THE LEADING UK CONSUMER ELECTRONICS TECHNOLOGY MAGAZINE

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SERVICING-VIDEO-SATELLITE-DEVELOPMENTS

A REED BUSINESS PUBLICATION

Servicing the Hitachi G6P Chassis

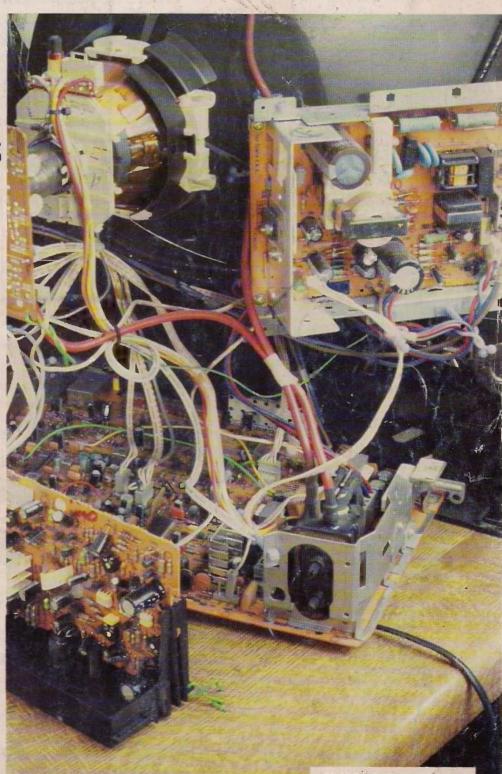
Eutelsat'sHot Bird

Test Report:
The Tektronix
TekMeter

Satellite TV Workshop

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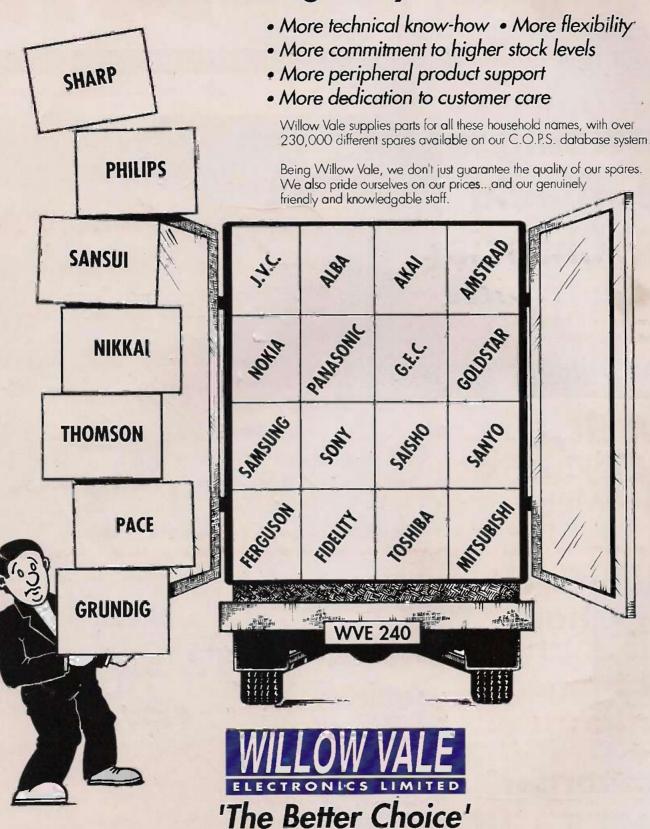


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Vol. 45, No. 10

Issue 538

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Mark Paul

The use of planar instead of conventional wound contruction for inductors and transformers offers considerable advantages in h.f. power conversion applications.

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704 Servicing the Hitachi G6P Chassis Glyn Dickinson

Though basically reliable the sets that use this chassis do have a few 'stock' faults, some of which can be confusing first time round.

708 Eutelsat's Hot Bird Eugene Trundle

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This combination of a full-specification digital multimeter and

an autoranging dual-channel scope is the ideal field servicing tool, enabling almost anything to be checked.

722 Satellite Workshop

Jack Armstrong

The sorts of problems that arise during day-to-day work in a busy satellite servicing workshop. Many are caused by the punters themselves.

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The September issue will be published on August 16th

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BD184 BD137	60p 60p 30p	BF617 BF760	30p 30p 40p	BUX84 8UX85	50p 50p	ZTX108 ZTX109	11p 12p	8 PIN 14PIN	5p 6p	AN203	210p	75195 2114	18Sp 150p	AN6332 AN6341	320p 200p	HA1388 HA1389	320p 210p	LC7132 LC7137	400p 450p
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80232 BD233	31p 30p	BFR90 BFR91	85p 99p	BUZ71 BUZ80 BY448	75p 200p	ZTX320 ZTX501	20p 13p	40PIN	16p 18p	1A/100V W02	19p	27128 27256-25	150p 150p	AN6387 AN6884	480p 200p	HA11225 HA11235	130p	LM311 LM319	26p 35p 165p
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LINEAR ICs / JAPANESE TRANSISTORS

Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price	Part	Price
LM431 LM710 LM723	50p 45p 40p	STK441 STK443 STK457	880p 700p 470p	STK5422 STK5431 STK5434	375p 550p 57 0 p	STR30115 STR30120 STR30123	400p 450p	TA7784 TA8132A TA8205	250p	TDA1574 TDA1576 TDA1578	125p 170p 210p	TDA3586 TDA3590 TDA3591	750p 300p 360p	TDA8170 TDA8172 TDA8173	170p 250p 280p	UPC1158 UPC1176 UPC1180	H 250p	2SA937 2SA939 2SA940	20p 140p 50p 60p 70p
LM741D LM741N LM747 LM1889	55p 300p	STK459 STK460 STK461 STK463	560p 880p 620p 950p	STK5436 STK5441 STK5451 STK5461	500p 400p 390p 500p	STR30125 STR30130 STR40090 STR41090	250p 350p 400p	TA8210 TA8215 TA8216H TA8227	300p 300p 375p 250p	TDA1579 TDA1596 TDA1598 TDA1600	200p 200p 250p 275p	TDA3592 TDA3640 TDA3651	350p 200n	TDA8174 TDA8175 TDA8178 TDA8185	300p 300p 400p 300p	UPC1185 UPC1186 UPC1187 UPC1188	80p	2SA942 2SA949 2SA950 2SA952	80p 70p 18p 50p
LM18940 LM3900 LM3909 LM3914	V 200p 40p 100p 160p	STK465 STK501 STK561 STK563	720p 550p 450p 415p	STK5462 STK5464 STK5466 STK5467	500p 300p 500p 400p	STR44111 STR45111 STR50020 STR50092	550p 550p 450p	TA8691N TA8718N TAA550 TBA120S	550p 550p 25p	TDA1670, TDA1675 TDA1701 TDA1771	230p 250p 300p 250p	TDA3652 TDA3653 TDA3653 TDA3654 TDA3710 TDA3720		TDA8190 TDA8191 TDA8192	200p 425p 275p	UPC1197 UPC1198 UPC1222	140p H 200p 130p	2SA953 2SA954 2SA958	60p 75p 60p
LM3915 LM3916 L200	150p 270p 200p	STK583 STK760 STK770	500p 600p 400p	STK5468 STK5471 STK5473	300p 330p 480p	STR50103 STR50113	500p 500p	TBA396 TBA520 TBA530	40p 70p 120p 100p	TDA1870, TDA1872, TDA1904	A 200p A 275p 80p	TDA3726 TDA3724 TDA3725 TDA3730	500o	TDA8196 TDA82148 TDA82158 TDA8303	300p 350p	UPC1225 UPC1230 UPC1238 UPC1270	150p 120p H 250p	2SA963 2SA965 2SA966 2SA968	120p 40p 35p 55p
M491BB M494B1 M501156 M501171	700p 320p 500p	STK772S STK780 STK1039 STK1040	490p 575p 460p 640p	STK5476 STK5478 STK5479 STK5481	350p 380p 300p 520p	STR51041 STR50213 STR53041 STR54041	500p 500p 350p	TBA540 TBA560 TBA800 TBA810A	90p 90p 40p \$ 40p	TDA1908 TDA1908 TDA1910 TDA1940	225p	TDA3740 TDA3750 TDA3760	400p 480p 400p 350p	TDA8305 TDA8340 TDA8341	600p 500p 200p 250p	UPC1274 UPC1277 UPC1278 UPC1288	240p 240p	2SA970 2SA979 2SA984 2SA985	25p 35p 25p 60p
M50119F M50784 M50786 M50790	9 525p 300p 500p 600p	STK1049 STK1050 STK1060 STK1070	700p 650p 700p 850p	STK5482 STK5483 STK5486 STK5488	285p 440p 450p 480p	STR55041 STR56041 STR58041 STR59041	500p	TBA820 TBA820M TBA920 TBA950	550	TDA1941 TDA1950 TDA2002 TDA2003	300p 175p 50p 85p	TDA3771 TDA3791 TDA3800 TDA3803	460p 300p 350p A 500p	TDA8380 TDA8390A TDA8405 TDA8415	200p 650p 550p	UPC1298 UPC1318 UPC1335 UPC1350	V 320p 300p V 320p	2SA988 2SA992 2SA993 2SA999	25p 30p 50p 30p
M513816 M513876 M51387F M51544	300o	STK1080 STK2025 STK2028 STK2029	940p 620p 500p 480p	\$TK5490 \$TK5632 \$TK5725 \$TK5730	450p 450p 450p 450p	STR60001 STR61001 STR80145 STR81145	525p 550p 550p	TBA990 TC5020 TC5081AF TC9106	60p 200p	TDA2004 TDA2005 TDA2006 TDA2007	150p 150p 70p 120p	TDA3803. TDA3810 TDA3825 TDA3840 TDA3843	200p 225p 300p 200p	TDA8417 TDA8421 TDA8245 YDA8432	650p 550p 500p 500p	UPC1363 UPC1363 UPC1364 UPC1365	190p C 300p C 350p	2SA1006 2SA1008 2SA1009	90p 125p 200p 225p
M51848 M545236 M545636 M58484	150p 200p	STK2038 STK2048 STK2110 STK2125	700p 950p 550p 580p	STK6316 STK6324 STK6431	300p 500p 850p	STRD1200 STRD1400 STRD1700	600p 600p 450p	TC91258F TC9134 TC9142	750p 320p	TDA2008 TDA2009 TDA2010	100p 160p 150p	TDA3856 TDA3857	325p 400p 350p	TDA8433 TDA8440 TDA8447	550p 600p 300p 200p	UPC1370 UPC1373 UPC1377	C 300p 85p C 200p	2SA1010 2SA1011 2SA1012 2SA1013	80p 85p 100p
M51516 M51518 MB3712 MB3713	260p 200p 140p	STK2129 STK2139 STK2155	610p 675p 900p 470p	STK6722 STK6732 STK6822 STK6922	725p 1000p 900p 500p	STRD1816 STRD1816 STRD4412	300p 500p	TC9143 TC9145 TC9148 TC149	300p 150p 200p 225p	TDA2020 TDA2030 TDA2040 TDA2048	120p 80p 140p 600p	TDA3950 TDA4050 TDA4092 TDA4100	225p 150p 350p 225p	TDAS443 TDAS451 TDAS452 TDAS453	350p 400p 200p 350p	UPC1378 UPC1382 UPC1384 UPC1387	180p 110p 425p C 250p	2SA1015 2SA1016 2SA1018 2SA1020	15p 30p 100p 30p
M83714 M83715 M83722	130p 270p 250p 280p	STK2230 STK2240 STK2250 STK3041 STK3042	740p 650p 370p	STK6932 STK6962 STK6972 STK69816	525p 275p 490p 600p	STRD4512 TA7054 TA7061 TA7066	190p 190p 115p 120p	TC9150 TC9152 TC9153 TC9156	425p 425p 300p 300p	TDA2054F TDA2107 TDA2148 TDA2151	110p 250p 350p 375p	TDA4180 TDA4190 TDA4200 TDA4280	145p 180p 360p 320p	TDA8490 TDA8702 TDA8703 TDA8708	350p 275p 500p 900p	UPC1394 UPC1397 UPC1403 UPC1420	350p	2SA1021 2SA1023 2SA1026 2SA1029	35p 60p 90p 60p
MB3730 MB3731 MB3756 MB3759	160p 220p 160p 200p	STK3042 STK3044 STK3062 STK3082	375p 500p 500p 550p	STK6982 STK7216 STK7217 STK7225	600p 420p 400p 500p	TA7089 TA7119 TA7120 TA7137	300p 150p 55p 60p	TC9163 TC9164 TC9172P TCA9940	375p 400p 300p 100p	TDA2170 TDA2220 TDA2270 TDA2320	260p 200p 250p 80p	TDA4282 TDA4290 TDA4400 TDA4420 TDA4421	360p 200p 175p 120p	TDA8732 TDA9045 TDA9080 TDA9403	400p 400p 550p 180p	UPC14216 UPC14236 UPC1470 UPC14888	CA 650p CA 550p 200p	2SA1036 2SA1037 2SA1038 2SA1048	50p 50p 40p 25p
M88719 MC1455 MC1496 MC3401	360p 45p 65p 45p	STK31021 STK31521 STK3156 STK4017	530p	STK7226 STK7251 STK7308 STK7309	600p 500p 350p 400p	TA7140 TA7157 TA7193 TA7200	100p 100p 320p 200p	TCEP100 TD62308A TD62362 TD62506	100p	TDA2501 TDA2503 TDA2504 TDA2505	400p 200p 200p 300p	TDA4421 TDA4426 TDA4427 TDA4431	300p 170p 200p 150p	TDA9503 TDA9513 TEA1002 TEA1007	150p 300p 650p	UPC15056 UPC15146 UPC15156 UPC15206	CA 200p CA 250p	2SA1051 2SA1060 2SA1069 2SA1076	300p 120p 150p
NESSS NESSS NESSS NESSS	20p 40p 80p	STK4019 STK4021 STK4024H STK4025	480p 380p	STK7310 STK7348 STK7358	470p 400p 425p	TA7205 TA7207 TA7208	110p 150p 125p	TD62705 TD6304AF TD6306P	250p 300p 350p	TDA2506 TDA2510 TDA25144	500p 450p 500p	TDA4439 TDA4440	300p 220p 180p	TEA1009 TEA1017 TEA1019	100p 280p 130p	UPC15360 ZN423 ZN424	550p 100p 100p	2SA1077 2SA1081 2SA1082	230p 300p 80p 80p
NE587 NE571 NE592 NE5532P	115p 290p 85p	STK4026 STK4028 STK4032W	480p 550p 510p	STK7358 STK7402 STK7404 STK7406	440p 560p 400p 650p	TA7214 TA7217 TA7220 TA7222	220p 145p 220p 90p	TD6350P TD6359P TDA1001 TDA1002	200p 300p 200p 200p	TDA2530 TDA2530 TDA2532 TDA2540	450p 450p 120p 85p	TDA4443 TDA4445 TDA4450	250p 250p 220p 225p	TEA1024 TEA1045 TEA1060 TEA1067	150p 300p 225p 160p 170p	ZN425 ZN426 ZN427 ZN429	260p 560p 215p	2SA1085 2SA1085 2SA1091 2SA1094	100p 75p 100p 190p
SAA1006 SAA1008 SAA1010	140p 300p 450p 400p	STK4036 STK4038 STK40401 STK40421	470p 680p 650p 800p	STK7408 STK7410 STK7554 STK7561	675p 900p 600p 650p	TA7223 TA7225 TA7226 TA7227	210p 300p 290p 170p	TDA1003 TDA10054 TDA10104 TDA1011		TDA2541 TDA2542 TDA2643 TDA2545	120p 110p 210p 120p	TDA4452 TDA4453 TDA4480 TDA4482	250p 275p 280p 350p	TEA1080P TEA1087 TEA1101 TEA1330	170p 40p 425p 65p	ZN459 ZN1040 ZNA134H		2SA1095 2SA1096 2SA1102 2SA1103	300p 80p 130p
SAA1024 SAA1025 SAA1075 SAA1124	250p 250p 350p 200p	STK4044 STK4046 STK4048 STK4060	800p 950p 1280p 510p	STK7562 STK7563 STK8050 STK8250	1000p 800p 750p 500p	TA7230 TA7232 TA7233 TA7237	100p 95p 120p 300p	TDA1012 TDA10134 TDA1015 TDA1016	120p 110p 85p 140p	TDA2546A TDA2549 TDA2566 TDA2556	300p	TDA4500 TDA4501 TDA4502 TDA4503	300p 400p 550p 300p	TEA1511 TEA2000 TEA2014A TEA2018A	150p 275p 80p 200p	JAPANE TRANSIS 2SA473	TORS	2SA1104 2SA1105 2SA1106 2SA1111	130p 140p 250p 160p 90p
SAA1251 SAA1251 SAA1274 SAA1293	280p 380p 280p 550p	STK4065 STK4101 STK4111 STK4112	650p 500p 500p 500p	STK8260 STK8280 STK73410 STK73410	1200p	TA7238 TA7240 TA7241 TA7242	400p 160p 165p 190p	TDA1020 TDA1022 TDA1023 TDA1024	110p 330p 130p 150p	TDA2557 TDA2558 TDA2575A TDA2577A	230p 225p 500p 100p	TDA4505 TDA4510 TDA4555 TDA4556	300p 270p 400p 370p	TEA2114 TEA2117 TEA5114A TL431	200p 450p 200p 45p	25A490 25A496 25A505 25A509	45p 30p 120p	25A1112 25A1115 25A1123 25A1124	150p 30p 40p 60p
SAA3004 SAA5000 SAA5010 SAA5012	400p 200p 220p 400p	STK4121 STK4122 STK4131 STK4132H	480p 560p 600p 800 p	STK73605 STR370 STR371 STR380	375p 300p 400p 350p	TA7243 TA7245 TA7267 TA7269	320p 225p 220p 260p	TDA1025 TDA1028 TDA1029 TDA1035	320p 175p 200p 150p	TDA2578A TDA2579A TDA2582 TDA2590	200p	TDA4557 TDA4560 TDA4600 TDA4600	450p 270p 140p	TL061 TL064 TL071 TL074	40p 80p 38p 60p	2SA537 2SA544 2SA550 2SA562	170p 650p 150p	2SA1127 2SA1133 2SA1141 2SA1142	50p 120p 200p
SAA5020 SAA5030 SAA5040 SAA5040	350p 440p A 280p	STK4141H STK4142 STK4151 STK4152	420p	STR381 STR383 STR384	390p 410p 350p 700p	TA7270 TA7271 TA7272 TA7273 TA7274	170p 220p 260p 300p	TDA1041E TDA1041P TDA1044 TDA1047	250p	TDA2593 TDA2594 TDA2595 TDA2600	110p 300p 200p	TDA4601 TDA4605 TDA4610 TDA4660	120p 220p 370p	TL083 TL084 TMS1000-0 TMS1000NL	55p 70p 41 400p	2SA571 2SA603 2SA606 2SA608	850p 100p 200p	2SA1145 2SA1152 2SA1156	100p 40p 150p 90p
SAA5050 SAA5231 SAA5243 SAB3013	650p 300p P€ 800p	STK4161 STK4162 STK4171 STK417211	650p 550p 750p	STR440 STR450 STR541 STR452 STR453	520p 600p 600p	TA7280	210p 190p 200p	TDA1048 TDA1053 TDA1054	200p 300p 180p	TDA2630 TDA2640	250p 100p 300p 220p	TDA4800 TDA4935 TDA4940	370p 350p 300p 325p	TMS100-23 TMS1024 TMS1025	300p 350p	2SA614 2SA634 2SA636	150p 50p 50p	2SA1162 2SA1169 2SA1170 2SA1175	30p 500p 500p 30p
SA83035 STA301A STA401A STA403A	200p 600p 200p 220p	STK4181 STK4182II STK4191	686p 750p 700p	STR454 STR455 STR456	500p 400p 500p 470p	TA7282 TA7283 TA7288 TA7299	160p 200p 220p 200p	TDA10598 TDA1060 TDA1062 TDA1072	140p 140p 150p	TDA2654 TDA2654 TDA2670 TDA2690	225p 200p 150p 100p	TDA4950 TDA5330T TDA5600 TDA5660P	450p 250p	TMS3617N TMS3701B TMS3712 TMS3891	N 300p 350p 550p	2SA640 2SA642 2SA673 2SA677	50p 15p 35p	2SA1184 2SA1186 2SA1198 2SA1206	120p 500p 40p 60p
STA405A STA431A STA432A	270p 280p 250p 250p 220p	STK4231H STK4241 STK4241V	700p 700p 1050p 1250p	STR457 STR470 STR1096 STR1195	600p 400p 275p 350p 325p	TA7310 TA7312 TA7313 TA7314	100p 120p 70p 175p	TDA1074 TDA1077 TDA1082 TDA1083	280p 250p 275p 95p	TDA2730 TDA2760 TDA2780 TDA2791	400p 600p 275p	TDA5708 TDA5708 TDA5709 TDA5800	400p 450p	TPU2732 TPU2735 U111B U211B	1200p 900p 250p 300p	2SA678 2SA683 2SA684 2SA699	25p 25p	2SA1208 2SA1209 2SA1210 2SA1215	70p 100p 120p 600p
STA434A STA435A STA441C STA456C	220p 240p	STK4272 STK4273 STK4301 STK4311	550p 500p 650p	STR1229 STR2005 STR2012 STR2013	400p 400p 300p	TA7315 TA7317P TA7324 TA7325	120p 75p	TDA1085 TDA1087 TDA1092 TDA1097	60p	TDA2795 TDA2822M TDA2840 TDA3047	200p 60p 200p	TDA5820 TDA5850 TDA6200 TDA7000	175p 750p	U254B U318M U321M U329M	150p 350p 450p	2SA708 2SA711 2SA715 2SA719	240p 280p 50p	25A1216 25A1217 25A1220 25A1232	550p 100p 75p 180p
STA471 STA901M STK0025 STK0029	210p 280p 420p 360p	STK4332 STK4352 STK4362 STK4372	500p 450p	STR2015 STR2105 STR3113 STR3115	600p 225p	TA7328 TA7335 TA7336 TA7341	85p 180p	TDA1151 TDA1154 TDA1170 TDA1180	40p 50p	TDA3048 TDA3082 TDA3083 TDA3190	130p 200p	TDA7010T TDA7050 TDA7052 TDA7053	120p 200p 120p	U338M U426B U427B U664B	300p 70p 70p	2SA720 2SA725 2SA726 2SA733	20p 80p 20p	25A1242 25A1244 25A1246 25A1249	80p 120p 80p 100p
\$7700039 \$7700040 \$7700049 \$770050	500p 520p 510p	STK4392 STK4432 STK4773 STK4793	600p 820p	STR3123 STR3125 STR3135 STR3212	400p	TA7343 TA7357 TA7358 TA7401	120p 340p 85p	TDA1180A TDA1190 TDA1200B TDA1220	190p 80p	TDA3300B TDA3301B TDA3316 TDA3330	480p 280p 120p	TDA7056 TDA7072 TDA7077 TDA7211	200p 175p 175p	U24018 U2829B U4606B UC3842N	125p 130p 600p	2SA747A 2SA748 2SA764	425p 60p 200p	2SA1261 2SA1262 2SA1263	150p 110p 280p
\$TK0059 \$TK0060 \$TK0070 \$TK0080	620p 820p 1100p	\$TK4803 \$TK4813 \$TK4833 \$TK4843	640p 800p 700p	STR3214 STR3215 STR3315 STR4090A	275p 275p 275p	TA7607 TA7608 TA7609 TA7611	200p 360p 170p	TDA1235 TDA1236 TDA1251 TDA1251 TDA1270	300p 240p 150p	TDA3410 TDA3420 TDA3501 TDA3502	150p 200p 340p	TDA7220 TDA7222 TDA7230A TDA7233	100p 200p 225p	UC3844 ULN2002 ULN2003	70p 69p	2SA759 2SA770 2SA771 2SA777	200p 90p 35p	2SA1264 2SA1265 2SA1283 2SA1284	280p 200p 50p 60p
STK011 STK015 STK016 STK025	330p 440p 760p	STK4853 STK4863 STK4873 STK4893	730p 700p 850p	STR4142 STR4211 STR4512 STR5015	450p 370p 400p	TA7612 TA7614 TA7616	300p 170p 300p	TDA1327 TDA1410 TDA1412	150p 200p 220p 35p	TDA3504 TDA3505 TDA3506	300p 275p	TDA7248 TDA7241	175p 250p 500p	ULN2068 ULN2804 UPC20C UPC554	170p 220p 130p	2SA778 2SA781 2SA786 2SA794	150p 25p 50p	25A1286 25A1296 25A1294 25A1295	60p 150p 450p 500p
STKS77 STKS76	1600p 520p 580n	STK4913 STK5314 STK5315	900p 475p 500p	STR5100 STR5214 STR5315	550p 475p 575p	TA7621 TA7622 TA7628 TA7629	420p 110p 220p	TDA1510 TDA1512 TDA1514A TDA1515A	180p 450p 200p	TDA3507 TDA3510 TDA3520 TDA3530	350p 650p 350p	TDA7255 TDA7256 TDA7272 TDA7273	600p 170p 80p	UPC555 UPC556H UPC571 UPC574	80p 220p	2SA798 2SA814 2SA817 2SA836 2SA839	60p 20p 20p	2SA1301 2SA1302 2SA1303 2SA1304	260p 300p 400p 110p
STKORG STKORG STKORG STKORG	540p 600p 900p	STK5322 STK5324 STK5325 STK5331	370p 300p	STR5412 STR6020 STR9005 STR9012	325p 400p 450p	TA7630 TA7632 TA7640 TA7641	400p 90p 140p	TDA1516Q TDA1517 TDA1519 TDA1519A	250p 200p	TDA3540 TDA3541 TDA3560 TDA3561	175p 260p 300p	TDA7274 TDA7275 TDA7284 TDA7350	75p	UPC575C2 UPC577 UPC592 UPC595	64p 95p	2SA839 2SA844 2SA872 2SA872A	20p 2	2SA1306 2SA1307 2SA1309 2SA1315	110p 100p 50p 100p
STICOSE STICOSO STICOSO STICOSO STICOSO	900p 1200p 400p	STK5332 STK5333 STK5335 STK5337	180p 1000p 350p 500p	STR10006 STR11006 STR12006 STR13006	450p 400p 450p	TA7658 TA7668 TA7680AP	100p 100p 225p	TDA1520 TDA1521 TDA1522 TDA1524	275p 250p 110p 200p	TDA3561A TDA3562 TDA3562TI TDA3563	300p 260p K 300p 350p	TDA7359 TDA7369 TDA7770 TDA8114	300p 700p 225p	UPC596 UPC1001 UPC1018 UPC1020	190p 220p 170p	2SA886 2SA899 2SA907 2SA909	40p	2SA1317 2SA1318 2SA1321 2SA1329	30p 20p 80p 200n
STK430 STK433 STK435 STK436	500p 400p 375p	STK5338 STK5339 STK5342 STK5361	295p 400p 245p	STR15006 STR16006 STR20005 STR20012	500p 450p	TA7688 TA7698 TA7699 TA7705 TA7750	450p 600p 300p	TDA1540 TDA1541 TDA1542 TDA1543	420p 750p 250p	TDA3564 TDA3565 TDA3565 TDA3567	325p 275p 280p	TDA8115 TDA8140 TDA8143 TDA8145	200p 200p 160p	UPC1023 UPC1025 UPC1026 UPC1028	230p 950	2SA913 2SA916 2SA921 2SA921 2SA933	100p 2 30p 2 40p 2	2SA1346 2SA1352 2SA1353	20p 100p 100p
STK437 STK439	460p :	STK5372 STK5421	280p	STR20015 STR30110	450p	TA7757 TA7769	200p	TDA1571 TDA1572	300p	TDA3570 TDA3580	375p	TDA8153 TDA8160	250p	JPC1031H JPC1032	150p	2SA934 2SA935	30p	2SA1356 2SA1358 2SA1370	100p 130p 100p

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Part SA1371	Price	Part 2SC1008	Price 20p	Part 2SC1730	Price	Part 2SC2270	Price	Part 2SC2750	Price 300p	Part 25C3277	Price 280p	Part 25C3693	Price 225p	Part 2508364		25D1279	Price	2SD1815	Price
SA1380 SA1381 SA1382	75p 100p 120p	2SC1010 2SC1012 2SC1013	225p 75p 170p	2SC1735 2SC1739 2SC1740	70p 800p 10p	2SC2271 2SC2274 2SC2275	30p 15p 50p	25C2751 2SC2752 2SC2767	270p 140p 300p	2SC3280 2SC3281 2SC3284	200p 200p 600p	2\$C3895 2\$C3897 2\$C3907	400p- 400p 250p	2SD837 2SD838 2SD841	55p 300p 110p	2SD1288 2SD1289 2SD1291	175p 250p 400p	2SD1825 2SD1843 2SD1846	900 1000 3500
SA1385 SA1386 SA1423	180p 400p 30p	2SC1014 2SC1030 2SC1047	140p 150p	2SC1741 2SC1756 2SC1756	35p 90p 35p	2SC2278 2SC2290	70p 1800p	2SC2769 2SC2773	400p 700p 500p	2SC3298	85p 50p 120p	2SC3927 2SC3950 2SC3953	250p 120p 50o	2SD844 2SD845 2SD850	200p 250p 170p	2SD1292 2SD1297 2SD1302	300p 20p	2SD1849 2SD1850 2SD1858	325¢ 325¢ 40¢
SA1489 SA1491	300p 300p	2SC1060 2SC1060	280p 70p	2SC1758 2SC1775	30p 10p	2SC2291 2SC2295 2SC2298	40p 60p 35p	2SC2774 2SC2785 2SC2786	60p 20p	2SC3299 2SC3300 2SC3303	400p	25C3973 25C3987	210p 220p	2SD856 2SD858	48p 250p	2SD1306 2SD1309	90p 140p	2SD1877 2SD1878	250s
2SA1493 2SA1516 2SA1535	500p 280p 175p	2SC1061 2SC1070 2SC1096	85p 65p 40p	2SC1781 2SC1789 2SC1809	190p 40p	2SC2307 2SC2308	300p	2SC2787 2SC2791	10p 500p	2SC3306 2SC3307 2SC3309	130p 600p	2SC3996 2SC4006 2SC4020	1200p 100p 280p	2SD863 2SD864 2SD866	23p 200p 120p	2SD1310 2SD1313 2SD1326	140p 1000p 200p	2SD1879 2SD1884 2SD1886	275 ₆ 399 ₆ 450 ₆
\$8324 \$8546	40p 45p	25C1098 2SC1106	120p 180p	2SC1810 2SC1815	250p 10p 7@s	2SC2312 2SC2314 2SC2316	300p 70p 150p	2SC2792 2SC2793 2SC2808	700p 40p	2SC3316 2SC3317	150p 280p 350p	2SC4023 2SC4056	325p 350p	2SD8664 2SD868		2SD1328 2SD1347	60p 70p	2SD1887 2SD1910	450;
258560 258561 258562	25p 50p 25p	2SC1114 2SC1115 2SC1116	415p 280p 290p	2SC1819 2SC1826 2SC1827	60 p	2SC2320 2SC2324 2SC2329	10p 120p 480p	25C2810 25C2812 25C2814	360p 40p 40p	2SC3323 2SC3327 2SC3331	480p 60p 25p	25C4106 25C4123 25C4124	200p 450p 250p	2SD870 2SD871 2SD879	190p 300p 60p	2SD1348 2SD1350 2SD1376	65p 150p 125p	2SD1911 2SD1913 2SD1929	300: 50: 60:
258566 258595 258596	90p 55p 50p	2SC1124 2SC1161 2SC116Z	270p 110p 30p	2SC1829 2SC1833 2SC1834	500p 40p 50p	2SC2331 2SC2333	50p 200p	2SC2824 2SC2825	75p 900p	2SC3333 2SC3345	120p 100p	2SC4169 2SC4236	60p 550p	2SD880 2SD882	40p 25p	2SD1379 2SD1380	100p 100p	2SD1939 2SD1941	75; 500
2S8538 2S8600	30p 500p	2SC1164 2SC1165	600p 750p	2SC1844 2SC1845	50p 15p	2SC2334 2SC2335 2SC2344	80p 75p 150p	2SC2826 2SC2827 2SC2832	200p 200p 300p	2SC3352 2SC3353 2SC3355	200p 280 p 50p	2SC4237 2SC4242 2SC4301	650p 170p 550p	2SD892/ 2SD894 2SD895	35p 200p	2SD1384 2SD1390 2SD1391	58p 350p 250p	2SD1959 2SD1961 2SD1978	235; 50; 50;
2S8646 2S8647 2S8648	40p 20p 45p	2SC1166 2SC1170 2SC1172	100p 180p 1 50p	2SC1846 2SC1847 2SC1855	35p 45p 85p	2SC2347 2SC2353	60p 120p	2SC2834 2SC2837	400p 250p	2SC3356 2SC3358	120p 50p	2SC4742 2SC4769	275p 300p	2SD896 2SD900	200p 400p	2SD1392 2SD1395	150p 150p	2SD1984 2SD2012	450; 54;
2SB649 2SB688 2SB703	35p 90p 90p	2SC1173 2SC1195 2SC1212	40p 210p 35p	2SC1856 2SC1865 2SC1870	25p 700p 700p	2SC2360 2SC2361 2SC2362	120p 150p 50p	2SC2839 2SC2853 2SC2877	40p 70p 120p	25C3361 25C3376 25C3377	50p 300p 50p	2SD198 2SD199 2SD200	140p 195p 180p	2SD905 2SD916 2SD917	450p 130p 300p	2SD1396 2SD1397 2SD1398	120p 120p 120p	2SD2125 2SD2333 2SJ48	300 425
258705 258 70 7	200p 200p	2SC1213 2SC1214	15p 15p	2\$C1875 2\$C1881	220p 70p	2SC2365 2SC2369	100p	2SC2878 2SC2879	20p 3200p	2SC3378 2SC3383	120p 80p	2SD201 2SD257	260p 195p	2SD921 2SD923	320p 360p	2SD1399 2SD1400	300p 280p	2SJ49 2SJ50	425 425
2SB716 2SB718 2SB727	20p 60p 200p	2SC1215 2SC1216 2SC1222	25p 200p 15p	2SC1890 2SC1904 2SC1906	15p 125p 15p	2SC2371 2SC2373 2SC2383	25p 210p 50p	2SC2883 2SC2898 2SC2899	60p 200p 50p	2SC3387 2SC3393 2SC3399	550p 80p 50p	2SD313 2SD315 2SD325	25p 75p 30p	2SD946 2SD947 2SD950	120p 100p 300p	2SD1402 2SD1406 2SD1407	150p 60p	2SJ56 2SJ74 2SJ75	700 60 280
2S8754 2S8755 2S8772	80p 310p 25p	2SC1226 2SC1252 2SC1278	75p 850p 110p	2SC1907 2SC1909 2SC1913	20p 250p 90p	2SC2389 2SC2407	45p 110p	2SC2909 2SC2911	60p 80p	25C3400 25C3401	35p 50p	2SD330 2SD348	85p 300p	2SD951 2SD957/		2SD1408 2SD1409 2SD1412	125p 170p 75o	2SJ76 2SJ77 2SJ79	350 225
2S8774 2S8775	50p 100p	25C1279 2SC1306	30p 90p	2SC1921 2SC1923	15p 10p	25C2408 25C2412 25C2440	K 50p	2SC2912 2SC2921 2SC2922	120p 650p 480p	2SC3402 2SC3409 2SC3412	40p 400p 300p	2SD357 2SD358 2SD371	40p 40p 240p	2SD958 2SD965 2SD970	60p 35p 170p	2SD1413 2SD1415	60p 190p	2\$J103 2\$J108	75 60
2SB791 2SB795 2SB825	280p 80p 135p	2SC13081 2SC1312 2SC1317	< 350p 40p 15p	2SC1929 2SC1940 2SC1941	180p 110p 27p	2SC2458 2SC2459	50p	2SC2928 2SC2929 2SC2934	550p 280p 75p	2SC3416 2SC3417 2SC3419	30p 90p 120p	2SD380 2SD381 2SD388	650p 50p 150p	2SD973 2SD973/ 2SD985	60p 4 70p 120p	2SD1417 2SD1425 2SD1426	125p 260p 160p	2SJ115 2SJ117 2SJ119	525 550 700
258861 258882 258886	110p 180p 90p	2SC1318 2SC1325 2SC1327	10p 400p 20p	25C1942 2SC1944 2SC1945	350p 350p 350p	2SC2470 2SC2481 2SC2482	65p 120p 20p	2SC2937 2SC2938	250p 235p	25C3420 25C3422	80p 75p	2SD389 2SD400	60p 14p	2SD986 2SD1012	120p	2SD1427 2SD1428	180p 220p	2SJ161 2SJ162	550 680
2SB950 2SB951	180p 190p	2SC1328 2SC1342	15p 15p	2SC1946 2SC1947	1500p 450p	25C2483 25C2484	120p 185p 200p	2SC2939 2SC2944 2SC2958	400p 300p 50p	2SC3423 2SC3446 2SC3447	60p 150p 200p	2SD401 2SD402 2SD415	50p 120p 55p	2SD:020 2SD:021 2SD:022	120p	2SD1429 2SD1430 2SD1431	410p 280p 400p	2SK19 2SK40 2SK49	45 50 50
2SB1009 2SB1077 2SB1109	110p 180p 100p	2SC1345 2SC1346 2SC1358	15p 100p 270p	2SC1957 2SC1959 2SC1967	70p 10p 1300p	2SC2491 2SC2495 2SC2498	1900p 50p	2SC2962 2SC2979	800p 160p	2SC3456 2SC3457	200p 125p	2SD424 2SD426	350p 150p	2SD1024 2SD1030	1 130p 75p	2SD1432 2SD1433	400p 750p	2SK55 2SK68	100 100
2SC182 2SC372	75p 25p	2SC1359 2SC1360	15p 70p	ZSC1969 ZSC1970	160p 190p	2SC2500 2SC2502	200p	2SC2987 2SC2988 2SC2995	250p 150p	2SC3459 2SC3460 2SC3461	180p 180p 350p	2SD427 2SD438 2SD467	350p 35p 15p	2SD1031 2SD1046 2SD1047	5 200p	2SD1438 2SD1439 2SD1441	140p 165p 280p	2SK73 2SK106 2SK107	75 44 44
2SC380 2SC382 2SC388A	10p 50p 80p	2SC1364 2SC1393 2SC1384	25p 25p 20p	25C1971 25C1972 25C1973	406p 800p 150p	2SC2519 2SC2527 2SC2534	300p	2SC2999 2SC3001	60p 50p 1400p	2SC3466 2SC3468	225p 70p	2SD468 2SD471	15p 20p	2SD1051 2SD1060	1 130p 1 130p	2SD1445 2SD1450	200p 50p	2SK118 2SK125	100
2SC394 2SC403 2SC454	80p 25p 15p	2SC1393 2SC1394 2SC1398	20p 15p 55p	2SC1983 2SC1984 2SC1985	75p 150p 100p	25C2535 2SC2538 2SC2540	100p	2SC3012 2SC3019 2SC3025	300p 320p 500p	2SC3481 2SC3482 2SC3486	300p 275p 275p	2SD525 2SD526 2SD545	50p 70p 18p	2SD1062 2SD1063 2SD1064	3 200p	2SD1451 2SD1452 2SD1453	250p 350p 140p	25K133 25K134 25K135	650 415 415
2SC458 2SC460	10p 10p	2SC1400 2SC1403	50p 500p	2SC1986 2SC2001	100p 15p	2SC2542 2SC2545	300p 55p	2SC3026 2SC3030	550p 300p	2SC3502 2SC3503	100p 50p	2SD549 2SD551	120p 300p	2SD1069	5 160p 9 150p	2SD1455 2SD1457	250p 185p	2\$K147 2\$K150	160
2SC461 2SC495 2SC496	15p 45p 25p	2SC1407 2SC1413 2SC1419	550p 150p 50p	2SC2002 2SC2003 2SC2004	15p 20p 20p	2SC2546 2SC2547 2SC2550	25p 65p 50p	2SC3037 2SC3038 2SC3039	125p 125p 80p	2SC3504 2SC3505 2SC3506	120p 240p 250p	2SD555 2SD560 2SD571	500p 50p 20p	2SD1071 2SD1073 2SD1088	3 350p	2SD1459 2SD1469 2SD1479		2SK163 2SK168 2SK176	40 40 800
2SC497 2SC515 2SC535	85p 180p 30p	25C1429 25C1444 25C1446	50p 275p 55p	2SC2021 2SC2022 2SC2023	10p 110p	2SC2551 2SC2552	70p 60p	2SC3040 2SC3042	260p 300p	2SC3507 2SC3509	650p 750p	2SD575 2SD600	530p 30p	2SD1094 2SD1110	520p 225p	2SD1487 2SD1491	225p 100p	2SK192 2SK195	156
2SC536 2SC558	20p 275p	2SC1447 2SC1448 2SC1449	70p 100p	2SC2026 2SC2027 2SC2028	30p 200p	2SC2553 2SC2555 2SC2562	120p	2SC3057 2SC3058 2SC3068	150p 2500p 60p	2SC3518 2SC3519 2SC3531	120p 250p 225p	2SD601 2SD602 2SD612	40p 60p 50p	2SD1111 2SD1113 2SD1128	3 225p	2SD1494 2SD1496 2SD1497	300p 350p 230p	25K197 25K214 25K216	14: 17: 20:
2S C563 2S C605 2S C619	120p 100p 100p	2SC1449 2SC1450 2SC1454	120p 200p 250p	2SC2028 2SC2029 2SC2037	75p 120p 50p	25C2563 25C2564	200p 230p	2SC3070 2SC3074	35p 200p	25C3549 2SC3552	200p 300p	2SD613 2SD636	70p 10p	2SD1133 2SD1135	3 100p 5 75p	2SD1497- 2SD1506	120p	2SK218 2SK240	14
2SC644 2SC644 2SC647	80p 10p 300p	2SC1470 2SC1472 2SC1473	120p 40p 15p	2SC2053 2SC2055 2SC2058	120p 150p 20p	2SC2565 2SC2568 2SC2570	260p 120p 30p	2SC3075 2SC3077 2SC3086	150p 120p 150p	2SC3568 2SC3584 2SC3595	200p 200p 220p	2SD637 2SD638 2SD639	15p 15p 20p	2SD1130 2SD1140 2SD1142	40p	2SD1507 2SD1509 2SD1511	60p 1 00p 100p	25K312 25K315 25K320	75 7: 12:
2SC681 2SC683	250p. 35p	2SC1474 2SC1475	45p 60p	2SC2060 2SC2061	60p 75p	2SC2571 2SC2577	350p 110p	2SC3089 2SC3101	130p 750p	2SC3605 2SC3606	60p 100p	2SD640 2SD655	350p 18p	2S01148 2S01159	90p	2SD1519 2SD1521 2SD1541	250p 70p 350p	2SK323 2SK386 2SK405	13 60 45
2SC708 2SC710 2SC711	100p 15p 15p	2SC1505 2SC1507 2SC1509	80p 45p 35p	2SC2068 2SC2071 2SC2073	60p 140p 40p	2SC2578 2SC2579 2SC2580	170p 110p	2SC3112 2SC3114 2SC3116	35p 40p 75p	2SC3607 2SC3636 2SC3657	150p 280p 400p	2SD661 2SD666 2SD667	60p 25p 20p	2SD1160 2SD1160 2SD1164	3A 220p	2SD1548 2SD1554	450p 170p	25K413 25K415	50 50
SC730 SC732 SC733	350p 40p 15p	2SC1514 2SC1515 2SC1520	35p 60p 45p	2SC2075 2SC2078 2SC2085	95p 100p	2SC2581 2SC2588 2SC2590	225p 600p	2SC3117 2SC3122 2SC3148	120p 50p 185p	2SC3659 2SC3668 2SC3675	600p 120p 100p	2SD668 2SD669 2SD673	120p 35p 350p	2SD1168 2SD1168 2SD1173	280p	2SD1555 2SD1556 2SD1564	170p 400p 100p	2SK429 2SK511 2SK513	18 45 32
SC735 SC738	40p 15p	2SC1541 2SC1545	110p 120p	2SC2086 2SC2092	60p	2SC2591 2SC2592	40p 50p 200p	2SC3149 2SC3150	180p 125p	2SC3678 2SC3679	280p 180p	2SD676 2SD716	250p 80p	2SD1185	6 400p	2SD1565 2SD1571	75p 170p	2SK531 2SK534	35 70
\$C739 SC761 SC762	150p 110p 150p	2SC1567 2SC1568 2SC1589	40p 35p 55p	2SC2094 2SC2097 2SC2099	1200p 2300p 2500p	2SC2610 2SC2611	10p 60p 30p	2SC3151 2SC3152 2SC3153	230p 130p 230p	2SC3680 2SC3685 2SC3687	380p 450p 600p	2SD717 2SD718 2SD722	180p 85p 240p	2SD1183 2SD1183 2SD1196	55p	2SD1572 2SD1576 2SD1577	100p 250p 250p	2SK537 2SK538 2SK539	90 35
SC783 SC790 SC792	85p 50p 380p	2SC1570 2SC1571 2SC1573	40p 50p 25p	2SC2118 2SC2120 2SC2131	1100p 10p 550p	2SC2621 2SC2625	70p 180p	2SC3156 2SC3157	350p 200p	2SC3688 2SC3692	550p 150p	2SD725 2SD734	270p 15p	2SD1191 2SD1192	1 120p 2 90p	2SD1579 2SD1589	120p 60p	2SK555 2SK556	110 40 50
SC805 SC828	225p 20p	2SC1580 2SC1583	600p 25p	2SC2141 2SC2153	60p 40p	2SC2626 2SC2631 2SC2634	600p 20p 10p	2SC3158 2SC3159 2SC3164	260p 200p 350p	2SC3715 2SC3717 2SC3729	480p 120p 450p	2SD741 2SD743 2SD756	120p 130p 100p	2SD1196 2SD1197 2SD1207	7 150p	2SD1590 2SD1591 2SD1593	100p 310p 125p	2SK557 2SK566	40
SC829 SC839 SC870	15p 20p 100p	2SC1586 2SC1617 2SC1623	540p 340p 50p	2SC2166 2SC2168 2SC2188	80p 120p 70p	2SC2636 2SC2637	40p 120p	2SC3169 2SC3170	150p 300p	25C3746 25C3747	100p 120p	2SD757 2SD758	120p 140p	2SD1210 2SD1211	280p 1 120p	2SD1595 2SD1608	160p 210p	2SK695 2SK719 2SK724	55 30 60
SC838 SC930	275p 15p	25C1624 25C1626	60p 55p	2SC2200 2SC2221	250p 650p	2SC2640 2SC2653 2SC2654	1800p 100p 180p	2SC3173 2SC3175 2SC3178	180p 150p 175p	2SC3752 2SC3781 2SC3783	250p 150p 300p	25D762 2SD763 2SD768	100p 140p 180p	2SD1218 2SD1223 2SD1225	75p	2SD1609 2SD1632 2SD1637	70p 500p 50p	2SK725 2SK727	80
SC941 SC943 SC944	15p 160p 140p	2SC1627 2SC1628 2SC1634	15p 75p 50p	2SC2228/ 2SC2229 2SC2230	15p 80p	2SC2656 2SC2656	75p 550p	2SC3179 2SC3181	70p 200p	2SC3787 2SC3789	100p 75p	2SD772 2SD773	200p 20p	2SD1227 2SD1229	7 40p 3 250p	2SD1647 2SD1649	40p 260p	2SK735 2SK758 2SK787	50 30 110
2SC945 2SC950 2SC959	10p 40p 225p	2SC1669 2SC1674 2SC1675	100p 15p 90p	2SC2233 2SC2235 2SC2236	100p 60p 20p	2SC2660 2SC2665 2SC2668	100p 200p 10p	2SC3182 2SC3199 2SC3209	120p 40p 120p	25C3790 25C3795 25C3798	120p 175p 220p	2SD774 2SD777 2SD784	30p 400p 850p	2SD1237 2SD1246 2SD1247	20p	2SD1650 2SD1651 2SD1663	180p 150p 450p	2SK794 2SK872	50 85
2SC980 2SC982	40p 20p	2SC1678 2SC1683	80p 100p	2SC2237 2SC2238	540p 45p	2SC2671 2SC2681	100p 170p	2SC3210 2SC3211	550p 220p	2SC3807 2SC3811	120p 80p	2SD786 2SD787	100p 20p	2SD1248 2SD1251	270p 1 180p	2SD1666 2SD1667	90p 120p	2SK903 2SK1057	50 60 80
2SC983 2SC1000 2SC1001	120p 20p 950p	2SC1684 2SC1685 2SC1729	30p 30p 900p	2SC2240 2SC2258 2SC2259	15p 30p 60p	2SC2688 2SC2688 2SC2690	27p	2SC3212 2SC3225 2SC3244	260p 50p 45p	2SC3832 2SC3833 2SC3853	200p 250p 220p	2SD788 2SD789 2SD792	30p 20p 400p	2SD1263 2SD1264 2SD1265	55p	2SD1668 2SD1677 2SD1730	120p 300p 350p	2SK1058 2SK1117 2SK1118	25 22
4.0	3 17	188		-		2SC2705 2SC2710	50p 50p	2SC3246 2SC3259	50p 350p	2SC3854 2SC3855	250p 220p	2SD794 2SD795A	33p 140p	2SD1266 2SD1267	180p 7 55 p	2SD1732 2SD1739	460p 275p	35K45 35K51	10 10
2				AGE	2	2SC2712 2SC2716 2SC2719	20p 50p 25p	2SC3260 2SC3281 2SC3262	220p 230p 280p	2SC3857 2SC3858 2SC3870	500p 550p 200p	2SD811 2SD819 2SD820	450p 200p 250p	2SD1271 2SD1271 2SD1272	A 225p	2SD1740 2SD1748 2SD1760	125p 90p 80p	35K59 35K74 35K77	10 5 5
			MOR			2SC2719 2SC2721 2SC2738	120p 200p	2SC3263 2SC3264	280p 390p	2SC3883 2SC3884	280p A 300p	2SD821 2SD822	550p 290 p	2SD1273 2SD1275	5 50p	2SD1762 2SD1773	50 p 160p	3SK81 3SK85	5 16
GR/	AND	ATA	BA	RGA	INS	2SC2740 2SC2749	450p 350p	2SC3269 2SC3270	50p 50p	2SC3886 2SC3890	A 400p 150p	2SD826 2SD836	30p 60p	2SD1276 2SD1277		2SD1783 2SD1796	100p 180p	3SK88 3SK121	15

