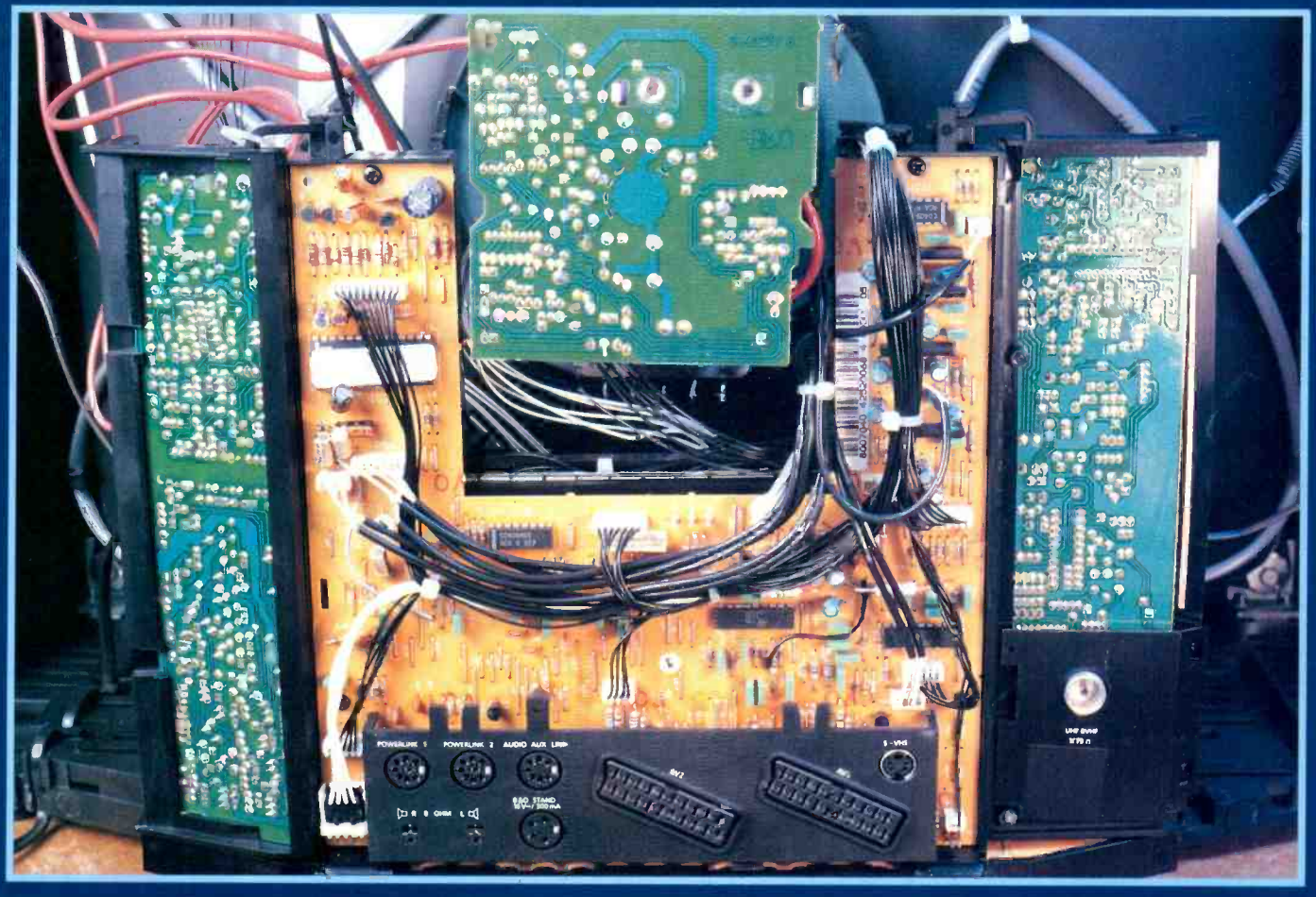
SEPTEMBER 1991 £1·80

TELEVISION

SERVICING·PROJECTS·VIDEO·DEVELOPMENTS



The B and O 39XX Series Chassis
Satellite Dish Alignment Meter
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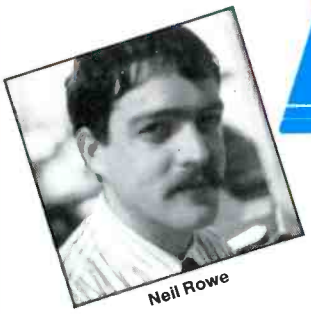
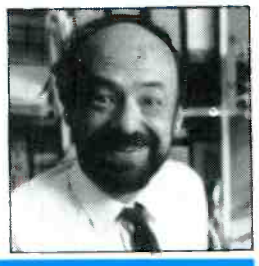
THE FACES BEHIND THE TELEPHONES

WYE AT MANCHESTER

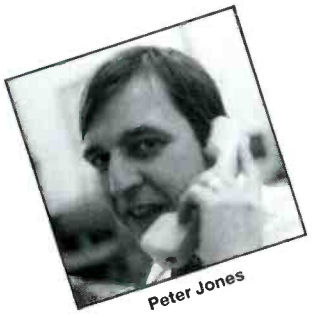

Neil Rowe

For

Sharp
Sansui
Phone David Allen
0734-876444




Mike Molloy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Grundig
Phone Stan Perkins
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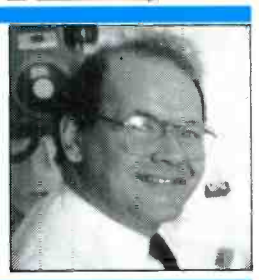


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Samantha Thomas

Philips/Pye
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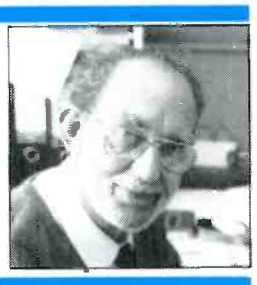

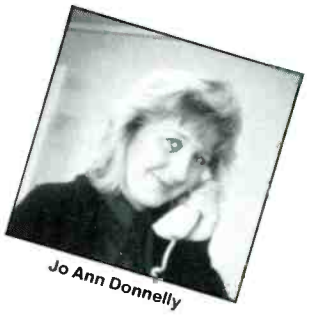
Jo Ann Donnelly


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Ferguson
GEC
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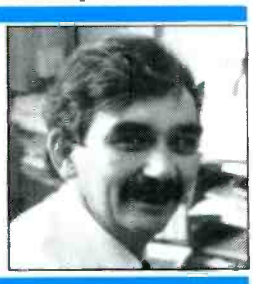
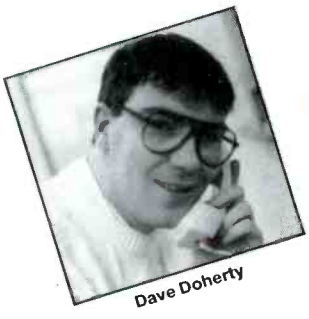
Phone Philip Pratt
0734-876444




Eddie Sloan

Amstrad, Akai, Fisher, Mitsubishi, Moulinex, JVC, Nat Panasonic, Pioneer, Matsui, Goldstar, Saisho, Salora, Sony, Toshiba, Yamaha and many others.

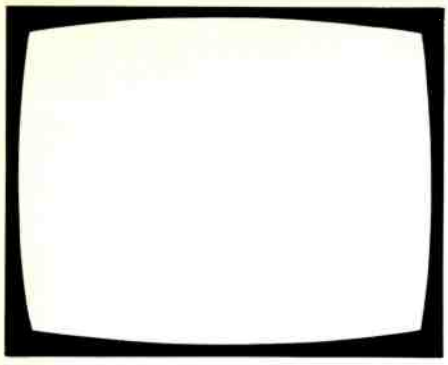
Phone Mike Curtis
0602-870789


Dave Doherty

MANCHESTER OFFICE
061-682 1415


Jan Skarratt

Willow Vale Electronics Ltd



TELEVISION

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CORRESPONDENCE

All correspondence regarding advertisements should be addressed to the Advertisement Manager, "Television", Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS. Editorial correspondence should be addressed to "Television", Editorial Dept., Reed Business Publishing Group, Quadrant House, The Quadrant, Sutton, Surrey SM2 5AS.

INDEXES AND BINDERS

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QUERIES

We regret that we cannot answer technical queries over the telephone nor supply service sheets. We will endeavour to assist readers who have queries relating to articles published in *Television,* but we cannot offer advice on modifications to our published designs nor comment on alternative ways of using them.

this month

OUR NEXT ISSUE DATED OCTOBER WILL BE PUBLISHED ON SEPTEMBER 18

AAY32 9p	BD332 40p	BTY79 140p	TIP117 50p	OA47 10p	PCF801 110p	AN7145 195p	ICL7106 650p	LM3909 80p	STK436 490p	STK7226 800p	TA7310 100p
AC107 40p	BD361 60p	BU100A 110p	TIP120 37p	OA90 10p	PCF802 80p	AN7146 210p	ICL7611 90p	LM3911 160p	STK437 500p	STK7308 410p	TA7312 120p
AC125 30p	BD362 60p	BU104 80p	TIP121 46p	OA91 10p	PCF806 115p	AN7154 180p	ICL7660 240p	LM3914 160p	STK439 550p	STK7309 450p	TA7313 110p
AC126 30p	BD370 30p	BU105 80p	TIP122 47p	OA200 10p	PCH200 100p	AN7156 240p	ICM7555 60p	LM3915 160p	STK441 680p	STK7310 550p	TA7314 210p
AC127 30p	BD371 30p	BU108 100p	TIP125 47p	OA202 10p	PCL81 65p	AN7168 260p	ICM75556 80p	LM3916 270p	STK443 740p	STK7348 410p	TA7315 200p
AC128 35p	BD410 50p	BU109 80p	TIP126 56p	IN.914 2p	PCL82 80p	AN7178 270p			STK457 500p	STK7356 650p	TA7317P 240p
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BC537 25p	BF362 30p	MJ3001 115p	2N3705 9p	7812 25p	AN5015 350p	CA3085 135p	LA4507 360p	NE567 115p	STK4231II 990p	STR45111 700p	TC9156 300p
BC546 8p	BF367 13p	MJE29A 30p	2N3706 9p	7815 25p	AN5020 200p	CA3088E 200p	LA4508 250p	NE571 290p	STK4272 720p	STR50020 650p	TC9161 750p
BC547 8p	BF371 17p	MJE30A 30p	2N3707 9p	7818 25p	AN5025 250p	CA3089E 150p	LA4510 160p	NE592 85p	STK4273 650p	STR50092 650p	TC9164 400p
BC548 8p	BF392 18p	MJE340 25p	2N3708 9p	7824 25p	AN5030 550p	CA3090Q 250p	LA4520 230p	NE5532P 140p	STK4301 700p	STR50100 650p	TC9172P 300p
BC549 8p	BF420 16p	MJE350 80p	2N3710 12p	7905 25p	AN5033 500p	CA3130E 80p	LA4530 250p		STK4311 800p	STR50103A 325p	TC9176P 500p
BC550 8p	BF421 18p	MJE520 30p	2N3711 12p	7906 30p	AN5034 500p	CA3130S 100p	LA4550 200p	SAS560 110p	STK4332 410p	STR50106 850p	TC9178AF 1600p
BC556 8p	BF422 21p	MP8111 40p	2N3771 85p	7908 30p	AN5111 550p	CA3134E 280p	LA4555 190p	SAS570 110p	STK4352 640p	STR50115 650p	TC9179F 2000Pp
BC557 7p	BF423 25p	MP8112 45p	2N3772 90p	7912 30p	AN5132 250p	CA3140E 38p	LA4570 300p		STK4362 600p	STR51041 650p	TC9305 300p
BC558 8p	BF450 20p	MP8113 55p	2N3773 100p	7915 30p	AN5135 600p	CA3160 85p	LA4112 190p	SAA1006 300p	STK4372 570p	STR52041 650p	TCA740 130p
BC559 8p	BF455 12p	MP8512 50p	2N3799 18p	7918 30p	AN5138 450p	CA3661E 140p	LA5523 150p	SAA1008 450p	STK4392 690p	STR52213 650p	TCA940 100p
BC560 8p	BF458 19p	MPS6571 20p	2N3819 29p	7924 30p	AN5150 600p	CA3162E 140p	LA5527 150p	SAA1010 400p	STK4432 900p	STR53041 650p	TCEP100 100p
BC637 20p	BF459 19p	MPS9012 20p	2N3866 68p	78L05 24p	AN5160 600p	CA3189E 230p	LA5700 300p	SAA1020 450p	STK4773 900p	STR53043 650p	
BC638 20p	BF462 50p	MPS9013 20p	2N3903 11p	78L08 24p	AN5215 100p	CA3193E 230p	LA6324 200p	SAA1024 250p	STK4792 1000p	STR54093 1100p	TD62308AP 200p
BC639 20p	BF469 30p	MPS9015 20p	2N3904 11p	78L12 24p	AN5250 150p	CA3240E 150p	LA6358 100p	SAA1025 250p	STK4803 720p	STR55041 650p	TD62381 200p
BC640 20p	BF470 28p	MPSA05 15p	2N3905 11p	78L15 24p	AN5256 150p	CA3260E 170p	LA7011 220p	SAA1124 250p	STK4813 950p	STR58041 480p	TD62382 200p
BCY33 200p	BF471 28p	MPSA06 15p	2N3906 11p	78L18 24p	AN5260 350p	CA3290E 150p	LA7013 400p	SAA1174 300p	STK4833 810p	STR59041 650p	TD62506 200p
BCY34 200p	BF472 28p	MPSA13 15p	2N4031 25p	78L24 24p	AN5262 175p	CX108 950p	LA7033 400p	SAA1220 400p	STK4843 720p	STR60001 650p	TD62705 250p
BCY70 16p	BF479 30p	MPSA20 15p	2N4036 25p	79L05 35p	AN5265 150p	CX134A 950p	LA7040 280p	SAA1250 280p	STK4863 900p	STR61001 750p	TD62781AP 250p
BCY71 16p	BF494 16p	MPSA42 15p	2N4037 25p	79L08 35p	AN5352 600p	CX136 600p	LA7042 280p	SAA1251 380p	STK4863 850p	STR80145 700p	TD62795 200p
BCY72 16p	BF495 16p	MPSA43 15p	2N4062 12p	79L12 35p	AN5355 450p	CX139 1450p	LA7046 300p	SAA1272 280p	STK4873 990p	STRD1106 800p	TD62802 250p
BD115 30p	BF506 25p	MPSA70 15p	2N4064 100p	79L15 35p	AN5410 375p	CX139A 750p	LA7224 150p	SAA1274 280p		STRD1816 800p	TD6304AP 300p
BD124P 50p	BF595 16p	MPSA92 20p	2N4401 12p	7818KC 100p	AN5411 450p	CX141 750p	LA7505 250p	SAA3004 400p	STK4883 1400p		TD6306P 350p
BD131 25p	BF596 16p	MPSA93 20p	2N4403 12p	7824KC 100p	AN5421 150p	CX143 800p	LA7507 250p	SAA5000 200p	STK4913 1180p	T2800D 52p	TD6350P 200p
BD132 25p	BF615 30p	MR510 35p	2N4443 76p	LM309K 100p	AN5429 420p	CX143A 1250p	LA7520 200p	SAA5010 220p	STK5314 550p		TD6359N 500p
BD133 50p	BF617 30p	MR856 36p	2N4444 76p	LM317K 200p	AN5431 300p	CX145 725p	LA7620 500p	SAA5012 400p	STK5315 600p	TA7054 190p	TD6359P 300p
BD135 20p	BF757 40p	OC28 250p	2N5061 20p	LM317T 100p	AN5440 400p	CX150B 325p	LA7800 180p	SAA5020 350p	STK5322 620p	TA7061 115p	
BD136 20p	BF759 40p	OC29 250p	2N5088 20p	LM323K 350p	AN5510 400p	CX158 825p	LA7801 280p	SAA5030 440p	STK5324 520p	TA7063 70p	
BD137 20p	BF760 40p	OC35 250p	2N5192 50p	LM338K 350p	AN5512 250p	CX175 325p	LA7802 300p	SAA5040A 280p	STK5325 580p	TA7066 120p	TDA1001 200p
BD138 20p	BF763 40p	OC36 250p	2N5241 500p	78H08KC 800p	AN5515 200p	CX186 750p	LA7806 260p	SAA5040B 280p	STK5331 400p	TA7073 200p	TDA1002 200p
BD139 20p	BF869 22p	OC45 50p	2N5245 45p	78H12KC 700p	AN5520 550p	CX187 825p	LA7808 250p	SAA5050 650p	STK5332 220p	TA7089 300p	TDA1003 150p
BD140 20p	BF870 22p	OC71 30p	2N5294 30p	79HGKC 800p	AN5521 250p	CX804A 775p	LA7820 250p		STK5333 700p	TA7119 150p	TDA1005A 220p
BD142 45p	BF871 22p	OC72 50p	2N5296 30p		AN5612 400p	CX832 825p	LA7823 280p	SAB3013 200p	STK5335 450p	TA7120 55p	TDA1008 350p
BD144 90p	BF872 23p	OC200 180p	2N5320 90p	VALVES	AN5613 300p	CX867 575p	LA7910 150p	SAB3035 600p	STK5337 600p	TA7130 80p	TDA1010A 150p
BD150 30p	BF960 38p	R2008B 100p	2N5321 60p		AN5615 300p	CX868 625p	LA7940 200p		STK5338 350p	TA7137 83p	TDA1011 120p
BD157 38p	BF961 35p	R2010B 100p	2N5366 25p	DAF96 100p	AN5620 330p	CX877 300p		STA301A 200p	STK5339 500p	TA7140 130p	TDA1012 120p
BD158 38p	BF963 40p	S2800D 52p	2N5401 12p	DAF96 80p	AN5622 350p		LC7131 260p	STA401A 220p	STK5342 500p	TA7157 140p	TDA1013A 120p
BD166 30p	BF964 38p	S2800M 72p	2N5448 12p	DL92 80p	AN5625 400p	HA1125 150p	LC7132 400p	STA403A 220p	STK5361 420p	TA7176 240p	TDA1015 100p
BD175 30p	BF966 40p		2N5496 80p	DY86 70p	AN5712 350p	HA1137W 135p	LC7137 450p	STA404 290p	STK5372 300p	TA7193 400p	TDA1016 200p
BD177 30p		T2800D 52p	2N6107 40p	DY87 80p	AN5722 140p	HA1144 380p		STA405A 280p	STK5412 650p	TA7200 200p	TDA1020 150p
BD179 32p	BFR40 25p	T2800M 72p	2N6109 40p	DY802 90p	AN5730 160p	HA1156 110p	LF347 110p	STA431A 250p	STK5421 625p	TA7203 180p	TDA1022 150p
BD181 45p	BFR90 52p	TIP29 15p	2N6292 40p	EABC80 85p	AN5732 160p	HA1197 150p	LF351 45p	STA432A 220p	STK5422 600p	TA7205 80p	TDA1023 200p
BD182 60p	BFR91 99p	TIP29A 22p	2N6385 120p	EB91 50p	AN5763 170p	HA1199 145p	LF353 48p	STA434A 270p	STK5431 650p	TA7207 150p	TDA1024 200p
BD183 30p	BFT43 30p	TIP29C 25p	2N6403 160p	EBF80 60p	AN5763 450p	HA1319 240p	LF355 60p	STA435A 270p	STK5434 600p	TA7208 145p	TDA1025 320p
BD184 60p	BFT84 30p	TIP30 25p		EBF89 60p	AN5790 300p	HA1338 300p	LF356 60p	STA441C 220p	STK5436 600p	TA7210 200p	TDA1028 220p
BD187 30p	BFW92 35p	TIP30C 30p	3N143 65p	ECC82 90p	AN5791 350p	HA1339A 350p	LF357 70p	STA456C 240p	STK5441 500p	TA7214 260p	TDA1029 250p
BD201 33p	BFX29 20p	TIP31A 22p		ECC83 120p	AN5836 350p	HA1367 300p	LF398 300p	STA471 210p	STK5451 480p	TA7217 145p	TDA1035 120p
BD202 38p	BFX84 20p	TIP31C 30p	DIODES	ECH84 80p	AN5862 300p	HA1368 160p		STA901M 280p	STK5457 425p	TA7222 120p	TDA1038 250p
BD203 42p	BFX85 20p	TIP32 24p		ECC85 90p	AN6135 150p	HA1372 300p	LM301 26p	STA8012 260p	STK5461 700p	TA7223 210p	TDA1044 250p
BD204 42p	BFX87 15p	TIP32A 21p	Rectifier	ECH81 100p	AN6238 400p	HA1377 160p	LM307 42p	STK0025 420p	STK5462 500p	TA7225 300p	TDA1048 225p
BD222 31p	BFX88 15p	TIP32C 28p	Diodes	ECL80 65p	AN6247 200p	HA1388 320p	LM311 35p	STK0029 360p	STK5466 850p	TA7226 290p	TDA1053 400p
BD225 31p	BFX89 60p	TIP33 50p		ECL82 80p	AN6270 400p	HA1389 210p	LM318 120p	STK0039 380p	STK5467 500p	TA7227 190p	TDA1054 200p
BD232 31p	BFY17 30p	TIP33C 60p	BY100 40p	ECL84 100p	AN6300 600p	HA1392 200p	LM319 165p	STK0040 520p	STK5471 400p	TA7229 300p	TDA1059 80p
BD233 30p	BFY18 40p	TIP34 50p	BY103 32p	ECL85 80p	AN6306 550p	HA1394 280p	LM324 30p	STK0049 510p	STK5473 600p	TA7232 250p	TDA1060 190p
BD234 32p	BFY50 14p	TIP34C 60p	BY127 8p	ECL86 90p	AN6307 150p	HA1397 250p	LM335Z 150p	STK0050 640p	STK5476 600p	TA7233 250p	TDA1062 250p
BD235 28p	BFY51 14p	TIP35C 65p	BY133 8p	EF80 80p	AN6320 300p	HA1398 240p	LM337 250p	STK0059 620p	STK5478 500p	TA7237 400p	TDA1070 400p
BD236 30p	BFY52 14p	TIP36C 65p	BY164 40p	EF85 80p	AN6328 400p	HA1457 120p	LM339 35p	STK0060 820p	STK5479 350p	TA7238 400p	TDA1072 300p
BD237 21p	BFY56 25p	TIP41A 20p	BY179 35p	EF89 85p	AN6332 450p	HA11219 280p	LM348 50p	STK0070 1100p		TA7240 260p	TDA1074 420p
BD238 24p	BFY64 25p	TIP41C 22p	BY184 32p	EF183 75p	AN6337 420p	HA11221 180p	LM358 45p	STK0080 580p	STK5481 420p	TA7241 260p	TDA1082 290p
BD239 30p	BFY90 45p	TIP42A 20p	BY196 20p	EF184 85p	AN6341 350p	HA11225 150p	LM380 80p	STK0110 370p	STK5482 550p	TA7242 290p	TDA1083 200p
BD240 40p	BLY48 85p	TIP42C 22p	BY206 11p	EL34 280p	AN6344 440p	HA11235 145p	LM381 150p	STK0115 490p	STK5483 550p	TA7243 350p	TDA1085 400p
BD241A 40p	BR100 14p	TIP47 40p	BY207 11p	EL36 90p	AN6350 610p	HA11251 240p	LM382 120p	STK0016 800p	STK5488 600p	TA7245 450p	TDA1097 550p
BD243A 50p	BR103 37p	TIP48 40p	BY208 18p	EL84 100p	AN6359 810p	HA11423 210p	LM384 130p	STK0025 700p	STK5490 500p	TA7247 350p	TDA1151 60p
BD244 50p	BR303 85p	TIP50 60p	BY210 22p	EL95 85p	AN6360 400p	HA11724 800p	LM386 60p	STK043 900p	STK5725 600p	TA7245 450p	TDA1154 50p
BD245 50p	BRY49 38p	TIP51 120p	BY225 120p	EL500 100p	AN6362 480p	HA12002 300p	LM387 100p	STK050 2200p	STK5730 600p	TA7267 290p	TDA1170 85p
BD246A 50p	BRY56 33p	TIP52 120p	BY226 18p	EL504 130p	AN6371 510p	HA12003 250p	LM392 100p	STK056 820p	STK6431 850p	TA7269 850p	TDA1180 140p
BD265 45p	BSS74 33p	TIP53 120p	BY227 19p	EY86 70p	AN6387 560p	HA12005 400p	LM393 45p	STK057 600p	STK6722 900p	TA7270 250p	TDA1190 90p
BD267 45p	BSX20 15p	TIP54 140p	BY228 28p	EY87 70p	AN6811 130p	HA12017 130p	LM709DIL 130p	STK078 620p	STK6732 1500p	TA7271 400p	TDA1200B 80p
BD269 45p	BSX26 18p	TIP105 65p	BY296 20p	EY88 80p	AN6884 240p	HA13001 170p	LM710 45p	STK080 600p	STK6822 1200p	TA7272 260p	TDA1220 150p
BD278 50p		TIP106 65p	BY298 23p	EZ35 80p	AN7105 210p	HA13002 250p	LM723 40p	STK082 580p	STK6922 600p	TA7273 350p	TDA1235 350p
BD311 100p	BT100A 70p	TIP107 65p	BY299 22p	EZ80 90p	AN7110 130p	HA13006 400p	LM741DIL 18p	STK084 660p	STK6932 600p	TA7274 260p	TDA1236 295p
BD312 100p	BT106 180p	TIP110 40p	BYX10 15p	EZ81 70p	AN7114 150p	HA13007 400p	LM741MET 45p	STK085 1050p	STK6962 320p	TA7280 330p	TDA1270 150p
BD313 100p	BT109 90p	TIP111 50p	BYX55/350 30p	PC97 100p	AN7115 150p	HA13108 350p	LM747 55p	STK086 870p	STK6972 630p	TA7281 270p	TDA1327 250p
BD314 100p	BT116 80p	TIP112 40p	BYX55/600 32p	PCC85 60p	AN7120 130p	HA13412 600p	LM748 30p	STK420 400p	STK6981B 850p	TA7282 260p	TDA1330 150p
BD315 150p	BT119 100p	TIP115 45p	BY X70/500 32p	PCF80 100p	AN7130 110p	HA13432 400p	LM1458 30p	STK430 500p	STK6982 800p	TA7283 260p	TDA1352 200p
BD317 150p	BT146 99p	TIP116 45p	BY70/800 36p	PCF200 135p	AN7140 450p	HA17524 250p	LM1889 300p	STK433 490p	STK7216 500p	TA7288 260p	TDA1410 215p
BD331 40p	BT151 58p					HA17805 100p	LM3900 40p	STK435 400p	STK7217 560p	TA7299 400p	TDA1412 100p

LINEAR IC's — Cont.

