS4	RC 148	750p	VHR2300
	RG305	RC 305	675p	RC628
	RG306	RC 306	750p	CHADD
	FS9/1-10/1	RC 307 RC 308	750p	SHARP G0121CES
	VS5 RUK VS4-1	RC 310	750p 750p	- 65.3
	MULTICONTROL (17C20)		750p	SIEMENS
	KORTING			FC616 FC631
	18279, 18396, 18460, 1852	1 SE RC 108	750p	FC742
	40540 VTS	RC 108	750p	
	LOEWE			SONY RM604, R
	DC11	RC 146	800p	32 CHAN
	MATSUI			RM613
	010270601	RC 889	750p	RM632, R
	VX770	RC 892	750p	TATUNG
	JAVA COLOR (6890)	RC 166	800p	FXA
	COLOR (7156)	RC 183	800p	RC70
	JAVA (7180)	RC 184	800p	FX70 FAS
	MITSUBISHI			TELEFUN
	939P/03607, 939P/03609	RC 140M	850p	FB632
	NOKIA			FB 639
	SATELLITE	RC 550	750p	THORN/F
	NORDMENDE			3V35-42
	TC2336	RC 351N	750p	3V31-32
	CMC1, TC3519	RC 356	800p	3V57-58 TX10 TEX
	OCEANIC	00.000	500	TX10 TEX
	390C9500	RC 339	750p	TX9-90-1
	ORION	DC con	750p	3V55, FV1
	RC53	RC 892	730p	TX100 FA
	PANASONIC EUR51200	RC 200	800p	TX100 ST
	TC2200	RC 201	850p	PROFESS
	VSQ0357/NV730	RC 202	750p	TOSHIBA
	TNQ1621	RC 203	750p	CT937
	PHILCO	A CHICAGO	1	CT9117 201R4B
	CARVEL, CONCORDE,	RC 108	750p	2011175
	TELESTAR		055	We
	TC10	RC 152	900p	
	PHILIPS	20.00	750	01
	RC5002,5154 KT3 NON TEXT	RC 134 RC 135	750p 750p	
	69117032	RC 178	750p g008	R
	69117194	RC 180	750p	
	RC5991-UNIV	RC 300	580p	-
				1

Description	Order	Price
	Code	
PHILIPS (continued)		Sec.
RC38	RC 301	750p
KT3 TEXT	RC 5301	750p
RC5352	RC 5352	750p
RC5375	RC 5375	750p
RC5 STANDARD	RC 5534	850p
RC5901	RC 5901	850p
RC5903	RC 5903	700p
SABA		
T6772	RC149	900p
TC319-320	RC 328	800p
TC356	RC 356	800p
TC358	RC358	800p
TC360	RC 360	750p
TC365	RC 365	750p
CALODA		
SALORA	RC 190	7500
SERIES L	RC 882	750p 750p
86173	NL 802	/30p
SANYO		
RC218, RC222, RC228, RC238	RC 140M	700p
JXGE	RC 878	800p
JXDE	RC 884	750p
VHR2300	RC 890	750p
RC628	RC 865	900p
CHARD		
SHARP	RC 140M	850p
G0121CESA, 123CESA, 204, 251	NC 1401VI	each
SIEMENS		
FC616	RC 130	850p
FC631	RC 132	750p
FC742	RC 164	750p
CONV		
SONY	RC 140	700p
RM604, RM605, RM606	RC 140M	700p
32 CHANNEL RM613	RC 141	750p
	RC 160	675p
RM632, RM636	110 100	0/39
TATUNG		
FXA	RC 877	750p
RC70	RC 883	750p
FX70 FASTTEXT	RC 894	750p
TELECHNICH		
TELEFUNKEN FB632	RC 632 ST	750p
FB 639	RC 639 ST	
LD 073	NC 033 31	7300
THORN/FERGUSON		
3V35-42	RC 342	650p
3V31-32	RC 344	750p
3V57-58	RC 628	750p
TX10 TEXT	RC 732	575 p
TX10 STEREO TEXT	RC 738	575p
TX9-90-100	RC 740	675p
3V55, FV11	RC 783	750p
TX100 FASTTËXT	RC 785	650p
TX100 STEREO FASTTEXT	RC 789	650p
PROFESSIONAL	RC 790	650p
TOSHIBA		
CT937	RC 950	750p
CT9117	RC 951	750p
201R4B	RC 952	750p
2711179		

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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

Spring Hook Mi VCR Head Extractor

Order Code: TOOL10 Price: 2900p **FUSES**

	TIME (20m	QUICK BLOW (20mm)		
Value	Order Code	Price	Order Code	Price
160mA	FUSE 01	75p	FUSE 17	60p
250mA	FUSE 02	75p	FUSE 18	60p
315mA	FUSE 03	75p	FUSE 19	60p
400mA	FUSE 04	75p	FUSE 20	60p
500mA	FUSE 05	75p	FUSE 21	60p
630mA	FUSE 06	75p	FUSE 22	60p
800mA	FUSE 07	60p	FUSE 23	60p
1A	FUSE 08	60p	FUSE 24	60p
1.25A	FUSE 09	60p	FUSE 25	60p
1.6A	FUSE 10	60p	FUSE 26	60p
2A	FUSE 11	50p	FUSE 27	60p
2.5A	FUSE 12	50p	FUSE 28	60p
3.15A	FUSE 13	55p	FUSE 29	50p
4A	FUSE 14	55p	FUSE 30	50p
5A	FUSE 15	60p	FUSE 31	50p
6.3A	FUSE 16	60p	FUSE 32	50p

1400		-
FI	JSES	
CURRENT RATING	ORDER CODE	PRICE
CERAMI	C PLUG TOP	
3A	FUSE 33	100p
5A	FUSE 34	100p
13A	FUSE 35	100p
20mm CER	AMIC TIME LAG	The same
3.15A	FUSE 41	100p
4A	FUSE 42	100p
5A	FUSE 43	100p
6.3A	FUSE 38	100p
8A	FUSE 39	100p
10A	FUSE 40	100p
32mm CERA	MIC SLOW BLOW	
8A	FUSE 44	210p
10A	FUSE 45	210p
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Sate

s I was driving away from the As I was driving away a call on my mobile telephone. A local electronics design company had a gentleman in reception: he wanted his Pace MSS1000 satellite receiver mending. Could I come immediately? As luck would have it, I was less than three minutes away - and the customer was quite impressed when I told him that his receiver would be ready for collection that afternoon

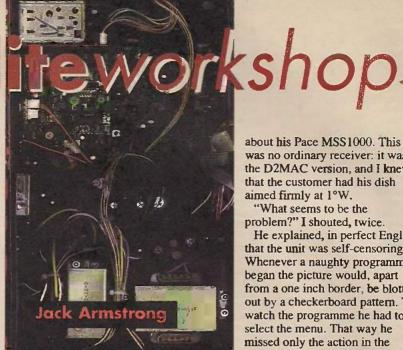
He thought that the intermittent audio was being caused by his scart lead, which was "only a metre long". It had been stretched tight, and the scart socket was badly marked and distorted.

Back at the workshop I discovered that the real culprit was the MSP3400 audio processor ship U18. This has about a zillion legs, spaced close together, and is time consuming to remove. If you use solder braid, be careful to avoid touching the adjacent surface-mounted components - I've seen one attempted repair where the dealer had unwittingly drained the solder away from these.

Once I'd replaced the audio processor chip I fitted a double scart socket from a scrap MSS1000 and tested the unit. As there were no problems I reassembled the unit and gave the owner a call.

The Grundia GRD150

A nice lady brought me her Grundig GRD150 receiver for repair. The



audio had never been very good, but when her son connected it to the stereo hi-fi stack there was a very noticeable sibilance. A number of upgrades have been issued by Grundig, one of which covers this very problem. The items to check/replace are as follows:

- (1) Replace C28 with a 470µF, 16V type if this value is not already fitted.
- (2) Change C24 and C32 to 0 1 µF.
- (3) Add 12pF capacitors in parallel with R41 and R42.
- (4) If L4 and L7 are not 4.7μH, change R40 and R43 to $47k\Omega$, change R44 and R117 to 680kΩ and change C23 and C25 to 22pF.

It took some time to locate the surface-mounted components around the ASIC chip IC1, so I decided to make a layout picture (see Fig. 1) which will be useful for future reference. There's not a great deal of work involved, but it does make life easier if you have to hand the surface-mounted components required and diagram before you start.

The customer was delighted with the result and phoned me the following day to say so. It made a pleasant change from the usual grumbles.

Norwegians Would

So you don't have to shout at foreigners to make yourself understood! A Scandinavian neighbour came to my workshop to seek advice

about his Pace MSS 1000. This was no ordinary receiver: it was the D2MAC version, and I knew that the customer had his dish aimed firmly at 1°W.

"What seems to be the problem?" I shouted, twice.

He explained, in perfect English, that the unit was self-censoring. Whenever a naughty programme began the picture would, apart from a one inch border, be blotted out by a checkerboard pattern. To watch the programme he had to select the menu. That way he missed only the action in the centre of the screen.

I told him to leave the unit with me so that I could test it that night. I had to force myself to stay awake, and it took me some time before I traced the cause of his problem to the fact that when you select Norwegian subtitles the naughty programmes are automatically blanked out. With any other language selected for the subtitles the picture remains clear. I've seen this with other D2MAC decoders, so it was no surprise. It probably explains why the Norwegians speak such good English - they learn it from the subtitles.

Since the customer left his official smart card with me, I decided that I had better keep the receiver for at least a week's soak test - just to be sure that the fault had been cleared, you understand.

A Grundig GRD200

The postman delivered a Grundig GRD200 for repair. It failed to show any decoder messages. Naturally I dived into the decoder board, and it was only after I'd replaced every

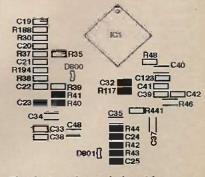


Fig. 2: Drawing to help with component location, Grundia GRD 150.

Fig. 1: Positions

components, on

of the surface-

mounted

PTV chip that I realised I hadn't checked the input and output signals.

My scope soon showed that the signal wasn't being routed through the decoder at all. The cause of the fault was the horrible 'gull-wing' ASIC chip beneath the board. This surface-mounted device is a pain to remove without the correct (expensive) equipment.

A replacement chip was ordered from the only Grundig stockist. As they hold no stock, it had to be obtained from Germany (1 had to find this out for myself). Meanwhile the customer was going doolally and telephoning me every other day.

When it did eventually arrive it was packed in an ordinary polythene bag with no antistatic protection whatever. My views about this are unprintable! Fortunately the receiver worked perfectly once I'd soldered the new chip in place – but whose fault will it be if the chip fails in a few weeks' time?

Although I've had several receivers in this series for repair, they are highly reliable – the failure rate is less than half a per

cent. I've confirmed this figure with other dealers. It compares favourably with the ten per cent rate of other makes.

FilmNet Decoder

The postman looked quite pleased as he dropped an enormous box on my counter. "Been doin' some weightlifting" he grinned. In fact the parcel was as light as a feather. It contained only a Philips FilmNet decoder, in a sea of polystyrene foam chips. I remembered telling the customer to pack it well – he'd done an excellent job. Some distributors originally shipped these units in a cardboard box with no packing whatsoever. I've seen several whose main board had snapped in two.

The complaint was of "speckly pictures". When I hooked up my trusty Pace SS9200 test receiver the pictures were very blotchy indeed. After replacing the usual socketed ICs without success, I traced the cause of the problem to the VCU2133 chip.

The picture was also reluctant to lock in place. It would scroll leftwards for half a minute before stabilising. This was easily cured

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

by entering the service mode, punching in "1 5 0" and using the handset to alter the VCO setting until picture movement stopped. The Philips handsets are not cheap, but mine has paid for itself several times over. The English language User Manual from SatCure (01270 753 311) is also quite useful: it includes all the service mode codes.

Test Case 407

Cathode Ray had been having a good time in the workshop—until the Hitachi C2118 (G7PS Mk 2 chassis) came back! He'd repaired it three weeks previously, charging Mr Robinson a handsome sum for replacing the overvoltage protection diode ZD903, a 130V zener type. This item had gone short-circuit, stopping the set's operation in no uncertain manner. Now here it was back again, with a rude note from the shop saying, in effect, "bounced repair, no go".

Ray took off the back cover, slid out the chassis and went straight to ZD903. Sure enough his replacement had gone short-circuit, and once again a new one restored the sound and picture. So why had two diodes failed? In the normal course of events, Ray would have turned to his good friends Sage and Television Ted for advice. But Ted was off sick and Sage, tiring of rainy Wales, had jetted off to Corfu. At that moment he was downing red wine in a Sidari bar. It beats mending TVs and VCRs!

Instead, Ray rang up Warner Rogers, the lecturer at our local tech, who after all had got him through City and Guilds 272. "What would make a 130V zener diode fail?" he asked.

"There's no such thing as a 130V zener diode" boomed Warner, "check your voltages." Not very helpful!

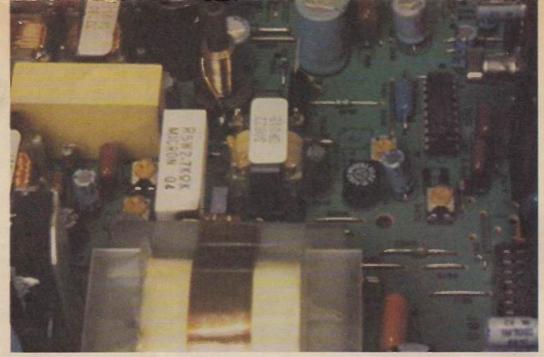
Well, the set was still working, with the BBC-1 afternoon programme on view. Why not give it a soak test and see what happened? But it was a pity that Ray didn't tune in some sort of test card or pattern display – this may have given him a clue. Towards the end of the day a clue presented itself anyway: the set tripped and cut out. When it was switched off and on again however the set perked up and continued to work. As it seemed likely that the troublesome zener diode was about to be splatted

once more, Ray decided to carry out some tests in the power supply.

He hooked a voltmeter to the HT rail and obtained a reading of 121V across the 100µF smoothing capacitor C720, which is in parallel with ZD903. Had he checked the picture size, he may have realised at an earlier stage that the HT voltage was too high. He should perhaps have done so three weeks before, when the original 'repair' had been carried out. Anyway, he found the HT preset VR901, and wound it down until the HT voltage reading was 114V, at which point VR901 ran out of travel—it was at minimum.

Now this was one circuit that Ray well understood. The error amplifier transistor's collector current depends on the feedback at its base, tapped from the slider of VR901, and the voltage at its emitter, which is set by the 6.8V zener diode ZD902. He replaced ZD902, and the transistor (Q905) for good measure. Now, with VR901 at minimum, he could get the correct HT voltage reading of 112V. He reassembled the set, but was dismayed to see that the picture size still fluctuated somewhat. For the next couple of days however the set neither tripped nor blew up its overvoltage protection diode.

Later in the week Television Ted returned. He wanted to know all that had happened in his absence. Told about the Hitachi set, he demanded to see the picture, then tuned in a test pattern. The picture size variations told their own story. Once more the back came off – the set hadn't been properly repaired, and the root cause of the problem was still there. What was it? And what did college mentor Warner Rogers mean about there being no such thing as a 130V zener diode? Ray had one in his hand, didn't he? For the solution, turn to page 52.



The Philips G110 Revisited

Richard Newman provides a service update on the chassis he wrote about in the December 1995 issue

have come across several faults of interest to service engineers since covering this chassis in December 1995. Naturally most of the problems have related to the power supply, so we'll take this first.

The Power Supply

Normally these sets come to life and operate correctly when the recommended Philips service kit has been fitted (part no. 4822 310 20489). But there are always exceptions.

A recent power supply rebuild failed to resolve the problem. I must admit that I had my suspicions from the start with this particular set. The BUT18AF chopper transistor had a hole blown through it, which is something I'd never seen before. After fitting the kit and doing the usual tests, I found that the set flatly refused to start. As the cause of the fault was definitely on the primary side of the power supply, I made some careful checks in this area. This revealed that R3615 (220 Ω) and R3616 (100 Ω) were both open-circuit. So it was not surprising that the set wouldn't start, since they are both associated with the chopper switch-off transistors T7615/T7616. Once they had been replaced the power supply started up and all was well.

When carrying out a basic rebuild, be careful of diode D6653. I've found that this is sometimes incorrectly marked on the PCB. Its cathode should point towards transistor T7652.

Sometimes, even after a rebuild, the power supply will fail instantly when the set is put into the standby mode. This is normally because coil L5619 (3.9µH), which is connected series with the base of the chopper

transistor, has gone open-circuit. I found out about this the hard way, and now always replace L5619 as part of a normal rebuild, together with the 10Ω resistor in parallel with it (R3619).

Extra Kit

Philips now produces an extra kit, ES7059 (part no. 4822 310 10708), which includes this choke and fourteen other parts. It's supposed to be used with 'rogue' sets, in conjunction with the main kit (SBC7020, part no. 4822 310 20489). I keep a couple in stock, but have not had to use them so far.

With this extra kit, it seems that ninety per cent of all known faults in the G110 chassis can be cured. But there is one thing you have to be careful about with this kit. Don't take too much notice of the component part numbers printed on the fitting instructions that come with it. They seem to have been changed at some point. Fortunately the zener diodes have their type and rating printed on the relevant packaging and the transistors are marked with the correct code.

Other Faults

I had a real nasty some time back. With a high-brightness scene the width would come in by as much as one and a half inches. Since the HT was correct and rock stable, the cause of the fault was obviously in the EW correction circuit. Checks showed that the voltage at the emitter of the 2SA1359 diode modulator driver transistor T7533 was bobbing up and down in sympathy with the width variations. More by accident than logical testing I found, after much checking around, that C2526

(8.2nF) was leaky – the test reading was several $k\Omega$. A new chip capacitor restored normal width. I've had this fault again since that first episode. It's also worth checking the width control, which can go open-circuit. The result is a wide, uncontrollable picture.

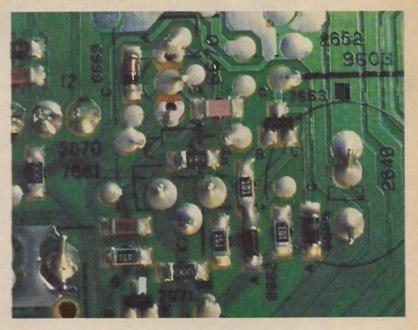
The report with one set that came to me said the picture had suddenly shifted to one side, after which there had been a loud pop and a puff of smoke. At that point the owner had wisely switched off. On investigation I found the remains of C2594, while C2593 was badly swollen. These two 10µF, 25V electrolytics are in the line shift balance circuit. The two transistors in this circuit, T7593 (BC858) and T7594 (BC848), were both leaky. Presumably the capacitors didn't like the excess voltage and line pulses to which they had been subjected. Normal operation was restored on replacing these items.

Control Faults

A TMP47C634N microcontroller chip (IC7720) is used in these sets. Its mask number varies with the software incorporated. If a fault arises in the control system, an F code will be displayed and the LED at the front of the set will blink.

I recently had a set that displayed F2 intermittently. The cause was dry-joints at the Nicam board's edge connector. There's a complete list of the F codes at the back of the service manual. Since F2 relates to the input/output expander chip on the Nicam board, this led me to the dry-joints.

With some faults there will be no display because the set will shut down (go to standby). The LED will blink



however, and its off time can be measured with a scope to help pinpoint the fault area.

in Conclusion

I hope that these further notes will be of help. Strangely, I am quite an enthusiast of these sets – probably because they presented something of a challenge in the early days.

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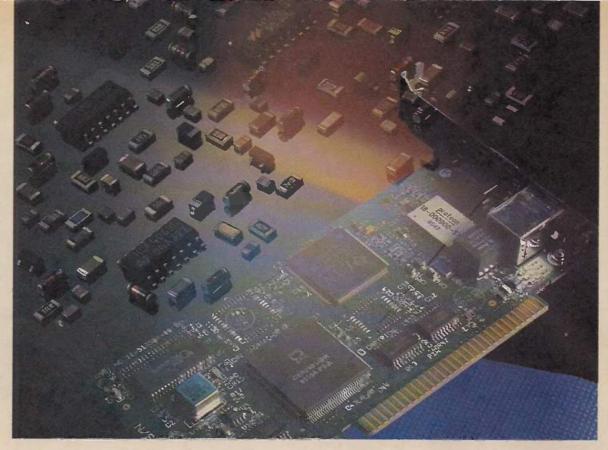
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Surface-mount failure mechanisms

Martin T. Pickering, B.Eng., on ways of reducing the stresses that can fracture surface-mounted components

n a previous article (May 1996) I promised to elaborate on stress fracturing of surface-mounted components. The following notes are based on personal experience and on discussions with various manufacturers, including Syfer Technology, AVX and Vitramon. The discussions and tests were carried out some years ago, but the relevant component technology has not altered significantly and the conclusions should remain valid.

As with my previous article, the notes are intended to provoke thought rather than lay down didactic rules. I don't want to impose 'rules' on anybody, but I do want those concerned to have a basic understanding of the problems that can occur and possible solutions.

Multilayer Ceramic Capacitors

The multilayer ceramic capacitor (MCC) is the component in which stress fracturing principally occurs, though it can also affect resistors. There's a multitude of possible causes. I will deal briefly with a few of them. It's useful to know how MCCs are manufactured, so that their internal structure can be understood.

To my knowledge there are two production methods. With one, successive layers of ceramic paste, alternated with a special film, are laid down to build up a sandwich of these materials. The special film is then vapourised at

high temperature, leaving a ceramic biscuit with empty gaps between the layers. Finally, lead alloy is forced into the gaps at high temperature to form the electrodes.

The second method is to lay down successive layers of ceramic paste, alternated with silver or a silver alloy, then fire the whole thing to bake the ceramic.