		REPL	ACE	MENT	VIDE	EO HE	ADS		
Model	Price	Model	Price	Model	Price	Model	Price	Model	Price
AMIA AVSG/AV77	1200p 1100p	VCR8103, VCR8107 VIP300A MKII	2200p 1900p	VR3833, 3912, 3913. 3 4913, VRP3823 VR3986	650p	NVM1, NVM3, NVM5 AG2100, AG2200	4200p 7 00 p	VHR1100, VHR1200 VHR1500, VHR2500	1500; 2100;
G700 G900	1500p	FISHER FVHP420, 510, 520, 530	615, 618, 620,	VP3826, 3906, 3916, 3 3948	1550p	NV430 NV730, NV770 4 HEAD NV366	1850p	VHR2700 VHR7900	2.450 ₀ 3000;
VSN05, 112, 115, 116, 125, 205, 220, 240, 244, 245, 24 361, 304, VSP6, VSP62	, 126, 201, 202, 17, 248, 250, 301,	622, 710, 711, 715, 720, 905, 906, 908, 910, 911, 5000, 5001, 5005, 5050,	915, 916, 918, 5075 1150p	VR3927 VR3976 VR3977	1400p 2300p 2700p	NV180, NVD48 NV788 NV810, NV830	2300p 2900p 2600p	SHARP VC390, VC393, VC496 VC488	2750;
VP7100, VS9300, VS9500, VP77, VP88, VP7100, VP72	VS9800 850p 200, VS9700,	VBS3500, 7100, 7500, 7 VBR330 VBS7600, VBS7100, VB	2000p S9000 2000p	VR3984, VR3994 VR3995, 3997 VR3917	2300p 1800p 1400p	NV850, NV950 NV870, NV890, NV970 NVG33, NVG46, NVL2	2750p 3600p	VC779 VC789, VC790	4200; 1800; 2900;
V53800 V51, VS2, VS3, VS4, VS5.	VS10, 1350p	FVHP500, 711, 715, 721 5100, FVHD720 FVHP725, 830, 980	, 722, 730, 830, 1100p 2500p	VR3730, VR3731, VR3 VR3918, VR3919, VR3 VR3520, 3701, 3719, 3	3749 2500p 1938 1500p	NVL28 NVG10, 11, 12, 14, 16, 450, 465	2000p	VC200, 220, 300, 381, 383 387, 388, 471, 477, 481, 44 3300, 8381, 9100, 9300, 9	82, 483, 485.
VS23, VS35, VS37, VS38, VS66, VS765, VS767, VS76 VS512, VS515, VS516	VS53, VS55, 68 2400p 2800p	FVHP990 FVHP975 FVHD40, FVHD140, FVI	2700p 2400p	9720 VR3907, V83908 VR3968	2000p 1600p 700p	NVG18 NVG20, 21, 22, 25, 28, NVG50, NVG300	2000p	9700 VC582, 583, 651, 681, 750	1100p 0, 780, 781, 683.
VS465 VS11. VS12 VS6. VS8. VS9	2600p 1400p 2400p	FVHP20 FIDELITY	1150p	J.V.C. & FERGUSON HR2200, 3300, 3320, 3	N	NVG45 NVH70	2000p 3600p	684, 402, 500, 571, 573, 5 693, 700, 772, 781 0, 782, 8481	80, 584, 600, 682, 7822, 783, 1100r
VSX9 VSF600, VSF650 VS155, VS165	2500p 3600p 2500p	HQS200, VCR600, VCR6 VR9100 VCR100	1500p	3660, 3750, 3860, 410 8902, 8903, 8906, 892 3V22	0, 3292, 8900, 8901, 2, 8928, 3V01, 3V06,	NV688 NV600 AG6800, AH6810	2400p 1500p 2600p	VC6000, 6200, 6300, 7300 8000, 8300 VC793	1800;
VSZ0, 22, 24, 25, 26, 27, 42 VSF10, VSP9	22,426,427, 1400p 1500p	VTR1000 GOLDSTAR	1100p 1100p	HR3660, 7600, 7610, 7 111, 120, 121, 220, 222 8923, 8924, 8925, 892	600p 7650, 7700, HRD110, 5, HRS100, 8904,	AG6100, AG6200, AG6 NVG7, NVG9, NV230 NV780	1200p 2800p	VC473, 785, 786 VC699, VCA501, VCA602	
VSR9 VS109, VS603, VS606, VS VS75		8000 3HSSDB GVH51, GVH122, VCP4		8944, 3V16, 3V23, 3V2 3V36, 3V38, 3V39, 3V4	24, 3V31, 3V35, 49 625p	NVG15, NVG400 NVM7, NVMC20 NVF70	2600p 3800p 5200p	VC585, VC685 VC90ET VFH815	2000g 3900g 2800g
ALBA YCR4000, VER5000, VER6	000 1650p	VCP4200 GHV123Z, 1233, 1241, 1 1245, 1246, 1290, 1291,	1295, 1296, 1891	BR1600, HRD140, 141 156, 157, 158, 160, 510 8948, 3V42, 3V44, 3V4	, 142, 143, 150, 152, 01, HRS 10, 8947, 15, 3V46, 3V47.	N.E.C. N9011, 9012, 9013E, 90 9016, 901A, 902A, 903	CORP.	SIEMENS	
AMSTRAD VCR4500, VCR5200, VCR9		8210, 8215, GVHP1240, VCP400, VCP4130, 4300 4306, 4310, 4311, 4315,	1241, 1247, 1248,), 4301, 4305, 4316, 4320, 4321.	8948, 3V42, 3V44, 3V4 3V52, 3V54, 3V55, 3V5 HRD154, 170, 171, 210 360, 521, 522, 525, 520	56, 3V57 1250p 0, 211, 217, 320, 321, 6, 527, 550, 8950	9016, 901A, 902A, 9033 9054, 9055, 9063, 9065 DX1000, 1600	3, 9034, 9040, 9053, , 9066, 906, 1300p	FM350, FM352, FM355, F FM363 FM354	1300p 1350p
TVR1 VCR7000 VCR5000, 6100, 6200, 8600		4326 G.E.C.	1300p	8951, 3V64, 3V65, FV1 FV21, FV26 HRD565, HRD566, 3V4	1400p	N911A, 914C, 915A, 91 9120 PVC600, 740, 744, 754,	6A, 917, 9110, 2400p	FM391, FM392, FM461 FM394, FM464 FM462 FM561	1800p 2800p 1600p
D06900, 8904, TVR4 TVRZ, TVR3, VCR4600, VC VCR4700	1200p R4600 MKli, 1150p	4000H, 4001H, 4002H V4001H, V4004 V4005H	1200p 1200p 1500p	HRD725, HRD755, 3V4 8930, 8931, 8933, 8940 8945	43. 3V53 3150p 0, 3V29 , 3V30 700p	2400, 760, 794, 770, 77 N380, N381, N830, N83 N834, N835, N836	4 1650p 31, N632, N833,	FM468 FM484, FM485, FM602, F	2450p M604, FM622,
AUTHENTIC N850	800p	GRANADA CS1, DS2	16000	3V00, 8902, 8903, 890 FV31	1500p	8261, AH1 (for model 0 N9610	3000p	FM624 FM585 FM600	1880p 1425p 1900p
AVFA ATVI	800p	VHSAH1 VHSAH3	1100p 2400p	FV37, FV43H, HRDe60 BR7000E, BR7000S HR7200, 7300, 7350, 2	2800p 650, BR6200 700p	N895 N9052, N9530, DX2000 VCP1	17000	SONY DSR-19R (FOR SL-T 9ME)	
EAIRD 2900, 8901, 8902, 8903, 89		VHSAN3 VHSAY3 VHSBH1. VHSCH1	800p 1200p 2100p	HRD455 HRD520 HRD300, 400, 580, 600	2000p 1400p 0,620,650 2300p	PVC2300, 2400, 740, 74 DS6000	14.760,764 1400p 3500p	DSR-21R (FOR SLC 8-C9) DSR-35R (FOR C20, C30, C	2800p C40,
8928 8904, 8923, 8924, 8925, 89 8944	650p 29, 3935, 8943, 650p	VHS8P1 VHS8Y3 VHSD52	850p 2600p 1600p	HR4100 HRD750, HRD830 HRD250, HRD257	1000p 3300p 2700p	NORDMENDE 460, 9-460, V100, 140, 1 450, 550	700m	SLF1UB, SLF1E) 2 PIN SU SLC33E, SLC44PS, SLF30 SLK85, SLT20ME, SLT30F	PF, SLF60PS
8909, 8912 8930, 8931, 8933, 8940 8942	800p 800p 2300p	VHSEH2 VHSEY1, VHSEY2 VHSFG2, VHSFG4	1600p 1400p 1300p	3V32, 8942, HR7655 HRD180, 190, 230, 610	2300p	V1001, 1005, 1015, 102 1055, 1065, 1105, 2005 V110, V333	5, 1035, 1041, 1250p 2000p	DSR-43R (FOR SLC7 RAN SL5100, SL3000) 1 PIN St	IGE, SL5000, LC8E,
8945 8947, 8948 8950	2000p 1600p 1700p	VHFS1, VHSFS2 VHSTJ1, VHSTJ2, VHS' VHSYJ2	1300p	FV208, 26, 30, 32, 33, HR0370, HR0430, HRI FV13H HRD530, HR0700, FV1	2300p	V101, 102, 103, 112, 14 301, 302, 350, 590, 300; V1205, V1215, V1235, V	1, 142, 200, 300, 5 700p	\$L36ES, SL37E SL3000, 8000, 8080, SLC5 SL17ME	1300p 5E, 1600p
VC141L VH582	3000p 7000p	VHSVH4, VHSWH1, VH VHSYH2 VHSWJ1, VHSXJ3	5XH1, 1800p	GRC1, GRC2, 3V41 HRD330, 337, 440, 637	7, 641, 660,	V1305 V380	2450p 2300p	SLV201, 202 SLK95, SLT50ME SLV373VB	2000p 2900p 2600p
BEAUPUNKT RTV199, 200, 292, 211, 214 RTX100, 200	4, 222, 224, 800p	GRAETZ	700p	HRFC100, FV44L KENNYOOD	2100p	V502, V503, V5005 ORION VH3, VH555, VH660, VI	3150p	TOSHIBA	THE SELECTION OF THE SERVICE OF THE
RTV301, RTX250, RTV333 RTV306, 307, 309, 311, 315	800p 5, 316, 520,	4312, 4605, 4905, 4912, TR4605, TR4812, TR490 TR4913, TR4914, TR494	3 650p	KV901, KV903, KV905 KV917	#50p 2450p	VH300, VH1000 (ALL M VH1, VH2A	100ELS) 1100p 700p	V63 V9680 V8600, V8700	1500p 3400p 3000p
707 RTV310, 311A, 312, 317, 3 RTV324, RTV325	1550p	4935, 4943, 4963, 4985, TR4935, TR4985, TR499 4920, 4927, 4930	3 650p 1700p	VR960 VR950	1500p 1400p	PHILIPS VR6460, VR6520, 64VR		V21, V31, V33, V50, V51, V V9600 V55, V57	
RTV328 RTV424 RTV434, RTV444	1850p 3500p 3900p	4946, TR4906, TR4916 TR4994 TR4996	1600p 2300p 3300p	I.OEWE OC410, OC420, OC440) 2400p	VR6711 4 HEAD 6920, VR6440 VR6441, VR6540, VR65	1800p 2500p 41, VR6640.	V71, V73, V74, V75, V77, V83, V84, V85, V86, V87	/80, V81, V82, 1200p
RTX260, RTX720, RTV330 RTV454, RTV740 RTV478	2300p 5000p 3700p	GRUNDIG VS410, 450, 460, 500, 50	5, 510, 520, 521,	OC50, OC55, OC60, OC	C65 1500p	VR6642 RANK	1300p	V80, V93 V5470, V5480 V600	1450p 1300p 2350p
RTV520, RTV530 RTV535, RTV560, RTV570 RTV635, RTV660, RTV670,	1800p 2000p	530, 546 BARCELONA, MVS400, SE5180, 6100, 6110, 910	440, 500, 600.	9225, 9256 9245, 9251, 9254 9270, 9271, 9273	1800p 1225p 1800p	8V6900AS N830EA, RV300, RV310 RV340, RV350, RV380	1800p), RV320, RV330, 700p	V280MS V700G	2600p 3700p
CR1000, CR1200, CR1500 CR1800 RTV321, RTV322	4650p 4100p	5510, V\$400, 440, 500, 5 610, 5180, V\$6190, 700, MADRID, SE5140, V\$54	05 510 518 600	9272, 928217 9252 928017, 928077, 92809	2700p 2500p	REDSON MR100	1700p	V500G, V509G V9680 V300G, V301, V305, V3090	2500p 2900p G 2550p
RTV338 RTV348 RTV404 RTV414	1700p 2600p 2700p	MVS550, 620, VS550, 62 930, 940 VS120	20, 630, 640, 790, 2400p	928117 9253	1700p 2500p	SABA 2A10, 2A70, 2B20	14000	V61, V63 V110, V120, V130, V140, V V220	1790p /210,
RTV640 RTV750, RTV800, RTV900	3000p 3000p 3500p	VS680 VS160, VS740	2300p 4600p 4400p	9281 9284,9295, VR3701, V VR3761	R3721, VR3731, 2100p	4A10, 4B20 6A10, 6A70 8A10, VR6038	2450p 2300p 3150p	ТПИМРН	1800p
RTV910 RTV910	4400p 4500p	VS170 MVS660, SE6160, VERO VS6690	3500p	MATSUI VX500E, 800A, 810A, 8	920, 80A, 770B,	CVR6083, VR600, 66001 7006, 7007 PVR5068, 6070, 8070, V	7, 6008, 6009, 1250p	VR9500, VR9501, VR9525 TELEFUNKEN	1100p
VRH50 VRP20	1000p 1000p	MVS710, 720, 910, SE71 720, 800, 810, 910, 920	20, 9120, VS710. 1700p	7738 VCRL3, VX730, VX750 VX735, VX755, VX990	1500p	6012, 7000, 9010 VHR7000, VR5005	600p 1500p	A920, VR1970, 2920, 2925 7921, 7926, 7931, 7970, 97	2700p i. 2930, 418, i0 1250p
VRP25 VRP30	1000p 3350p	VXL2, 3, 4, 20, 35 VXL5, V20H	1150p 1300p	VX735A, VX765, VX85 VX600	0 1750p 1100p	VR6004, 6005, 6011, 60 6022, 6023, 6024, 7004, 7730, 8011, 8014	7011, 7014, 7720, 700p	VH400, 410, 450, 510, 519, 610, 620, 640, 920, 1920	, 520, 529, 540. 700p
VR10 VR30A, VR30B, VR30E, VR	40A 3350p	VXL6 VXL7 VXL8, 9, 10, 11, 90, VCR	1500p 2200p	MITSUBISHI HS303, HS304, HS320, HS306, HS318, HS710	1600p	VR6018, VR7018 VR6028 VR7016	2450p 2300p 2000p	A930, 932, 935, VR2931, 2 4935, 4940, 4942, 4945, 59 A935, VR3945, VR3950, VI	35, 7932 1400p R7959 2450p
DAEWOOD 912, VCR12, VCR30, VCR32	2. VCR50,	VTV200	1300p	HS307 HS319 HS330	2600p 2500p 2600p	SAISHO VR100, 605, 705, 805, 9	05, 1000, 1100,	A940, VR1925, 1930, 1940 440, 449, 530, 535, 539, 54 925, 930, 940, 950	, 1950, 2960,
VCR52 VCP11 RAF	1800p 1800p	VT11, 14, 15, 16, 30, 33, 640, 5030, VTP10, 30 VT7, VT17, VT18, VT19	34, 330, 340, 503, 1000p 2200p	HS400 HS349, HSE31, HSE32 HS411	2800p	1200, 1600 VR3300X, VR3600X, VR VR3800	1400p	VR1980, VR7980, VR980 VR2915	3150p 1100p
BECCA 8300 8400, 8500	1000p 650p	VT35, VT38, VT39 VT106, 110, 111, 112, 11	3.115.118.120.	HSE30, HSB30 HS338 HSE10, HSE11, HSE20	2400p 2200p	VR3200, VR3500 VR2000, VR3300, VR360	1400p 1400p	VR2970, VR7971, VR975 VR7979	2450p 2300p
DUAL EVR101	2300p	125, 128, 220, 225, 400, 415, 418, 510, 518, 526, 526, 725, 726, 728	1400p	HSB10, HSB20 HS300, HS301, HS302,	, HS310, 2200p	SALORA 6500, 6600 SV7300, SV8200, SV830	1600p 00, SV9200 1500p	THOMSON TX8000, V309, 316, 320, 33 4100, 4200, 4300, VX305T,	21, 323, 326.
VR70, VR71, VR74, VR81, V VR91 VR85, VR96	7R90, 650p 2300p	VT3000 VT4000, 4200, 5000, 550 VT77, 680, 6500, 6700, 6	800, 7000, 8000,	HS273 HS200 HS337, HS347	1550p 650p 1500p	SV7400, 8406 SV8100	1600p 1200p	3301, 312T, 410T, 411T TX8500, V318, 342, 343, 35	650p
VR97 VR80, VR92 VR93	3300p 650p 2450p	9300, 9500, 9700, 9900 VT8, 9, 56, 57, 570, 575,	1000p	HSE12, HSE22, MX1 HS411EZ, HS411GZ HSB11, HSB21	2200p 2900p 2200p	SAMSUNG SVX301, VB900, 910, V 5600, VX510, 511, 520, 0	VT510, VT320, 616, 626, 627, 717.	4210, 4230, 4260 V333 V340	1250p 1100p 1100p
EDISON VC2130, 2133, 2135, 2140,		588 VT65 VT130, 135, 138, 145, 25	3400p 2400p 0, 255 258, 420	NATIONAL PANASC		5600, VX510, 511, 520, 614, 619, 629, 710, 712, 972, SV716, 717, SVX30, 520, 610, 616, 617, 619,	3. 305, VB510, 1	V357, VK309LP V360, V5500	2300p 2450p
2932, 2934, 3122 VK2132, VK2512 VK2436, VK2340	650p 2300p 850p	425, 42 6, 428, 430, 431, 4 VTL30, 301, VTM630, 63 VT52, VT60, VT61E, VT6	35, 438, 535, 536, 5, 636 2000p	NV306, 322, 333, 396, 2 7000, 7 500 , 7800, 7850 8600, 8610, 8620	2000, 2010, 3000, 8176, 8200, 8400, 625p	710, 971, V1520, 616, 62 910 VB770, V1730, V1770, V	21, 626, 900, 1350p	V364, V4400 V368, V6000, V8540 V410, 510, 610, 630, 715, 4	2000p 3150p 240 1400p
VK2530, VK2 532 , VK2631, VK2632 VK2637	VK2541 1600p 1700p 3050p	VT640 VT168, VT150, VT260, V	T498 (4	NV777, NV330 NV6050, NV8051 AG1000, AG1050, NV2	1500p 2800p	VK770, VK8225 VM1560, VN1561	1900p 2200p	V430, 530, 4340 V450	2450p 2300p
VKH2545 VKH2639, VKH2439	2450p 3300p	HEAD) VT530 VT522, VTM620, VTM62		NV470, NV480 AG6010, AG6015	1800p 2500p	SANYO VTC5000, 5400, 6000, 65	500, VPR5000.	VK300T, VK301T, VK302T, VK308P VM10, VM20	, VK3031, 650p 2700 p
FUNAI E11, 1100, VIP1000, 1400, 3	3000, 5000,	V7M722, VTM822 VT660E	1900p 2600p	AG6840 NV100, NV200, NV370 NV630	725n	VTC1500, VTCM10, 11, VTC2000, 5100, 5150, 5: 5370, VTCNX10, VTCNX	300, 5400, 5350, (15, 20, 30,		
VCR4000, 4500, 4800, 5200 6400, 6600, V1, V25 VCR4600, VCR5400, VCR56	1100p 1200o	H.M.V. HV1000, HV2000, HV300 HV4000, HV7000, HV800	0 650 р	NVD80, NVH65 NVF65, NVH75 NVF51	3900p 3200p 4200p	VPR5800 VTC5500, 5550, 9100, 93 9455, 9500	1800p 300, 9350, 9355, 1980n	GRANDAT	
VCR5480, 5843, 8007, VIP2 6000, 150 VCR4530, VCR6000, VCR61	2000p 100, VCR6800,	I.T.T. VR3605, 3905, 3935, 394		NVG19 NVJ30, NVHJ33, NVL2 31, 40, 130	2300p	VHR1110, VHR1150, VH VHR2300 VHR3200, 3270, 3100, 3	R1300, VHR1700, 1300p	Tel: 0181-90	
VCR6803	1300p	3985, 3993, 4993	850p	NVJ35. NVG46	2500p	3310, VHRD500	1500p	Fax: 0181-90	<i>J</i> 3 6126