TDA1420	200p
TDA1470	140p
TDA1510	380p
TDA1512	200p
TDA1514A	450p
TDA1515A	200p
TDA1516Q	350p
TDA1518	300p
TDA1520	350p
TDA1521	300p
TDA1522	200p
TDA1524	350p
TDA1540	420p
TDA1541	1600p
TDA1596	260p
TDA1670A	300p
TDA1675	250p
TDA1701	320p
TDA1770A	300p
TDA1870A	300p
TDA1872A	450p
TDA1904	120p
TDA1905	150p
TDA1908A	90p
TDA1940	280p
TDA1941	300p
TDA1950	280p
TDA2002	70p
TDA2003	80p
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TDA2005	90p
TDA2006	70p
TDA2007	180p
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TDA2170	300p
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TDA2510	450p
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TDA2532	120p
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TDA2541	120p
TDA2542	150p
TDA2543	300p
TDA2545	200p
TDA2556	350p
TDA2560	120p
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TDA2577A	160p
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TDA2579	250p
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TDA2640	220p
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TDA2690	100p
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TDA2795	250p
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TDA3048	150p
TDA3082	300p
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TDA3190	100p
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TDA3301B	380p
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TDA3410	170p
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TDA3501	400p
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TDA3540	300p
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TDA3566	330p
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TDA3576B	400p
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TDA3592A	350p
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TDA3791	400p
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TDA4439	300p
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TDA9513	350p
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TL072	55p
TL074	80p
TL081	40p
TL082	46p
TL083	55p
TL084	70p
ULN2002	70p
ULN2003	69p
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ULN2804	170p
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UPC555	60p
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2SD-1910	280p
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2SD 1984	150p
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2SJ-50	425p
2SJ-77	350p
2SK 19	45p
2SK-49	50p
2SK-55	100p
2SK 68	100p
2SK 134	415p
2SK 135	415p
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VCR7000 **£0.80**

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IDLERS & PULLEYS REPLACEMENTS

AMSTRAD		Reference	
VCR7000		150280	£1.50
AKAI			
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	£4.50
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	£6.00
V9700	IDLER	BV321979	£6.00
VS125, 126, 155, VS165, 240, 244, VS245, 247, 248, VS250, 512, 515, 516	IDLER ASSY	MZ366966J2	£11.00
FERGUSON			
3V16-22	T-UP IDLER	PU47752	£4.50
3V16-22	T-UP IDLER	PU49280	£6.30
3V23, 3V29-30, 3V31-32, 3V35	REEL IDLER	PU48967	£3.00
3V23	ROLLER ASSY	PU49042A	£4.00
3V29-30, 3V31-32, 3V35-36, 3V38-39, 3V49	T-UP IDLER	51402	£1.45
3V29-30,3V31-32	T-UP CLUTCH	PU51380	£2.60
3V35-36, 3V38-39, 3V49	REEL IDLER	PU55374	£2.85
3V35-36, 3V38-39, 3V49	T-UP CLUTCH	PU55373	£2.25
3V58-59, 3V64-65, FV10-11, FV12-13, FV14	IDLER ARM	PU58645	£2.50
3V42	CLUTCH ASSY	PU55822	£13.50
3V44	CLUTCH ASSY	PU57658	£11.50
3V42, 43, 48, 53, 56	T-UP CLUTCH	PU56043-1-4	£2.80
3V42, 43, 48, 53, 56	SUPPORT CLUTCH	PU56044-1-5	£2.80
FISHER			
FVHP520, FVHP530	FF-REW PULLEY	HI638531	£1.00
FVHP615	COMP. IDLER ASSY	FI1430420400300	£3.30
FVHP615	GEAR IDLER ASSY	FI1430490400900	£5.50
FVHP840	REEL T-UP ASSY	FI1430410400900	£6.50
FVHP905, 906, 908, FVHP910, 916	GEAR IDLER ASSY	FI1430490402400	£6.20
FVHP975, 990, 999, FVHP5000, 5100	IDLER	FI1430420400700	£5.20
GOLDSTAR			
	IDLER	435038A	£2.50
HITACHI			
	FF-REW IDLER	6886971	£1.50
	PLAY IDLER	V-6861482	£3.20
VT11-33, VT63-64, VT14, 17, 19, 38, 57, VT86, 88	CLUTCH ASSY	6879515	£7.50
VT120-220	CLUTCH ASSY	6886824	£7.50
VT8000-8300, VT8500-8700	FF-REW IDLER	6413663	£2.80
VT8000-8300, VT8500-8700	PLAY IDLER	6414221	£3.60
VT8000-8300 VT8500-8700	FF-REW PULLEY	6383531	£0.80
VT9300-9500	FF-REW IDLER	8681471	£3.30
VT9300-9500	PLAY IDLER	6861482	£3.20
VT9300-9500	IDLER	681505	£3.00
	IDLER	687043	£3.80
VT11-33, VT63-64	FF-REW IDLER	6886971	£1.50
HINARI			
VXL3, VXL20	REEL IDLER	40000009	£1.50
ITT			
VR3905, VR3906	T-UP IDLER	PU51402	£1.45
VR3906	REEL IDLER	PU55374	£2.85
VR3913, VR3943	REEL IDLER	PU48967	£3.00
JVC			
HR330, 3660, 4100	T-UP IDLER SML	PU49280	£6.00
HR7200, HR7600, HR7650, HR7655	T-UP CLUTCH	PU53462A	£3.00
HR7200, HR7600 HR7650, HR7655, HR7700	REEL IDLER	PU48967	£3.00
HR3300, 3660, 4100	ROLLER ASSY	PU49042A	£4.00
HR7200, 7600, 7650	T-UP IDLER LRG	PU47752	£4.50
HR7655, HRD110, HRD120-121, HRD225	T-UP IDLER	PU51402A	£1.45
HRD110, HRD120-121, HRD225	T-UP CLUTCH	PU55373	£2.25
HRD110, HRD120-121, HRD225	IDLER ARM	PU55374-3-8	£2.85
MATSUI			
VX730, 735, 750, 755, VX810, 820, 880, 990	CLUTCH	850A00005	£6.50
MITSUBISHI		Reference	
HS306, 307, 318, 319, HS410, 710	GEAR ASSY	522P00201	£6.25

IDLERS & PULLEYS REPLACEMENTS — Cont.

NATIONAL			
NV322, NV600, NV688, NV777, NV788	IDLER UNIT	VXP0463	£3.00
NV333	IDLER ARM	VXL0997	£3.60
NV333, NV366	IDLER UNIT	VXP0401	£0.75
NV333, NV366	PLAY IDLER	VXP0433	£3.00
NV333, NV3000	ACTION GEAR	VDG0016	£0.60
NV333, NV2000, NV3000 NV7800	LOADING GEAR	VXP0325	£2.00
NV333, NV2000, NV3000, NV333	INTERMEDIATE GEAR	VXG0017	£0.65
NV333	CAM GEAR	VXG0158	£1.00
NV366	IDLER ARM	VXL0997	£3.60
NV370, NV430, NV730, NV830, NV850, NV870, NVG7, NVG10, NVG12, NVG18	IDLER ARM	VXP0521	£1.70
NV370, NV430, NV870, NV730, NV830, NV850	CAM GEAR	VDG0200	£1.20
NV730	IDLER UNIT	VXP0581	£2.50
NV2000, NV3000	IDLER UNIT	VXP0331	£1.20
NV2000, NV3000	IDLER UNIT	VXP0329	£1.20
NV2000, NV3000	CAM GEAR	VDG0069	£1.00
NV2000, NV3000	ACTION GEAR	VDG0016	£0.60
NV7000, 7200, 7800	IDLER UNIT	VXP0344	£1.00
NV7000, 7200, 7800	CLUTCH	VXP0343	£5.50
NV8400, NV8600, NV8610, NV8620	IDLER UNIT	VXP0245	£1.20
NV8600, NV8610, NV8620	PLAY IDLER	VXP0243	£1.20
NV8620	CLUTCH	VXP0343	£5.50
NV600	IDLER	VXP0488	£3.50
NVG21-25, NVG40-45	PULLEY UNIT	VXP0767	£5.80
ORION			
VH200-201 VH555-700, VH844-900, VH1000-1500, VH1800,	IDLER	850A200004	£3.50
VP200, VH530 VH535-630, VH635-640, VH893-1440, VH2500-2600, VH2700-4010, VH5010	IDLER	850A200005	£6.50
PHILIPS			
DV464, VR6462, VR6463, VR6660, VR6860	IDLER	52220334	£2.50
VR6460, VR6520, 6920	IDLER ARM	40340162	£1.70
DB532, VR6542, VR6843	REEL IDLER		£7.50
SANYO			
VHR110, VHR1300, VHR1500	IDLER	1430662T14730	£5.00
VTC5000, VTC5150	FF-REW IDLER	1430741T20001	£3.00
VTC9100, VTC9300	IDLER	1430551T01400	£1.20
VTC9300	FF ROLLER ASSY	1430547T00200	£2.20
VTCM10-20	REEL DRIVE PULLEY	1430662T10350	£5.00
VHR2100, VHR2300	IDLER	6130374899	£5.00
VTC5000, VTC5150	PULLEY	143-0-662T-01201	£5.20
VTCM10	PULLEY	143-0-662T-10350	£5.50
SHARP			
VC651, VC681, VC685	IDLER ASSY	NPLYV0107GEZZ	£6.15
VC7300, VC7700	PLAY IDLER KIT	NPLYV0041 + NDA1V1007	£5.00
VC381, VC383, VC386, VC8381, VC9100, VC9300, VC9500, VC9700	IDLER	NIDL0005GEZZ	£1.50
VC300, VC387, VC481, VC482, VC483, VC496, VC571, VC585	IDLER	NIDL0006GEZZ	£1.50
VC780-781, VC785-787, VC793-VCT72	REEL IDLER	NPLTV0111GEZZ	£7.00
SAISHO			
VR1100, VR1200, VR1200HQ, VR1600, VR2500, VR3300, VR3500, VR3600	CLUTCH	850A20000	£6.50
SAMSUNG			
VT510-511, VT520-610, VT611-616, VT620-621-626	IDLER WHEEL	65224704220	£1.50
VT510-511, VT520-610, VT611-616, VT620,621-626	IDLER COMPLETE	69000250330	£4.50
SONY			
C6	IDLER KIT ASSY	A 6706391	£3.50
C7	IDLER ASSY	X 36533100	£3.80
SL-C5, SL-C7	REW PULLEY	A-6706-348-B	£4.00
SL-C6	REW PULLEY	A-6706-391-A-B	£3.00

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FERGUSON & JVC		
PU 45979, 3V16, 3V22, HR3300, HR3660	CAPSTAN MOTOR	£21.00
PU 55371V, 3V35, 3V36, 3V38, 3V39, 8943, 8944, HRD110, HRD120, HRD121, HRD225	CAPSTAN MOTOR	£19.50
PU 46414, 8904, 8922, HR3300, HR3320, HR3330, HR3360, HR3600, HR3660	DRUM MOTOR	£19.50
PU 51381V, 3V39, 3V30, 8930, HR7200, HR7300	REEL MOTOR	£26.50
PU 58635V, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430	CAPSTAN MOTOR	£29.00
PU 58636W, 3V58, 3V59, 3V64, 3V65, 8950, 8951, FV10B, FV11R, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD170, HRD180, HRD230, HRD370, HRD430, HRD530	REEL MOTOR	£18.00
3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8945, 8947 8948, HRD140, HRD150, HRD455, HRD565, HRD725, HRD755, HRP50, R73AF	LOADING MOTOR	£8.00
MITSUBISHI		
288P02801, HS300, 301, 302, 310	MOTOR REEL SPOOLING	£33.50
288P02806, HS303, 304, 320, 330, 700	MOTOR REEL SPOOLING	£31.50
288P03401, HS303, 700	MOTOR REEL TAKE-UP GEN	£21.00
NATIONAL		
MYN 135V5L, NV332, NV333, NV340, NV366	REEL MOTOR	£13.50
VEM0212, NV730-NV770	MOTOR REEL GEN	£30.00
SANYO		
4-529V-10800 (RM11), VTC5000, VTC5150	REEL MOTOR	£6.30
SHARP		
RMOTV 1008GEZZ, VC200, VC381, VC384, VC385, VC386, VC483, VC3300, VC8381, VC9100, VC9300, VC9500, VC9700	REEL MOTOR	£13.50
RMOTV 1007GEZZ, VC387, VC483, VC486, VC585	REEL MOTOR	£16.50
RMOTV 1010GEZZ, VC300, VC402, VC471, VC477, VC481, VC482, VC488, VC496, VC500, VC571, VC581, VC582, VC583, VC584, VC5F3, VC8481, VC8581	REEL MOTOR	£16.00
SONY		
BHF 11000, SLC7	CAPSTAN MOTOR	£25.00

CASSETTE HOUSING

FERGUSON & JVC	
3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, HR0110, HRD120, HRD121, HRD225	£24.00
3V42, 3V43, 3V44, 3V45, 8945, 8947, HR0140, HRD141, HRD150, HRD455, HRD725	£24.00
8948, 8950, FV10B, FV12L, FV13H, FV14T, FV20B, FV21R, FV22L, HRD230, HRD430, HR0530	£24.00
3V58, 3V59, 3V64, 3V65, FV11R, HRD170, HRD180, HRD370	£24.00

VIDEO LAMPS

UNIVERSAL VIDEO LAMPS 12V 60mA (300mm WIRES)	£0.30
PANASONIC VIDEO LAMPS	£0.50

SONY FLYBACK TRANSFORMERS

Part No.	Models	Price
1-439-216-00	KV-2002E, 2010E, 2200E, 2015, 1820E, 2010SE, KV-2012ME, 2016ME, 2015ME, 2010ME	£14.00
1-439-256-11	KV-2704EC, 2704UB, 2704ET, 2704E(A), 2704E	£40.00
1-439-286-21	KV-2215UB, 2217UB, 2215EI, 2215FE, 2212EX, 2215ET	£30.50
1-439-289-21	KV-2705F, 2705FE, 2705UB, 2705E, 2706UB, 2720EC	£40.00
1-439-303-00	KV-2064EC, 20PS1, 2082ME7, 2056EC, 2060SA, KV-2062E(ESP)	£22.75
1-439-311-00	KV-1440AEC, 1440AS MK2, CPS-14CD3, CPV-14CD2, KTX-1350NF, KTX-1430UB	£22.00
1-439-332-21	KV-2756, 2730EC, 2730FE, 2764EC, 2752UB, 2752F	£30.00
1-439-333-00	KV-1882EC, 1882UB, 1882F, 1882CH, 1882AEB, 1882AM, KV-1882ME3, 1882HK, 1882AS, 16TR1, 882EC(PS), 1770R	£21.50
1-439-363-21	KV-19HT1A, 19FX1MT, 18G2, 1602M7, 1602GE, ADM-16B, KV-2092UB, 2096UB	£22.00

NATIONAL LINE OUTPUT TRANSFORMER

TLF 146-11B	£19.00
TLF 15542F	£25.00
TLF 14568F	£26.00
TLF 14567F	£26.00
TLF 14715F	£27.00
TLF 14749B	£20.00

NATIONAL TRANSFORMERS

TLF 6609B	£23.00

HITACHI TRANSFORMERS

2434274	£20.00

TRIPLERS

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THORN 9000 SERIES	£8.00
PHILIPS G9	£7.50
G8 520/550	£7.50
KT3	£4.50
DECCA 100 SERIES	£7.50
120/130	£6.50
ITT CVC 20/30	£7.00
CVC 825	£8.00
RANK T20A	£7.00
UNIVERSAL	
To fit: 20AX TUBE	£8.00
30AX TUBE	£8.00

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LEADS TO FIT CHASSIS CODE: CTX TYPE	£2.50
G11 TYPE	£2.50
KT4 TYPE	£2.50

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2114	150p
2532	310p
2716	150p
2732	250p
2732A	280p
2764	180p
27C64	400p
27128	190p
27256-25	300p
27512	500p
4116	50p
4164-15	110p
4164-12	120p
4164-10	130p
41256-15	130p
41256-12	140p
41256-10	150p
41464-12	240p
41464-10	250p
6116	110p
6264-15	160p
6264-12	200p
6264-10	210p
62256-12	450p
6502	300p
6502A	360p
65C02	930p
6522	280p
6551	380p
6800	210p
6802	220p
6803	500p
6808	500p
6809	500p
6810	150p
6818	380p
6821	130p
6840	290p
6845	370p
6850	110p
8080A	380p
8085A	300p
8086	500p
8088	480p
8156	300p
81LS96	130p
81LS97	130p
81LS98	130p
8224	240p
8226	240p
8243	250p
8250	750p
8251	240p
8253	210p
8255	200p
8256	700p
8257	220p
8271	3400p
8279	270p
8283	400p
8284	440p
8287	260p
8288	650p
8748	700p
8755	800p
Z80ACPU	110p
Z80ABCPU	200p
Z80ADMA	300p
Z80AP10	170p
Z80BP10	200p
Z80ACTC	170p
Z80BCTC	250p
Z80AS10	350p
Z80AS10-1	300p
Z80AS10-2	300p
Z80AOART	350p
74S289	180p
74S387	200p
75107	65p
75110	75p
75113	100p
75122	110p
75150	95p
75154	100p
75162	700p
75182	95p
75183	95p
75188	55p
75189	55p
75195	185p
75451	40p
75454	65p
75492	55p
8T26	95p
8T28	110p

SIMMS

256K × 9-80	1300p
256K × 9-70	1500p
1MB × 9-80	3800p
1MB × 9-70	4000p

SIPS

256K × 9-80	1400p
256K × 9-70	1600p
1MB × 9-80	3900p
1MB × 9-70	4100p

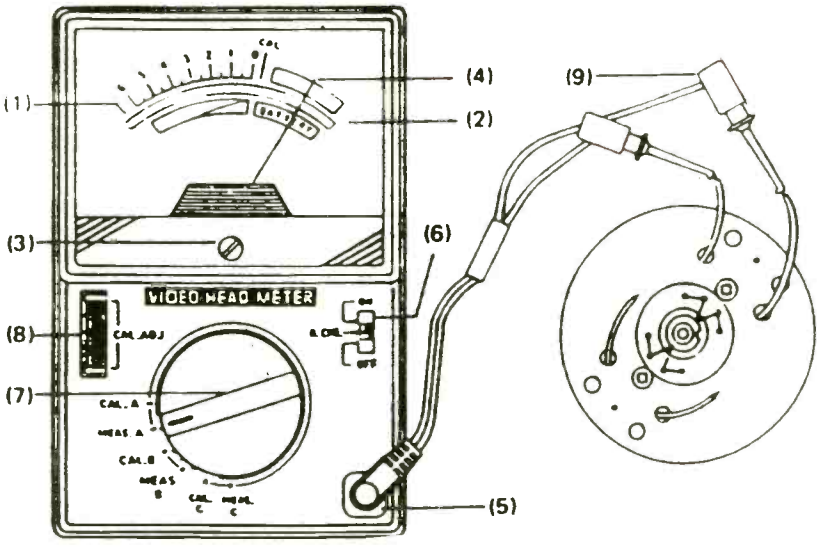
OPTO COUPLERS

4N25	50p
4N26	50p
4N27	50p
4N28	50p
4N29	90p
4N30	90p
4N31	90p
4N32	100p
4N33	100p
4N36	58p
4N37	58p
4N38	68p

LED DISPLAY

MAN74	100p
MAN8910	200p
DL747	120p

VIDEO HEAD TESTER



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4. Pointer
5. Measuring Socket
6. Power ON/OFF and Battery Check Switch
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8. CAL. ADJ (calibration volume)
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Part Number: PS 403-40205 Price ...625p

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30 Watt 220/100 Volts Soldering Iron..... **3.50**
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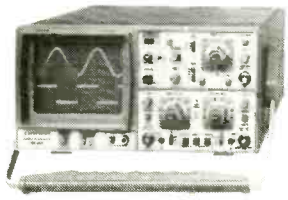
All supplied with **2 PROBES, a COMPREHENSIVE MANUAL** and a **2 YEAR WARRANTY**.

HM203-7 20MHz STANDARD

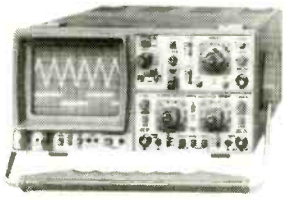


SPECIFICATION
* 2 Channels
* Bandwidth: DC - 20MHz
* Sens: Ch.!, Ch.2, 1mV/cm
*Timebase: 0.1s - 20ns/cm
* Triggering: DC - 40MHz
* Active TV - Sync - Separator
* Variable hold-off
* Trigger LED indicator
* Calibrator: 1KHz Square wave
* Component tester
* Plus many features

Price £338.00 + £59.15 V.A.T. **FREE Specialist Carrier Delivery**

HM604 60MHz UNIVERSAL

SPECIFICATIONS
* 2 Channels
* Bandwidth: DC - 60 MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase : 2.5s - 5ns/cm
* Triggering: DC - 80MHz
* Active TV - Sync - Separator
* After delay trigger
* Sweep delay
* Delay line
* Trigger LED indicator
* Calibrator: 1KHz & 1MHz Sq. Wave
* Component tester



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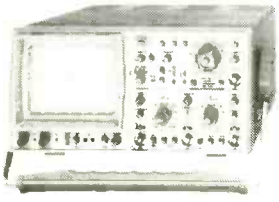
HM1005 100MHz UNIVERSAL

3 CHANNELS - UP TO 6 TRACES

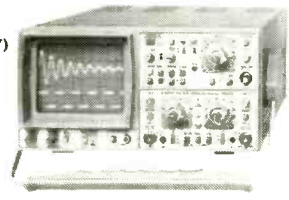


SPECIFICATION
*3 Channels
* Bandwidth: DC - 100MHz
* Sens: Ch.1, Ch.2, Ch.3, 1mV/cm
* Timebase A: 2.5s - 5ns/cm
* Timebase B: 0.2s - 5ns/cm
* Triggering DC - 130MHz
* After delay trigger
* Delay line
* Trigger LED indicator
* Overscan LED indicator
* Active TV - Sync - Separator
* Calibrator: 1KHz & 1MHz Sq. Wave

Price £792.00 + £138.60 V.A.T. **FREE Specialist Carrier Delivery**

HM205-3 20MHz DIGITAL STORAGE

SPECIFICATION
* Digital Storage
* Analogue real time (Same as 203-7)
* Bandwidth: DC - 20MHz
* Sens: Ch.1, Ch.2, 1mV/cm
* Timebase Digital: 5s-1μs/cm
* Triggering DC - 40MHz
* Active TV - Sync - Sampling
* Max sampling rate: 2 x 20MHz
* Memory: 2 x 2048 x 8 Bit
* Dot joiner
* Printer/plotter output



Price £610.00 + £106.75 V.A.T. **FREE Specialist Carrier Delivery**

B.K.'s CRT TESTER REJUVENATOR

Tests and rejuvenates blue, green and red guns separately. Fitted with delta and P.I.L. sockets. Compact size 120 x 65 x 60mm. Supply 240V AC

Price £32.00 + £5.60 V.A.T.