In both cases the 'biscuits' must, at some stage, be chopped up to form individual components and metal end terminations added. One end will be connected to the even electrode layers, the other to the odd layers (don't ask me how!). The end terminations are usually deposits of palladium silver. Some manufacturers add a coating of nickel to reduce the possibility of silver being leached away during the soldering process. Fig. 1 illustrates the basic structure of an MCC.

Mechanical Stress

Surface-mounted resistors and capacitors are very brittle, their structure making them prone to fracture under certain circumstances. One such circumstance is when the component is soldered rigidly to a PCB that can be flexed. When such flexing occurs, any ceramic components that are subjected to a high-tension force will crack, usually pulling off an end termination (see Fig. 2).

Such a failure need not be immediately catastrophic.

The component is held together, and may continue to fulfil its circuit function for many years. In fact problems often arise only when a PCB assembly has been disturbed - perhaps to rectify a different fault - or after a period of high humidity and/or temperature change.

We carried out tests to show the effects of mechanical stress. Two test boards were made up (see Fig. 3) with pairs of tinned copper pads in a row across the centre. Type 1206 ceramic capacitors, with a thickness of less than 0.6mm, were soldered to the pads of one board. Thicker capacitors were soldered to the other one. The resultant assemblies were checked carefully to ensure the integrity of the capacitors.

Each board was then placed in a jig that applied pressure along the board's centre line - directly above the capacitors, which were on the underside. The boards were flexed until cracking noises were heard (at 2.5mm flexure in the centre of a board of 100mm length). The boards were then removed from the jigs and the capacitors were checked. Only small variations in capacitance from the original values were detected - less than ten per cent. Some capacitors showed no electrical change at all.

The boards were then subjected to several temperature varying cycles in a humidity chamber. After being allowed to rest at room temperature for an hour, the capacitors were again checked. More than half of the thinner capacitors showed a massive decrease in capacitance value, and several of the thicker ones did as

well. In addition, leakage current was high

This was a fairly drastic test to prove what was already obvious: bend something that's brittle and it snaps! It's also obvious that a slate snaps more readily than a brick. Less obvious was the fact that there would be no measurable sign of damage until the capacitors had been subjected to temperature/humidity conditioning. The point here is that initial function testing would have shown no board faults, but they could have failed in

The tests were taken further. More boards were made, but with narrower solder pads. It was found that if the pad width was reduced to 60 per cent of the width of the capacitor, not fracturing at all occurred! At 75 per cent the cracking was minimal. Thus to eliminate mechanical stress fracturing, all you have to do is to reduce pad widths to two-thirds of the component widths. In fact we found that a pad is not really needed at all: the track width alone is sufficient to ensure a reliable joint. The solder connection then becomes a sort of flexible buttress at each end. In addition to ensuring that mechanical stress is not transferred to the component, this approach minimises solder use and, as an extra bonus, leaves more room for tracks.

Some further experiments were carried out. The components were mounted at angles, so that they did not lie on the axis of the tracks. The solder joints were still good. Even when the solderable ends of the tracks were moved away from each other, so that the components only just touched them, the soldering was still perfect.

So the solder pad does not need to lie beneath the component. It can simply butt up against the end termination. In practice however it's necessary for the pad to extend a little way under the component to allow

for placement tolerances.

To summarise, we have the following advantages: solder pads can be smaller, with less solder (which is expensive) required; more room is left for additional tracks around and beneath components; and there is less risk of solder forming unwanted bridges between pads.

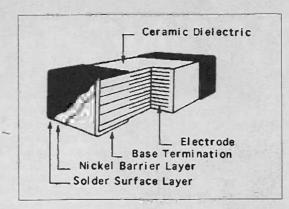


Fig. 1: Basic multilayer ceramic capacitor structure (Syfer Technology Ltd.).

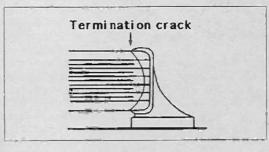


Fig. 2: Damage caused to an MCC end termination by mechanical stress (Syfer Technology Ltd.).

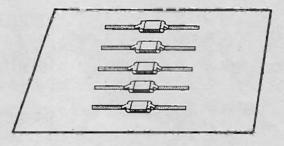


Fig. 3: Sketch of a board set up to test MCC stress conditions.

Causes of Mechanical Stress

There may be good reasons why you cannot or won't reduce the solder pad width. There is often great resistance to change, especially in large organisations. In many companies the "we've always done it this way" attitude persists. It can take many years to implement the simplest of changes. With this in mind, the thing to do is to avoid subjecting components to stress

Mechanical stress occurs when a board is flexed. The effect of the stress on components can be reduced by aligning them along the line of greatest flexure instead of across it. It helps if the board size is small. Board flexing can occur in the following circumstances:

- (1) As the board cools after soldering it can change shape. There is little you can do to prevent this, but you can slow it down.
- (2) A board is often flexed when it's fixed in a test jig. Look at he design of the jig.
- (3) Boards are often flexed when they are pressed on to plastic clip pillars or bolted into a housing.
- (4) Flexing occurs when a daughter board is pressed or cropped from a mother board.

Thermal Stress

The test boards mentioned above were also used to subject the capacitors to thermal shock. Each capacitor was heated with a soldering iron tip, then the board was plunged into cold water. Cracking noises were heard.

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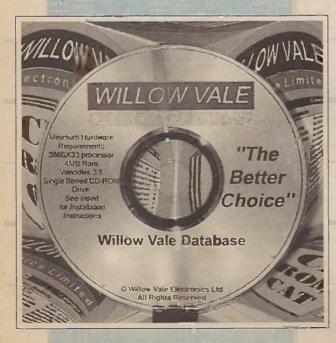
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plunged into cold water. Cracking noises were heard. Once again we were proving the obvious, but it was instructive to discover the failure modes.

This time the thick capacitors cracked while the thin ones didn't. In addition, only the capacitors soldered to wide pads failed. This may have been because of the larger thermal mass of solder, or to the more rigid joint. The cracks could be seen under a microscope. Most of the capacitors that cracked did so at one end termination, the crack propagating diagonally through the body of the capacitor. A few showed a characteristic semicircular wedge crack near the centre. Again the effect of the cracks could be measured only after humidity conditioning.

This test was unrealistically harsh. In practice you don't get this degree of thermal shock. A lesser shock can occur during soldering however, and capacitor failures have been experienced after wave soldering. To prevent this, it's important to heat the board assembly before it reaches the solder wave. The temperature difference between the components and the solder should be minimised (it should preferably be less than 100°C). Many wave-soldering machines cannot achieve this. The damage will be greatest at the outer edges of a PCB, since these are often much cooler than the centre after 'pre-heat'.

Thermocouple measurements on a PCB can and should be carried out to check all soldering machines. The results may well horrify you.

Crushing Forces

The equipment used to place surface-mounted components on a board can also cause damage.

The suction-tube type presses directly down on the centre of the component. While the placement force can be set for a particular component thickness, if there is debris on the board, or the component is replaced with a thicker type and the equipment is not reprogrammed, the force exerted may be too great.

Other placement machines use jaws, which can crush the component if set incorrectly.

In either case, examination of the component under a microscope will reveal damage that differs from thermal or mechanical stress cracking.

Inherent Faults

This article has been concerned with faults caused by assembly methods. A tiny percentage of capacitors are faulty when made however. The production problems, using a combination of metal alloys and ceramics, with high-temperature processing, virtually guarantee that there will be a number of faults.

Modern manufacturing methods and screening tests have reduced the number of such faults to minuscule proportions. You can safely leave the manufacturers to worry about them.

In Conclusion

It would be impossible to cover all aspects of surfacemounted technology design in a short article such as this. I have therefore concentrated on points that are most often overlooked or are perhaps unknown to younger designers.

In my previous article on design reliability I mentioned that a lot of design knowledge and experience fails to be passed on to younger designers. As a result, mistakes continue to be made. Hopefully, through articles such as this one, we can redress the balance — by making designers aware of potential problems before they become production disasters

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Reception

Reception of Channel 5 will present different problems in different parts of the country. Bill Wright surveys the likely situation

or over a quarter of a century a rational, efficient UHF TV channel allocation plan has been in operation in the UK. Four channels, broadcast from co-sited transmitters of identical power, have been available to almost everyone, only a single, small receiving aerial being required. A few channels in the middle of the band were reserved for other purposes: they have come to be convenient for signals generated at the receiving site – by VCRs, satellite receivers and TV games. Three channel groups have between them catered for almost every transmitter, making the business of stocking and selling aerials very simple. Now, with the advent of Channel 5, all this is about to change.

A great deal has been said and published about the technical rights and wrongs of Channel 5, but come January 1st 1997 it could be a reality with which we shall have to deal. There will be an initial period of hooha, when half the country will find that it is suffering from interference of one sort or another. Then we will settle down to a five-channel (or four plus one channel) situation. In this article we will be looking at the techniques that will be required for Channel 5 reception once the VCR etc. interference problems have been dealt with.

Will Channel 5 make us rich?

Well no, I don't think so. In a large part of the country existing aerials will provide acceptable Channel 5 reception. This will be the situation where the new transmission falls within or adjacent to the channel group already in use, where the polarisation is the same,

where the transmitter power is similar and where the transmitters are co-sited (or at least in the same general direction).

Most aerial manufacturers have modified their Group A and Group B products to include ch. 37, by far the most common one to be used for the new service. A few quick tests have shown that even pre-Channel 5 Group B arrays perform reasonably well on ch. 37. But Group A aerials don't, their response falling off significantly above ch. 34. Incidentally the Nottingham relay will have the new service on ch. 34, which is within the channel group already in use and a continuation of the existing channel sequence (21, 24, 31 and 37). Same transmitter site, ERP, polarisation and channel group—not much extra work there for the aerial riggers of Nottingham!

Will it make some of us rich?

In many areas the Channel 5 signals are to be transmitted at much lower power than the existing services and on a frequency outside their channel group. So it looks as though a lot of viewers will have to spend money if they want to receive the new service satisfactorily. Or, to put it another way, for zero expenditure many people within the planned service areas will get no more than a very snowy Channel 5 picture.

How much will people be prepared to spend to receive Channel 5? When you consider many customers' astonishing tolerance of poor TV reception, it's likely that many will accept below standard Channel 5 pictures rather than pay for another aerial. In many cases a Channel 5 installation will require a diplexer and possibly a masthead amplifier, pushing the cost up still further.

Certainly many viewers will wait to see whether the channel is worth having before they pay up. Enthusiasm will no doubt be generated should the new channel turn out to be a commercial success, with attractive programming.

None of this will apply with commercial installations, where the assumption is that good quality reception of

all local TV services should be available.

An examination of the transmitter list (see September issue supplement and page 863 last month) will show that different parts of the country are going to have very different reception conditions. For aerial nerds like me, who travel the country peering excitedly at the rooftops, this will be an interesting test of local riggers' ingenuity. I look forward to seeing many a strange configuration atop the nation's chimneys. Later in this article I'll look at the situation that is likely to arise in some parts of the country, taking Sheffield and East Anglia as representative examples. First, let's consider some general problems.

Multiple use of Ch. 37

The use of ch. 37 by transmitters that are by all previous standards too close together will inevitably result in some co-channel interference. There will be large areas where otherwise good reception will be affected. A particular example will be that part of the country lying between Sheffield and Nottingham, where there will be a strong possibility of mutual interference between the Emley Moor and Lichfield transmitters. It appears that the two signals will be of equal strength at some locations, making usable reception impossible.

One drawback of analogue TV transmission is its great susceptibility to co-channel interference. Even where there is a 40dB differential between two signals, visible interference will be present. Theoretically the front-to-back ratio of the aerial could provide 25dB of rejection, but since the transmitter bearings at Alfreton, Derbyshire for example are 130° rather than 180° apart the practical rejection figure is likely to be much less. A signal that is too weak to produce a picture itself can still cause patterning.

Another area of ch. 37 overlap will be the Isle of Man. As there will be no Channel 5 transmitter on the island, reception will be possible only in northern coastal areas, from the mainland. Unfortunately, any signal from Divis will probably suffer permanent or intermittent

interference from Cambret Hill.

We will no doubt have to redeploy anti-ghosting techniques – stacked and phased arrays, and the use of buildings as a screen. But no matter what we do, the effective service area of some transmitters will inevitably be reduced by co-channel interference, which produces close-spaced horizontal lines on the screen. Even when it is slight, this venetian blind effect can be very annoying, especially with a large-sized screen.

The broadcaster will presumably attempt to minimise the problem by the use of frequency offsetting. With offset operation the carrier frequencies are moved from the nominal by either zero, +5/3 or -5/3 of the line frequency. It has been found that these values minimise the visible effect of co-channel interference.

Transmitters not Co-sited

In a radical departure from previous UHF planning, some of the Channel 5 transmitters will not be co-sited

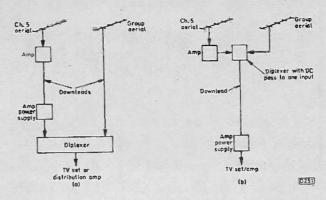


Fig. 1: Channel 5 received using a separate aerial with a masthead amplifier. When Channel 5 is well outside the existing channel group, it should be possible to use a diplexer to combine the signals. In the arrangement shown at (a) the diplexer is mounted below the amplifier's power supply. If a diplexer with a DC throughpass to one input is used, as shown at (b), it can be fitted at the masthead, removing the need for a second downlead.

with the existing TV transmitters for the service area concerned. The service areas affected are:

Crystal Palace: Channel 5 from Croydon.
Divis: Channel 5 from Black Mountain.
Pontop Pike: Channel 5 from Burnhope.
Ridge Hill: Channel 5 from Churchdown Hill.
Rosemarkie: Channel 5 from Mounteagle.
Rowridge: Channel 5 from Fawley.
Sudbury: Channel 5 from Chelmsford.
Sutton Coldfield: Channel 5 from Lichfield.

Where the two transmitters lie in the same direction, or within 10° or so of each other, the same aerial will probably receive them both without problems. No doubt where the two are say 45° apart the cowboys will happily align aerials somewhere in the middle. A few bemused viewers, such as the inhabitants of Shenstone in the English Midlands and Annfield Plane in the North East, will find that their Channel 5 signal comes from a direction more or less opposite to that of the other channels. I expect the cowboys will throw the reflectors away.

Even where the two signals come from almost the same direction, problems might arise should there be large differences in field strength because of screening along one signal path.

Combining Signals

There will be many areas where a separate aerial is required for Channel 5, either because the reception angle between the two transmitters is too great, because one or both signals is/are very weak, or because of severe ghosting problems. This raises the question of how to combine the signals.

Never use a splitter to combine the signals from two aerials. This has a disastrous effect on the installation's directional characteristics, especially when both aerials are of the same channel group. Ghosting will be likely. In the case of the Chelmsford and Sudbury transmitters a simple diplexer can be used, as shown in Fig. 1, because the channels are 41, 44, 47 and 51 and, for

Table 1:	New Antiference	e diplexers.
Model	Low input	High input
UF3134	21-31	34-69
UF3437	21-34	37-69
UF3739	21-37	39-69
UF4648	21-46	48-69
UF4850	21-48	50-69
UF5052	21-50	52-69
UF5355	21-53	55-69
UF6567	21-65	67-69

Channel 5, 63. A normal A/B to C/D diplexer will suffice.

With Channel 5 in mind, Antiference is to introduce a new range of diplexers that cover most permutations, see Table 1. They are outdoor units, with a switchable DC pass to one or both inputs.

In some cases it may be better to use a channel-pass filter (see Fig. 2) rather than a diplexer. If Channel 5 is on a frequency close to the existing transmissions, or if there is need for particularly good out-of-band rejection, channel-pass filters are to be preferred.

LO and Image Interference

The standard four-channel groupings used in the UK rigorously avoid five-channel and nine-channel spacing. This is because of image-rejection and local oscillator interference problems, which are inherent in the design of a superhet receiver. For the same reason, it's good practice to avoid these channel spacings when installing a satellite receiver or VCR.

Imagine my surprise therefore when I found a number of n+5 and n+9 clashes as I compared the Channel 5 allocations with the existing four channels in each area. These clashes are as follows:

Black Hill: BBC-2 ch. 46, Channel 5 ch. 37, n+9 clash. Huntshaw Cross: BBC-2 ch. 62, Channel 5 ch. 67, n+5 clash

Lichfield/Sutton Coldfield: BBC-1 ch. 46, Channel 5 ch. 37, n+9 clash.

Presely: BBC-1 ch. 46, Channel 5 ch. 37, n+9 clash.

Some TV sets and VCRs will react badly to this. I have two Panasonic VCRs at home, an NVG40 and an NVL20. Neither will receive ch. 59 properly, because we also use ch. 54 (one day I'll do something about it!).

I've recently been called out to a large communal aerial system that uses Crosspool (chs. 21, 24, 29 and 31) and Bilsdale ITV (ch. 29). It's a fairly deprived area, and the TV sets are a rag-bag assortment. Quite a few of them display distinct patterning on ch. 24 because of the presence of the ch. 29 signal.

It seems inevitable therefore that the frequency clashes listed above will cause problems. There is no quick or cheap fix for this, other than attenuating one signal in the hope that the patterning on the other will disappear before the first one becomes grainy – and of course doing the converse, increasing the level of the channel with the interference. Such tricks are not really a good idea however: they are rarely very successful, and we should always aim to present every TV set with all the channels at a correct and equal level.

Channel changers are the answer, but since goodquality units would raise the bill for receiving Channel 5 to more than the cost o a satellite system I can't see many domestic customers being interested. A device

announced by Pace – it apparently moves ch. 37 signals to ch. 68 – might find an application here. We'll return to channel changers in Part 2, when we deal with distribution systems.

Wide Channel Range

Sheffield would be well within the Emley Moor service area were it not for the fact that the city is low lying and surrounded by hills. A high-powered relay transmitter, Crosspool, serves the city and many outlying areas. It transmits on chs. 21, 24, 27 and 31, at 5kW (vertical). Channel 5 will be right up near the top of the band, in ch. 67, at 2.5kW (vertical).

I am taking Sheffield as an example, but there will be a number of other areas where the existing four channels are within group A and the new service is up at the top end of group B or within group C/D. This section thus applies to the following: Belmont, Blaen Plwyf, Caldbeck, Craigkelly, Durris and Fenham.

Channel 5 reception is going to be very poor at most existing installations, because the group A aerials in use perform very badly at the higher channel frequencies. As most forms of signal screening, in particular trees, attenuate the higher frequencies more severely than lower ones, we can expect some screened locations to have ch. 67 (in the case of Sheffield) coming in at 15 or 20dB below the existing services. This is reminiscent of the start of UHF transmissions, when we discovered that Band IV and V coverage is much more patchy than Band III. Those with even greyer beards than mine will chime in "yes, and it was just the same when ITV started, using ridiculously high frequencies such as 200Mc/s". What a pity that the new service could not be on ch. 34, which would mean that Sheffield would use the same channel line-up as Nottingham. And why shouldn't the service be on ch. 34? A casual look through the transmitter lists for any existing ch. 34 signals that might suffer from interference reveals - nothing!

Wideband Aerials

Where the field strengths are high, it will often be possible to carry out a straightforward aerial replacement, using a wideband array instead of the existing grouped array. But remember that wideband arrays don't work as well as their grouped equivalents. Channels near the ends of the bandwidth are particularly likely to suffer from reduced gain and directivity. For example the gain of the Antiference XG8 aerial in the group A version is 15-5dB on ch. 21. The wideband version of the aerial manages just 8-5dB on this channel. Amplification might compensate for the signal level shortfall, but it will not help with ghosting, a likely consequence of the wideband aerial's inferior directivity.

The cheap 'contract quality' wideband Yagi arrays, which consist of a folded dipole and reflector cut for group A and a chain of eight directors cut for groups B and C/D, are in my opinion next to useless. Log-periodic and stacked dipole ('fireguard') arrays are far better but don't have very good gain. Simply replacing a grouped array with a wideband one is going to be a dodgy business. The customers won't thank you if your attempts at improving their Channel 5 reception result in poor reception of the other four channels!

When we take into account the lower transmitter ERP and the increased cable loss at the higher frequency, in an unscreened location the ch. 67 signal from the Sheffield transmitter will probably arrive at the TV set at 8-10dB less than the other channels. This will not be acceptable in areas of moderate or low field strength, so other measures must be considered. In many cases a

broadband masthead amplifier will be fitted, raising all signal levels more of less equally. At difficult sites, or where quality matters more than cost, installations will probably involve a separate aerial, a masthead amplifier and a diplexer (Fig. 1) or a set of channel-pass filters (Fig. 2).

Narrowband Aerials

If a separate aerial is installed it will need to receive only one channel. I wonder if some enterprising manufacturer will introduce a range of narrowband arrays, for chs. 34, 37, 56 and 67, the ones to be most commonly used for the new service? These would out-perform a normal grouped aerial hands down, since the design could be optimised for one channel.

To take the idea a stage further, a kit comprising a 'one-channel' aerial, a short connecting cable and a combiner would surely be a winner. The combiner would diplex the extra channel (only) with the rest of the signals, and would need switchable DC throughpasses available at both inputs to allow for masthead amplifiers.

A narrowband aerial would be a particular boon for ch. 37. This is going to be used at high power by a number of main stations, many of which will have coverage overlap with other transmitters that are going to broadcast Channel 5 either at very low power or not at all.

An example is the large service area overlap between Lichfield (Sutton Coldfield), Waltham and Sandy Heath. Lichfield will transmit on ch. 37 at 1,000kW, Sandy Heath on ch. 39 at only 10kW while Waltham won't carry the new service at all. Viewers in the Sandy Heath and Waltham areas will want to keep their own regional programming, so it looks as if there will be a large market for add-on aerials here.

Furthermore, within the coverage areas of the Channel 5 main stations there are literally hundreds of local relay stations that are not going to transmit the new service. Viewers using a relay will have to get their Channel 5 from the main transmitter. Reception is likely to be a problem, otherwise there wouldn't be a relay, and in most cases the new array will be fixed to the same mast as the existing installation. What's needed is a compact, light, end-mounted aerial with very good gain and directivity – these are much easier to achieve when the aerial is optimised for one channel.