	PINCH ROL	LERS / VCR	BELT KITS	
Model Price	Model Price	Model Price	Model Price	Model Price
AKAI VS10, VS9308, VS9500, VS9700, VS9800, VP7100, VP77 180p	VHSTJ1, VHSTJ2, VHSTJ3 180p VHSWJ1, VHSWJ3, VHSXJ3 180p VBXYB3 180p	N.E.C. N830, 631, 832, 833, 895 PVC2300, 2400, 740, 744, 745, 760, 764,	FM568, FA3568, FM560, FM562, FM564, FM574, FM578 180p FM601, 603, 605, 607, 608, 617, 619, 620, 621, 623, 625, 626, 628, 630, 832, 634, 636.	FERGUSON 3292, 3V00, 3V01, 3V16, 3V22, 8903, 8901, 8904, 8905 3V23, 8923, 8924, 8929 65p
VS1, VS2, VS3, VS4, VS5, VS6, VS8, VS9 180p VS105, 112, 115, 116, 126, 205, 220, 240.	VHSEH3, VHSES2 180p VHSF34 180p VHSFP2 180p	766 \$800 DX1000, 1600, 2000, 3000, N9072, 9013. 9014, 9016, 9033, 9034, N9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530,	838, 639 180p	3V29, 3V30, 8830, 8931, 8933, 8940 90p 3V31, 3V32, 8941, 8942 85p 3V35, 3V36, 3V36, 3V39, 2V49, 8943 85p
244, 245, 247, 248, 250, 512, 515, 516, VSX9 VSX9 VS201, VS301, VS303, VS304, VS603, VS606, VS607, VPS6-P82 180p	GRUNDIG BARCELONA, MADRID, MVS500, 510, 600, 620, 660, 710, 720, 910, 9105,	9810 180p	NCVR1000, NCVR5000 180p	3942, 3943, 3944, 3945, 3943, 3953, 3954, 3955, 3957, 2946, 5947, 8948 65p 3943, 3944, 3948, 3955, 8550, 8951, FV10, FV11, FV12, FV13, FV14, FV20, FV21,
VS125, VS155, VS165, VS220, VS240, VS250, VS512 180p VS22, 23, 25, 35, 37, 38, 53, 66, 75, 422,	SE5110, 5140, 6100, 6110, 7120, 9100, 9120, TVR4000, 4510, 5510, VERONA, VS500, 505, 510, 520, 530, 540, 550, 600,	VH1, VH2 180p VC150, 180, VH3, 33, 200, 201, 205, 212, 250, 254, 288, 300, 303, 312, VH404, 555 700, 704, 712, 770, 780, 844, 900, 1000,	SLC5, 8, 7, SL2000, 8000, 8080, 8200, SLJ10, SLT6ME, SLT7ME 188p SLC9, 20, 24, 30, 33, 44, SLHF100, SLF1, 11, 20, 25, 30, 60, 100, 200, SLF60PS.	FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV28, FV32, CV141L 80p FV31R 125p
425, 426, 427, 462, 465, 467, 485, 965, 967, VSA77 180p VSE260, 281, 262, 265, 270, 274, 280, 290, 410, 440, 400, 455, 480, 490, 497, 550,	610, 620, 630, 640, VS650, 680, 680, 790, 710, 720, 740, 790, 800, 310, 900, 910, 920, 930, VS940, 5180, 5480, 6190, 6690, 180p MVS400, 440, 400, 410, 440, 441, 400, 456.	2948, 3030, 3312, VHF2A, VP2948 1809 COMBI15000, 16000, HV03, LVH50, NEVH, NEVHM, NEVHML, TVP230RC,	SLF90E, SLHF150, 850, SLK88, 95, SLT20ME, SLT30ME, SLT50ME 180p BMC100, BMC200, BMC500 180p	FIDEUTY H05200, VCR600, VCR5100 180p VCR100 160p
599 180p AMSTRAD VCR4000, 4600, 4700, 5200, 6000, 6100,	460 180p VS120 180p VS150 180p VS180, 200, 220, 226, 262, 265, 267, 306,	VCP, VH04, 30, 103, 300, 358, 360, 362, 400, 416, 512, VH530, 532, 535, 536, 606, 636, 635, 640, 666, 730, 735, 744, 774, 790, 800, 820, 850, 888, 893, 900, 930, 940, 942.	SLV201, 202, 301, 302, 401, 402, 801, 802 180p SLV210, 220, 273, 275, 309, 353, 373, 410, 415, 474, 656, 715, SLV757, 777 180p	VTR1000 100p
8600, 8602, 8603, 8604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD8904, TVR1, 2, 3, 4 180p	310, 315, 320, 326, 345, 380 180p	974, 1012, 1040, 1050, 1060, 1070, 1160, 1120, 1264, 1440, 1500, 1680, 1800, 2004, 2151, 2308, 2204, 2400, 2500, 2600, 2700, 2960, 2970, 3050, 3060, 4000, 4008, 4010,	SLV255 180p	VR2005, VR2010, VR2020, VR2025, VR2040 105p VR2008 160p VR3009 144p
AIWA AV66, AV77 180p	GHV61, 1221, 1232, 1240, 1241, 1242, 1243, 1244, 1245, 1246, 3000, 8200, 8210, 8215, GHVP1240, 1241, 1247, 1248, 1290.	4012, 4015, 4020, 4300, 5020, VP10, 290, 220, 225, 245, VR821, 925, 1032, 2949, 2959, 2967, 2966, 2979, 2960, VTV300,	A920, 930, 932, 935, 940, 960, 980, 990, 1200, VR925, 930, 940, 950, 971, 975, 980, 1920, 1925, 1930, 1940, 1950, 2920, 2925, 2930, 2931, 2935, 2941, 2960, 2970, 2671,	VR3009 1440 FISHER VBS7000 245p VBS3000 120p
G700. G900 180p ALBA VCR3000X, VCR4000 180p	1291, 1295, 1296, VCP4000, 4100, 4130, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4316, 4320, 4321, 4325, 4326, 180p	VXL20, 25, 30 180p PHILIPS VR6460, VR6920 180p	3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 4970, 6000, 7921, 7926, 7929, 7931, 7932, 7970, 7971, 7979, 7980 180p	VBS9000 120p FVHP520, FVHP530, FVHP428 80p FVHP615, 818, 620, 622, 710, 711, 720, 721, 722, 725, 730, 840 100p
VCR5060 VCR6000 180p AUTHENTIC N850 180p	HINARI V20H, VXL5, VXL6, VXL7, VXL8, VXL9, VXL10, VXL11, VXL19 180p VXL12, VXL3 190p	VR2020, VR2021, VR2022, VR2023, VR2024 180p VR6711 180p	VR1970, VR1980 180p VR400, 410, 440, 429, 400, 510, S19, 540, 549, 510, 640 180o	FVHP905, 906, 908, 910, 911, 915, 916, 918 100p VBR330, VBS7500, VBS7600, VBS9000 100p
BLAUPUNKT RVT100, 200, 202, 222, 224, 301, 306, 307, 309, 311, 312, 315, 316, 317, 319, 320, 328,	VXL2, VXL3 190p VXL4, VXL20, VXL35 180p	VR6540 OV856, 586, VR702, 703, 6485, 6589, 6785, 6880, 6948 VR445, VR6442, VR6542, VR6843,	VR520, 529, 530, 535, 539, 550, 620, 630, 650, 920 180p	V8S3500 75p
309, 311, 312, 315, 316, 317, 319, 320, 328, 404, 414, 434, 444, 478, 707, RTX100 180p RTV211, 214, 321, 322, 348, RTX250, 260 180p	VT7, 11, 14, 16, 17, 19, 33, 34, 35, 38, 39, 88, 330, 680, 6500, 6800, 5000, 5500, 7000, 8000, 8300, 8500, 9300, 9500, 9700,	VR6943 DV484, VR7270, 2300, 2324, 2330, 2334, 2340, 2350, 2414, 2480, VR2485, 2486, 2489, 2490, 2498, 7840, 6462, 6463, 6464,	THOMSON SV1900, TX8500, V320, 321 323, 326, 342, 343, 361, 362, 363, 360, 384, 368, 410, 430, 400, 510, 520, 530, 540, 620, 630, 640,	HS760, HS750, VGX715, VGX720D 160p FUNA! V1, V25, VCR4600, 4800, 5200, 5400, 5860,
RTV324, 325 RTV330, 454, 520, 530, 535, 580, 680, 670, 720, 730, 740, 800, 810, 900, 910, 920 180p	9900 VT8, 52, 57, 61, 62, 63, 64, 65, 85, 96, 88, 100, 110, 111, 113, 115, 118, 120, 122, 125, 130, 135, 138, 145, 156, 168, 175, 220, 225,	6560, 6660, 6860, 6861, 6862, 6863 180p N-1700, VR2870 180p VR2025, VR6580 180p	4200, 4210, 4230, 4240, 4260, 4390, 4340, 4400, 5500, 5540, 6000, 8540 180p TX8000, V309, 316, 357, 309, 410, 411, 3801, 4100 180p	6400, 6600, VIP3000, VIP5000 160p VCR4530, 5840, 5843, 6800, 6803, 8007. 8103, VIP150, 6000 160p
DÄEWOOD VCR12, VCR32, VCR52 180p VCR30, VCR500 180p	250, 255, 258, 260, 400, 406, 410, 413, 414, 415, 416, 420, 425, 426, 428, 430, 431, 435, 440, 498, 510, 518, 520, 525, 526, 576, 580, 585, 563, 640, VTD660, 665, VTF770.	VR6549, VR6648 120p PRESSURE ROLLER ASSEMBLY PS403 40205, DV186, 190, 286, 291, 292, 486, 471, 562, 582, 571, 761, VR201, 202, 203.	V333, V340 VX300, 301, 302, 305, 306, 312, 3301, 180p	G.E.C. 100p V4004 100p
DECCA VR8300 VRH8495DK (Pressure Roller Assembly)	775, VTL30, VTLC50, VTM620V, TM625, 626, 630, 635, 638, 640, 645, 646, 720, 722, 725, 726, 728, VTM730, 731, 735, 736, 740,	302, 303, 305, 6180, 6182, 6185, 6785, 6290, 6291, 6293, 6362, 6367, 6380, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6766, 6760, 6761, 6762, 6870, 6970.	TOSHIBA QV55, 57, 61, 63, 65, 66, 67, 71, 73, 74, 75, 77, 81, 83, 85, 86, 93, 94, 80, 90, 96, 97, 200, 202, 205, 207, 300, 309, 500, 509.	GOLDSTAR GHV1221, 1232, 1241, 1242, 1243, 1244, 1245, 1246, 1247, 1248, 8219, 8215, VCP4106, VCP4130 80p
PS403-40205 400p FERGUSON 3V00, 3V01, 3V16, 3V22, 3V23, 3V24.	745, 746, VTS80, 85 180p VT3000 180p	6975, 8681, 63SB7, 68SB4, 71SB4, 72SB8, 92SB31	700 180p V5470, V5480 180p V108, V109, V199, V209, V609 180p	VCP4100, VCP4130 80p GHV1296, 1291, 1295, 1296, VCP4000, 4200, 4300, 4301, 4305, 4306, 4310, 4311, 4315, 4321, 4321, 4325, 4326
3292, 8900, 8901, 8902, 8903, 8904, 8906, 8909, 8912, 8922, 8923, 8924, 8925, 8929 180p	I.T.T. VR3605, 3828, 3905, 3906, 3916, 3926, 3935, 3946, 3948, 3976, 3985, 3986, 3995, 3997, 6348	SANYO VHR1100, 1150, 1200, 1300, 1500, 2100, 2300, 2500, 2700	PRESSURE ROLLER ASSEMBLY - PS403- 40205, V91, V95 400p	GRANADA
3V.29, 3V30, 3V31, 3V32, 3V52, 8930, 8931, 8933, 8940, 8941, 8942 180p 3V35, 3V36, 3V38, 3V39, 3V42, 3V43, 3V44, 3V45, 3V48, 3V49, 3V54, 3V54, 3V46, 3V55, 3V54,	VR2913, 3914, 3943, 3954, 3984, 3993, 3994 180p VR3907 180p VR3908 180p	VTC5000, 5150, 5300, 5350, 5400, 5500, 6000, 6500, 9100, 9300, VTCM10, 20, 11, 21, 31, 50, VPR5800 VHS3100, 3300, 3310, 3400, 3700, 3800.	VCR BELT KITS AKAI VP7100, VS9300, VS9500, V9700.	VHSYH2 50p VHS8H1, VHSCH1 150p VHS8P1 135p
3V55, 3V56, 3V57, 3V58, 3V59, 3V65, FV10, FV11, FV12, FV14, 8943, 8944, 8945, 8947, 8948 180p	VR3912, VR3963, VRP3833 180p VR3917, VR3833 180p	VHRD500, 700 180p VTC3000 VHR4100, 4160, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200,	V\$9800 120p V\$1, V\$2, V\$4, V\$5 100p V\$10 65p	VHSDS2 125p VHSAY3 125p VHSBY3 100p VHSEY1, VHSEY2 70p
3V52 8950, 8951, FV10B, 11R, 13H, 14T, 205, 21R, 26D, 31R, 32L, 41R, FV42L, 50B, 51R, 52L, VC141L	SVR3799, VR3520, 3791, 3719, 3720, 3721, 3730, 3731, 3749, 3759, VR3761, 3781 180p	7500, 7530, 7540, 7800, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4000, 4600, 4610, 4710, 4890, 6700, VHRS700 180p	VSX9, VS105, 172, 115, 116, 205, 220, 24, 244, 245, 247, 248, VS250, 512, 515, 516 300p VS22, VS23, VS26, VS35, VS37, VS38,	VHSCC1 100p 1 VHSDP1, VHSFv2 80p 150p 1 150p
FV44L, FV46T. FV43H 180p FISHER FVHP420 520, 530 180p	VR3918, 3919, 3958, 3998 189p VR570, VR680, VR681 180p VR3927, VR3977 180p VR482, VR580, VR581, VR582 180p	VCR100 180p SHARP VC200, 381, 384, 385, 386, 388, 390, 393,	VS53, VS55, VS66 100p VS4, VS8 150p VSA77 140p	VHSFJ2 140p
FVHPs15, 618, 620, 622, 710, 711, 715, 716, 720, 721, 722, 725, 730, 830, 840 180p FVHP905, 906, 908, 910, 911, 915, 916,	VR9720 180p	800, 2330, 3300, 6000, 6200, 7300, 7700, 7750, 8300, 8100, 9300, 9500 180p VC300, 387, 402, 471, 473, 477, 481, 482,	ARWA AV86 125p AV77 140p	VHSFG1, VHSFG4, VHSF63 180p
918, 970, 975, 980, 990, 5000, 5605, 5050, 5075, 5100 180p VBR330, VBS3500, 7000, 7500, 7600, 9000, 9900 180p	HR2200, 3300, 3330, 3360, 3660, 4100, 7700 180p HR2650, 7200, 7300, 7350, 7600, 7610,	483, 486, 488, 496, 500, 571, 573, 581, 582, 583, 584, 535, 6481, VC5F3, VC5W20E, VCA1031 VC600, 651, 681, 682, 634, 685, 693, 699,	G700 150p	
FVHD250, 270, 370, 2000D, FVHP3, 210, 250, 300, 310, FVSD2095 180p	HRP50 180p	700, 772, 750, 779, 780, 781, 782 VC782MK2, 783, 785, 786, 787, 793, 800, 7810, 7822, VCT72, VCSF3, VCSV3,	ALBA VCR46000 130p VCR5000, VCR6000 105p	2200, 2280, MVS200RC 90p VS150 160p
HOS200, VCR100, 600, 6100 180p VTR100 180p		211, 234, VCA303, 501, 602, 5011. VCD901, 802, 861, 862, 881, 892, VCM73, VCT73 180p	AMSTRAD TV/h123, VCR4600, VCR4700, VCRS200 1460p	HINARI
HS760, VX715, VX7200 180p		VCA10, 30G, 60, 103, 105, 106, 211, 244, 505, 606, 615, 1031, VCD806, 810, 815, VCH80, 865, 910, VCS1000, VCT318, 410, VCH80, VCH80, VCT318, 410, VCH80, VCT318, VCH80, VCT818, VCH80, VCT818, VCH80, VCT818, VCH80, VCT818, VCH80, VCT818, VCT	VCR7000, 6100, 8500, 8602, 8603, 6604, 8700, 8704, 8714, 8800, 8804, 9000, 9340, DD6800, DD8904, TVR4	VXL4 VXL35 70p VXL5 VXL6 160p VXL3 VXL20 90p
V1, V2, VCR4000, 4000, 4530, 4540, 4600, 4800, 5200, 5400, 5600, 5800, 5840, 5843, 5800, 6400, 6600, 6800, 6803, 8007, 2103, VIP150, 3000, 5000, 6000, 600	LOGIK VR955 180p	610, VCT1314, 5313 1889p	AUTHENTIC 120p	
ViP1000, ViP1400 189p G.E.C.	9245, 9251 180p 8252, 8253, 8256, 8285 180p	VHL3, VR1000, VR2000, VR2500, VR3800 180p	BLAUPUNKT PTV100 200p RTV200, RTV222, RTV224 90p	VT5006, VT5500 120p YF7000, VT8000, VT8300, VT8500 60p VT680, VT6500, VT6800, VT9300, VT9500, VT9700, VT9900
GRANADA VHSAH1, 3, VHSVH4, VHSWH1, VHSXH1,	9255 180p 9270, 9271, 9273, 9274 180p 9272, 928017, 928077, 928097, 928217.	\$V6500, \$C6600 180p \$V7300, \$V8200, \$V6300, \$V9200, \$C9300 180p \$V2400 8400, \$420, 8500, 8520, 8550	RTV202, RTX200 150p RTV222, RTV248 100p RTV306, 307, 309, 310, 311, 312, 328, 414	VT52, VT57, VT81, VT62, VT63, VT64, VT85, VT85, VT86, VT640 VT3000 VT300, 110, 111, 113, 115, 118, 120, 125,
VHSYM2 180p VHSAN3, VHSBP1, VHSVN1, VHSVN2 180p VHSAY3, VHSX42 180p	929017,929117,929317 180p 9281,9283,9284,9292,9295, VR3701, 9 3721,3731,3761,3781 180p	9500, 8620, 8700, 8710, 8720, 8800, 8830, 9500, 9600, 9810 180p 5V8000, \$V8190 180p	RTV211, RTV214 143p RTV324, RTV325 65p RTV315, RTV316, RTV319, RTV320,	128, 130, 135, 138, 145, 190, 168, 175, 220, 225, 250, 255, 258, 260, VTL 30 130p
VHS8H1, VHSCH1, VHSFS1, VHSFS2, VHSEH2, VHSEH3 180p VHSBY3, VHSCC1 180p	MATSUI VX850 180p	SV601, SV800, SV900, SV901, SV8910, SV8800, SV9900 1809 SV6700, SV8710, SV8750, SV9700 1809 SV6800, 6900, 8820, 8850, 8870, 8910,	RTV317 550 RTV301, RTV333, RTV332, RTV404, 350	VR3985 90p VR3985 70p
VHSDS2, VHSXN2 VHSDP1, VHSFP2 (Pressure Roller Assembly) P5403-40205 VHSEY1, VHSEY2, VHSFY2 180p	HS200, HS300, HS301, HS302, HS303, HS304, HS310, HS320, HS330,	\$920, 8970 180p SAMSUNG SVJ16 717 VRS10 520 610 616 617	80NOSTEC 87100 110p 87300, 87310 170p	VP3826, VR3906, VR3916, VR3926, VR3946, VR3956, VR3976, VR3986 VR3995, VR3997, VR6948 55p VR3997, VR3977
VHSFG2, VHSFG3, VHSFG4, VHSFH6 180; VHSFJ2, VHSFJ4 1909 VHSF83, VBXAS1 1889	HS306, HS307, HS318, HS319, HS337, HS338, HS347, HS349, HS400, HS410, HS411, HS412, HS421, HS710, HSB10, 20,	519, 620, 626, 627, 629, 900, 5V910, VI510, 520, 611, 616, 621, 621, 626, 900, 910, VX610, 520, 616, 617, 615, 626, 627, 629 180p	87350 140p 8130 150p	VR3963 65p VR3912 130p VR3917 150p
	30, HSE10, 20, 30, 70 HSE11, HSE12, HSE21, HSE22, HSE31, HSE32, HSE41, HSE51, HSE52 180g	SVX301, 303, 305, 307, 319, 322, VB710, 770, 971, 8220, 8225, V1730, 1790, 18226,	VRH50 700p VRH60 140p	VR3907 100p SVR3799, VR3520, 3701, 3719, 3720, 3721, 3730, 3731, 3749, 3759, 3761,
SEE OTHER	NATIONAL PANASONIC NV100, 180, 380, 332, 333, 340, 366, 600, 638, 777, 788, 3321, AG6010, 6015, 6100.	SANSUH SVR5030 1807	I VUNDULAY 150F	
PAGES	620, 5400, 6800 180; NV230, 250, 260, 280, 370, 390, 430, 431, 433, 400, 460, 465, 470, 480, 630, 650, 730, 770, 780, 810, 830, 850, 870, 890, 2000,	SIEMEN FM350, FM352, FM355 180s	VCR30DBD, VCR500BD, VCR50DFD, VCR50DFP 170p	HR4100 130p HR7200 HR7300 70p
FOR MORE	2010, 3000, 7600, 7200, 7800, 8050, 8150, 8200, 8300, 8400, 8600, 6610, 6620, NVG14, NVG7, 10, 12, 15, 18, 30, 130, 400, AG1000, 1050, 1200, 1500, 2103, 2200,	FM351, FM362, FM363, FM364 180; FM391, FM392, FM394, FM461, FM462, FM464, FM468, FM561 180; FM464, FM468, FM561 180;	VR8300 90p VRH8945DK 80p	HR7350, HR7600, HR7610, HR7650,
GRANDATA	6810, NVH70 180; NVGS, NVG120 180; ACGRAD, ARHES 75, NV 130, NVI 20, 23	FM585, FM602, FM604, FM622, FM624, FM627 180;	DUAL VR4430 90;	HR0225 90p HR0140, 150, 157, 158, 160, 250, 257, 455,
BARGAINS	25, 28, NVG300, NVF65 NVF70, NVF51, NVF5100, NVG19, 20, 25, 33, 40, 50 180, NVD48, NVD48, NVG21, NVG45 180,	FM204, 303, 304, 314, 325, 328, 374, 375, 376, 384, 386, 383, 404, 424, 428, 429, 489	VR90 90s	337, 350, 370, 490, 430, 440, 441, 530, 700.

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

VCR BE	LI KITS / R	EPLACEM	EN	ΓV	IDEO	LAMPS
Model Price	Model Price	Model	Price		Mo	odel Price
HRD520, 600, 620, 637, 641, 650, 830 95p HRD540, 550, 580, 683, 860, 960, HRS5800 130p	VR8010, VR9010 70p VR6020, VR6022, VR6023, VR6028, VR7730 75p	Models & Description	Order Code	Price	0	N/OFF MAIN
KENWOOD	VR7730 75p VR8024 75p VR6520, VR6540, VR6560 90p VR6710, VR6720, VR6735, VR6720 130p	UNIVERSAL VIDEO LAMP 9V	VL01	25p	GRUNDIG	SWITCHES
KV901 70p KV903 90p	VR6720, VR6730, VR6760, VR6775, VR6790 160p	80mV (310mm WIRES)			PART NO: USED ON:	29703, 29102 C7500, C7500TT, C8500, C8502,
0C11, 0C40 95p 0C410, 0C420, 0C440, 0C460 130p	SAISHO VR2006, VHL3 90p VR3800 75p	PANASONIC VIDEO LAMPS	VL02	35 p		C8712, C8714, C8894, M68-190, M68-190/99, M70-195, P40-345,
OC50, OC55, OC60, OC65, OC70. OC75 120p	VR3800 75p				PRICE: £2.25	ST66-1602, T55-340, V77722
LOGIK VR955 180p	\$V6500 100p \$V6600 150p \$V8000 120p	SHARP VIDEO LAMPS	VL02	35p	PART NO:	13/1074
LLIXOR 9245, 9251 130p 9252 148p	SV8100 80p SV8500, SV8520, SV9500 150p SV7400, SV8400, SV8420, SV8550 120p	HITACHI 5381682 (VT63, VT64)	VL04	135p	USED ON:	CP0200, 0211F, 0323, 0323/1, 0341/14, 0345F, 0351/1, 0361,
9253 140p 9254 100p	SV6700, SV8710, SV8750, SV9700 120p SV6800, 6900, 8810, 8820, 8870, 8910. 8920, 8970 95p	VIDEO LAMPS			PRICE: £3.00	0361/1, 9350, CT0500, 0500/1/T, 0500T
9255 130p 9256 130p 9270, 9271, 9273, 9274 115p	SV8600, 8620, 8700, 8 720, 8830 , 9600, 9810 130p	AIWA, AKAI, ALBA, AMSTRAD,	VL05	150p	PART NO: USED ON:	LFC 005 CVC40
9272, 9280 9281, 9284, 9285, 9292, V83701, 3721, 3731, 3761, 3761	SAMSUNG SV716, 717, V1616, V1621, V1625, VX616, VX617, VX619, VX626, VX627, VX629 85p	BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FWITSU,			PRICE: £2.00	110
MATSUI VX850 75p	V8520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V8510, 520, 611, 616, 621, 628, VX510, 520	FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI,			MATSUI/SAIS	MATSUI-2190, SAISHO- PST2130TX
MITSUBISHI	V9900, VB910, V1900, V1910 110 PX980, 981, 982, SE9001, SV9001, SVX307 319, 322, V8770, 8220, 8225,	HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI			PRICE: £2.00	
HS200 HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 26, 30, 70	V1770, 790, 8220, 8225, VK8220, VPX31, VX750, VX790, 8220, 8225 135p SVX301, 303, 305, SX7301, V8710, 971	NEC, ORION, NATIONAL,			PHILIPS USED ON:	K30, K35, K40, KT3, KT4
HS303, HS304, HS306, HS307, HS330, HS400, HS700 150p	V1730, 710, VX712, VX720, 730, 970, 971, 972 230p VX9880 110p	PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP,			PRICE: £0.95	
MEC	SANYO VTC5000, 5150, 6000, 6500, VTC1410, 11,	SIEMEN, SONY, TELEFUNKEN, THOMSON, TOSHIBA		5	PART NO:	(POWER SWITCH + REMOTE SWITCH)
N830, N831, N832, N833 100p N895 80p PVC2300, PVC2400 180p	20, 21, 30, 31, 50 75p VTC5300, VTC5350, VTCS460, VPR5800 100p			-	· USED ON:	KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056,
DX1000, 1600, 2000, 3000, N5012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9066, 9110, 9120, 9510, 9520, 9530,	VTC5500 95p VTC9100, VTC9300 220p VTC1106, 1300, 1500, 1100, 1150, 1200,	AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912)	VL01	25p		KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706,
9619 95p NATIONAL PANASONIC	1300, 1500 90p VHR2100, VHR2300, VHR2500, VHR2700 150p	VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI				KV2752PE3, KX20PS1, KX20PS2, KX27PS1
NV300, NV332, NV333, NV340, NV366 125p NV777, NV788 100p	VHR3100, 3300, 3310, 3400, 3700, 3800, VHRD500, 780 110p VHR4100, 4150, 4200, 4300, 4350, 4770.	(HS200), TELEFUNKEN (VR510,			PRICE: £2.75 PART NO:	(POWER SWITCH + REMOTE
NV2000, NV2010, NV3000 130p NV7000, NV7200, NV7800 95p	5100, 5200, 5300, 5350, 5709, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHRD4400, 4410, 4500, 4600.	519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON			USED ON: PRICE: £3.00	SWITCH) KV2022, KV2024
NV8600, NV8610, NV8620 145p NV230, 250, 280, 430, 431, 433, 450, 460, 485, 470, 730, 370, 810, 870, 890, AG1600, 1050 125p	4610, 4710, 4890, 8700 90p SHARP	(3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912,			PART NO: USED ON:	(POWER SWITCH) KV1810 MK1, KV1810 MK2,
NV370, NV380, NV480, NV630, NV780, NV830, NV850 100p NV600, NV888, AG6010, AG6016 110p	VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700 100p VC7300, VC7700, VC7750, VC7600.	8922, 8925)			PRICE: £8.00	KV1820. KV1822, KV2000 MK1
NVG7, 10, 12, 14, 15, 18, 30, 130, 400, NVH70 70p	VC8000 150p VC8300 150p VC300, 387, 471, 473, 481, 482, 483, 486,	BLAUPUNKT, ORION (VH1, 2A)	VL02	40p	PART NO: USED ON:	(POWER SWITCH 26mm) KV1400, KV1440, KV2040, KV2060:
NORDMENDE V100, V140 V1000M, 1005M, 1205, 1215, 1235, 1245,	488, 496, 8481 VC402, 500, 571, 573, 581, 582, 583, 584, 585, VCSF3	NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600,			PRICE: £2.00 PART NO:	(POWER SWITCH 21mm +
1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 2000D, 2405, 2500H, 3090H, V3405H, 3105, 4405H, 5000, 8005, 900,	VC600, 651, 682, 684, 685, 693, 783. VC6F3, VC6V3 70 VC772, 779, 781, 782, 785, 286, 793, 630,	8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700,			USED ON:	REMOTE SWITCH) KV2020
905 65p V1901, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502,	7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCD806, 810, 615, VCH80, 885, 910,	8000, 8300)			PRICE: £2.00 PART NO: USED ON:	2 PIN (FUNCTION SWITCH) KV1612 MK1, KV1612 MK2,
503 80p W101, V102, V103, V112, V141, V142, V301, V302 90p	VC51000, VCT310, 410, VCT1314, VCTS312 115p	AKAI (VS10), GRANADA	VL06	40p	0323 011.	KV2052, KV2056, KV2212, KV2215, KV2216, KV2252,
V110, V333 110p V1500T, V2000B, V2000P, V400H 95p V250, V460, V9460, V20035642,	SIEMENS FM350, FM352, FM355 60p	(VHSXJ3), ITT (VR3993, 3994),	VLOO	qup	DDICE: 60.10	KV2256, KV2704, KV2705, KV2706, KV275PE3, KV2756PE3
V20035543 130p V300, V303, V380 75p V500 75p	FM494, FM485 55p FM391, FM392, FM394, FM462 100p FM461, FM464, FM468, FM561 150p FM361, FM362, FM363, FM364 120p	JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530,		2	PRICE: £0.40 PART NO: USED ON:	(4 PIN FUNCTION SWITCH) VARIOUS
ORION COMB15000, 16000, NEVHM, TVP230RC.	EONY	535, 539 , 550, 630, 650), THOMSON (V 309 , 316, 3 57 ,			PRICE: £0.50	
900MVH1012, VH1030, 1040, 1060, 1070, 1700, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2300, 300,	SLC6, SLJ10, SLT6ME 140p SLC5, SLC7, SLJ7, SLJ9 140p SLC9, SL8000, SL8080, SLT50 185p	VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)			AKAI REPL	M132773 IT01
356, 350, 352, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 540, 730, 735, VP220, 225, 245, VR1032,	\$18000E, \$18080E, \$18200, \$18600 175p \$1V255 95p		-		GOLDSTAR	MZ366960J2 IT02 VXP0521 IT17
2966, 2980, 821, 925, VXL25 30p NEVHL VCP, VH1204, 2034, 2204, 3050, 3063, 4008, 400, 4012, 412, 512, 600, 665,	TELEFUNKEN VR400, VR410, VR440, VR449 130p VR450, VR540, VR549, VR640 70p	AUTHENTIC (N850), DECCA (VR8300), GRANADA (VHSTJ3,	VL07	40p	HITACHI	6861471 1T03 6861482 1T04 6886971 1T05
744, 774, 7905, 800, 820, 900, 974, VP200.	VR520, VR529, VR620, VR920 70p VR530, VR536, VR539, VR550, VR630, VR650 75p	WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350,			JVC/ FERGUSON	PU 48967B IT06 PU 51380 IT07
*C150, 138, VH1000, 200, 201, 205, 212. 250, 254, 288, 306, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 782, 844, 900, VHF2, VH3 80p	A940, VR1925, 1930, 1940, 1950, 2960, 925, 930, 940, 950 90p A920, VH1970, 1980, 2920, 2925, 2930,	7700), TELEFUNKEN (VR450,			PERGOSON	PU 51402A IT08 PU 55373 IT09
252, 944, 900, VHF2, VH3 80p WH2A 150p	2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980 65p A1200, 930, 932, 935, 960, 986, 990,	520, 529, 540, 549, 620, 640, 920 1920), THOMSON (V4100,			NATIONAL	PU 55374 IT10 VXP 0329 IT11
170p 100 35 286, 291, 292, 468, 471, 562, 571,	VR2931, 2935, 2941, 2971, 3935, 3945, 3955, 3965, 3975, 4935, 4940, 4942, 4945, 496, 5VR4970, 6000, 7932, 7959, 7979, 65p VR1935	VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923,			PANASONIC	VXP 0343 IT12 VXP 0344 IT13
201, 202, VR20DV1, 20DV2, 25801, 25801, 25802, 302, 303, 305,	VR1935 100p VR2915 90p	8924, 8929, 8930, 8931, 8940)				VXP 0401 IT14 VXP 0433 IT15 VXP 0463 IT16
71586, 71588, VR86582, 91582, 91584, 71586, VR86582, 91582, 92583, VR858C, 5185, 6285, 6290, 6291, 6293, 8888, 6391, 6393, 6467, 6468, 6470,	THOMSON SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540 65p	GRANADA (VHSAY3), SHARP	VL08	60p		VXP 0521 IT17 VXP 0581 IT18
## 5581, 6670, 6676, 6760, ## 96561, 92583 85p	TX8000, V309, V357, VK411 75p TX8500, V342, 343, 351, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, 5506,	(VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)			SANYO SHARP	1430662T15620 IT19 NIDL005GEZZ IT20
700p 100p 100p 100p	6000, 8564 90p V320, V321, V323, V326, V4200, V4300 90p					NIDL0006GEZZ IT21 NPLY0107GEZZ IT22
110p	V333 100p V340 90p V4100, VK308, VK309, VK410 128p	PANASON			PRICE 22p EACH	A PACK DESEMBLACUSTODEL
535 5450, 6480, 6480, 6620.	VK300, VK301, VK302, VK303, VK305, VK3301 135p VK312 65p	MODE SWITC NV2000, 2010, 7000, 7200, 7800		£3.50		A PACK OF 5 FOR EACH MODEL A PACK OF 10 FOR EACH MODEL
5420, 2A10, 70, 2820, 3820, 55, 13, 5A70, 5820, 8820, 65p 6011, 5014, 7004, 7011, 30p	TOSHIBA	NV230, 260, 430, 810, 870, 2300, (VSS0110)		€2.25		MATALTA
### 9000 VR6012, VR7000.	V55, V57 V33, V31, V51, V53, V9600, V9680 85p V61, V63, V65 V66, V67 DV808, DV800, V71, 73, 74, 75, 81, 83, 85.	NV830 (VSS0091) NV300, 333, 340, 366, 688, 777, 7	78	£2.10		ANDATA LTD
8057 6008, 5009, 6015, 9016, 2008, 7007, 7016, 7018, 65p	88 120p V106, V109, V199, V209, V609 120p V91G, V95G 135p	(VSS0060) NVG21, 25, NVH65, NVD80 (VSS		£3.75 £2.00		0181-900 2329
bsp bsp	1150	14 4023, 23, 144 hos, 144 D80 1455	V173/Q	22.00	rax:	0181-903 6126

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AMSTRAD	VT11/VT33	Economy lift Contents	SHARP VC381	
VCR700 Contents BELT SET PINCH ROLLER. REEL IDLER VIDEO LAMP	Gontents BELT SET. TAUP REEL TABLE TYRE, SUPPLY REEL TABLE	BELT SET PINCH ROLLER. FF/REW IDLER TYRE T/UP REEL	Contents E	Conomy Kit Contents BELT SET PINCH ROLLER
Brder Code: SK41		TABLE TYRE SUPPLY REEL TABLE TYRE	REEL IDLER, TENSION BAND. F VIDEO LAMP	REFLIDLER TYRE
FERGUSON & JVC	TENSION BAND Order Code: SX45 £13.00	Order Code: SK46 £3.75		order Code: SK48 £3.25
HRD455HRD725 Contents Economy Kit Contents	VT52/61/62/63/64/65/85/86/640			Casomy lift Contents
BELT SET PINCH ROLLER CLUTCH MECHANISM TENSION SUPPLY CLUTCH, TAKE UP	Contents BELT SET PINCH ROLLER	BELT SET, PINCH ROLLER	REEL IDLER, TENSION BAND	BELT SET, PINCH BOLLER. BEEL IDLER Brider Code: SKG1 £5.88
BAND Order Code: SK37 £16.00 Order Code: SK38 £9.0	FF/REW ARM, CLUTCH PLATE. TENSION BAND	FF/REW IDLER Order Code: SK50 £3 00	Order Code: SK60 £9.50 € VC781VC7810VC7822/VC765/VC786	
3V58:59/64:65	Order Code: SK49 £14.00 VT400/405/410/13/14/15/18/420/25		VCA100/VCA102/VCA104/VCA202	Economy Kit Contents
HRD170/180/210/230/300/320/370/400/430/530/700/750 HRS5000	510 520 25/26/530/35/36/540/545/ Contents		BELT SET, PINCH ROLLER.	BELTSET PINCH ROLLER. REEL DRIVE UNIT TYRE
Contents BELT SET PINCH ROLLER, IDELR ARM TENSION BAND Brider Code: SK44 £7.0	TIMING BELT, PINCH ROLLER !	THE REAL PRINCIPLE STATE	BAND	Order Code: SX65 E3.75
3/29/3/30	Order Code: SK52	£9,J5	VC681/A/C682/A/C684/A/C685/A/C693/A	C699/VC6F3/VC700
HR720073097350 Contents	VT100/110/111/113/115/116/120/1 175/220/225/250/255/258/260/VTL		BELT SET, PINCH ROLLER I	Economy Kit Contents BELT SET PINCH ROLLER REEL DRIVE UNITTYRE
BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES Order Code: SX05 £5.0		REW ARM CLUTCH PLATE	BAND	Order Code; SK63 £5.00
3/35/36/38/39/49 HRD110/11/1/20/225	TENSION BAND Order Code: \$K51	£14.00		
Contents SELT PINCH ROLLER, TENSION BAND, IDLER TYRES	PANASONIC		FOR MORE DETAIL	
Order Code: SKD4 £5.0		NV7000/NV7200:NV7800 Contents	TYPES OF SER PLEASE R	CONTRACTOR OF THE PARTY OF THE
3V31/3V42 HR76007610/7650/7655	BELT SET PINCH ROLLER TENSION BAND, IDLER TYRES	BELT SET. PINCH ROLLER. TENSION BAND, IDLER TYRES		
Contents BELT SET. TAU REEL TABLE BELT SET. TAU REEL TABLE BELT SET. TAU REEL TABLE	Order Code: SK03 £5.00	Order Code: SK02 £5.00	BACKUP B	
TYRE PINCH ROLLER REEL IDERL TAUCLUTCH. TAU IDLER. TENSION BAND VIDEO LAMP TAUCLUTCH TAUCLUTCH	NV300NV330NV333AV340NV3		REPLACEMENT PHILIPS NI-C Replaces Ferguson Part No:	CANCEL PRODUCTION OF
TENSION BAND VIDEO LAMF TAJ CLUTCH Order Code: SX33 ET1.00 Order Code: SX34 E5.0	BELT SET, PINCH ROLLER TEN Order Code: SKO1	E5.00	00£6-067-001, used on TX10, l Replaces Philips Part No's: 138-10138, 138-10313, 1.2V - 9	
3V35/3G38/39/49 HRD110/111/120/121/225	NV2000 NV2010 Contents	Economy Kit Coalents	Replaces Philips Part No's: 138-10229, 2.4V – 90mAh	180p
Contents BELT SET. TAU REEL TABLE BELT SET. TAU REEL TABLE BELT SET. TAU REEL TABLE	BELT SET PINCH ROLLER FE. IDLER PLAY IDLER, TENSION		REPLACEMENT FERGUS	CONTRACTOR AND ADDRESS OF THE PARTY OF THE P
TYRE SUPPLY REEL TABLE TYRE PINCH ROLLER TAU TYRE PINCH ROLLER TAU	BAND, VIDEO LAMP	Order Code: SK14 £3.50	Replaces Ferguson Part Nos 00E6-066-001, 2.4V	
CLUTCH TAU IDLER REEL OLER TENSION BAND Order Code: SK35 E18 00 Order Code: SK36 E5.	NV7000/NV7200/NV7800		Used on: 3V35, 3V56, 3V58, 3	V65 200p
Order Code: SK35 £10.00 Order Code: SK36 £5.1 3V29/3V30 200.00	BELT SET, PINCH ROLLER.	Economy Kit Contents BELT SET PINCH ROLLER. IDLER TYRE CLUTCH TYRE	REPLAC	
HR7200/7300/7350 Contents Economy Kit Contents	HOLER UNIT. PLAY IDLER TENSION BAND Order Code: SK11 £8.50		LINEOU	JTPUT
BELT SET, TAU REEL TABLE TYRE SUPPLY REEL TABLE TYRE SUPPLY REEL TABLE TYRE SUPPLY REEL TABLE	NV3004V330HV333HV340/NV3		TRANSFO	Price Order
TYRE PINCH ROLLER REEL IDLER T/U CLUTCH, T/L IDLER HOLE TYRE, T/L IDLER TYRE.	Contents GELT SET. PINCH ROLLER.	Economy Kit Contents BELT SET. PINCH ROLLER	HITACHI 2433752	Code 1500p LOT01
TENSION BAND. VIDEO LAMP TAJ CLUTCH Order Gode: SK31 £10.80 Order Code: SK32 £5.	IDLER LINE PLAY IN FR	IDLER TYRE. PLAY IDLER TYRE	ORION 3714002 FIDELITY ZX300	1500p LOT02 1500p LOT03
3/44/45/4653/54/55/57 HRP50+PRD140/150/158/160	Order Code: SK15 £7.00		FE TX100 90 DEG SABA 490607182	1500p LOT04 1500p LOT05 1650p LOT06
HRD250/257/565/566/755 Contents	NVG7/NVG9/VNG10/NVG11/NVG NVG18/NVG30/NVG120/NVG130	ITZINVGT4/NVGT5/NVGT5/ INVG400/NVH65 (PXIAC)	FE TX90 WHITE ITT D307/37 EQ BLAUPUNKT 210	1600p LOT07 1600p LOT08
BELT SET, PINCH ROLLER CLUTCH MECHANISM, TENSION	AG1810 (P/K) Contents LOADING BELT, CAPSTAN	Economy Kit Contents LOADING BELT CAPSTAN	GRUNDIG 2922010 ITT CVC800/1/3	1600p LOT09 1500p LOT10 1600p LOT11
BAND Order Code: SK39 £15.00 Order Code: SK40 £9.	DOLT BUICH BOLLED INCD	BELT PINCH ROLLER IDLER TYRE	ITTD218/37 EQ NORMENDE 5255 SABA 81000 200	1600p LOT12 1600p LOT13
FISHER	Order Code. SK27 £6.00	Grder Code: SK28 -£3.00	SALORA T236 EQ SABA 811-50-24	1650p LOT14 1600p LOT15
PVHP905906/907/908/910/911/916/918 Contents BELT SET, PINCH ROLLER BELT SET, PINCH ROLLER.	NV332 Contents	Economy Kit Contents	SABA 770223500 TELEFUNKEN AT1 TELEFUNKEN EQ	1600p LOT16 1450p LOT17 1400p LOT18
IDLER GEARIDLER UNIT. IDLER TYRE TENSION BAND	BELT SFT PINCH ROLLER. PLAY IDLER FF.REW IDLER.	BELT SET PINCH ROLLER PLAY IDLER TYRE, FF-REW	SALORA FM0218B NORMENDE 5255	1600p LOT19 1600p LOT20
Order Code: SK57 £13.00 Order Code: SK58 £5.	TENSION BAND FF/REW TYRE Order Code: SK29 \$12.00		ITT CVC 1150/1 ITT COMPACT 80	1500p LOT21 1500p LOT22 1450p LOT23
PVHP615/618/620/622/710/711/715/716/720/721/722/725/ 730/830:840	NV230/250/260/280/430/450/460 AG1200PK/AG1500PK	r4 70/650 /810/890/	FE TX100 GREEN HINARI CT4/5 5113 SELECO 6320418	1500p LOT24 1600p LOT25
Contents BELT SET, PINCH ROLLER BELT SET PINCH BOLLER, IDLER GEAR IDLER UNIT, IDLER TYRE	Contents BELT SET PINCH ROLLER.	Economy Kit Contents BELT SET PINCH ROLLER.	BLAUPUNKT 8667 HT COMPACT B1	1600p LOT26 1450p LOT27 1500p LOT28
TENSION BAND Order Code: SK68 £11.00 Order Code: SK69 £3	IDLER TENSION BAND	IDLER TYRE	ITT CT3326 MUL ITT D066/37 EQ ITT 3546 EQ	1600p LOT29 1500p LOT30
HITACHI	NV600/NV688	Francou Wit Banks	LUXOR 5810110 SABA 849380920	1600p LOT31 1600p LOT32 1450p LOT33
VT11VT33 Contents	Contents BELT SET PINCH ROLLER. PLAY IDLER, FFREW IDLER.	BELT SET PINCH ROLLER PLAY IDLER TYRE FF/REW	HITACHI 2434141 CP FE TX100 110 D HANTAREX 28021	1700p LOT34 1600p LOT35
BELT SET PINCH ROLLER, TENSION BAND, IDLER TYPES Order Code: \$808	TEMPLONI DARIO	IDLER TYRE	SHARP C3700 EQ HITACHI 2432981 CP	1600p LOT36 1500p LOT37
LINEYEDOM TOIDLED	NV730/NV770		FERGUSON 00D3-508-D02 Fits Chassis TX99 41cm + Used On: 51K2, 51J8, 51J7	1650p LOT38 5 51cm 7, 41H3,
UNIVERSAL TRIPLER	Contents SLOT IN BELT, LOADING BELT	Economy Kit Contents SLOT IN BELT LOADING BELT.	41H3, 41H2, 51K3 PANASONIC TLF14567F	1850p LOT39
Price: £4.00 each	PINCH ROLLER IDLER UNIT TENSION BAND	PINCH ROLLER TYRE	Used On: TC2043, TC2243, PANASONIC TLF14568F Used On: TX2231, TX2244	TX300 1850p LOT40
AMSTRAD MODE KIT	9rder Code: SK19 £5.0 NV370:NV380/480/630/760/830/		PANASONIC TLF14584F Used On: TC2218, TC2160,	2350p LOT41
Price: £2.75 each	Contents BELT SET. PINCH ROLLER.	Economy Kit Contents BELT SET PINCH ROLLER.	TX1752, TX2112 TX2112, TX2162, TXC22	2350p LOT42
SEE OTHER PAGES	IDLER TENSION BAND Order Code: SK21 £5.0	IDLER TYRE	PANASONIC TLF14586F TC1651, TC2051, TC2061, TC2253, TC2263, TX5500	
[NV7777NV788		HINARI Used On: CT15	1600p LOT43
FOR MORE		Contract of the contract of th		
GRANDATA BARGAINS	Contents BELT SET PINCH ROLLER. IDLER UNIT. TENSION BAND	Economy Kit Contents BELT SET, PINCH ROLLER. IDLER TYRE	HITCHI 2434274 CPT2174, CPT2176, CPT217	1250p EOT44 PB. 2434274 ormers for over 100 different

VIDEO SERVICE KITS (Cont.)