DIGITAL CAPACITANCE METER

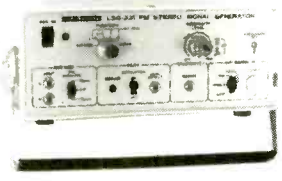
* High accuracy.
* 0.1pf-2,000μf.
* LCD display.
* 8 ranges.
* Accuracy + /- 0.5%. Full scale + /- 1 digit.
* Inc. protective case.

Price £38.00 + £6.65 V.A.T.

LEADER FM STEREO SIGNAL GENERATOR

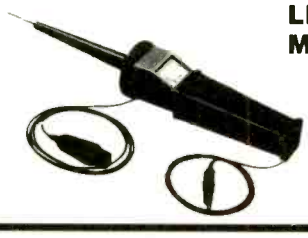
At last! A generator specifically designed for testing and fault finding on FM stereo and monaural VHF receivers including stereo multiplex circuits.

FEATURES
* Carrier frequency 100 + /- 1MHz (adjustable).
* Output level 0.1mV - 10mV.
* Pilot signal 19KHz + /- 2Hz.
* L & R separation over 50dB.
* External Modulation 50Hz - 15KHz.
* Pre-emphasis 50μs, 75μs & off.
* Comprehensive test lead set included.
* Mains powered.
* Size: 80 x 200 x 250mm.



Price £299.00 + £52 .33 V.A.T.

LEADER HIGH VOLTAGE METERED EHT PROBE

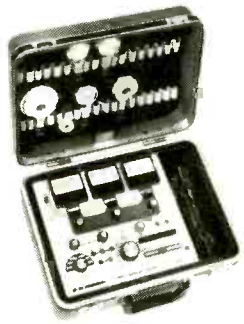


Light weight, easy-to-grip high-impact plastic handle with arc-over protection and no need of extra equipment. An indispensible item in your TV service kit. Measures up to 40kV DC with safety and the greatest of ease. Entirely self-contained. Connect the lead clip to chassis and probe tip to the check point, read the meter for voltage.
A must for the Health and Safety at Work Acts.

Price £66.00 + £11.55 V.A.T.

B & K PRECISION CRT ANALYSER-RESTORER

The number one CRT Test Instrument. Over 5000 U.K. Television engineers wouldn't be without it.



* All CRT's checked identically, including all in-line and one gun types * Tests all three guns of colour CRT's simultaneously under actual operating conditions (model 490) * Exclusive multiplex technique (model 490) * Measure true dynamic beam current that actually passes through G1 aperture to screen * Measures all shorts and leaks - preserving more CRT's * Tests focus electrodes lead continuity finding faults that **other testers miss** *Uses most powerful restoration method known with minimum danger to CRT * Rejuvenated CRT's guaranteed as new for two years * Obsolescence proof - perpetual set up chart updated and new adaptors developed * Tests and rejuvenates VDU's and oscilloscope tubes * A range of over 40 CRT base adaptors available * Increase profit * Pays for itself in months.

Prices

Model 490 Tri-dynamic three meter instrument inc. 6 common adaptors	£446.00 + £78.05 V.A.T.
Without adaptors	£393.00 + £68.77 V.A.T.
Model 480 Single meter instrument inc. 6 common adaptors	£334.00 + £58.45 V.A.T.
Without adaptors	£281.00 + £49.18 V.A.T.

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The Sadelta Field Strength Meters have been designed to facilitate the dish alignment of satellite TV systems and aerial alignment of VHF/UHF television and radio systems. Signal levels can be accurately measured on the TC402-C and the TC90, allowing the evaluation of signal conditions for satisfactory operation. Both models have a clear LCD direct frequency readout, coupled to a multiturn tuning control enabling precise channel identification.

TC402-C VHF & UHF

FEATURES
* Three bands:
  Low VHF: 45-110MHz
  High VHF: 110-300MHz
  UHF : 470-862MHz
* Digital display for direct frequency readout.
* Built-in monitor loudspeaker AM/FM.
* Signal measurement from 20μV to 100mV.
* Powered by eight 1.5 AA batteries.
* Fully portable with sturdy carrying case.

Price 259.00 + £45.33 V.A.T.

TC90 VHF-UHF- SAT.

FEATURES
* Five bands:
  Low VHF : 45-110MHz
  High VHF : 110-300MHz
  Hyper VHF : 300-470MHz
  VHF : 470-862MHz
  Satellite : 950-1750MHz.
* Digital display for direct frequency readout.
* Signal measurement VHF/UHF 20μV to 3V.
* Signal measurement satellite -70dBm to -10dBm.
* Audible indication of satellite signal level.
* Built-in-monitor loudspeaker AM/FM (not satellite).
* Powered by rechargable battery (complete with charger 220/240V AC).
* Fully portable with sturdy carry case.

Price £470.00 + £82.25 V.A.T.

BLACK STAR COLOUR PATTERN GENERATOR

THE 'ORION' THREE-IN-ONE

PAL VHF/UHF - PAL VIDEO COMPOSITE - R.G.B.

The Orion is a compact, bench instrument offering a wide range of patterns and facilities at a truly low cost.

In addition to a switchable sound carrier facility which allows use with the majority of PAL TV systems, the Orion provides highly flexible RGB outputs, ensuring compatibility with most video monitors.

More than 50 pattern combinations can be selected, including those for testing static and dynamic divergence, video amplifier linearity, colour purity, general colour performance, focus etc.

A separate video input to modulate camera signals; fully variable RF and video output levels facilitating AGC testing; trigger output allowing easy triggering of difficult oscilloscope waveforms; external sound modulation input via DIN connector for frequency response testing of TV sound systems; adjustable wide frequency coverage of VHF and UHF TV bands.

Just some of the features making the Orion Pattern Generator an indispensible tool in the manufacture, test, and servicing of televisions, and computer and video monitors.

FEATURES
* Colour bars, purity, greyscale, crooshatch, dots, focus, etc.
* VHF/UHF Channels.
* 5.5MHz, 6.0MHz, 6.5MHz Sound Carriers.
* Internal/External Sound.
* External Video Output.
* Trigger Output.
* PAL B,D,G,H,I,K.
* Separate R, G, B and sync. O/P's.
* RGB @ TTL & 1V.
* Green + 0.3V Syncs.
* Composite Video Output.
* Variable RF/Video Output.
* Switchable Video Polarity.
* Mains powered 220/240V AC 50/60Hz.
* Size: 98 x 219 x 240mm.

Price £209.00 + £36.58 V.A.T.

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0.1f 5.5v (back-up)	2.50
1uf at 250v	.20
1uf at 400v	.25
1uf at 400v	.25
4.7uf at 250v	.25
4.7uf at 400v	.35
10uf at 250v	.35
10uf at 400v	.75
22uf at 250v	.40
33uf at 250v	.55
47uf at 250v	.65
100uf at 250v	1.25

(All the above are pcb mounting)

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BY133	.15
BY227	.20
BY229/800	.95
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1N5408	.20
BZX61C (1.3 Watt) 5v6, 6v8, 7v5, 9v1, 12v, 15v, 24v, 33v, 68v, 120v, 130v (5 per Value)	1.00

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RBM T20/22A	7.95
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UNIVERSAL	5.95

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20mm O/B; (Pkts of 10) 500MA, 630MA, 800MA, 1A, 1.6A, 2A, 2.5A, 3.15A ..... .60

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TDA1037	2.75
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TDA1516	7.75
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TDA3654A	3.95
TDA4500	3.95
TDA4501H	5.95
TDA4503	4.50
TDA4505E	6.95
TDA4600/2	2.95
TDA4600/2D	3.95
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TEA1014A	3.95
TEA1039	2.95
TEA2018A	2.95
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UPC1420CA	8.50

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Ferguson TX90 (14")	19.75
Ferguson TX90 (20")	21.50
Ferguson TX99	22.75
Ferguson TX100 90D	19.95
Ferguson TX100 110D	19.95
Ferguson TX100 110D FST	23.50
Fidelity ZX2000 + Mod)	12.50
Fidelity ZX3000	11.50
Fidelity ZX 22"/36"	21.50
Hinari CT4/5	19.95
Hinari CT6/7	19.95
Hitachi CPT1446	22.95
ITT Compact 80	19.95
ITT CVC25/30/32	9.95
ITT CVC800/1/2/3	23.95
ITT CVC830	19.95
ITT CVC1100	19.95
ITT CVC1150	21.50
ITT CVC1200/1	19.95
ITT CVC1204	14.75
ITT CVC1215	19.95
ITT Monoprint 110D	22.50
ITT Monoprint B	22.50
Matsui C1410/1420	26.95
Matsui C1480A	26.95
Philips CF1	23.50
Philips CP90	22.95
Philips CTX 14"/20"	21.50
Philips K30	23.75
Philips K35	22.95
Philips K40	23.75
Philips 2A	23.50
Saisho CT141X	26.95
Sharp C1410	24.95

ON/OFF SWITCHES

TX9/10 Standard	1.00
TX9/10 Remote	1.75
TX90/100 Standard	1.50
TX90/100 Remote	1.75
Fidelity CTV140	1.50
Fidelity CTV14R	2.95
Fidelity CTV14S	2.95
Grundig CUC731	3.50
Philips G11 Standard	1.35
Philips G11 Remote	1.75
Philips KT3 Remote	1.75
Philips KT4/CTX Remote	1.75
RBM T20A 3K3 Volume	3.95
Sony Universal	3.75
Sony KV1612 Remote	3.95
Sony KV2022 Remote	3.95
Thorn Universal	1.00

REMOTE CONTROLS

Ferguson T725	12.95
Ferguson T734	14.95
Ferguson T742	14.95
Ferguson T785	12.50
Ferguson T789	12.50
Ferguson TX10 Non Text	12.95
Ferguson TX10 Text	12.95
Ferguson TX10 Stereo	12.95
Ferguson 3V23	14.95
Ferguson 3V32	14.50
Ferguson 3V35	14.50
Ferguson 3V45	14.95
Ferguson 3V43	14.95
Ferguson 3V55	15.75
Fidelity CTV14S	13.95
Fidelity CTV22T	14.95
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Grundig TP650	14.95
Hitachi CPT2038	15.95
Hitachi CPT2188	15.95
Hitachi CPT2246	15.95
Hitachi CPT2508	15.95
Hitachi CPT2888	15.95
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Hitachi VT120E	14.95
ITT FS9/10 Digivision	14.95
ITT RG305	12.95
ITT RG306	12.95
ITT VS4	14.95
ITT VS5 Text	14.95
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Panasonic TNQ1411/2	14.95
Panasonic TNQ1419	16.95
Panasonic TNQ162I	14.95
Panasonic NV730	15.75
Philips G11 I/R N/Text	12.95
Philips G11 I/R Text	12.95
Philips KT3/30 N/Text	12.95
Philips KT3/30 Text	12.95
Philips KT4/CTX Text	12.95
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Tatung RC40/45	15.95
Tatung RC42	14.95
Tatung RC60	14.95
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BC327	.10
BC337	.10
BC547/8	.10
BC557/8	.10
BC639	.20
BC640	.20
BD238	.40
BD677	.65
BF337	.30
BF422	.35
BF423	.35
BF458	.35
BF460	.95
BF757	.70
BF871	.95
BR103	.75
BT151/800	1.35
BU126	1.95
BU208A	1.45
BU208D	1.95
BU326A	1.95
BU426A	1.45
BU500	2.00
BU508A	1.50
BU508AF	1.95
BU508D	1.95
BU508DF	2.50
BU508V	2.75
BU705	2.95
BU807	1.75
BU826A	2.95
BU907	2.95
BU908	2.95
BUT11AF	2.75
BUT12A	2.95
BUT56A	2.75
BUX84	.80
R4050	2.95
T9053V	3.50
T9054V	3.50
T9064V	1.95
TIP29E (TO168V)	.75
TIP41C	.50
TIP42C	.50
TIP112H (TO167V)	.75
TIPL791A	1.95
2SC1942	2.95
2SC3156	2.95
2SD725	4.95
2SD1398	2.50
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Amstrad 7000	19.95
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Ferguson 3V32	24.95
Ferguson 3V42/55	19.50
Ferguson 3V43	32.50
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Hitachi VT17/19	34.95
Hitachi VT63/64	22.50
Hitachi VT65	34.95
Hitachi VT120E	24.95
Hitachi VT130E	29.95
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Matsui VX735A	22.95
Mitsubishi HS301/302	24.95
Mitsubishi HS303/305	24.95
NEC 9034/9053	22.50
Panasonic NV230	22.50
Panasonic NV333	9.50
Panasonic NV366	24.95
Panasonic NV370	12.50
Panasonic NV430	19.95
Panasonic NV688	33.50
Panasonic NV730	23.95
Panasonic NV777	27.50
Panasonic NV788	38.50
Panasonic NV2000/7000	9.50
Panasonic NVG7/9	19.50
Panasonic NVG10/12	19.95
Panasonic NVG18	29.95
Panasonic NVG20/21	29.95
Panasonic NVG30/40	24.50
Philips 6460/6520	12.50
Philips 6462/6560 Genuine	42.95
Philips 6467	37.95
Philips 6760 Genuine	39.95
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Sanyo VHR1100/1300	19.50
Sanyo VHR2300/3200	19.95
Sharp VC9300/381/481	17.50
Sharp VC581/681	17.50
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Toshiba V73/83B	21.50
Toshiba V93B	23.95

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Capacitor Back-up	2.50
Pinch Roller	3.95
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Reel Pulley	1.95
Video Head	21.50

VCR5000

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Pinch Roller	3.95
Reel Idler	3.95
Reel Pulley	1.95
Video Head	21.50

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VCR4500/4600

Belt Kit VCR4500	1.95
Belt Kit VCR4600	1.95
Modification Kit	6.95
Video Head VCR4500	18.75
Video Head VCR4600	18.75

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Take-Up Clutch (Small)	5.95
Video Head	9.50

3V29/30

Repair Kit	12.95
Belt Kit	1.80
Capstan Motor	32.50
Cassette Lamp	.80
Loading Belts (5)	1.95
Pinch Roller	3.95
Reel Idler	2.95
Take-Up Clutch	2.95
Take-Up Idler	1.85
Tension Band	2.45
Video Head	9.50

3V35/39

Repair Kit	12.95
Belt Kit	1.95
Capstan Motor	22.95
Cassette Housing	25.95
Cassette LED	1.95
Loading Belts (5)	1.95
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Pinch Roller	3.95
Reel Idler	2.95
Remote Control	14.95
Take-Up Idler	1.85
Take-Up Clutch	2.95
Tension Band	2.45
Video Head	9.50

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3V44/45

Repair Kit	14.95
Belt Kit	1.50
Cassette Housing	25.95
Clutch Assembly	12.95
Pinch Roller	3.95
Remote Control	15.95
Video Head	19.50

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Belt Kit	1.75
Capstan Motor	27.50
Cassette Housing	29.95
Pinch Roller	3.95
Reel Idler	2.75
Reel Motor	15.95
Video Head	23.50

FISHER VIDEO SPARES

FVII615/720

Belt Kit	1.95
Clutch Assembly	5.95
Pinch Roller	4.50
Reel Idler	5.95
Video Head	17.50

FVH905/910

Belt Kit	1.95
Clutch Assembly	19.95
Reel Idler	5.95
Video Head	17.50

HITACHI VIDEO SPARES

VT8000/8700E

Belt Kit	1.95
FF/REW Idler	2.95
FF/REW Pulley	.95
Play Idler	3.95
Video Head	17.50

VT9300/9700E

Belt Kit	1.95
Capstan Motor	31.95
FF/REW Idler	2.75
FF/REW Pulley	.95
Play Idler	3.95
Remote Control	15.95
Video Head	17.50

VT11/33E

Repair Kit	17.95
Belt Kit	1.95
Capstan Motor VT11E	26.95
Capstan Motor VT33E	29.95
Clutch Assembly	7.95
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Pinch Roller	3.95
Tension Band	2.95
Video Head	17.50

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Belt Kit	1.95
Capstan Motor	27.50
Clutch Assembly	7.95
FF/REW Idler	2.50
Pinch Roller	3.95
Repair Kit	17.95
Video Head VT63/64E	22.50
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Belt Kit	1.95
Clutch Assembly	7.95
FF/REW Idler	3.75
Pinch Roller	3.95
Repair Kit	18.50
Video Head VT120E	24.95
Video Head VT130E	29.95

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NV230/430

Repair Kit (Genuine)	12.95
Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Tension Band	2.45
Video Head NV230	22.50

NV333/366

Repair Kit (Genuine)	13.75
Belt Kit	1.95
Pinch Roller	3.95
Play Idler (Genuine)	4.95
Reed Idler (Genuine)	1.25
Reel Motor	17.95
Tension Band	2.45
Video Head NV333	9.50
Video Head NV366	24.95

NV370

Repair Kit (Genuine)	12.95
Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Tension Band	2.45
Video Head	12.50

NV730

Repair Kit (Genuine)	12.95
Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Reel Motor	29.95
Remote Control	15.75
Tension Band	2.45
Video Head	23.95

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Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Video Head	23.95

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Repair Kit (Genuine)	21.50
Belt Kit	1.95
Pinch Roller	3.95
Play Idler (Genuine)	1.25
Reel Idler (Genuine)	1.25
Video Head	9.50

NV7000/7200

Repair Kit (Genuine)	17.50
Belt Kit	1.95
Pinch Roller	3.95
Play Clutch (Genuine)	4.95
Reel Idler (Genuine)	1.25
Video Head	9.50

NVG7/10/12

Repair Kit (Genuine)	12.95
Belt Kit	1.95
Mode Switch	3.95
Pinch Roller	3.95
Reel Idler (Genuine)	2.95
Video Head (NVG7/9)	19.50
Video Head (NVG10/12)	19.95

PHILIPS VIDEO SPARES

VR6460/6520

Repair Kit	12.95
Belt Kit	1.95
Pinch Roller	3.95
Reel Idler	2.95
Video Head	12.50

VR6462/6560

Repair Kit	14.50
Cassette Housing	17.50
Pinch Roller	4.50
Reel Idler (Genuine)	4.95
Video Head (Genuine)	42.95

VR6467

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Belt Kit	1.95
Cassette Housing	19.95
Pinch Roller Arm Assy	12.95
Reel Idler Assy	11.95
Video Head (Genuine)	37.95

VR6760

Repair Kit (Genuine)	21.50
Belt Kit	1.95
Cassette Housing	19.95
Pinch Roller Assy	12.95
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SANYO VIDEO REPAIRS

VTC5000

Belt Kit	1.00
Reel Motor (Genuine)	7.95
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Video Head	17.50

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Belt Kit	2.50
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Reel Idler (Genuine)	3.95
Reel Motor (Genuine)	14.95
Video Head	17.50

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Belt Kit	2.50
Pinch Roller	3.95
Reel Idler (Genuine)	3.95
Reel Motor (Genuine)	18.95
Video Head	17.50

VC681

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Pinch Roller	3.95
Reel Pulley (Genuine)	7.95
video Head	17.50