The alternative is to use a group A or group B array for ch. 37. This is not an attractive idea, since either type of array would be working at the very edge of its designed bandwidth.

Because the Channel 5 transmitter network is only loosely modelled on that of the existing four-channel services, it's likely that reception from a different transmitter will be quite common in many parts of the country.

Channel 5 at Low Power

The most significant factor in the Channel 5 transmission plan is the use of a very low ERP (effective radiated power) in many areas. Taking East Anglia as an example, Tacolneston transmits on chs. 55, 59, 62 and 65, to which Channel 5 is to be added on ch. 52. This is fine, since most group C/D aerials work quite well down to ch. 49. But the ERP for the new transmitter is a bit of an eye-opener – a measly 4kW compared with 250kW for the existing four channels.

Now it's a fact that in the opinion of many East Angian aerial men Tacolneston is under powered as it is — which is true, since there is a ring of thirteen relay transmitters around the edge of this relatively small, flat region. The height of the Tacolneston transmitting aerials, at only

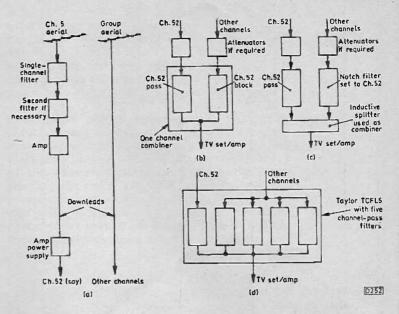


Fig. 2: Reception of Channel 5 where the transmission is low-powered but within or close to the channel group used by the other transmitters being received. One solution where there is a serious signal level imbalance between the new service and the existing four would be to use a separate aerial and masthead amplifier. For Tacolneston the Channel 5 aerial should be a group B type if a narrowband aerial is not available. A group B aerial will minimise pick-up of the four 250kW group C/D channels, and is likely to have better ch. 52 gain than a group C/D array. An 8MHz (one channel) pass filter tuned to ch. 52 provides further attenuation of the other channels to avoid possible cross-modulation in the masthead amplifier. The Taylor TCFL-1 is suitable. A second identical filter might be necessary. These filters have an insertion loss of 2dB and are not waterproof, so protection will be required if they are fitted outdoors.

The response of a diplexer is not sharp enough to combine signals that are only two or three channels apart, so channel-pass filters must be used. Three possible arrangements are shown in (b) - (d).

(b) Use of the Taylor TCFL1=1CH, which is intended for combining one UHF channel with the rest of the band. It has a single-channel notch filter at one input and a single-channel pass filter at the other. The notch filter will ensure that the ch. 52 signal does not get through and combine, in random phase relationship, with the other wanted signals. The channel-pass filter prevents masthead amplifier noise degrading the signals at the other port. It may be necessary to add attenuators at the inputs to obtain the correct signal levels.

(c) Use of separate channel-pass and notch filters. The trouble with the TCFL1-1CH is that it is factory tuned. It's not feasible to stock filters for every channel. If you operate in several transmitter areas you need to be able to build filters on the spot. The TCFL-1 and TBF4 are one-channel pass and notch filters respectively. For Band V use the TBF5. The TCFL-1 is sold as factory-tuned, but can be tuned about ten channels away from the nominal carrier. Thus only four filters need be stocked to cover the whole band. Accurate tuning requires the use of a spectrum analyser.

Use a good-quality inductive splitter to combine the outputs.

(d) Use of the Taylor TCFL5. If the signals are fed to a distribution system of any size, it's important that each channel is at the correct level. This justifies use of the TCFL5, which incorporates five one-channel pass filters. Each has three tuned stages and a variable attenuator, enabling the level of each channel to be set independently.

Various input configurations are available. For this application we need option A, which has four inputs fed from one aerial and a fifth input fed from a separate aerial.

Putting all the off-air signals through filters like this has another advantage; all unwanted signals are kept out. This eliminates many types of interference and ensures that unwanted inputs do not lower the amplifier's cross-modulation threshold.

221m above sea level, makes matters worse. This is much lower than virtually every other main transmitter in the country. Though the area is not hilly, Tacolneston doesn't even put a decent signal into some parts of Norwich, which is only twelve miles away. And the problem is field strength, not ghosting. So what chance has Channel 5, at 4kW?

The early coverage maps showed Tacolneston's Channel 5 coverage to be quite wide – not much less than that of the existing channels. A later version showed a considerably reduced coverage. With the signal more than 17dB down, even the later version could be optimistic. Sending 4kW out across the sparsely populated but broad acres of rural Norfolk sounds pretty ineffective. So Channel 5 is clearly going to be very restricted in East Anglia – and in many other regions. The transmitters with the most remarkable power disparities are as follows:

Caldbeck: Channel 5 10kW, existing channels 500kW, received signal level difference about 17dB.

Fawley/Rowridge: Channel 5 1kW, existing channels 500kW, received signal level difference about 27dB

signal level difference about 27dB.

Huntshaw Cross: Channel 5 2kW, existing channels 100kW, received signal level difference about 17dB.

Sandy Heath: Channel 5 10kW, existing channels 1,000kW, received signal level difference about 20dB.

Tacolneston: Channel 5 4kW, existing channels 250kW, received signal level difference about 17dB.

Winter Hill: Channel 5 12.5kW, existing channels 500kW, received signal level difference about 16dB.

Readers who operate in these service areas can amuse themselves by conducting the following imaginary experiment. You are at a customer's house where the reception might be good, bad or indifferent. Fit an 18dB attenuator and observe the results. That's Channel 5!

Masthead Amplifiers

OK, if this low-power transmission is really going to happen, what's to be done? Some viewers – those whose rooftops have a clear line-of-sight to the transmitter – will be able to receive the new service perfectly at little or no expense. In some cases the existing aerial installation will be highly inefficient, producing acceptable reception only because of very high field strengths. If a decent aerial is installed, good reception of the five channels may well be possible.

Where the existing channels are at reasonable but not excessive signal levels, a masthead amplifier will probably bring in a decent Channel 5 picture. But at locations where the existing four channels are even slightly snowy a masthead amplifier, whilst improving them, is unlikely to provide good Channel 5 reception.

At North Walsham, which is well within the Tacolneston service area at 22 miles and not particularly screened, the line-of-sight signal is around +16dB/mV. But few rooftops in the town have more than +4dB/mV available, and in many places the signal falls to -17dB/mV. For Channel 5 this becomes -13dB/mV at best, i.e. adequate with a masthead amplifier, and -34dB/mV at worst, i.e. no chance at all. These figures assume the use of a good-quality 18-element aerial: add 5-6dB if a really splendid high-gain array is used.

A common complaint about reception from Tacolneston is that the higher channels appear to be the weakest - Channel 4 on ch. 65 is a particular problem in many locations. It will be interesting to see how the new Channel 5 signal compares. Will it be 17dB below the

best of the existing four, or 17dB below the worst? Since it will be the lowest frequency, things might not be as bad as one might expect.

Many locations in rural East Anglia are screened from Tacolneston by trees. So high-gain aerials and masthead amplifiers are used. Although Channel 5 reception might at first sight seem impossible here, as it will be the lowest frequency in use this might not be the case.

At many locations, both screened and unscreened, the difference in field strength will be such that where an amplifier is required for Channel 5 reception a low-gain unit will have to be used. This is most likely to be the case where a masthead amplifier is at present employed, with moderately good signal levels, to compensate for losses in a long downlead. A two-stage amplifier could well be driven into cross-modulation by the other channels. Where signal level imbalance is a real problem, the answer will be to use a separate aerial for Channel 5 and feed the signal through a one-channel pass filter before amplification (Fig. 2). The disadvantage of this is that the filter introduces a slight signal loss just where you don't want it — in front of the amplifier.

When a separate aerial and masthead amplifier are used for Channel 5, the signals will have to be combined. If they are too close for diplexing, channel-pass filters will be needed (Fig. 2). This applies to Tacolneston, Burnhope/Pontop Pike, Huntshaw Cross, Perth, Oxford, Selkirk, Winter Hill and most areas where the existing four transmitters are in group A or B and the new service is on ch. 37.

Next month we'll look at the problems with communal aerial systems.

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Testing Electrolytics

Ian Rees's capacitance tester/
comparator (September) is unlikely
to disclose the true condition of
capacitors removed from switchmode supplies or other highfrequency/high-current applications,
where the capacitor may have to
pass hundreds of milliamps of
ripple current at anything from
15kHz to 150kHz.

Capacitance meters often show that an electrolytic has the correct value, despite a substantial lack of effective capacitance in circuit, because they measure at a relatively low frequency, often 1kHz. Using DC, as suggested in the article, would make a meaningful assess-

Letters

We welcome letters from our readers and try to publish as many as we can. You can send them typed, handwritten or on disc, addressed to the Letters Editor – for address see page 7.

ment even less likely.

In view of this I offer the following notes:

(1) It is the low HF impedance of 105°C capacitors that makes them suitable for use in switch-mode power supplies. Do not fit 'standard' 85°C electrolytics in supplies that generate at HF, even if one was fitted originally. Also don't fit a capacitor which is physically smaller than the original, as its operating temperature will be higher.

(2) Wherever possible, check the ripple on the capacitor in circuit.

ripple on the capacitor in circuit. Switch the scope's input to AC, and look for a ratio of DC to ripple of more than 100:1. It is important to connect both scope leads directly to the capacitor itself, as large ripple voltages can be developed across printed circuit tracks. A good capacitor should not show any narrow spikes on the ripple. Great care is obviously needed when working on the live side of power supplies, and an isolating transformer is absolutely vital.

(3) In many circuits a coupling capacitor is used to discharge the base of a power transistor. A check at the capacitor in situ will show if

the full drive voltage is being transferred. If in doubt, check that the collector waveform is fully saturated for the entire on portion of the drive cycle, with no spurious blips or ramp, which can look like LOPT failure.

(4) In my experience, leakage is usually accompanied by a DC offset, domino failure or obvious sign of distress, and is self-evident. Capacitors usually self-destruct if unlimited current is available when they start to leak. Rectifier diode failure is common in such cases.

To summarise, the eyes and nose, together with an in situ check, are usually the best guide. Beware of measurements that do not fully replicate the actual circuit conditions.

My capacitance meter now collects dust, as it has wasted more than enough of my time. In fact it is usually permissible to use electrolytic capacitor values of plus or minus 100 per cent of the original value, provided size and HF parameters are considered.

C.N. Cory T. Eng., MIQA, Thatcham, Berkshire.

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Reports from Philip Blundell, AMIEEIE, Giles Pilbrow, Paul Hardy, John Edwards, Albert Browne, Roger F. White, Michael Dranfield, Brian Storm, Nick Beer, Michael Maurice and Graham Colebourn

Tatung C Chassis

There was no remote control operation with one of these sets. Although the 5V supply was present, there was no output from the remote control receiver chip IC750. The TFMS4360N originally used in this position has been replaced by a TFMS5360 with a new mounting bracket. Fitting this restored normal operation. P.B.

Grundig CUC3400 Chassis

This set was dead though the fuses were all OK and there was 300V at the collector of the chopper transistor T661. I decided to carry out some resistance checks on the diodes in the combined chopper/line output stage and found that D691 (BYV28/100) was short-circuit. It's the 20V supply rectifier on the secondary side of the circuit. P.B.

GoldStar CIT9508

The relay would click as the set was switched out of standby but there was no line drive. We found that fusible resistor FR802 (1Ω) in the 22V rectifier circuit had gone high in value, removing the supply to the line driver stage. G.P.

Matsui 1455

This set wouldn't come out of standby. The reason for this was a low supply voltage at pin 42 of the microcontroller chip – 3.5V instead

TV Fault Finding

of 5V. Capacitor C612 (220 μ F, 25V) in the power supply had dried up.

For reliability, C607 (47µF, 25V) should always be replaced when one of these sets is serviced. **G.P.**

Panasonic Alpha 2 Chassis

This set would fizz and the width would come in. The HT was correct, but the 2SD1441RL line output transistor was leaky. After replacing it I found that the real problem was dry-joints at the line driver transformer. Thermal fuse R567 (part no. TSF19102) was also replaced, to reduce the chance of a bouncer.

Whenever I see one of these sets now I resolder the line driver transformer's joints as a matter of course. If the customer is quick about switching the set off when the fault develops no other work is usually required. P.H.

Harwood HAR14

The complaint with this set was that it would die intermittently. But despite extensive testing I was unable to fault it. I had no circuit, but the set bears a superficial resemblance to the Fidelity ZX4000 chassis. What I did notice was pronounced horizontal wriggle at times, which occasionally resulted in loss of sync. All the presets on the board had Sellotape beneath them, probably as an aid in production. I removed the presets and the tape and cleaned the board. On refitting the presets the wriggle had gone. I never did get to the bottom of the intermittently dead problem - the customer didn't want to spend too much on the set. P.H.

Sanyo CTP6102

This was an ancient set and I'd no circuit diagram, but as there were only field problems I decided to have a go. C451 (330 μ F, 10V non-

polarised) had been getting warm and was low in value. Two 680µF electrolytics connected back-toback seemed to work all right, but I was left with the lower half of the scan missing and the upper half distorted and varying in height. Voltage checks showed that the bias in the field output stage was varying. I tried replacing the driver and output transistors, also the thermistor, without luck. Finally, in desperation, I tried resoldering every joint in the field timebase section of the chassis. Miraculously, this cured the problem. P.H.

Ferguson TX100 Chassis

This set took a very long time to produce the correct grey scale. When switched on it would produce a green picture for ten minutes, followed by five minutes of red, then a normal display would appear. C52 (1µF), which decouples pin 19 (grey-scale reference) of the TDA3562A colour decoder chip, was open-circuit. P.H.

Hitachi G7PS Chassis

The complaint with this set was that it went into the standby mode almost immediately after powering up. I disconnected the line output stage, added a 40W bulb as a load and fed the set via a variac. The HT rose to 125V. With it reset to 112V and the line output stage reconnected the set worked all right. But checks in the power supply seemed advisable. R909 was then found to have risen in value from $39k\Omega$ to $45k\Omega$. A replacement was fitted and the HT reset. P.H.

Matsui 1422

A snowy raster was the complaint with this set, along with no signals and no channel display. The cause was loss of the LT supply because F602, which is in series with D610, was open-circuit. I have to say that this is a horrid bit of construction.

The fuse has wires soldered to both end caps. One end is soldered to the board, the other to the anode of D610, the whole lot being encased in a plastic sleeve. There's no room for a proper fuseholder. **P.H.**

Hitachi G8Q Chassis

"Lots of smoke then dead" was the complaint with one of these sets. On investigation we found that there was charred print at one leg of C715, which is one of the capacitors in the EW diode modulator circuit. We scraped away the burnt remains of the print, then soldered the capacitor's leg to a good section of print. This solved the problem. J.E.

Goodmans FST51TT/ Murphy CTV3540T

The display consisted of a white raster with flyback lines – there was normal sound. A check on the CRT base panel showed that the 100mA fuse and 220Ω resistor (R115) that supply about 190V to pin 4 of the TDA8153 RGB output chip IC100 had failed. After replacing the fuse, resistor and chip I carried out slight RGB preset drive adjustment to correct the grey scale. J.E.

Panasonic TX21M2T (Z4 Chassis)

This set was dead with the surge limiter resistor R802 (4·7Ω, 5W) open-circuit and the STR54041M chopper chip IC801 and the two associated 2SD965 control transistors Q801/2 short-circuit. The overvoltage protection diode D854 also seemed to be faulty. C809 (0 luF) was the cause of the trouble. It provides feedback to the base of the chopper transistor in IC801. Because it was faulty, there had been excessive HT. We replaced these various items, also C808 (10µF). A 105°C, 63V electrolytic should be used in this position. A.B.

Hitachi NP84 Chassis

The customer complained about a horizontal line across the middle of the screen (the set was a Granada C14BA1). When I switched the set on without an aerial connected the top half of the screen was completely black. Increasing the tube's first anode voltage proved that there was a blanking rather than a field fault. When an aerial was connected there was a normal picture apart from a black band across the screen. This black band varied in size when the height control was adjusted. With the height at minimum, the black band disappeared. The cause of the fault

was R605, which had increased in value from $220k\Omega$ to $400k\Omega$. R.F.W.

Fidelity CTV 1400

There was so little contrast that the picture was only just visible, the contrast control having no effect. R106 was found to be open-circuit. R.F.W.

Philips GR1-AX Chassis

The picture was smeared and looked washed out, with bending verticals. The cause of the fault was traced to C2060 (680µF) which is the smoothing capacitor in the 12V supply to the TDA8305 timebase generator chip. R.F.W.

Ssangyong STV9214R

This Great Wall portable produced a good picture but no colour. We were able to use a similar set to carry out detailed waveform comparisons around the decoder chip and found that those in the APC filter (pins 16 and 18) were of low amplitude. The cause of the trouble was an open-circuit resistor, R361. R.F.W.

Matsui 1455

The sound was OK but there was no picture. The RGB outputs were being blanked because of a fault in the control circuitry. Q408's collector voltage was high – there was only 0.2V at its base. But there was 10V at the collector of the preceding DC coupled transistor Q407. So I replaced Q408, which made no difference. The cause of the trouble was D417 (1N4148) in Q408's collector circuit. It was leaky. R.F.W.

Philips CP90 Chassis

The width changed as the brightness was turned up. When it was turned down the overvoltage trip came into operation. The cause of the fault was found in the chopper control circuit, where R3665 (4·7 Ω) was open-circuit and D6665 (1N4148) was short-circuit. These two components are connected in series. We also replaced the CNX62 optocoupler. **R.F.W.**

Philips CP90 Chassis

If the problem with one of these sets is a strange interference dot pattern on the screen, don't examine the IF department as we did. Replace C2703 and C2691 in the power supply. They are both 330μF electrolytics. M.Dr.

Ferguson TX100 Chassis

This set was dead, with the start-up

resistor R116 getting hot. A scope check at pin 8 of the TDA4600 chopper control chip showed that it was producing a drive output, but this didn't arrive at the base of the BU508A chopper transistor because choke L15 was open-circuit. A replacement from a scrap set restored normal operation. M.Dr.

Alba CTV600

This set was brought in because there was no sound, but on inspection we found that the picture was oversized. C910 ($10\mu F$, 50V) and C909 ($47\mu F$, 63V) in the power supply had dried up. As a result, the HT voltage had risen. This was probably the cause of the TDA1904 sound output chip's failure. M.Dr.

Amstrad TVR3

This combined TV/video wouldn't tune. We found that there was no 12V supply at pin BU of the tuner. The culprit turned out to be the LA7913 band-switching chip IC2. M.Dr.

Sharp DV5161H

Beware of some very odd faults when the field output chip fails. This set had no sound and no picture. The screen was lit up: it was covered in lines and one half was darker than the other. We might never have found the cause of the fault if the field output chip's heatsink hadn't been getting red hot. M.Dr.

Panasonic TX25T2 (Alpha 2 Chassis)

A particularly nasty field fault occurs when R469 goes high in value. This resistor is part of a damping network that's connected across the field scan coils. Its purpose is to prevent line-frequency waveforms reaching the field scan circuitry, induced by the close proximity of the line and field scan coils. This line-frequency signal can show up as black lines across the upper part of the field scan. The value of R469 can vary from that given in the service manual. It's usually 150Ω or 180Ω . Check by reading the bands. Fitting a wrongvalue resistor will produce a similar fault symptom. B.S.

Panasonic Euro 1 Chassis

The display produced by this digital receiver consisted of a dark, blank raster. Its owner claimed that the picture was poor before this symptom occurred. Scope readings in the digital circuitry failed to produce any clues, but a burnt

finger told me that the ACVP2205 adaptive comb filter chip was faulty. When this had been replaced the picture, though restored, was decidedly solarised. This second fault was eventually cured by replacing the SAD2140 S-VHS analogue-to-digital converter chip IC1601. B.S.

Panasonic TX25T2 (Alpha 3 Chassis)

Something was upsetting the field output chip (IC451) in this receiver. About twice a year bright flyback lines would appear across the top of the screen. A new field output chip would put matters right. Fortunately there's now a permanent cure. Kit TZS5EN001 consists of a replacement scan coil and output chip. Apparently some earlier scan coils used in this model proved to be a bit too much of a burden on IC451, leading to its premature failure. B.S.

Panasonic Alpha 2 Chassis

This receiver was dead, with a plaintive whistle coming from the power supply. D854, the avalanche overvoltage protection diode that's connected across the 160V HT supply, was short-circuit. This usually means that the HT supply has risen to a dangerous level. So I replaced the chopper chip IC801 and D854 and checked the components that affect the regulation (D807, R815, C808 etc.). Then I checked the 2SD1441RL line output transistor Q551, which was faulty. As I couldn't find anything else faulty after replacing this item I switched on, and was immediately greeted by the friendly rustle of EHT as the set sprang to life. Fortunately no further damage had occurred and the picture was excellent. B.S.

Matsui 1455

There was no line sync. Resetting VR203 restored a picture, but it was unlocked and at best there was hooking at the top of the screen. The line-frequency pulses that should have been present at pin 35 of the do-it-all chip IC202 were found to be missing. They come from the line output transformer, via R274 ($27k\Omega$) which was opencircuit. N.B.

Samsung CI210R

This portable was dead apart from the standby LED. A check on the 11V 'HT' line showed that at switch on it pulsed to 2.5V then off. Disconnecting the supply to the line output stage resulted in the HT pulsing to 11V before returning to standby. There was obviously a short in the line output stage, and one could be measured from the collector of the line output transistor to chassis. But it was in the parallel FR304 efficiency diode D106, not the transistor itself, N.B.