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IDLERS &	PULLEYS REPI	LACEMENT		VT630, 6500, 6800	PS-BRAKE	6861505	230p
AKAI V\$1-2, V\$4-5, V\$15 V\$3.6, 12, 56, 58, 59	FF-REWICKER	M1327773	400p	VT9700, 9900 HTACH TV OUTPUT MUDULE HIM 60 OUTPUT MODILE HIM 60	251 232		C5.50
VS1-2, VS4-5, VS15 VS3, 6, 12, 59, 59 V9700	T-UP IDLER	8V327815 8V321879	500p	JVC HR350, 3660, 4100 HR7200, 7600, 7650	T-UP IDLER SML	PU49280	£5.50
VS125, 126, 155, VS165, 240, 244, 246, 24 VS22, 38, 105, 112, 115, 1 VP7100, VS8300	IDLER ASSY 7, 248, 259, 512, 515, 516 116, 205, 220 T-UP IDLER	MZ366950J2 PU47752	900p	HR7655, 7300, 7350, 7610 HR7200, 7300, 7350	T-UP CLUTCH REEL IDLER	PU48967	220p
VS9500, VS9300 VP7100, VS9300	UNLOADING IDLER	PU46381	£4.00	HR7600, 7610, 7650, 7655, HR7600, 7610, 7650 HR7655, 7700	ROLLER ASSY	PL149042A	350p
VS9500, VS9900 VF7100, VS9300 VS9500, VS9900	REW IDLER	PU46360	500p	HR3300, 3660, 4100 HR7200, 7600, 7650 HR7655, HRD110, HRD111 HRD110, HRD120-121,	T-UP IDLER LRG T-UP IDLER 1, HR7300, 7350, 7610, HRD 1 T-UP CLUTCH	PU\$1402A 20-121,225	£4.50 100p
VS1, 3, 4, 9, 12 VS15, 56	REEL TABLE	BV336067 BR347731	£5.00 450p	HRD225, HRD111, HRD110, HRD120-121,	IDLER ARM	PU55373 PU553743-8	150p 200p
VS23, 35, 37, 63, 55 VS66, 75, VSA77 VS9700 VS9700	PF IDLER	ML373043 BV321761 W321762	1100p £3.20	HRD170, 180, 210, 230 HRD170, 180, 210, 230 HRD320, 370, 400, 430, 470	EDLER ARM. 8, 530, 700, 750, 950, 3000	PU58465	62.25
AMSTRAD VCR7000	REWIDLER IDLER	150280	£1.50	HRS5000, HRS5500 HRD455, HRD725 HRD140, 150, 157, 158 HRD160, 250, 267, 565, 56	CLUTCH MECH CLUTCH MECH	PU556822 PU57658	1200p 1050p
TVR1, VCR4500 VCR4600, VC5200, VCR9 TVR1, VCR4500	GEAR HOLDER	150873	£3.75	HR0160, 250, 267, 565, 56 HR3300, HR3330 HR3650, HR4100 HR0140, 150, 157, 158	REW IDLER	PU46380	500p
VCR4600, VCR5200, VCR TVR1, VCR4600 VCR5200	9000 REF CLLUTOH		£3.50	HRD140, 150, 157, 159	TAKE UP CLUTCH	PU56043-1-4 PU56044-1-5	240p 160p
VCR4500, VCR5100 VCR4500, VCR5000 VCR4500, VCR4600	CLUTCH CLUTCH MODIKIT	153202 (TAPE CREASING)	£3.80 £4.00 3000	HRD160, 250, 257, 455, 56 MATSUI			-
VCR4700 MOD KIT TAPE CREASIN VCR4500, 4600, 4700	IG FOR AMSTRAD		£3.00	VX730, 735, 750, 755, VX810, 820, 850, 880, 990 VX730, 735, 750, 755	LIMITED POST LEVER	850A00005	420p €1.30
FERGUSON 3V00, 3V01, 3V16 3V22, 3292, 8900, 8901, 8	T-UPIDLER	PU 47752	£4.50	VX770, 800, 816, 680 VX990 VX800A, VX903 VX800A, VX620	ELER REEL		£1.50
3V15, 3V22 8903, 8909, 8912, 8922 3v23, 3V29 3V30,	T-UPIDLER REELIDLER	PU48280 PU48967	£5.50	MITSUBISHI HS306, 307, 316, 319,	GEAR ASSY	522800201	290p
3V31, 3V32, 3V35, 8923, 1 3V33, 3V31 3V29, 3V30, 3V31	8924, 8929, 8930, 8931, 8940. ROLLER ASSY T-UP IDLER	9941, 9942 PU49042A 51402	350p 100p	HS400 410 710	IDLER ISB20, HSB30, HSE10, HSE2		325p
3V32, 3V35, 3V36, 3V38, 3V29, 3V30, 3V31 3V32, 8930, 8931, 6940, 8	3V39, 3V49, 8930, 8931, 8940 T-LIP CLUTCH	8941, 8942 PU51380	200p	HSE70 HS306, 307, 318, 319 HS400, 410, 710	IDLER	641034301	52.00
3V35, 3V36, 3V38 3V38, 3V49, 8943, 8944	REEL DLER T-UP CLUTCH	PU55374 PU55373	200p	HS347, 349, 412 HSB10, HSB20, HSB30, HS	IDLER 5E10, HSE20, HSE30, HSE70 IDLER		£3.00
3935, 3930, 3938 3939, 3945, 8943, 8944 3955, 3956, 3964	IDLER ARM	PUSE645	150p £2.25	HS337, 338, 411, 421 HS200 HS200	TAXE UP IDLER (LARGE)	552801807	320p £4.50 £4.00
FV30, FV32, FV33, 8990, 1 3V42, 3V43 3V43, 3V44, 3V45	V13 FV14, FV20, FV21 FV22 VC141L CLUTCH ASSY CLUTCH ASSY	PU\$5822	1200p	HS200 HS306, 307, 318, 319 HS400, 410, 710 HS306, 307, 318, 319	REWIND IDLER SUPPLY REEL DISK TAKE UP REEL	522A00101	£5.00 £3.20
3V48, 3V53, 3V54, 3V55, 3V42, 3V43, 3V44	3V57, 8947, 8948 T UP CLUTCH	PU57658 PU56043-1-4	1050p 240p	HS320	DISK REEL DISK	522A00102 522C06361	£3.20
3V42, 3V43, 3V44	3V55, 3V56, 3V57, 8947, 8948 SUPPORT CLUTCH 3V55, 3V56, 3V57, 8947, 8948 LOADING IDLER	PU56044-1-5	160p	HS337, 338, 411, 421 HS300, 301, 302, 310 HS306, 307, 318, 319	REEL DISK PULLEY GEAR WHEEL	522C05201 522C05201 641D711 01	£5.00 £2.25 £1.50
3V22, 3292, 8900, 8901, 8 8912, 8922	902, 8903, 8904, 8906, 8909		£4.00	HS400, 410, 718 HS306, 307, 318, 319 HS400, 410, 710	GEAR WHEEL	641071001	£1.50
3V00, 3V01, 3V16 3292, 8900, 8901, 8904, 8 3V16, 3V22, 8902 8909, 8912, 8922	REWIDLER 906 IDLER	PU45350 PU45261	500p £1,70	NEC N830, N831, N832, N833	TAKE UP CLUTCH TAKE UP IDLER		150p
PISHER PANPAZO 570 530	FF-REW PULLEY	H9638531	80p	N830, N831, N832, N833 N830, N831, N832, N833 N895 N911, N915, N916, N917	REEL IDLER TANE UP IDLER SMALL REEL DRIVE PULLEY		100p 200p 550p 350p
FVHP615,618,620 FVHP622,710,711,FVHP FVHP640,905,906,FVHP	COMP. IDLER ASSY 720, 721, 722, FVHF725, 730, 908, 910, 911, FVHF915, 916,	F1430420460300 830 918	£220p	N9012, 9013, 9014, 9016, 9 N9518, 9520, 9530, 9610	033, 9034, 9054, 9055, 9066,	9110	Joup
FVHP622, 710, 711, FVHF FVHP725, 730, 830, FVHP	7720,721,722 940	111-20090430900	380p	NATIONAL NV322, NV800, NV688, NV777, NV788, NV332, AC	IDLER UNIT 55100, 5200, 5800, 5810	VXP0463	£2.75
PVHP615, 618, 620 PVHP652, 710, 711, FVHP FVHP725, 730, 830, FVHP	REEL T-UP ASSY 720, 721, 722 840	R1433410400900	£5.50	NV300, NV333, NV340 NV306 NV300, NV330, NV330	IDLER ARM IDLER UNIT	VXL9997 VXPC401	£3,60 80o
FVHP905, 906, 908, FVHP910, 911, 915, FVHP FVHP975, 980, 990,	GEAR IDI FRASSY	Fi1430490400700	275p 300p	NV340, NV366 NV300, NV330, NV333 NV340, NV366, NV8620	PLAYIDLER	VXP9433	62.75
FVHP999, 5000, 5005 FVHP5050, 5076, 5100 FVHD40, 55, 140	REEL DRIVE ROLLER		£6.00	MV300, MV332, MV333	ACTION GEAR 7777, NV788, NV2000, NV20	*DG0916 19, 3000, 7000	€0.60
PVHP1, 10, 20 FVHP975, 980, 990 PVHP420, 520, 530	OLUTCH IDLER	F12430510404200	£9.50 £2.80	NV333, NV686, NV2000 NV3000, NV7800 NV300, NV332, NV333	LOADING GEAR INTERMEDIATE GEAR	VXP0325 VXG0017	£2.00 £0.65
FVHP420, 520, 530 PVHP990 VSS3500	TAKE UP IDLER LOADING GEAR REEL DRIVE PULLEY		90p 90p £3.20	NV342, NV368, NV600, NV AG6010, AG6015 NV553, NV333, NV340	777, NV788, NV2000, NV20 CAM GEAR	10, 3000, 7000 VXG0158	£1.00
VBS3500 V2S7000 QOLDSTAR	REWIOLER		250p 95p	NV366, NV777, NV786 NV230, NV260, NV260 NV280, NV376, NV380, NV	IDLER ARM (430, NV460, NV466, NV466,	VXP0521 NV470, NV480	110p
GHV1221, 1232, 1240 GHV1241, 1242, 1243, GH GHV1200, 6210, 8215, GH	CLUTCH GEAR 1V1244, 1265, 1246, GHV124; RVP51, VCP4100, 4130	435038A 7, 1248, 8000,	€2.50	NV630, NV650, NV730, NV NVG7; NVG9, NVG10, NVI NVG30, NVG400, AG1000	780, NV810, NV830, NV850. G11, NVG12, NVG 14, NVG1 AG1200, 1500, 1810, 2300	NV870	
GHV1221, 1232, 1240 GHV1241, 1242, 1243, Gr GHV8200, 8210, 8215, Gr	101.ER 101.244, 1245, 1246, GHV124,	7, 1248, 8000;	110p	AG2200, NVH55, NVH70 NV370, NV430, NV870, NV730, NV830, NV850, NV	CAM GEAR IG10, NVG12, NVG18	VDG0200	£1.20
HENARI VXII.3, VXII.20	REEL IDLER	48000009	110p	NV2000, 2010 3000 NV2000, 2010, 3000	IDLER UNIT IDLER UNIT IDLER UNIT	VXP0381 VXP0381 VXP0329	€2.50 80p 80p
VXL2 VXL4, VXL35 VXL4, VXL35	IDLER - CLUTCH		110p £2.75 £6.50	NV7000, NV3000 NV7000, 7200, 7800 NV7000, 7200, 7800	CAM GEAR IDLERUNIT CLUTCH	VDG0069 VXP0344 VXP0343	£1.00 75p 300p
VXL4 VXL12, VXL25 VXL30, VXL35, VTV300 VXL5 VXL6	CLUTCH GEAR HOLDER		£1.30	NV8150, 8200, 8300, NVB400, 8600, 8610, 8620 NV8200, 8400, 8600	PLAY IDLER	VXP0245 VXP0243	80p 80p
VXLE VXL6 VXL5, VXL6 VXL7, VXL8, VXL9 HTACHI	GEAR HOLDER CLUTCH		£3.80	NV9610, 8620 NV9620 NV332, NV600, NV688	CLUTO+ DLER	VXP0343 VXP0488	250p 300p
V711-33, V783-84 V714, 17, 19, 38, 57, 86, 8 22, 65, 95, 330, 640, V716	CLUİTCH ASSY 6, 34, 35, 39, 52, 61 S	6879515	£7.50	NV332, NV500, NV588 NVG20, NVG21, NGV25 NVG40, NVG45 NV230, NV250, NV280 NV230, NV550, NV280	PULLEY UNIT WORM WHEEL WES BRISSO BUSINESS BRISSON	VXP0767 VXP0604	400p
V7120-220, 100, 110 111, 113, 115, 118, 200 125, 128, 130, 135, 138, 14	CLUTCHASSY	6886824 6886972	£7,50	NV870, NV390, AG1000 NV370, NV380, NV630	'465, NV 650, NV 730, NV 770, IDLER	VXP0523	390p
255, 258, 260, VTL30 VTB000-8300, 7000 VTB500-8709	FF-REWIDLER	6413663	£2.80	NVG79 NVG7, NVG11, NVG12	CLUTCH GEAR WORM WHEEL NG30, NVG120, NVG130, N LOADING GEAR	VXP0595 VXP0691	£1.00 £1.50
V78000 8300, 7000 V78500-8700 V78000-8300, 7000	PLAY IDLER FF-REW PULLEY	6414221 6383531	290p 80p	NV2000, 2010, 3050 NV7000, 7200, 7800, 8050 NV230, NV256, NV370	LOADING GEAR	VDG0035 VXF0520	£0.60
VT8600-8700 VT9300-9500, 8500 VT680, 6800, 9700, 9900	FF-REW IDLER	8681471	250p	NV430, NV450, NV460, NV NV330, NV890, NV67, NV	630, NV730, NV770, NV780, G10, NVG12, NVG15, NVG3	NVEVO D. NVG120	£1:50
VT9300-9500, 6500 VT680, 5800, 9700 VT 9900	PLAYIDLER	6961482 6861481	230p	NGV130, NVG400, NVH70, NV230, NV250, NV260 NV280, NV430, NV450, NV	CLUTCH GEAR 230, NV770, NV810, NV870	NV890	£2.50
VT9300-9500, 9700 VT9900, 6500, 680, 6900 VT11-33, VT63-64	IDLER IDLER FF-REW IDLER	681505 687943 6886971	230p £3.80 125p	NV230, NV250, NV266	(G12, NVG14, NVG15, NVG1 0, NVH70, AG1900 UMITER ROLLER PAR AVVISE NVT70, NA4430		£1.50
1774, 16S, 17, 19, 34, VT3	25, 38, 39, 52, 61, 62	0686792	240p	NV465, NV630, NV650, NV NV870, NV890, NV2000, N	'340, NV366, NV370, NV430, 1777, NV780, NV788, NV810, V2010, 7200, 7803, NVG7, N	NV830, NV950, VG10, NVG12,	
971400 AOS AND ATT	FF-REW ARM 128, 130, 135, 138, 145, 150 256, 260, VTL30 FF-REW ARM	5897094	240p	AG1000 SAISHO	IVG30, NVG120, NVG130, N	r GHGO, RIVIT/U,	
V7414, 415, 418, 420, 425 V7438, 450, 498, \$10, 518 V7536, 540, 545, 546, 546	. 426, 428, 430, 431, 435 . 520, 525, 526, 530, 535 . 570, 575, 576, 590, 595		21.30	VR505, VR800, VR900 VR1100, 1200, 1808, 2500, VR3500, 3500, 3800	CLUTCH 3200, 3300 LIMITER POST	850A20000	420p
97588, 9159625, 625, 638	(635, 636, 660, 845, 846, V I S	690,2051	£3.25	VR3500, 3500, 3500 VR1100, 1205, 1600, 2500, VR605, VR900, VR900 VR2500, 3200, 3300, 3600,	3200, 3300, 3560, 3600, 3700 IDLER		€1.30 280p
17536, 450, 498, 510, 518 17536, 540, 546, 546, 548	,426, 428, 430, 431, 435 ,520, 525, 526, 530, 535 ,570, 575, 576, 580, 585 ,636, 636, 640, 645, 846, VTS T-UP (DLER (LARGE)	80 85		VR705, VR805, VR906 SANYO	IDLER		110p
V 2500. V 140025. 626, 630	T-UP IDLER (LARGE) REW IDLER		£4.50 £6.00	VHR1110, 1150, 1200 VHR1300, 1500	DLER	143-0-662 T-14730	£5 00
	STATE OF THE PARTY	N. S.	DER!			2213.50	W 1.

	V705000, 5150, 6000	FF-REWIDLER	143-0-741T-20001	2500
	VTC6500, VTCM10, M11, P			
	VTC9100, VTC9300	IDLER	143 0-551T-01400	96p
	V7C9300	FF ROLLER ASSY	143-0-547T-00200	200p
ı	VTCM10, M11, M20, M21	REEL DRIVE PULLEY	143-0-662T-10350	£5.00
	VTCM30, M31, M50	W1.50	C4000004000	200
ı	VHR2100, 2300, 2500 VHR2700	POLER	6130374899	300p
	VTC5000, 5150, 6000	PULLEY	143-0-662T-01201	£5.20
8	VTC6500	POLLET	1930002101201	224
	VTCM10, M11, M20, M21	PLEIFY	143-0 6627-10350	65.50
i	VTCM30, M31, M50			STATE OF THE PARTY.
ľ	VHR3100, 3300, 3310	REEL DRIVE	143-0-662T-15621	350p
	VHR3400, 3700, 3800	ROLLER		15000-
	VHRD500 VHRD700	THE WORLD THE THE PARTY OF	STOLEN THROUGH	55.54
	VPR5800, VTC5300	LOADING ROLLER	143-0-661T-03800	80p
	VTC5400			Service of
1	V1C3000	FWD LIMITER		(3.50
	VTC3000	IDLER		750p
ı	SHARP			1000
1	THE RESERVE TO SHARE THE PARTY OF THE PARTY	EDLER ASSY	NIDL0005GEZZ	110p
		DLER	NiDL0006GEZZ	1100
ı	VC600, 651, 581, 682	DLER ASSY	NPLYVU107GEZZ	€6.15
ı	VC684, 685, 693, 699, 700, VC7309, VC7700, 7750	783, VC6FR, VC6V3 PLAY IDLER KIT	NPLYV0041 +	Derivation of the last
I	VOISAN, VE1700, 7780	TEAT EXENTED	NDA1V1607	£7.50

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Satellite Fault Finding Guide Issue 1. Listing about 1,000 faults for over a range of 24 different brands. Order Code: BOOK05.

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A comprehensive guide to receiver reviewing, featuring stock faults and installation tips.

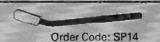
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VIDEO MAINTENANCE TOOLS



Set of 8 Allen keys packed in a plastic wallet Order Code: TOOL9

Zmm Specifically designed for video maintenance

Solder Mop 1.2mm×10metres 400P
Tubed Silicon Grease 50 gram 200P
Tubed Heat Sink Compound 25 gram 150P

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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.

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REMOTE CONTROLS

KEN		EC	ONIKULS	
Description	Order	Price	Description	Order
GRUNDIG	Code		PHILIPS (continued)	Code
TP160E	RC 107	900p	RC38	RC 301
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301
TP400	RC 401	800p	RC5352	RC 5352
TP590-600 TP390,TP610	RC 600	850p	RC5375	RC 5375 RC 5534
TP621	RC 610 RC 621	850p 850p	RC5 STANDARD RC5901	RC 5901
TP630, TP650	RC 650	850p	RC5903	RC 5903
TP660	RC 660	850p	SABA	
TP661	RC 661	850p	T6772 ~	RC 149
HITACHI		Sec. 15	TC319-320	RC 328
CLE800-CLE830	RC 140M	850p	TC356	RC 356
A617402/655602 A512120/230	RC 192 RC 900	875p 800p	TC358	RC 358
A514790	RC 901	850p	TC360 TC365	RC 360 RC 365
A5088470	RC 902	900p	CANADA CONTRACTOR OF THE C	NC 303
A518612	RC903	900p	SALORA	DC 100
SCL002	RC904	850p	SERIES L 86173	RC 190 RC 882
C2096 A511940	RC 905 RC 906	850p 80 0 p		110 002
655602H	RC 907	850p	SANYO RC218, RC222, RC228, RC238	RC 140M
П	310 307	озор	JXGE	RC 878
IFB13, 14, 15	RC 143	875p	JXDE	RC 884
FS4	RC 148	850p	VHR2300	RC 890
RG305	RC 305	825p	RC628	RC 865
RG306	RC 306	825p	SHARP	
FS9/1-10/1 VS5 RUK	RC 307	850p	G0121CESA, 123CESA, 204, 251	RC 140M
VS4-1	RC 308 RC 310	825p 850p	SIEMENS	
MULTICONTROL (17C20)	RC 311	800p	FC616	RC 130
KORTING		-	FC631	RC 132
16279, 18396, 18460, 18521 SE	RC 108	850p	FC742	RC 164
40540 VTS	RC 108	900p	SONY	
LOEWE		- 31	RM604, RM605, RM606	RC 140
DC11	RC 146	850p	32 CHANNEL	RC 140M
MATSUL			RM613	RC 141
010270601	RC 889	850p	RM632, RM636	RC 160
VX770 METZ	RC 892	850p	TATUNG	80.077
JAVA COLOR (6890)	RC 166	850p	FXA RC70	RC 877 RC 883
COLOR (7156)	RC 183	850p	FX70 FASTTEXT	RC 894
JAVA (7180)	RC 184	850p		
MITSUBISHI		No.	TELEFUNKEN FB632	RC 632 S
939P/03607, 939P/03609	RC 140M	850p	FB639	RC 639 S
NOKIA			THORN/FERGUSON	
SATELLITE	RC 550	850p	3V35-42	RC 342
NORDMENDE	Do and	050	3V31-32	RC 844
TC2336 CMC1, TC3519	RC 351N	850p	3V 57- 58	RC 628
OCEANIC	RC 356	875p	TX10 TEXT	RC 732
390C9500	RC 339	900p	TX10 STEREO TEXT	RC 738
ORION	110 000	осор	TX9-90-100 3V55. FV11	RC 740 RC 783
RC53	RC 892	850p	TX100 FASTTEXT	RC 785
PANASONIC			TX100 STEREO FASTTEXT	RC 789
EUR51200	RC 200	800p	PROFESSIONAL	RC 790
TC2200	RC 201	850p	TOSHIBA	
VSQ0357/NV730 TNQ1621	RC 202 RC 203	875p	CT937	RC 950
PHILCO	no zus	900p	CT9117	RC 951
CARVEL, CONCORDE,	RC 108	850p	201R4B	RC 952
MERCURY, TELESTAR		ОЗОР	UNIVERSAL PROGRAMMABLE R	EMOTE CO
TC10	RC 152	900p	Controls up to 4 different devices	
PHILIPS		5346	remote controls including TV, audit	
RC5002,5154	RC 134	850p	(need original remote control	
KT3 NON TEXT	RC 135	825p	Order code: IR100R	Price
69117032	RC 178	875p	We stock Remote Controls for or	
69117194 RC5991-UNIV	RC 180 RC 300	8 75p 7 00p	models. Ring for further details	on 081-900-
HOUST BIN	110 300	, ooh		SOURCE STATE

UNIVERSAL PROGRAMMAB	E REMOTE CONTROL
Controls up to 4 different devi	ces which use infra red
remote controls including TV,	
(need original remote co	ntrol TC program)
Order code: IR100R	Price: 1950p
We stock Remote Controls f	or over 5000 different

-2329.

VCR ALIGNMENT	KIT
CONTAINS: SET OF 7 HEAD & TAPE PATH AUGMERS	SET OF 8
* RCATYPE AUDIO & CONTROL HEAD POSITIONING TOOL	G * 0.37mm • 0.90mm
* RCA ADJUSTMENT TOOL FOR TAPE GUIDE POST: * RCA TYPE BACK TENSION TOOL	S * 1.27mm 1.50mm
• TENSION ADJUSTMENT TOOL FOR VARIOUS USE	1 2 000000
* VCR ADJUSTMENT TOOL 3 Reversible Screwdrivers Circ	3.00mm
	Jip Ptiers Screwdmen
Order Code: TOOL10 Price	e: 2900p

Price

800p 750p 800p 850p 850p 850p 800p

900p 875p 875p

850p 800p 800p

875p 850p

850p 850p 850p 850p 900p

850p

850p 900p

850p 850p 850p

850p 750p 850p

850p 850p

800p 800p 650p

650p 700p 900p 700p 700p 700p

800p

FUSES

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

FUSES				
CURRENT RATING	ORDER CODE	PRICE		
CERAM	IIC PLUG TOP	130 m		
3A	FUSE33	100P		
5A	FUSE34	100P		
13A	FUSE35	100P		
20MM CER	RAMIC TIME LAG	The state of		
3.15A	FUSE41	100P		
4A	FUSE42	100P		
5A	FUSE43	100P		
6.3A	FUSE38	1009		
8A	FUSE39	100P		
10A	FUSE40	100P		
32MM ČĒRA	AMIC SLOW BLOW			
8A	FUSE44	210P		
10A	FUSE45	210P		
15A	FUSE46	210P		
20A	FUSE47	210P		
38MM CERA	MIC SLOW BLOW			
10A	FUSE48	875P		

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

1.	C. PRO	TECTO	R
PF10	ICPF38	ICPN10	IC
PF15	ICPF50	ICPN15	IC

ICPF15 ICPF30 ICPN15 ICPN50 ICPF20 ICPF75 ICPN20 ICPP20 ICPF75 ICPN25 ICPN25 ICPN25 ICPN25 ICPN25 ICPN25 ICPN25 ICPN25 ICPN25 ICPN35 ICPN25 ICPN35 ICPN25 ICPN35 IC

Amstrad Original No: 153154
Used on Amstrad 08900, 8904, VCR2000, 6000, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 9244
Also fits: Antitech, Boadstec, Casio, Crown, Fidelity, Goldhead, Granada, Hinari, Marguartt, Omega, Protex, Schneider, SEG, Sentra, Shiptom, Tashiko, Tatung, Towada, Universum
Order Code: AH02 Price: £14.50

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MAKE & MODEL	ORDER CODE	PRICE
PACE PRD900, PRD900	SATPSUT	650p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	.650p
AMSTRAD SRD510, SRD520	SATPSU3	650p
AMSTRAD SRD500	SATPSU4	650p

Replacement Video Heads

MAKE	MODELS	PRICE
нітасні	VT570, VT575, VT676, VT580, VT585 VT588, VTF70	3100ş
LT.T.	VR3761	31000
JVC & FERGUSSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL	NVFS200, NVFS90, NVV8000	4600p
PANASONIC	NVHD100, NVHD101, NVHF100	3100p
	NVSD	1400p
	AG7330, AG7350, AG7355, AG7450	5000p
Design Ages	NVFS100	5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100	3100p
	VHR7800, VHR7810, VHR8000SP, VHR8801SP, VHRD4800	3100p
SHARP	VCH80, VCH81, VFH815	2800p
	VCA33, VCA36, VCA43, VCA44, VCA46, VCA49	1500p
	VCA55, VCA63	2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825	4800p
	SLV353UB	3200p
	CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4800p

Original Video Heads

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

Audio Control Head

AMSTRAD ORIGINAL NO: 150751
Used on: AMSTRAD TVR1, 2. 3, VCH4600, 4600MKII, 4700,
FUNALVSZ, VCR6500, 4800, 5200, 5600, 5600, 978700, 5000
Also fits: FIDERITY, FUNAL, HINARI, FROUINE, SCHNEIDER,
TOWADA, UNIVERSUM
ORDER CODE: AH01 PRICE: 1350p

TOWADA, UNIVERSUM ORDER CODE: AH01 PRICE: 1350p
AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DO8900, 8904, VCR2000, 6000, 6100, 8600, 8602.
8603, VCR8694, 8700, 8704, 8714, 8800, 9005, 8244
Also firs: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY,
GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGE, PROFEX,
SCHNEDIER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG,
TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

	The second secon	-
PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
Y8R 0050	NV300, NV340.etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625n

8 way Preprogrammed Universal Remote

A single remote control to operate Tolevisions, Videos and Satellite Receivers. Plus Auxilliary Options!!

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*Clear ilerge key) layout * Code Search Facility

*Stylish and easy to operate * Replace broken or lost remotes

*Order Code: 8 WAY | Price 1450p + VAT

Keplacement	Video Cassette Housings	
		i

MAKE	MODELS	CODE	PRICE
AKAI	V\$35, V\$53, V\$55, V\$56, V\$75	CH18	2600;
GRANADA	VHSOP1	CH05	1100p
THE RESERVE OF	VHSYJ2	CH01	2800)
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325	CH25	2000
	GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000, 8200	CH26	29005
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD 110, 111, 120, 121, 225	CH01	2600p
	3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 169, 250, HRD267, 455, 565, 566, 725, 755	CH02	2600p
	8948, 8950, FV108, 12L, 13H, 14T, 20B, 21B, 22L, 26, 395, HRD230, 430, 530	CH03	2600¢
	3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8961, HRD170, HRD180, HRD370	CH04	2600;
	FV31R	CH19	4300
	HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H	CH20	2400;
	HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH27	2400
LT.T.	VR3605, VR3905	CH01	26001
	VR3915, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH02	26001
	VR3916, 3926, 3946, 3943, 3976, 3986, 3995, 3997, 6948	CH02	2500
NATIONAL PANASONIC	NV730	CH06	4300;
N.E.C.	N830EG, N831EG, N832, N833EG	CH01	2600
	N895	CH02	26001
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 6467, 6468, 6470, VR6561, 6670, 6761, 6870, 6970	CH05	1100;
	VR6443	CH22	2900;
	VR6448	CH23	2500p
	49SB6	CH24	2500
SHARP	VCA100, VCH851, VCH852	CH22	29000
	VCA103, 103GV, 106, 106GVM, 254GVM	CH23	2500p
是。 一种的现在	VCS211, 244, 5055, 805, VCS230, VCD808G, 810G, VCT212, 310, 410G, 610	CH24	2500p
TELEFUNKEN	VR2970	CH02	2600
THOMSON	V320, 321, 323, 326, 4200, 4300	CH01	2800p
	V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 6540	CH02	2600
TOSHIBA	V55, V57	CH01	2600p
12 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	V65, V66	ČH02	2600g

Service Aids

DCI VICE ANUS	- POSSESSION -	1000	
DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZEIT	170ML	SP04	200p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	\$P06	170p
AEROKLEANE	135ML	SP07	140p
AERO DUSTER	150ML	SP08	. 200p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	160p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT	- 1	SP26	2100p

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

Cassette Tape Heads

and the second s		
HEAD TYPE		PRICE
MONOHEAD	AND DESCRIPTION OF THE PERSON NAMED IN COLUMN TWO IS NOT THE PERSON NAMED IN COLUMN TWO IS NAMED IN COLUM	90p
STEREO-HEAD		1100
MINIHEAD		150p
AUTO REVERSE HEAD	and the second	200p

Soldering Accessories

DESCRIPTION

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15 WATT 240 VAC (XS15W 240V)	S102	900
25 WATT SPARE ELEMENT	S103	450E
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SPARE SPONGE	S109	55p
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18 SWG 500 GRAMMES	5110	500p
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22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS	Day -	22300
SOLDER MOP STANDARD GAUGE 1,2mm x 1 5M	S107	70p
SOLDER MOP 1.2mm x 10M	S113	400p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	50p

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BU 810	110p	MJE 18004	125p	25D 633	70p
BUZ 90A	180p	STK 8982H	6000	2SD 1680	225p
CXA 1044P	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	1000	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	5500
L272	200p	TMP 47C434N	1250p	2SK 1342	750p
L6210	250p	SAA 1300	200p	2SK 1358	600p
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TELEVISION



A Peep at the Crystal Ball

Could there be a future in which the BBC and the ITV operations as we know them are no longer around to provide us with broadcasting services? The idea was suggested recently by the National Heritage Secretary Stephen Dorrell. It may have seemed inconceivable just a few years ago, and is still extremely unlikely, but it is nevertheless something that ought to be considered. After all, things can change quite quickly. It is only just over seven years (June 1988) since Sky Television signed its initial contracts with the Astra operator SES to start broadcasting four channels. The start of its services had a decidedly tentative air about it, yet the latest ITC annual report shows that BSkyB now has the highest income of any individual UK broadcasting company. Another recent ITC report shows that cable TV is beginning to take off in a big way: in the year to April 1st the number of broadband cable subscribers rose from 642,000 to 963,000, an increase of over fifty per cent. Recent mergers amongst cable TV companies are producing more powerful cable operators. The traditional UK broadcasters are clearly facing increasing and stiffer competition.

We are almost at the start of a new era in broadcasting, one that could see a complete change in the services available to the public: I refer to all those hundreds of channels that digital technology plus satellite and broadband cable distribution are about to make possible. Where will the traditional

broadcasters stand in this new scene?

Although a lot of change has already occurred, and a lot more is inevitable, it remains possible and likely that the core UK broadcasting services, the BBC and the ITV companies in particular, will remain much as they are today. It's worth recalling that the traditional three major US broadcasting networks went through a difficult period just a few years ago, when cable networks expanded rapidly. Their audiences declined sharply, but the decline eventually bottomed out. Although the majors lost audience share, they seem to be safe enough for the present. What it all boils down to is whether a broadcaster can provide what a sufficient number of viewers require, thus achieving an adequate income. With their considerable experience and resources, the established broadcasters should be able to survive.

The thing that surprises this observer is people's willingness to subscribe to TV services. There must be some good salesmen around! But then again there has been a lot of churning in both the satellite and cable TV fields. This is not always clearly apparent, as new subscribers take over from lapsed ones.

The big questions are whether people's viewing behaviour might change, and if so whether such change would be permanent or a brief fad (remember citizens' band radio?). Three possible new viewing patterns suggest themselves. We could see increasing

interest in hundreds of minority-interest channels. We could see an increasing emphasis on interactive TV services of one sort or another. And we could see ever larger numbers of people surfing the World Wide Web.

None of these look like serious threats to traditional broadcasting as we know it. Far more people will want to continue watching sport and yet more sport rather than plug themselves into the Internet, while the interactive TV experiments that have been conducted to date suggest that interest in such services is decidedly limited. It is interesting that interactive cable services have long been possible and have been tried in the past, with little success. Minority interests are probably better served by other media.

The main danger is that a multiplicity of new services could result in a substantial reduction in average audience sizes and thus broadcasting service revenues. This could lead to reduced quality and in turn a further loss of viewers. Once the rot set in, it might be difficult to find any quality TV. But it seems reasonable to assume that the established broadcasters will be able to look after themselves and avoid this situation.

It may be that we shall all get used to linking our PCs to cable networks to simplify our banking, shopping and other needs, but traditional broadcasting will probably remain much as we know it now.

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COVER PHOTO

This month's cover photograph shows the Hitachi G6P chassis, in Model CPT2178. See servicing article on pages 704-707.

Reports from Nick Beer and David C. Woodnott

Camcorner

Panasonic NVMS70

The symptom with this camcorder was intermittent colour from the camera head. On examination I found that the fault could be instigated or cleared by applying a tiny amount of pressure to the titler PCB above the lens. This pressure was in turn flexing the process PCB where IC317, a surface-mounted chip, had a couple of dry-jointed connections. Resoldering cured the problem.

JVC GR45, 60 etc

We've had several of these camcorders in recently with symptoms that suggested worn or contaminated video heads. The cause however was poor connection of the ribbon cable between the lower drum and the head amplifier PCB. The action required is to tighten the contacts of the connector on the head amplifier PCB.

D.C.W.

Sony CCDV800E etc

We were recently asked to check the autofocus action with one of these Hi-8 models. The point to note is that at the wide-angle end of the zoom range the focus lens assumes a mid-position (approximately 7ft) and will not alter from this state even when an object is positioned closer (4ft minimum). This doesn't affect the quality of the picture, but can be misleading as some models operate differently – the focus lens moves to a closer setting when the zoom is moved towards the telephoto end of its range.

D.C.W.

JVC GRAX7E

This camcorder had been dropped and as a result was inoperative, the emergency code £04 showing in the viewfinder. We found that the mechanism was jammed in the half-loaded position, with no drum rotation. The mechanism problem was simply due to a piece of cassette lid that had broken off and become stuck in the supply-side guide rail base. Fortunately we were able to put this right without any need to realign the loading rings etc. But the drum still refused to rotate.

The cause of this second fault condition was a 'nick' in the drum-motor ribbon cable, which is dressed around the underside of the loading motor. Because of its position between the motor and the lower case this cable is often a casualty when one of these camcorders has been dropped. In our experience the cable can usually be saved by carefully removing the insulation and linking across the damaged print. The damaged area can then be insulated and the cable refitted – saving the cost of a replacement drum assembly.

D.C.W.

Sanyo VMD6P

The cause of flickering camera E-E pictures with several of these camcorders has been traced to poor soldering of the CCD imager's pins, on board CA1.

D.C.W.

Minolta 8100E

We don't see many of these camcorders. But those we do see seem to suffer from the same problem - a very loud

'screeching' sound when loading and unloading. To the customer this probably sounds like an expensive matter. In fact it can usually be cured by lubricating the loading motor bearings suitably. Unfortunately it isn't the easiest of camcorders to take apart, but once you know the method it's not too bad. Don't forget to refit the sliding cover over the AV socket!

D.C.W.

Canon E300E

This camcorder recorded and played back all right but there were only lines in the viewfinder display. The cause of this was traced to C468 (4.7µF, 25V) which had leaked over the track to pin 1 of IC462 on the grip PCB.

D.C.W.

Sanyo VEMS1P

White flashes on the playback picture was the complaint with this camcorder. C1005 ($10\mu F$, 16V) on board VD1 was the culprit: it had leaked over the print directly around its connections. **D.C.W.**

Canon E50E

Yet another leaky electrolytic problem! This time the symptoms were no playback and no EVF pictures, also no zoom operation and no clock or data information. The cause was C2931 (47µF, 16V) on the grip PCB. It had leaked over and severly corroded the EVF 'on' L signal print between pin 7 of CN2901 and pin 2 of IC2931. Cleaning up the PCB, replacing the capacitor and fitting a link between the two points mentioned provided a complete cure for this curiously varied set of fault symptoms.

D.C.W.

Sony CCDV8AF

Because it had been dropped on its rear end this old-timer was, except for E-E pictures, inoperative. Fortunately the VTR operation PCB had survived without damage, needing only to be refitted in its correct position. The cause of the failure was the fact that PS601 (board HS5) and PS602 (board MC8) were both open-circuit. Why they had both failed is difficult to say, but their replacement restored the unit to working order.

D.C.W.

Sanyo VMD6P

There are some common faults with these popular camcorders, but they seldom fail completely as this one had. There was no response to power-up or eject, and a cassette was stuck in the machine. The cause of the fault was traced to an incorrect reset condition at IC301 on board SY1 (VTR operation). A discrete-component circuit produces the reset pulse. Transistor Q3014 in this circuit was found to be leaky, the result being a permanent low at IC301's reset pin. Replacing the transistor cured the fault.

When fault finding it's helpful to know that the camera section can be disconnected for work on the VTR unit – but the SY2 board must be connected to the SY1 board. D.C.W.

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Planar Magnetics and H.F. Power Conversion

Mark Paul

The use of switch-mode power supplies of various types has increased greatly in recent years, introducing some intriguing engineering ideas and unusual circuits to the service engineer. Designers have concentrated on power conversion systems in order to achieve higher power density, the advantages being greater efficiency, cooler running, improved reliability and reduced PCB size.

In theory the size of the magnetic components (coils and transformers) and capacitors used in such systems should decrease as the operating frequency increases. In reality a higher however switching frequency will not by itself necessarily lead to higher power density. To avoid losses and retain the benefits of high-frequency power conversion it's necessary to reduce switching losses, improve filter capacitor current handling, avoid copper losses caused by the skin effect (at high frequencies the current flow tends to be greatest at the surface of a copper conductor), reduce core losses and improve heat conduction.

Most of the problems that the arise as switching frequency increased relate to the magnetic components used. copper Unless and core losses minimised, the net reduction component size as the operating frequency is increased my be only marginal.

The purpose of this article is to identify the main

problems that have to be overcome in the design of magnetic components for h.f. switching power conversion systems, and to introduce the technology of planar magnetics as the solution. I feel that it is important for the service engineer to appreciate the reasons for changes in circuit design as they come along.

Planar magnetics offer the designer a cost-effective solution to h.f. power conversion. At frequencies as low as 20kHz, planar technology is a viable alternative to wound magnetic components, especially where large production quantities are involved. Planar transformers can be designed to operate in both d.c.-to-d.c. and a.c.-d.c. systems.

The main differences between planar and conventional, wound magnetic components relate to the geometry of the ferrite core and the structure of the 'windings'. Both approaches conform to the same basic laws of physics of course.

Planar Transformer Construction

In a conventional wound component the windings are made of solid or litz wire. Planar 'windings' however are made from pre-tooled

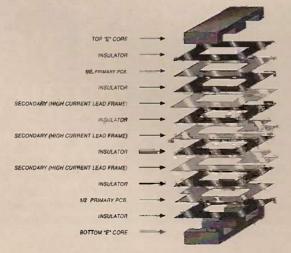


Fig. 1: Basic planar transformer construction.

parts with no wire whatsovever: they consist of copper foils (lead frames) that are self-supporting, or flat copper spirals on a thin dielectic substrate. The windings are stacked on flat ferrite cores, and glued

together using fow-grain diameter epoxy resin. Thin slices of mylar, nomex or kapton insulating material provide inter-winding isolation.

Most planar transformers have a split primary that consists of two or more boards. There is usually one board on the top of the stack with another at the bottom. With a 'multiwound' transformer the two halves of the primary are on top of and beneath the main secondary 'winding'. The remaining secondaries are evenly spaced on both sides of the stack. The main winding delivers fifty per cent or more of the total power. This technique provides a significant improvement in the magnetic coupling where it's most needed. Fig. 1 shows the idea.

The primary winding of a transformer for use in an a.c.-d.c. switch-mode power supply is assembled using special high-isolation plastic mouldings, referred to as 'bobbins', that conform to strict creepage and clearance distance safety requirements laid down by international standards. The bobbin approach also enables the secondaries to be split equally on both sides of the primary. The technique is illustrated in Fig. 2.

In both cases the stacked inductive elements are linked together in series and/or parallel externally to meet specific user requirements.

Characteristics

This sandwich assembly provides greatly increased primary-secondary coupling and significantly reduces the parasitic leakage inductance. As a result the design of the power supply is simplified and reliability is increased.

Assembly of the 'windings' with this pre-tooled PCB and lead-frame design is easy and fast. And because both inductive components have precisely defined positions it's possible to predict the planar magnetic geometry and electrical characteristics much more accurately than with conventional magnetic components. This applies with both

inductors and transformers. Planar technology's high degree of repeatability and predictability mean that operational parameter spreads are reduced.

Another major difference between planar magnetic and conventional construction is found in the ratio of the ferrite to the copper used. A planar magnetic device typically has a core with a relatively larger cross-sectional area and 'windings' with a smaller number of 'turns'. The result is a low-profile device that uses less copper.

'Windings'

The self-supporting foil conductors are shaped to fit the core as a single turn and can carry a heavy current, up to 200A per winding layer. They are

TOP 'E' CORE

INSULATOR

INSULATOR

INSULATOR

INSULATOR

BOSBIN A (ISOLATING SHROUD)

PRIMARY PCB.

INSULATOR

PRIMARY PCB.

INSULATOR

PRIMARY PCB.

INSULATOR

BOTTOM 'E' CORE

Fig. 2: Planar transformer construction with bobbins.

thus suitable for low-voltage, highcurrent applications, used in either a single- or multi-layer winding arrangement. The PCB approach is better suited to high-voltage, low-current applications, and can also be arranged in single- or multi-layer form.

Planar foil conductor technology has direct and indirect advantages in h.f. switching applications. Some relate to copper losses, others to the magnetic properties of the device.

At high switching frequencies the uneven current distribution in conventional wire contributes significantly to copper loss. As a result the a.c. resistance may be appreciably higher than the d.c. resistance. Two factors contribute to this: the skin and proximity effects. Both are caused by the interaction of the current and the magnetic field associated with it.

The skin effect is caused by the influence of the magnetic field

produced by a conductor on the conductor itself. The proximity effect is caused by electromagnetic interaction between adjacent conductors. Both tend to push the current towards the surface of a conductor, thereby reducing the effective cross-sectional area of a round conductor. The foil inductor technology used in planar magnetics reduces this problem because the conductors have a large surface area compared to the width.

Leakage Inductance

Leakage inductance represents a coupling loss between the primary and secondary windings of a transformer. In many applications, such as a flyback converter, the energy stored in the leakage inductance is lost, reducing the

efficiency of the device. (Chopper line and output transformers that release energy to rectifiers on the secondary side when the initial current flow in the primary side ceases are flyback converters.) The remedy is to reduce the distance between the primary and secondary windings. Because of the foil conductor structure and the reduced number of 'turns'. leakage inductance

minimised in a planar magnetic device. In fact in some cases a planar magnetic transformer has a tenth of the leakage inductance of a conventional transformer. About 0.2 per cent of the primary inductance is claimed as typical.

Core Loss

Another area where planar technology improves on the performance of conventional magnetic technology is in core losses. These are in the main caused by eddy currents and hysteresis effects. Because ferrite and powder cores have a high volume resistivity, eddy losses with them are normally negiligible. They are thus economical solutions for switch- and resonant-mode power conversion systems. Planar magnetic devices provide a considerable reduction in hysteresis loss however, because of the large core cross-sectional area but relatively

small volume, this ratio being larger than with a conventional core.