VCA140/VCT72

Belt Kit	2.95
Pinch Roller	3.95
Reel Pulley (Genuine)	7.95
Video Head	17.50

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Ferguson 3V29	80
Panasonic NV2000	95
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VR6467 CASSETTE HOUSING	£17.99p			TA7273	350p	2SA-765	300p	2SB-558	300p	2SC-1382	40p	2SC-2275	50p	2SD-560	50p
3V35 CAPSTAN MOTOR	£22.99p			TA7274	260p	2SA-769	130p	2SB-560	35p	2SC-1383	35p	2SC-2278	75p	2SD-570	40p
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		M293B1	695p	TA7280	330p	2SA-777	50p	2SB-562	35p	2SC-1393	30p	2SC-2335	120p	2SD-592	20p
AN5111	350p	M51102L	325p	TA7281	270p	2SA-794	60p	2SB-564	70p	2SC-1398	70p	2SC-2371	45p	2SD-600	80p
AN5010	475p	M51104L	400p	TA7282	260p	2SA-798	55p	2SB-566	110p	2SC-1399	50p	2SC-2427	80p	2SD-612	40p
AN5265	320p	M545485	430p	TA7299	400p	2SA-817	25p	2SB-568	40p	2SC-1403	250p	2SC-2440	70p	2SD-613	70p
AN5410	350p	MB3705	180p	TA7680	480p	2SA-841	40p	2SB-595	80p	2SC-1443A	240p	2SC-2458	30p	2SD-621L	450p
AN5431	250p	MB3722	310p	TBA800	40p	2SA-844	15p	2SB-596	75p	2SC-1417	20p	2SC-2482	40p	2SD-636	25p
AN5435	250p	MB3730	200p	TBA820M	50p	2SA-861	50p	2SB-618	325p	2SC-1445	250p	2SC-2500	30p	2SD-637	20p
AN5510	275p	MB3731	300p	TBA950	120p	2SA-872	20p	2SB-631	40p	2SC-1446	60p	2SC-2501	85p	2SD-639	25p
AN5620	330p	MB3732	300p	TDA1515	250p	2SA-893	15p	2SB-632	40p	2SC-1447	75p	2SC-2502	90p	2SD-641	310p
AN5900	150p	NE555	25p	TDA1670	300p	2SA-896	35p	2SB-633	50p	2SC-1454	320p	2SC-2537	450p	2SD-666	25p
AN6341	350p	NE646	150p	TDA1908A	100p	2SA-899	60p	2SB-641	20p	2SC-1473	30p	2SC-2546	20p	2SD-667	25p
AN6344	440p	SIK433	490p	TDA2003	100p	2SA-900	35p	2SB-643	20p	2SC-1474	45p	2SC-2550	70p	2SD-669	40p
AN6350	610p	SIK435	510p	TDA2005	130p	2SA-905	20p	2SB-644	25p	2SC-1475	45p	2SC-2555	150p	2SD-687	50p
AN7145	195p	SIK439	550p	TDA2575	200p	2SA-915	30p	2SB-647	30p	2SC-1507	50p	2SC-2564	230p	2SD-716	120p
AN7156	240p	SIK460	720p	TDA2577	250p	2SA-916	30p	2SB-648	55p	2SC-1509	45p	2SC-2565	260p	2SD-718	130p
AN7161	325p	SIK461	720p	TDA2581	200p	2SA-917	35p	2SB0649	40p	2SC-1514	40p	2SC-2570	50p	2SD-721	150p
AN7168	260p	SIK463	780p	TDA2593	150p	2SA-921	10p	2SB-673	80p	2SC-1520	85p	2SC-2575	25p	2SD-725	350p
AN7171	425p	SIK465	800p	TDA2653A	350p	2SA-940	50p	2SB0681	250p	2SC-1550	60p	2SC-2577	125p	2SD-745	250p
AN7172	425p	SIK0029	500p	TDA3560	320p	2SA-950	25p	2SB-686	120p	2SC-1567	60p	2SC-2579	130p	2SD-748	150p
AN7178	270p	SIK0040	560p	TDA3561	300p	2SA-958	70p	2SB-688	130p	2SC-1568	60p	2SC-2580	175p	2SD-761	50p
BA532	140p	SIK2029	500p	TDA3562	260p	2SA-962	60p	2SB-695	325p	2SC-1573	40p	2SC-2581	200p	2SD-773	30p
BA536	180p	SIK2125	650p	TDA3565	300p	2SA-964	65p	2SB-705	200p	2SC-1577	800p	2SC-2582	40p	2SD-781	30p
BA5402	250p	SIK2129	900p	TDA3651	250p	2SA-965	25p	2SB-716	30p	2SC-1584	600p	2SC-2603	20p	2SD-788	30p
BA5406	280p	SIK4121	800p	TDA3654	299p	2SA-966	25p	2SB-717	70p	2SC-1627	30p	2SC-2611	40p	2SD-789	25p
BA5408	220p	SIK4131	650p	TDA4500	360p	2SA-968	70p	2SB-718	70p	2SC-1667	150p	2SC-2631	40p	2SD-792	340p
BA6109	180p	SIK4141	650p	TQA4503	400p	2SA-970	15p	2SB-738	25p	2SC-1669	85p	2SC-2634	40p	2SD-794	60p
BA6208	250p	SIK4142	800p	TDA4505	300p	2SA-984	30p	2SB-744	60p	2SC-1670	85p	2SC-2660	85p	2SD-822	400p
BA6209	250p	SIK4151	680p	TDA4600	200p	2SA-985	65p	2SB-755	310p	2SC-1675	20p	2SC-2688	50p	2SD-836	85p
BA6219	300p	SIK4152	900p	TDA7240	300p	2SA-992	30p	2SB-757	350p	2SC-1677	80p	2SC-2753	50p	2SD-837	80p
BA6238	200p	SIK4161	800p	TDA8180	500p	2SA-999	20p	2SB-764	25p	2SC-1708	20p	2SC-2781	50p	2SD-838K	475p
BA6239	250p	SIK4162	1000p	TDA9503	240p	2SA-1015	20p	2SB-772	45p	2SC-1722	60p	2SC-2785	50p	2SD-845	250p
BA6304	190p	SIK4171	1000p	UPC1031	180p	2SA-1016	20p	2SB-792	45p	2SC-1756	40p	2SC-2791	325p	2SD-850	260p
HA1366	160p	SIK4172	1100p	UPC1181	110p	2SA-1020	30p	2SB-793	35p	2SC-1758	30p	2SC-2792	275p	2SD-859	100p
HA1367	300p	SIK4191	1100p	UPC1182	110p	2SA-1048	20p	2SB-794	90p	2SC-1760	85p	2SC-2944	175p	2SD-863	70p
HA1368	160p	SIK5315	650p	UPC1185	230p	2SA-1060	90p	2SB-817	200p	2SC-1775	20p	2SC-3078	40p	2SD-869	320p
HA1377	200p	SIK5325	650p	UPC1188	275p	2SA-1062	125p	2SB-837	60p	2SC-1775	20p	2SC-3078	40p	2SD-869	320p
HA1384	400p	SIK5338	700p	UPC1225P	200p	2SA-1094	190p	2SB-856	60p	2SC-1815	15p	2SC-3156	325p	2SD-870	320p
HA1389	210p	SIK5421	625p	UPC1230	210p	2SA-1095	275p	2SB-857	60p	2SC-1819	50p	2SC-3179	200p	2SD-871	320p
HA1392	230p	SIK5481	499p	UPC1263	230p	2SA-1102	180p	2SB-861	60p	2SC-1845	20p	2SC-3182	250p	2SD-880	40p
HA1394	280p	SIK5482	520p	UPC1277	240p	2SA-1104	200p	2SB-886	65p	2SC-1846	45p	2SC-3284	175p	2SD-882	70p
HA1396	395p	SIK7308	580p	UPC1278	240p	2SA-1106	200p	2SC-789	50p	2SC-1848	45p	2SC-3298	120p	2SD-898B	260p
HA1397	255p	SIK7348	600p	UPC1288	400p	2SA-1110	60p	2SC-790	80p	2SC-1875	260p	2SC-3506	250p	2SD-917	180p
HA1398	240p	STR451	480p	UPC1318	400p	2SA-1123	40p	2SC-815	15p	2SC-1890	20p	2SC-3519	150p	2SD-951	175p
HA1717	600p	STR4090	650p	UPC1363	190p	2SA-1141	200p	2SC-828	25p	2SC-1906	30p	2SD-198	180p	2SD-982	80p
HA11225	170p	STR40090	600p	UPC1365	320p	2SA-1142	65p	2SC-829	20p	2SC-1909	250p	2SD-200	210p	2SD-985	80p
HA11226	410p	STR50103	500p	UPC1378	210p	2SA-1145	60p	2SC-839	25p	2SC-1913	100p	2SD-234	40p	2SD-1128	80p
HA11227	225p	STR50020	700p	UPC1470	200p	2SA-1146	190p	2SC-929	20p	2SC-1914	30p	2SD-235	40p	2SD-1134	80p
HA11235	170p	STR58041	650p			2SA-1147	190p	2SC-941	25p	2SC-1922	275p	2SD-288	80p	2SD-1135	90p
HA11423	210p	STR6020	490p	**TRANSISTORS**		2SA-1156	60p	2SC-945	20p	2SC-1923	20p	2SD-299	160p	2SD-1138	60p
HA11724	800p	TA7205	100p	2SA-473	35p	2SA-1180	200p	2SC-959	65p	2SC-1941	40p	2SD-313	40p	2SD-1153	50p
HA12413	275p	TA7193	400p	2SA-489	55p	2SA-1220	50p	2SC-984	40p	2SC-1942	190p	2SD-315	75p	2SD-1207	50p
HA13001	195p	TA7203	180p	2SA-490	40p	2SA-1232	175p	2SC-998	300p	2SC-1945	350p	2SD-325	45p	2SD-1265	100p
LA4261	300p	TA7222	120p	2SA-495	25p	2SA-1265	150p	2SC-1162	35p	2SC-1969	160p	2SD-331	80p	2SD-1267	140p
LA4270	300p	TA7229	300p	2SA-496	40p	2SA-1282	35p	2SC-1172	150p	2SC-1980	25p	2SD-400	20p	2SD-1273	100p
LA4430	130p	TA7230	170p	2SA-564	15p	2SA-1386	275p	2SC-1173	45p	2SC-1986	60p	2SD-401	50p	2SD-1275	125p
LA4440	230p	TA7240	260p	2SA-608	15p	2SB-507	100p	2SC-1195	200p	2SC-2003	25p	2SD-414	40p	2SD-1276	125p
LA4445	260p	TA7241	260p	2SA-628	70p	2SB-509	100p	2SC-1212	60p	2SC-2009	60p	2SD-421	60p	2SD-1397	200p
LA4460	170p	TA7245	400p	2SA-672	30p	2SB-511	100p	2SC-1213	60p	2SC-2022	60p	2SD-424	350p	2SD-1398	170p
LA4461	170p	TA7269	550p	2SA-673	20p	2SB-512	100p	2SC-1214	40p	2SC-2026	45p	2SD-426	300p	2SD-1426	275p
LA4465	425p			2SA-677	60p	2SB-514	100p	2SC-1222	20p	2SC-2057	25p	2SD-427	300p	2SD-1427	275p
LA4466	425p			2SA-683	25p	2SB-527	40p	2SC-1226	75p	2SC-2068	50p	2SD-428	300p	2SD-1432	400p
LA4500	230p			2SA-684	40p	2SB-528	40p	2SC-1306	75p	2SC-2073	50p	2SD-438	45p	2SD-1439	200p
LA4505	260p			2SA-697	45p	2SB-531	200p	2SC-1307	75p	2SC-2120	15p	2SD-461	100p	2SD-1441	200p
LA4507	360p			2SA-715	35p	2SB-534	200p	2SC-1317	25p	2SC-2153	40p	2SD-468	25p	2SD-1453	170p
LA4508	260p			2SA-720	20p	2SB-536	60p	2SC-1318	25p	2SC-2229	25p	2SD-471	30p	2SD-1497-02	520p
LA4520	230p			2SA-722	40p	2SB-537	60p	2SC-1327	20p	2SC-2230	30p	2SD-476	60p	2SD-1497-06	520p
LA4700	425p					2SB-544	60p	2SC-1328	25p	2SC-2236	30p	2SD 478	100p	2SJ-50	425p
LA5512	130p					2SB-546	70p	2SC-1344	30p						

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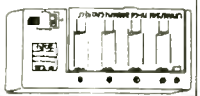

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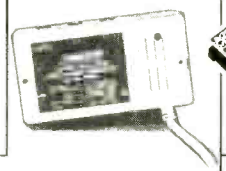

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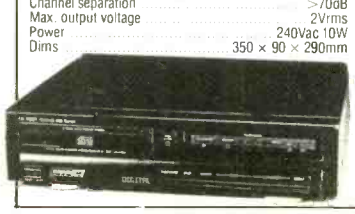
Frequence response	20-20000Hz
Harmonic distortion	<0.09%
S/N ratio	>80dB
Channel separation	>70dB
Max. output voltage	2Vrms
Power	240Vac 10W
Dims	350 × 90 × 290mm



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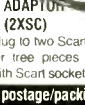

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ECF80	1.55
ECF82	1.60
ECH83	2.25
ECH35	4.35
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ECH81	1.30
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ECL82	1.85
ECL83	3.80
ECL84	1.25
ECL85	1.15
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EF37A	5.45
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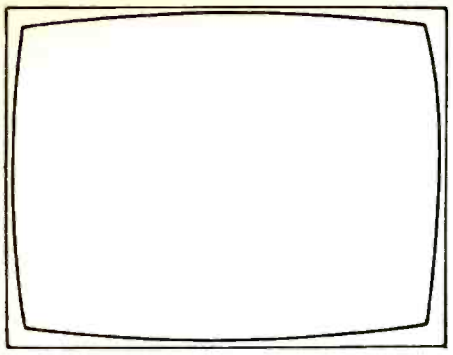

TELEVISION

EDITOR
John A. Reddihough

Please note that the telephone numbers below are for contact with the advertisement departments only. Editorial enquiries should be sent to the editor at the address given on page 697.

EDITORIAL ASSISTANT
Tessa Winford

ADVERTISEMENT MANAGER
Jan Thorpe
081-661 8114

DISPLAY SALES MANAGER
Shona Finnie
081-661 8115

CLASSIFIED ADVERTISEMENTS
Pat Bunce
081-661 8116
Fax 081-661 8596

ADVERTISING ADMINISTRATION
Kathy Lambart
081-661 3649

ADVERTISING PRODUCTION
Chris King
081-661 3224

SUBSCRIPTION ENQUIRIES
0444 440 421

PUBLISHER
Robert Marcus
081-661 3930

COVER PHOTO

This month's cover photograph shows the B and O 39XX chassis. See article on pages 804-7.

Thumbs Up or Down?

An interesting controversy over TV broadcasting prospects in the UK has been going on in the pages of *The Independent* recently. It was started by Steven Barnett of the Henley Centre who put forward the view that "the multi-channel TV revolution is a myth", hyped up in order to get lenders to invest in the new services. He supported his contention that the basic four-channel system has survived intact and will continue to account for the major share of the public's viewing for the foreseeable future by pointing to the failure of cable TV to persuade households to subscribe in any appreciable numbers and satellite TV's limited success to date, with BskyB still running up considerable losses. According to Mr. Barnett, Henley Centre research suggests that thirty per cent of the population would watch less television if they had more money. Watching television is, apparently, something that we do largely when we've nothing better to do. If this is indeed the case, the idea of adding more and more channels is simply going to result in bigger and bigger losses.

More optimistic views were put forward by John Clemens, chairman of Continental Research, which carries out the satellite TV monitoring for the *Financial Times*, and Peter Bowman, director of Carat Research. Mr. Clemens pointed to the accuracy of his organisation's forecasts to date and went on to say that its present longer-term forecast is that by 1997 over nine million homes in the UK, some forty per cent of all households, will be able to obtain multi-channel TV via either cable or dish, with a slower increase thereafter. He suggests that there will be adequate funds to support around fifteen channels by the year 2000. Mr. Bowman drew attention to the fact that the new channels are focused on sizeable subgroups, for example sports, music or film devotees, and do not seek to attract the highest possible audiences.

This more sanguine approach sounds reasonable, but there are nevertheless other factors that give rise to some concern. For example TVS has just revealed that its bid to retain its S.E. England franchise was just over £45m a year. That's a substantial sum by any reckoning, and prompts the question whether TVS, assuming that it succeeds with its bid, will be viable. Its profit projections are based on further cost cutting and an assumption that advertising will grow substantially – by 11·7 per cent between now and the end of 1993, and at a compound annual rate of 5·7 per cent between 1993 and 1997. On this basis it predicts a profit of £1·1m in 1993, a pretty miserable return even if all goes well. An analyst suggests that a loss of £20m in 1993 is more likely. Considering that TVS is in a loss situation to start with, the outlook doesn't seem to be particularly promising and prompts the question of what the ITC would do if a contractor went bust?

The announcement that W.H. Smith is to withdraw from TV, selling its interests for £45m to a consortium that consists of Canal Plus, ESPN and Générale d'Images, adds further substance to the view that TV is going to be a tricky business in the Nineties. W.H. Smith's £45m represents an appreciable loss on an investment estimated to have been as high as £80m. It's noteworthy that the consortium consists of French and US companies. Similarly most of the money going into cable TV is coming from abroad. Do foreigners know something that we don't about the future of TV in the UK? Or could they be trying to apply to the UK policies based on their own domestic markets, policies that might turn out to be inappropriate? They might feel that at bottom it's possible to run channels cheaply by churning out pap. Who'd watch it? Well if the worst came to the worst there perhaps wouldn't be much choice, just pap, pap and more pap. The situation is not unknown elsewhere.

But it's possible to overdo the pessimism. A well-run broadcaster offering a quality service should have no great difficulty in making a success of its business. The Nineties are clearly going to be a more difficult time for everyone than the previous decade however, and the recent changes in the way in which TV broadcasting is run are not going to make them any easier.

Jasmine Bligh

The death of Jasmine Bligh on July 21st severed a link with the earliest days of TV broadcasting in the UK – she was the BBC's first female announcer when regular transmissions from Alexandra Palace started on November 2nd, 1936. She started a stage career at the age of seventeen and subsequently replied to a BBC advertisement for female television "hostess-announcers". The BBC received 1,122 applications, out of whom Jasmine Bligh and Elizabeth Cowell were selected. There were no autocues or prompts back in 1936: Jasmine had to learn 400 words a day to say directly to the camera. Pay was £350 a year, plus a dress allowance that included two evening dresses which had to be worn after 6 p.m.! Jasmine entered fully into the pioneering spirit of early TV, taking a great interest in outside broadcasts. She is remembered in particular for her comment "hello, remember me?" when she was the first to appear on the screen at the restart of TV broadcasting in 1946.

Publishing Changes

Some important changes to *Television's* publishing arrangements have come into effect this month. They affect in particular the advertising side. We have been moved from IPC Magazines Ltd. to Reed Business Publishing Ltd. in Sutton, Surrey – both firms are subsidiaries of Reed International, so there has been no change in the magazine's ownership. The main reason for the change is to consolidate the firm's publishing activities in the electronics field – we have joined a group that publishes such well-known titles as *Electrical and Radio Trader*, *Electronics Weekly* and *Electronics World + Wireless World*.

Letters

GRANADA/GEC EQUIVALENTS

There were inaccuracies in the list of Granada TV receiver equivalents (July) regarding GEC produced models. First, the reference to the GEC 2295 is incorrect: the GEC C2295H was based on the Tatung 160/161 series chassis. Secondly we are not aware of any Granada variants of our Models C1657H/C1658H which were manufactured in 1984/5. Thirdly our records show (up to 1985) the following information regarding Granada sets and the nearest GEC models and Hitachi chassis from which they were derived:

Granada	*GEC*	*Chassis*
C14BA1	C1405H	Hitachi NP84 Mk 1
C20VA1	C2026H	GEC PIL chassis
C22VA1	C2236H	GEC 20AX chassis
P22VA3	C2260H	GEC 20AX chassis
C20XA1	C2067H	Hitachi NP81CQ
C22XA1	C2267H	Hitachi NP81CQ
C20XA5	C2069H	Hitachi NP81CQ text
C22XA5	C2269H	Hitachi NP81CQ text
C20AA4	C2087H	Hitachi NP83CQ text
C22AA4	C2287H	Hitachi NP83CQ text

The above list covers only the models that are most likely to be encountered. It is important that those in the trade are aware of the following points:
(1) Although a Granada model may be based upon a particular GEC or Hitachi chassis this doesn't imply that the service information for these chassis will cover all the circuitry in the Granada variants. This is because Granada often required additional features, and changes to or replacements of complete areas would be made during production. For example the C14BA1 has RGB inputs, a feature not included with the GEC C1405H on which it was based. Granada models were very rarely just "badge variants".
(2) When receivers were supplied to Granada the appropriate service information was also supplied. This information was and still is the property/Copyright of Granada Ltd. For this reason we at GEC/Hotpoint do not have any facilities to supply service information or technical assistance on Granada models. All copies of Granada service data carry a note stating that the information is the company's property.
(3) The best advice we can offer is to obtain a copy of the manual for the nearest equivalent model – via component suppliers, please! – and study the set carefully before repair.

As a rule the above models are relatively trouble free and easy to repair if the correct approach is adopted. In general, unless you happen to be really lucky any attempt to repair an unfamiliar piece of equipment without the relevant service information will result only in frustration and failure.

S. McManus, Technical Dept. (GEC Radio & TV),
Hotpoint Ltd., Celta Road,
Peterborough PE2 9JB.

FINLUX 1000 CHASSIS

Finlux UK recently issued a modification for the 1000 series chassis. The recommendation was to modify the scan coil plug by soldering two rivets to the pins, thus strengthening the joints which in a few sets had caused concern by becoming dry-jointed and thus overheating. I wonder whether this suggestion has actually cured the problem however. On two occasions I've subsequently had to replace the plug/socket because of arcing inside. I rather suspect that this was the cause of the problem in the first place: when the pins get hot as a result of arcing the soldered joints will deteriorate, as happens with so many other sets.

Several different faults can occur when this plug is faulty, i.e. intermittent very high e.h.t., flashovers that blow the line output transistor, and intermittent line tearing.

Domanic Watton,
Wrangle, Boston, Lincs.

VIEWDATA TECHNOLOGY

In connection with Roy Baines' article (June) on viewdata terminals and systems I'd like to add some information on the public switched telephone network (PSTN). In the early days of communications CCITT conducted subjective tests with telephone circuits, using people of different nationalities. It was found that the minimum telephone channel bandwidth required for someone to be able to identify someone else's voice is 4kHz. It was also found that the human ear is most sensitive at 800Hz–1kHz if you happen to be American. I note that the latter has been adopted.

The reason for using modulation, FSK in this case, is the same as with any transmission system – to get information (the modulating frequency) from A to B on a carrier wave (the carrier frequency). With viewdata the modulating frequency is ten bits on the data input line and the carrier frequencies are 1,300Hz, 2,100Hz, 450Hz and 390Hz, all audible as they have to be within the PSTN bandwidth.

The two main forms of distortion from which the signals suffer are attenuation and group delay effects. Equalisers are used with higher bit rates. They are usually incorporated within the modem. So far, 9·6kbit/sec is being used.

Dialling can be LD (loop disconnect) or DTMF (dual tones, multiple frequency). The former is ten impulses per second while the latter is as fast as one can press individual digits. The choice of LD or DTFM depends on the type of exchange to which one is connected.

J. Tharanee,
Bicester, Oxon.

SATELLITE RECEPTION PROBLEMS

With reference to R.N. Baker's problem with his Amstrad satellite TV receiver I believe, like S.K. Guy, that the problem is caused by a mismatch at the receiver end of the cable. The fact that the problem doesn't arise with Ferguson and Sakura receivers seems to be conclusive proof.

J.A. Glenton's original letter, concerning the testing of coaxial cables, seems to indicate that some mismatching could still be involved. Certainly standing waves seem to be in evidence. One difficulty in designing terminations at the frequencies concerned is in maintaining a purely resistive impedance across the band: if the impedance has a reactive component, this will result in a frequency-dependent mismatch. A perfect cable, perfectly terminated, is not frequency conscious for any parameter other than transmission loss, which increases with frequency. We don't however live in a perfect world!

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R.S. Porter points out that there can be re-reflection towards the load if the source impedance is wrong. Perhaps this, along with individual cable characteristics, accounts for some of the variations shown in Mr. Glenton's table of results. I also agree with Mr. Porter's point that connecting two cables in series does not change the impedance but increases the overall loss.

Mr. Glenton's second letter, with its comments on losses associated with poor satellite TV installations, makes interesting reading. I'm sure that many installers have no idea that such subtleties are involved. But hasn't this always been the case? I recall an aerial installer whose main tools consisted of a beaten-up pair of sidecutters and a small screwdriver. He cut lashing cables and tightened nuts with the sidecutters and stripped coaxial cable with his teeth . . .

Returning to Mr. Porter's letter, I'm sure that he's hit the nail on the head in pointing out that multiple reflected signals suffer greater cable attenuation than the original direct signal. The longer the cable run, the greater the attenuation of the reflections so that the effects of a mismatch become less significant. I suspect that this effect is non-linear. Since f.m. is used for satellite TV transmissions, capture effect may also be involved, such that when the reflected signal falls to 12dB or more below the direct signal its effect will be insignificant. This could account for the "magic" extra twenty feet of cable that appears to cure (or should I say mask?) the Amstrad problem consistently.

In another letter Mr. Gadsby mentions loop systems for the hard of hearing. When I worked in the trade twenty years ago a kit (I forget who made it) was available. It consisted of a matching/isolating transformer, a wirewound potentiometer and fixings. Drive to the transformer was taken from the TV set's loudspeaker connections. The potentiometer was set so that a single loop around the room provided sufficient volume from a hearing aid when the speaker volume was right for those with normal hearing. As Geoff Darby points out in his letter, safety was an important consideration: while the kit instructions didn't suggest it I nevertheless rewired the TV set in use with a three-core mains cable and connected the earth lead to the transformer's secondary winding that fed the external loop. I felt that this "belt and braces" approach minimised the risks involved. Most of the loops I installed were fed from Dynatron TV sets: older readers will recall that these had splendid veneered cabinets of the kind you just can't buy nowadays – except as a separate item of furniture to house your TV set and VCR. Consequently I was always anxious when drilling into the inside of the cabinet to mount the loop transformer – it wasn't a good moment for the family dog to come and investigate!

Keith Cummins,
Holbury, Hants.

HITACHI NP84 Mk 2 CHASSIS

Stephen Leatherbarrow mentions a couple of problems with the GEC Models C1407/8 (Hitachi NP84 Mk 2 chassis) in the July TV Fault Finding section. They call for some clarification. The sound "gurgling" problem normally occurs only with copy-protected tapes, where the additional sync pulses on the tape cause the TDA4503 chip to unmute. Usually a slight increase in value of the resistor mentioned (R702), to say 82kΩ or 100kΩ, should help, though the problem is not considered to be a common one with this chassis. We don't recommend fitting a potentiometer as difficulty with mounting and unreliability with age could cause further problems for the unwary in the future. The original design should also be adhered to for safety reasons.

Steve didn't mention the symptom when the sandcastle pulses in these sets are lost or distorted. Not loss of colour, as some might expect, but partial or complete picture blanking.

S. McManus, Technical Dept. (GEC Radio & TV),
Hotpoint Ltd., Celta Road,
Peterborough PE2 9JB.

MORE ON IR TESTING

Since camcorders can see infra-red radiation, a camcorder can be used to provide a quick test for infra-red emission from a remote control handset. But imagine the boss's reaction should you requisition one as test gear! A phototransistor connected to a meter switched to the ohms × 10 range is cheaper, but not so much fun. Alternatively a solar cell with a meter switched to the 500μA range works well: an IR emitter a centimetre from the detector is much "brighter" than room lighting, and the low-frequency output pulses are clearly seen.

John Jolley,
Prescot, Merseyside.

REVIEW MODE TAPE TANGLING

Test Case 342 (June/July) about a tape tangling problem with a Panasonic NV370 VCR reminded me of a similar problem we had with an NV333 that worked normally in all modes except reverse search. In this mode the tape tended to lift from the drum near the exit pole, and occasionally produced a tape wrecking loop.

Various things were tried, including thoroughly cleaning then polishing the drum assembly with metal polish. This improved things a little, but reverse search was still not up to standard and, as the age of the machine precluded drum assembly replacement, a different solution was sought.

It was noted from the circuit diagram that IC6006 controls the supply to the reel motor, providing around 6V in review and 13V in rewind. So what was required was a higher control voltage at pin 3 during reverse search. A suitable source voltage can be obtained from relay RY1 which is used to reverse the direction of the capstan motor. In reverse search one of the normally-open contacts is switched to 14V. We connected this point to chassis via a 10kΩ potentiometer and connected the slider via a diode and a 1kΩ resistor to pin 3 of IC6006. This enabled the torque applied to the take-up spool to be adjusted, while viewing in the review mode, until full drum contact was achieved. All danger of loops being formed is also removed. In our particular example we found that increasing the voltage across the reel motor to 9V provided enough torque to cure the problem.

While this is perhaps not an ideal solution to the problem it has nevertheless given us some satisfaction in getting a bit more service out of an otherwise good machine without having to disable the reverse search function.

Alan Oxton,
Frodsham, Cheshire.