Philips GR1-AX Chassis

I see quite a few of these sets since entering into a deal with the operator of a local holiday site, where quite a number of them are in use. Suffice it to say that I buy line output transformers in bulk. But it was nice to get a different fault for a change. There was a raster, the graphics were OK, but there was no sound or vision. Checks showed that there were no outputs from the TDA8305A multipurpose chip IC7020, though its supplies were present and the tuning worked correctly. A new TDA8305A restored normal operation. N.B.

Samsung Cl3351A

This portable produced a low brightness picture. Even turning up the first anode control on the line output transformer failed to produce adequate brightness for normal viewing. A check showed that the first anode voltage at the tube base was lower than expected, and varied over a period of time — as did the brightness. The cause of the trouble was a varying leak within the 1nF, 2kV decoupling capacitor C907 on the tube's base panel. I was able to lift it to prove the point. N.B.

National Panasonic TR5030G

Most people wouldn't have bothered with this aged monochrome set, but it belonged to an aerial installer colleague who found it invaluable because of its portability, battery operation and VHF as well as UHF tuning. The problem was no EHT, because the linc timebase wasn't working. Checks showed that there was no drive from the AN5750 chip IC41, whose supply was being pulled down. A new AN5750 restored normal operation. N.B.

Samsung CI1213R

This set was dead: the power supply would start up, then shut down. I have to say that the PCB was a mess, with wires lashed everywhere in what looked like production modifications. The cause of the problem was that L110, in the HT

feed to the line output stage, was dry-jointed at one end. This was not clearly visible, but a meter check revealed the fault. N.B.

Ferguson TX100 Chassis

This monstrous old 26in. set came in deadish, with a faulty line output transformer. When a replacement had been fitted the set ran up but the sound was permanently muted. Lifting the various lines that lead to muting brought me to the SAA5012 remote control decoder chip, which turned out to be faulty. N.B.

Bush BC7100

This is the old Rank-Bush colour portable with the Saba chassis. The complaint was that after the first half hour or so the sound would disappear. The cause was found to be a dry-joint on the lead from the slider of the volume control to the front interface PCB. Despite the set's age its picture still looked very good and the dreaded button unit was OK. N.B.

Goodmans 2875

This set was dead. On investigation I found that it was riddled with dry-joints – despite being only just out of guarantee. The cause of the fault was that the top EW modulator diode (BY448) was short-circuit (almost turned to dust) while the adjacent capacitor was severely dry-jointed. N.B.

Hitachi M Chassis

If the mains switch was on and the set was switched on from the mains it would go to standby. Otherwise it was dead. Checks showed that the 2SD1577 line output transistor TB626 was leaky and that the wrong type had previously been fitted. In addition its heatsink clip wasn't attached. To fit the transistor correctly, it is best to remove the heatsink from the board - it's soldered to the main PCB by three lugs. Fit the transistor to the clip, then refit the whole assembly back on the board. A new 2SD1577 restored normal operation. M.M.

B and O 20AX Chassis

This ancient set suffered from a purring sound accompanied by picture flutter. Replacing 5C10 (47µF, 63V) in the thyristor drive circuit cured the fault. M.M.

Amstrad TVR2

When this set was brought in it was supposed to be intermittently dead. But several days of soak testing failed to reveal any fault. A week later it came back, this time permanently dead. Checks showed that the primary side of the line driver transformer T401 was opencircuit. A replacement (part no. 152591) put matters right. M.M.

Philips CP110 Chassis

This set seemed to be dead, apart from 'F1' in the display. A quick check showed that fuse F1653 had failed. A replacement restored some life, but the HT was pulsating. So I disconnected the supply to the line output stage, connected a light bulb as a dummy load, switched on and attempted to put the set into standby. Although the display showed standby, the bulb still glowed brightly and pulsated. A replacement CNX62 optocoupler (IC7670) provided a complete cure, proved by reconnecting the line output stage and switching on. This must be the ouly Philips chassis in which the power supply doesn't self-destruct when the optocoupler fails. M.M.

Cascade TV511T

There was a sharp crackle of EHT at switch on, then the set tripped. A

check with the line output stage disconnected showed that the HT was too high. C909 (47µF) was responsible for this. We then found that ZD402 was short-circuit and R422 open-circuit. When these items had been replaced there were pictures plus distorted sound. A slight tweak on the sound trap coil restored normal sound. M.M.

Philips CP110 Chassis

This set came in dead, with a short-circuit line output transistor. When we removed scan plug R13 and tested the power supply with a dummy load we were pleased to find that it ran normally. But when a new line output transistor had been fitted the results were awful. The line output transformer emitted a raucous scream, and the display consisted of a dark grey raster with a vertical band of lines near the left-hand edge. This slowly changed to a very low contrast picture, with no colour and false line lock.

A new line output transformer made no difference. Concentrating on the false line lock, we checked the waveforms around the IF/sync module and discovered that the sandcastle pulses at pin 5 were incorrect - the short, high-amplitude pulse was delayed with respect to the longer blanking pulse. Adjustment of the line hold and phase presets simply made matters worse, and a new TDA2579 (plain or A version) sync/timebase generator chip didn't provide a cure. Philips don't show the circuit of this module in the CP110 manual, but the same circuits appear in the CP90 manual, where the sync and IF parts are separate. We finally traced the cause of the problem to the 3.9V zener diode D6067, which had developed a leak. G.C.

B and **O** MX5500

Intermittent shut down with no pilot light display was the complaint with this set. We traced the cause to a cracked joint at the base of TR19, a small transistor right at the top of the power supply board. B and O tell us that this fault is common, being caused by mechanical stress from the nearby fixing screw. In some cases the transistor itself can break. The official advice is to slacken the screw off by a quarter turn as a routine servicing measure. G.C.

TBA 1205 = 030 AN 3320K = 750 STK 0049 = 500TBA 120T = 030 AN 5135 = 585 STK 0050/2 = 899 TBA 1013A = 299 STK 436 = 399 AN 5790 = 240 TDA 1022 = 530 AN 7320 = 100 STK 483 = 850 TDA 1060 = 325 STK 1050/2 = 800 BA 514 = 150 TDA 11705 = 135 BA 4232AL = 190 STK 2048/2 = 1299 STK 2155 = 895 TDA 1520B = 330 BA 7767 = 180 TDA 1540 = 420 CXA 1044P = 1485 STK 2240 = 650 TDA 1600 = 360 HA 11381 = 250 STK 3042/3 = 500 TDA 2009 = 250 STK 3082/2 = 725 HA 11714 = 380 STK 4038/2 = 695 TDA 2170 = 1999 HA 13119 = 315 TDA 2506 = 500 STK 4131/2 = 650 KIA 8210 = 425 TDA 2545 = 130 STK 4141/V = 750 LA 3210 = 060 TDA 2577 = 1299 STK 4162/2 = 515 LA 3350 = 199 TDA 2577A = 200 STK 4211/V = 1200 LA 4282 = 350 STK 4362 = 450 TDA 2579A = 250 LA 4500 = 200 TDA 2600 = 425 STK 4773 = 820 LA'7294 = 150 TDA 3300B = 2475 STR 4853 = 699 LM 317T = 150 TDA 3561A = 410 STK 5322H = 450 LM 1203 = 499 TDA 3576B = 915 STK 5331 = 300 M710B1 = 610TDA 3654 = 090STK 5337 = 485 M 190B1 = 495TDA 4500 = 310 STK 5467 = 650 M51393 = 595TDA 4504B = 790 STK 5490 = 450 M 54519 = 499 TDA 5850 = 375 STK 7348 = 400 M 54564 = 115 TDA 7050T = 170 STK 8050 = 750 MC 1377P = 425 TDA 8153 = 1599 STK 736051 = 300 MC 3357P = 095 STR 441 = 1899 TDA 81795 = 999 MDA 2062 = 450TDA 8180 = 1815 STR 451 = 2999 MEA 2901 = 300 STR 454 = 1499 TDA 8390 = 850 SAA 1026 = 450 STR 5412 = 400 TEA 1039 = 175 SAA 1061 = 375 STR 50092 = 550 TFA 2018A = 150 SAA 1294 = 850 TEA 2164 = 325 STR 50103A = 385 SAA 3004P = 315 STR 54041 = 350 TFA 6300 = 685 SAA 3028 = 845 UC 3842 = 150 STR 58041 = 300 SAA 5231 = 895 UC 3844 = 150 STRD 1816 = 399 SAA 5241P/A = 1000 UPC 1168 = 360 STRD 6008 = 680 UPC 1216V2 = 110 SAA 7000 = 899 TA 8210 = 300UPC 4558C = 050 SAA 7274 = 650 TA8205 = 300SAB 3021 = 399 TA 8200 = 350 2SA 839 = 140 SAB 3035P = 545 TA 8207 = 165 2SA 1232 = 250 SAB 3209 = 450 2SA 1302 = 300TA 8216 = 390 2SB 618 = 305 TA 8644 = 499 STK 050 = 1599 STK 0029 = 300 TAA 550 = 0302SB 1292 = 150

2SC 901A = 350 2SC 1577 = 600 2SC 2200 = 250 2SC 3427 = 340 2SD 1391 = 300 2SD 1577 = 480 2SD 1887 = 435 2SD 2125 = 415 BU 500 = 265 BU 508A-PHIL = 80 BU 508AF-PHIL = 125 BU 5080D-PHIL = 110 BU 2508AF = 250 BU 2525AF = 410 **BUT 11A-PHIL = 070 BUT 18AF = 120** BUT 56A = 080 S 2000AF-TOSH = 175 S 2055A = 165

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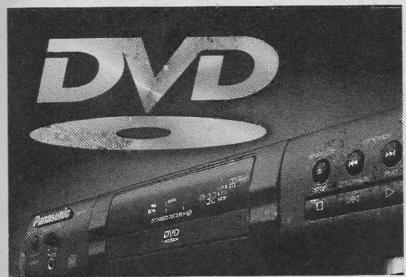
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A recent international forum in Brussels set out to clarify the current DVD situation and press for agreement between the various parties involved. George Cole reports

n September 16-17th the DVD Alliance, which consists of Time Warner and nine major consumer electronics companies including Philips, Sony, Toshiba, Hitachi, Thomson, Pioneer and Matsushita, hosted a forum in Brussels to discuss the current DVD format situation and latest developments. It also presented a chance to see prototype DVD players, drives and encoders in action.

The DVD system is almost ready to be launched on world markets, though the date when the first discs and players will be available is at present (mid September) still far from clear. There were numerous arguments and contradictions at the forum, with one company saying one thing and another saying something quite different.

Specifications

First however a brief description of the DVD format – a more detailed specification will be provided in a later article, when certain details have been finalised.

DVD originally stood for Digital Video Disc. It then came to be known as the Digital Versatile Disc (since it can be used for purposes other than video storage). The official line now is that DVD simply means DVD!

The format is designed to take the compact disc into the 21st century. Although it is little more than a decade old, the CD – and in particular the computer version CD-ROM – is showing its age. When the CD-ROM was launched in 1985, many wondered how they would fill a disc that could hold over 600Mbytes of data, the equivalent of 500 high-density floppy discs. But with the advent of Video CD, multimedia CD-ROMs and complex video games, the CD is struggling to hold enough data. Indeed for this reason some games titles are spread over several CD-ROMs. As a result of all this there was a move to develop a high-density CD.

The DVD that has emerged is a hybrid of two rival high-density formats, the Multimedia CD (MMCD) developed by Sony and Philips and the Super Density (SD) disc developed by Toshiba in collaboration with Time Warner and others. The disc is of the same size and thickness as a conventional CD, i.e. 120cm in diameter and 1.2mm thick, the big difference being that the DVD

At The DVD Forum

consists of two 0 6mm discs bonded back-to-back. This gives the disc greater mechanical stability and a higher storage capacity. DVD discs are also more resistant to heat and humidity than conventional CDs.

With the DVD the minimum pit length is 0.4 microns, the track pitch being 0.74 microns. DVD uses lasers with a shorter wavelength than those used with ordinary CDs (635-650nm, compared with 780nm for CDs). It also uses Reed-Solomon error correction and an 8-16 modulation system. The reference speed is 4m/sec CLV (constant linear velocity).

Versions

DVD has been designed as a single- and dual-layer (i.e. two layers on each side of the disc) system, and as a single- and double-sided format. With the first generation of players at least, users will have to turn over a double-sided disc, but we will doubtless at some stage see players that switch sides automatically. There are thus four basic disc versions, ranging from a single-sided disc that holds 4.7Gbytes of data to a double-sided, dual-layer disc able to hold 17Gbytes of data.

DVD makes use of the MPEG-1 and MPEG-2 digital video systems, the latter being able to provide broadcast-quality pictures for material such as blockbuster films. The video data rate can be varied between 1-10Mbits/sec, the average for audio and video data being 4-69Mbits/sec. For computer applications DVD's data rate approaches that of a x8 CD-ROM drive. The variable bit-rate system improves coding and storage efficiency. There are two alternative audio systems: Dolby Digital AC-3 coding is to be used in 525-line/NTSC territories while MPEG-2 audio is to be used in 625-line/PAL areas. These audio systems both offer 5-1 multi-channel sound, but are not compatible.

DVD is actually a family of discs, designed to store films, computer data, multimedia programs and games. The two basic formats are DVD Video (sometimes called DVD Movie) and DVD-ROM. The former has been developed as a means of recording and storing films and other video material. Up to 133 minutes of MPEG-2 video can be stored by a single-sided, single-layer disc. DVD Video can also store up to eight audio streams and 32 subtitled languages. There is provision in the specification for recordable and erasable-recordable discs.

The Forum

Jan Oosterveld, president of Philips' key modules division, gave the opening speech. He immediately got to the heart of the problems that have led to the delay in

STOP PRESS

At the time of going to press Toshiba has announced that it plans to launch a range of DVD systems in Japan on November 1st.

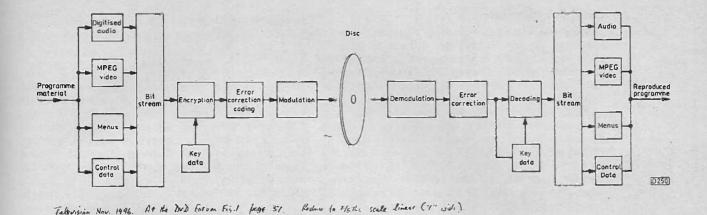


Fig. 1: The DVD Video record and playback processes.

launching the DVD system: the differing needs of the film and computer industries. As he pointed out, a computer software package has a shelf life of around six months while a film may have a life time of sixty years or more (think of Gone with the Wind!). This has led to problems in deciding what copy protection systems DVD should use. According to Jan Oosterveld, the problem is "close to being solved"

Television Nov. 1996.

Film companies not only want to stop people making high-quality analogue or digital copies of DVD material, they also want to preserve a system that one "Intelligent executive calls Sequential Distribution", i.e. releasing films around the world at staggered intervals. Typically, a top movie will be released in the USA months before its European launch. By the time it reaches Europe it will already be available in video form in the USA. Until recently, film companies relied on the differentiation between NTSC and PAL regions to preserve this system of distribution, but by digitising everything DVD eliminates this divide. As a result a system to stop consumers importing DVD discs from other regions has been developed. It's called Regional Coding, and divides the world into six areas as follows:

Region 1: The USA and Canada.

Region 2: Europe, Japan and South Africa.

Region 3: Asia.

Region 4: Australia, New Zealand, Mexico and South America.

Region 5: Africa.

Region 6: China.

The idea is that DVD players and many discs will be developed for specific regions. Most DVD film discs will be encoded with a flag to identify the region for which they are intended. DVD players will contain a chip set that recognises the appropriate flag and refuses to play a disc when there is a regional mismatch.

Regional Coding takes DVD well away from the original aim of "one world, one disc". Some of those at the forum felt that the system would hinder rather than help DVD Video. One argument is that a group likely to be amongst initial buyers would be home cinema/film enthusiasts who probably already have Laser Disc players. Many of these are dual PAL/NTSC models, enabling users to choose from the thousands of titles available in the USA and Japan. The contention is that DVD would severely restrict disc supply, and without an adequate supply of titles the format would be unlikely to get off the ground as a consumer product.

Copy Protection

The other major stumbling block has been copy protection. Film studios point out that DVD will give users access to a high-quality digital master, so there should be protection against both analogue copying (on to VHS tapes) and digital copying (on to digital tape systems and, when they are introduced, DVD players that can also record). This has led to disagreements with the PC industry, because the film industry wants to see copy protection systems applied to multimedia computers and DVD-ROM drives. At the time of writing this the following systems were close to being accepted by all concerned, though the situation remains fluid and could change.

DVD Video discs will be protected in the following way, see Fig. 1. The original programme material is first digitally encoded, producing a bit stream that contains a mix audio, video, control and other data. This is then encrypted, using a 40-bit key system. The Disc Encryption System (DES) has been developed largely by Matsushita. Error correction coding and modulation are then applied, after which the encrypted data is recorded on the disc.

The DVD player reads the disc to see whether an anticopy flag is present. It then uses a key to decode the data. To prevent copying, Macrovision's Colour Stripe system is used during the analogue output conversion. This disrupts the colour subcarrier: as a result, green stripes appear on the screen when copied material is played

The PC system is more complex. A DVD-ROM drive will also sense whether an anti-copy flag is present on the disc. If so, the drive will encrypt the key but not the programme data (which is already encrypted of course). There will be a second key in the MPEG playback card or in MPEG software to decode the encrypted key, then the data. Why such an involved procedure?

If the DVD-ROM drive simply decoded the data, it could be digitally copied on to a PC hard disc or tape system. The double-key encryption arrangement gives you only the second part of the key system when copying the data. If you tried to use a DVD-ROM drive or player to reproduce the copied data, it wouldn't recognise the key and would refuse to play.

So far this system has not been adopted officially. Incidentally not all DVD discs will be copy protected. The computer industry is unlikely to encrypt DVD-ROMs, while there may be material - such as old films that have already been broadcast many times - that is not considered to be worth encrypting. Free, cover-mounted DVD discs are also unlikely to be copy protected.

Launch Intentions

Despite the setbacks over copy protection, several companies are confident that they will be able to launch DVD players or drives before Christmas, in some markets at any rate. Toshiba and Matsushita have stated that this is their intention. Pioneer and Hitachi are also hoping to be able to achieve a 1996 launch.

Others, such as Philips and Sony, are being more cautious and simply say that they will not go ahead with a launch until all the specifications have been agreed.

There are also plans for DVD-R (write once) discs that hold 3.9Gbytes of data and DVD-RAM (recordable-erasable) discs that can store 2.6Gbytes. Many expect these discs to appear within the next two-three years despite the objections of the film industry.

Players

A certain amount of information on how the DVD players will operate was available. The first thing the player will do is to read the disc to see whether the regional code is correct and whether it is copy protected. If the regional code is incorrect, the player will simply refuse to work.

One speaker stressed the importance of software designers creating good screen displays that tell the user clearly what's happening. If, for example, a player simply said "cannot play this disc", the user might take the disc back to the shop. If the player said "disc is not designed for this player" the user would know where the problem lay.

The players will be operated by six main buttons on a remote control handset. These will enable the user to navigate around on-screen displays. The buttons include title (to display the title screen), up, down, left, right and enter. There will also be VCR-type buttons for fast forward, still frame, etc. The on-screen cursor will jump from point to point instead of floating around the screen. Anyone who has used a CDi joystick control will know how tricky it can be to move a cursor to the right spot

The DVD disc menus are known as sub-pictures. They will be used for a variety of purposes, such as choosing the preferred menu language (English, Spanish, etc.), selecting closed captions or subtitles and so on.

The DVD player adapts cleverly to your language of choice. You could for example choose to have captions in say English and the disc's sound track in French. If part way through the disc you select Spanish captions for example, the end credits will include information about the companies that provided both sets of captions.

In other words, the end credits will vary in accordance with the facilities you use while playing the disc.

Options

Another session was hosted by Mike Fitzgerald, vicepresident of MCA. He stressed how important it would be to prepare plans carefully before developing a DVD film title, and the need for the best source materials. DVD will offer disc developers many options, including 4:3 and 16:9 aspect ratio pictures, multiple language sound tracks, Surround sound, closed captions, subtitles, choice of camera angles, and extra material such as the director's views or an actor's biography. Although some film companies present (including MCA and Warner) pledged to make use of such options, others were not so sure. It's hard to see why film companies would want to invest in all the extra time and expense to produce multi-language discs. Differences such as censorship laws would make it hard to develop discs for multiple markets.

The general feeling was that DVD offers some fancy features, but that few of them will be used in practice. Mike Fitzgerald added that the average cost of developing a DVD title would be around £20,000, which seems very low when you consider the work that has to go into the creative process alone. He also suggested that some DVD titles may not need high-quality MPEG-2 video, offering hours of MPEG-1 video instead – one example given was of a DVD exercise video, whose users would not be too concerned about having the best picture quality as they went about their routines.

Prospects

So will DVD be a success? Few doubt that it will sell well in the PC market, with sales of DVD drives probably fast replacing CD-ROM drives. In the consumer electronics market its prospects are less clear. DVD players will be expensive (around £500-£700), won't provide a record facility (to start with at any rate) and will not be able to play discs intended for other regions.

Although DVD will offer superior sound and picture quality, there is little evidence that the public is prepared to pay for this (S-VHS and Laser Disc have remained niche products). One delegate suggested that the DVD market would be more akin to the camcorder than the VCR or audio player markets. Until DVD machines can offer recording facilities, this is probably about right.

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Servicing the Samsung P68 Chassis

A range of colour TV sets use this chassis, which is prone to several fault conditions. With John Coombes' service guide, you'll have little difficulty putting them right.

Getting on the Internet

Why should you, and how do you go about it? Martin Pickering provides practical answers, in particular on equipment.

Versatile Video Buffer Amplifier

If you want your video camera to drive more than one monitor you'll need a buffer amplifier. An emitter-follower is the obvious answer, but Keith Cummins describes a versatile alternative which has several advantages.