Heat Dissipation

The useful power level of a device is basically determined by thermal conduction away from the component's 'hot spot'. Poor thermal conduction causes an unsafe temperature rise and eventual failure. With planar magnetics the geometry of the core design means short thermal paths: the large surface area helps to dissipate heat. This means that planar is more economical than conventional technology, since the power handling capability is higher.

The power handling capability can be further enhanced by using a hightemperature electrical isolation material and heatsinks. The large, flat footprint of a planar magnetic core can be easily and efficiently connected to a large surface, so that the device will run cool with or without a fan. The reduced thermal impedance to the heatsink means that there is a smaller temperature rise for the same power loss or increased converted power for the same temperature rise. Thus with planar technology the power density can be appreciably increased, in fact by up to three times in comparison with a conventional transformer.

The Future

Planar magnetic technology using foil windings is not a new concept, and its benefits have long been appreciated. Lack of commercial availability has until now been the main restriction on its use. A family of planar transformers and inductors that range from a few watts to 20kW per unit at frequencies between 20kHz and 1MHz is now available to manufactures in the UK however.

The trend in electronics is towards low-profile designs, with higher component density on smaller PCBs and reduced ambient temperatures. Planar technology offers a viable and economical alternative to conventional magnetics in meeting these needs. Not least in importance is its efficiency rating, which is claimed to be up to 98 per cent without volume increase.

Because of its efficient core shielding, planar technology offers inherently low EMI emission. It is therefore an attractive approach in h.f. switching applications.

Finally, planar technology offers simple and easily customised construction, lending itself readily to full integration into multi-layer PCB designs.

Inside the Panasonic Alpha 4 Chassis

Part 3

40 Standby control output 41 OSD blanking output 42 OSD blue output

43 OSD green output

OSD red output 44 Volume control output 45

46 Picture noise reduction output 47 Colour system 1 output

48 Colour system 2 output

50/60Hz height adjustment output (DP models 49

Rav Mēadows

50 AV control 2 output 51 AV control 1 output RGB contrast output 52

53 Mute 1 output 54 Reset input

55 Field sync input 56 Mute 2 output

57 50/60Hz scan sense input 58 Tint control on/off output

12C bus data connection 59 60 I2C bus clock connection

5V supply 61

Clock oscillator connection 1 62 Clock oscillator connection 2 63

Chassis connection

The sections of the chassis we'll focus on this month are the main microcontroller chip and the timebase and protection circuitry - a slight change from the previously announced coverage.

The Main Microcontroller

The main microcontroller chip IC1213 is from the Matsushita MN18XXXXXX series, the exact type depending on the features incorporated in the particular model. For example, the UK Model TX25X1DP with Dolby Pro Logic sound uses an MN18P73233 while the TX21V2 variant for the German market is fitted with the MN1872432TME. These devices have similar pin-out arrangements to the microcontroller chips used in the Z4 chassis. They all contain 16K of RAM, 24K of ROM, twelve control function digital-to-analogue converters (DACs), an 12C bus interface and a full on-screen display

Pin allocations are as follows:

Remote control input

2 Key scan 1

3 Key scan 2 Key scan 3

5 Option set 1

Option set 2 6

Option set 3 7

8 Option set 4

Scart slow-switch input

10 Sound info. input A.F.C. input 11

Chassis connection 12

No connection 13

14 Bass control output

15 Treble control output Balance control output 16

17 Loudness control output

Mono/stereo select output 18

19 Sccam tint output

20 Secam L/not output 21

Secam L' sound hi/lo output

22 5V supply

23 Colour control output

24 Contrast control output

25 Brightness control output 26 Sharpness control output

27 Chassis connection

28 Audio mode info. input

29 Scart fast-blanking input 30 I.F. stop info. input

31 Video stop info. input

32 S video info. input 33 I2C bus control switch output

34 Video mute output

PAL/Secam/Auto mode output 35

Nicam/f.m. select output 36

37 Stereo/mono select output

38 5V supply 39 Line sync input

EEROM chip IC1202, reset chip IC1212 and the remote control receiver chip IC1131 are all part of the control system with IC1213. There are also four option-set resistors and an on-board control panel. Some unused microcontroller chip outputs are left disconnected, while unused inputs are connected to chassis via resistors.

Because the Alpha 4 chassis uses frequency-synthesis tuning, one major difference between its microcontroller chip and that used in the Z4 chassis is the absence of a voltage-synthesis tuning output.

Some pins have slightly different functions depending on the mask. Pin 16 for example is normally the sound balance,

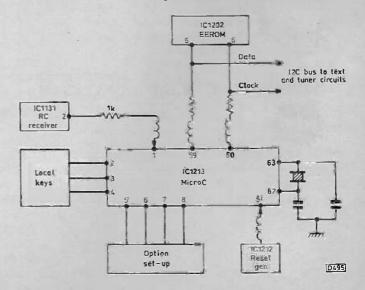


Fig. 1: Simplified block diagram of the control system.

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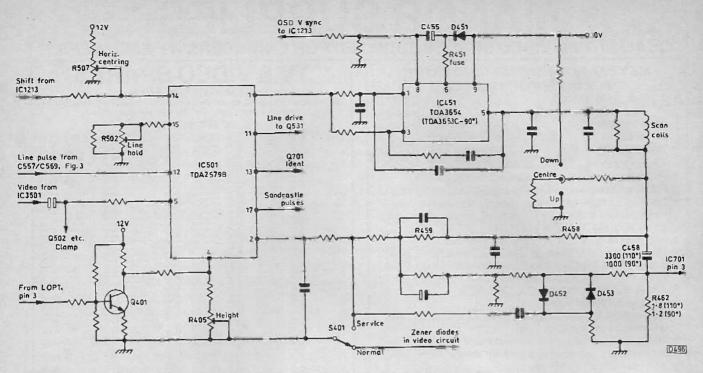


Fig. 2: The timebase generator and field scan circuitry used in 110° models.

control output. In Dolby Pro Logic models this pin still provides a balance control function, but as a noise-generator control output that tells the Pro Logic decoder to send a burst of noise sequentially to each of the speakers for balance adjustment (see the February 1994 issue, page 255).

In-line chokes protect most pins that are connected to the external circuitry from flashovers. The OSD output pins 41-44 are each connected via an LC T-filter.

Pin 34 (video mute) has a tri-state (logic high, logic low or high impedance) output.

Fig. 1 provides a simplified view of the control system.

To simplify the connections, there's no provision for multiplexed key scanning. Instead, a resistor chain connected to the local keyboard on panel M presents different resistance values when different keys are operated. The keyboard is split into three sections, each of which is monitored by a separate microcontroller chip input. The Alpha 4 chassis doesn't use the key scan 1 input. The key scan 2 input monitors the preset tuning keys while the key scan 3 input monitors the main user keys (volume and channel change).

Resistors are used in the same way for the model options. These are read by the chip which can then determine the model's type, i.e. whether it is PAL or PAL/Secam set, has a single- or a triple-band tuner, etc.

At power on, or at any time when the 5V supply line falls below 4.5V, IC1212 sends a logic-low reset signal to pin 54 of the microcontroller chip which then clears any erroneous data from its internal memory.

Tuning and user volume, colour, contrast etc. settings are stored in the EEROM chip IC1202, which is connected to the microcontroller chip via the I2C bus. The remote control receiver chip, which is mounted on panel M, sends commands to pin 1 of the microcontroller chip via its own serial data line. As these devices are all powered by the 5V supply derived from transformer T1201 they remain in operation when the set is in the standby mode.

As in the Alpha 3 and Z4 chassis we've looked at previously, the microcontroller chip itself rarely causes problems. If a control system fault is suspected, start by checking the operation of the clock (pins 62 and 63 of IC1213). Failure of

the set to come on is much more likely to be caused by failure of the standby supply. In this case there will be no standby LED illumination.

One feature, the scart slow switch, is added to models with Dolby Pro Logic. It had previously been available only with Continental models and other makers' sets that use these microcontroller chips. What it means is that the set is forced, when a satellite receiver or other signal source supplies a logic high at pin 8 of the scart socket (pin 9 of the microcontroller chip), to accept the signal from this source in place of the tuner signal. Although installers will be familiar with the advantages (and disadvantages) of this arrangement, there will no doubt be cases where a customer upgrades from an older Panasonic model without this function and gets 'unexpected' results. Rather than delve into the set to disconnect pin 9 of the microcontroller chip you can make a quick snip at pin 8 of the scart cable!

As mentioned when we covered the teletext decoder last month, the Alpha 4 chassis does not have a text mix mode as standard. The circuitry required is present however. To improve text legibility in the text mix mode Q3502 (see Fig. 5, page 637 last month) is switched on, reducing the reference level voltage at pin 18 of IC3501. The same control signal, produced at pin 20 of IC3501, reduces the video contrast level by pulling down the voltage from the subcontrast control via the diode at the bottom left of Fig. 5 (the labelling and arrow were a bit misleading in this respect). If you want the mix mode with an Alpha 4 set, either use a Z4 remote control handset (part no. TNQ8E0445) or cut a hole in the panel of the Alpha 4 remote control unit where you will find the unused mix button hidden!

Sync and the Timebase Generators

The Alpha 4 chassis returned to the tried and tested sync/timebase generator system based on the Philips TDA2579 chip, dropping the rather unusual arrangement used in the Z4 chassis. The basic TDA2579A circuit dates back to the U5 chassis. Fig. 2 shows the arrangement as used in the Alpha 4 chassis.

Pin 12 of the teletext decoder chip IC3501 on panel H

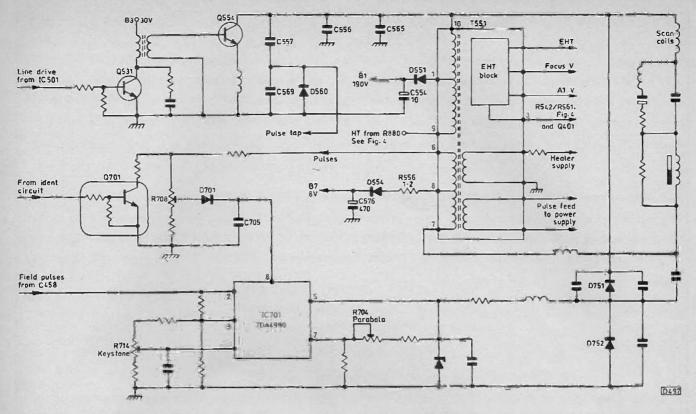


Fig. 3: The line output and EW correction circuits, shown simplified.

produces a composite video output in the TV mode or an internally-generated composite teletext sync output in the text mode. This output was not shown in Fig. 5 last month. It's fed to pin 5 of the TDA2579B chip IC501, with Q502 providing a clamp action at this point.

IC501 contains a sync separator and line oscillator. The field drive output at pin 1 is generated by dividing down from the line frequency. An internal phase detector system ensures that the outputs produced remain locked to the video signal, field and line feedback signals playing a role in the overall operation. The phase detector has three operating modes, to take into account the different requirements with normal, weak or VCR-sourced signals. Internal black-level detection as a reference and a noise-inversion system ensure stable operation of the sync separator.

There are only three adjustments, height (R405), line frequency (R502) and line phase (R507). A horizontal shift signal from the main microcontroller chip IC1213 is fed to pin 14. It's used to centre the picture in the text and external RGB input modes.

The outputs are line drive (pin 11), field drive (pin 1), ident (pin 13) and sandcastle pulses (pin 17).

Field Output and EW Correction

The field drive output from pin 1 of IC501 is applied to pins 1 and 3 of the field driver/output chip IC451. In 90° deflection models this is a TDA3653C while in 110° deflection models it's a TDA3654. Although the chip is powered by a 27V line it can generate a 50V peak-to-peak output, thanks to the voltage doubler formed by D451 and C455. This part of the chassis is similar to the AN5521-based arrangement used in the Alpha 3 chassis.

The overall gain is set by the feedback, which is returned to pin 2 of IC501. There are d.c. and a.c. paths, so that both linear and non-linear correction can be applied. The d.c. path is via R458/9 while the a.c. feedback is taken from the junction of the field scan coupling capacitor C458 and R462. A

Third path, via diodes D452/3, provides simple NS correction. A three-position plug and socket arrangement adds a small d.c. voltage to the scan circuit for field shift correction.

In the event of field scan failure there's no feedback to IC501 and the drive is cut off. The service switch is also connected to pin 2 of IC501. When S401 selects the service mode the field feedback is blocked and the field drive is removed. The beam is enabled however, via zener diodes D305-7 which are connected to the colour decoder chip's RGB outputs. We'll look at this feature next month.

Models fitted with 110° deflection tubes – the 25 and 28in. types – require EW correction. A conventional diode modulator is used for this purpose, see Fig. 3. It's driven by the Philips TDA4950 chip IC701, which is functionally identical to the SGS-Thomson device used in the Alpha 3 chassis. The field-frequency input is taken from the junction of C458/R462. There are adjustments for parabola (R704) and keystone (R714) correction. R708 provides width adjustment: its slider is connected to D701 and C705 which rectify the pulses tapped from pin 6 of the line output transformer. A switching transistor, Q701, is used to adjust the width when a 60Hz signal is being received.

Line Timebase

The line-drive output from pin 11 of IC501 is fed to conventional driver and output stages. Fig. 3 shows the basic circuitry. Note that 110° models have additional components for scan-correction, EW correction and line linearity adjustment. Also that 90° and 110° models use different line output transformers with quite different pin connections.

Protection

In the event of an excessive load on the 12V line the voltage will fall, zener diode D870 will cut off (see Fig. 4) and Q851 will turn on. As a result Q542 is forward biased, in turn turning on Q541. As the collector of Q541 is linked to

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the base of Q542 these two transistors latch on until the power is removed. The output from this circuit is applied via D1253 to the base of the line driver transistor Q531 and via D890 to the base of Q890, which drives the optocoupler in the power supply (see Fig. 3, page 550 June). Thus under a fault condition the line output stage and the power supply both shut down. Excessive beam current will also produce shut down as a result of the link via R542.

The system also provides over-voltage protection. Q880 senses the voltage developed across R880 which is in the h.t. feed to the line output stage. In the event of excessive

voltage or current conditions here Q880 conducts and, via D880, activates the latch Q541/542. The operation of this protection arrangement is controlled by the time-constant of R880/C880/R882.

Next Month

In the concluding instalment next month we'll take a look at the video processing and audio circuits, inluding the Dolby Pro Logic module and the extra circuits used in the surround sound Models 25X1DP and 28X1DP.

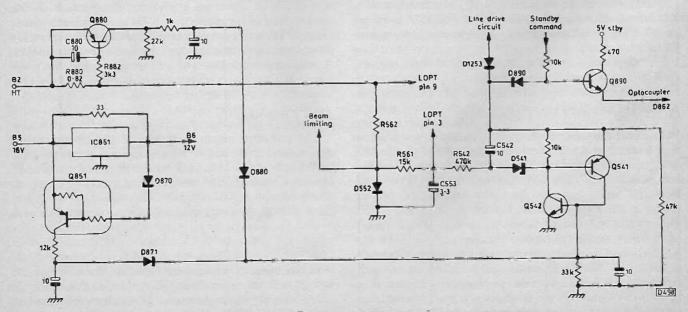


Fig. 4: The protection circuit.

Satellite Notes

Reports from Philip Blundell, AMIEEIE, Christopher Nunn and Hugh Cocks

Maxat SAX1100

There were no signals from this satellite receiver, only a hum bar being visible at the r.f. output. A check on the voltages produced by the power supply – they are marked on the top PCB – showed that they were all at about half the specified level. Visual inspection of the power supply revealed a sorry-looking 47µF capacitor, C3, next to a hotlooking 2W resistor. A new 47µF capacitor brought the pictures back.

P.B.

Amstrad SRD500

The power supply in this receiver was ticking very quietly. On other occasions I've had these receivers with no LED illumination at all and sometimes with the standby LED flashing on and off in time with the power supply ticking. The circuit diagram shows C5 in the power supply as being a 33µF, 25V type. Whenever I've encountered these faults its value has been 47µF. Changing it to 33µF restores normal operation. Incidentally a capacitance meter check on the 47µF capacitor will almost always show that it is o.k.

Pace SS9000

The fault with one of these receivers was no sound at all in any mono mode and only weak, hissy sound in the stereo mode. A replacement U2829B sound demodulator chip (U1) restored normal operation.

It's wise to ensure that these receivers are well ventilated, especially if the PCB looks at all black around the power supply area. Make sure that nothing lives on top, and that if the receiver is housed in a recess below the TV set there is a large gap above it. Also make sure that the receiver is not above a hot VCR. Doing this will prolong the receiver's life no end. It's amazing to think that the earliest 9000s are now nearly five years old!

H.C.

Grundig GRD250

This receiver emitted what can best be described as a rasping noise, while hum bars were present on the video display. The noise seemed to consist of a high-frequency component together with 50Hz modulation. Once the receiver had been opened up it was obvious that the 47µF, 400V reservoir capacitor in the mains rectifier circuit had been in some distress. Why the fuse hadn't blown was something of a mystery. The receiver lived on a boat in the local marina and was fed with a wildly varying mains supply via a very long cable.

Replacing the electrolytic and cleaning up a small amount of fluid around it produced a quiet power supply and good pictures. Just two weeks later the same thing happened again, but this time the fuses blew. The owner now runs the boat's generator when he wants to watch TV!

H.C.

Pace SS9200

All the front LEDs were alight but there was no response to any command from the remote control unit. In addition a loud squealing noise came from the power supply. The fault occurred after a brief power supply interruption. Prior to that the receiver had been working well. Considering its age, the power supply section of the PCB was a healthy colour.

Replacing C9 and C11 (both $1\mu F$) in the power supply restored normal operation, but I then noticed that the programmed channels had returned to the factory settings. This is quite a common occurrence when there's a power supply problem or the mains supply is very spikey. To cap it all C416 ($2\cdot 2\mu F$) in the tuner, mounted above IC401, had as usual dried up, causing patterns on the picture. Often the first sign that C416 is failing occurs when the mains power has been off for a while and the receiver is cold: at switch on the pattering is very bad, decreasing after a few minutes as the receiver warms up – the patterning may even disappear. It's interesting to listen to customers' descriptions of this fault over the phone!

Notes from Pace

Astra 1D crosstalk when using a 10GHz LNB: The symptom is as follows. An Astra 1D transmission is seen in the background with terrestrial reception of channels above ch. 54 or with satellite reception where the r.f. modulator frequency is set at above ch. 54. The interference occurs because the 10GHz LNB down-converts the Astra 1D channels to the upper part of the u.h.f. spectrum. At present ch. 60 is the one mostly affected, but it can be expected that the interference will eventually affect chs. 55 upwards.

Changing to a 9-75GHz LNB provides a complete solution. Many owners may object to the expense however. As a second-best solution, replace all interconnecting leads between the TV set, the VCR and the satellite receiver with good-quality, double-screened coaxial cable, using metal plugs with soldered connections. Check the quality of the terrestrial and satellite TV downleads and improve if necessary. The satellite downlead should consist of CT100 or equivalent quality cable. The terrestrial TV downlead may also have to be changed to CT100 or similar quality cable to increase crosstalk immunity, particularly where both cables run together down a wall or inside trunking. Low u.h.f. signal level makes the problem worse. Because of the high level of crosstalk they introduce, combined u.h.f./satellite TV wall outlet plates are unusable with a 10GHz LNB.

Crosstalk from Astra 1D i.f. signals may occur on all satellite channels where the u.h.f. modulator in the satellite receiver has been set in the range ch. 54-69 and an r.f. connection to the TV set is used. The solution is to retune the output from the satellite receiver to the range ch. 21-50.

MSS200/300 Series receivers: The menu background colour changing to monochrome can occur with some TV receivers. The cause is 17.7344MHz colour oscillator tolerance spreads. To ensure that the oscillator runs at the correct frequency, change the trimming capacitors C213 and C214 from 12pF to 8.2pF, Pace part no. 950-0825301. These are 50V surface-mounting capacitors with a tolerance rating of ± 0.25 pF.

Servicing the Hitachi G6P Chassis

Glyn Dickinson

The Hitachi G6P chassis was used in five models which were introduced in 1986. Model numbers are CPT2174, CPT2176, CPT2178, CPT2476 and CPT2478. As these numbers suggest, there were 21 and 24in. versions. The former are housed in plastic cabinets, the latter in a rather cumbersome wooden one. All models have on-screen displays and FS tubes. The final digit of the model number indicates the basic features: 4 denotes a standard set, 6 remote control and 8 teletext. Don't confuse these sets with the earlier CPT2074/6/8 and CPT2274/6/8 which were fitted with the NP83 Mk. II chassis, or the CPT2578 which has the later G8 chassis.

The smaller-screen sets have a Mullard or Philips A51EAL30X tube or the Hitachi equivalent. The focusing of the Mullard tubes tends to deteriorate after a few years. Thus a compromise has to be adopted when the set includes teletext. As the emission fails, the picture begins to streak. This is especially noticeable with the green content of the display. The 24in. sets are fitted with a peculiar Hitachi tube, type A56JKZ61X. It gives a very good picture, though some faults make it look as if the tube is faulty (see later).

The sets are a few years old now, but provided the tube is in good shape they can, with a little care, be persuaded to give several more years' service. The CPT2174 was in production for some years as it was Hitachi's last manual model.

General Features

As with most Hitachi sets the chassis is mounted horizontally. The line output stage is to the right, with the power supply behind it. The tuner and i.f. stages are on the lefthand side, tuning control in the rear centre and the decoder at the front centre. If fitted the teletext panel is on the cabinet, at the left. With later models the power supply is on the right-hand side.

The chassis is of Japanese design and there are several unusual i.c.s in it. Some, the microcontroller and colour decoder/timebase generator chips in particular, have the pins spaced much closer than usual for chips of this period. Thus care must be taken to avoid print damage or shorts between pins.

As with many sets, the control flap is easily broken. We usually leave it with the customer, having first checked that it's still in one piece, as replacements are quite expensive and it is difficult to persuade the customer that the flap was broken to start with!

There are several differences between models. The 24in-versions have a different line output transformer which is not interchangeable with that used in 21in. sets. Later remote control and teletext sets have a separate power supply, which makes servicing much easier. An unusual (for the time) feature with remote control models is the standby system, which removes the supply to the line oscillator. The power supply is very much alive in the standby condition!

The Power Supply

The switch-mode power supply circuit varies slightly between models but will be familiar to those who have handled earlier Hitachi sets. Fig. 1 shows a representative example. It uses an MN650 (2SD1496) series chopper transistor (Q901), with voltage stabilisation achieved by means of thick-film module CP901. A feedback winding on the line output transformer synchronises the operation of the chopper and line output stages. The free-running frequency

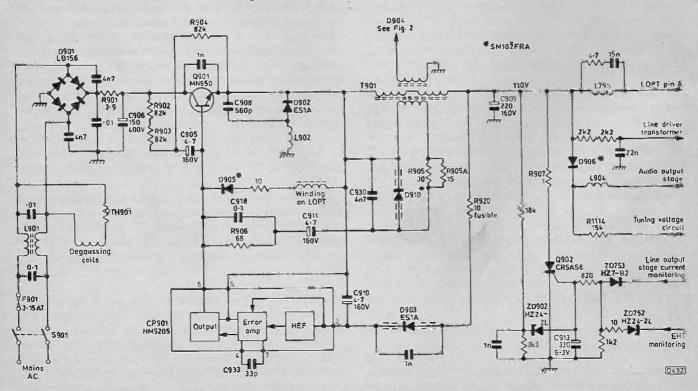


Fig. 1: The power supply circuit used in Models CPT2176/2476.

is determined by C911, R905 and R906.

Error comparison is carried out within CP901. Feedback at pin 3, from the secondary side of the chopper transformer T901, is compared with approximately 110V from the primary side of the transformer, at pin 5.

There are varations between models, the main difference being the fact that CP901 is type HM9024 in the CPT2174 and type HM9205 in the other versions. One point to remember about this type of power supply is that it is not mains isolated. Thus the AV sockets fitted to some models are isolated by means of optocouplers.

Faults

The power supply itself is very reliable. Most failures are caused by the line output transformer developing an interwinding short, which leads to destruction of the power supply. This is usually indicated by the fact that the chopper transistor Q901 has exploded! If you encounter this situation, replace the transformer (T761), assuming it is the original one, also Q901 and CP901, then check C911, C910, C905, R906 (56Ω) and ZD901 (11V) if fitted. C911 should be a 4.7µF, 160V electrolytic: early models may have a 2.2µF, 50V non-polarised capacitor in this position. Hitachi advise that this is replaced with the later type, positive connection to R906. In models that have the power supply on the main PCB there may be the remains of some hot-melt glue around the LOPT. Scrape this off, as it will have become conductive. The mains fuse F901 and the surge limiter resistor R901 (3.9 Ω , 7W) will usually have survived, so before you handle the panel make sure that the mains bridge rectifier's reservoir capacitor C906 is fully discharged.

As mentioned above, CP901 is a different type in Model CPT2174 compared to the other models. The two types are not interchangeable. Replacements come with the suffix A. With this a capacitor (C933) has to be added or changed. It's fitted between pins 4 and 7 of the module, and may not be present in sets without remote control though the holes are there. The suggested value was 100pF, but Hitachi now suggests 33pF or 47pF. If this capacitor is left out the power supply screeches. My experience has been that the exact value depends on the set. With too high a value the power supply will whistle. The value may have to be as low as 15pF. Make sure, when fitting CP901, that it is positioned vertically and away from Q901's mounting bolt.

Before running the set, disconnect L795 in the h.t. feed to the line output stage and apply the mains supply via a variac, building up slowly to about 120V. If the power supply appears to be working without distress, apply the full mains voltage – this type of power supply doesn't seem to like being run up on a variac! Reconnecting L795 should get the set running again.

If the set is intermittently dead, resolder both earthing tags on the line driver transformer T721. It's advisable to do this with any of these sets.

An annoying buzz from the set is usually, as with many Hitachi models, caused by the mains filter choke L901. This item is cheap to replace, so it's not worth attempts to silence it.

The cause of a dead set with a ticking noise and low h.t. was traced to C910 (4.7 μ F, 160V). Ageing capacitors are often the cause of no-go faults – a capacitance meter comes in handy.

CP901 can be responsible for odd faults including lack of height and a hum bar at the top of the screen. The 110V h.t. voltage seems to be very critical.

Over-voltage protection is provided by the CR5AS8 crowbar thyristor Q902. Its gate monitors the voltage at pin 5 of the line output transformer T761 via zener diode ZD752.

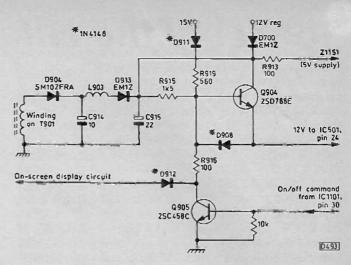


Fig. 2: The remote control on/off switching circuit. Q905 is switched on for standby, switching off Q904 and thus the 12V supply to the line oscillator circuit in IC501.

the current through the line output transistor Q781 via zener diode ZD753 and (not all models) the h.t. voltage via ZD902. These items can fail, giving the impression that the line output transformer is faulty. Q902 can become thermally intermittent and is best checked by substitution.

The Line Output Stage

The line output transformer is responsible for most service calls with this chassis. The versions used in 21in. and 24in. models are not interchangeable, being different both physically and electrically. They fail in various ways. Presenting a dead short across the h.t. line is one possibility. This gives the impression that the line output transistor is short-circuit: it rarely is. You get no other damage with this fault condition. The most common situation is that the set works for a couple of seconds then trips. It's worth checking ZD752 and ZD753 (types vary between models) for leakage, but the cause is usually the transformer. As mentioned previously, it can also be responsible for failure of the power supply.

The price of a transformer for a 24in. set from Hitachi is over twice that of the one for a 21in. set. This might make the repair of a larger-screen set uneconomic. Fortunately however pattern parts are available. They seem to give good results, and are often to BS specification. Some of the more obscure transformers (usually of a garish colour) are not as reliable and their safety is not proven.

The Field Timebase

The field output stage is based on a uPC1378H/LA7830 chip, IC681. The most common fault is intermittent cramping at the top of the screen. This can be caused by a dry-joint, but it's best to remove the i.c., thoroughly clean the PCB print and fit a new chip, using plenty of heatsink compound.

If the chip has gone short-circuit R762 (2- 2Ω fusible) will be open-circuit. This resistor sometimes fails for no apparent reason, but it's wise to replace the chip at the same time.

C611 (0·1 μ F) can be responsible for lack of height, C686 (2·2nF) can cause lines at the bottom of the screen while C682 (100 μ F) can be responsible for lines at the top.

The Colour Decoder/Timebase Generator Chip

IC501 (M51338SP) carries out the colour decoder and sync/timebase generator functions. If the set is dead with

the power supply fuctioning, check for 12V at pin 24 of IC501 and at pin 7 for the line drive output, assuming a remote control set. If the 12V supply is missing, check the standby switching transistors Q904 and Q905 which are controlled by pin 30 of the microcontroller chip IC1101. If the standby 12V supply is missing at Q904, check R926 (if fitted) and D904 in the power supply. The main 12V supply is derived from pin 3 of the line output transformer, via the 1Ω fusible resistor R761 and rectifier diode D761, and is stabilised by Q791 (2SD882). This supply is applied to pin 25 of IC501.

Because of the different versions/manuals and the two 12V supplies, faults here can be a little confusing. A strange fault can occur when the conditions around Q904 and Q905 change. The set works, but when standby is selected the timebases continue to run leaving a peak white raster with no sound. Slight leakage in one of the transistors or the associated diodes can cause this: alternatively in one set we had R919 and R916 had been transposed during manufacture! As previously mentioned a set that starts up only to shut down within seconds has a faulty line output transformer that's causing protection circuit operation or a protection circuit fault, while intermittent operation should lead to a check for dry-joints at the metal tags of the line driver transformer T721.

The colour decoder section of IC501 is fairly trouble-free, the on-screen display circuitry being responsible for most faults whose cause appears to to lie in this area. A peak white raster should lead to a check on the transistors Q301 (2SA673C-D) and Q302 (2SC458C-D/2SC1740Q-R) which couple the luminance signal to the tube base panel. IC501 supplies colour-difference signals, at pins 1, 2 and 3, to the RGB output stages on the c.r.t. base panel, via the teletext board if one is fitted.

Luminance and beam-limiting faults, such as smearing or crushing, are often caused by the on-screen display driver transistors, which can sometimes give the impression that the c.r.t. is tired. Also check Q1112 and the associated diodes for this fault.

Failure of IC501 in a 24in, set can be caused by tube flashover. Later versions are fitted with an improved tube base socket. It's slightly conical, the original one being cylindrical. When replacing IC1101, IC501 or any onscreen driver chip or transistor it's vital to check the tube base socket and if necessary change it to the later type. Fig. 3 shows the modification required. This problem does not seem to affect 21in, sets as much, but tube base socket replacement is often a sensible precaution to take, especially if any chips have previously been replaced.

Note that there are two mask numbers for IC501. If the replacement is not identical, there will be erratic start up. Fortunately modification is easy. For mask number SP-03 there should be a 330Ω resistor across C711. This resistor should not be present with the SP-01 version.

Tuning and the On-screen Display

The microcontroller chip is IC1101. It works in conjunction with the non-volatile memory chip IC1102 and the on-screen display generator chip IC1104. No, I don't know what happened to IC1103! Things start to get complicated with the suffixes used here, since different versions of the chassis have different chips.

IC1101 is type M50161-554SP for Model CPT2174, type M50432-551SP for Models CPT2176/2476, type M50432-552SP for Models CPT2178/2478. IC1102 is type M58655P in remote control and teletext sets, type M58658 in Model CPT2174. IC1104 is type M50143-006P in the

CPT2174, type M50450-023P in Models CPT2176/2476 and type M50450-030P in Models CPT2178/2478.

Confused? You will be if you fit the wrong ones! This can result in hieroglyphics instead of captions. I have to admit to fitting the wrong control chip once and telling the customer that the new one was programmed for the Japanese market, the strange symbols being intended for that market. He was very impressed, and showed his friends. Luckily none of them were Japanese!

A feature with teletext sets is that you can write your own captions on the screen for each channel – it's wise to check whether anyone has been adding rude comments instead of the channel names, especially if you intend to sell the set as a reconditioned one!

Possible faults include a lively set with no on-screen display or a set stuck in standby because IC1101 is faulty. If the channels can be tuned in but not stored, suspect lack of the -30V supply at pin 2 of IC1102 because zener diode ZD1152 is leaky: if this supply is present, IC1102 is suspect.

A bright red or green screen, red fringeing, weak or poor luminance, poor contrast or the impression that the c.r.t. is tired can be caused by IC1104, D1120 or Q1112. As previously mentioned, check that the tube base socket is the later type when replacing semiconductor devices in this area.

Various odd faults can be caused by spillage through the front, especially with non-remote control sets. To tune manual sets, turn the preset knob on then hold the recall button together with the + or - buttons for fast tuning. Fortunately the silver buttons and the associated switches give far less trouble than with previous models.

A complaint you sometimes get with Model CPT2176 is that the 'normal' settings are wrong – the colour too high and the brightness too low. To cure this, add a $22k\Omega$ resistor in parallel with R1139 and reset the grey scale. The resistor is part of CP008, to the left of IC1101.

Signals Circuitry

The tuner is either a Mullard U743 or an Hitachi special type ET568A. They are not interchangeable. On odd occasions they can be responsible for drifting. We have experienced no i.f. circuit faults.

Sound Faults

The audio output stage uses a pair of 2SD401 transistors, run from the h.t. rail, and an output transformer. The transistors can be responsible for distorted sound but the cause is more likely to be leakage through the hot-melt adhesive that anchors them. In cases of intermittent sound, don't forget the headphone socket. According to Hitachi Q1108 can cause loss of volume control operation, but we've not come across this one.

A modification to cure a buzz with VCR sound is to reduce the value of R224 from $68k\Omega$ to $18k\Omega$.

Teletext

The teletext panel comes as a shock to some – not an SAA device in sight! The circuit uses a Texas design which has its own peculiarities. Not the least of these is the lack of a hold button, using instead the idea of storing the page as a sub-page in memory. This is fine – unless the customer is familiar with conventional teletext.

Faults here are usually 'one-off', generally because of a chip failure. It's a good idea to make sure that the supplies are correct before diving in with the desoldering gun. A

display that consists of only the top line can be caused by IC2102 (TMS3551), which can also be responsible for no text sync. IC2108 (4016) can also cause this latter fault. If there's no text but the set switches to text it's helpful to have a spare panel for test purposes, as IC1101 or the power supply can cause this. But almost any chip on the panel can be the cause. In view of the age of the sets and the cost of the chips, text faults are often uneconomic to repair. This is not very satisfying from the engineering point of view, but it can lead to a large sigh of relief! Things got worse with the G8 chassis, which has a smaller and less accessible PCB, a more complex circuit and double-sided print. . .

The Tube Base Panel

The RGB output and on-screen display output transistors are on the c.r.t. base panel. Remote and text versions are more complex because the graphics are in two colours and, for improved teletext handling, the RGB output stages each use two transistors. The arrangement is unusual in that the text is injected, in colour-difference form, after the colour decoder chip, with separate output transistors for the red and green on-screen display graphics, the Y signal then being blanked. This is why the circuit can give such strange faults. As a help when fault finding, the OSD signals can be disconnected at the panel while the text panel can easily be eliminated. Tube base panel faults are confined to the odd transistor failure.

Miscellaneous Matters

Flashovers can cause the set to go into the standby mode – replacing the tube base socket (see Fig. 3) provides a cure

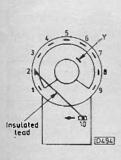


Fig. 3: The modified tube base socket, which has integral spark gaps to prevent the failure of i.c.s as a result of flashovers When fitting this socket to the PCB, pin Y must be cut off so that it does not protrude beyond the central boss and bend pin 10 in the direction shown by the arrow. After fitting to the PCB, connect a length of insulated wire between pins 2 and 10. It should be 50mm long and stripped back 7mm at both ends. Wrap the wire once around pin 10 and dress it away from the copper track.

as long as the chips have survived. An unusual fault is the set coming out of standby at random intervals! This happens with some Mullard tubes that have a $1M\Omega$ resistor on the scan coil assembly: it goes open-circuit, allowing static build up to send a pulse to the microcontroller with the result that the set switches on. Strange, but true!

To cure pulling with VCR playback signals, increase the value of R706 and R716 from $2.7k\Omega$ to $5.6k\Omega$.

Conclusion

These sets are making their way into the ex-rental market and are well worth renovating. Despite the long list

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BU326A		STK7348	4.84	TDA1524A	1.72	TDA2600a	3.63	TDA4503	4.61
BU426A		STR4211	10.22	TDA1543	2.95	TDA2611a	.99	TDA4505E	4.85
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BUT11AF	.85	TDA1028	1.73	TDA2003H+V	.86	TDA3420	1.98	TDA4800	3.80
BUT12A	1.03	TDA1029	1.96	TDA2004		TDA3510	3.48	TDA4950	1.60
BUTIBAF	1.13	TDA1035b		TDA2005	2.40	TDA3541	1.84	TDA5600	4.60
BUT56A	1.10	TDA1035T	3.96	TDA2005	1.00	TDA3560 TFK	2.80	TDA5700	1.95
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BUW81A	1,99		NIC	TILE	-	ED		TDA7240	2.20
BUW84	1.00		NO	TLIS		ED		TDA7250	4.95
M58655P	4.85		-			_		TDA7255	5.21
SAA129302	8.55		C	ALL	U	5		TDA7272	1.75
SAA 1293 03	9.98							TDA7275	.96
STA441C		TDA1053	2.99	TDA2010	1.99	TDA3562 A	3.82	TDA7350	5.70
STK41212		TDA1057	4.89	TDA2030av	1.00	TDA3562TFK	3.78	TDA8115	2.12
STK4352	5.87	TDA1059b	.39	TDA2040V	1.99	TDA3564	3.20	TDA8138	2.79
STK5331		TDA1060	1.61	TDA2048	5.65	TDA3580	3.99	TDA8170	1.94
STK5332		TDA1082	4.12	TDA2270	2,42	TDA3592 A	3.48	TDA8172	2.60
STK5338	4.89	TDA1097	4.73	TDA2320	.78	TDA3640	5.80	TDA8173	2.95
STK5339		TDA1151	.49	TDA2510	4,40	TDA3651	2.41	TDA8175	4.12
STK5342	4.88	TDA1154	49	TDA2530	3.99	TDA3771	4.50	TDA8190	2.80
STK5372H		TDA1180p	1.55	TDA2540	1.06	TDA3803 A	4.75	TDA8196	1.68
STK5421	4 49	TDA1190z	.79	TDA2541	1.70	TDA4050 B	3.80	TDA8380	2.50
STK5422		TDA1220b	.80	TDA2542	1.09	TDA4280 U	4.15	TDA8443	3.65
STK5451		TDA1270	1.79	TDA2543	2.06	TDA4400	1.69	TDA8702	2.95
STK5464		TDA1412		TDA2545a	1.19	TDA4420		TDA9403	1.99
STK5466		TDA1510	3 29	TDA2546a	1,99	TDA4426		TDA9503	2.10
STK5471		TDA1515a	2 43	TDA2549	2.88	TDA4431		TMP8188	14.80
STK5473		TDA1516Q		TDA2556	2.27	TDA4437		TMP8189	14.85
STK5481		TDA1517		TDA2578a	3.99	TDA4440		TMP3555	14.99
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of faults recorded here they are very reliable, with just two components, the line output transformer and the c.r.t. base socket, giving rise to the majority of problems. The sets look modern, especially the 21in. version, give good results and have features that were well ahead of their time.

My thanks to Hitachi's computer brain dump for some of the more obscure faults mentioned above.

Useful Part Numbers

Tube base socket	2953101
MN650 (Q901)	2326622
HM9204 (CP901)	2371674
HM9205 (CP901)	2371675
LOPT (21 in. models)	2434274
LOPT (24in. models)	2434002
L901 (mains filter)	2122694
IC501 M51338SP-01	2913612
IC501 M51338SP-03	2913613
IC1101 (Model CPT2174)	2913561
IC1101 (Models CPT2176/2476)	2915081
IC1101 (Models CPT2178/2478)	2915082
IC1104 (Model CPT2174)	2368742
IC1104 (Models CPT2176/2476)	2915091
IC1104 (Models CPT2178/2478)	2915092
Flap (Model CPT2174)	X252892
Flap (all other models)	3796811

Those who do not have an account with Hitachi can obtain spares from Charles Hyde and Son Ltd., Prospect House, Barmby Road, Pocklington, Yorks YO4 2DP, telephone no. 01759 303 068, fax no. 01759 303 620.

Eutelsat's Hot Bird

Eugene Trundle

For all but a very small minority – the satellite enthusiasts – Astra and BSkyB have monopolised satellite viewing since direct-to-home transmissions started six years ago. The price at which complete Astra receiving outfits are currently being offered in multiple stores – less than £100 – represents little more than a four-month movie-package subscription, which is obligatory when you buy at this price. At this price there's little incentive for the independent dealer to try to compete, and very little profit if he does – especially if any sort of call-back is required. Neither is there much joy

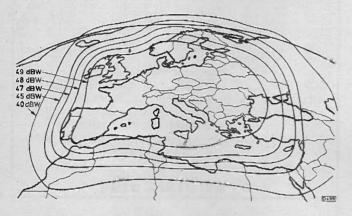


Fig. 1: Hot Bird 1 super-widebeam footprints.