ANOTHER SATELLITE TV PROBLEM

Can anyone suggest a solution to a problem that occurs with two types of satellite TV receivers we know of, the Maspro SRE90 and Uniden 8008, used with a Sky decoder? Even when all other channels are perfect,

including the weaker German ones on both satellites, sparklies persist on the Movie Channel and Sky Sports. Even with readings of 80dBμV plus on the Maspro signal-strength meter (75dBμV is adequate with other receivers) no amount of skew etc. can remove them. Is it possible that these receivers have a compatibility problem with the Sky decoder? If so, how come that the Sky Movies Plus channel is perfect? Any advice would be greatly appreciated.
Larry Smith, Fitsat,
Rhyl, Clwyd.

THE DOWNMARKET END

One of the older Nikkai models came in a little while back with the complaint that the picture and sound would disappear after some time. Simple enough I thought, just tuning drift.

When I exposed the PCB my eyes were immediately drawn to a large power diode beautifully soldered on the print side of the board. Sheer curiosity led me to refer to the circuit diagram to see what it did. But it wasn't there! Further investigation revealed the reason for this. It was bridging two points, firmly connected by print, at earth potential. Now I wonder who did that?

I then went on to the main business and changed the 33V zener diode. This naturally made no difference at all to the fault. So I wondered about the a.f.c. and checked the voltages around the TA7680AP chip. All seemed to be well here. The a.f.c. worked beautifully, but was unfortunately not able to cope with the drift. I next checked the tuning supply from the line output stage. It was as steady as a rock.

I then went to where I should have gone in the first place and monitored the tuning voltage at the tuner. It varied alarmingly. Having run out of ideas I squirted some freezer on the zener diode, which turned out to be heat sensitive. When a ZTK33B was fitted normal operation was restored. I still think about that one. My data didn't suggest that there was anything special about the original zener diode.

For me at any rate it will probably have to remain one of life's little mysteries. Some time ago I concluded that I was seriously in need of a refresher course, but I've left it a little late. My wife and I are desperately trying to retire. Known affectionately as "Aggie", my wife has for many years been fighting a long list of ailments. But I fear that not everyone will want a crumbling Victorian pile, situated in a road known locally as "Bankruptcy Alley". To be fair the shop has been good to us during our stay, so perhaps there is hope.
E.G. Kempshall, 109 Portland Road,
Hove, East Sussex BN3 5DP.

VINTAGE OB

I well remember the vintage OB mentioned by Roger Bunney in his August issue column, also a later hook-up on January 6th 1954. Using a modified R1132 receiver I was able to pick up the v.h.f. intercom from Warren Street water tower, Lenham, Senate House London and of course Wrotham. Communication with Wrotham was lost two minutes before the programme was due on air, then Johnie came on all out of breath – the circuit breaker in the main building had tripped! The relay equipment was housed in a small building close to the base of the v.h.f. aerial mast.

My first sound receiver was the *Wireless World* adaptor. I used it to pick up the reopening of the TV service on June 7th 1946. For vision a Responsor unit with rebuilt front end from W.T. Cocking's book and a 6in. green tube produced the first viewable pictures on July 12th 1947. It had a total of 26 valves. The Alexandra Palace signal was pretty weak here three hundred feet below the North Downs.
Clement E. East,
Wrotham, Kent.

HELP WANTED

Can anyone suggest how to remove teletext lines with a B and O 323X TV set? They spoil an otherwise excellent picture.
Paul G. Glazebrook, 26 Beech Road,
Rushmere, Ipswich IP5 7AN.
0473 624 517.

Can anyone supply a service manual and front fascia panel (not cracked!) including buttons for the Ferguson 3V29, also any dead or dying Ferguson/JVC VCRs from the 3V29 onwards?
Dave L. Hills, 86 Netherhampton Road,
Salisbury, Wilts.

Can anyone supply an SP1 cartridge for the Bang and Olufsen record deck used in the Beogram 900? The part is no longer available from B and O.
P. Cracknell, 22 Hungate,
Beccles, Suffolk NR34 9TT.
0502 712 428.

I have a mono Displat unit which runs o.k. on 12V d.c. What must I do to use it as a monitor with the composite video from my computer?
Alan Brown, 14 Ashby Drive,
Rushden, Northants NN10 9HJ.
0933 312 358.

Can anyone supply a service manual or circuit diagram for an Escort EDM1111A digital multimeter?
John A. Hanley, 306 Thornaby Road,
Thornaby-on-Tees, Cleveland TS17 8PJ.

Can anyone supply any servicing information for the Wallis 30kV power supply used with the LKB Tachophor 2127 system?
Greg Strange, I.Eng., G8IWJ, 12 Bronington Avenue,
Bromborough, Wirral, Merseyside L62 6DT.

As a collector I'd be interested in purchasing any of the following: (1) Early colour TV sets, especially prototypes, dual-standard models or other unusual types. (2) V2000 format VCRs, especially second generation models, portables and Bang and Olufson models. (3) Any reel-to-reel video equipment or tapes, especially Akai ¼ or ½in. machines with colour.
M.J. King, Crowfield Cottage, Stone Street,
Crowfield, Ipswich, Suffolk IP6 9TA.
0449 79 366.

Does anyone have any interface information for the Grundig V1F-E1 remote control unit used with the 2 × 4 Super VCR? Any information on the chip (type C0P420HPX/N) would also be of help. Intended use is with a 3V30 VCR.
A.M. Elford, 62 Goodlands Vale,
Hedge End, Southampton.

Long-distance Television

Roger Bunney

There were several good Sporadic E openings during June. A number of signals from Arabic Band I transmitters were received in the UK during the period and on the 15th the m.u.f. reached Band III. I still feel that there is less SpE reception during periods of high solar activity, but this is merely my personal view based on experience of 28 SpE seasons. Would anyone care to comment on this?

Apart from a slight lift on the 5th, tropospheric reception has been virtually non-existent. Auroral activity was noted on this same day, with Band I and III signals (mostly unidentified) received during the evening phase. There have been no reports of unusual reception following the large solar flares on June 5th.

The general SpE log looks impressive, but many openings were neither intense nor long lasting:

5/6/91 RAI (Italy) ch. IA; NRK (Norway) E2.
6/6/91 TVE (Spain) E2, 3, 4; TVE-2 E2; RAI IA; +PTT (Switzerland) E2, 3; RTP (Portugal) E2, 3; TSS (USSR) R1.
7/6/91 TVE E2, 3, 4; RAI IA.
8/6/91 TVE E3; RAI IA.
9/6/91 NRK E2; TVE E2, 3, 4; RAI IA; JRT/HTV (Yugoslavia) E3.
10/6/91 TVE E2.
11/6/91 TVE E2, 3, 4; RTP E3; +PTT E2.
12/6/91 TVE E2, 3, 4; TVE-2 E2; RAI IA; ARD (Germany) E2.
13/6/91 ERT (Greece) E3; HTV E3; TVA (Italy) IA; C+ (France) L2, 3.
15/6/91 TVE E2, 3, 4; TVE-2 E2; RTP E3; RAI IA, B; TVA IA; C+ L2, 3, 4; +PTT E2, 3; HTV E3, 4; RTM (Morocco) E4; TVP (Poland) R1, 2; DR (Denmark) E3, 4; CST (Czechoslovakia) R1, 2; MTV (Hungary) R1, 2; TSS R1-7 inclusive; SVT (Sweden) E2; NRK E2; RTSH (Albania) IC; JTV (Jordan) E3; RUV (Iceland) E2, 3, 4, 5, 6, 7; also unidentified N. American signals on chs. A2, 3 at 1730 BST.
16/6/91 ARD E2, 3; HTV E3, 4; RAI IA, B; TVE E2, 3, 4; TVE-2 E2; C+ L2, 3, 4; ORF (Austria) E2a; +PTT E2; ERT E3 ; CST R1, 2; TSS R1, 2, 3; YLE (Finland) E3, 4; NRK E2, 3, 4; SVT E2, 3, 4; RUV E4; TVR (Rumania) R1; MTV R1; Dubai E2; JTV (Jordan) E3.
17/6/91 TVE E2, 3, 4; RTP E3; C+ L3; ARD E2; RAI IA; +PTT E2; TSS R1, 2; TVR R2; TVR-2 R2.
18/6/91 CST R1; TSS R2; +PTT E2, 3; TVE E2, 3, 4; HTV E3; ERT E3; RAI IA; TVA IA; NRK E2, 3, 4; SVT E2; TSS R1, 2, 3; RUV E4.
19/6/91 TVE E2, 3, 4; RTP E2, 3; TSS R1, 2.
20/6/91 TVE E2, 3; +PTT E3; C+ L2; RAI IA, B; HTV E3, 4; ERT E3; JTV E3; CST R1, 2; SVT E2, 3, 4; TVP R2; TSS R1, 2, 3; YLE E4; TVA IA; PTB (Italy) E3.
21/6/91 TVE E2, 3, 4; RAI IA, B; TVA IA; HTV E3; ARD E2; ERT E3; TVR R2; NRK E2, 3, 4; SVT E2, 3, 4; CC (Italy) E2.
22/6/91 TVE E2, 3, 4; TVE-2 E2; RTP E3; RAI IA, B; TVA IA; SVT E2, 3; NRK E2, 3, 4.
23/6/91 TVE E2, 3, 4; RAI IA, B; TVA IA; ORF E2a, 4; HTV E4; +PTT E4; ERT E3.
24/6/91 TVE E2, 3.
25/6/91 TVE E3, 4; RAI IA, B; TVA IA; C+ L2.
26/6/91 TVE E2, 3, 4; HTV E3.
27/6/91 TVE E2, 3, 4; +PTT E2; RAI IA; TSS R1, 2.
28/6/91 TVE E2, 3, 4; TVE-2 E2, RTP E2; C+ L3; ARD E2; +PTT E2; RAI IA, B; TVA IA; YLE E3; TSS R1, 2; NRK E2, 3, 4; SVT E2, 3, 4.
29/6/91 RAI IA, B; TVE E2, 3; C+ L2; ERT E3; HTV E3.
30/6/91 RAI IA, B; TVE E2, 3, 4; C+ L2; HTV E3, 4; MTV R1, 2; ARD E2; TVR R2; RTSH IC; TSS R1-5 inc.; Italian station with "RC" logo at lower right-hand side E2.

My thanks to David Glenday (Arbroath), Garry Smith (Derby), Roger Fussell (Torpoint), Tim Anderson (St. Leonards), Simon Hamer (Powys), Cyril Willis (King's Lynn), Peter Schubert (Rainham) and George Gaskin (Gibraltar) for sending in reception reports.

Tim Anderson's reception of Dubai ch. E2 at 0835-0910 on the 16th was quite remarkable, with the signal reaching P3 quality and teletext pages being shown – one of the UAE flag and another showing the outline of the UAE. Tim comments that in view of the frequency of its reception TVA (Tele Valle Aostatia, Italy) must be using increased power.

Simon Hamer's reception of RUV on the 15th included a ch. E2 relay station and the Band III chs. E6 and 7 with the *Black Adder* programme, subtitled. At 1730 on the same day Simon received unidentified signals on chs. A2 and 3.

Several unidentified Italian Band I private stations were seen during the month, with logos like "CC", "2" and "Antenna" in the lower right-hand corner, all on ch. E2.

News Items

Poland: By May nearly four hundred applications had been received from those wishing to set up independent broadcasting stations. It's likely that West European style band allocations will be adopted.

Czechoslovakia: Several aspiring broadcasters have applied for TV licences. It's likely that u.h.f. channels used for relaying Soviet TV to Russian army units will be used. Several v.h.f. radio services have been approved and should be in operation by Christmas.

Baltic countries: Latvia, Lithuania and Estonia are seeking broadcasting independence.

OIRT: A decision to dissolve the East European broadcasting organisation OIRT was taken at its 25th Assembly in Budapest earlier this year. By January 1st, 1994 the Prague-based OIRT is expected to have merged completely with the EBU.

Gibraltar: Decisions have been taken to revamp GBC. Local news and features produced during weekdays only will be slotted into the BBC's TV World Service, which will come via a satellite feed and then be encrypted. Thus viewers will in future require a decoder and have to pay a subscription.

Yugoslavia: OTV Zagreb now has its own teletext service. The FUBK test pattern used carries the identification "OTV OTV 1".

Israel: A terrestrial PAY-TV service called TELEPUI is

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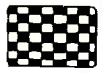

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being introduced. When fully operational it will consist of three channels: Tele+1 with movies and entertainment, Tele+2 with sports and Tele+3 with documentaries and cultural programmes. Encryption is to start next summer.

Spain: As an amendment to a previous publication the Benelux DX Club reports that the powers of several transmitters have been altered as follows: Alicante (Aitana) TVE-1 ch. E3 60kW; Coruna (Santiago) TVE-2 ch. E2 50kW; Vizcaya (Sollube) TVE-1 ch. E4 71kW; Zaragoza (La Muela) TVE-1 ch. E3 50kW; Madrid (Navacerrada) TVE-1 ch. E2 500kW. These are all e.r.p.s.

Satellite TV

In the early hours of May 29th the Olympus satellite at 19°W wobbled and attitude control was lost. As the satellite swung away from Earth its battery charging power was reduced – a solar panel had already been lost in January. The satellite then started to drift at about 5° a day, out of control and rotating once every 90 seconds. At the time of writing this the satellite has passed over the eastern horizon. An attempt will be made by the high-powered NASA Madrid ground station to regain control when the satellite reappears in the west. Services carried include RAISAT and BBC TV.

Apparently the Astra 1B satellite at 19°E went into a spin at 1056-1231 GMT on June 4th, cycling over a three minute period. There are rumours that 1B has a solar array fault which has resulted in a loss of nearly a quarter of its power. A loss of power also seems to have occurred during the period 1658-1805 GMT on May 23rd with Astra 1A's transponder 7. Solar cell problems have also been reported with the Japanese BS3a satellite, resulting in a 25 per cent loss of power. As a result NHK and JSB are sharing one transponder instead of three.

The USSR is to launch a major satellite telecommunications system called "Energy" in the autumn of 1992. It will include facilities for five TV channels. TV capacity will be increased to over thirty channels when the system is expanded in 1997.

The Middle East Broadcasting logo is currently being radiated at 11·554GHz, with horizontal polarisation, from Eutelsat II F1 at 13°E. Its service is due to start in late summer.

The new high-powered Intelsat K craft will have sixteen 54MHz bandwidth transponders, giving it 32 TV channel capacity. Due to come into operation in early 1992, its coverge will extend from central Europe to the US mid-west, touching South America. Orbital position will be 21·5°W and the power will allow dish sizes down to 1·8m to be used.

Turner International is looking into the possibility of taking over the Super Channel operation. CNN is to set up more offices in Africa.

Protel Satellite Systems Ltd., 295-297 Ballards Lane, North Finchley, London N12 8NP (telephone 081 445 4441) has introduced at £42.95 plus VAT a new lower-noise (1·2dB) LNB which is a direct replacement for the Marconi Blue Cap LNB used with the Amstrad satellite TV system. This should overcome problems with sparklies and improve picture quality.

For Disposal

Geoff Chadwich of Wirral, Cheshire has for disposal free to a good home an Australian 13-channel turret-tuned TV set manufactured by Philips. He can be contacted on 051 644 0815. Collect or pay for carriage and packing. Geoff is on the lookout for reasonably priced radar equipment, dead or alive.

Maxview Signal Boosters

The Maxview range of aerial equipment was expanded earlier this year. It now includes an attractive range of omni-directional active aerials for indoor or outside installation. Though intended for u.h.f. use, an additional add-on rod extention gives operation at v.h.f.

Perhaps of greater interest to readers is a range of indoor distribution amplifiers with a single wideband input and either one, two, three or four amplified outputs, the bandwidth being 40-860MHz. The units are for 220/240V a.c. mains operation, unswitched. An unusual feature is an integral gain control (six turn carbon track) with a range of typically 20dB. Overall gain depends on the number of outputs – 22dB, 10dB, 8dB and 6dB respectively for the one, two three, and four output versions. Thus the adjustable gain for the four-output amplifier is −14dB to 6dB for all outputs.

Measurements carried out on a sample three-output amplifier confirmed the information in the specification. Noise is quoted as typically 3dB. Inputs and outputs are conventional 75Ω unbalanced of course. When I dismantled the unit I found that there's a cool running mains transformer: the power supply is connected to the main amplifier strip by twin wires. As the amplifier is a completely screened and soldered up module it was not possible to examine its internal construction. It appears to be of the usual hybrid transistor type with resistive splitting for the outputs. The unit is housed in a brilliant white high-impact resistant case measuring 5·75 × 3 × 2·5in. It comes

with screws for wall mounting.

Clear connection instructions are provided, but problems could arise. The illustrations show a standard u.h.f. aerial and an omni-directional f.m. aerial joined together via a small Y-shaped combiner. Maxview can provide a suitable v.h.f./u.h.f. diplexing filter but purchasers may be tempted to use an inexpensive oriental wideband combiner. This would create difficulties because the u.h.f. signals would be picked up on both aerials and would be mixed in the wideband combiner, causing distortion – ghosting, signal loss, teletext errors etc. – because of the lack of filtering at the inputs. It's less likely that v.h.f. radio reception would suffer from such effects.

The amplifiers are sold in clear blister packs and come complete with a coaxial connecting lead and coaxial plugs as appropriate to the version, e.g. the three-output version has four plugs. The units do not provide a supply for a mast-head amplifier.

I was impressed with the sample unit which worked well and was stable across the whole v.h.f./u.h.f. bandwidth. For further details contact Maxview Aerials Ltd., Setchey, King's Lynn, Norfolk (telephone 0553 810 376).

Meter Precautions

George Wilding

Connecting the negative lead of a test meter to chassis using a crocodile clip is handy when making voltage checks. With most analogue meters however – this doesn't seem to apply with digital meters – the red lead is the negative one on the resistance ranges. As a result, if you clip the black (positive) lead to chassis when making resistance checks in situ the results will often be much less accurate than they need be and will suggest that leaks are present where in fact there isn't any leakage.

The reason for this is that when a point fed from a positive supply line via a low-value resistor is checked the meter's negative output will forward bias the supply rectifier and thus place the low source impedance of the power supply – say the secondary winding of a chopper, mains or line output transformer – across the circuit being checked. Then again, applying the meter's negative output to the collector of an npn transistor can result in the base-collector junction being forward biased, the reading then being affected by the transistor's low-impedance base circuit. In either case the degree of error will of course depend on the total resistive path and the meter's current output.

Thus for accurate in situ resistance checks when using an analogue meter with circuitry having positive supply lines the meter leads must be reversed with respect to their connections when making voltage checks. Since fault diagnosis often calls for a mixture of voltage and resistance checks, and testing across non-earthed components virtually necessitates the use of prod terminations to both leads, there is a very strong case for using prod terminations at all times.

Another problem arises when checking for an open-circuit bridge rectifier diode. Unless the diodes can be isolated from the supply transformers' winding, by disconnecting a plug or lifting a fuse (see Fig. 1), checking across any diode results in the meter also being applied across another one. Thus if the meter is connected across diode A it will also be connected via the very low resistance of the winding across diode B, and vice versa. Individual tests across A and B would therefore suggest that both are in order through one could be open-circuit. Similarly, when checking the resistance of one of the two diodes in a full-wave mains rectifier circuit with an earthed centre tap in the transformer's secondary winding, one diode must be isolated from the other.

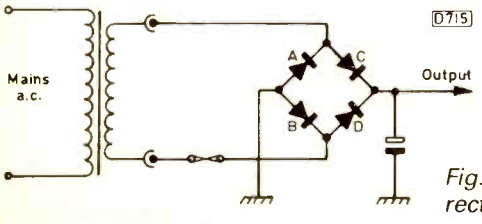

Fig. 1: Basic bridge rectifier circuit

When testing resistors for value change or capacitors for leakage the prods must be applied in both directions so that any d.c. linked pn junction is reversed biased one way round.

When carrying out voltage checks around transistors, readings that are close to those given on the circuit diagram generally mean that the transistor is operating correctly, that the associated resistor values are within tolerance and that there is no leakage in associated capacitors. There are occasions however when a fault condition exists though the voltages remain within tolerance.

Notable examples are with transistors used as emitter-followers or as i.f. amplifiers, since in both cases the collector feed will be via a very low-value resistor – in fact there is generally no decoupling resistor at all with an emitter-follower.

In i.f. circuits decoupling resistors with values as low as 10Ω can be found. Thus the total resistance in the collector circuit, i.e. the coil/transformer winding resistance plus that of the resistor, may be negligible. As a result, a big change in collector current will produce only a very small change in collector voltage, which is always at or marginally below the supply rail voltage. The base voltage is generally provided by a potential divider network or, in the case of an emitter-follower, a d.c. feed from the preceding stage. With both arrangements there's a high degree of base voltage stability. Say that after some years' use the low-wattage, low-value emitter resistor falls in value. The emitter voltage will be slightly reduced, increasing the net forward base-emitter bias voltage and thus the emitter current. Voltage checks will indicate that the collector voltage is at or marginally below the rail voltage, the base voltage is correct while the emitter voltage is only slightly below the correct figure, i.e. all three voltages are about right. Nevertheless the forward bias is greater than it should be and the transistor is not working at its normal d.c. operating point.

An increase in the value of the emitter resistor will reduce the forward bias applied to the transistor, but once again the voltage readings my suggest that everything is working normally.

In both cases, depending on the degree of the shift from the correct operating point, the gain with small-amplitude inputs could be reduced while the peak of the positive- or negative-going excursions of high-amplitude inputs could drive the transistor towards the non-linear extremities of its transfer characteristic, thus introducing signal cramping and distortion. The sorts of things that you can get as a result are sync pulse crushing and/or a non-linear grey scale.

A correct understanding of meter readings is essential for successful fault finding.

Satellite Dish Alignment Meter

Mark Stevenson

Early in 1989, prior to the launch of the Astra 1A satellite, my boss and I attended a seminar on how to sell and install satellite TV dishes. We concluded that whilst the installation principles were similar to those that apply with u.h.f. aerials there would be problems with dish alignment. An accuracy of ±0·5° was quoted – and any chance of being able to see the transmitter mast was definitely out! To be able to set the dish correctly we decided that an inclinometer and a signal-strength meter would be required, the former to set the elevation and the latter to set the azimuth and peak both settings. An order was subsequently sent off, and both items arrived about two months before we had any receiving equipment to sell or install.

Two Years On

Two years or so later the inclinometer lies unused beneath the van seat: the dishes we install come with an elevation scale stamped on them and this is good enough for rough vertical alignment. The meter on the other hand has proved to be invaluable in saving both time and our sanity. How some so-called "engineers" manage to fit dishes by having one person watch the TV set and shout to the other one up a ladder I do not know and never will. Despite its usefulness however the meter has certain shortcomings. As it's powered from the receiver, the dish, cable and receiver have to be installed before any alignment can be done, wasting time. It's fiddly to use, requiring constant adjustment to the gain and reset controls. But its main problem is that it cannot tell one satellite from another, or even satellites from sunrays. On one memorable occasion we had to wait for an hour while the sun moved far enough from Astra for the meter to be able to tell one from the other.

Advantages of the New Design

The meter described in this article was designed and built to overcome these problems. Since it's powered by its own batteries it doesn't require the complete cable run to be installed before the dish can be aligned. Once the initial setting up has been done all you need to do with the meter is to switch in a preset for the satellite in question. Its main advantage however is that it demodulates the 6·5MHz sound channel, so that the satellite can be identified from the sound heard.

Circuitry

Since the circuit is straightforward we won't give a full description of its operation. The tuner/demodulator module was taken from an old Alba receiver. A tuner/demodulator from another source could be used, the only limitations being that it should be a positive a.g.c. type that will work with a 10V supply.