At the Vision 97 Show

Hitachi recently hosted Vision 97, in Tokyo, to demonstrate its latest developments in the digital video field. George Cole describes the technology that was presented, including the MPEG standard camera.

The ESD Danger

Most of the chips used in TV etc. control systems are based on MOS technology, which means that they are particularly susceptible to damage as a result of electrostatic discharge. Frank Harding outlines the problem and the precautions required, with tips on implementing them economically.

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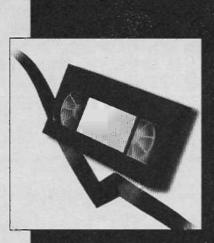
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Reports from Philip Blundell, AMIEEIE, Eugene Trundle, Mike Leach, Terry Lamoon, Andrew Tebbutt, Gerald Smith, Steve Hague, John Coombes, George Whiteside, Chris Watton and Michael Dranfield

Mitsubishi HSB31

No rewind was the complaint. The brakes failed to come off as the latch magnet was open-circuit (it should have a DC resistance of approximately 600Ω). The part number for the latch magnet is 299P124010. **P.B.**

JVC HRDX22

This one caused me to scratch my head for a few minutes before I realised that the Phantom Fiddler had been at work. The symptom was faulty cassette lift operation: the machine would accept a cassette, but something prevented it going fully down.

I noticed that the pin was broken off the guide arm (exploded view reference 47) and was wondering whether the gears had jumped some teeth when I saw that the half-loading arm (reference 49) had two pins! Yes, someone had glued the broken pin on to the wrong arm.

Hitachi VT150

This machine was nearly ten years old and still going strong – except that its E-E and recorded sound

VCR Clinic

were quiet and 'buzzy'. Playback of a known good tape was fine. A check on the audio output from the IF module showed that it was weak and noisy. The culprit was a 4.7μ F, 35V coupling capacitor (C08) in the module. There's a circuit diagram of this in the manual but no layout picture. E.T.

JVC HRJ210

Intermittent picture jumping was the problem with this machine – for the very good reason that the playback video FM envelope was very ragged at the start of a scan. A check showed that the supply guide was a little sloppy in the V block. The cause of this turned out to be a latchety loading arm assembly on the underside of the deck. Its part number is PQ43537B. E.T.

Samsung VIK316

This machine was to all intents and purposes dead. The obvious power supply checks were carried out – fuses etc. – but everything appeared to be in order. Time to get the circuit and check some voltages. This revealed that the always 5-8V supply was low at 3-5V. I decided to replace C35 (400µF, 16V) and C36 (330µF, 16V), after which the machine fired up and worked perfectly. M.L.

Mitsubishi HSB41

This machine came in because of mechanical problems: it needed a new pinch roller assembly and a good grease up. After doing this I tested the machine and found that there was no E-E or record sound. Perhaps a plug had come adrift? No, all the plugs were in place and no dry-joints were evident on the main panel. When I used the scope to trace the path of the audio output from the IF section I found that it

went to the front panel for the headphone take-off. The cause of the trouble turned out to be a dry-joint at transistor Q8B0 on this panel. After resoldering this transistor the machine performed correctly with good audio. M.L.

Hitachi VTF770

If one of these machines shows "CODE –1" in the display when you press the operate button, try replacing C711 (33 μ F, 6·3V) and C771 (220 μ F, 6·3V). They are both on the front panel, beneath the display.

I've also had to replace the EEPROM (IC702) when the machine wouldn't change channels after replacing the two capacitors just mentioned. M.L.

Matsui VX1000

According to the customer this machine intermittently chewed tapes and forward search was slow. When we put the machine on test it slowed down after a while. Application of freezer to the capstan motor got the machine going normally again, while warming the motor with a hairdryer shut it down altogether. A new capstan motor was the costly answer. T.L.

Mitsubishi HSB12

The complaint with this machine was that it played at the wrong speed and produced Mickey Mouse sound. Sure enough, that's exactly what it did. When we removed the top we saw that the loading arm was sticking and in the wrong position. This was because the brake pad lining had come adrift from its lever. A replacement brake lever cured the fault. T.L.

Akai VSF33

This machine suffered from the

usual problem: the display was missing. After fitting a modification kit the display was there but was so low that a new display tube had to be fitted to give normal viewing. The machine also needed a new pinch roller. T.L.

Matsui VP570

This machine would intermittently shut down because the drum stopped rotating. Careful examination of the connector board that runs between the mechanism and the mother board revealed a dryjoint at pin 1. Resoldering this stopped the playing up. T.L.

Sony SLVE25

There was no playback, just a blue screen. When the machine was put in the visual search mode a picture appeared. On checking out the mechanism I saw that the pinch roller wasn't engaging correctly. I then realised that the pinch roller was too high, because the circlip that should hold it in position was missing. Where it had gone remains a mystery, but a new one cured the fault. Perhaps it had never been fitted in the first place? Strange. T.L.

Bush VCR802

As the cassette flap had come adrift this machine wouldn't accept a tape. After refitting the lever we inserted a cassette and found that it couldn't be ejected. The tactile eject switch had fallen to pieces. A new switch restored normal operation. Incidentally the deck looks very similar to the one in some Akai models I've seen. A.T.

Ferguson 3V48, JVC HRD140

These two machines, which have similar mechanisms, had the same fault – they required new loading belts (remember the 3V30?). The 3V48 came back however with the complaint that it would only rewind/wind fast forward in the picture search modes. A plastic lever on the loading block had come adrift – it's used to free the brakes for rewind/fast forward. I can't quote a reference/part number for it as it's not listed as being separate from the loading block. A.T.

Aiwa VXT1420K

This combined TV/VCR would eject a tape as soon as the loading cycle had been completed (tape fully around the head drum). The cause was failure of the drum to rotate. A new motor restored

normal operation. The mechanism in these units is the same as that used in some Orion VCRs. A.T.

JVC HRD520

This machine damaged tapes on eject. I replaced the mode switch as usual, but the tape was still a little loose and sometimes caught on eject. The cure was to replace the capstan belt and clean the capstan brake. G.S.

Finlux VR3724

This machine wouldn't memorise or change channels or tune in properly. A replacement memory chip (IC602) put matters right. G.S.

Nokia VR3615

Intermittent failure to rewind or leaving tape out on eject was the complaint with this machine. When the fault showed up I noticed that the reel gear didn't come over far enough to touch the reels. Thus no take-up on eject or rewind. A replacement reel gear assembly cured the fault. G.S.

Samsung SI3240

There was a tape stuck in this machine and the quarter load arm was out of sync with the mechanism. If you get this problem, check the gears and arm for damage, replace any defective parts and align the mechanism. The most likely cause of the fault however is a broken brake trigger spring on the loading motor spindle. So check this as well! G.S.

Nokia VR3615

The customer complained that there was intermittent loss of the play-back or E-E picture. We found that the on/off 5V output from the power supply occasionally disappeared. The cause was dry-joints at Q854. **G.S.**

Sharp VCH81HM

There was no play, fast forward or rewind with this machine, which also damaged tapes on eject. A faulty capstan motor was the cause. On closer inspection however I found that C6 ($10\mu F$, 25V) was open-circuit and that the leakage from it had corroded the print that links the 12V supply to the motor. I was able to get the motor going again by repairing the print and replacing the capacitor. G.S.

Sanyo VHR190

There was an odd fault with this centre-deck machine. When rewind was selected it would wind the tape forwards, though the display said that the machine was in the rewind mode. As we didn't have a service manual, we gave Sanyo a quick call and were told that a forward-reverse switching voltage is applied to pin 1 of the capstan motor drive unit connector. A meter check showed that this was happening. So we were left with the LB1688 motor drive chip as the only possible culprit. Unfortunately it's not available as a separate item. You have to replace the complete motor unit (ouch!). Anyway, this cured the fault. S.H.

Mitsubishi HSB20

This one gave us a hard time. It was reputed to run slow, refuse to accept commands, eat tapes and in general exhibit some pretty expensive sounding symptoms. After many hours of soak testing the capstan motor seized up. So we fitted a replacement, gave the machine a soak test for several hours then returned it to the customer.

Two days later it came back with the same complaints. After several more hours of soak testing the fault put in an appearance. It transpired that the microcontroller chip was applying a gradually increasing braking voltage to the capstan drive chip. A new micro was the answer. S.H.

Panasonic NVJ30/35

Poor (noisy) playback, which gives the impression that the video heads are dirty or faulty, can be caused by a poor connection on the lower drum. The solution is to remove the heads and resolder the connections to the lower drum assembly. J.C.

Toshiba V212

Intermittently poor playback was the complaint with this machine. The fault could be instigated by tapping the head preamplifier. We found that CQ05 was faulty but have also had CQ06 go opencircuit. J.C.

Panasonic NVJ45

If there's no colour with the machine's own recordings and the drum servo is hunting, check whether the 4.43MHz NTSC switch on the front panel is switched to on. It should be in the off position – the switch should be in the on position only in the dubbing mode. J.C.

Akai VSF30

Tape chewing with this model is usually caused by failure of the loading block mechanism to seat properly. Replacement of the

loading block unit may be necessary. If it's all right, check the retaining clip. If this is loose the eject gear will jump a cog. The only way round this one is to insert a piece of plastic of the correct size to prevent it happening. J.C.

Panasonic NVSD40

This machine wouldn't accept tapes. On checking it we were perhaps lucky to find the cause of the problem first time: there were dry-joints at plug/socket P1506. It's connected to Q1503 (2SB941), which is mounted on the diecast chassis. J.C.

Akai VSF200

To cure tape creasing at the top only, replace the pinch roller with the modified type. If the old type with a U-shaped insert and the spring tension on the side is fitted, replace it with the new type. Make sure that you read the modification sheet carefully and set the machine up correctly for an even FM video envelope. J.C.

Sony SLV415

There was no picture and a smell of burning. When we took the top off we saw that the drum motor wasn't rotating. It was pulsing instead, but if spun would build up speed. After finding that the motor drive chip was OK (by replacing it) we suspected the Hall chip within the lower drum and, taking the easy course, replaced the lot. The fault was still present however. The cause of the trouble was actually C014 (0·1µF). Failure of C013 or C015 would have had the same effect. It's best to check all three capacitors by replacement. J.C.

Panasonic NVG21/25

For intermittent loss of playback colour, check C1023 (1,000µF, 10V) in the power supply. It may be open-circuit or just dried up. J.C.

JVC HRD580

There was a line, about 1.5 in. wide, across the picture. It looked like a very wide noise bar, the sort of thing you get with poor back tension or a badly worn lower drum. The cause turned out to be a faulty 3.3 µF, 50V chip capacitor (C6) on the drum motor PCB. J.C.

Panasonic NVSD40

One of these machines gave us a lot of trouble. Sometimes the symptom was tuning drift on one or all channels. Alternatively there could be a flashing or flickering picture

that varied when the tuner/IF panel was tapped. We eventually cured the fault by removing the $0.1\mu F$ chip capacitor C706, cleaning the paint mark off the PCB and then refitting it. J.C.

Sony SLV353/373 Series

This one comes under the heading "how could I have missed that?" The machine couldn't be switched off and would only play, rewind or wind fast forwards. As disconnecting it from the mains supply and waiting a few seconds had no effect, I started to dismantle the machine to check whether any of the front-panel buttons were jammed on. When I went to remove the rotary control I noticed that the play arrow pointed down instead of to the right. Gently pressing it and rotating it counter-clockwise enabled me to gain full control of the machine.

The culprit turned out to be the customer's granddaughter. This 'fault' could be an ideal way of keeping a toddler amused: by inserting a favourite tape and selecting continuous play. G.W.

Toshiba V110

The tape would load but the pinch roller wouldn't engage. The machine would then go to standby. When the tape was ejected we noticed that the drum was rotating too fast. A check at BT33 (drum PG/FG in) showed that the waveform was missing. This is the drum tacho – a squarewave should be present here. The optocoupler on the drum motor PCB had failed. C.W.

Panasonic NVJ40

The customer complained that when he used this machine in the visual search mode all he got was a blank screen. Various checks were made, which brought us to the lower drum. This seemed to be worn. If the tape tension in the search mode was increased the picture reappeared. As the drum unit is so expensive we tried to revive it by polishing with Brasso and Duraglit. Needless to say, the lower drum soon found its way to the bin. A new drum restored perfect operation. C.Wa

Samsung VI7220

This machine did everything it should but the pictures were poor. So something was amiss. As the machine was loading I noticed that a kink appeared in the picture. This gave me a clue as to where the cause of the trouble lay. A check on the power supply's outputs quickly

took me to C102, which had dried up. C.W.

Hinari VLX10

This machine worked in the E-E mode, but when any tape function was tried it started up then reverted to standby. The cause of the trouble was traced to bridge rectifier D502 on the power supply PCB. C.W.

Philips VR727

Failure to load, with mechanical noises, should lead to a check on the pulley shaft that transfers the loading motor drive to the deck. The small plastic cog at the end splits and just spins on its shaft. To replace it you have to remove the capstan motor, the loading block, the deck and the cassette housing. The part number is 4822 528 81462 it's item 47 in the exploded view. This is the only item that's available on its own. All other deck components are supplied in kits. This applies with all Turbo deck VCRs. M.Dr.

Hitachi VTM722

Fuse F852 in the power supply had blown. Checks showed that there was a dead short across the 12V rail. Many items were disconnected before we found that the RF booster was the culprit. A splash of solder was shorting out two pins. M.Dr.

Sharp VCM60

We'd sold this top-of-the-range model some ten months previously. It came back dead, and on inspection we found that the 4.7Ω surge limiting resistor R904 was open-circuit and the 2SC4231 chopper transistor Q901 short-circuit. Replacements brought the machine back to life, but we noticed that heat had discoloured the PCB below Q901. So we decided to fit a small heatsink to it. An old Ferguson 9000 chassis sound output transistor heatsink proved to be an ideal fit. **M.Dr.**

Samsung VIK326

This machine would power up then return to standby. In fact it did this so quickly that we didn't have time to carry out any checks in the power supply. So we placed a short-circuit across the collector and emitter of the power control transistor Q158, thereby keeping the supply lines switched on. In this condition we found that the 5V supply was low at 3.5V. The culprit was the 8V supply's smoothing capacitor C35, which had dried up. It's a 470µF, 16V 105°C electrolytic. M.Dr.

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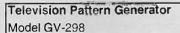
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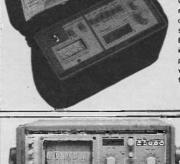


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What a Life!

Donald Bullock had a hard time with son Steven's oddball clientele while Steve was away on holiday in Greece

I've had a terrible time while son Steven has been away on holiday somewhere in Greece. Before he went he wired his soldering iron to the front of the bench. Since I don't walk like a German, I kept getting my foot caught in its long lead. He's nothing like as intellectual as I am - follows Greeneyes I suppose and seems to encourage thickheads and oddballs just for the laughs. For the last fortnight they've all converged on me. I've had about enough, I can tell you.

Drop of Solder, Please

The first was Norman Kneejerk, the happiest sap I know. He called last Monday morning, when it was raining hard. I'd just caught my foot in that cable again and upset my tea down my shirt when he marched in with a Panasonic TX2 television set in his arms and a screwdriver in his

mouth. Since he's a walking warehouse of jokes that make you cringe, I decided to get rid of him quickly. I shook the tea off my cuffs and pulled a job card towards me.

"Mornin' sunshine" he bawled, "likes your drop of tea then."

He plonked the set down. "Bunches into lines when it's hot. But have no fear - Norman's 'ere." That was followed by a peal of insane laughter.

Then he slipped the back off the set and pointed to the line driver transformer T531. "This 'un's dryjointed" he blared. "Drop a bit of solder on his legs, will you?"

I did as I was told and he quickly reassembled the set, put his screwdriver in his mouth and swept

Liney Pictures

After changing my shirt I returned to see the postman arrive. "Duck" he said. I looked around me then saw that he had left the post. Electricity bill. Gas bill. Rates And they're big money nowadays. As I stood nursing my misery, a thin dark cove with bright eyes pranced in nursing a Panasonic CR. He smiled and pointed at me.

"Super forehead" he said, "but it's being liney." I decided to ignore the jibe and drew up a job card.
"Name?" I asked.

"Ramonshab Habeshamwee-Skwyl" he smiled.

I put my pen down. "Pop in tomorrow" I said.

The machine was in NVJ45 -Super 4 head. I tried it in the E-E mode and the picture was terrible all lines and interference. Then I played a tape. The results were even worse. Was there one fault or two?

I decided to concentrate on the E-E fault symptom first and approached the power supply with

the hairdryer. A single blast at C27 (330µF, 10V), the slyest looking electrolytic I could find, made the picture much worse. A blast of freezer improved it. The same applied with the playback picture. Our meter said C27 was OK, but a replacement cured the trouble.

A Dead Maspro

Then a lanky misfit sauntered in. He looked like a dyspeptic question mark. "Where's Steve, mate?" he asked.

I looked behind me, then at the questioner. "Greece" I said.

"You any good?" he asked, producing a Maspro SRE250S satellite receiver. "Cos this 'un's dead, mate."

He was just too much. I waved him out and opened the Maspro. It's identical to the Pace PRD800, and as usual required a full rebuild on the primary side of the power

supply. I reached for the usual bits and replaced the TEA2018 chopper control chip U1, the BUT11A chopper transistor Q1 and the various capacitors and resistors. After this it sprung to life. I wondered what sort of kit would be required to get its owner right, and decided that a ten-year spell in the army might be a good start - but tough on them.

Just then my journalist daughter Rebecca popped in. "What's a spin doctor, dad?" she asked. "Dunno" I said, and she fled.

Sprained Wrist

The next caller looked like a sprawling birthmark. As though he'd been bleached then unsuccessfully dyed strawberry pink. He had a couple of feathers in his ginger hair and was clutching a Matsui 209T TV set.



"Hwahna hwuppnah hweep chwah" he said. His gutteral voice made Jimmy Knapp sound like a falsetto. I looked at him and passed him a job card and a pen. "I've sprained my wrist" I said.

He picked up the pen, shut one eye, pulled his mouth open and wrote "Herb McHaggis" and a phone number on the card.

When he'd left I pulled the set on to the bench and tried it. The picture was good, apart from a bright line across the centre—like field collapse superimposed on a normal picture. The set has a discrete-component field output stage, with complementary pnp and npn transistors.

"What causes that bright line?" asked Greeneyes.

"The spot that writes the picture is writing two lines in the same place before carrying on." I said.
"Why?" she asked. "Well, one

"Why?" she asked. "Well, one transistor writes the top half of the picture, then the other takes over to write the lower half." I said. "There's a bit of a problem where they meet, and while it's waiting for instructions the spot is hanging about and writing away out of cussedness."

I spied a 10μF, 50V bootstrap capacitor nearby (C302). Now I don't like low-value, high-voltage electrolytics. Their crime rate is high. This one added to it. Its value had fallen, a replacement curing the fault.

The Mouse

A bit later Nick and Doris came in. Doris and Greeneyes went into a huddle and Nick dived his hand into his pocket.

"I've brought you my mouse" he said. "Perhaps you can do something with it. It won't work."

I looked at him. Didn't even know he kept mice, let alone working ones. Then he produced this computer mouse.

When I looked inside I saw that there were three tiny, round pressure switches. They were sticking. I picked up an old VCR front that used identical switches. When the faulty ones had been replaced the mouse was OK.

replaced the mouse was OK.
"That's clever of you" Nick said.
"You know I recommend you all over our club."

As they were leaving Nick pointed to the sun blind above the shop front. "There's a big belly of rainwater up there" he said. He picked up the sweeping brush and pushed the blind up — just as McHaggis came to collect his set.

He collected the deluge first.

"Hrupplahnnoop.
Kwaaahahruppnah Twoe n
hwopper" he bellowed. "Ai cannah
fwalpren. Bluddahwhall
sokenwhaitt!!"

"Sorry" said Nick, skipping off.

Crackles and Flickers

A huge old car pulled up. The Reverend Goode clambered out, hugging a Panasonic NVL20 VCR.

"Good to see you, Donald" he boomed. "You've met Curate Blande before I think . . . "

"Er, good to see you" said the Curate, three octaves higher.

"Crackles and flickers like the devil" bawled the Reverend. "Not the bally Curate, the set!"

"Like the . . er . . devil" said the Curate. ". . . the set."

"Always did, mind, but it's intolerable now" the Reverend continued.

"Intolerable now" squeaked the Curate.

The E-E picture and sound were unstable, and touching the PCB almost anywhere made it worse. I took out the tuner subpanel, resoldered some very dry joints, then reassembled it. The fault was still present. Further tapping and flexing took me to the RF demodulator can. There were a couple of poor joints inside, but resoldering them made no difference.

Then I noticed a ribbon of fifteen conductors that connected the main PCB to the clock/control panel. It was connected to the main PCB directly, but was connected to the front panel via a plug and socket arrangement. Or rather half connected. The plug wasn't pressed fully home, and its covering of dust showed that it never had been. Pressing it home cured the trouble.

James's Problem

As I was boxing up the Panasonic VCR unit son James came in, looking a bit down in the mouth.

"The disc drive motor in my Amiga A500 computer seized last night" he said. "So I took the computer to my room and carefully removed the motor assembly. It's mounted on a 9 × 7cm PCB, with its metal backing plate, and there's a sync magnet attached to the rim. I slid the disc platten off the motor shaft, placed it carefully on a keyed drawing on the desk, and took the motor to the workshop to clean and lubricate it. The motor's all right now."

"Good" I said. Then he told me

the bad news. While he was in the workshop Greeneyes had gone into his room, seen the mess on his desk and tidied it up. The platten and keyed drawing were separated. So far his attempts at achieving the correct reassembly position have been unsuccessful. The motor spins, but fails to boot up the disc and stops.

Does anyone have any alignment information? Or perhaps someone has a surplus replacement motor panel assembly or replacement disc drive?

Jammed Switch Mayhem

My last tussle of the day was brought in by Phyllis Puke. It was a 20in. NEI set, Model 2051R.