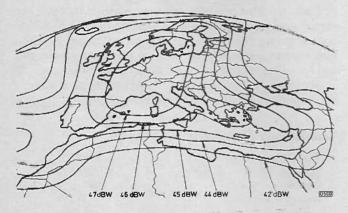


Fig. 2: Eutelsat II F1 widebeam footprints.



Fig. 3: Eutelsat II F1 superbeam footprints.

or profit for professional riggers in fixed-dish, single-feed Astra installations, whose price is similarly cut to the bone.

Significance of Hot Bird 1

The many other TV satellites in orbit have relatively little appeal for the ordinary viewer. The situation has now changed however with the launch of Eutelsat's Hot Bird 1. This relatively high-power satellite, positioned at 13°E, is dedicated to public broadcast transmissions. It's co-sited with Eutelsat's II F1 craft, and in 1996 and 1997 will be joined by Hot Birds 2 and 3, with more powerful transponders.

Most of the European countries are members of Eutelsat, which was established in 1977. It has long been in the businesses of public telephony, mobile communications, business services, satellite newsgathering and point-to-point links – as well as broadcast TV. The organisation at present has eight satellites in operation over an arc that ranges from the original Eutelsat I F1 at 48°E to Eutelsat II F4 at 7°E.

Hot Bird 1 has been operational since April, with 70W per channel. This compares with 45W for Astra 1A and 60W for the later Astra satellites. Hot Birds 2 and 3 will have 110W transponders. This will permit the use of smaller dishes in single-feed, direct-beam systems. It's likely however that the main limitation on dish size reduction will be interference from adjacent satellites rather than signal strength.

What's on Offer?

Table 1 lists the programmes currently available from Hot Bird 1 while Table 2 shows what's on offer from Eutelsat II F1. The co-siting of the two satellites ensures that a Hot Bird installation will also pull in the II F1 programmes provided its gain is sufficient.

Although there are no premium movie channels so far—they will come in the fullness of time—there are programmes that will appeal to a wide spectrum of viewers, including those interested in music, news, adult features, Italian football and in particular science fiction. The sixteen transponders aboard Hot Bird 1 and II F1's 22, some of which are operated in the half-transponder mode, currently offer thirty TV channels and fifty radio stations. When Hot Birds 2 and 3 arrive, each with twenty high-power transponders, there will be the potential for seventy analogue or hundreds of digital TV channels.

Eutelsat hopes that 3.8m UK homes, representing fifteen per cent of the population, will be able to receive its transmissions by the year 2000. The 13°E slot is to be given over to TV and radio exclusively. Thus, so Eutelsat maintains, a receiving installation can be regarded as an investment. Certainly 13°E at present has more in-the-clear channels than any other location.

Technical Details

Hot Bird 1's transmissions are in the FSS band (10-95-11-7GHz). They range from $11\cdot2$ to $11\cdot534$ GHz (carrier

Table	1: Hot	Bird 1	channels	and free	quencies.
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Channel	Frequency (GHz)	
Canal Horizons	11-408V	
CLT	11-492V	
CLT	11-534V	
EBN (European Business News)	11-263H	
EDTV (Emirates Dubai TV)	11-513H	
Eurosport	11-387H	
MCM	11-304H	
MTV Europe	11-242V	
Polsat	11-428H	
RAI Uno	11-336V	
RAI Duo	11-449V	
Sci-Fi Channel	11-283V	
TV5	11-325V	
TVE International	11-220H	
TV Polonia	11-471H	
One other to be announced.		

frequencies). The co-sited Eutelsat II F1 has seven wide-band (36MHz) and five conventional (27MHz) transponders in this band plus nine conventional and one wideband transponder in the Telecom band (12·5-12·75GHz). By 1997 Hot Birds 2 and 3 will introduce an extra forty transponders that will operate in the DBS band (11·7-12·5GHz). One implication of this is that a 10GHz LNB will be o.k. for the present but will not provide reception of the forthcoming Hot Bird 2 transmissions.

Field-strength footprint diagrams for Hot Bird 1 and Eutelsat II F1 are shown in Figs. 1, 2 and 3. In general a 60cm dish is adequate for direct-on-beam reception, assuming a modern LNB, though an 80cm dish is preferable – to minimise the risk of co-channel interference from adjacent satellites. For Ireland and Scotland the corresponding rule-of-thumb sizes are 80cm a 1m.

Practicalities

Much as Eutelsat would like to see dish/LNB combinations pointed solely at 13°E, in practice few of those who have splashed out on a new receiver and dish, or an upgrade, will want to miss out on Astra/BSkyB at 19·2°E. So the norm will be a single dish that gives reception from 13° and 19·2°E.

There are three ways of going about this. First to move the complete dish/LNB assembly between the two locations,

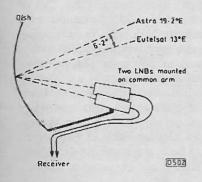


Fig. 4: The single dish, dual-feed system.

using a motorised system. Secondly to use a motorised arm to move the LNB so that it points at different parts of a fixed dish. Thirdly to fit two LNBs, each aligned for reception from either location via the fixed dish. The ultimate way of implementing this last approach is to use the SMW

Table 2: Eutelsat II F1 channels and frequencies.

Channel	Frequency (GHz)
BBC World	11-620V
Deutsche Welle TV	11.163V
Euronews	11-575V
Eurotica	11-181H
Kabel 1	11-055H
Landscape Channel	11-181H
MBC (Middle East Broadcasting)	11-554H
NBC Superchannel	10-987V
Polonia 1	11-673H
RTL 2	11-095H
RTLTV	11-596H
TRT International	11-181H
Viva TV	11-006H
Viva 2	11-146H
Worldnet	11-163V
There is capacity for other chann some transponders are shared.	els. Note that

multi-focus dish shown in the June issue, on page 580.

A fully-motorised system is not really appropriate for use with just two satellites in a domestic/entertainment set-up. The motorised arm technique is both more expensive and less reliable than the dual-feed system (see Fig. 4), which

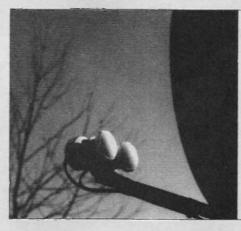


Fig. 5: Two LNBs in a dual-feed arrangement.

looks as if it will come to be the most widely used approach. It also has the advantage of offering simultaneous reception from the two satellites, for separate viewing or recording from one while watching a programme from the other.

The dual-feed system consists of a single offset dish (recommended size 80-85cm in England and Wales, 1m in Ireland and Scotland) with two separate LNBs at the end of the boom. These look at the dish from slightly different angles. Both the LNBs should be of the enhanced type (with 9.75GHz local oscillator) or, ideally, of the universal type (see later), and have their own separate double-screened, high-quality coaxial cable feed to the indoor receiver.

The accompanying photograph (Fig. 5) shows a dual-feed arrangement. Many dual-LNB mounting brackets are available for the purpose, costing typically about £15 retail. But if possible it's best to buy a bracket produced by the dish manufacturer: this will ensure correct positioning and focusing.

Alignment and Fixing

If the dish is fixed so that it's aligned with one satellite and is then fitted with a second LNB on a 6° bracket, the loss with this second feed will be typically 1-8dB. If, on the other hand, the dish is aligned midway between the two satellites and the LNBs are equally offset from the centre line, the loss with each feed will be little more than 0.5dB. With the first approach the idea is to aim the dish and the 'primary' LNB at the less powerful satellite, offsetting the LNB that will be used for reception from the more powerful satellite. Our experiments however suggest that to align the dish to a mid position is better – there's a useful alignment aid in the shape of Eutelsat II F3 at 16°E. This approach also minimises the risk of interference from other satellites.

With this dual-feed technique the vertical alignment of the wall bracket, and hence the centre-line of the dish, becomes important. Greater care with drilling and alignment is required. There's an elevation difference of about 0-75° between the 13° and 19° orbital slots.

The other physical point to bear in mind is the size and diameter of the two LNBs. Some are too fat to sit easily side-by-side with a 6° spacing. A 40mm diameter clamp is becoming the norm – some older non-standard shapes and diameters are difficult to adapt for dual-feed operation.

Alignment of the dish and the LNBs is more difficult than with an Astra-only set-up, requiring greater care with switching system to select the LNB or, with a multi-band LNB, the required band. This is programmable with user-set software. You can get stand-alone tone generators and receiver/switches to adapt non tone-equipped gear. The 22kHz selection tone is superimposed on the LNB's supply voltage (13V for vertical polarisation, 17V for horizontal polarisation) at an amplitude of 600mV.

The receiver itself needs no special features for reception from 13°E. As with Astra reception, suitable decoders will be required for scrambled/encrypted transmissions. Today's receivers will not be able to handle the digital broadcasts that are expected to be with us before too long. The analogue transmissions will not disappear overnight of course, rending receivers obsolete. More relevant perhaps for future-proofing is the type of LNB you use for new 13°E or dual-satellite reception.

The Universal LNB

The first of a new breed of 'universal' LNBs is the Continental Microwave UA type. It's designed to give reception of the entire 2.05GHz frequency spectrum (10.7-12.75GHz)

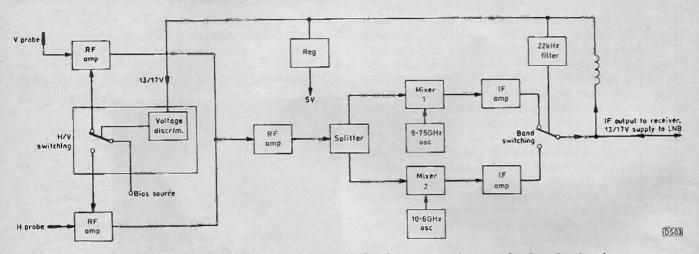


Fig. 6: Block diagram of a universal type LNB with tone switching for band selection.

the direction setting of the dish itself. The dish should be fixed and tightened before aligning the separate LNBs for maximum signal pick up.

A spectrum analyser type instrument is best for dual-feed installation work – the common dish-peaker or sat-finder type can give confusing results with their all-embracing, untuned and uncalibrated readout. The Satlook, a new and relatively cheap instrument available from Satellite Solutions (01604 787 888), is helpful for this type of work. It displays the satellite spectrum, picture and signal level, though it's not calibrated in terms of absolute signal strength. It also has 22kHz tone generation and 13/17V powering, comes with a battery charger and carrying case, and is amenable to being hung from the neck. Its price is just under £500 trade.

LNBs and Receivers

With two LNBs the ideal receiver is obviously a dual-input type. Many are currently available – the Amstrad 550, Echostar 800, Grundig 250, Maspro ST8 Mk II, Nokia 1700 and Philips 824 are examples amongst budget/domestic models. There are several types of LNB selector, automatic and manual, for use with receivers that have only a single LNB input. Manufacturers such as Global Communications supply them.

The latest LNB and receiver ranges have a 22kHz tone

used for TV (and other purposes) in the Ku band. As the design of an indoor receiver than can handle a frequency range of 2GHz is difficult, the universal LNB switches between low-band (10·7-11·7GHz) and high-band (11·7-12·75GHz) operation. This is done by using two separate local oscillators that run at 9·75 and 10·6GHz, switched by the 22kHz tone, as shown in block diagram form in Fig. 6. The block-converted i.f. outputs are at 950-1,950MHz (low band) and 1,100-2,150MHz (high band).

Polarity is switched in the nomal way, by the 13/17V supply. The noise figure achieved is 1.5dB maximum in the low band, 1.3dB maximum in the high band. Polar rejection is 20dB minimum, conversion gain typically 52dB. Particular attention has been paid in this design to the phase stability of the local oscillator: phase noise is a factor that will become important when digital TV transmissions, which use phase modulation of the carrier signal, come into general use. Intended as an industry standard for Europe, this is the most future-proof LNB available at present. It's retail price is understood to be in the region of £100, with normal trade discounts offered.

In Conclusion

Eutelsat is very actively promoting 13°E reception. There's a dealer/installer helpline at PO box 846, Bristol BS99 5HR - telephone 0117 925 3525. Point-of-sale

material, system information, programme information and schedules, technical advice, planning permission help and even a Fax-back site survey service are available.

To simplify installation, setmakers are being encouraged to factory-preprogram receiver software for the Hot Bird and Eutelsat transmissions so that their sat boxes come pretuned and even captioned. Pre-assembled dual-feed LNB brackets and fitments are to be made available to speed dish installation and alignment.

Many satellite equipment wholesalers have special offers and package deals for dual-feed outfits and upgrade kits. Typical examples are a conversion kit that consists of a clamp plus an 0.9dB enhanced (10GHz) LNB for £26.95; and a dish pack that consists of an 80cm dish (pole- or wall-mounting), a dual LNB bracket and a pair of 0.9dB LNBs for £49.95. These prices are trade only, exclusive of VAT, from Satellite Solutions. Non-trade customers can obtain upgrade and dual-feed packages from Trac (01642 452 555) and M.A. Riley (01604 602 959).

Test Case 392

Cathode Ray peered again at the display on the oscilloscope screen as the playback picture produced by the newly-repaired VCR juddered and rolled vertically. He was examining the off-tape f.m. playback signal envelope at field rate, and couldn't see much wrong with its shape. But it wouldn't synchronise the field scanning of either of the monitors he'd tried, though the picture produced by the little Hitachi set didn't jig up and down quite as much as the picture produced by the little Tatung set. . .

Ray had replaced the middle-aged machine's upper drum. The old one had been worn out and had produced a very spotty, streaky picture. It hadn't rolled or juddered until the drum change however. There was little doubt therefore that the new fault arose in some way from the repair – the E-E pictures were steady enough.

This sort of thing normally arises because of poor signal transfer from the tape to the video head at the very start of the head's scan across the video track on the tape. The two most common causes are physical misalignment of the entry tape guide at the left-hand side of the head-drum assembly, and insufficient tape back tension. Both conditions are part of the routine checks and adjustments that follow replacement of a video-head drum, and both had been very carefully checked a dozen times! - by Ray. With both scope beams producing displays, one to show the drum flipflop waveform (SW25) and the other the envelope waveform, and the scope's sweep triggered by the flipflop waveform, Ray was able to examine the shape of the f.m. envelope closely. Guide adjustment had made it straight-edged and full-bodied, while X (lateral) adjustment of the audio/control head during playback of an alignment tape had optimised the tracking for maximum signal amplitude at the mid-point setting of the tracking control. So what could be wrong?

Ray set up the scope for maximum horizontal expansion (X gain) and adjusted the sweep trigger control to magnify the portion of the signal envelope corresponding with the beginning of the head sweep. There was no 'bottlenecking' or signal shortfall there. Tweaking the tape entry guide obviously couldn't improve on that. As he slowly wound the guide in either direction the amplitude of the f.m. signal display on the scope's screen dropped sharply, which certainly didn't help the stability of the picture!

If the envelope signal was correct, what could be wrong with the video signal derived from it? Ray switched back to single-beam operation, turned the scope's gain control down and connected the test probe to the video-out test point. With the scope sweep still running at field rate, he carefully examined the waveform now displayed. As far as he could see nothing was missing.

Ray appealed to Sage for help. That gentleman had problems of his own, in the shape of an ITT Digivision TV set that had been on his bench all morning, but he came and peered, with Ray, at the display on the scope's screen, zooming in on the field sync pulse component of the composite waveform. Sage got the second beam up and running and very soon discovered the cause of the problem – and cured it!

What had Cathode Ray forgotten in his attempts at fault diagnosis? Certainly the problem was to do with the head-drum replacement job, but the new heads were not in any way faulty. Neither was there anything wrong with the guide alignment or the tape back tension. The solution will be found on page 725 – but don't go there until you've given it some thought!

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Service Briefs from Toshiba

The following information is based on Toshiba Technical Bulletins CDH50-CDH54 issued between October 1994 and June 1995. This month we feature TV Receivers.

Model 155R9B

No control over brightness although the graphics scale alters: Replace leaky 1N4148 diode in position D204, part no. 23115599T.

Models 156R9B/T9B

Field creep from the bottom when the set is hot: Replace ZPD24 zener diode in position D322, part no. 23118982.

Models 175R9B/T9B

Faint vertical lines from the left-hand side of the screen to the centre: Replace C902 (4,700pF, 1-6kV) on the tube base panel.

Model 210T6B

Lack of height and width at switch on: Replace C814 (100µF, 50V).

Model 259D9B

Patterning on white scenes, sometimes turning black: Replace the 1µF capacitor CV01 on the back terminal PCB, connected to pin 6 of the TA8628N chip ICV01.

Model 289T6B

Dead set: Cause could be Q801 (type 2SD1279, part no. A686553) going short-circuit because C811 (0·47μF) is open-circuit. If so replace Q801 and C811.

Model 1400RB

Stuck in standby: Replace leaky 5.1V zener diode in position DA43, part no. A7116325. Clue is that the 5V supply to the microcontroller chip is low.

Model 1400TBT

Tuning drift: Replace leaky 1N4148 diode in position DA17, part no. 23115599.

Power supply tripping or h.t. low at approximately 26V: Replace the 2SC3425 transistor in position Q803, part no. A6361601. The transistor leaks when under load, measures o.k. with a test meter.

Field cramping: Replace R317 (7.5 $\bar{\Omega}$, 0.5W) which can change value.

Screeching from chopper transformer T802; picture has a small kink on verticals: Power supply is not synchronised with the line timebase. Replace C811 (22nF) which goes low in value.

No colour: Can be caused by a base-collector leak in the 2SC2482 transistor Q510, part no. A6330059.

Model 1510TB

Intermittent dead power supply: Replace the 2SC3425 transistor Q803, part no. A6361601.

Models 2100RB/TBT

Loss of sync: R302 ($24k\Omega$) can go high in value or open-circuit to cause this fault. The clue is that the voltage at pin 33 of the TA8659AN chip IC501 is about 10V instead of 1:3V.

No station tuning: Can be caused by no line sync input to the microcontroller chip because QA09 (type BC557A, part no. 23114961) has failed.

Model 2112DB

Holds station until the channel is changed, then goes off tune; won't stop during search tuning: Replace leaky 1N4148 diode in position DA04, part no. 23115599.

Screeching noise from chopper transformer T803, h.t. voltage normal: Replace D811 (BYD33J), part no. 23118479.

Models 2112DB 2512DB 2812DB

Very intermittent switch off: Pin 52 (excess beam current protection) of the TA8783N chip IC501 is being activated in error because of a static discharge from the speaker grilles to the speaker body (chassis). If a static problem exists, change the cabinet. Otherwise connect pin 52 of IC501 to chassis at the nearest available point, using a short length of insulated wire.

Models 2132DB 2535DB 2539DB 2835DB 2939DB 3339DB

A different Nicam unit is used in later production receivers. It has an SAA7283ZP Nicam chip in place the the previous TB1204N chip and is not interchangeable. Although both modules fit physically, use of the wrong one will result in loss of sound. Part no. of the later unit is 23703040. The earlier unit is 2.5in. high, the later one 3.5in. high.

A different microcontroller chip (ICA01) has to be used with the later Nicam unit. Later and earlier microcontroller chips are not interchangeable. Details are as follows:

Model 2132DB: Earlier version M37210M2-580, later version M37210M2-681SP (part no. 23904757).

Models 2535DB/2835DB: Earlier version CXP85332-103S, later version CXP85332-111S (part no. 23904758). Note

that with the later version pins 25 (S/S) and 33 (WDT RST) are reversed: this can be identified by the additional wire links A (red wire) and B (yellow wire) on the component side of the PCB.

Models 2539DB 2939DB 3339DB: Earlier version CXP80424-166S, later version CXP80424-169S (part no. 23904759).

If a set fitted with the new unit reverts from Nicam to f.m. when hot either replace the Nicam unit or carry out the following modifications: change RD11 to $1.8k\Omega$ (from $2.2k\Omega$), change RD12 to $33k\Omega$ (from $100k\Omega$), change CD18 to 47nF (from 22nF).

Model 2145DB

Sound mutes with very bright scenes, reducing the contrast setting to half way avoids occurrence of the fault: Cure is to add a $1\mu F$, 25V electrolytic capacitor between the base of Q604 and chassis, on the print side of the PCB. Cause of the fault is that Q604 in the off mute circuit is being activated when the beam current is high.

Models 2145DB 2539DB 2545DB

These sets are fitted with the later Nicam unit referred to under Models 2132DB etc. above. The note on reverting to f.m. also applies to these models.

With models that use a CXP85332A-105S microcontroller chip in position ICA01, note that pins 25 and 33 are shown correctly connected in the circuit diagram but the pin function descriptions should be reversed.

Models 2512DB 2812DB

A blank screen with a Nicam display in white appears during channel change, the picture returning to normal when the display goes: Replace the TA8775N RGB switching chip ICY50, part no. B0383930.

Models 2527DB 2539DB 2927DB 2939DB 3327DB 3339DB (C2D Chassis)

Note that the base and emitter markings of Q841 (2SA1015) are shown incorrectly on both sides of the PCB and in the layout drawing. Fit the transistor as the white symbol on the PCB shows, i.e. the opposite way round to Q842.

Lack of width and height, picture and sound distorted: Replace R868 (270k Ω) in the low-voltage limiter circuit. This resistor tends to go high in value: all the power supply secondary voltages then fall.

No picture, sound o.k.: Caused by the top of the sand-castle being absent because D402 reduces the amplitude of the line-frequency pulse at pin 38 of IC501. Replace D402, type UZ33135B, part no. 23316367.

Teletext has slight drop-out, mix mode no sync and channel change no text in the ident box: Replace the 2SC3852 transistor in position Q861, part no. 23314141. Cause is the 5V +2 supply being low at 3.5V.

Channel indicator appears intermittently: Replace the 6.2V zener diode in position D864, part no. 23316313. Cause is the 12V -2 supply being unstable.

Models 2535DB 2835DB

Note that two different Dolby modules have been used in these models, part nos. 23148189 and 23703550. They are not interchangeable – the pin spacing is different.

Another point to note about these models is that the mains lead is located in a channel that runs underneath the back cover, from front to back. It's then routed up the back over a moulded support and is anchored with a cable tie. This is done to prevent damage to the lead when the set is moved around on a flat surface. After servicing, the lead must be relocated in the same way as it may otherwise be damaged. Push the cable tie off rather than cutting it – so that it can be re-used.

At switch on scart 2 and 16:9 are immediately selected: Replace leaky 1N4148 diode in position DW04, in parallel with the base and emitter of OW04. Part no. 231115599.

Models 2539DB 2939DB 3339DB

No centre channel sound: Replace leaky 6.2V zener diode in position DA31, part no. 23316312. It's connected to pin 56 of ICA01 and pulls down the data line to the Pro Logic PCB.

No r.f. picture and sound, scart input o.k.: Can be caused by faulty solder connections to Q103 in the PIF unit. Resolder the connections and bend the transistor over to avoid contact with the PIF can's metal cover.

Model 2835DB

Stuck in standby: Can be caused by circuit protector ZP31 (type PRF1000, part no. 23144452) in the 27V supply to the field timebase going open-circuit. When this occurs the h.t. rises and the protection thyristor D471 is fired, activating the standby mode.

Intermittent loss of sync and teletext: Replace crystal ZF01, part no. 23153012. When this crystal is faulty the 27MHz text clock stops.

Intermittent audio muting with dark scenes, mainly with VCR or satellite TV signals: Increase the value of RB12 from $27k\Omega$ to $39k\Omega$.

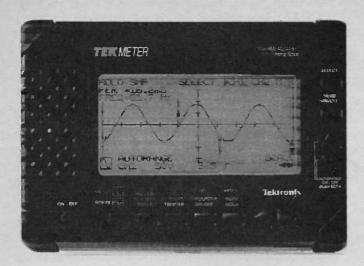
Repeated failure of the audio output chip IC670: Check C682 (100µF), C685 (1,000µF) and C686 (0·12µF) for leakage and replace as necessary.

General Points

New versions of several long-running models have been introduced. The basic model number remains the same, with 5, 6 or 7 added, e.g. Model 2100TB becomes Model 2100TB5. There are important circuit differences between the different versions however, including a new teletext module, microcontroller chip (ICA01), chroma/timebase generator chip (IC501) and remote control handset.

Different tubes have been fitted in several models. This may involve a front cover change. It's thus important to specify the tube type number when ordering replacements for either of these items. Models concerned are the 1400RBT, 2100TB5, 2101TB5, 2102TB7, 2145DB, 2500TB5, 2527DB and 2539DB.

NEXT MONTH: We feature VCR's



Test Report: The Tektronix TekMeter

David Botto

Tektonix' new TekMeter, Model THM565, could be the answer for the field engineer who is looking for a light-weight instrument that tests virtually everything. It combines the power of a true r.m.s. digital multimeter, an autoranging dual-channel scope and a whole lot more in a single, compact hand-held instrument.

General Description and Features

Its appearance is neat, with all the controls arranged on a single front panel. Weight was found to be only 1kg (2lb 3oz) on my scales, including batteries. Measurements are 140 x 210 x 43mm (5 x 8·3 x 1·7in.). A dimple pattern moulded into the case enables the instrument to be held with the left hand and operated with the right hand. Four well-insulated sockets at the top cater for the inputs: the red socket is marked DMM, the black socket COM while yellow and blue sockets are marked CH1 and CH2 respectively. These sockets have a tough appearance and should stand up to hard use.

The test leads are light and designed so that components on compact PCBs can be easily checked. They are well insulated and incorporate finger guards at the business end.

There are two versions of the TekMeter, Models THM560 and THM565. The THM565, which was the one sent to us for review, has extra features such as an event clock, extended built-in memory, a line test and a motor drive test. The latter can also be used with three-phase motors.

The bright, clear display uses an advanced, supertwisted liquid-crystal panel. Model THM565 has a useful electroluminescent back-lit display. A low-battery indicator appears at the upper right of the display when the internal battery voltage falls below a certain point. It's important that you don't expose the display panel to direct sunlight for long periods.

What makes the TekMeter so special? Unlike a conventional DMM, the large display shows all you need to see at a glance. It includes an autoranging numerical readout and an analogue bar readout. It also shows you max, min, max-min and hold readings. Computer-type menus select the required range and function. The TekMeter is controlled by an advanced

microprocessor and a hefty chunk of static RAM.

There's a handy facility for mounting the instrument on an ordinary photographic tripod. This can be useful in certain circumstances.

Voltage Measurements

The THM565's full-scale reading is 4,000 counts, or 3.75 digits. For d.c. measurements the manual or autoranging coverage is 400mV to 850V with an accuracy of ±0.5% of the reading plus five counts. The a.c. ranges cover 400mV to 600V with a resolution of 100mV in the lowest range: accuracy is specified as ±2% plus five counts, with a signal peak (true r.m.s. crest factor) to r.m.s. value ratio of three. The DMM ranges are all autoranging, though any range can be selected manually.

Measurements I made using precision voltage sources show that the TekMeter operates well within the claimed accuracy limits. My readings were as follows:

Precision source	TekMeter THM565	
1-21V d.c.	1-21V d.c.	
1.406V d.c.	1-40V d.c.	
2-39V d.c.	2.39V d.c.	
11-30V d.c.	11-30V d.c.	
16-00V d.c.	15-99V d.c.	
32V d.c.	32-10V d.c.	
17-0V a.c.	17-06V a.c.	
34V a.c.	34-19V a.c.	
240V a.c.	244V a c	

The clear, linear bar graph proved to be excellent for observing varying voltages.

The TekMeter is virtually auto-everything. This saves much time. Besides its autoranging facilities the instrument has max, min, max-min, hold and maths facilities. A DMM store/recall menu enables you to store and recall instrument setups.

Resistance Ranges

The six resistance ranges span, in decades, from 400Ω (resolution $0{\cdot}1\Omega)$ to the maximum reading of $40M\Omega$

(resolution $10k\Omega$). When I checked these ranges 1 found that the accuracy was spot on.

Diode Tests

The diode test voltage is 0.2V, the test current being 1.6mA. An excellent feature, in addition to the diode good/bad readout, is the ability to check forward and reverse diode voltages. You then have no doubt about the condition of the diode being tested.

Continuity Tester

The continuity test indication is an audible tone/graphic display arrangement. On screen you see a large picture of an open switch: when continuity of 150Ω or less is detected the switch visibly closes and an audible tone is heard. This test takes some beating for practical servicing work.

The Scope Functions

The meter/scope button selects either DMM or scope operation. In the scope mode the THM565 operates as a double-channel display device with buttons and menus to enable the required range to be selected quickly. The hold button freezes the display. Operation is autoranging, the display scaling and tracking automatically as the input varies. This provides the advantage of hands-free operation.

The built-in interface provides fast access to a whole range of features such as cursors, automatic measurements, true power and spike detection. Patented features are claimed to give you fifty times more information about the signal being measured. For example the 'dynamic display DSP' updates the signal a hundred times a second, providing the equivalent of an analogue display. You always see the real signal.

There are six vertical channel ranges from 5mV to 500V. The analogue bandwidth is d.c. to 1MHz at 5mV/div, d.c. to 5MHz at 10mV/div to 2V/div, and d.c. to 1MHz at 5V/div to 500V/div. Most TV/video work will be done at a range setting between 10mV/div and 2V/div.

The TekMeter seems to handle most TV and VCR signals without difficulty but it won't, when you are working on a modern PC, check the frequency of the central processor. CPU frequency tests are now normally carried out using specialised software however: such processors as 80MHz 486s and the powerful Pentiums are far too expensive to be put at risk of static or other damage by jabbing at their pins with test probes.

The horizontal timebase covers 60s/div to 200ns/div in a 1-2-5 sequence. A choice of triggering arrangements enables spikes to be captured at all timebase speeds.

Scope Use

To view a waveform you connect the common and channel one probes across the signal source. To view the channel two signal the common and channel two probes are used. The exact position of the triggering signal is always clearly shown. An electronic graticule system has provision for no graticle, crosshair or a calibrated grid display.

A comprehensive computer-type scope menu tree makes both manual and auto setups easy to understand. The store feature enables waveforms to be stored and

recalled as required. Model THM565 stores up to eight sctups, eight waveforms and eight screens. Selecting print provides hard copies of saved waveforms via an RS232C interface. Model THM565 date and time stamps the stored waveforms: this is shown on the printed hard copies.

Disturbances on mains and other power supply sources can cause obscure problems with some modern high-tech equipment, including PCs. Thus a fast method of detecting such disturbances can be very useful. With the scope test probes connected across the power supply exhaustive tests can be made using a special on-screen line-check menu.

It's important nowadays to be able to check the motors you find in equipment such as VCRs and CPs. Is the motor or its drive circuit at fault? Waveform checks will enable you to find out fast. This includes three-phase, delta-configuration motors. The waveforms and any faults can be clearly seen on the display, labelled on screen and with their phase differences shown.

Protection

The TekMeter is UL and CSA certified to 600V a.c. or 850V d.c. and is surge protected to 6kV. The case is solidly built and has a pleasant, chunky feel. It's also well insulated.

Optional Accessories

A soft case (THM5SCA) or alternatively a neck strap transport case (THM5HCA) is available. Whichever you choose costs £70. To save unnecessary expense with dry batteries a NiCad battery pack (THM5BAT) is available at £40. A mains/12V car cigar socket recharger (THM5CHG) is available at £130. An adaptor (THM5AC) to enable the TekMeter to be operated with a 240V mains supply can be obtained at £45.

The RS232 communications adaptor (THMCOM1) enables a printer or a PC with suitable software to be connected. Its price is £45.

Current probes are available to enable you to measure up to 500A a.c. (type A605), up to 2,000A a.c. (type A621) or up to 100A a.c./d.c. (type A622).

Conclusion

The TekMeter is a beautiful instrument and 1'd love to own one. My only reservation is that I would prefer to have vertical scope input channels with a wider bandwidth – even if this meant a higher price. The current price of the THM565 is £995 while the THM560 is £685. Both prices are exclusive of VAT. The TekMeter is sold via distributors. For addresses etc. and further details if required apply to Tektronix UK Ltd., Fourth Avenue, Globe Park, Marlow, Bucks SL7 1YD, telephone 01628 403 300.

If you decide to buy a TekMeter I'd recommend the THM565. As with all test gear, it's best to see and try out the instrument before buying it. The TekMeter will represent a substantial investment which will be with you for a long time.

Acknowedgement

My thanks to Barbara Rodriques for the loan of the test TekMeter and for supplying photographs and technical information.

TV Fault Finding

Reports from Philip Blundell, AMIEELE, Nick Beer, Chris Watton, Michael Dranfield, John Edwards, Graham Thompson and Tony Ashworth

Philips 3A Chassis

If you have a power supply fault and find that the BC369 transistor Tr7686 is faulty, take extra care in checking that the pin connections of your replacement match the circuit requirement. Check with the circuit diagram: take the writing on the PCB with a pinch of salt.

P.B.

Ferguson ICC5 Chassis

If the line output transistor has a short life, check CL48 in the flyback tuning circuit by replacement. The value varies with different models. It was 11nF in this case (Model 51K7).

P.B.

Philips 25PT410A (GR2.2 Chassis)

If the set always comes on in standby, and you have to use the remote control unit to get it going, the child lock in the special functions menu has been set to on!

P.B.

Philips 2A Chassis

If there's no sound or vision, the 140V h.t. supply line is at 40-50V and a screaming noise comes from the power supply, check whether the h.t. reservoir and smoothing capacitors C2697 and C2701 are open-circuit. They are both 47µF, 250V types.

P.B.

Samsung CI5937AN

This set was dead and whining. A check showed that there was a dead short across the h.t. line because the R2K, 170V overvoltage zener diode D808 had tripped. The cause was traced to a dry-joint at pin 2 of the optocoupler PC801 — there was thus no illumination within the device and no feedback.

Ferguson A51F (IKC2 Chassis)

When this set was switched back to standby a fairly loud plop came from the speaker. The owner hadn't complained about this and we were not sure whether it was normal or not. So we looked at the circuit and found the power muting system. Checks here brought us to CA15 (10µF) which you could say was open-circuit – it had never been fitted! According to the circuit the power muting system is not fitted in the 17in. Model 41P3.

Samsung Cl6837AN

This 28in. monster was dead: it whistled even in standby. I came to the conclusion that there must be a short on the secondary side of the power supply, even though one couldn't be measured, and was correct – the TDA2616 audio output chip IC603 was shorting to chassis internally under load.

These sets are menu-driven for the service adjustments. but the manual is a disgrace in this respect. A call to the

Samsung Technical Advice line will produce a clear version of how to gain access to and use the service mode. N.B.

Panasonic U4 Chassis

There was a burst of life at switch on, then the set went off as the protection system came into operation. A check showed that the h.t. rose to far too high a level. The feedback to the error detector transistor is developed across C808 (47 μ F, 16V) which had dried up and was virtually open-circuit.

Ferguson B14R (TX80 Chassis)

The red standby LED was alight but there was a rumbling noise from the set which would do nothing else. A check showed that the start-up voltage at RP71 (9·1k Ω) was very low, at about 1·1V. Rather interestingly, RP71 had fallen in value to about 8k Ω . But the cause of the fault was DP36 (BA157) which was short-circuit.

Panasonic Alpha 2 Chassis

This set was dead apart from a whine that came from the power supply. The 2SD1441RL line output transistor Q551 was short-circuit and the fusible resistor R567 in the feed to the stage was open-circuit. When these items had been replaced the set was still dead, the SR2KL overvoltage diode D854 having gone short-circuit. Removing this diode and disconnecting the line output stage enabled me to confirm that the h.t. voltage was much too high. The cause was IC801 (STR54041M).

Toshiba C1401B

This rather aged portable was dead. The mains fuse was black and the 2SD820FA-1 chopper transistor Q801 short-circuit. When these items had been replaced the power supply worked but was being heavily loaded by the line output stage, which we isolated by lifting R444. Not only was the 2SD869 line output transistor Q404 short-circuit but C464 (560pF, 2kV), which is in parallel with it, produced a resistance reading of 150Ω .

Ingersoll XK505B

This combi monochrome TV/cassette/radio was dead. A check showed that the small power supply circuit in the back of the cabinet produced just 4.5V instead of 9.8V. Its output couldn't be adjusted and the transistors there all read o.k. The cause of the trouble was the 100Ω set-voltage potentiometer SFR800 which was open-circuit all ways round.

Samsung Cl3351X

There was no red in the picture though the on-screen

displays were fine. The signals that produce the latter are injected after the RGB chip, so it was a question of working back from the output stages. The chroma delay line in this chassis is a TDA4661 chip, IC501. It's a perfect point for checking the R - Y and B - Y signals, as they loop through it. I soon found that there was an R - Y input at pin 16 but no output at pin 11. A new delay-line chip restored correctly coloured pictures.

Ferguson ICC8 Chassis

No picture was the complaint with this set, though it worked fine when put on test. The next day it failed: there was no vision though the tube's heater and e.h.t. supplies were present. Vision was restored when the video drive board CD17000 was flexed. On removing this plug-in subpanel we found that every through-the-board joint had been resoldered, as had the socket connections to the mother board. The cause of the trouble however was that the MELF devices CD41, RD42 and CD12 had not been correctly soldered from new: solder was present, but it had not taken to the pads. Correcting this cleared the fault.

Philips CP90 Chassis

Only the number 3 showed on this otherwise dead set. After a few seconds the display changed to F1. Checks in the power supply revealed that the 95V and 22V outputs were both missing, the former because the BYW95B rectifier D6695 was open-circuit and the later because the 400mA Wickman fuse F1690 had failed. I wonder which went first?

C.W.

Tandy CTV1406

There was no sound output from this Turkish-made portable, just a burp from the speaker at switch on. The supply to the discrete-component audio output stage was present but there was no bias as R132 (8·2k Ω) was open-circuit. C.W.

Philips 2A Chassis

This set ticked all the time it was in standby. At least I had to take others' word that it did, as my permanently whistling ears couldn't detect the ticking. Replacing C2690 (1µF, 100V) cured the fault. Thanks to Steve Cannon who reported it in the April 1993 issue (page 440). C.W.

Salora J Chassis

The problem with this set was no sound. So checks were carried out around the TDA2030 audio output chip ICB100. The 28V supply was correct at pin 5, the speaker was linked to pin 4, and audio could be seen when a scope check was made at the input coupling capacitor CB108. But the feedback/input pins 1 and 2 were both at 26V. Potential divider RB124/5 provides a bias voltage for these pins. RB124 (1.8k Ω) had risen in value to around 6k Ω , upsetting the d.c. conditions with the result that the chip was cut off. C.W.

Finlux 3021F

There was excessive width, with EW correction troubles. In addition bright pictures produced tearing at the top and bottom of the screen. We started by checking the supplies, which were all correct and smooth. Moving to the EW correction circuitry, we found that the waveform at pin 19 of ICH2 was incorrect. This pin is linked to pin 8 of the line

output transformer, the beam sensing point. The voltage here was varying much more than it should have done. Checks along this line brought me to CH29 (0·1µF) which was open-circuit. It's on the signals panel. A replacement restored perfect geometry.

Incidentally the set had been very poorly serviced in the past, with resistors and capacitors stuck on the wrong side of the panel on full-length leads. Criminal with such a good set.

C.W.

Ferguson A10RWH

The 1.6A mains fuse was open-circuit. As no obvious shorts could be measured we tried a new fuse. It shattered at switch-on. Further checks led us to a low-resistance posistor which crumbled when it was opened. The set is rather tedious to work on, as there are scores of wires to unclip then reclip afterwards. But it was nice to use my old 4BA nut spinner.

C.W.

GEC C2662H

This set had been plagued by intermittent loss of red for many years. Any attempt to repair it would restore the red, which might remain for months on end. We eventually found that R819 was going open-circuit, though the slightest movement would join it up again.

C.W.

Sony KV2075

The convergence was poor. As the customer said, everyone had red and blue lines around them. We traced the cause of the trouble to L551, a 27mH inductor in the Y bow correction circuit. Unfortunately A.N. Other had been adjusting those bits around the tube's neck.

C.W.

Unitra 349

This Polish made set is old-fashioned but very sturdy. The one we had in had an EW correction fault: after a few hours' operation the picture width would vary, with a concave effect. The EW driver transistor T660 was the cause of the trouble, a TIP41C making a suitable replacement. C.W.

Ferguson A59N (ICC8 Chassis)

The e.h.t. and other supplies were present but there was no sound or picture: just a volume-at-minimum on-screen display was present. The cause of this was the set's volume button being short-circuit. It's a membrane type assembly. Unfortunately the stupid thing is glued to the front of the cabinet.

C.W.

Matsui 1481B

Stuck on one channel, no remote control operation and no response from the set's on-board controls means microcontroller chip lock-out. Replacing R158 will cure the fault. But be careful. In the manual it's shown as a 315mA circuit protector (ICP401). It looks like a small, white wirewound resistor.

M.Dr.

Triumph CTV8209

The complaint with this set was flashovers from the tube's final anode cavity. After cleaning the bowl of the tube with trichloroethane and applying a smear of silicone grease the fault was still present though not as bad. We found that the

h.t. was spot on at 112V, but the e.h.t. was 32kV. So we removed and tested the flyback tuning capacitor. The digital capacitance meter said 8-2nF, which was the value stamped on the capacitor, but the manual said 10nF. When this value had been fitted and the height had been readjusted everything worked correctly. Could the set have been like this from new, or had the 'it's near enough' brigade been at work?