A 10V regulator is incorporated because otherwise a fall in the battery voltage has quite a dramatic effect on the

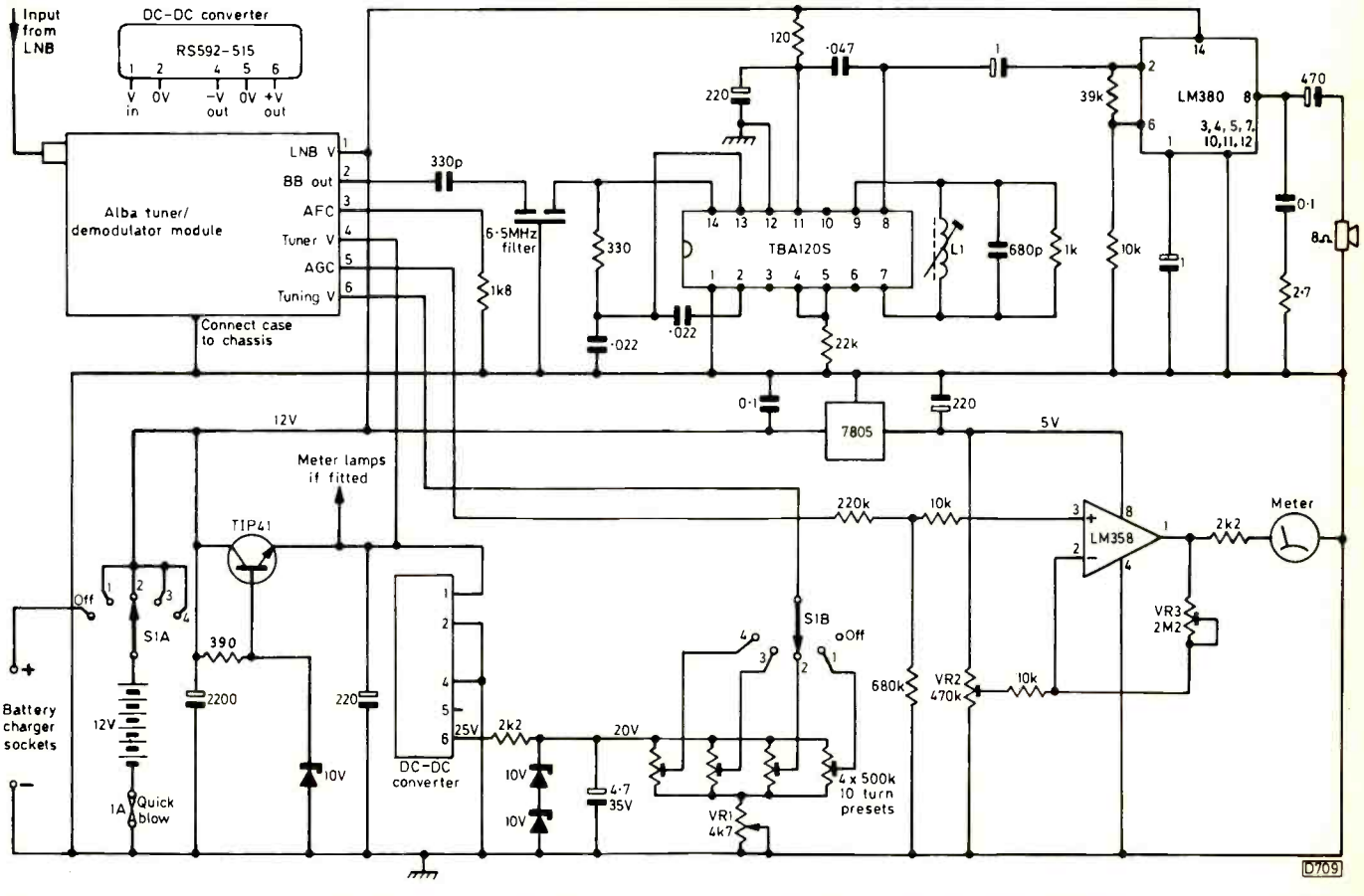

Fig. 1: Circuit diagram of the dish alignment meter. The electrolytics are all 16V unless otherwise indicated.

a.g.c. voltage, turning the whole thing into an expensive battery meter. Operation at 10V gives a reasonable battery life without affecting the tuner unduly. The d.c.-d.c. converter used is an RS type, stock code 592-515. It's designed to step up the voltage from 12V to 15V, but in this application it's used to provide a stabilised 20V supply for the tuning presets. This is quite enough to be able to tune to the top Astra 1B channels.

The 6·5MHz ceramic filter (NEC part no. 61105031) used at the input to the TBA120S audio demodulator chip was obtained from SEME, who tell me that they have it in stock. The demodulator coil L1 is not critical. I found that any appropriate coil would give some audio output but the type specified gives the best output. It consists of fifteen turns (±1 turn) 0·5mm apart wound on a 3mm former with a ferrite core. The demodulator's input is taken from the tuner's baseband output. This arrangement works well enough and no additional filtering or amplification is required, keeping things simple. The audio output from the demodulator chip is coupled by a 1μF capacitor to the LM380 chip. I used this simply because I had one in stock: any similar type can be used, with the speaker chosen to suit. You could fit a headphone socket to prevent traffic noise masking the sound from the internal speaker. An LM358 chip is used as the a.g.c. amplifier. It was taken from the same Alba receiver that provided the tuner/demodulator module. This type should be used as it will run from a single 5V supply rail – other operational amplifiers may not.

The 12V battery is a Dryfit sealed lead-acid type rated at 1Ah. As the meter and LNB have a consumption of about 500mA it will give two hours' continuous use. A second 6V battery could be connected in series with the supply to the LNB via a switch to enable the polarity switching with Marconi type LNBs to be checked, but this is an expensive option.

VR1 in series with the tuning presets acts as a fine tuning control to compensate for variations with different LNBs. It's rarely needed. The number of presets could be more or less as required.

The meter is not critical. Any 50 or 100μA moving-coil type could be used to suit the case adopted. I used a case from Maplin. It's very reasonably priced and has a matching shoulder strap. Order numbers are YU98G and JR03H.

Alignment

The only real alignment required is to set the gain and remove the a.g.c. offset. Connect the meter to a dish that is already set up for Astra. Switch on and tune one of the presets to Sky News. If the sound is faint and cannot be improved by adjusting L1, try adding or subtracting one turn until good sound is obtained. Set VR3 to the quarter travel point, i.e. about 450kΩ. Then adjust VR2 until the meter reads about seven eighths of f.s.d. Turn the dish away from Astra then adjust VR2 until the meter reading falls almost, but not quite, to zero. Turn the dish back to Astra and use VR3 to return the meter reading to seven eighths of f.s.d. You may have to go through this procedure two or three times as the presets interact. Once set up however there's no need for further adjustment. You could then replace VR2 and VR3 with fixed-value resistors.

It's recommended that audio tuning is done with Astra. Some sound will be heard with other satellites but it won't be very clear because of the different carrier frequencies used. It should be good enough to be able to identify the

station however – except with the Marco Polo satellite which will provide no sound because of the MAC encoding.

In Conclusion

Assuming that a tuner/demodulator module is available the cost of the meter, including the case and battery, should not exceed £50. Most of the parts are standard, inexpensive items that are readily available.

This may not be a state-of-the-art design but it's easy to use, works well and is even sensitive enough to show the loss along a long run of cable. Try it with just a 1m fly lead as used when tuning in the dish, then at the end of a 20m cable run. Even with RG6 cable the signal indication on the meter almost disappears. The design is simple and can easily be built on Veroboard. The principle I follow when building such items is KISS – Keep it Simple Stevenson!

CD Player Casebook

Reports from Mike Leach, V.W. Cox and Ronald Aranha

Pioneer PDX540

This player read the discs all right but wouldn't play. When I selected one of the disc's outer tracks the laser/sled assembly wouldn't move. All that it did was to chirp and whistle at me. Similar faults have been described in these pages before. Often the cause is a worn or faulty sled motor. In this case however the cause was a faulty TA7256 tracking drive chip (IC17) **M.L.**

Aiwa DX700

This player is part of a midi system. The reported fault was failure to play. As the laser wouldn't focus on the disc properly there was no TOC reading. Also the turntable motor wouldn't rotate. I've had dry-joint problems with similar machines on previous occasions so I adopted a highly technical approach: I had a good prod around with Big Bertha, my large, insulated fault-finding screwdriver. Suddenly the machine sprang to life. It wasn't just a case of dry-joints however, it was rather more serious. On looking at the board carefully I noticed that there was cracked print around the various test points. It seemed that the holes drilled in the board to accommodate the test points had been slightly too small. Thus when the test points had been inserted automatically they had cracked the print. The piece of print that appeared to be causing my problems was around test point 10. Linking the print around this test point cured the problem, after which the player worked extremely well. **M.L.**

Denon DCD300/600

Skipping and jumping is a problem we've had on several occasions recently with these machines. In each case slippage of the sled belt has been the cause, producing erratic movement of the sled assembly. We find that the belt becomes severely stretched. Now every one of these machines that comes in for repair gets a new sled belt irrespective of the reported fault. The sled belt is part no. 4230044023, the loading belt part no. 4230044007. **M.L.**

Yamaha CDX810

This attractive up-market machine suffered from various faults. It read discs intermittently, wouldn't search properly, would occasionally skip and jump, and would drop out of play into the stop mode. On one of the rare occasions that it did play I was able to check the r.f. eye pattern which was very poor. Each of the diamond shapes in the waveform was indistinguishable from the next one. It jumped and stopped, and I was beginning to suspect the laser unit. I pressed play again and the waveform was this time perfectly o.k., the disc playing correctly. When an outer track was selected however the waveform once more deteriorated. The cause of the problem was not the laser but the crimped connections on the laser plug, at the PCB end. They were in very poor condition. The faults cleared when I hardwired these connections to the plug. I found that the r.f. waveform was now clear but the laser power had been set way over the top. When it was reset and a new turntable motor had been fitted the machine once again performed as well as it looked. **M.L.**

Hinari DK200

The customer said he heard a clunk after which the player had stopped. We saw that the arm was being driven over completely to its stop. Examination showed that R212 in the 12V feed was open-circuit while IC103 (L272) was in a very miserable state. Replacement of both items restored normal operation. **V.W.C.**

Sony CDP-H300

This player came in as part of Sony's portable music system type FH-E626. When we loaded test disc YEDS18 and selected play we heard lovely sound from the speakers. After some time however there was only distorted sound from both channels. Application of freezer to the TDA1543A DA converter chip IC222 restored normal sound. A replacement cured the problem. **R.A.**

Sony FH-B7CD

This new music system has an edit facility that enables you to dub into a tape without loosing the tracks at the end of the tape. When a disc was inserted into the CD player section there was no sound from the speakers except for an occasional "khur khur" noise. The digital signal processor/CLV servo chip is IC202, type CXD2500Q. We connected the scope to its data port and noticed that the signal waveshape changed from time to time. A few bursts of freezer on IC202 restored correct sound. Fitting a replacement had to be done with great care as it's an 80 pin SMD chip. This restored normal operation. **R.A.**

Sony D55T

This is a Discman with an a.m./f.m. tuner built in. The card said "no results". We connected a 9V supply, loaded a disc and pressed play. There was no response and we noticed that the LC display was blank. The 5V supply reached the CXP5024H-003Q system control chip IC801 but there were no auxiliary supplies from the d.c.-d.c. converter. Now pin 30 of IC801 is the power controller port and there was no change here. Replacing IC801 restored normal operation. **R.A.**

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Teletopics

BROADCASTING NEWS

The BBC formally starts broadcasting with Nicam stereo sound on BBC-1 and BBC-2 from the end of August – the first programme will be from the Royal Festival Hall on August 31st, on BBC-2. Seventy three per cent of the British population will be able to receive the Nicam stereo TV sound from ten main BBC transmitters and their 402 relays. BBC Television is committed to extending the service throughout the country, and over the next four years four further main transmitters are to be modernised, increasing the stereo sound coverage to eighty four per cent of the population. These transmitters are Divis (1992), Rowridge (1993), Tacolneston (1994) and Bilsdale (1995). On the programme side it's the BBC's intention to broadcast as much material as possible with Nicam sound.

The European Commission's recently published draft directive on satellite TV broadcasting seeks to commit broadcasters and the European consumer electronics industry to common objectives, in particular the adoption of the D2-MAC system for all future satellite TV stations, leading to HD-MAC at a later date. The directive would require approval by the governments concerned and the Commission hopes that it will come into effect early next year. The broadcasters and industry have been arguing about the terms of the directive for over six months however, while the UK government has already attacked the proposals. Sticking points include whether to make D2-MAC mandatory, the position of the current PAL satellite transmissions, and the receiver features that would become obligatory – whether all sets would have to incorporate a D2-MAC decoder or whether a baseband socket would be sufficient, making sets "D2-MAC ready". The saga of the directive seems set to run for some while yet.

Channel 4 will introduce PDC (programme delivery control) this autumn. The system uses codes in the teletext signal to enable a VCR to identify the start and end of a programme the user wishes to record. This makes timer setting much simpler and means that the VCR will make the recording correctly even when the programme time has been altered. The VCR has to include PDC circuitry of course – several models were announced at the spring shows. Programme schedules broadcast in advance as teletext pages will incorporate programme identification codes that the user can select and store using a remote control handset and an on-screen cursor.

A similar system called VPS (video programming system, see *Television* May 1986, page 450) has been in use in Germany, Austria and Switzerland for about six years. It was rejected in the UK since the programme code occupies a complete teletext line, which was considered to be wasteful, and prior to a recent change in the law programme recording was strictly speaking illegal. The similar TP (text programming) system first introduced by Grundig provides user programme selection for recording but doesn't overcome the problem of transmission time changes. PDC, which is an EBU standard, is a more efficient method of including the programme codes within the teletext lines. It was adopted by Channel 4 with the approval of BREMA. Channel 4 has been able to introduce this system first because it uses a computerised programme schedule system to control the transmission of commercials throughout the network.

According to the *Financial Times* satellite monitor, a further 64,000 satellite TV installations were carried out in June, doubling the number over the twelve-month period. The figure for July was 55,000 – some 1·7m households now have access to satellite TV.

VIDEO HD-TV STANDARD

Hitachi, Matsushita and Sony have agreed on an HD-TV standard for VCR use. It's been developed for use with the Japanese MUSE HD-TV system but could be adapted for use with other standards. Signal compression has been rejected as a means of reducing the bandwidth required. Instead, two other techniques are employed. First the drum speed is doubled to 3,600 r.p.m. Secondly the video signal is divided into two components and recorded by two heads simultaneously as a luminance/chrominance time-division multiplex. Sixteen-bit PCM is used for the two- or four-channel digital audio signal. The cassette, which uses half-inch metal-particle tape, has a playing time of three hours. The three firms are to propose to the IEC (International Electrochemical Commission) that the system be adopted as a world standard. A ten-chip set will be developed for use in the VCRs, which it is hoped will be on sale within two years. The Japanese state broadcasting system NHK is at present broadcasting an hour of HD-TV daily. This is to be increased to eight hours later in the year.

AUDIO NEWS

An agreement has been reached between US recording companies and consumer electronics firms over digital audio tape systems. Under its terms a royalty payment on all equipment, tape and disc sales would be made to a government administered fund. The necessary legislation would have to be passed for the agreement to come into effect. A similar arrangement may be proposed in Europe.

Philips has announced that Matsushita (Panasonic) is a co-licensor of the DCC (digital compact cassette) system, which is to be introduced next year.

CHIPPERY

Sanyo Electric and US semiconductor manufacturer LSI Logic have agreed to undertake joint development of a sophisticated chip set to handle Japanese MUSE HD-TV signals. The aim is to reduce from forty to between six and ten the number of chips required for signal processing, cutting the decoder PCB size by three-quarters and halving its cost. The MUSE decoder is expected to be in production in the latter half of 1992.

NEC has developed a video compression system for videoconferencing use. It consists of three chips capable of compressing a 90Mbit/sec data stream to 64kbit/sec and meets the ISO H261 specification. The CPU chip incorporates 1·13 million transistors on a 13×15·5mm die. To achieve the necessary operating speed static instead of dynamic RAMs are used with the processor.

ITT Semiconductors has developed a chip for decoding captions for the hard of hearing. The CCD3000 is capable of handling all TV display functions, works with NTSC, PAL or SECAM transmissions and is compatible with ITT's Digi 2000 system.

TRADE NEWS

Nokia Consumer Electronics has established an in-house service department at its Swindon headquarters (Bridgemead Close, Westmead, Swindon SN5 7YG) to handle repairs and spares for ITT Nokia, Salora and Luxor

products. Service back-up had previously been provided by a subcontractor, Hoopwell Ltd. The move follows the creation of a centralised service and spares operation at Bochum, Germany, ensuring fast delivery of spares to Nokia companies throughout Europe. The Nokia service department telephone numbers are 0793 511 636 for spares, 0793 512 856 for service and technical (2-5 p.m.).

A correction is required to our note last month about Sentra Electronics Ltd. It's the spares and service division of Sentra that's now trading as ASJ Electrotechnik, to whom orders and cheques etc. should be made out. Address and telephone number as last month.

Modification details are available from ASJ Electrotechnik for reception difficulties with the Sentra SX1000 and Channel Master 6010 satellite receivers when used with the Astra 1B satellite.

Still no news of a UK spares supplier for Loewe Opta products. Those who need to contact Loewe Opta GmbH should write to the firm at Industriestrabe 11, Postfach 220, D-8640 Kronach, Germany. The spares telephone no. is 010 49 926 199 700 – but there are no English speakers available.

TAPE FORMAT TRANSFER

Flintdown Channel Five Television Ltd., 339 Clifton Drive South, Lytham St. Annes, Lancashire FY8 1LP (telephone 0253 725 499 or 712 011, fax 0253 713 094) offers a tape transfer service for those who have video material stored on obsolete tape formats, transferring the material to modern video tape and cassettes such as VHS, S-VHS and 1in. Betacam SP. The company maintains a range of videotape recorders that were long ago discontinued, including Philips N1500 and N1700 machines, Hitachi half-inch reel-to-reel, IVC 1in. and quad 2in. models.

SERVICE ENGINEER SHORTAGE?

Roger Warren, senior lecturer at the Hastings College of Arts and Technology, has warned that a serious shortage of service engineers in the consumer electronics field is in prospect. Over the past three years there has been a fifty-sixty per cent drop in the number of students in his area taking the City and Guilds 224 courses. He has even had to cancel a satellite TV servicing course. Bad conditions and poor pay are suggested as reasons for the continuing decline in the number of people employed in the servicing industry. The increased reliability of consumer electronics products is another factor of course.

VIDEOPHONE SYSTEM

GPT has announced that it will launch a videophone in time for the start of the proposed pan-European videophone service in 1993. The price is expected to be between £1,000 and £2,000. It will be based on the company's videoconferencing system, which is to the ISO H261 specification, and will use the two 64kbit/sec digital lines provided by BT's ISDN-2 service.

AERIAL NEWS

A new omnidirectional indoor aerial from Maxview, the Omnivision, provides coverage of the u.h.f. bands plus v.h.f. radio. It comes with a separate amplifier that provides a variable gain of up to 26dB. Suggested retail price for the combination is £45, which includes various accessories. For further details apply to Maxview Aerials Ltd., Common Lane, Setchey, King's Lynn, Norfolk PE33 0AT (telephone 0553 810 376).

Manufacturing arrangements for the Astra version of the Squarial, which uses phased-array technology, are close to being agreed. It will be 45cm square, 45mm deep and have an efficiently of 72 per cent, about ten per cent higher than an equivalent dish. One of the problems with the Squarial has been the manufacturing tolerances, which with some dimensions have to be of the order of a thousandth of an inch.

New rules on satellite dishes came into effect on July 31st, subject to local conservation area etc. restrictions. The plan for two dishes per home without planning permission, proposed when Sky Television and BSB were separate, has been withdrawn. The latest regulations allow one dish of diameter up to 70cm provided it doesn't project above the highest part of the roof. To meet reception needs in some areas a 90cm dish is permissible. A 45cm dish can be chimney mounted provided it doesn't project above the top.

UNIVERSAL HANDSET

Cullam Ltd., Technology House, Stanton Harcourt Road, Eynsham, Oxford OX8 1TH (telephone 0865 882 100, fax 0865 882 110) has introduced a multi-purpose remote control handset that can be simply programmed to operate almost any IR controlled equipment. Known as the Scholar, the unit has a suggested retail price of £39·95 including VAT. It's programmed direct from existing handsets, retains its memory while the batteries are changed and offers up to 192 commands. Cullam is shortly to introduce a Nicam unit, the Interpreter, that upgrades existing TV sets and VCRs for Nicam stereo via a hi-fi system.

CASSETTE VCR SERVICING COURSE

Microforge Ltd., 339 Clifton Drive South, St. Annes-on-Sea, Lancashire FY8 1LP (telephone 0253 725 499, fax 0253 713 094) has produced a domestic VCR servicing course on seven separate cassettes. The programme is detailed and uses animated diagrams, graphics, spectrum analysis and oscillograms etc. to illustrate VCR operation. Each cassette is accompanied by additional printed notes with many diagrams and pictures. The seven cassettes cover VCR systems overview, servo systems, colour record systems, frequency modulation, VHS/S-VHS/Video-8, component video and VCR faults respectively.

The series has been made in conjunction with the Department of Trade and Industry and Aston University. Each cassette with its printed notes sells for £39: a discount is available if more than one part of the programme is ordered at the same time.

VCR Clinic

Reports from Philip Blundell, AMIEIE, Ian Bowden, Chris Avis, Ed Rowland, Eugene Trundle, J. Edwards, Nick Beer and John C. Priest

Philips VR6362

The cassette would eject when play was selected. A check on the error memory showed that the capstan tacho signal was missing, though the capstan was seen to turn a few times when the cassette went in. The cause of the trouble was no supply to the tacho amplifier as C2206 on board P607 was short-circuit. **P.B.**

Grundig VS540

This machine came in with a cassette, which hadn't been inserted correctly, jammed inside. Now normally the machine would attempt to load the cassette for a few seconds then go to eject, but this didn't happen. Instead the machine kept trying to take in the cassette. After extracting the cassette I found that everything was fine if the cassette was inserted correctly, the problem occurring only when it was inserted incorrectly. After a break I noticed that the time was wrong. This was reset but a few minutes later I saw that the clock had stopped. It was then a simple matter to check the clock chip and find that it wasn't oscillating. A new PCF8583 was required. This cured both problems. The system controller uses the clock chip as a time reference: as the clock wasn't running, it wasn't timing the tray operation and sensing the jammed cassette lift. **P.B.**

Fujitsu General VGX625B/Panasonic D deck

"Speckly picture" was the fault noted on the card. I'd never seen a VCR like this one before, but when the top had been removed I recognised the Panasonic D deck. Things were all right once the heads had been cleaned, but why had this been necessary? A check on the back tension revealed that it was too high at 60g. The cause of the trouble was revealed when I inserted my Scotch E240 tape and tried forward and reverse search. There was too much friction between the lower drum and the tape, so the tape was buckling at the rotating guides.

Due to the cost of a new lower drum the machine will probably be written off. But we have a lot of machines that use the Panasonic D deck out on rental and have been changing rather a large number of lower drums. So we've been checking the back tension on all our machines. The normal playback tension should be around 40g when checked with a Konig tension cassette. With a large proportion of the machines the back tension has been 60g or more. Hopefully we will have reduced our need for lower drums by resetting the tension before the wear has become excessive. **P.B.**

Ferguson FV41

If pause or a search mode was selected when the machine had been running for a few hours the picture would roll. A check on the video signal showed the reason for this: in these modes there was a field sync pulse only on alternate fields. The pseudo-V sync pulse that's used in these trick modes is generated by the servo microcomputer chip and is fed to pin 28 of the luminance processing chip IC26. Even when the fault was present the 50Hz pseudo-V signal was correct. Checks around IC26 showed that the supply voltage was high at 6·4V instead of 5V. A small regulator circuit in the servo area of the main PCB produces this 5V supply from the U7 8V line. The regulator circuit isn't the same as that shown in the provisional circuit diagram. We found that the faulty component was the 2·7V zener diode DT53 which had nearly 4V across it. **I.B.**

Hitachi VT17

The operate button LED said that the machine was on but there were no functions and no clock display. The NiCad backup battery should read 2·5V: this one read 2·5Ω! It had also killed the 10V regulator transistor Q1795. A new NiCad battery and 2SC2030 transistor restored normal operation. **C.A.**

Ferguson 3V53/JVC HR-D755

The owner complained about "fine net curtains" across the playback picture after ten minutes or so. He was right. Scope checks narrowed the source of the noise to the MSM6989RS delay chip IC2, which obligingly cleared the fault when it was frozen. We had some difficulty obtaining a replacement. Eventually we found that Thorn EMI Home Electronics had it in stock. **C.A.**

Sharp VC831H

The playback sound from prerecorded tapes was very low and muffled. The machine wouldn't record any sound at all, though the erase was o.k. As head cleaning produced no improvement a replacement was fitted. This cleared up the trouble completely. **E.R.**

Sharp VC582

When the cue (forward search) mode was selected the tape would stop moving, the deck reverting to the stop mode. The same shutdown sequence would occur during playback when a blank section of tape was encountered – the machine is designed to "search past" these, triggered by cessation of the off-tape control track pulses. The cue command came from pin 29 of the control microcomputer chip correctly. Further checks showed that C753 (100μF, 16V) in the reel motor drive circuit was short-circuit. **E.T.**

JVC HR-D110/Ferguson 3V38

This machine had a fault that was unusual to say the least: playback was o.k. but the machine's own recordings played back with erratic servo lock. If the machine was stood on end it made good recordings! There are two capstan FGs in this design, one in the motor and one on the belt-driven flywheel. The bracket that supports the bottom of the flywheel shaft had become somewhat bent. As a result the FG printed coil had moved away from the capstan, reducing the FG output at TP402 to 0·2-1·1V. **E.T.**

Tatung VRH8350

This particular Tatung machine is made by Akai. It would intermittently shut down to stop during play or record –

except when it was being watched in the workshop! An old scope was finally left hooked to two key points. Just before the machine went to stop we saw that the reel sensor pulses faded away slowly to zero. Changing the reel-sensor optocoupler and the cassette LED, which is in series with the coupler's sender diode, seems to have cured the problem as we've heard no more. **E.T.**

JVC HR-D750

The complaint was of diagonal blue lines on red backgrounds in the picture: it was received with some scepticism in the workshop. Sure enough, on test the reproduction of reds was flawless, even with the Madonna tape that accompanied the machine for the purpose of demonstration. We had to get the TV set, a JVC one at that, before we could sort this one out. The cause of the trouble was interaction between the TV set and the VCR, and was cured by physically separating them by a foot or two. The effects produced by this sort of radiation interference can vary tremendously with different combinations of VCR and TV receiver. **E.T.**

No Record with Camcorders

One of our customers made himself an elaborate and excellent battery belt for his camcorder. Its only problem was that the machine cut out each time he went to record! All the other functions worked however. You get the same sort of thing with worn-out batteries and with inadequate bench PSUs used to test camcorders. The reason for this is that the machine's current consumption is at maximum just after the record button is pressed: the camera section is then powered, the loading and head motors are running and sometimes the auto-focus motor is also operative. Current consumption can exceed an amp, much more than in the other modes, and the power source must be able to supply this with little drop in voltage.