"There can't be much wrong with this set" she announced, "it's almost new. My husband always reckoned it to be a loose wire or the valve. He's dead, that's the problem."

"I'm sorry to hear that" I said, "er,

what happened?"

"Dunno" she said, looking at the set. "He was OK last night. When I tried him today he was just dead. Can you get him right by tomorrah?"

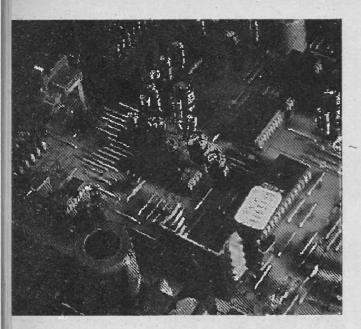
I waved her out and pulled her set on to the bench. If I pressed the on/off button enough to close the mains switch, but not enough to short the pulse contacts, the set went into standby and couldn't be brought out by either manual or remote control. If I pressed the switch in all the way there was a rustle of EHT but nothing appeared on the screen.

I marked the position of the first anode preset carefully, then turned it up. A milky raster with pronounced flyback lines appeared. Then I noticed that a button on the front panel was jammed in the on position. It was the 'select' button, for colour, brightness etc., and was made of flimsy plastic. By jamming in, it had disabled the microcontroller chip. I found a better replacement in our junk box and this cured the trouble.

I boxed the set up and, as I was putting it down, caught my foot in Steven's loop of soldering iron lead. The hot iron flew up and I did an impromptu juggling act with it and the set as the phone rang and rang. When I picked it up it was Steven calling from Greece.

"I've had a terrible time" he said.
"It's been raining every day. I've never seen so much."

A wicked smile creased my face. "Good!" I bellowed, "good, good, good!!"



Satellite Notebook

Reports from Chris Hawkins, Philip Blundell, AMIEEIE and Hugh Cocks

Cambridge ARX200

If the mains fuse has blown, check the MA2810 hybrid switch-mode regulator chip U14. The internal chopper transistor has its base, collector and emitter connected to pins 3, 2 and 4 respectively and can thus be easily checked for shorts. C.H.

Grundig GIRD3000

"Decoder not working" was the complaint with this receiver. It was very reluctant to come out of standby at power up, though it did after a few minutes. Reception of clear channels was OK, but with VideoCrypt ones the picture didn't clear and there were no "insert card" etc. messages.

A check on the outputs from the power supply showed that the +5V rail was low at 4.5V and had at least a volt of ripple on it. C25 (2,200μF) had dried up. To avoid future problems I replaced the capacitors in the other 'hot spots' as well. P.B.

Lightning Strikes

We had a call to a Pace MSS100 following a thunder storm. A tree 100m away from the house had been struck by lightning, and after this the receiver wouldn't come on. The LEDs on the front panel were all out, and the terrestrial TV signals didn't pass through the modulator module, though plugging the aerial into the TV set directly produced good pictures.

I removed the satellite receiver's lid and checked the mains fuse FS1, the 10Ω surge limiter resistor R1 and the TOP202 chopper device. All were OK. When I reconnected the receiver to the mains supply it powered up normally. The TOP202

seems to be able to shut itself down where necessary, an admirable feature!

The same storm produced a call to a Pace MSS500. The customer knew that it was wise to unplug his receiver when lightning was around, but had been keen to listen to the end of The Archers on Radio 4. The strike had taken out the telephone and burglar alarm, though the TV set worked when the aerial was connected to it directly.

The inside of the MSS 500 looked innocent enough – a very slightly blown mains fuse appeared to be all that was wrong. The chopper control chip U1 was producing drive, and the chopper transistor Q1 measured OK. So I refitted Q1, replaced the fuse and switched on. Several of the reservoir/smoothing electrolytics exploded, which was an unnerving experience to say the least.

Further checks showed that optocoupler U2 appeared to be open-circuit on its secondary side, thus removing the regulation feedback to the primary side of the circuit. In this situation the power supply outputs appear to go sky high.

The lightning must have hit the dish and struck the receiver via the feeder rather than the mains supply—the LNB had also died, lending weight to this theory.

As the receiver was a write-off, I thought I would find out how high the power supply's DC output voltages could rise with no feedback from the secondary to the primary side of the circuit. The chopper part of the circuit was still working of

I disconnected all the rectifiers on

the secondary side of the circuit except the one for the 5V supply, then connected this rectifier to a 400V electrolytic capacitor. As the 5V rectifier was intact I left it—ideally it should have been replaced with a higher voltage type.

When power was applied I obtained a reading of 100V and hurriedly switched off! Surely some form of overvoltage trip could have been included at minimal extra cost?

The owner decided to keep the MSS500 as a 'dummy' – he's away a lot. If someone steals it they will be in for a surprise! H.C.

SVA1 Sky Decoder

This old decoder displayed the message "your card is invalid" even when there was no card in the slot. Diagnosis is fairly easy. Disconnect the mains power from the unit, insert a card in the slot, reapply the power and a picture should be seen. But when the card is removed the "invalid" message will return and remain even when the card is reinserted.

On removing the top of the card reader you'll see two contacts at the rear. They are pushed open-circuit when a card is inserted in the slot, and should make contact when the card is withdrawn. Otherwise "your card is invalid" will be displayed. Cleaning the contacts should restore normal operation. As they are normally open-circuit, with a card in the slot, they become oxidised.

If operation seems to be intermittent after cleaning the contacts, replace the card reader. Sometimes the card contacts don't make good connection – pushing down on top of the card reader brings a picture back. We've had a

couple of cases where something has been forced into the slot violently, bending the contacts beyond repair - and usually ruining the user's card when it is reinserted.

I normally use an old viewing card for initial decoder tests. If everything is OK, the message displayed will be "your card has expired". It's all too easy to destroy a current card accidentally when working on a decoder. H.C.

Motorised Dish Systems

A common problem with motorised systems is poor dish reset accuracy after a few years' use, i.e. the dish doesn't return to a satellite position precisely each time. Modern receiver/positioners get round the problem by means of an autofocus system, which uses a kind of AGC arrangement for final control of the dish drive so that the dish settles at the highest signal strength position with each change of position. With an autofocus system you will, when the dish mechanics are poor, be warned by the receiver when storing a new channel (this applies with an MSS500/1000 motorised system anyway) that the dish position is not the same as that in the receiver's memory, though you can continue storing channels with no ill effects.

The first and most obvious thing to check is that the nuts and bolts that secure the actuator to the dish mount are secure. This is often the

cause of the problem.

In stubborn cases, replace the actuator. In a recent case where various dish resetting troubles occurred with a Drake ESR250 receiver/positioner a new actuator solved the problem.

I think that the main trouble is often to do with the motor movement sensing system, which generally uses a reed switch and rotary magnet. But in view of the fairly low cost of a new actuator, it's not worth replacing these items - the cause of the problem could as well be the gearbox mechanics.

Some older actuators require frequent oiling to prevent them becoming excessively noisy. Modern ones are better in this respect.

When replacing the motor, ensure that the dish movement sensor and motor drive lead pairs do not get mixed up - a reed switch doesn't appreciate the motor voltage being across it at all!

Don't forget to set the mechanical limit switches in the motor box. The west limit is normally with the

actuator nearly closed. We usually set the east one just beyond Astra (Turksat at 42°E is not available in this part of Europe).

Don't just rely on the positioner's electronic limits. Some years ago the first Connexions 8520R receiver/positioners had no electronic motor limits, relying solely on the installer to set the limits at the motor. After a power failure the dish would always move 10° or so by itself. This would confuse users no end. After rekeying the satellite via the remote control, the dish would happily return to where it should have been.

In one case the installer hadn't bothered to set the motor limits and the dish was fairly near a wall: the actuator worked well, driving the 1.8m dish so hard against the wall that it was a write off. Needless to say, electronic limits were introduced with later production of the 8520R. H.C.

Cable Trouble

I recently received a call for help from someone with three 1.2m prime-focus dishes with magnetic polarisers. The dishes were all looking at Astra, as the owner had been told by the installer two years previously that "this was the only way to connect different types of receiver".

Dish no. 3 was used less than the others, being linked to a part of the house used only in summer. It had been disconnected all winter. The receiver worked for a few hours, after which it provided reception of only the higher-frequency channels - above 1,500MHz. Similar results were obtained when one of the other receivers in the house was connected up.

The owner was keen to upgrade the system and run all the receivers from a single dish for Astra, using one of the other dishes for Eutelsat at 13°E. This was going to mean installing a 'magic switch', a dualoutput LNB and supplying some new receiving gear, to say the least. Since this couldn't be done on the spot, and the customer was keen to have reception that evening, I removed the suspect LNB from the dish. It was no great suprise to find that it was corroded inside, water having entered via the bare F connector during the winter.

I replaced the LNB (the magnetic polariser DC resistance reading was correct at about 100Ω) and was rewarded with good pictures across the entire IF band. After about half an hour however the signals became

Viewing Card Problem

We've had several cases of intermittent VideoCrypt decoding recently. The decoding fails for a few seconds every minute or so then returns to normal. After spending a lot of time on the problem the first time we had it we discovered that the viewing card was the cause. In every case it has been subjected to excessive heat because the decoder-receiver was enclosed in a TV cabinet with glass doors.

Decoding often seems to cease with pictures that contain a large white area. This tends to raise suspicions about the level and quality of the

video input to the decoder. H.C.

very erratic at all frequencies. Since the LNB and the receiver had been changed, the only thing left was the cable. Connecting a new run proved the point. When the original cable was cut back for the first few metres, evidence of corrosion was revealed. It's essential to cover F connectors with self-amalgamating tape at least, and if possible use a cover to protect the LNB from the elements. H.C.



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Wanted: LOPT for the Pericom 7800 terminal CP/M microcomputer system, or rewind of existing transformer. Alan Kilby, 3 Silkmill Row, Eckington, Worcs WR10 3AT. 01386 750 474.

For disposal: SM111 18MHz dual-trace portable scope with two x10 probes, x1 probe, cables and service manual, £65. Avo Model 8 Mk III with leads and leather case, £35. Avo EM4 electronic testmeter with leads, x10 multiplier and handbook, £25. Or £110 the lot. All in excellent condition and performing to specification. To collect. G.M. Kitchen, The Nook, The Butts, Colyton, E. Devon EX13 6NU. 01297 553 301.

Wanted: Aerial and RF rear tuner input box and remote handset for the Akai VS467EK; remote handset (type V803B) for the Akai VS301EK. Have for disposal working panels for the Ferguson 3V23 and a Philips VR6460 with a power fault. R. Bruce, 11 New Zealand Way, Rainham, Essex RM13 8JP.

For disposal: Quite a lot of memorabilia. Copies of *Television* back to 1974 almost complete to 1989 and a few copies to 1992. Hunts capacitance bridge, Advance signal generator, Beamax tube tester, *Trader* service sheets, valves, etc. Anyone interested should phone 01543 491 695. John Bates, Armitage, Staffs.

Wanted: Copies of *Television* from 1990 on, also books on TV faults. Arthur Norton, 17 Portland Avenue, Seaham, Co. Durham SR7 8AN. 01915 813 775.

Wanted: An IMI Polar II rotary UHF tuner or any other type of rotary UHF tuner converted to feed TV sound to an FM tuner. John Lawless, 71 Langdale Avenue, Mitcham, Surrey CR4 4AJ. 0181 646 0002.

Wanted: Service information for or someone with repair experience of Nufax teletext adaptors. Phil Blundell, c/o Television, Quadrant House, The Quadrant, Surrey SM2 5AS. 0181 652 8120.

Wanted: Circuit diagram (photocopy OK) for the Bush CCD5500 car CD player, also a Sony CXD1130Q IC. Paul Ewers, 12 Brae Hill, Brill, Bucks HP18 9TF. 01844 237 131

Wanted: Back issues of *Television* from 1990 to 1993 inclusive. R. Oldfield. 103 Leeds Road, Harrogate, Yorks HG2 8EZ. 01423 870 172.

Wanted: Circuit diagrams for the Sanyo VTC5300P VCR, particularly the loading circuits. J. Abram, 11 Derwent Gardens, Ilford, Essex IG4 5NA. 0181 550 8546.

Wanted: LOPT for the Panasonic Model TC492EUD, or its TLF number. M.P. Nalletamby, 57 Upwood Road, Lee, London SE12 8AE.

Wanted: Front control panel for the Fidelity 51TRS TV set, or source of this item. Have Sony VO2860P U-Matic VCR for disposal – offers or exchange please. Service TV, 18 Benfleet Road, Hadleigh, Essex SS7 1QB. 01702 558 444.

Wanted: User's manual or channel tuning

set-up procedure for the Sharp 21BN21 multi-standard TV set. Dennis O'Sullivan, Inniscarra, Nursery Hill, Ansley Common, Nuneaton, Warks CV10 0PY. 01203 397-886.

Wanted: Circuit diagram (photocopy OK) for the Hikona RM2000 colour TV receiver. J. Naughton, 40 Gala Crescent, Wishaw, Strathclyde ML2 7JR.

Wanted: Lens assembly for the Panasonic NVM1 video camera. R.J. Hughes, Glandy, Dinas Cross, Newport, Pembs SA42 0XP. 01348 811 255.

Wanted: TCM1705A and TCM1512P ICs. Also a photocopy of data on each would help. Peter Ward, Petgra, Forest Corner, Ringwood, Hants BH24 3JW. 01425 475 445.

Wanted: Data sheet or any other information on the TDA3300B colour processing chip and Secam adaptor for the Rediffusion Mk 4 chassis. Paul Eaves, 51 Victoria Road, Garswood, Wigan WN4 0SZ. 01942 273 883.

Wanted: Cassette deck for the JVC 5DD stereo cassette player, or a complete unit. J. Austin, 5 Cranwell Road, Greasby. Wirral L49 3PP. 01516 779 048.

Wanted: Circuit diagram for a Portavision 5in. monochrome TV set. Circuit diagram or user manual for an Excelerator DSZ6EVTH409 5-25in. disc drive made in Taiwan. Or photocopies or source of this information. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 01912 620 712.

Answer to Test Case 407

- See page 17 -

When servicing TV sets – and many other things, which include ailing people! – an apparent but temporary cure can often be achieved by treating the symptom rather than its true cause. This is what had happened with the Hitachi C2118. Plainly the HT voltage was not stable, rising erratically, sometimes to a point at which the set would trip, sometimes to a level at which the protection zener diode would be destroyed. The extreme setting of the HT preset VR901 should have indicated to Cathode Ray that something else was wrong, especially when ZD902 and Q905 had been replaced with little effect.

In a case like this it pays to bear in mind that drift in either the reference or the sample voltage applied to an error detector/amplifier transistor will affect its output. The cause of the problem here lay in the sampling voltage circuit. R909, one of the resistors in series with the preset control, had become both unstable and high in value. When it was checked the resistance reading was closer to $47k\Omega$ than the correct $39k\Omega$, and the reading was erratic. Ted supervised the fitting of a replacement $39k\Omega$, 0.5W resistor, which restored the mid-travel setting of VR901 for the correct HT voltage of 112V- and a steady picture.

What about Warner Rogers? He was making a largely academic point, as was his wont. Any such device operating above 7V is, he declared, an avalanche diode. "He theorises about them, while we actually mend them" commented Ted.

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J. LeJeune
describes
the technology used
in the Pace
MSP200
dishpositioner
unit

he Pace MSP200 dish positioner will operate as a slave unit in conjunction with many Pace satellite receivers and their equivalents in other ranges and can also be used as a stand-alone unit. Three configurations provide operation with Pace MSS series receivers, Models PRD800/900 and MRD950/960; earlier models like the SS9000, SS9200 and MRD920; and as an independent unit. There are two versions, with or without a polariser module.

When used in conjunction with a compatible satellite receiver the MSP200 receives instructions from the receiver's microcontroller chip via an interconnecting scart cable. The connection is between the receiver's decoder scart socket and the positioner's receiver interface scart socket.

Modes and Configurations

The positioner has three operational modes, two of which are used only for initial setting up or if changes are to be made to the satellite line-up. The 'set-limits' mode is used immediately after the dish actuator's limit switches have been set and before any other parameters are entered. The 'program' mode is then used to enter the satellite position data and skew (if used). For everyday operation the positioner will be in the 'normal' mode, to which the unit switches each time it is powered up from standby.

Of the three configurations provided, Config 1 is

available only when the unit incorporates the polariser control circuitry.

Controlling the MPS200

Data is sent to the positioner's own Z8 type microcontroller chip from the receiver's microcontroller chip via the scart cable interface. For MSS series receivers and their equivalents the code consists of eight bits, the first seven being used for the satellite number (1-64) while the eighth is used for polarisation control (horizontal or vertical). With PRD series and MRD950/960 receivers the 8-bit code denotes the satellite number only: as all eight bits are used, the satellite numbers can be from 1 to 128. With earlier models such as the SS9000, SS9200 and MRD920, seven of the eight bits are used to pass the program number to the positioner, allowing satellite numbers up to 90 to be used.

Thus Config 1 passes satellite number and polarisation information, Config 2 passes satellite numbers only and Config 3 passes program numbers only.

The Power Supply

The MSP200 contains a straightforward power supply (see Fig. 1) with a mains transformer and two bridge rectifiers. Low-voltage outputs are obtained from the toroidal mains transformer T1. These are 36V for motor drive via relays and a 12V supply. The 36V supply is isolated from the rest of the receiver to ensure that no harm can come to the positioner's circuitry should a wrong motor connection be made. The 12V supply is unregulated, but an LM340T5 regulator is used to derive from it a 5V line for the processing sections of the unit.

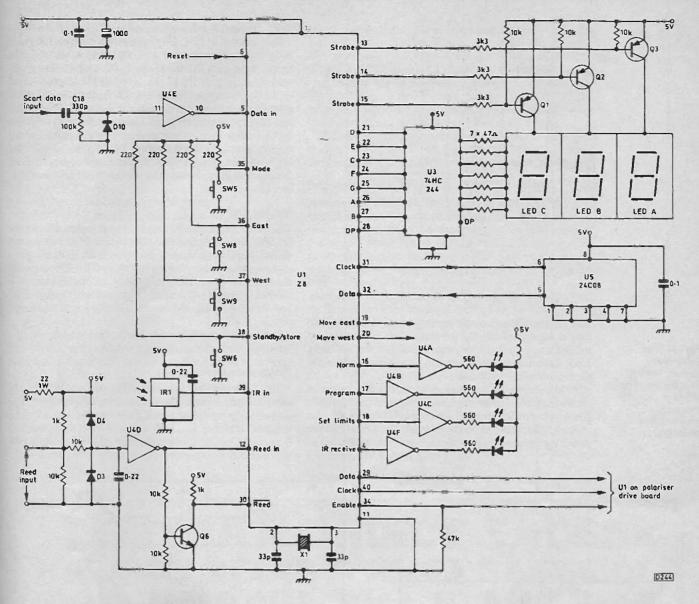
Relays are used to switch and reverse the motor drive supplies. When the relays are de-energised their contacts short-circuit the motor to provide dynamic braking.

The Microcontroller

The Z8 microcontroller chip U1 (see Fig. 2) oversees all the positioner's functions. Commands can be entered via infra-red remote control. There is also a more limited set of commands available via front-panel keys.

The infra-red commands are received by IR1 and are passed to pin 39 of U1. The front-panel standby on/off

Fig. 1: The power supply circuit used in the Pace MSP200 dish positioner unit.



switch SW6 connects pin 38 of U1 to chassis to toggle between full power and standby. The cast switch SW8 connects pin 36 to chassis to move the dish in an easterly direction. Switch SW9 connects pin 37 to chassis to provide westerly dish movement. The east key has an upwards arrow while the west key has a downwards one. The mode switch SW5 earths pin 35 to put the positioner into the 'set-limits' mode. If the mode key is used in conjunction with another key however other functions are available. These are as follows.

- (a) In the 'normal' mode, use of the mode and east keys puts the positioner into the 'program' mode, stage A.
- (b) In the 'program' mode, stage A, use of the mode key puts the unit into the 'set-limits' mode unless any other keys have been pressed since entering the program mode. If you have done this, the unit reverts to the 'normal' mode.

The east and west keys move the dish in the direction indicated.

The standby key puts the unit into the 'program' mode, stage B.

(c) In the program mode stage B, the east or west keys change the satellite number. The mode key returns the unit

to the normal mode. The standby key provides a 'store' function to memorise the current satellite number and the dish position reference. The unit also returns to the normal mode.

(d) In the 'set limits' mode the east and west keys move the dish in the direction indicated, the standby key provides a store function to memorise the east and west limits and the mode key returns the unit to the normal mode.

Programming via the infra-red remote control handset is more comprehensive. For details of this the user handbook should be consulted.

U1 operates at a clock frequency of 8MHz – crystal X1 is connected between pins 2 and 3. An internal ROM contains the system control software, but all the user set parameters are stored in the non-volatile EEPROM U5. Communication between U1 and U5 is via a serial data bus – clock at pin 31 and data at pin 32 of U1. Pin 34 of U1 is used to sense the presence of the polariser board: in its absence, the unnumbered $47k\Omega$ resistor links the pin to chassis potential.

Serial data from a compatible satellite receiver is fed to the positioner via pin 12 of the scart cable. It's passed via C18 to pin 11 of U4, with D10 providing DC restoration.

Fig. 2: The microcontroller and associated circuitry used in the MSP200.

Fig. 3: The motor drive circuit.

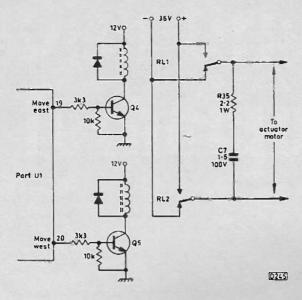


Fig. 4: The polariser circuit, which can be used to drive a magnetic or mechanical polariser.