M.Dr.

Panasonic TX3 (Alpha 1 Chassis)

If you get one of these sets that is dead with 300V at pin 2 of the STR54041 chopper chip, try shorting out pins 3 and 4 of the standby control optocoupler D811. If this brings the set on, replace the optocoupler (ON3105TV).

M.Dr.

Hitachi CPT2218 (NP81CQ Chassis)

This set came in with field collapse. We had replaced the HM6251 field output module some months previously. A scope check at pin 4 produced a field-rate squarewave. Odd – this could only mean that the set was running without the effect of the field coils' inductance being present. So we checked the 220µF, 50V field scan coupling capacitor C610. It had dried out, a replacement restoring normal operation. M.Dr.

Sharp DV5150

This set would come on then, after two seconds, switch back to standby. We found that the 24V supply to the field output chip was missing because R612, a 3.3Ω safety resistor, was open-circuit. When we checked through our Sharp Technical Bulletins we found that there's a modification here. R612 should be changed to 2.2Ω , again a safety type, part no. RR-XZ0204BMZZ; and wire link J13 should be replaced with a 1.2Ω , 0.5W resistor, part no. VRD-RA2HD1R2J.

Toshiba 140R4B

There was an odd fault with this set. The local stations could all be tuned in and memorised but if, after changing channels, BBC-2 (ch. 24 in our area) was selected it would be slightly off tune. We came to the conclusion that the TMM842P memory chip was faulty. As we didn't have one in stock we tried a TMM843P from a 10in. Samsung set – after fitting a 16-pin i.c. base. It not only worked, it cured the fault.

M.Dr.

Sony KVX25TU (AE1 Chassis)

There was intermittent loss of the sound and picture, leaving a blank screen. Normal operation would be restored if the metal section that runs along the centre of the main board was tapped. All three legs of the 7812 12V regulator Q608 were found to be dry-jointed. For reliability with these receivers we resolder the chopper transformer's pins, the metal plate's through-board tags and C612 in the power supply.

J.E.

ITT CP3125 (Pico S/3 Chassis)

This set was dead apart from a brief flicker from the standby LED when the on/off switch was pressed. There was 300V at the collector of the BU902 chopper transistor Tr701, but the power supply wasn't producing any outputs. When pin 4 of the line output transformer T501 was disconnected we

got an h.t. reading of 97V. As no shorts could be measured in the line output stage we fitted a new transformer. This cured the fault.

J.E.

Goodmans 2185T

This set was dead and the customer said that two other dealers had refused to look at it. Although we didn't have the circuit diagram we decided to have a go. Checks around the STK54041 chopper chip produced a reading of around 300V at pin 3 but nothing at the other four pins. As there were no signs of any stress, such as an open-circuit surge limiter resistor or a blown fuse, we decided to take a look at the secondary side of the power supply. A CNX82A optocoupler lives here, so apparently some sort of h.t. monitoring and feedback to the primary side of the circuit is used. It seemed that the chopper chip was for some reason being told to switch off. There was nothing for it but check the few capacitors, resistors and transistors in the power supply individually. This paid off. After a few minutes we found that R104 (270kΩ) was open-circuit. As it showed no signs of having had a hard time we fitted a replacement. The set then burst into life. Some we win, some we lose!

Philips V7620 (K40 Chassis)

After a while the signals would disappear as the tuning drifted, leaving a snow-filled raster. By monitoring the tuner's VT pin during the fault condition we found that the voltage here dropped to 0.7V, though-the 33V feed via R3104 and D7104 to the tuning control PCB remained correct. To solve the problem we had to resolder all the joints on the tuning control PCB, spray switch cleaner on the edge connector and socket, and finally resolder the socket pins on the mother board.

J.E.

Bush 2114T

For normal colour in the text mode but only monochrome in the TV mode replace the TDA3562 colour decoder chip. But be sure to use only the Telefunken version. Others are not compatible.

J.E.

Grundig CUC41KT

This set remained dead although its power supply was producing the correct 124V and 18V outputs. There was no 12V supply to the timebases however as the TY40164 (7812) regulator had failed. It takes its input from the 18V supply. A replacement brought the set to life.

J.E.

Toshiba C2295B1

The screen would blank out intermittently, the sound remaining normal. We found that the $2-2\Omega$, 2W c.r.t. heater supply resistor R920 on the tube base was badly dry-jointed. J.E.

Bush 2114

This set would die after being on for two-three minutes. We found that the 5V regulator IC5 on the remote control/tuning PCB was getting rather hot and shutting down. The cause of the trouble was C22 (470µF) which was short-circuit. G.T.

Soundwave CTV1405R

The problem we had with one of these sets was intermittent low brightness. We found that C588 was dry-jointed. It's



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mounted near the line output transformer.

If one of these sets comes on in the child lock mode and the customer can't remember the code, press the programme up and down buttons on the set or the remote control unit together for a few seconds.

G.T.

Beko

All the Beko models we've had seem to have the same chassis. For field collapse, check R717 and R722 which go open-circuit.

G.T.

Alba CTV600

This set would shut down intermittently. To cut a long story short, the cause was eventually traced to a hairline crack in the print, near a screw that fastens the PCB to its plastic frame. The relevant section of print connects the emitter of the chopper transistor to chassis, via R914.

There are several screws through the PCB. The one that caused the trouble is near Q904's heatsink and the main reservoir capacitor.

G.T.

Elbex ECM1400 Monitor

This monitor was dead with no h.t. supply to the line output stage. The cause was simply that R254, a 1Ω safety resistor, had gone open-circuit. G.T.

JVC AV21F1EK (JX Chassis)

This set suffered from an unusual effect that looked like a

hum bar. Scope checks showed that there was indeed ripple on the h.t. line, but the cause proved to be rather elusive until L2001 in the chopper transistor's base drive circuit was checked. It was open-circuit (part no. CELC005-2R5).

T.A.

Toshiba 2112DB

Failure of the line output transformer (T461, part no. 23236427) seems to be quite a common occurrence in this model. After replacing it always check the standby operation as the standby switching transistors Q843 and Q845, which are in the power supply, are often damaged. T.A.

Philips 25ST2716/05B

The cause of distorted left channel Nicam sound was traced to the TDA1543 DA converter chip IC7168. This little eight-legged device is commonly found on CD player PCBs. Part no. 4822 209 73236.

T.A.

Sony KVX2562 (AE2 Chassis)

This set's problem was bands of field non-linearity through the picture. It looked as if there was ringing in the field output stage, but extensive checks here failed to reveal the cause. In desperation I swapped over panel M with one from another set. This cured the fault. The cause of the trouble turned out to be the CXD2018Q chip IC561. This 48-pin surface-mounted device provides the deflection circuit drives, under the control of the microcomputer chip. The part no. is 8-752-347-92.

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Satellite Workshop

Jack Armstrong

We get some curious customers in our workshop. This one was no exception. He hopped from one foot to the other in an agitated manner as he waited for me to finish soldering a tuner in place.

Too Much Skew

I looked up and he grinned nervously.

"It's got too much skew" he explained, thrusting a Swedish Microwave LNB and polariser at me. "I got it from this bloke but it won't work. It's definitely got too much skew and I can't get the channels. It got hot when I plugged it in, then the fuse blew."

Occasionally the mind boggles. Mine was boggling like mad. "Can you tell me what you did and what happened?"

"I got it from this bloke in the pub. It's an Echostar. When I connected the wires to the mains it went really hot and there must be too much skew."

Light began to dawn. After further questioning I discovered that he had fitted a second-hand satellite system. Not knowing where the ferrite polariser should be connected, he'd joined the wires to a mains cable then plugged it in. It had become a little warm. Unbelievable!

Equally unbelievable was the fact that I had one in stock. It was a more modern wideband type, but it was exactly the same size and shape. I'd ordered it last year for an enthusiast who never came back to collect it. I still had his £20 deposit. Mr Agitated seemed happy to give me £38 for it, so I fitted it to his LNB and explained how to connect it to the receiver. Armed with the telephone number of a local installer, he trotted away happily enough.

A Pace SS9200

Back on the repair bench I'd just completed the tricky job of fitting a Sharp tuner kit in a Pace SS9200 receiver. The old tuner had expired and even a nice new tantalum bead capacitor had failed to revive it. Soldering surface-mounted components is not my favourite pastime,

but they are part of the kit and I had made quite a neat job of fitting them.

When the receiver clicked into life however the decoded pictures looked distinctly streaky. I'd seen this before after fitting this kit and immediately replaced C21, the reservoir capacitor for the 12V supplies. It's a 2,200µF electrolytic rated at 105°C, but the high temperature rating hadn't saved it from the cooking it had received. Honestly, I think most customers keep their receivers in an oven! The picture was now better but still a little streaky. This was going to be tricky.

I decided to replace the connector on the decoder board, since it can cause the same effect. At this point my £600 desoldering station decided to clog its nozzle. Consequently a two minute job took fifteen minutes. A pity, because the streaky patterning was still present! In desperation I began to replace all the electrolytics around the tuner and at the secondary side of the power supply. No improvement.

At last I had a moment of inspiration. I increased the value of C125, which decouples the tuner's 5V supply, to 1,000µF. Result: a nice clean picture! Since Pace had supplied a 470µF capacitor to replace the original 10µF capacitor in this position, I guessed that the new tuner was particularly sensitive to noise on the supply rail. Increasing the value further had done the trick. A quick call to the Pace technical help line confirmed that they are aware of the problem.

By Post

A lot of my repairs arrive by post. Most of them are reasonably well packed, but today the postman placed the parcel carefully on the floor then ran. As I picked up the box I found out why – it rattled. To be fair, it wasn't the postman's fault. This Ferguson SRVI (Pace SS9000) had been squeezed into a box which was an exact fit. There was no resilient packing and the cardboard was single layer, not corrugated. It hadn't stood a chance.

When I pulled the receiver out, the front panel was detached and the

cover had a large dent in it. I thought it was a no-hoper. But on removing the screws to look inside I found that there was just a tiny crack in the PCB – and it hadn't gone right through.

There was no letter with the unit, but a 'Postit' sticker said "Faulty, please fix and add a crystal for more channels".

I removed the PCB and inspected it more carefully for damage. Apart from the tiny crack and the usual signs of overheating there wasn't any. I replaced C9 in the power supply, always a wise precaution, then connected the receiver to the mains supply. It zipped into life but, with the decoder board removed, it produced a blank screen. When I switched to channel two a mass of horizontal lines with a hint of a picture behind appeared. The audio was fine and I immediately suspected the infamous capacitor in the tuner.

The picture from the decoder scart socket was perfectly clear however. This is obviously not possible with a faulty tuner, so I began to poke around with an oscilloscope probe. Eventually I traced the cause of the problem to a dry-joint on a surface-mounted capacitor below the TEA2029 sync separator chip. As the picture was still a little streaky I replaced the various electrolytics that dry out around the tuner and in the power supply.

Having got a decent picture I replaced the decoder board and retested the unit. The decoder worked all right, but the 'please wait' message was very faint. Reference to the Satellite Secrets book published by Davenham Satellite Systems (I have a terrible memory) reminded me to check R92 on the decoder board. It had already been upgraded from $22k\Omega$ to $43k\Omega$, and the surface-mounted resistor R342, beneath C171 on the main board, had been replaced with a 680Ω resistor.

Having eliminated the most likely causes of the fault I checked the outputs from the power supply. This provided a clue: they were all slightly low. Someone had correctly removed the surface-mounted capacitor that makes the 100Ω resistor run hot but they had not fitted a 270Ω surface-mounted resistor in place of

the zero-ohms link next to the $43k\Omega$ resistor. Once I'd done this the voltages were correct and the decoder messages were much darker.

I was not sure whether the customer was serious about increasing the number of channels, but I decided to fit the ninety-channel upgrade kit from Davenham Satellite Systems (1 Firths Fields,

Davenham, Northwich, Cheshire CW9 8JB - 01606 49 085). It consists of a new microcontroller chip and a tiny board with an EEPROM on it. When I applied mains power the timer LED remained on for some twenty seconds as the new micro reprogrammed the memory chip. The receiver was now effectively an

SS9200.

The only problem that remained was the day age to the front panel. The best soldion seemed to be to fit a panel from a scrap SS9200IRD. It fitted the bill nicely. A quick polish with a quirt of WD40 and the unit was ready for packing. Properly this time, and the customer would be charged accordingly!

Help Wanted

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

Wanted: Lower drum assembly (or complete head drum assembly) for the Panasonic NVG10B. S. Oliver, Hunter's Moon, Roman Bank, Holbeach Bank. Spalding, Lincs PE12 8BN. 01406 423 966.

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

Wanted: I.F. panel (part no. VEP07186H) for the Panasonic NV830 VCR, with or without tuner. Carl Anson, 22 Church Street, Beaumaris, Anglesey LL58 8AB. 01248 810 758.

Wanted: Radio and Television Servicing books from 1981/2 to 1986/7. B.R. McLeod, 8 Cunningham Road, Horndean, Waterlooville, Portsmouth, Hants PO8 9LT. 01705 597 941.

Wanted: Service manual for the Uniden VM100 miniature LCD camera and monitor, or any information about this or a similar model. Also a service manual for the JVC HR7700/Ferguson 3V23. R. McGrath, 41 Belvedere Place, Dublin 1, Ireland. Wanted: Texas Instruments TMS9129NL video processing chip. Stephen Quantrill, 28 Berryfields, Brundall, Norwich NR13 5QE. 01603 714 221.

Wanted: Three-legged, 115V 5A regulator chip for the Sharp SP2 Mark 2 CTV chassis. R. Lane, 29 Hawthorne Crescent, Gilesgate Moor, Durham DH1 1ED. 0191 354 3843.

Wanted: Service manual and source of spares, specifically the mains trans-

former, for the Quen Data Excellence 70 typewriter. I.J. Radford, Forge House, Bromsash, Ross on Wye, Herefordshire HR9 7PJ. 01989 750 288.

Wanted: Any information on the Beckman HV211 high-voltage probe. Lance Williams, Kemberton, Ribchester Road, Blackburn. 01254 249 668.

Wanted: Service manual/circuit diagram (photocopy would do) for the Atari SM125 high-resolution mono monitor. E.S. Gitsham, 17 Grimston Lane, Trimley, Ipswich, Suffolk IP10 0RU, 01394 275 261.

Wanted: Circuit diagram (photocopy will do) for the Spectrum Plus 3 computer. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne and Wear NE28 7JF. 0191 262 0712.

Wanted: Circuit diagram or any information on an external plug-in module, part no. 8087016, for the B & O VX5000 VCR. It's a remote IR sensor to enable the VCR to be used with a non-B & O TV set, to provide direct control rather than via the TV set. David Newton Smith, Little Trecame, Advent, Camelford, Cornwall PL32 9QR. 01840 213 343.

Wanted: A 510WZB22 tube for the Finlux Model 1122M; a LOPT for the Teleton Model CPL145; a drive belt for the Connoisseur BD1 turntable; and help in identifying a Finlandia Nicam CTV chassis with 59cm tube, two scart sockets and controls for on/off, channel up/down and fine tuning mid-mounted under the tube. V.E. Buffin, Do-Bits Electronic Services, 2 Southern Terrace, Mutley, Plymouth PL4 7LS. 01752 670 803.

Wanted: Service manual (copy will do) for the Telequipment D67 or D31 scope. Phone Bill on 0181 445 3503.

Wanted: Service manual for the Fisher FVHP907 VCR. W. Boylan, 98 Upton Road, Moreton, Wirral, Merseyside L46 0SF. 01516 778 111. Wanted: Circuit diagram for the WEM Copycat echo unit, made by Watkins Electronic Music Ltd. M.P. Quinn, 21 Hawarden Way, Mancot, Deeside, Clwyd. 01244 531 639.

Wanted: I PT for the Triumph CTV8000 5rd. mains/battery colour portable, or a source for this item. Vic Stevens, 337 Rochester Road, Gravesend, Kent DA12 4TH. 01474 334 156.

Wanted: Circuit diagram for the Ferrograph Encore Model IV505 video player – or a machine needing repair. J. Holmes, 2 Lyngford Gardens, Lyngford Lane, Taunton TA27LJ.

Wanted: Spares for the Ferguson TX10 chassis, in particular the chopper transformer T705, part no. 00D4-198-001; also a circuit diagram or service manual (good photocopy would do) for the Fisher CA40 stereo amplifier. R. Anderson, 33 Broadmanor, North Duffield, Selby, N. Yorkshire YO8 7RZ.

Wanted: Service manual for the Osume Model CTV1494R or an equivalent model. N. Childs, 30 Chobham Road, Knaphill, Woking, Surrey GU21 2SX. 01483 472 011.

Wanted: Service manuals for the Baird Model 8233 (Ferguson TX10 text chassis) and the Philips PM5508 pattern generator, also an M28-11W or equivalent monochrome tube and a portable Philips V2000 VCR system. T. Martini, 122B Cannon Street Road, Shadwell, London E1 2LH. 0171 702 8774 (home). 0171 251 3196 (workshop).

Wanted: Cheap working main PCB for the Cambridge ARD200 satellite receiver or a clone. Also an on/off switch for the Sony Model KV2217. Kieth Sargeant, 128 London Road, Stanway. Colchester, Essex CO3 5HD. 01206 563 471 (evenings).

Wanted: September 1985 issue of *Television*. P. Makin, 6 Fairisle Close, Clifton Estate, Nottingham NG11 8QD. 01159 215 460.

Wanted: Grid-dip oscillator/f.e.t. dip meter, with or without plug-in coils, up to 250MHz – or source for same. John Porter. 4 Cromore Gardens, Greggan Estate, Londonderry BT48 9TF. 01504 266 794.

Wanted: Circuit diagram (photocopy would do) for the Amstrad PCW8512. I.R. Smith, 40 Delaval Road, Billingham, Cleveland TS23 3BT.

Teletopics

DISC DEVELOPMENTS

The Toshiba/Time Warner group is now calling itself the SD-DVD (Super Density-Digital Video Disc) Alliance. Members include Matsushita. Thomson, Hitachi. Pioneer, Samsung and Mitsubishi. The Alliance has announced further developments and has also given the first European demonstration of its system, in Paris. Those present report that the results were most impressive. Six types of disc are proposed, as follows:

- (1) SD5. This is a single-sided disc with a 5Gbyte capacity, intended for films. It will offer multiple aspect ratios 4:3, 4:3 letterbox and 16:9.
- (2) SD9. A single-sided disc using a dual-layer system, developed by Matsushita. There are two data layers which are read from the same side of the disc. Capacity is

9Gbytes. This makes it suitable for very long films, advanced ROM applications or interactive games.

- (3) SD10. A two-sided disc with a total capacity of 10Gbytes, intended for double-length feature films or film/computer game applications.
- (4) SD18. A two-sided disc, each side having a data capacity of 9Gbytes. Intended for future HDTV applications.
- (5) SD-R. A recordable (write once), two-sided disc with a capacity of 6-4Gbytes. Intended for archive storage.
- (6) SD-Rewritable. A rerecordable, two-sided disc using phase-change technology for writing and erasing the data. Capacity would be 5-2Gbytes. The disc would be aimed at computer applications. There are however no plans to release such discs for several years

at least. This disc has also been referred to as an SD-RAM.

The competing Philips-Sony group has also announced a standard for a recordable/erasable disc, which it calls Multimedia CD-R/E. It's a single-sided, dual-layer disc able to record up to 3-5Gbytes of data.

The SD-DVD Alliance says that over 650,000 SD discs have now been made and that production requires only a slight modification to existing CD manufacturing equipment. Production cost is claimed to be 114-139 per cent more than that of existing CDs, depending on the type of disc.

The Alliance expects to launch the first players and discs next year, with the former likely to cost around £700. Despite this relatively high cost for a play-only machine, the Alliance believes that three million SD-DVD players will be sold in Europe during the first year.

INTERACTIVE TV

In its latest report Interative TV: The Market Opportunity the market research company Ovum says that over fifty interative TV trials are at present being conducted worldwide. **Participation** increased from a few hundred households in 1992 to several thousand last year and is expected to rise to almost 20,000 next year. The UK is described as the leading European country in this field. According to the report no single equipment manufacturer has established a clear lead, though Digital, Oracle, Hewlett Packard, Silicon Graphics, IBM and

Philips are all involved in trials in more than one continent.

Computer companies are moving into interactive video. Oracle and Intel are developing technology that will enable interative video to be sent to PCs via ISDN phone lines. Digital and Sybase are to integrate two of their product lines to offer a complete system for creating, delivering and managing interative TV Novell services. and Microwave are to develop compatibility between Microwave's DAVID interative TV operating system and Novell's NetWare network operating system.



The new flat aerial, known as the Interial.

NOVEL INDOOR AERIAL

Rovic Communications Ltd., PO Box 2996, Danbury, Chelmsford, Essex CM3 4RR (01245 226 867) is marketing a new and novel indoor u.h.f. TV aerial known as the Interial. The suggested retail price is £29.95. Unlike conventional aerial designs, it has a figure-of-eight polar response. It is also wideband, but with a choice of two connection points — at the top and bottom — for different bands. The Interial consists of a flat panel measuring 470 x 450 x 5mm: it has two internal foil elements that are capacitively coupled to the output lead and interact to reinforce the signals they pick up.

BUSINESS/TRADE NEWS

The sales and servicing of Grundig satellite TV equipment have been transferred to Grundig International at Rugby, the Llantrisant centre now being used solely for manufacturing purposes. The change has involved a number of redundancies. Those who have lost their jobs include service manager Paul Goldring, who had been with Grundig since 1984. He can be contacted on

01443 413 175. Spares should be ordered through Grundig International, Willow Vale or Wizard Distributors.

Tatung plans to invest \$250m on setting up a UK c.r.t. manufacturing plant that will create up to 3,000 new jobs. When in full operation the plant would be able to produce three million 14 or 15in. colour c.r.t.s a year.

LATEST CD NEWS

Philips is planning to launch a new portable CDi player, Model CDi370, at around £1,250. The machine will be aimed at the professional presentation market and have PAL/NTSC capability and a digital video cartridge.

Philips Media and IPC Corporation, a Singapore-based electronics company, have signed an agreement to produce and manufacture a CDi/PC kit to enable CDi discs to be used with PCs. It consists of a plug-in PCB, a CD-ROM drive and a special cable and is expected to cost approximately £330. Release will be worldwide, expected during the last quarter of the year.

Sony and Philips have released specifications for a new CD standard, referred to as the Blue Book. It's for an Enhanced Audio CD (or CD Plus) that can be used with both CD audio and CD-ROM drives. Microsoft and Apple Computer have taken part in the development of the format.

DIGITAL TV

NTL and ITC demonstrated a live multi-channel terrestrial digital TV system at the Montreux TV conference. It used MPEG-2 codecs and the new SPECTRE-II 2,000-carrier OFDM modulator. Four TV services were transmitted in a single 8MHz u.h.f. channel with a digital capacity of 20Mbits/sec. NTL showed a new MPEG-2 encoder and announced a codec for digital satellite news gathering - it will be compatible with MPEG-2 and DVB (Digital Video Broadcasting) standards.

A specification for standard-definition digital TV is likely to be added to the FCC's HDTV specification for US broadcasting. The aim is to be able to provide compatible standard- and high-definition digital TV services.

The MPEG has announced a new low-bit rate coding system, known as MPEG-4, for videophones, mobile AV communication, electronic papers etc. It has a 176 x 144 pixel array with a refresh rate of 10Hz.

Answer to Test Case 392

- see page 711-

With all helical-scan VCRs the field sync pulse train is recorded and read off at the beginning of each head's scan across the tape, consisting of some 6.5 TV lines (about 400µsec) after the head-switching point. That's why Ray and Sage had, in their investigations with the scope, concentrated on the waveforms corresponding with this point. If the field sync pulse train is missing, damaged or corrupt, the inevitable result will be field roll and judder on the screen of the TV set/monitor.

While looking at the composite, field-rate playback video signal on the scope's screen, and magnifying it in both the X and Y directions, Sage saw that there was a burst of noise just at the point where the broad field sync pulses should occur. This led him to compare the phase of the noise with the rising and falling edges of the head-drum flipflop waveform (SW25). They coincided of course!

Ray had neglected to check the head switching point adjustment in the servo section of the machine. Because of lateral 'tolerances' in the replacement drum's position, the switching point was occurring about seven-eight TV lines late – slap in the middle of the field sync pulse. The inevitable noise generated by the head switching virtually obliterated the most vital section of the sync pulse train. Tweaking the appropriate preset restored the switch timing to the correct point, whereupon the playback picture became rock steady. As we write, Sagc is still struggling with that ITT Digivision set. . .

Next Month in TELEVISION

SERVICING MATSUI AND SAISHO VCRs

Jack Barclay on repairs to Matsui and Saisho VCRs that appeared in the post-1990 period. Models include the Saisho VR3400, VXL12A, VR6000A and VRS5000A and the Matsui VX1000, VX1100, VX2000, VX2500, VX2700, VX3000, VX6400, VX6600, VP9301, VP9401 and VP9501. They were fitted with a new mechanism that has a single motor to drive the front loading assembly (carriage) and the main mechanism.

DESIGNING FOR RELIABILITY

Building reliability into electronic equipment is largely a matter of appropriate component selection/specification. All too often a component that is not up to the particular requirements of its circuit function is used, leading to repeated failures. It seems that the lessons are seldom learnt, as new generations of designers repeat the old mistakes. Martin Pickering on some points to watch. There are, naturally, lessons for the servicing side of the industry as well.

TEST REPORT: THE OZAN TELETEST-PRO

Eugene Trundle on Ozan's latest pattern generator, which is intended for professional and semi-professional users. It has a wider range of patterns than the standard model, also a choice of audio test tones and both composite and S video outputs.

SERVICING PIONEER CD MULTIPLAYERS

John Coombes on how to tackle faults experienced with the widely sold Pioneer multi CD players.

JVC CAMCORDER POWER SUPPLIES

Keith Keeton on faults encountered with the switch-mode power supply adaptor/charger units used with JVC camcorders

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VCR Clinic

Panasonic NVJ42

This was a true video nasty! The machine would run for days without misbehaving, then suddenly shut down to stop, giving us a diagnosis time of perhaps two seconds. But we solved it! The waveform produced by the supply spool rotation-detector optocoupler was of low amplitude, just borderline for tripping the operational amplifier switch that's connected between it and the microcontroller chip. A new optocoupler solved the problem.

E.T.

Sony VHS Models

This note applies to a large number of Sony domestic VCRs in the SLV model range. How many times have you replaced the pinch roller to cure tape edge damage (scalloping, crinkling) only to find that the job bounces shortly after? Very often the cause is a warped capstan motor housing. To avoid the high cost of a new motor, a repair kit, part no. A6759-567-A, is available from Sony. It includes four surface-mounted capacitors that must also be fitted to certain types of motor.

E.T.

Tatung TVR7121

Intermittent failure to operate in the fast forward or rewind modes seems to be an increasingly common complaint with these machines. Sometimes the cause is a faulty clutch solenoid under the deck, but far more often the mode switch is responsible. It's mounted under the loading motor and is quite easy to change. At a pinch it can be cleaned, but replacement is far better.

E.T.

Akai VSS99

A dead machine, with all the fuses intact and current flowing in the primary winding of the mains transformer, may well be the result of the fusible resistor in position R902 going open-circuit. This 6.8Ω , 0.25W safety component seems to fail for internal reasons. We've never seen a failed one with signs of overheating, and have never had a bounce back after fitting a replacement.

Sanyo VHR135E

Intermittent failure to operate in the fast forward or rewind modes has been the problem with a number of these machines that have come into the workshop. In every case the cause has been failure of the cam slide assembly, item 29 in the exploded diagram. The part no. is 613 094 9240. What happens is that its claw sometimes fails to engage. Replacement involves a lot of dismantling and reassembly: when you put everything back together, ensure that the mechanical phasing of the mechanism and the mode switch is correct.

Akai VS765

After a very involved, costly and time consuming job elsewhere in this machine we were dismayed to find that the u.h.f. tuning drifted and dithered when the machine warmed up. The cure was to replace all the capacitors —

Reports from Eugene Trundle, Brian Storm, David Belmont, Chris Watton, R.J. Longhurst, Mike Rathbone, Jeff Herbert, Richard Newman, Nick Beer, Gerald White and Michael Dranfield

C11-14 – in the low-pass RC filter that produces the tuning voltage. E.T.

JVC HRD180/Ferguson 3V59

If the fault with one of these machines is permanent or intermittent failure of some of the front-panel keys (station selection etc.) to operate, look for dry-joints at CN1, where it's soldered to timer PWB no. 15, before getting involved with the front panel.

E.T.

Akai VS765

A very puzzling no-go situation, with the main power supply section working correctly, can be caused by loss of the BU (back-up) 5V supply to the microcomputer chip or the front control panel. The usual cause is R221 (15 Ω) on the main PCB going high-resistance or open-circuit. E.T.

Panasonic NVL25

This machine suffered from intermittent operation. After a few hours' use the mechanism would just shuffle, cut out then power down. A replacement deck mode switch, part no. VSS0175A, cured the problem.

B.S.

Panasonic NVG18

The reason why this machine was dead seemed to be a corrupted reset voltage at the front display microcontroller chip IC7501. Adjusting the TH.ADJ control on the main board restored operation: the real cause of the problem then became apparent, as there was a bad ripple on the E-E picture. Replacing C1104 ($100\mu F$, 63V) on the power supply panel restored correct operation B.S.

Panasonic NVF55B

When a tape was inserted, the capstan motor would judder around very slowly. If you were lucky, the tape might load. We checked the voltages around the capstan motor drive chip. They all appeared to be correct. So we tried a new stator, which made no difference. Time for some drastic action! We earthed pin 16 of the chip. This time the motor rotated, but fast. Pin 16 is controlled by the syscon/servo chip IC6001. Replacing this cured the fault.

D.B.

Ferguson FV62

This machine appeared to be dead. There was no display, no nothing. The cause of the trouble was in the r.f. converter/tuner, where the SDA and SCK lines were shorted. A replacement module cleared the trouble.

D.B.

Matsui VX1000Y

This machine didn't record sound and there was no output from the bias oscillator. We found that there was liquid spillage in the vicinity of T5001 and the surrounding components. After removing them we cleaned the board

thoroughly. Then T5001, I5002 and C5031 were replaced. This restored sound recording. D.B.

JVC HRD910

A tape was stuck in this machine. It couldn't be ejected nor could any other function be selected. This wasn't surprising, as the loading motor drive chip IC1 had a large hole in it, probably caused by the motor. Replacing IC1, the loading motor and the circuit protector restored normal operation. D.B.

Logik VR950/Samsung VI611

These machines have never been favourites of mine. The customer's complaint was that there was no record picture or sound. It transpired that someone had had a good twiddle. The f.m. record level, carrier and deviation controls had to be set up correctly. Good results were obtained after doing this.

D.B.

Panasonic NVL25

The customer complained that the counter would stop when the machine was in forward search. On inspection we found that the tape was riding up the audio/control head. As the pinch roller was worn we fitted a replacement, but this made little difference. Next comes post P5, which will produce the condition if even only very slightly bent. But it was o.k. Attention was next turned to the AC head, which was worn. Replacing this and realigning the machine cured the fault. The upper drum was also worn. The customer accepted a further estimate, and once a new upper drum had been fitted the machine worked faultlessly.

D.B.

Sanyo VHR135

This machine worked only intermittently. We found that most of the pins at connectors CN301 and CN302 were dryjointed.

D.B.

Grundig VS510

When this machine was powered all that could be heard from it was a clicking noise. It was otherwise dead. Whenever you get an odd fault like this with one of these VCRs head straight for the electrolytic coupling capacitor in the chopper transistor's base circuit (usual value 47µF). In this case replacing it stopped the clicking and restored the power to the rest of the circuitry.

D.B.

Sony SLV270

This Grundig clone was dead. Replacing C1325 and C1326 in the power supply brought it back to life. **D.B.**

Philips VR6462

No picture was the complaint with this machine. Bench tests showed that the fault was no loop-through and no test signal. When checks were carried out in the power supply we found that there was a short-circuit across the 12V line. The cause was traced to C2404 (330µF, 16V) on the audio panel.

C.W.

Hinari VXL90

We were told that there was intermittent slow playback. On test we soon noticed that the tape was travelling at the LP speed when an SP cassette was being played. The tape speed indicator showed SP however. The tape speed was constant but slow. Checks in the servo section were fruitless. The supply was at the correct voltage, but a scope checked showed that noise was present. This was upsetting the action of the CTL amplifier. Replacing the bridge rectifier (D506) in the power supply restored normal operation.

C.W.

Alba VCR5000X

This machine had a tuning problem. When search tuning was tried it generally wouldn't stop. On some occasions it would stop at a station and when this was stored it would be remembered, but when the channel was changed the previous one would would remain for anything up to five seconds before the correct station appeared. All this was caused by wire link C on the tuner/i.f. board not being soldered at one end.

C.W.

Panasonic NVL20

This machine was completely dead. There was rectified mains voltage at the bridge rectifier's reservoir capacitor but no start-up ripple for the power supply because C1109 (1µF, 400V, 105°C) was open-circuit.

Hinari VTV100

No playback colour was the complaint with this VCR/TV combi machine. The cause of the fault turned out to be in the TV section. We noticed that unless the off-air signal was perfect the colour lock was poor (good job we've some dodgy flyleads to help with tests!). So attention was turned to the chip that seems to do almost everything, including colour decoding. A check at pin 38 showed that the line pulse input was incorrect. C481, an 0.47µF, 50V electrolytic, was low in value. A replacement restored good lock with both off-air and off-tape signals.

GoldStar RQ504l

There were white spots and lines across the playback picture. The static discharge brush had obviously fallen off. Wrong again! As numerous checks on the earthing failed to bring anything to light, attention was turned to the bottom of the machine. I temporarily connected another earth wire to the shaft of the drum spindle. This made a difference to the spots, but only for an instant. So I took the motor apart and found that one of the stator turns was loose and had been rubbing on the rotor/magnetic flywheel. Redressing and fixing it with some superglue kept it away from the flywheel, clearing the discharge effect.

C.W.

Sanyo VHRD4890E

The complaint with this machine was crackling on sound. The cause was dry-joints at filter XF02 on the Nicam PCB.

R.J.L.

Panasonic NVG500EM

This machine was dead following a power cut. We found that C3 (4.7µF, 250V) was the cause. R.J.L.

Matsui VX820/880/Saisho VR1200

During playback the colour drifted in and out and there was

a gurgle on sound. E-E operation was o.k. The cause of the trouble was the 100µF capacitor C2508. R.J.L.

Sony SLV270

There was no display and you could hear the deck solenoid clicking. Checks showed that all the outputs from the power supply were varying. C1326 (47µF, 25V) was the cause of the trouble.

R.J.L.

Matsui VX6600

There was a blue screen in the E-E mode and recordings showed i.f. pulling and a.g.c. overloading. C17 was responsible. It's an 0·1µF tantalum capacitor. R.J.L.

Panasonic Bar-code Remotes

Panasonic combined remote control/bar-code readers such as the VEQ1107, VEQ1119 etc. sometimes fail to respond when the scanner on/off button is pressed. This usually happens after the customer has replaced the batteries. If you get this problem, remove the batteries and short the power terminals together for ten seconds or so. After replacing the batteries the display should come alive when the button is pressed. Don't ask me why this works, but I've used this trick successfully about a dozen times over the past few years.

M.R.

Mitsubishi HSM20V

There was no playback colour, though a recording made by the machine produced colour when played back on another VCR. This suggested that there was a fault in the chroma playback processing circuitry, but in fact Q289, a surface-mounted buffer transistor in the record signal path, was responsible. It was leaky, causing the no playback colour fault by upsetting the d.c. bias at the input to the main chroma processing chip. The record signal passed through the faulty stage without being affected.

J.H.

Matsui VX2500

The problem with this machine was very intermittent shutdown to standby after several hours' use in the play or record mode. The cause turned out to be intermittent loss of the FG pulses from the drum motor because C18, which couples the pulses to the servo chip, was dry-jointed. The drum would suddenly run at full speed: as the head-switching squarewave was then so far off frequency, the microcontroller chip would switch the machine to standby.

J.H.

Panasonic Power Supplies

I've had a run of Panasonic machines recently, all with power supply faults. Dried out electrolytics have been the cause. They run quite hot, and the only reliable way of dealing with the problem is to fit 105°C types. When tackling dry-joints around transformers and chokes it's best to remove the device and clean the tags before resoldering. Otherwise you may get trouble later on.

R.N.

Panasonic NVG25

This machine's head was clogged when it was first brought in. No other problems were evident. A few days later however the customer said that it had gone dead. When it was back on the bench I found that the mains fuse had blown. A closer look at the power supply revealed the cause. The STR11006 chip had overheated so badly that its plastic clamp had melted, allowing it to fall free of the metalwork and thus run without a heatsink. D02 and Q11 were short-circuit, also D05 on the little subpanel. R1009 on the subpanel was dry-jointed. I used a BYD33J in position D02, a BC640 in position Q11 and a 1N4148 in position D05. A new STR11006 and a 1-6A fuse completed the repair.

Ferguson FV31R

This machine was completely dead with no clock display. Checks on the supply voltages revealed that the on/off monitor wasn't working. We traced back to the timer display board and found that RK44 (1Ω fusible) was open-circuit. A replacement restored normal operation. G.W.

GoldStar GHV94001

If the E-E sound is low, remove R460 and fit a wire link in its place.

G.W.

GoldStar GSE12901Q

If the machine won't accept or eject a tape, remove diode D521 and fit a wire link in its place. G.W.

Hitachi VT150

Though intermittent the fault was present most of the time. The symptom – snow over the playback picture – gave the impression that a head had failed or was clogged. It could be instigated by touching the YC board almost anywhere. The HT4757A luminance processing hybrid chip was the cause. When this item fails the symptom is often patterning on the playback and E-E pictures. Not on this occasion however.

Sony SLV280

This machine uses a Sanyo mechanism and sufferes from the same tape chewing on eject problem – the capstan brake pad becomes sticky. For a lasting cure replace it.

N.B.

Hitachi VT410

Very intermittently when play or record was selected the drum would just kick rather than rotate. The cause was traced to failure of the thick-film chroma processing chip IC301.

N.B.

Matsui VX3000

If the capstan motor appears to have lost its torque, operating slowly with some tapes, try cleaning and lubricating the bearing. This may enable you to avoid having to replace the motor.

M.Dr.

Panasonic NVJ40

There was no recorded chroma though playback was o.k. After carrying out scope checks around the VEFH14D hybrid chroma chip we came to the conclusion that it was faulty. But in view of its price, about £42 plus VAT, we decided to give Panasonic technical a call before ordering a replacement. A nice man agreed with our diagnosis, and a new chip cured the fault. Phew!

M.Dr.

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What a Life!

Donald Bullock

I was scribbling away in my little Spanish hut the other day when I heard a sudden shout from inside the house. It was Greeneyes. I ran over and found her looking at a fax.

"It's from Steven" she said. "He's taking you to task for being away so long. Says he's redesigned the workshop and has some interesting sets awaiting your attention."

So, pausing only to buy a few £3 bottles of Scotch for me and a gallon of Jalon Valley red wine for Steven, I returned to a proper pint of British beer and another batch of the oddballs who seem to comprise the major portion of our clientele.

Gladys's Toshiba

Once I'd settled down, the first customer to arrive was scruffy Gladys Mugwump. She brought a Toshiba 213D4B black-stripe colour set in just as I was trying to complete a tricky bit of soldering. I decided that she could wait a minute. Then I noticed a strong smell. Perhaps I'd better get her out quick. So I put the soldering iron down.

"What's your trouble?" I asked briskly.

"Keeps going dead. Then it thinks it's a rainbow" she said. I waved her out and returned to my soldering. Only the smell got worse. It turned out to be the flux in Steven's reel of CEL 60/40 solder.

She'd been right about the set. I opened it up, reached for my giant magnifier and found some dry-joints. First at pins 2 and 3 of the line output transformer, then at both legs of the safety resistor R421. The rainbow effect on the picture was trickier. Its cause turned out to be a crumbling carbon tablet in the degaussing posistor.

Looking Ahead

Later Mr and Mrs Lee brought along a JVC HRD180 VCR. She was thin and baked while he looked like a Spanish gypsy. "You enta spendin' much" he said to her as he stretched his face to the top video shelf. "You enta spendin' much."

The VCR turned out to be dead. I soon found that the STK5481 regulator was the cause. It's like a large, twenty-legged domino. Once a replacement had

been fitted the machine came back to life and worked well. Except that the LP picture was broken up and unwatchable – the accompanying sound was perfect however. After a good deal of work I contacted the boys at JVC, who were keen to help. But they couldn't and it's still not fixed. Any ideas?

Mrs Lee called in alone next day. Instead of asking about her VCR she picked up the cup I'd just put down and studied the tea leaves.

"I see that your life is a string of problems" she said. "As fast as you overcome one, along comes another." I nooded sadly. "Your money line tapers to nothing, and you're the victim of a hard woman. I see only work and worry and a feeling of failure. And there's going to be the pain of an accident. But I can see some fun. A fool will soon enter your life and there'll be rueful laughter." With that she departed.