The total resistance introduced by our friend's battery belt, contributed by several feet of thin wire, the connections, plugs and sockets, probably added up to an ohm or so, enough to lose a volt or more when entering the record mode. We found that the voltage at the camcorder dipped below the auto-cut circuit's threshold point, whereupon the machine promptly shut down again. **E.T.**

Sanyo VEMS1P Camcorder

The dew indication was almost always present in the viewfinder. As a result, all functions except eject were inhibited. Perhaps surprisingly, dew sensors go high-resistance when moist: the problem here was simply a dry-joint at one of the sensor's terminations. **E.T.**

Hitachi VT130/150

This machine accepted a tape all right and fast forward/rewind worked. When play was selected however the drum rotated and the machine laced up but there was no capstan rotation. So stop was initiated and the machine unlaced. Slight flexing of the servo panel would enable the machine to enter the play mode but after the slightest movement it would shut down. Much time was spent checking the voltages around the servo chip (IC601) whilst trying to flex the panel in an effort to note any changes in the readings in the go/no go states. This didn't work so I decided to let the machine shut itself off then carry out checks, hoping that it was still in the fault condition. There should be a 4·43MHz signal at pin 32 of IC601. This was missing. I traced it back to pin 27 of IC301 on the luminance panel, where it was also missing. Slight movement of IC301 made it come and go. Resoldering IC301 provided a complete cure. **J.E.**

Panasonic NV-G40

The playback picture was clean and noise free but without colour. A recording played back on another machine proved that the fault was present in the playback mode only. The playback r.f. chroma is applied to the YC panel at pin 32. It was present here, though indistinct and of low amplitude. More alarmingly it sat on a d.c. potential of 3·32V. If the feed from the head amplifier was disconnected the d.c. potential disappeared. We found that it was present at pin 13 of the chroma hybrid chip IC801 (part no. VEFH04A). The same potential was present at pin 11 of the i.c. on the hybrid module, these two points being coupled by a capacitor which was apparently short-circuit. A new hybrid chip restored the playback colour. **N.B.**

Panasonic NV-MS50

This camcorder wouldn't play or record. The customer mentioned that he'd scraped it against a wall and wanted the marked case parts replaced. The symptoms were identical to those with an exhausted battery except that the viewfinder didn't show the appropriate indication, i.e. the unit would lace but then immediately unlace. With the covers off the reason for this was soon obvious – the drum didn't spin. This was in turn caused by the fact that the hi-fi audio rotary transformer's stator, which in these small units is mounted above the drum, fouled the latter because its bracket was bent. Further investigation showed that the tripod mounting bush was cracked in half. More than just a scrape I fear! **N.B.**

NEC N9077

This machine was brought into the workshop with the complaint "can't tune out radar interference". Radar at Squires Gate is a major problem in this area, making chs. 35/36 almost unusable in some parts of the Fylde. In this case however radar was not the cause of the problem. The white dashes across the screen were longer than the familiar radar blips and didn't have the characteristic repetition frequency. In fact the problem was caused by tape drop out as the drop-out compensation circuit wasn't doing its job.

A look at the circuit suggested that VR204 controlled this function, but a couple of experimental tweaks had no noticeable effect on the fault. There's no circuit description in the manual, and the function of IC1202, which precedes VR204, is not shown on the circuit diagram. It's identified in the parts list as a "PAL 1H CCD", i.e. a one-line delay CCD chip. Pin 12 of the LA7323 luminance processor chip IC1201 feeds pin 6 of IC1202. IC1202's output, at pin 4, goes to VR204 via an emitter-follower (Q209) and a filter (FL202). VR204 feeds back to pin 10 of the LA7323 chip via another emitter-follower (Q208) and a coupling capacitor (C208). The waveform at TP207/8 didn't look much like that shown in the manual and didn't vary when VR204 was adjusted. As Q208/9 and C208 checked o.k. I decided to order and fit a replacement line-delay chip. This was a mistake – it was the LA7323 chip that was the cause of the problem. **J.C.P.**

The New BBC Identification Symbols

Keith Hamer and Garry Smith

Followers of our articles will know that from time to time we delve into the archives to present various BBC test cards, identification symbols and clock captions used in days gone by. Our first article on the subject appeared in the May 1978 issue of *Television*, when we reviewed unusual BBC globe symbols and test cards. This time we're going about things the opposite way in featuring some of the very latest on-screen identification graphics.

Previous Changes

Major changes to BBC on-screen graphics were introduced on February 16th, 1991. Previously the last overhaul of the BBC-1 identification had been on February 18th, 1985 when the mechanical globe symbol, which had been used in various forms since 1963, was changed to a fully digital display. BBC-2 changes were introduced in March 1986, when the traditional "2" was changed to a written "TWO" symbol. The identification captions for both networks had remained largely unchanged since then.

Call for Something New

In 1988 BBC-2 controller Alan Yentob made it clear to BBC Presentation that he didn't like the red, green and blue TWO identification. In fact he hated it! So plans were started to alter the BBC-2 image. Meanwhile the world of BBC-1 seemed set to continue rotating for some time to come.

By the late Eighties ideas about "market forces", "reorganisation", "rationalisation" and, worse still, "competitive tendering" were becoming current at the BBC Television Centre. While the BBC's Graphic Design department had traditionally been responsible for designing and producing the various identification symbols, it now faced competition from outside design agencies.

Planning the Changes

In June 1988 Pam Masters left Channel 4 and became head of Presentation at the BBC. She had started her career there, moving to Channel 4 in 1981 to become head of Presentation with responsibility for its on-screen appearance and identification. The design consultancy Robinson Lambie-Nairn devised Channel 4's logo, and it was perhaps not surprising that the same company was commissioned by the BBC to update its TV identifications, no doubt much to the disappointment of the BBC staff who had devised all previous BBC identifications with great success and a high degree of professionalism. What could we expect from Lambie-Nairn?

In recent years the company has designed the logos used by Channel 4, Scottish Television, Anglia Television and the French TF1 network. Remarkably similar identification symbols have been devised – they either look like bits of plastic that hurtle around the screen, or they seem to be made of shiny stainless steel. Such patterns are fine for some organisations, but surely not for the BBC. Throughout the world various graphic designers have chosen to use this style for television logos, as a result of which there's a great deal of similarity.

In 1988 we discussed over lunch with Pam Masters and Graphic Design Manager John Aston at the Television Centre the fine tradition of the various BBC identification symbols. We mentioned to our hosts that the BBC had used a globe of some description since the Thirties, and suggested that it would be a terrible break with this tradition to discontinue the BBC-1 globe symbol. To support our view we produced photographs and videos from our extensive archives. As events unfolded last February, we needn't have worried too much about this. The first hint that we received about changes to the BBC-1 globe came in December 1990. A tip-off from Television Centre advised us that the new symbol was being viewed for the first time, behind locked doors and under strict security. The new BBC-1 symbol was indeed to feature a globe – but only just! For the first time ever the symbol was not going to include any sort of "BBC" identification: it would simply feature a large figure "1" in the centre of a swirling expanse of sea and land. Oh dear! That didn't sound too encouraging, but at least there was going to be a globe.

The Changeover

The final transmission of the BBC-1 digital globe symbol and the familiar clock caption occurred at closedown on February 16th, at around 0145. There was a brief mention from the continuity announcer that a new identification symbol would appear at the start of programmes later that day. We were given a hint as to what the new "1" would look like when Test Card F appeared for about ten seconds after closedown. On the extreme left (see the accompanying photograph) there was the new BBC identification, in sloping boxes with short white lines below. To the far right there was the new-style "1". Several people at the Television Centre were, with ourselves, left wondering why there was such a large space in the identification. Perhaps someone at the BBC knows the reason for this unusual gap: at the time of writing this we are still in the dark!

Test Card F was again transmitted, at some length, prior to the start of the Open University programmes at 0640 on BBC-1 and 0650 on BBC-2. The OU programmes started on time and we were to discover that the work of the graphic designers had even extended to this area which, it seemed, hadn't changed much for centuries! But there was still no sign of the new BBC clocks and symbols. We had to wait until 0900 for the new BBC-1 clock to appear, prior to a Gulf News report. It was shown for only a few seconds but was clearly a pleasing design that was certainly different from any other clock caption. There was just one nagging doubt. What would the BBC show during a national emergency or ahead of some really awful news story? The clock seems too colourful for use on such sombre occasions.

The New BBC-1 Globe

The official unveiling of the new BBC-1 globe symbol was due to be carried out by Philip Schofield and Sarah Greene at 0905, during the children's programme *Going Live!* It appeared for a few seconds just prior to the start of this programme however. And what a colourful symbol it

Photo 1: The BBC-1 globe. Australia appears twice but where are Europe and Africa?

Photo 2: The BBC-1 clock caption is superimposed on a strange psychedelic map.

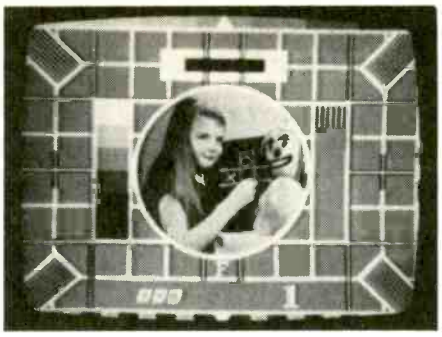

Photo 3: Test Card F with the new BBC identification and a strange space between it and the 1 or 2.

Photo 4: Part of the animated Open University sequence on BBC-1.

Photo 5: The OU identification caption as radiated on BBC-2.

Photo 6: BBC-2 identification with the 2 covered with blowing satin.

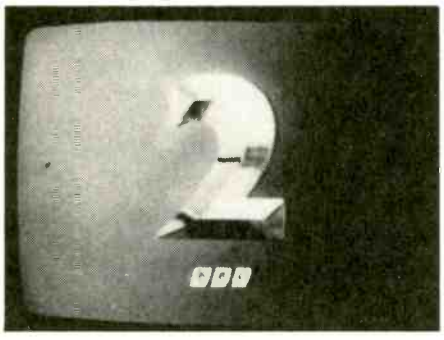

Photo 7: The 2 identification here takes on a stainless-steel appearance.

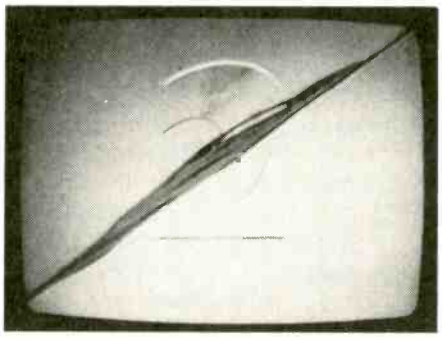

Photo 8: This 2 has a small river or satin rip across it.

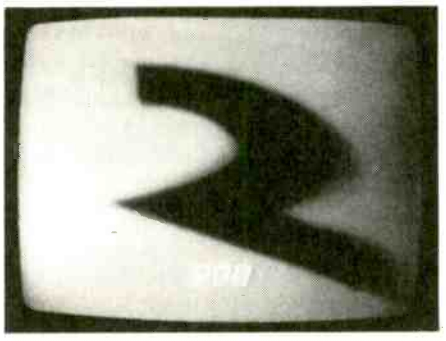

Photo 9: Here we have a rotating and silhouetted 2.

Photo 10: The 2 here seems to have a 3-D effect.

Photo 11: A 2 that's illuminated by neon lights.

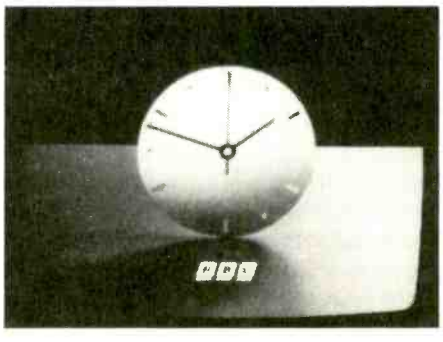

Photo 12: The new and extremely elusive BBC-2 clock.

turned out to be! Perhaps, as with the clock, a little too colourful for use during national emergencies. Incidentally the overall colour scheme is officially known as "BBC-1 Indigo".

Two traditions are embodied in this new symbol: the globe idea and the BBC corporate logo (the latter had been absent when executives first viewed the caption last December). But where on earth (quite literally) are the continents of Europe and Africa? For some odd reason Australia appears twice in some instances. The Americas are also there, but apart from a vague outline there's very little sign of Europe and Africa. Just when these large landmasses should appear they seem to be swallowed up in a mysterious black hole. It has been suggested, perhaps rather unkindly, that Australia is featured twice in readiness for the BBC to be snapped up by some TV-

hungry Aussie entrepreneur when the Royal Charter expires in 1996.

BBC-2's New Look

BBC-2's new look was due at 1445, following the close of the OU programmes. Would the symbol consist of cheap and cheerful children's plastic playing bricks shooting across the screen? Fortunately it didn't. Instead, the bold figure 2 appeared in the place of the familiar TWO symbol. Then, without any warning, a jet of blue paint hurtled towards the 2, splattering it completely. For paint connoisseurs, the colour is actually "BBC-2 Viridian" rather than blue! Certainly the new symbol differs from any of its predecessors. This wasn't all however: there isn't just one BBC-2 symbol but a whole selection of them, some of which are shown in the accompanying photographs. They are generated from two laserdiscs which can produce no fewer than forty identification symbols, one of which includes part of Test Card F. Each BBC-2 symbol is accompanied by some rather unusual but soothing radiophonic-style music. The new BBC-2 clock caption first appeared during the closedown sequence.

Regions and the Graphics Review

The BBC Regions haven't been overlooked in this updating process. BBC Scotland, Wales and Northern Ireland each have a vague outline map of their particular area on all programme menus and trails.

The authors now publish a quarterly, 20-page publication entitled *TV Graphics Review* for those interested in test cards and logo designs. It includes photographs and articles on test cards, the accompanying music, identification symbols and general TV graphics used throughout the world over the past seven decades. It's available at an annual subscription of £7 from HS Publications, 7 Epping Close, Derby DE3 4HR (telephone 0332 513 399). If anyone has available photographs or videos of early identification symbols and test cards we'd like to hear from them. We would also be pleased to hear from anyone with recordings of BBC test card music from the Fifties and early Sixties.

The B and O 39XX Series Chassis

Nick Beer

For convenience we are referring to the group sets described in this article as the 39XX series. To date there have been four models as follows: L4500, L5500, LX4500, LX5500, MX3500 and MX5500. An M in the model number indicates monitor styling. L only models are basic sets. Bang and Olufsen's set identification system has never been very clear, what with model and type numbers but no chassis numbers. Model L4500 is listed as type 393X, Model L5500 as type 391X, Model LX4500 as type 392X, Model LX5500 as type 390X, Model MX3500 as type 316X and Model MX5500 as type 326X. Having got that out of the way we'd like to say that the basic chassis used is an extremely interesting one.

The 25 and 28in. LX sets are, as with previous models having the same prefixes, traditional looking sets with speakers at each side of the glass-plate covered c.r.t. The speaker frets and glass plate fit flush to the top of the set however rather than to an escutcheon as in previous models. This means that the standby indication has had to be moved. It's now a bi-coloured LED in the right-hand top corner above the c.r.t. The same LED is red for standby and green when the set is on. A power indicator is required because the chassis has no on/off switch, also because the picture as well as the sound can be muted via the handset and the sets can run in an audio-only mode. In previous sets that had an audio-only mode (for hi-fi playback) there was a LED indicator showing two arrowheads.

Apparently some viewers have found the closeness of the standby/on LED to the tube distracting. The indicator musn't be blocked or covered as this contravenes safety approval requirements. A series resistor can be added to limit the brightness. I must say that we've never found this to be a problem with our customers.

Operation of the Set

The only controls on the set are a channel step forward button and a reset button. These are beneath the tube, to the right. There's an array of sockets at the rear – two scart sockets, an S socket for S-VHS VCR use (Y and C inputs), two power link sockets (see later), a motorised stand socket and audio auxiliary/link sockets.

The sets come with the now standard Beolink 1000 handset, which is more than just a remote control unit. Within the set there's a transceiver rather than a remote control receiver. This enables it to work with the Beolink 5000 and 7000 handsets. Remote transception is not new with B and O gear: hi-fi systems have been able to communicate with master control panels for some years, but this is the first TV chassis to have this feature. It will not work with the MCP5500/6500 master control panels however.

One thing to remember is that these sets will come on only with the TV command, unlike earlier sets that used the Beolink 1000 handset and would respond to the channel number buttons. A couple of useful additions to the features available via the handset are separate sound and vision mutes and resets. Picture mute is useful when calling up an on-screen menu. To select the individual functions, prefix the command with "sound" or "picture" as appropriate.

As with earlier sets frequency rather than channel tuning is used. The conversion table was included with my previous article (April 1989) on the 37/38XX LX00/02 series. This mode is selected by pressing the "goto" key, typing in the figure then pressing "store" twice. Search tuning is by pressing either channel step key in place of the digits. Each channel location can be given an identification header by pressing "goto" six times then using the step and fast forward/rewind keys to select and move along the characters. There's no need to code a location specifically for VCR r.f. use – any location can be used.

Although the sets have fifty locations only the first 45 can be used as the final five are reserved for future and/or link use. This is more than sufficient of course.

When the set is connected to a Beosystem 6500 hi-fi installation, VX4500 or VX5000 VCR the tuning (VCR only) and clock data are dumped, obviating the need for separate setting of the other units. There are one or two

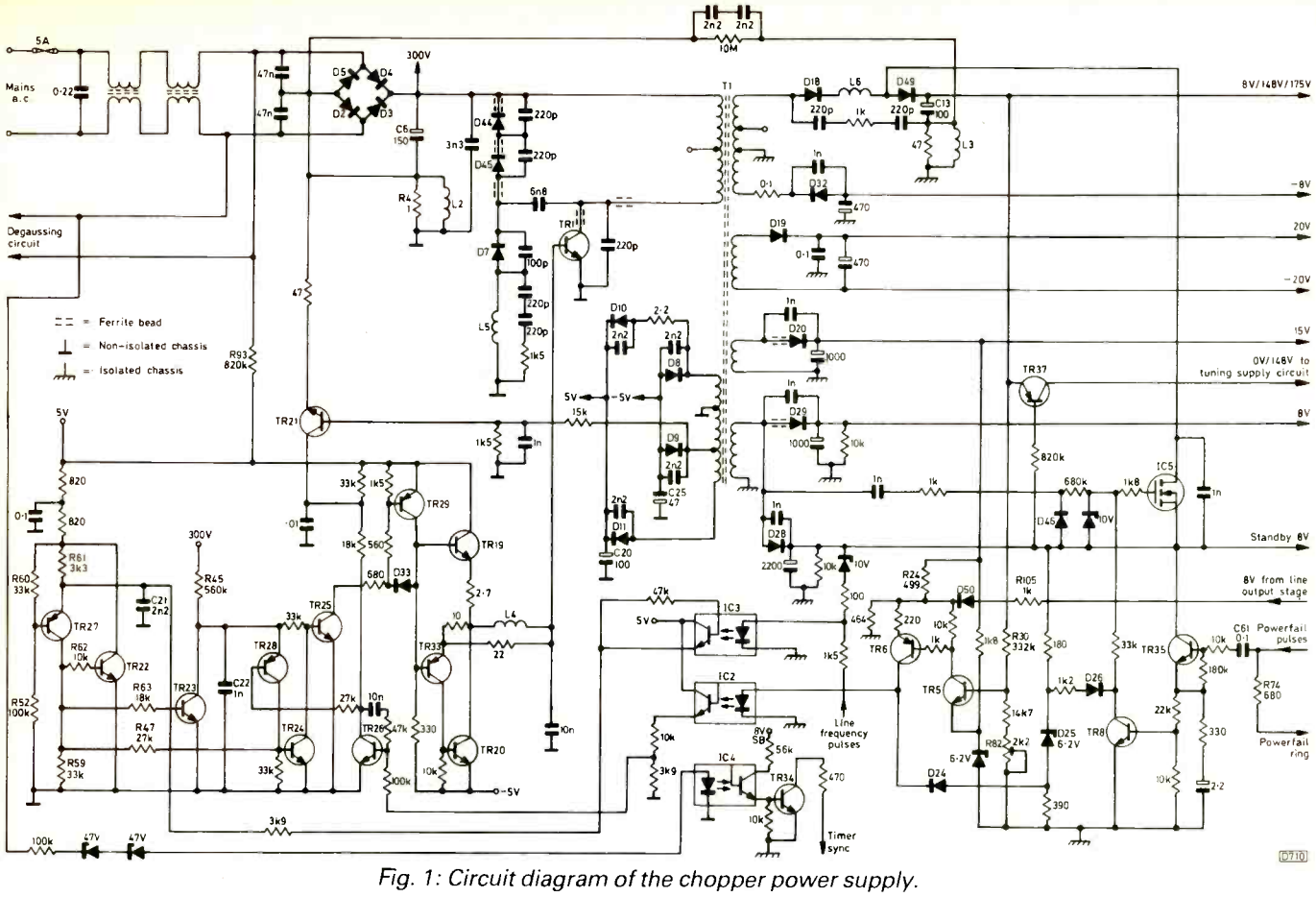

Fig. 1: Circuit diagram of the chopper power supply.

anomalies however. VX5000s with 1·5 software will not dump, and Master 6500s need software 1·4 to prevent the clock resetting to Monday at each dump.

Power Supply Circuit

It's essential to understand the operation of the power supply when any work is done on these sets. The circuit is shown in Fig. 1.

A start-up supply is fed to the oscillator and driver stages via R93. The oscillator, which runs at about 32kHz, i.e. approximately twice the line speed, is formed by TR27 and TR22 with C21 as the timing capacitor. The voltage at the base of TR27 is fixed by the potential divider R60/R52. When the voltage across C21, which charges via R61 etc., is higher than the voltage at its base TR27 will switch on, in turn switching on TR22. C21 is then discharged via TR27/R62/TR22, and when the voltage across it has fallen sufficiently the two transistors switch off. The oscillator's pulse output, developed across R59, drives the ramp generator circuit. This consists of the switching transistor TR23 and C22 which charges from the 300V supply via R45. The ramp forms one input to the pulse-width modulator stage consisting of TR28 and TR24. TR25 acts as a buffer through which the pulse-width modulated drive signal is fed to the push-pull driver stage that consists of TR29, TR33, TR19 and TR20. Note that the driver stage is operated from +5V and −5V lines.