U4E inverts the pulses for feeding to pin 5 of U1. This data is used primarily for automatic dish positioning by reference to the satellite or program number, but in Config 1 polarisation information can also be sent to the unit using the last bit of the 8-bit code.

U1 also drives the three seven-segment LED indicators on the front panel. A multiplexed drive from pins 21-28 is passed via the eight-channel driver chip U3 to the cathodes of the LEDs. Three strobe lines (pins 13-15 of U1) drive switching transistors Q1-3 which supply the anodes of the

three common-anode indicators.

Four individual LEDs to give mode indication (normal, program and set limits) and IR receive are fed via buffer/driver amplifiers U4A, B, C and F. They are controlled by pins 16, 17, 18 and 4 of U1 respectively.

The remaining section of U4 (D) is used to invert the reed switch pulses from the actuator assembly. Diodes D3 and D4 at its input clip any transients from an actuator motor with a 'sparky' commutator or static picked up by the cables as a result of storms or local fields. To cater for a photo-interruptor type of pulse generator, 5V is available at the red connector on the unit's rear terminal block.

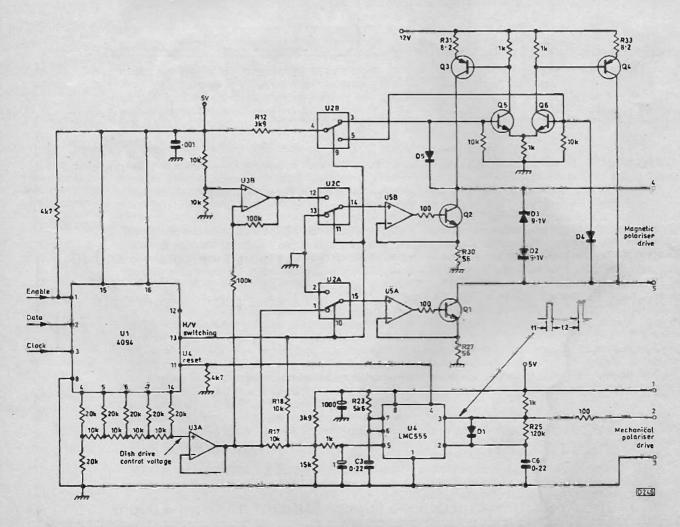
Motor Drive

The motor drive arrangement is similar to that used in the MSS501IP module described last month. Fig. 3 shows the circuit. For eastwards dish movement pin 19 of U1 goes high, switching Q4 on to operate relay RL1. The contacts change over and 36V is applied to the motor. For westwards movement pin 20 goes high. Relay RL2 operates, applying the motor voltage with reversed polarity.

R35 and C7 are included to provide transient limiting – important since the motor is an inductive load.

Polariser Drive

Fig. 4 shows the polariser drive circuit, which can control either a magnetic or a mechanical polariser. The control chip on this separate PCB has the same circuit reference number U1, but is type 4094 (shift register) instead of type Z8. Commands are sent to U1 from the Z8



chip in serial form: pin 1 receives an enable signal, pin 2 the data and pin 3 the clock signal.

The resistive ladder network connected to pins 4-7 and 14 forms a digital-to-analogue converter whose output is buffered by U3A.

Voltage-to-current conversion is required for the magnetic polariser drive. Operational amplifiers U5A/B provide this conversion, the following output stages providing a current swing between -80 and +80mA. U2A and U2C control the current switching, with U3B providing inversion for reverse drive.

Pin 13 of U1 provides the H/V switching level to control U2A and U2C. At the same time U2B is switched to

provide forward or reverse current drive.

If pin 13 of U1 goes high, U2A selects the input at pin 1—the non-inverted output from U3A—and U2C selects the input at pin 13, which is at chassis potential. U3A's output is directed to U5A and then output transistor Q1. The voltage at pin 9 of U2B goes high, moving the switch contact to pin 3. Thus forward bias is applied to Q5, which switches on. Q3 in turn conducts, current flowing via R27, Q1, the polariser, Q3 and R31, with control of the current being exercised by Q1 and U5A.

If pin 13 of U1 goes low, the conditions are reversed. The outcome is that current flows via R30, Q2, the polariser, Q4 and R33, this time in the reverse direction.

The 9 1V zener diodes D2 and D3 provide protection against voltage transients on the output lines. D4, D5, Q5 and Q6 provide short-circuit protection.

Mechanical polarisers require a different type of drive, which is provided by the 555 timer chip U4. This produces a variable pulse-width output at pin 3.

The output from the AD converter network connected to

U1 is summed with the H/V control signal by resistors R17 and R18, altering the bias at pin 5 of U4. This input is compared with the voltage at pin 6, which is connected to the timing components R23 and C3. These set the period t1 shown in Fig. 4. R25 and C6 at pin 2 set period t2, which starts when the output at pin 3 decreases. At the end of period t2 the voltage at pin 7 also decreases, initiating the discharge of C3. This starts the next timing period.

The variable mark-space ratio waveform thus generated can move the polariser backwards or forwards, setting it accurately. The pulse width varies between 0.8-2.4msec.

Servicing

Servicing the MSS501IP module or the MSP200 unit should not present any problems. The control logic is straightforward, and the components are readily available.

The only faults we've encountered have caused dish positioning errors: the diodes in the reed/optical sensor input circuit can develop leakage, the result being a count error or count failure.

One case of mains-borne spikes causing spurious dish movement has been recorded. This called for modification by the manufacturer, after which the installation behaved perfectly.

In Conclusion

Only satellite TV buffs nowadays insist on a polariser. A low-noise, universal LNB with a polar-mounted dish is adequate for the vast majority of installations where multisatellite reception is required. In most locations an LNB with a noise figure of 0.9dB and a 1m dish suffice, though north of the Caledonian Canal I would suspect that the dish size should be increased to 1.2m.

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Long-distance Television

DX conditions and reception. Satellite sightings and news. LNBs for satzappers. Roger Bunney reports.

combined Band I/III Yagis.

ugust turned out to be a relatively quiet month for terrestrial DX-TV reception. It was the tail end of a less than enthralling Sporadic E season, though there were a few openings. The warm summer weather helped to lift tropospheric conditions in the middle of the month, giving Band III/UHF reception from the Benelux countries and NE France in the southern and south eastern UK. Conditions were most active on the 17/18th. During this period Roger Fussell (Torpoint, Cornwall) logged numerous Spanish Band III/UHF stations - no less than twelve on the 18th.

During the latter part of the month I spent a bit of time aerial spotting. There were no bowties anywhere. The directions of the UHF Yagis varied between the main Guernsey transmitter and the St Peter Port relay. A few were directed towards Cherbourg, including a magnificent Triax MTH13 Band III Yagi. Several relics of the 405-line days remain, mainly five-element

I was on holiday in Guernsey, where

The rather sparse August SpE loggings are as follows:

Syria ch. E2 (at 0900 5/8/96 BST); RAI (Italy) ch. IA; TVE (Spain) chs. E2-4; NRK (Norway) E2, 3; SVT (Sweden) E2-4; DR (Denmark) E3; C+ (Canal Plus France) L2.

7/8/96 SLO (Slovenia) E3; HRT (Crotia) E4; DR E3; an unidentified E2 signal from the SE with what appeared to be Russian/Serb sound.

10/8/96 SVT E2, 3; TVE E2; NRK E3, 4; DR E3; Russia R2; RTP (Portugal) E3; RAI IA, B; ARD (Germany) E2.

NRK E2-4; YLE (Finland) 11/8/96 E4; ARD E2; SVT E2-4; LTV (Latvia) R2; RTP E2 (a 35W relay), 3, 4; TVE E2-4; RUV (Iceland) E3, 4; RAI IA; SLO E3.

12/8/96 NRK E2; RAI IA, B; C+ L2; DR E3; an unidentified Arabic E2 signal at 0827

13/8/96 TVE E2; DR E3; Russia

14/8/96 TVE E2; Video (Italy) E2; an unidentified Arabic ch. E2 signal at 1845 BST.

15/8/96 RAI IA, B; TVA (Italy) IA: Video E2.

16/8/96 RAI IA; Video E2; TVE E2-4; RTP E2, 3.

17/8/96 TVE E3.

18/8/96 TVE E2-4; Video E2; SLO E3.

19/8/96 NRK E3; DR E3; SLO E3; RAI IA.

20/8/96 TVE E2. 21/8/96 SLO E3

22/8/96 SLO E3; RAI IA, B; Video E2.

23/8/96 SVT E2; Russia R1; Video E2; an unidentified logo (T.R. ?) on ch. E2.

26/8/96 An unidentified ch. E4 signal.

My thanks to Cyril Willis (King's Lynn), Roger Fussell (Torpoint) and Peter Schubert (Rainham) for sending in reception reports.

Satellite Sightings

It's been Fun in the Sun for those Brits who hiked to South Spain for their holidays only to find the **GMTV Outside Broadcasting Unit** transmitting early morning song, dance and entertainment routines to the folks back home. The SNG UKI76 truck's output was relayed back via Intelsat K (21.5°W) at 11-5GHz horizontal. At the time of writing, the summer series has been running for well over a month - nice for the lucky crew!

On a more sombre note, there was extensive on-site reporting of the Watford train crash on the 8th, from UKI40 via Intelsat K.

On the 14th, not sleeping too well, I checked out the Clarke Belt at 0330 hours. Intelsat K was alive and well with Bob Dole's electroral speech from San Diego, California. That put an end to my insomnia!

Fred Pilkington has retired to Malaga, Spain with his 1m tracking dish and receivers from Maspro and Nokia. He was delighted to find the new home of MED-TV, at 11-075GHz vertical aboard Intelsat 705 (18°W). It has moved from Eutelsat II F2. No luck however with Amos-1 at 4°W. On the 11th he had the Orangemen's march from Intelsat K via the Reuters 11.497GHz lease. The news footage etc. came from Intrax UKI22

A call from John Locker (Wirral) alerted me to the arrival of Turksat

This caption, with sound-in-sync, was snapped by John Locker using the new Dutch EBU decoder. It was received from Eutelsat II F4 at

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1C at 31°E, with 11·45GHz test transmissions. Unfortunately it's behind the trees here at my location. There are apparently still stable though weak signals from GALS (38°E), with NTV at 11·912 and 12·16GHz.

Many C band transponders were used for the Olympics in addition to the numerous Ku band ones. Ian Waller (Lincoln) counted seven aboard Intelsat 512 at 21·3°W. There were feeds via TDRS at 41°W and TDRS-6 at 47°W. All were using NTSC.

Malcolm Dewis (Nuneaton) has sent in a long VHS tape of his reception from 42°E to 45°W, using a 1m Lenson Heath dish driven by a Satman motor, a triple-band 0.8dB Echostar LNB and a Nokia 1700 receiver. One particular set of pictures shows NTL feeding MPEG-2 transmissions as received/recorded then played back for inspection and quality degradation, showing how quality was maintained despite changes in the symbol bit rate and FEC parameters. I suspect that they were relayed via Orion 1 at 37.5°W an impressive catch.

Bandula Gunasekera (Sri Lanka) is now receiving good Ku band signals from PAS-4 at 68-5°E. Earlier poorquality reception had been caused by incorrect setting of his 60cm offset dish (prime-focus dishes are the norm in his region). Now that the dish has been correctly set up, the NHK Tokyo-Paris circuit at 12-591 GHz comes in crystal clear. Heavy rain hasn't introduced too much loss, since the signals are received at a very steep vertical angle (elevation 78°).

There's an interesting advertisement for a Winersat WR3000 manually-tuned receiver in the August 1996 issue of the NZ magazine SatFACTS. "Last of the Manual Receivers" a caption claims. Certainly a manual receiver is the most effective type for sat-zapping, enabling each satellite to be checked rapidly. Long may they continue to be manufactured!

News Items (Terrestrial)

USA: The first digital terrestrial TV stations should be licensed by the summer of 1997. Broadcasters are being encouraged to adopt dual analogue/digital transmission. The Federal Communications Commission is suggesting that the 1,600 or so terrestrial stations move to digital only operation after a period of dual-standard transmissions. One suggested target date for the close down of analogue services is 2010.

Canada: A leading cable company is testing MPEG decoders and plans to start marketing them this autumn. Spain: The following regional services are to be privatised: Madrid TM3; Valencia TVV; Andalucia Canal Sur; Catalonia C33 and TV3; Basque region ETB1 and ETB2; Galicia TVG. TVE-2 is to remain under government control until the end of 1999, after which it may be privatised.

Pakistan: Shaheen Pay TV has opened MMDS (microwave multichannel distribution system) operations in Islamabad and Karachi, with eight satellite-sourced Englishlanguage channels. There are plans for further expansion.

UK: Tyne Tees Television, which opened in 1959, has changed its name to Channel 3 North East.

France: There are plans to run the La Cinquieme day-time and Arte prime-time services as a single operation to save costs. An alternative suggestion is to merge Arte with the France 3 service.

Satellite TV

A new series of satellites. Intersputnik 8, is being developed by the Russians. The first launch is expected in late 1997/spring 1998. The satellites will each have 24 C band and 16 Ku band transponders. with EIRPs of 40dBW and 52dBW respectively. Provisional slots are at 16°W and 75°E, covering the Europe/Africa and Middle East/India/SE Asia regions. The Russian NTV network is to launch a new satellite network early next year in conjunction with Gazprom, a state-owned gas company. There will be five 24-hour channels, with a satellite launch planned for October.

Arabic broadcaster Orbit has switched from Intelsat 704 at 66°E to 705 at 18°W. The change should provide improved coverage across North Africa, where dishes down to 1m should suffice for the digital service.

SE Asia is getting more analogue TV, with AsiaSat-2 providing MTB (Mongolian Television Broadcasting) at 4·17GHz and two Chinese stations, Guangdong Satellite TV and Henan TV, at 4·01GHz and 4·13GHz respectively. AsiaSat-3 is to be launched next year, taking up position at 105·5E with AsiaSat-1 moving to 122°E to provide additional commercial services. AsiaSat-4 is planned for 1999, with C, K, L, Ka and X band transponders for TV, commercial and general communications use.

The Indian satellite TV market is



booming, with a production studio complex to be opened in Bombay by December for the Star TV India service and more centres planned in Bombay and New Delhi.

A teleport caption, again received by John Locker via Eutelsat II F4.

Sat-zapper's Guide

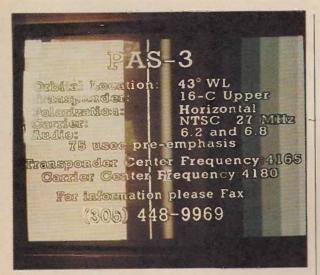
This month we'll consider the lownoise amplifier/frequency converter block (LNB). The Ku band LNBs used in most 'package systems' operate without a preceding in-line polariser. Instead, a polarisation selection voltage is sent up the



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This nice, informative identification caption was received from PAS-3R at 43°W. coaxial lead from the receiver to switch between microstrip probes for either vertically or horizontally polarised signals. This is a cheap yet very effective approach. The LNB is aligned for optimum vertical/horizontal reception with an attenuated signal (a wet J-cloth progressively folded over the feedhorn acts as an excellent attenuator). The screws are then tightened.

This is OK for fixed reception from a single satellite, e.g. Astra, but a tracking dish tilts as it travels from one extreme to the other to scan the satellite belt. Thus polarisation correction is desirable to maximise signal pick-up. The non-variable LNB is not really suited for use with a tracking dish, and the sat-zapper interested in reception of the weaker signals is best advised to use an inline magnetic polariser, such as the Racal wideband one, with his selected LNB.

Some ten years ago the standard LNB covered 10.95-11.7GHz and

had a noise figure of over 2dB. We now expect a noise figure of 0.5dB to 1dB maximum, with a coverage of 10.7-12.75GHz. The receiver's bandwidth has also increased. It's common for receivers to be tunable over 700MHz-2,100MHz, or selective bandwidth chunks between these limits.

While scanning the satellite belt the sat-zapper will encounter signals of varying strength from very high, e.g. Astra/Telecom, to low, e.g. Amos-1, GALS and the signals from inclined orbiting craft. With a dish of say 1-2m it's unlikely that overloading will occur, but such a dish will certainly bring in many weak signals.

The most important LNB characteristic is its noise figure. Low noise means better performance but a higher price. Other factors to look for are good linearity (i.e. no overloading or instability, fairly level gain, strong-signal handling capability etc.) and reasonable gain. I'd be happier with an LNB that had a quoted noise figure of say 0.7dB and a gain of 56dB than one with an 0.9dB noise figure and a gain of 90dB. Remember that to minimise those sparklies with weak signals a low electronic noise level is vital. Buy an LNB of reputable make from an equally reputable supplier.

The more advanced LNBs switch bands (Lo and Hi) when 13V or 17V is fed up the feeder. Since you are using a separate magnetic polariser with its own two-wire control, you can make use of this fact. Packaged LNBs of the Astra variety cannot use 13/17V switching to change bands, so a 22kHz signal is used instead—again sent from the receiver to the LNB via the coaxial feeder.

While looking through satellite component/LNB advertisements you'll come across reference to

single-band, triple-band, quad-band, multiband and universal LNBs. A single Ku band LNB will cover a specific spectrum such as 10-95-11.7GHz (the FSS band), 11.7-12.5GHz (the DBS band) or 12.5-12.75GHz (the Telecom band). A triple, quad or multiband LNB will cover the whole 10-95-12-8GHz spectrum, usually in two sections (10.9-11.8GHz and 11.7-12.75GHs the Lo and Hi bands) with voltage or tone switching to select them. An enhanced LNB extends the coverage down to 10.7GHz, intended for Astra 1D but also useful in including the Russian MIR video downlink! As its name suggests, the universal LNB covers 10.7-12.75GHz.

When the LNB switches from Lo to Hi its local oscillator frequency changes. As an example, the MTI quad-band LNB switches between 10·7-11·75GHz and 11·7-12·75GHz. Its local oscillator is switched between 9·75GHz and 10·75GHz. Thus the IF output to the receiver remains at around 950-2,050MHz. Incidentally the gain is quoted as 56dB, with a noise figure of 0·9dB when running at 200mA. The input flange is a rectangular WR75 type.

To obtain an exact frequency readout from the receiver it may be necessary to program a small offset oscillator variation – check with the user instructions.

When connecting the coaxial lead to your LNB always use the correct F plug crimping tool. Smear a touch of silicone grease on the LNB socket, and once tightened carefully wrap the plug/socket and first few inches of cable with self-amalgamating tape. It's best to provide the LNB/polariser assembly with weather protection. I use a modified washing-up liquid bottle. After two years' use the LNB head still looks like new!

Book Review

Seeing by Wireless, by Ray Herbert

Some 70 years ago John Logie Baird gave a public demonstration of his production of moving images, or television, using a combination of mechanical and electronic technology. He had produced shadow images three years earlier. During the following months his research and development led to an application for a TV transmitting licence. This was granted on August 5th, 1926, with the call sign G2TV.

Within a year the first ever DX-TV occurred: his 30-line transmissions were received in Hartsdale, New York. Transmissions were also received at sea, by the Berengaria in particular. Baird International Television was formed in June 1928.

Ray Herbert, who was himself involved with Baird's work, has written a fascinating account of the early days of Baird Television, with descriptions of receiver developments and transmission equipment. It's an impressive work, both in terms of the content and the many quality

illustrations. The slim volume (26 A4 pages within a card cover) take us from the early Hastings days through to Alexandra Palace. Baird also carried out work on stereoscopic and colour TV, and patented the Telechrome tube in July 1943.

This is in fact a remarkable document, which deals with a vital part of British TV development. It includes little known facts about Baird's work. Anyone interested in television should obtain and read the book — progress through the past 70 years has been dramatic. Financial support for the production of the book was provided by Quantel Ltd. of Newbury, which is well known for its progressive video equipment, both analogue and digital. I am very impressed with this publication, which I feel is underpriced at only £3 including postage (UK). To obtain a copy, send a cheque to Ray Herbert at 24 Norfolk Avenue, Sanderstead, South Croydon, Surrey CR2 8BN.



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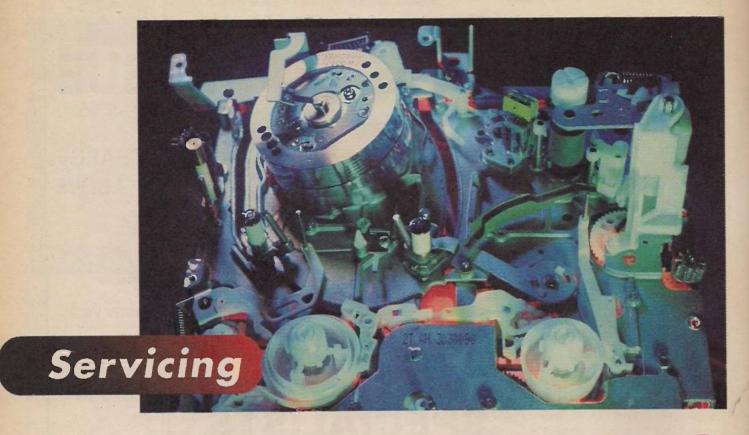
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TUBES



The Panasonic K Deck

It's three years since Panasonic VCRs started to use the K deck, long enough for a service history to be prepared. John Coombes describes the various fault conditions he has encountered

he design of the Panasonic K deck, used in NVHD and NVSD series models, follows the line adopted by all VCR manufacturers in recent years, with a substantially reduced number of parts in the drive mechanism.

Design Features

A separate motor is used for loading and mechanism control, with the brakes and loading gears directly driven via a multi-function lever. There are no sub-levers or solenoids. A tape end/beginning detector LED is used instead of a slide switch: this reduces the wiring required. There are fewer joint parts, and a smaller and thinner top plate and rack.

There is no longer any take-up reel incline position or P5 post height adjustment. Gear phase position alignment is also reduced. The K deck has only six gear phase alignment positions in comparison with the G deck's twelve positions.