Field Collapse

It was time for lunch. Steve decided to have some of his Jalon wine and was quite talkative by the time Mr Creep came in with his Ferguson TX90 set.

Mr Creep talks slowly, as his eyes dart about your face. "The picture cramps up and turns into a straight line" he drawled. "Don't sound like much to me, do it? 'T isn't the tube, I knows that. And it ain't the line transformer thing, the dear 'un. I knows that too. Ent much else in 'em, is there?"

I soon found that R198, one of the string of four $6.2k\Omega$ resistors that provides bias for the field output stage, was open-circuit. It seemed sensible to replace the lot, also the field output transistors TR104 and TR105 as a precaution.

As time goes by I find the thin print in this chassis less easy to work on. Meanwhile Steven was grinning as he reached over for the Avo, which fell on to my foot. I howled – I was wearing sandals. "Well" I said, "so much for the fool and the pain of the accident."

I next picked up a GoldStar CIT2168 Fastext set – the PC04A chassis. The sound was all right, but there was nothing on the screen. As with most sets these days, the screen blanks out when the field output stage stops working. I advanced the setting of the first anode preset to confirm this – after carefully

marking its original position with a blob of paint. This produced the tell-tale horizontal line.

Visual examination showed that R320, a 10Ω 1W resistor, had cooked. It read open-circuit. I replaced it and switched on and the new resistor went the same way. So I got out the circuit diagram. The field timebase is a simple one based on a TDA1170N chip (IC301), with R320 and C301 (1.000uF) filtering its supply. C301 was obviously suspect but turned out to be all right. Further checks brought me to C302 (100µF, 35V) in the flyback boost network. It had fallen in value to 80µF, thus damaging the chip. Replacing these two items and fitting another 10Ω, 1W resistor cured the trouble. Up came a plucky picture on a model that always seems to me to look as if it has a slightly flat tube.

Before boxing the set up I checked, as usual, for dry-joints. There were quite a few, and I resoldered every one of them.

Julian's Saisho

There are certain people I can't stand. Julian Jaunty is an example. He brought in a Saisho CM16TT portable and stood too close, grinning at me as though we shared some secret.

"What's up?" I asked, rather coldly.
"Dead as a door nail, Donny old chap" he grinned.

When I tried it I heard the rustle of e.h.t. but there was no sound or brightness. Again I marked and upped the setting of the first anode preset. This produced a blank raster, which was not what I expected. Rather than think too hard I flexed the PCB and was rewarded with a good picture and sound. It didn't take me long to find that one end of D408 was dry-jointed. I resoldered it, to the accompaniment of that strong smell, and that was that.

A Dead Samsung

When I saw Mr M'Babwa approaching the shop with his Samsung TV I toyed with the idea of popping under the counter.

"This set no good" he announced. "No sound, no picture, no nothin'."

"O.k., o.k." I said, "just leave it and don't worry."

When I tried the set, a Model

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CI54129, I found it dead though the channel indicator was alight. Seeking an easy way out I examined the chassis with my magnifier, looking for dry-joints. I found some around relay RL801 and P802, a funny little blue resistor thing. Resoldering them restored the set to good health and made me think of a glass of Guinness.

SERVICE is our **MOTTO**

An Old Sport

Mr Prism is old but slim and sporty. Since I have no interest in any games or sports except fishing, I find him a decent old bore. He sprang in with a Ferguson 2203 and told me that Newcastle had just won six to five and that Sid Munks of Spurs had cracked his ribs. Then he pointed to the set.

"It's a TX100" he said. "Have you worked on TX100s?"

"Like no one else" I replied. Then I pulled it on to the bench.

It was lifeless, though the relay clicked at switch on. I reached for the old cream-coloured Avo that Steven had picked up somewhere and checked at the collector of the BU508A line output transistor TR10. The reading was only 55V. It was no better when I disconnected TR10. So I moved back

to the h.t. supply source where I found that the 47µF, 160V reservoir capacitor C121 was almost open-circuit. A new one brought the h.t. back to 119V and the set came to life.

"Well" bawled Mr Prism when he called to collect it, "didn't Arsenal take a drubbing?"

Familiar Fault, Unfamiliar VCR

I next picked up a VCR and almost put it down again when I saw that it was a Blaupunkt. A Model RTV301, the first Blaupunkt I'd seen. But it looked vaguely familiar. I opened it up and saw that it was really a Panasonic NV370. The fault had a familiar ring about it as well. The clock display was all right, but at switch on the capstan motor shuffled a bit then the machine shut down. I homed in on the power pack at the rear right of the machine and spotted a couple of fusible resistors in yellow plastic overcoats. One of them, R1101, was opencircuit. A replacement restored normal operation.

Final Round Up

"It's ticking" said the sweet little thing who came in with a Ferguson 22B2. It was another TX100. Apart from the ticking it did nothing. When I opened it up I found that the solder joint where the mains lead joins the chassis was dry and arcing. Resoldering it cured the trouble.

Saisho and Matsui sets continue to come our way. This one was a Model 1476 14in. portable, just out of guarantee. At switch on the standby light lit. It went out when the set was switched from standby, but the set refused to come to life. I suspected the STR50103 chopper chip IC501, but cold checks suggested that it was o.k. Though working without a manual, I soon found the cause of the trouble: the chip's start-up voltage was missing. Pin 2 should receive a feed via two 330k Ω resistors, R502 and R503. One of them was open-circuit. In view of the high value of these resistors, I expect to come across the fault again in the months ahead.

It had been a long day. After our meal Steven and I settled down for a drink - or two.

"You won't believe thish" said Steven, "I'm beginning to feel a bit squiffshy."

"Personally I feel fine. Ish because I'm more mature I shpect."

Long-distance Television

Roger Bunney

This is being typed on June 2nd, and at last I can report the start of the 1995 Sporadic E season. Today's reception was in fact good, with Band I wide open when I switched on at around 0845. The band was still very active when I got back from work at 1750, with several programmes floating across each channel. The mass of interacting signals made identification mostly impossible, but their presence was very welcome!

My own log for May was extremely thin. Fortunately several other enthusiasts sent in reports. Taken together, these logs give a reasonable impression of activity. Actual log presentation is still being made difficult by the split up of the USSR, Czechoslovakia and Yugoslavia. We'll do our best. The following is a collated log of May SpE reception:

8/5/95	RAI (Italy) chs. IA, B; unidentified ch.
	E2, 3 signals.
9/5/95	TVE (Spain) E2.
11/5/95	NRK (Norway) E3; DR (Denmark) E3;
	RAI IA, B; Italian commercial station
	with 'Video' corner logo ch. E2.
15/5/95	TVE E2.
20/5/95	YLE (Finland) E3; TVE E2; TVE-2 E2;
	unidentified ch. R1, 2, E3 signals.
21/5/95	RAI IA, B; 'Video' E2; Canal + L2, 3;
	RTP (Portugal) E2, 3, 4; TVE E2, 3, 4;
	TVE-2 E2; +PTT (Switzerland) E2; TVB
	(Yugoslavia) E3; unidentified ch. E4, R2
	signals.
22/5/95	RAI IA; 'Video' E2; +PTT E2; TVE E2,
	3; HRT (Croatia) E3; unidentified ch. E4,
	R2 signals.
23/5/95	TVB E3; RAI IA; TVE E3; RAI E3;
	'Video' E2; TVS-1 (Slovenia) E3.
27/5/95	TVS-1 E3; RAI IA; 'Video' E2; ARD
	(Germany) E2, 3, 4; SVT (Sweden) E2, 3;
	OK-1 (Russia) R1, 2; YT (Ukraine) R1;
	Nova TV (Czech Rep.) R2; ORF (Austria)
	E2a.

28/5/95	C+ L2, 3, 4; TVE E2, 3; TVB E3; +PTT
	E2, 3; RAI IB.
29/5/95	RAI IA, B.
30/5/95	TVS-1 E3; RAI IA, B; 'Video' E2; TVA
	(Italy) IA; C+ L2, 4; Yugoslavia E3, 4;
	+PTT E2; ARD E2; TVE E3.
1/6/65	OK-1 R2;
2/6/65	RAI IA, B; unidentified signals on chs.
	E2, 3, 4, R1, 2, 3.

At last a respectable log for the time of year, mainly thanks to Garry Smith (Derby), Roger Fussell (Torpoint), David Glenday (Argyll) and Peter Schubert (Rainham). Roger Fussell received good tropospheric signals from Spain on May 5th (TVE chs. E35 and 37). George Gaskin (Gibraltar) reports that SpE conditions were good there on many days throughout May, with signals mainly from the north east and east – Belgium, the Netherlands and Italy.

Roger Fussell has various old circuit diagrams, valves etc. for disposal. Anyone interested should write to him at 55 Peacock Avenue, Torpoint, Cornwall PL11 2EX.

Satellite Sightings

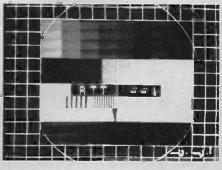
Mystery morse signals heard by several enthusiasts via various satellites, particularly PAS-1 at 45°W, were mentioned recently in this column. Len Wooley (Bude) tells us that he has received them via Eutelsat and Intelsat craft and that they are used for identification purposes. With these craft they consist of similar length groups of numbers followed by a unique label, 'PSSI STAR' with Intelsat and 'STI KU2' with Eutelsat. They are mentioned in the World Satellite Almanac.

The Bosnian problems have led to much satellite activity. The Reuters Eutelsat transponder (12.522GHz horizontal) at 13°E was extremely active, with numerous feeds from Europe, news conferences etc., while the Intelsat 603 Sarajevo link (10.979GHz vertical) at 34.5°W fired up for long periods. Unfortunately a new development with this uplink is sound in syncs (SIS), which gives rise to an unstable picture when audio modulation is present – there's also no sound of course. The signal level fluctuates. A 1.5m dish and 0.7dB LNB produce a gritty picture. The feed has also been seen at 10.996GHz and is often relayed via leased EBU capacity on Eutelsat II F4 at 7°E.

There are obviously problems with the Sarajevo mains supply. An SNG feed at 1700 on May 29th, via Eutelsat II F3 (16°E) at 12.539GHz to CBS then Sky, showed picture instability with mains-frequency bars moving downwards rapidly. The reporter shown was agitated and complained







Left: An African C band feed using digital compression (DSNG = digital satellite news gathering), snapped by lan Waller. It was received in Europe via the Med TV transponder aboard Eutelsat II F2 at 10°E. Centre: John Locker caught this bunch of cosmonauts on the MIR space station, downlinked via Cosmos 2054 at 16°E then Eutelsat II F4 at 7°E. Right: A version of the FubK pattern used by Tunisian TV (RTT).

that his "IFB keeps cutting out". IFB stands for international foldback: it's the sound signal the reporter receives through an earpiece from the distant programme source so that he can follow the questions etc.

Early on the same evening an unknown identification was noted via Eutelsat II F4 at 7°E. It consisted of colour bars with the identification 'CPT CAPAJEGO'. Can anyone suggest the source?

As far as Ku band is concerned Intelsat 603 at 34.5°W is normally quiet. In recent weeks however programmes from NBC New York have been present at good signal levels. John Locker (Wirral) noted these signals first, at 11.639GHz vertical with clear PAL – and all the US commercials.

I was puzzled by late evening colour bars and the identification 'DSTV - C HAGEN' via Eutelsat II F2 at 10°E (11·177GHz horizontal). Leaving the receiver tuned to this frequency, I returned half an hour later to find pictures. Not the expected late news but Eurotica TV! The signals subsequently became scrambled. An unusual sighting: Erotica and Eurotica TV are usually seen at 16°E (II F3).

A new arrival at 16°E is TV10 Gold, which shares a transponder with The Music Factory (TMF) – at 12.557GHz horizontal. TV10 shows mainly older English-language programmes, during the day and early evening, with TMF filling in later. TMF has adopted a simple form of scrambling – video inversion. The Dutch PTT test pattern is another signal that's been seen with video inversion, via Orion Atlantic 1 at 37.5°W. It shares the 11.496GHz transponder with the German VH-1 service (in the lower half).

A transmission about which little is known was noted at 2050 on May the 8th via this satellite: "Air Force Satellite News" appeared at 11-620GHz. Featuring several news packages, it seems to have been intended for American forces in Europe. The transmission ceased abruptly without any source identification being provided.

Bandula Gunasekera (Sri Lanka) has been busy assembling small units for reception of the u.h.f. TV transmissions from the Ekran satellite at 99°E. They are sold to a satellite dealer in Colombo. The PCB comes from India. It has five main signal processing chips and includes a low-noise head amplifier. Bandula reports that NAM TV has been replaced by Tamil Bimkam: the Russian first programme can still be received.

Ian Waller (Lincoln) is using his 3.4m dish again for C band monitoring. His recent reception includes Reykjavik, Iceland from 1°W and the Caribbean Satellite Corporation (Puerto Rico) via the TDRS satellite at 41°W.

The Intelsat craft at 60°E has presented many African signals, including the Newsforce SNG crew back in action in Zaire. This latter link was also seen on Eutelsat II F4 at 7°E via EBU leases.

Altogether a very active month – I've had room to mention only a few of the signals of interest. Finally a request from Aidan Murphy, Main Street, Dunshauglin, Co. Meath, Ireland. He's seeking information on the use of inclined orbit tracking systems. Anyone who can help can write to the above address or phone +35 318 250 414 – after 1900 hours.

News Items

Video compression: According to Television Broadcast International the Houston Advanced Research Centre has devised a "revolutionary new form of digital compression" that exceeds the currently accepted MPEG/JPEG standards. 300:1 compression enables VHS quality pictures to be delivered at 200kbits/sec, which compares with



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1.5Mbits/sec with MPEG-1. An advantage is that decompression can be achieved in real time – MPEG decoders require additional software, cards etc. to provide the high processing power needed. In short, HARC-C compression means that far less bandwidth is required, enabling more channels to be squeezed in.

Korean manufacturer Hyundai Electronics intends to launch an MPEG decoder globally starting this August.

Japan: NHK has drawn up plans to start transmitting digital terrestrial TV early in the next century. The current NTSC analogue services would continue in use for a time before being phased out. The Hi-Vision HDTV system would be redeveloped in digital form and incorporated within the proposed Integrated Services Digital Broadcasting (ISDB) system.

Iran: The proposed fourth channel will have a pay-TV option.

Ghosts: NTL is to start testing a ghost-busting system in the UK next year. It's based on the transmission of a reference signal (GCR) during the blanking period. The receiver uses this as a sample for a secondary image cancellation system.

Solomon Islands: A local TV service is to start in late 1995/early 1996, with a small studio in the capital Honiara. UK: Eddystone Radio, part of the Marconi group, is to supply the transmitters for the BBC's digital audio broadcasting service, which is to start this September in the London area. Some 27 transmitters will be required netween now and 1997 for phase 1 of the national DAB network.

Russia: The government has made illegal all forms of picture encryption that have not been accepted by FAPSI, the Federal Agency of State Communications and Information. This has hit local MMDS and satellite broadcasters

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hard. The law also makes the import of non-approved coders and decoders illegal.

A new commercial station in Moscow, Kosmos 10, is in operation on ch. R51. The present service area covers a radius of 25km. This is to be extended with an increase in the e.r.p.

Transmitter Listings

Estonia: Tallinn ch. R3 is now off air.

Finland: Ruka has moved from ch. R4 (3kW) to ch. E36 (300kW).

Latvia: The following transmitters are now in operation. Kraslava (10W) and Targale (5W) ch. R2; Oagda (10W) and Ugale (3W) ch. R4; Odbele (50W) ch. R5. These are low powers, but during intense SpE conditions it's possible to receive signals from transmitters using only a few watts.

I have received a list of nearly thirty Polish Premiera TV stations that use u.h.f. transmitters in the ch. R23-58 spectrum with powers in the range 2-50W. It's unlikely that many will be received in the UK, but I'll be pleased to send readers a photocopy of the list on request-

Satellite TV

Intelsat 705 is now in operation at 50°W, offering links between Europe and N/S America in the C and Ku bands. Intelsat 706 was launched on May 17th to provide similar services at 53°W. Intelsat 506 has moved from 50°W to 31-1°W

Egypt intends to launch a satellite, Nile-Sat, in late 1997, offering twelve TV channels across the region. The Israeli government has given approval to an Arab/Israeli commercial satellite TV channel serving the Middle East.

The SportsWire channel seen via Intelsat 601 at 27.5°W has closed. Its football coverage was a familiar sight for many satellite zappers.

WTN has leased a digital transponder aboard Asiasat 2, whose footprint covers all Asia into the Middle East.

BSkyB is planning to start a 120 digital TV channel service for the UK by early 1997. It would include a payper-view film service showing current releases time-shifted across five channels.

Transatlantic Propagation

Much attention to the possibility of two-way transatlantic communication in the 144MHz band was given in the June issue of the RSGB's publication RadCom - the Irish Radio Transmitters Society is to present an award to the first amateur stations that achieve this feat. An article in the issue covers every potential way of establishing transatlantic contact at v.h.f. F2 layer propagation is at present nil, since we are at the bottom of the current sunspot cycle, i.e. solar activity is low; tropospheric propagation with ducting might just be possible, assuming a favourably located weather system; SpE presents the best chance, especially if accompanied with tropospheric enhancement at either or both ends. Signal reflection via the moon (EME) or meteor scatter (MS) is vaguely possible but extremely difficult for two-way communication. Auroral reflection offers some potential but is again much more likely during a period of high solar activity.

My own feeling, based on DX-TV experience, is that at present only SpE can provide transatlantic propagation. Long-hop signal reflection occurs at times of intense E layer ionisation, and it has often been noted that SpE can increase when solar activity is low. Since a single hop (reflection) rarely exceeds 2,000km, a double hop is required to bridge the Atlantic, even with end-path tropospheric enhancement.

Thus UK SpE reception from the eastern seaboard of Canada/the USA requires two ionised patches suitably positioned to reflect the incident v.h.f. signals. With increasing ionisation the maximum usable frequency (m.u.f.) rises, enabling higher-channel signals to be propagated in this way.

In most years there are a couple of SpE Band I openings between Canada and the UK. While they can occur from the early afternoon, the most likely times are from about midevening to around 2300, sometimes extending past midnight local UK time. The period from late June through July to early August offers the best opporunities. Such SpE openings can be intense, with multipath propagation common. The lowest channel (A2, with the vision carrier at 55.25MHz) may fall off in intensity, with the higher channels (A3, possibly A4 and 5) then being favoured. As the ionised clouds above the Atlantic move, so the pattern of received stations changes - often over a few minutes, an initial signal fading as another one comes up, with perhaps two or three providing co-channel interference. A good indication of the possibility of transatlantic reception is when ch. E3 and 4 signals from Iceland appear, indicating the build up of SpE towards the north west.

Reception is generally confined to the north eastern corner of Canada, i.e. the Newfoundland/New Brunswick region, though stations deeper into Canada. for example in Montreal or Quebec, are occasionally received. There has even been suspected reception of a prairie station in the lower part of the band.

I've known only low-band transmitters to be received in

this way – usually chs. A2, 3, possibly chs. A4 or 5 under extreme conditions – and have never seen a report of transatlantic reception at above 100MHz. To achieve two-way amateur communication at 144MHz would be remarkable, though hopefully it will happen. If it does, the low-band channels should be wide open! But one has to bear in mind that whereas a TV-DXer is looking for a bandwidth of at least 1.5MHz, amateur communication requires only a few kHz.

It's well worth checking for such exotic signals during the summer period. While there have been many cases of European SpE reception from North American TV stations, I've never heard of reception in the opposite direction. The channels to check are as follows: A2 55.25MHz video, 59.75MHz sound; A3 61.25MHz (V), 66.75MHz (S); A4

67·25MHz (V), 71·75MHz (S); A5 77·25MHz (V), 81·75MHz (S); A6 83·25MHz (V), 87·75MHz (S). They use the N. American System M - 525 lines, 60 fields, negative-going video modulation, f.m. sound spaced at 4·5MHz, NTSC colour.

Correction

There was an error in Fig. 1 last month (page 648). The connection between IC1's common (adjust) pin and the 240Ω resistor at its output was omitted. The three resistors $(240\Omega,820\Omega$ and $2\cdot 2k\Omega)$ are connected in series, with IC1's common pin connected to the junction of the 240Ω and 820Ω resistors and switch SW1 used to short out the 820Ω resistor in the 18V position.

Letters

PRERECORDED TAPES

In reply to Michael Maurice's letter last month, the problem he raises with hi-fi VCRs is caused not by anti-copying signals but by the audio levels recorded by the tape manufacturers being too high, the result being overloading in the audio section of hi-fi decks

There were problems with a Ferguson 3V48 I used to own when playing back prerecorded tapes. I found that correct play-back could be achieved by backing off the hi-fi tracking control, thereby reducing the signal fed to the hi-fi section. With modern decks auto-tracking or dynamic tracking is used, so that overloading is achieved automatically! Some decks however have a manual override, so that the tracking control can be backed off, but this usually affects the video signal as well. Nevertheless a happy compromise can be established. I can't comment on colour dropout with Disney film cassettes as I've never tried one.

The onus is on the manufacturers of prerecorded tapes to sort out their audio levels, especially with the hi-fi signal. It might help however if VCR manufacturers built in an attenuator that could be switched in as required.

Ian R. Potts, Congleton, Cheshire.

WILLOW VALE'S COPS

In his article on Computer Communication and Moderns last month Jon Lye wrote: "The best solution seems to me to be an ordering system which allows the part number to be found offline in a database". Willow Vale was aware of the need for this service some years ago and introduced a PC-based catalogue called 'Catdisk' to enable parts to be looked up off-line. Although Catdisk is no longer supported, a Windows-based Willow Vale Database is currently available to qualifying account holders via our area sales managers. This enables searches to be carried out using Willow Vale order codes, manufacturers' part numbers or a model/description. It includes a fax

or print order facility.

In addition the current version (2.00) of the database program is COPS II ready, with a modern pushbutton that enables orders to be 'uploaded' to COPS when the communications module becomes available (due July). This will allow the transfer of off-line generated orders to our mainframe at the rate of several lines per second, thereby reducing phone charges.

I'd like to remind COPS users that our modems at present support all speeds between 300 and 2,400 bauds, with the possibility of 14,400 bauds in the near future for customers with PCs and fax modems.

Dave Allen, Technical Director, Willow Vale Electronics Ltd., Enterprise Park, Manchester.

SATELLITE SOUND RECEPTION

I was surprised that Donald Bullock went to so much trouble to get the 6MHz UK intercarrier sound output from a satellite TV receiver to work with a Spanish TV set designed for 5-5MHz sound (June, page 582). In most satellite receivers it's simple to retune the modulator's intercarrier frequency. Failing that, use a scart connection. Some small-screen TV sets still use phono sockets for AV connection, depending on the market for which they are intended, but it's rare for AV connection to be impossible. An additional advantage is that the TV set can continue to pick up Spanish TV, whereas converted to 6MHz sound it won't.

With Pace MSS/PRD receivers the intercarrier ferrite core is at the top of the modulator can and retuning is very easy. It's best to remove the modulator from a Pace 9000/9200 chassis: you will then find the core near the channel adjustment screw. Armstrad 510s are a little more difficult. The core is near the channel adjustment screw, but a hole has to be made in the plastic, about 1mm below and 5mm to the right of it. Failing this, remove the main PCB from the case to carry out the retuning.

Use the correct trimmer, as the cores are easily cracked.

I agree that satellite radio reception is much better when the receiver's output is remodulated on to the f.m. band. With care an entire mono sound transmitter can be built into a scart plug, power being provided from the receiver itself via one of the scart pins. Hugh Cocks, Algarsat Ltd.,

Algarve, Portugal.

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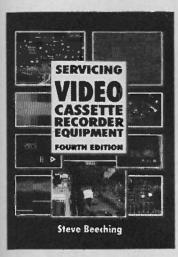
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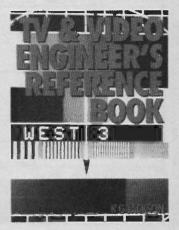
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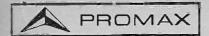
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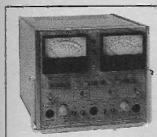
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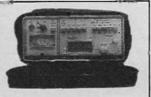
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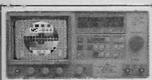




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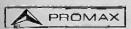
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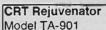
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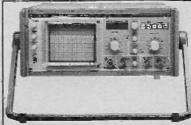
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Table - 13E Look Angles - UNITED KINGDOM

Graph

Absorption

Satellites (Ku, Band) Above 5 Degrees Elevation

Look Angle Table: UNITED KINGDOM

(1) This (2) Side (3) Groun (4) All an

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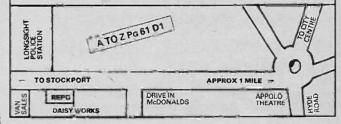
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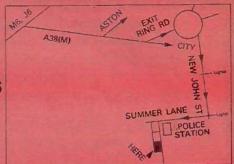
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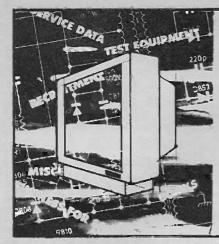
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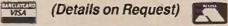
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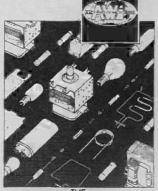
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Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177.	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00	BUS24 50p BUT11 50p BUT11AF £1.00 BUT13600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50	BU824 50p BUT11 50p BUT11AF \$1.00 BUT13 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BYW95 10p	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 28 each 950 to 1750 NOKIA Sat-Tuner
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Teletex £12.00	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00	BUS24 50p BUT11 50p BUT11AF £1.00 BUT15 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BYW95 10p BUX39 25A-150V £1.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Teletex £12.00 TX10 Hand Set Text £12.50	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00	BUS24 50p BUT11 50p BUT11AF 11.00 BUT13 600V-28A 11.00 BUT18AF 11.00 BUV84 60p BYW20-08-9 11.00 BYW95 10p BUX34 100 BUX34 50p	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-52 BF-IF Module 5829-01-05 B8 each 950 to 1750 NOKIA Sat-Tuner £4 each
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Teletex £12.00 TX10 Hand Set Text £12.50 TX9 with Text £12.50	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00	BU824 50p BUT11 50p BUT11AF £1.00 BUT118600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BYW95 10p BUX39 25A-150V £1.00 BUX84 50p BUY49 20p;	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00	BU824 50p BUT11 50p BUT11AF £1.00 BUT113 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BUW895 10p BUX39 25A-150V £1.00 BUX84 50p BUY49 20p; BUK444/800 £2.00 BUK444/600 £2.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 88 each 950 to 1750 NOKIA Sat-Tuner 64 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Teletex £12.00 TX10 Hand Set Text £12.50 TX9 with Text £12.50	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICCS £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00	BUS24 50p BUT11 50p BUT11AF £1.00 BUT13 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BYW95 10p BYW95 10p BUX39 25A-150V £1.00 BUX84 50p BUY49 20p BUK44/800 £2.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner 64 each KTF FOR NOKIA 1TT SETS SAA 5231-SAA 5243 P/E LH 5164D — IC's On Text Panel
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Tcletex £12.00 TX10 Hand Set Text £12.50 TX9 & TX10 button print £1.00 TX10 Focus Pots £4.00	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00	BUS24 50p BUT11 50p BUT11AF 11.00 BUT13 600V-28A 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BUW89 10p BUW99 20p BUX84 50p	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 88 each 950 to 1750 NOKIA Sat-Tuner 64 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICCS £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00	BU824 50p BUT11 50p BUT11AF £1.00 BUT113 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW820-08-9 £1.00 BUW84 50p BUX84 50p BUX84 50p BUX84 50p BUX84 50p BUX44/800 £2.00 BUK454/600 £2.00 BUK454/600 £2.00 BUK454/600 £2.00 BUK454/600 £2.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-50 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA 1TT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's On Text Panel Text Decoder, Fastext 6911-11-61 £10 each
Pyc & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price £13.00 RC4001 KT3 and Tcletex £12.50 TX10 Hand Set Text £12.50 TX9 with Text £12.50 TX9 & TX10 button print	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00	BUS24 50p BUT11 50p BUT111 50p BUT11AF 11.00 BUT118600V-28A 11.00 BUT18AF 11.00 BUW84 60p BYW95 11.00 BYW95 11.00 BUX99 25A-150V 11.00 BUX94 50p BUX94 20p BUX94 20p BUX84 50p BUX94 12.00 BUX84 50p BUX94 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX854/600 12.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner 64 each KTF FOR NOKIA 1TT SETS SAA 5231-SAA 5243 P/E LH 5164D — IC's On Text Panel
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICCS £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10	BU824 50p BUT11 50p BUT111 50p BUT1116 600V-28A £1.00 BUT1186 £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BUW985 10p BUX39 25A-150V £1.00 BUX84 50p BUY49 20p BUX44-4800 £2.00 BUK454/600 £2.00 BUK544/600 £2.00 BUK544/600 £2.00 BUK544/600 £2.00 BUK544/600 £2.00 TDA3047 £1.00 TDA3048 £3.00 TDA3085 £2.00 TDA3085 £2.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 E8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00 T780 £2.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset	BU824 50p BUT11 50p BUT11AF £1.00 BUT113 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW20-08-9 £1.00 BUX39 25A-150V £1.00 BUX39 25A-150V £1.00 BUX84 50p BUY49 20p, BUK444/800 £2.00 BUK445/600 £2.00 BUK454/600 £2.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC'S On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI – ORION – \$ASHRO Video hand set
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICCS £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10	BU824 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT118600V-28A 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BUW985 10p BUX99 20p BUX99 20p BUX84 50p BUX99 20p BUX445600 12.00 BUK445600 12.00 BUK445600 12.00 BUK445600 12.00 BUK445600 12.00 BUK454601 10.00 BUK554601 10.	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video band set L.C.D. 1992-1993 models £5 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 T780 £2.00 T780 £2.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset	BU824 50p BUT11 50p BUT111 50p BUT11AF £1.00 BUT113 600V-28A £1.00 BUT18AF £1.00 BUW84 60p BYW820-08-9 £1.00 BUW84 50p BUX84 50p BUX84 50p BUX84 50p BUX 600 £2.00 BUK 600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L.C.D. 1992-1993 models and RC07 and RC44 £25
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 TX85—TX8 Ferguson £10 PANASONIC TV Video Handset	BU824 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT118600V-28A 11.00 BUT18AF 11.00 BUW84 60p BYW20-08-9 11.00 BYW95 10p BUX99 20p BUX84 50p BUX845/600 12.00 BUK845/600 12.00 BUK845/600 12.00 BUR845/600 12.00 BUR85/600 12.00 BUR85/60	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L.C.D. 1992-1993 models £5 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 IK7000 £5.00 IK700 £1.00 TRED 2 £1.00 TRED 3 £1.00 TRED 4 £1.00 TX85—TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BU824 50p BUT11 50p BUT11AF \$1.00 BUT116 600V-28A \$1.00 BUT18AF \$1.00 BUW84 60p BYW90-08-9 \$1.00 BUX99 \$1.00 BUX99 \$20p BUX44 \$0p BUK445600 \$2.00 BUK445600 \$2.00 BUK445600 \$2.00 BUA3047 \$1.00 TDA3048 \$3.00 TDA3083 \$2.00 TDA3505 \$3.00 TDA3506 \$3.00 TDA3506 \$3.00 TDA3561 \$2.00 TDA3560 \$4.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 £8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L.C.D. 1992-1993 models and RC07 and RC44 £25
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 IK7000 £5.00 IK700 £1.00 TRED 2 £1.00 TRED 3 £1.00 TRED 4 £1.00 TX85—TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BU824 50p BUT11 50p BUT11AF \$1.00 BUT116 600V-28A \$1.00 BUT18AF \$1.00 BUW84 60p BYW90-08-9 \$1.00 BUX99 \$1.00 BUX99 \$20p BUX44 \$0p BUK445600 \$2.00 BUK445600 \$2.00 BUK445600 \$2.00 BUA3047 \$1.00 TDA3048 \$3.00 TDA3083 \$2.00 TDA3505 \$3.00 TDA3506 \$3.00 TDA3506 \$3.00 TDA3561 \$2.00 TDA3560 \$4.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-50 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KIT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DREM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L. C.D. 1992-1993 models and RCO7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 2.5K, 10K £5 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BU824 50p BUT11 50p BUT11AF 1.00 BUT11AF 1.00 BUT11AF 1.00 BUT18AF 1.00 BUT18AF 1.00 BUW84 60p BYW95 1.00 BYW95 1.00 BUX84 50p BUX84500 12.00 BUX8500 12.00 BUX8500 12.00 BUX8500 12.00 BUX8500 100 BUX8	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 E8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA TIT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM/2024F £20 each MATSUT - ORION - SASHIO Video hand set L.C.D. 1992-1993 models and RC07 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 25K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-55 BR-IF Module 5827-01-51 RF-IF Module 5827-01-55 BR-IF Module 5827-01-55 E8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 51640 - L'C's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L.C.D. 1992-1993 models and RCU7 and RC44 £5 each CVC 40 Push Unit with 4 Siders 4K - 1.5K, 2.5K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 18E 1411
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 51640 - LC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video band set L.C.D. 1992-1993 models and RCU7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 2.5K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 18E 1411 £8 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA TIT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI – ORION – SASHIO Video hand set L. C.D. 1992-1993 models and RCO7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K – 1.5K, 2.5K, 10K FANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 £8 each FERGUSON HANDSETS
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-02-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5829-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 51640 - LC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI - ORION - SASHIO Video band set L.C.D. 1992-1993 models and RCU7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 2.5K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 18E 1411 £8 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRUM PDM2024F £20 each MATSUI – ORION – SASHIO Video hand set L. C.D. 1992-1993 models and RCO7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K – 1.5K, 2.5K, 10K FANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 £8 each FERGUSON HANDSETS 3V58-3V57 3V43-3V53 £15 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D – IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRLM PDM2024F £20 each MATSUI – ORION – SASHIO Video hand set L. C.D. 1992-1993 models and RCO7 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K – 1.5K, 2.5K, 10K FANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 £8 each FERGUSON HANDSETS 3V58-3V57 3V43-3V53 £15 each FV31R-FV321 £25 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA ITT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRIM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L. C.D. 1992-1993 models and RC07 and RC44 £2 CVC 40 Push Unit with 4 Sbiders 4K - 1.5K, 2.5K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ IE 1411 £8 each FERGUSON HANDSETS 3V58-3V57 3V43-3V53 £15 each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA TIT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRIM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L. C.D. 1992-1993 models and RC07 and RC44 £2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 2.5K, 10K FANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 £8 each FERGUSON HANDSETS 3V58-3V573V43-3V53 £15 each FV3IR-FV321 £25 each AAA Batteries (handset type) 5p each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BUS24 50p BUT11 50p BUT11AF 11.00 BUT11AF 11.00 BUT11AF 11.00 BUT18AF 11.00 BUW84 60p BYW90-08-9 11.00 BYW95 10p BUX94 20p BUX94 20p BUX84 50p BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX845/600 12.00 BUX85/600	RF-IF Module \$428-04-10 RF-IF Module \$827-02-51 RF-IF Module \$827-03-51 RF-IF Module \$827-01-51 RF-IF Module \$827-01-51 RF-IF Module \$827-01-51 RF-IF Module \$827-01-55 BR-IF Module \$827-01-55 BR-IF Module \$827-01-55 BR-IF Module \$827-01-55 BR-IF Module \$827-01-65 BR-IF FOR NOKIA ITT SETS SAA \$231-SAA \$243 P/E LH \$1640 - IC's On Text Panel Text Decoder, Fastext 6911-11-61 E10 each FERGUSON LOWER DRUM PDM2024F E20 each MATSUF - ORION - \$ASFHO Video hand set LC.D. 1992-1993 models E5 each and RC07 and RC44 E2 CVC 40 Push Unit with 4 Sliders 4K - 1.5K, 2.5K, 10K E5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 E8 each FERGUSON HANDSETS SVS8-3V57 3V43-3V53 E15 each FV31R-FV321 E25 each AAA Batteries (handset type) 5p each
Pye & Philips handset KT3-K30 chassis No. RC5150-RC5176-RC5071-RC5177. Special Price	Amstrad 4700 £5.00 Amstrad 4600 £3.00 IQ081 GEC £3.00 FERGUSON Hand sets BSB £1.50 ICC5 £5.00 IK2000 £5.00 IK7000 £5.00 SRD 2 £1.00 SRD 3 £1.00 SRD 3 £1.00 T780 £2.00 SRD 4 £1.00 TX85-TX8 Ferguson £10 PANASONIC TV Video Handset 1993 models with door- 3 types £7.00 each	BU824 50p BUT11 50p BUT111 50p BUT113600V-28A £1.00 BUT18AF £1.00 BUT18AF £1.00 BUW84 60p BYW90-08-9 £1.00 BYW95 1bp BUX34 50p BUX49 20p BUK445/600 £2.00 BUK445/600 £2.00 BUK445/600 £2.00 BUK45/4600 £2.00 TDA3047 £1.00 BUA3047 £1.00 TDA3048 £3.00 TDA3085 £2.00 TDA3505 £3.00 TDA3506 £3.00 TDA3506 £3.00 TDA3506 £3.00 TDA3506 £3.00 TDA3560 £3.00	RF-IF Module 4828-04-10 RF-IF Module 5827-02-51 RF-IF Module 5827-03-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-51 RF-IF Module 5827-01-05 g8 each 950 to 1750 NOKIA Sat-Tuner £4 each KTT FOR NOKIA TIT SETS SAA 5231-SAA 5243 P/E LH 5164D - IC's On Text Panel Text Decoder, Fastext 6911-11-61 FERGUSON LOWER DRIM PDM2024F £20 each MATSUI - ORION - SASHIO Video hand set L. C.D. 1992-1993 models and RC07 and RC44 £2 CVC 40 Push Unit with 4 Sbiders 4K - 1.5K, 2.5K, 10K £5 each PANASONIC Hand Set TNQ 8E 0442 PANASONIC Hand Set TNQ 1E 1411 £8 each FERGUSON HANDSETS 3V58-3V573 V43-3V53 £15 each FV3IR-FV321 £25 each AAA Batteries (handset type) 5p each

MARCONI COMPACT L.N.B. Switched Model 338. 32642 Fer Philips switched transformers for	guson £1 od mode	VIDEO AMSTRAD (HOME M (EXPORT	MARKET) &		SEND FOR DATA D2 MAC SATELLITE RECEIVER £35 (£5 Post)
SATELLITE RECEIVERS - New Ferguson BSB 33V33, 3V37 TXI	00 HAND SRT (785)	WILL WORK	IN HOME M	IARKET	TELEPHONE BATTERY SANYO 3.6V 250/MA – £2
Chaseic with Tuner Modulator atc 510 DATTEDY 610 Pow	er Supply 0-15 Volts Volts 3 Amps with Meters £34 Post £5	6.000 ar 4.600 4.70	0 £3 conv	ew Eprom for erting Ferguson Receivers to D2 C and PAL – 99	VARTA 3.5V 2 280 M/A £3.00
SMALL SATELLITE TUNERS (950 to 1750 MHz), L. F. frequency 4000MH VHFIUIF S,BAND TUNER DAM MAINS CHASSIS AMSTRAD MONITOR C	£3,00	PB500 Panic and But Transmitter 180MHz G11 CAP 250V, 470N	£1.00 chann	nel is tunable and one can be put memory — also	d FEEDHORN FOR OFFSET ANTENNA
UNIVERSAL TRIPLER. NEW TYPE VIDEO LEADS. AMSTRAD Line O.P. Transistors with Diode 2SD/453 VIDEO LAMPS. Long Lead		LEADS Scart to S		£20 PAL panel	FOR NOKIA LNB's £3.00 each Washer Kit included
HITACHL & GEC FRAME, Thick Film FIDELITY SPLIT DIODE K39 FRONT PANEL TELLTEN TYPE NEW G11 LINE OP PANEL PHILIPS VARBS AHEAD		all pin connecte	ed £2.00 (to c	envert to PAL £20 ND FOR DATA	HITACHI U/V HAND
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TX91F	BATTERIES 4 for £1 ATTERY PACKS AH £6, post £3	HITACHI UHF-VHF SMALL TUNER ETS98A £5.00 ETS95A £5.00	GREY OR BLACK SAMP MAINS LEAD PLUG SOCKET FOR EQUIPMENT ET	WITH Mains TEST choke	input M494B1 c for on Rémote
TX100 REMOTE PANEL No.56413IC M293B/and SAA5012 £10 etc 6251 FRAME O/P THICK FI HITACHI GEC £9.00 THICK FILM HITACHI HM9205A £43		VIDEO CONTI		1	100 SWITCH MODE FRANS 5157/48 £5 AND 00D4252001 06D3082001
NICAM UNIT — Ferguson made for ICC5 Hitachi Lopt 2435062 LOPT		AMSTRAD	OEC 9009 OEC 0015C OEC 9005 14DN513		REO SOLAR RADIO AND MW £10.00
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Decca 75p SXT290234 Sat. Tuner with Base Band M BSB SAT/REC NEW. CHASSIS, PHILIPS NEW TY	in £4	£1 each cell —	10 off £8 S		3V33 HAND SET £10
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