The VCRs that use the deck are easy to dismantle, with the deck coming away from the main PCB. This enables mechanical parts to be replaced very easily. To help with fault finding, the VCR software has a built-in selfdiagnostic test system.

The Servicing Position

The K mechanism can be removed from the main circuit board assembly, but an extension cable (part no. VFK0889) between the loading motor and PCB socket P2001 has to be used to maintain operation. With the deck in the service position, its condition and the gear phase alignment can be checked. The loading/unloading operation can also be checked. This can be done by connecting a 4.5V battery across the loading motor pins, or by manually turning the worm gear or worm wheel gear.

If eject occurs when the cassette carriage has been removed, on reinserting it after repair the main cam gear will not engage with the carriage connection gear and will not rotate. To set up the eject operation with the cassette carriage disconnected you have to rotate the carriage connection gear by hand in the anti-clockwise direction.

Faults Encountered

As with so many decks, the most common problem is tape damage because of a faulty pinch roller (part no. VXA2246). The symptom can be tape creasing or chewing. There may also be tape looping, which can cause damage in playback or when the tape is ejected—

you can get looping around the guide poles or the pinch roller itself. The tape can ride up and down a well polished pinch roller, the result being creasing at the bottom and/or top of the tape and possible damage. This problem can also affect the sound and/or picture quality. If there is wow on sound, or picture jitter with missing control pulses, but no tape damage the cause can again be incorrect tape drive because of a polished pinch roller.

If playback of a machine's own recordings produces a noisy picture (poor sound and picture), check whether the audio/control head is dirty. The cause of the problem is missing control pulses. Cleaning the audio/control head usually suffices, but on a few occasions we have had to replace it. Although we have not had any electronic faults in this respect, the control pulses come from pins 34 and 35 of the MN6743VRTB chip IC6001. If there is no sound with a machine's own recordings and the output at pins 34 and 35 of IC6001 is correct, replace the AC head.

A worn lower drum can also affect the sound, and we've had this with a few machines. Because of the wear, the tape wanders up and down the AC head.

Mechanical noise in the fast forward mode can be caused by the tape itself or a faulty idler arm unit. If the VCR won't load correctly after replacing the idler arm unit, check that the idler control lever is correctly fitted and is not broken – replace it if you are not sure.

If the tape becomes stuck when eject is selected, check whether the take-up brake arm unit has come off or broken – this will mean that the take-up reel is unable to rotate.

If the playback picture is noisy, check the lead connections to the lower drum. Be sure to check the RF envelope. If the lead is broken, there will be no FM output from the video heads or upper drum.

On a few occasions we have had a machine whose playback has been spoilt by noise bars. They have been very noticeable with prerecorded tapes, though the machine's own recordings have been free of the fault. The cause has been dust or dirt on the inclined base assembly (guide poles).

Always check whether anything is obstructing the inclined base assembly. If this is OK but the VCR goes into the cuc mode when the play button is pressed, check whether the inclined base units (supply and take-up) are completely locking. Ensure that the V stopper and inclined base assembly is well greased.

If the machine won't accept a cassette, check the cassette holder plate unit. The cause may be just a broken release lever at the side of the unit.

If the video head cleaner arm unit is broken or incorrectly positioned, the head cleaner can be left in contact with the head all the time. This can result in a very badly worn upper drum.

There are several possible causes of chewed tape, including the pinch roller (see previous note). If necessary check the P5 arm unit, which may be bent. This can prevent tape ejection, with damage to the tape. Also check P5's stopper base, which can crack. Visual inspection will show whether either of these faults is present. If the P5

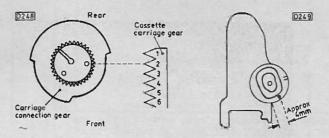


Fig. 1 (left): Carriage connection gear phase alignment.

Fig. 2 (right): Mode switch alignment.

post stopper retaining clip is broken there can be incorrect mechanical functions.

If the cassette blinder flap doesn't close, check the operation of the carriage connection gear with the side plate unit (right-hand side). There may be a phase error between the two assemblies. Remove the cassette unit and ensure that the tape will go in and out of the housing freely by hand. If this is OK, set up the carriage connection gear as laid down in the service manual. If the two side plate units and the carriage connection gear are incorrectly set, the tape may be ejected immediately after it's inserted. For smooth loading and unloading, the carriage connection gear must be set up to fit into the cassette carriage gear as shown in Fig. 1.

For correct operation of all mechanical functions the mode switch must be set correctly. Set it as shown in Fig. 2, in the eject mode, so that there is a 4mm gap between the edge of the switch and the arrow marked on the dial.

Note that if eject is selected when the cassette carriage is not in position, when it's refitted the main cam gear will not engage with the carriage connection gear which will not rotate. To reset, rotate the carriage connection gear by hand so that, as shown in Fig. 1, it's in alignment with the cassette carriage gear.

The mode switch causes its share of problems, many of which are intermittent. No play, fast forward in play and no rewind for example. If any of these operations works intermittently, try cleaning the contacts on the switch and the PCB before resorting to mode switch replacement.

For noisy rewind and/or fast forward operation, check that the take-up and/or supply reels are lubricated so that their rotation is free.

Earlier Models

We've had forward visual search problems with some earlier models, such as the NVSD30 and NVSD40. Because of a worn lower drum unit, line lock is lost during search. The fault has been experienced with three-and four-hour tapes. Playback and cue have remained stable.

The cause of the excessive wear has been a broken takeup brake arm unit. As a result the back tension is increased. A new unit may cure the fault, but the drum assembly will need replacement in the near future.

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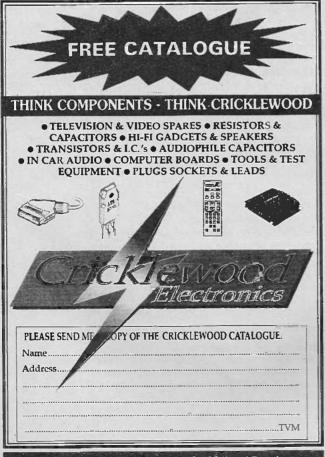
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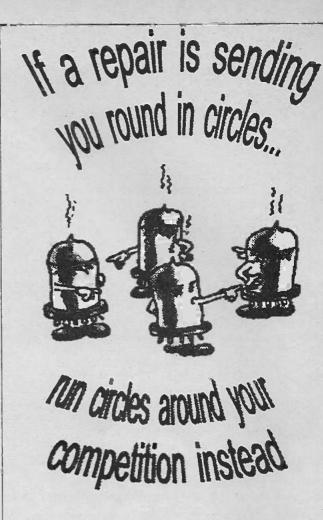
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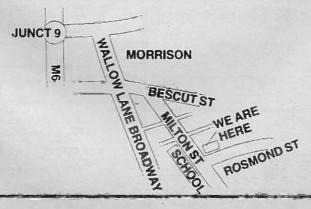
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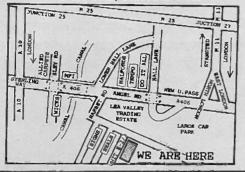
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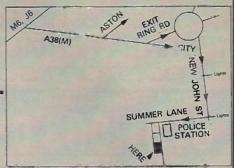
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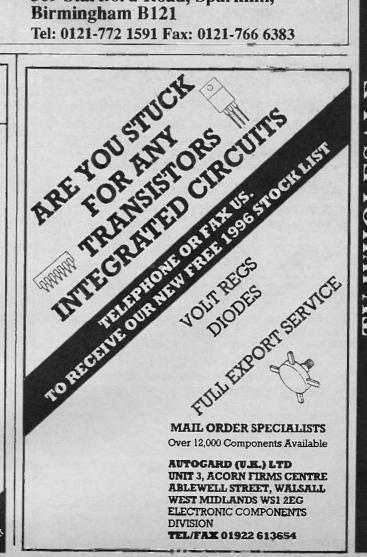
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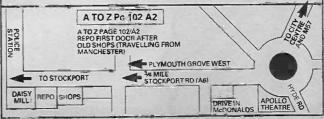
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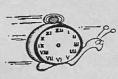
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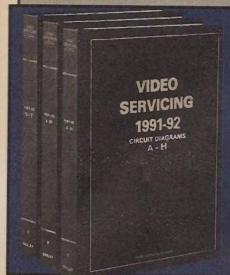
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Amstrad - Perdeo	Downt-7	F33 184	PHILIPS ideo Repair Kit
Fidelity - Dccker - Tatung	Regulator	£5	31037289
Plastic - Front Panels for all	£4 each 12981N	FERGÜSON T.V./SAT	TMP47C834N
1992 Models	7806 20p	Hand Set with FST	R107
Mitsubishi RMM35 Hand Set Video	£5 7809 20p	£3	£3
Nokia RC202 Hand Set	7812 20p 7812F 20p	Tripod shoulder pod for eamcorder	£5
Siemens Hand Set 1994 Model T/V		Ferguson VA super 218 cardioid camera microphone telescopic Ferguson camcorder battery VA366 6v-1400 M/A	
Video	£5 Ferguson Camcorder	Mitsubishi viceo hand set r.m.m. 45	£5
FV31R FERGUSON	Car adaptor charger	Ferguson lens for camcorder 2 off tele conversion lens x 1.4 and:	x 0.7 £6
64 pin Main IC HD6140815	ŁĨ VA308 and battery	Ferguson TX98, TX99 Text Panel T1228B	£15
FERGUSON TX9 - TX10	£20	RC Matsui hand set £5. Equivelant models Pace 900, hand set Fe	rguson, Sony, Grundig £8
IF PANEL £4	OFNET	CALL DO TO	
TX85 8 Push Button Unit	s SENDZ	Burglar alarm kit main control par	
TX86 8 Push Button Unit TX85 Switch MOD	ES CLIVEZ	CUNPUNENTS Firguson tripods large type	£15 £1.50 post each
TX86	01702 3		
TX89	(To order see i	Dack Danel	P.S.U. AC 9v 1A £1.50
		FIT CMC201 Panel	£10

HITACHI OSCILL	OSCOPE 20 MHz DOUBL	E BEAM - V212 £188.00	_ V222 £195.00
	ICC5 Tube Base on Panel	SANYO	Amstrad Tuner UE33-B01 £3.00
£10 each FERGUSON	ICC5 Tube Base on Panel ICC5 Decoder Panel each £5.00	U/V Video Hand Set £3	TX10 Focus Units £6 for £10.00
Line Transformers	Mains Stand-by Switch	Handset CLE 874B £5.00 each	Conversion Kit ITT Teletext £8.00
FST Y260482 £10 TX9 LOPT £4	with Coil £1.00	Handset CLE 874B £5.00 each CPT2158 (No Replacement) £5.00	Burglar Alarm Siren 12 Volt 50p
TX10 LOPT £6	Nicam Boards	IR3506 All modules	Tuners Nat. Pan. Small. UHF/VHF £3.00
White Spot	Texas Instruments MkII £10.00	CPT1408T	U321 - U341 - U342 - U343 - U344 - U944
Blue Spot £10 Yellow Spot £8	Toshiba Nicam Board £6.00	CPT2176 £5 £8 each	Tuners each £5.00
Red Spot £6 TX85 £8	TDA2170 £8.00 BYX55/600	CPT2176 CPT2478	U743 - U744 £3.00 Tuner, 1F TERC8-022A TRJZ4-00ZA
TX86 £8	TDA3561A £3.00 (Bead) 10p	Modules	Alps £7.00
FERGUSON FST LOPT	TDA3566 £3.50 BYT71/600 15p	£10 INVERTER 12V IN 5927-01-51	15 Mixed hand set LCD Video T/V
Y260482 £12	TDA3564 £4.00 BYV95B 10p TDA3565 £3.00 BYV95C 12p	24V OUT 5027-01-51	All new £20.00
DECCA LCD	TDA3581 £3.00 BYV96D 10p	9 AMPS 5827-03-51 5828-04-10	Keyboard Mains Adaptor 12v/800m/a £5.00
NICAM HAND SET £4 RECEIVER	TDA3590 £3.00 BYZ106 10p	TV 5020,02,58	U411 - U412 Tuners each £5.90
PHILIP INFRA RED £1	TDA3591 £1.00 BPW41 15p TDA3592A £3.00 BYW562A/	DIODES MIXED 5929-03-41	LNB'S MARCONI Ex Rental Black Cap £2.00
2435013 £10 47003481 £10	TDA3650 £7.00 1000v 8p	100 for £3 £8 each	No Guarantee
2436771 each 36761 each	TDA3651 £3.00 BYW29/50 15p	PANASONIC-TV	Bridge Rectifiers 10 for £1.00
2436773 36061 2435012 36162	TDA3651AQ £3.50 BYW95C 10p TDA3652 £3.50 2SC3795 30p	Handsets for models: TC1632, TC1642, TC2232, TX2034,	Matsumi Miniature Infra Red Receiver \$1.00
2435085 36362	TDA3652 £3.50 2SC3795 30p TDA3653AQ £2.00 2SC3973B 30p	TX2044, TX2200, TX2234, TX2244.	Turntable Satellite Modulator TV £1.00 Sound 5.5 MHz MPM 1000T £1.00
2436792 36481	TDA3654 £1.00 2SC4313 £1.00	TX2200, TX2234, FX2244, FX2300, TX2636, TX3300, RC20Treplaces	Sound 5.0 MHz MPM 1040 £1.00
2435066 2435063 36761	TDA3654Q £2.00 28C735()- 15p	TNQ1411/2 £8.00 each	FERGUSON CHASSIS Post £5.00 New TX80 Notioner £15.00
2435016 36831	TD 13900 154 00 25D100 103	HITACHI sets HANDSETS CLE871A £5.00 Amstrad Export £3.00	New TX80. No tuner £15.00 TX98 Chassis £20
2433004 36922	TDA3803A £4.00 2SD200 £2.00	STR6020 £6.00 Amstrad U/V £3.00 SS2000AF Amstrad 6800 -£4.00	Ferguson FV31R £5.00
2436792 36967	TDA3180 \$2.00 2SD401 £1.00	line o.p. £1.00 Amstrad 6000 £15.00	Remote and Power Supply FV31R Display Panel Post £2 £5,00
2435062 2436797 AT 2076/78	TDA4501 £3.00 2SD716 - £1.00	BU105/04 . 80p Amstrad 4600 £3.00	1000
2433752 AT 2077/81-£15	TDA4505NE £3.00 2SD787 30p	BUIDS £1.00	Quartz Halogen 500w. 200v. For outdoor lamps £1.00
2434141	TDA4420 £2.00 2SD789 30p	'BU126 80p	AMSTRAD
2434451 TFB 3035D 2434494 - £12 TFB 3069D	TDA4439 £2.00 2SD820 £1.00 TDA4600 £3.00 2SD868 75p	BU204 60p Hundsots	Plastic Front with Flap 8.900 £3.00 Clock Display Panel 8.900 £5.90
2434492 - £12 TFB'4023AD	TDA4601 £2.00 2SD880 30p	BU206 £1.00 BSB £1.50	Sharp Tuner & IF
2434393 2432981 IFB 4066AD	TDA8190 £3.00 2SD1264 £1.00	BLI 207 1K2000 £5.00	1810587 PA1 UK £3.00
2435372 2435701 LOPTS	TDA8763 £3.00 2SD1266 £1.00 TDA8349 £3.00 2SD1398 £1.00	PETROST) 900 SRD2 £1.00	KT3/K30 Tripler £5.00
2432351 £10 EACH	TDA8349 £3.00 2SD1398 £1.00 TDA9403 £1.50 2SD1415 £1.00	BU222 £1.00 SRD 3 £1.00 £2.00	U/V Tripler £4.00
2432211 2432984 Y260482	TDA9503 £3,00 2SD1427 £1.00	BU407 60p SRIJ4	Grundig Tripler with Focus Pot £7.00
2432491 2435121	TDB2033 £1.00 2SD1432 £1.00	BUSORAF \$1.00 HITACHI	Grundig Universal Tripler. Upright Printed Circuit type £7.00
2432871 FERGUSON	TDD1610S 50p 2SD1453 £1.00	BU508D 80p Microwave BU705 £1.00 Turntable Motor	BG 2087-642-1005 Triplers \$7.00
3220029 TUNERS	TDA1060 £3.00 2SD1576 £1.00 2SD1577 £2.00	BU806A £1.00 £10 BU807 £1.00	BG 2032-642-3002 £7.00
3714016 3216001 TX90/TO100 - £4	TEA1009 50p 2SD1878 £1.00	BU808DFI 11.00 SANYO SANYO	PERDIO PV 1188 Handsets £3.00
DST 85B 235/40153200	TEA1039 £2.00 TDA3560 £2.00	BUK454/600 £1.00 TDO 124EB	BU 208A, BU 508A, BU 508D,
10000CAD C10	TFA2029C £3.00 TDA3654 90p	BU824 50p UHF VHF Tuner BUT11 50p £4	BU 508AF, BU 508DF \$1.00 each BU 801 60p
DST 88N 234/47805200 L DST 81N 243/472593 00 each	1K7 ST6391 B1 £3.00 TDA3653AQ £1.00 ST6393 B1/IM £3.00 TDA3562A £0.00	BUT11AF 11.00	2SD 1398 £1.00
DST 186N 243/473058 00	ST6393 B1/IM £3.00 TDA3562A £0.00 BYX10 10p STR4211 £6.00	BUTISAF 11.00 SUPER BUW84 60p HIGH CAPACITY	2SC4589 10A/500V
HM9204A Thick Film £3.50	BYX38/300 25p STR4420 £5.00	BYW20-08-9 £1.00 BATTERY VA310 BYW95 10P 9.6V 1700 MA £4	FERGUSON Sat. Modulator SRD-3-4 £2.00 FERGUSON SRBI modulator 25p each
2x and 4x Magnifier £3.50	BYX55/350 10p STR6020 £6.00 BYX71/600 20p STR6602D £4.00	BUX39 25A-150V £1.00	
MATSUI 3000 Orion Video	BYX71/600 20p STR6602D £4.00	BUX84 50p VPT ADAPTOR BUY49 20p VA354 FERGUSON	Regulated power supply, 500m/a 3-12v £5.00 HITACH1 620E head and drum £12.00
Decks with heads £16.00	REMOTE LEADS TX 100 Scart to Scart	BUK444/800 £2.00 £5.00 (TEXT)	AMSTRAD Nicam head and drum \$12.90
TV & Vidco hand set £2.00 Orion TV & Video Handset £2.00	Front Panel Scart to Scart to Scart to Scart all pin connected	BUK454/600 £2.00 TDA3047 £1.00 06D4-025-001	AMSTRAD 6000 head and drum \$12.00
B.Sky.B VHF to IF	£4 £2.00	TDA3048 £3.00 Mains Input	TATUNG universal tuner 205, or equ with aerial
Block Converter 50p		TDA3083 £2.00 Choke for TDA3190 £1.00 TX9 £4	socket £8.00
10 Panels Ferguson Mixed from TX9 to ICC5 £20.00	TX 9 Remote Panels £5 TX 10 Remote Panels £5	TDA3506 E3.00 **	U/V REMOTE HANDSET 5 IN ONE TV1 - TV2 - VCR £15
TV Aerial Ring Type 40p	TX 90 Remote Panel No. 139-001	TDA3561 £3.00 THORN TDA3560 £4.00 M494B1£5	SAT - AUX
UHF Tuner for ICCS £5.00	IC Nos. M293B1 & TMS 1000£10 each TX 100 Remote l'ancis	Text-Type	BURGLAR ALARM
VHF Tuner for ICC5 £5.00	IC M293B1-SAA5012	Replace Handset for Philips KT3/K30. K4 etc £6.00	Use Infra Red Detector Wide or Short Angle
Amstrad-Double Decker Switch Mode POWER SUPPLY £5.00	TX 100 Remote Panels with Stand-by Battery	Thorn Handsets	Wall Mount, with Relay £8.00
Amstrad-Long Chassis and Short Chassis	and ICs	9000-9600-TX9-TX10-TX100 Text and Non-Text £ 0.88	MODULATOR KIT £5 5v to 12v for all cameras etc.
Power Supply £3.00 Models 1991/1992	99 – 100 Tuners£4	Philips RC5171 Handset £8.00	
Ferguson Switch Mode Transformer TX85,	Orion Modulator Video MDLK 6B513A£2.50	1992 to 1993 Mod. Orion Video handset with LCD £5.00	POTACHI GEC 19.00
TX86, TX100 each £5.00	Hitachi Mains Switch with Stand-by 50p	SATELLITE TUNER UNIT 2427611	HITACHI IIM9205A £4.00
ICC5 Ferguson Switch Mod Trans 3112-338-32642 £4.00	Scart to 4 Phone Leads 1½m £2.50	with Base Band, Video Out £6.00	PHILIPS NEW TYPE
12v DC and 24v DC Power Supply	SXT2302234 Sat. Tuner with Base Band Min£4	AMSTRAD Long Chassis Display Panel 1992/1993 £4.00	MALTIN MINCET CIO
regulated £2.00		THE RESIDENCE IN COLUMN 2 IN COLUMN 2	06D4-025-001 Mains input choke for TX9 £4
Ferguson U/V Camcorder 1800 MA Battery VA310 9.6v £4.00	SENDZ	OMPONENTS	TX100 REMOTE PANEL
Desolder Pump £2.00		DEBURYNESS, ESSEX SS3 8AF CE • SUBJECT TO AVAILABILITY	No. 56413IC M293B
IF Panel for	No accounts • Technical Informatio	in by telephone only • No credit cards mail orders • Additional charges for ses are PER ITEM • For UK addresses **S VAT TO TOTAL • This applies for the n • FXPORTS — P P at cost •	and SAA5012 £10 etc.
Philips CP90-CP110 £5.00	heavier items • Specific P-P charg	es are PER ITEM • For UK addresses	LEADER I.MV-181A milli voltme (cost £255) 240v mains input
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Philips KT3 Text Decoder K40 £7:00	Tel: 01702 332992 GVMT School order	Fax: 01702 338805 ◆ s on official headings	R.S. SAFE BLOC

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