The p.w.m. drive is applied to the base of the BUT12 chopper transistor TR1 via L4. When this transistor conducts, current flows via the primary winding of the chopper transformer T1 to the reservoir capacitor C6. When the drive waveform cuts TR1 off, the field established in the transformer collapses and current flows in the secondary windings. Rectifiers D18/19/20/28/29/32 provide various supplies. The width of the chopper drive pulse is determined by feedback from the error detector/amplifier circuit TR5/6 via isolating optocoupler IC2 and TR26 which sets the bias at the base of TR28.

TR28 thus receives a ramp waveform at its emitter and a feedback bias at its base. It conducts when the voltage at its emitter exceeds that at its base. TR24 is then switched on. When TR23 discharges C22, TR28 and TR24 switch off.

Excessive loading is detected by R4/L2 which are connected in series with the negative side of the mains bridge rectifier's reservoir capacitor C6. TR21 switches on when there's excessive voltage across R4/L2, in turn reducing the bias at the base of TR28. This reduces the chopper drive. The circuit also provides protection during the start-up procedure, before the power supply's output voltages stabilise and the feedback circuit takes over.

In the standby mode the field-effect transistor IC5 switches on. As a result, the h.t. voltage falls to 8V: all other outputs from the power supply are reduced to a fifteenth of their normal running value. IC5 is controlled by TR35 and TR8, which are off in standby. The powerfail signal, which is not present in the standby mode, is used to switch TR35 and TR8 on. We'll return to the powerfail action in a minute. Because of the large back-e.m.f. that's created by this dumping action, an usually complex snubber network is required. It consists of D7/D44/D45 and the associated components. TR37 switches off in standby, removing the supply to the tuner.

In the TV mode the error detector transistor TR5 samples the 148V line via R30. The supply for TR5/6 is obtained from a rectifier connected to a winding on the line output transformer, the feed being via R105 and D50. This arrangement provides anti-breathing compensation. In the standby mode the feedback is via D24 and D25 from the 8V line – the voltage at the anode of D24 is 1·6V.

In the audio only mode the h.t. line is unloaded and rises to about 175V. There is no supply via R105 and D50 to TR5/6 which are instead fed from the 15V line via R24. In this condition the 15V supply determines the feedback.

Line flyback pulses are coupled to the power supply oscillator via optocoupler IC3 to provide synchronisation. This is done to avoid picture disturbance.

The other optocoupler in the power supply, IC4, is used to synchronise the built in clock with the mains frequency. The teletext clock is not used in these sets to provide the "time" feature. To synchronise the two clocks, select "time, text, store, store" with the 1000 handset. When the set is connected to other B and O audio or video equipment with suitable software the clock is, like the tuning, dumped and synchronised between units.

Powerfail System

The powerfail circuit detects excess loading on the various supplies and operates in a ring manner. Fig. 2 shows the arrangement of the powerfail loop. A 4·4V peak-to-peak 50Hz squarewave output from pin 10 of the master microcomputer chip IC13 should return to pin 13 of this chip. If it's missing or badly distorted the set won't start and a powerfail message will appear. The set won't start because, as we have seen, the powerfail signal is used to switch on TR35 in the power supply.

In the event of a powerfail fault, make load checks on the various supply lines. The reset button on the front of the set must be pressed after each failed start-up when there's a powerfail fault. This resets the microcomputer chip. If you don't do this you may continue to look for a fault long after it has been put right.

Timebase Generator Section

The timebase generator arrangements are interesting. Fig. 3 shows a block diagram. The line oscillator is in IC2 while the field oscillator is in the TDA8432 deflection processor chip IC5. This chip contains an I2C bus interface and DAC to decode line frequency, line phase, field geometry and interlace/non-interlace commands.

Composite video to provide sync pulses passes to IC2 via the still-display module. This is used to ensure that stable menus are displayed on the screen whether the deflection is synchronised or not. Without this module no-signal noise would disturb the line oscillator, the result being unstable/tilted menus. The circuitry on the module scans to check for noise in the sync part of the composite video signal. Strong noise brings a transistor switch into operation to short the module's output to chassis. As a result the line oscillator runs freely but stably.

The set is designed to operate with either interlaced or non-interlaced field deflection. In the non-interlaced mode, lines from odd and even fields are superimposed. This mode is used for static displays such as teletext. A 4013 D-type bistable chip is used to adjust the field sync for the two modes. Switching between them is automatic but can also be manually controlled via the 1000 handset by using "shift, 7". This could be convenient when, for example, using the set as a computer monitor.

On-screen Menus

On-screen displays are used in both the viewing and service modes. We can't deal with viewer operation of the set in any depth here – that would call for an article three times the length of this one! In addition to on-screen

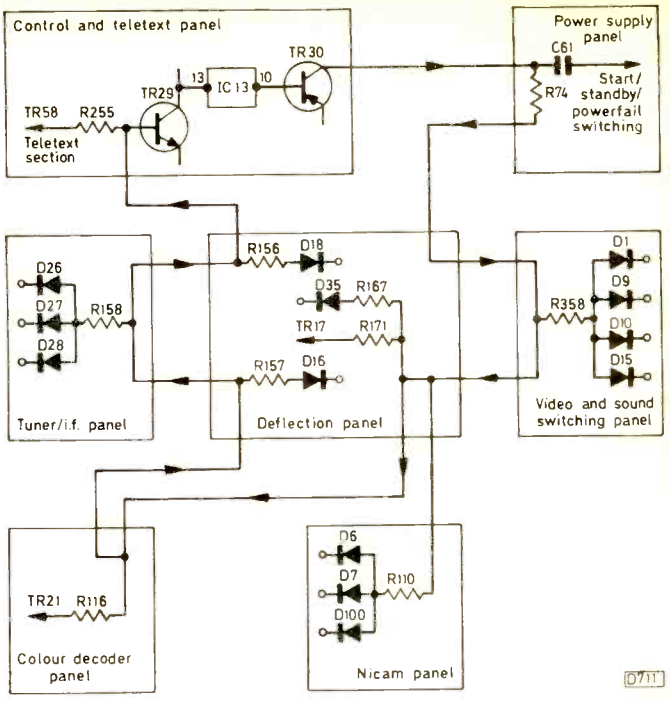

Fig. 2: The Powerfail loop.

indicators for all level settings, both audio and video, the "shift, text" command brings up a system map which, in block diagram form, illustrates the TV set and the units connected to its various sockets. This screen also allows the set to be switched to respond to timer commands from the auxiliary socket, thus obviating the need for a "link" transceiver in the TV room in a link system. The set can produce this display from data fed via pin 8 of the scart interconnecting leads.

The exact shift-text command depends on the mode in which the receiver is working – "TV, shift, text" in the TV mode, "text, shift, text" in the teletext mode and "Vtape, shift, text" in the video mode. The set knows when a VX-type VCR is connected to the auxiliary two scart socket: it displays "VTAPE1 on AUX2". As it also knows that it has a scart input and that a decoder could therefore be connected the display adds a + symbol to illustrate this possibility.

"Shift, text" from the teletext mode allows teletext programming of a VX5000 VCR if one is connected.

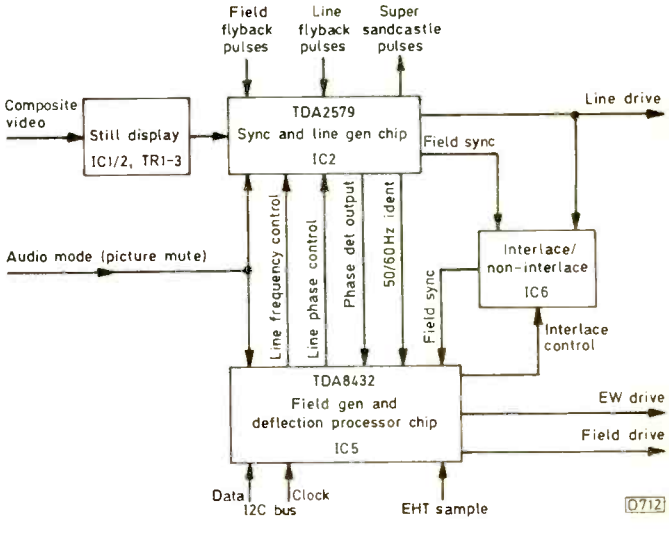

Fig. 3: Block diagram of the timebase generator section.

"Shift, text" in the video mode brings up the main video menu when a VX5000 is connected. Don't confuse the uses of "shift, text" between modes.

Service Mode

To enter the service mode, bring the set on from standby with the service link shorted out. Open the link when the set comes on. The link consists of a two-pin plug whose pins can be squeezed together easily with the fingers: it's plug P48 on the AV socket module. The first menu that appears in the service mode is "type serial no.", i.e. the set's type and serial number. This information is obtained from the system control memory. As a result, if a memory chip is faulty the panel has to be returned to B and O in order to maintain the electronic tagging.

The next two menus, "picture set-up" and "geometry", will probably be the most frequently used ones. The procedure is as with all B and O menus. Use "FFW" and "REW" to select the option, which will turn red to highlight the cursor position, then press "play". With the alignment menus, when an adjustment is selected from the list the menu, except for the adjustment and its value, disappears from the screen.

The "TV variant" menu tells you the set's standard/system. You can alter the display but not the set's capabilities.

The next menu is "error message". This indicates the reason for failure, e.g. powerfail or an I2C bus device failure. In this latter case there are error codes as follows:

02 = production computer
22 = text generator (6IC8) fault
40 = nicam port expander (8IC3) fault
42 = picture DAC (2IC5) fault
80 = audio control (5IC1) fault
84 = A2 stereo decoder (1IC7) fault
8C = deflection processor (10IC5) fault
C0 = citac chip (1IC4) fault
44 = PIP input selector 12IC10 fault
2E = PIP output control chip 12IC9 fault.

When the fault has been dealt with the error display must be cleared. Otherwise if a new fault occurs it won't be registered. "Error clear" is an option on this menu.

A final menu, obtained by selecting "TV, shift, text, 0, 0, play", provides mainly production data. There is one useful piece of information here however, the EPROM software version.

Features and Options

The text decoder is a FLOF type employing three i.c.s. It has three modes of operation. Pressing "text" gives access to four stored pages, MEM1-4, which are selected with the step keys. Pressing "text" a second time selects fastext, keys 1-4 acting for the four colours. From text, selecting "goto" gives traditional text operation by page number. There's an option to record text with vision, for example when subtitles are used.

An integral satellite TV receiver, the LM SAT, can be fitted inside the cabinet. It's an incredibly small module that fits at the bottom, to the right of the main chassis. The Beolink 1000 handset will control it without modification, as it does the LX and RX satellite TV receiver units.

A nicam decoder can be fitted. The same circuit is used as in the VX5000 VCR and the 77XX series chassis. It can be demuted by putting a high on pin 20 of 8IC2. The circuit mutes when one in a hundred parity bits is missing. It will demute only when fewer than one in four hundred parity bits is missing.

Power Link Sockets

A couple of 8-pin DIN sockets, Power Link 1 and Power Link 2, enable the set to be connected to B and O's active speakers with displays.

Stands and Brackets

There's a comprehensive range of stands and brackets. It includes motorised swivel stands and bases, the latter for shelf mounting. You turn the set by selecting "picture" then using the left and right "step" keys as required. Switching to standby returns the stand to the centre parallel position. When the set is switched on from standby the stand automatically moves to a preset viewing position. This preset position is stored by moving the stand to the required position then selecting "picture, store, store". Ensure that all picture parameters have been preset to the required levels first.

Miscellaneous Points

Finally, some miscellaneous points. The line shift control is a three-position switch on the c.r.t. base panel. UK sets have the A2 stereo decoder. If a software upgrade is required, 6IC5 will have to be replaced. The S-VHS socket is selected by "shift, 9" on the system map menu. Picture-in-picture is an option. Note that several electrolytic capacitors are drawn the wrong way round in the circuit diagram – they're connected to negative supply lines.

Servicing Notes

Failure of the chopper transistor TR1 (see Fig. 1) has been a problem with a few sets. Fit only a replacement obtained from B and O, with a dab of white paint on it. When TR1 fails the mains fuse blows. The cause can be the transistor itself or incorrect triggering due to transients on the mains supply. If you are unfortunate you may find that the fault has resulted in destruction of the print between the chopper and the pre/driver transistors and damage to these transistors. A modification has been introduced in the control circuit, as follows: remove R63; disconnect the track to the base of TR23 as close as possible to the transistor; fit R63 (18kΩ part no. 5011344) on the copper side of the panel, from the base of TR23 to the side of R47 that faces link J35. This modification is incorporated in all sets that have serial numbers above 08676072.

Intermittent sound muting when the picture is at predominantly black level can occur with early software. Upgrade to 2·1 software, part no. 8341713. This fault seems to have occurred in particular with sets that incorporate a satellite TV tuner.

On the satellite TV side there's an option to fit a "positioner" to drive a motorised dish. Apparently there have been problems with certain positioner motors in cold weather, when the current has been too high. There is now a modified "piggyback" transformer for the module.

Acknowledgement

My thanks to B and O's Hans Rackman who has been running some excellent courses on this chassis at Gloucester.

Fifty Years in Radio and TV

Part 9

Harold Peters

Television receiver manufacture, retailing and servicing have, over the last half century, fully stretched just about everyone who got involved. I was no exception. So I was worried by the prospect of suddenly stopping at retirement. Too many of my colleagues had failed to survive the transition. Fortunately I was allowed to do so gradually, with first a four-day week then just three. This helped a lot. Nevertheless all sorts of thoughts pass through your mind during the final year, mainly because at last you have time to reflect. You appreciate how the character of the business has changed over the years, and how the complexity and greater reliability of modern equipment have turned servicing into work for specialists. Broadcasting has ceased to be run by a band of dedicated enthusiasts, becoming managed and cost-effective. TV itself has come to be taken for granted. There are not many left in the trade who can recall when there was no TV at all.

I began to feel that there was not a lot left to write about. It seemed that the days when you could knock up a little service aid, write it up for the magazine and have it avidly accepted had gone. But had they? The last twelve months of active service turned up some surprises. In fact the year was to prove as eventful as the previous fifty. It got off to a shaky start for me. I must have tried to pack the work of five into my three working days: but the thyroid couldn't take it and I had a job to hold a screwdriver still. Just as I was beginning to feel sorry for myself I read one of Les's columns and discovered that Tiny Tim was suffering too. At least my problem was as easily controlled as with a.g.c., by adjusting my pituitary "feedback circuit". I bought an electric screwdriver to help until my hand steadied down, and carried on.

One night, on the way home, I installed a package deal consisting of a VCR and a teletext TV set. The daughter of the house let me in, and when I'd completed the installation I showed her in detail how the combination worked. Then her parents turned up and explained that she was totally deaf, though by lip reading she'd understood everything I'd said. The VCR was to be used to record her favourite programmes for weekend viewing when she got back from residential school. "Pity the subtitles don't come out on the tape" they said. This bothered me and I spent some time on the problem, the outcome being a small one-transistor mixer panel to add behind the TV set's scart output and an article on *Recording Teletext Subtitles* that you may have read.

Satellite TV

Then there was the Wembley Satellite Exhibition. 1988 saw the emergence of pro-Astra and pro-BSB groups, the latter further dividing into the D-MAC and D2-MAC camps. It needed two articles to straighten that out, one to recap on the mess that space TV had got itself into and the other to try to explain in a simple manner the "conditional access" aspect of MAC broadcasting. Writing this latter article decidedly worried me. I couldn't see any of our customers putting up with the rigmarole of conditional access. Then Rupert Murdoch dropped his bombshell by announcing that his four Astra channels would be clear, mostly free and all in PAL.

At the time I felt that the Murdoch approach was the right one, since viewers have always been reluctant to pay any more for TV than the original asking price for the set. It's strange that since the late Forties the price of a monochrome set has remained at around £70, and that the price of a basic, medium-sized colour set has remained at around £300 for the last twenty-one years. I can think of no other item that's defied inflation in this way. People just don't want to pay more. As if to strengthen this belief of mine, the original Norwich cable system pulled the plug at about the same time "on economic grounds". Satellite TV could not be ignored however, and we maintained a team to cope with the existing and hoped-for future demand.

Changes

By now VCRs had reached the stage where a basic model preselected four programmes, had remote control and one-touch recording. Because no two were alike, and many of the instruction manuals arrived from the Far East via Scandinavia, suffering from double translations, we had to produce our own abridged instructions. TV sets were, to a lesser extent, also becoming harder to tune in, different models using different digital arrangements, and to make matters worse they tended to have black buttons on a black surround beneath the screen. To use them you had to get so close to the c.r.t. that the picture dazzled you and you pressed the wrong ones. There were two big clangers: Computer Controlled Teletext, which was neither wanted nor understood, and the Flat Square Tube, which only Sony had really mastered and had to be run at reduced drive to prevent high beam currents damaging the shadowmask. Tubeless TV sets with liquid-crystal displays came along, in small screen sizes, and performed with varying degrees of indifference. The last valve in the set, the c.r.t., was going to take some shifting despite the fact that CCD sensors had taken over from tubes in camcorders.

Viewing habits were changing. The soap operas that used to fill the gaps between prime-time programmes started to lead the ratings. Subsequently *Crossroads* was killed off, and ITV started to stay on all night. Repeats were the order of the day, with oldies like *Steptoe* and *Faulty Towers* still head and shoulders above 1988's output. Even the 405-line *Face to Face* and *Hancock* recordings held up well against the latest offerings.

Retirement

My reflections were making me feel sorry for the gang I was about to leave. I was dreading the arrival of my last day at work. Traditionally it has been an excuse to have a do, but in my case a guardian angel did its stuff. Our senior lady clerk, one of the longest serving members, was to retire a few weeks before me, so Roy gave us a combined "night to remember" while I still had seven weeks to go. This cushioned the impact that the last day can have on someone who has enjoyed his work. But when the last day comes you still have to clear your bench and do the rounds, shaking hands. Again the guardian angel took a hand: there was an almighty thunderstorm that flooded our four phone lines with service calls. It happened to be finals at

Wimbledon. I was in the way and cadged a lift home in one of our service cars that was going to a call out.

They say that you feel dreadfully aimless and depressed on the first Monday of your retirement, but it didn't happen that way. There was plenty to do around the house, and I had this to write. Then I drew my pension and for the first time in fifty years the contribution flowed in the reverse direction! It was high summer, and the dog needed a walk.

It was not until several months later that I felt the door had finally clang shut behind me. I had gone back to the "old firm" and saw a different world. The lads were struggling with surface-mounted components, Astra was up and running and, in the magazine, Les was reporting difficulty in finding a buyer for his business. Pye colleagues who had gone to Croydon found themselves faced with a second factory closure.

Then down came the Berlin Wall and the Germans dropped MAC like a hot brick, spreading PAL into eastern Europe instead. Not the best time to launch BSB, but they went ahead. During the BSB trial period Granada wired up the Lancashire village of Waddington for multi-channel TV. The conclusions drawn from this six-week experiment were that although the technology was wonderful it was the entertainment that counted most. It was ever thus: colour took off only when duplication gave us *Coronation Street* etc. in colour, and it was entertainment software that floated VHS to the top.

It's now 1991 and history is being made faster than the pen can write. The Broadcasting Act, more inept even than Pilkington, disbanded the IBA and paved the way for sponsorship and takeovers. Deregulation goes ahead despite it being the cause of the collapse of decent TV in Australia and New Zealand. You would think that manufacturers, bitten by the BSB affair, would think twice about putting dubious innovations into production, yet five contenders offer different ways of doing home digital recording. As Ruskin said, "change is certain, progress is not".

It's not all gloom however. The old firm still needs as many engineers, though they tend to specialise, and youngsters still come into the business. How on earth do they begin, when there is so much more to learn? When I started in the Thirties you had to master only three golden rules to be set for life: I = E/R nine times out of ten; no man can solder without flux; and what goes up must come down. Come to think of it, in the shed in the garden they still apply to this very day.

Electronic Stethoscope Testing

P.J. Ratcliffe

Diagnosing the cause of intermittent faults can be a very time-consuming process. The empirical trial and error method of resoldering dry-joints and testing connectors depends on a certain degree of luck. Often it's successful. Those of us who firmly believe in there being a specific physical cause for all faults should however be able to arrive at a definite diagnosis, i.e. track down the cause to a particular item by testing. Doing this can involve the use of a mixture of tests and equipment. Jobs differ considerably: to illustrate the technique described here we'll take a particular example.

A 16in. Grundig Super Color Model 1510GB came in with a line timebase fault. After the smoking rectifier had been replaced we ran the set for two hours, during which it worked perfectly. On switching on from cold the next day however the line sync and colour had gone, producing a scrambled, jittery picture. Opening the set and adjusting the line hold control restored correct operation and the set was then given a further twelve-hour test run. The following day the same problems reappeared. We opened up again and flexed the line oscillator module, which is mounted on an edge connector. Picture lock was restored when this module was wiggled.

A check was then made on the voltages at the connector pins. We found that the voltage at pin 13 differed with the two conditions. It was 1·1V when operation was correct and zero when the fault was present. To start with we suspected the physical condition of the connector, so this was cleaned and tightened. Unfortunately the fault was still present.

We removed the module and traced the connections across the board, looking for obvious dry-joints and checking the values of resistors as we proceeded. When the module was replaced the fault was still there.

Our next suspicion was that a component was noisy. Our difficulties related to the intermittent nature of the fault and the fact that the digital multimeter didn't respond fast enough when we clipped the leads to a component then flexed it slightly. Overcoming this problem called for ingenuity, so out of sheer determination to find the exact cause of the fault I used an audio amplifier and headphones, with a d.c. bias at the input (a 1kΩ resistor as used with electret microphones), clipping test leads to the components in the paths where the fault lay.

One component, R408 (3·3MΩ), was found to be very noisy when the board was flexed. When it was unsoldered and tested the noise was much less. We fitted a replacement however and tried again. The fault persisted. The only other thing left was the associated printed track. When the board was flexed towards the copper clad side the fault disappeared. If the penny had dropped I'd have realised at the start that the copper track was suspect.

Close inspection didn't reveal the slightest break. When the noise amplifier was connected to two points on the copper track associated with R408 and the output node however the noise crackle as the board was flexed was obvious. The input voltage rose from 0V to 2·5V.

The conclusion we reached was that a hairline fracture was present in the printed circuit track routed near a rectangular hole in the board, where the vertical plastic retaining clip passes through. Having located the cause of the fault by using this "electronic stethoscope" technique we were able to use the digital meter to measure the fault precisely. The resistance varied from 0·3Ω to 100Ω when cold, changing to a complete open-circuit as the board was flexed. A piece of wire soldered in parallel across the length of the faulty track cured the problem.

When using this technique for fault finding with microprocessor circuitry I use a low-voltage amplifier, with a low sensor current, to avoid possible damage to CMOS devices. With an intermittent fault the machine code generally crashes. Since the electronic stethoscope is so useful, the next problem is to include the amplifier facility within the digital multimeter (or vice versa) and fit a headphone socket, thus minimising the number of items of test equipment required.

What a Life!

Donald Bullock

I got up bright and breezy the other day, ready for all the work likely to come my way. "First of all" I said to Greeneyes "I'm nipping down to my chalet to type a letter, then I'm going into the workshop. Tread warily if you're in that direction. The sets will be flying out so fast you could be in danger."

I typed the letter on my Amstrad PCW9526, but when I tried to print it the cog and belt arrangement that moves the head across the page faltered and shuddered loudly as the printer initiated. This went on for twenty seconds or so then the printer appeared to work normally, except that the paper remained blank. The striker thing that clouts the letters didn't seem to be coming to them far enough. Faint printing became visible as the letter progressed, but it was garbled. By the end of the letter the printing was better and made sense. I tried printing it again immediately. This time it was better but still not right. It took four attempts before the result was satisfactory.

One of my customers nearby has an identical machine. So to prove that the fault was in the printer I tried with his. It was.

I returned in time for the arrival of Quiet Norman Glutton. He was carrying an Hinari CT16 colour portable. Now Norman's a short squat man with a passion for eating. When I'd taken the Hinari from him he pulled out a large pork pie and a penknife and set about it. By the time he'd finished it I was into his set and he quietly departed.

The set had a raster but wouldn't tune, neither did the volume control work. I looked at the manufacturer's circuit diagram, which is nicely laid out, and saw that the control arrangements are centred around the M50433B-501S microcomputer chip IC101 and the associated M58658P EAROM chip IC102. A small MN1280M5 chip IC103 appears to provide a reset action for IC101. A quick check on IC103 revealed that it was short-circuit. So was D110 at its input. Before replacing these items I checked the 2SC1815 5V regulator transistor Q656. Just as well, for it too had expired. When I'd replaced these items I connected a meter to IC103's output pin and switched on. The voltage was only 2·3V instead of 5V. This pin is connected to pin 11 of IC101 via a filter circuit. As the filter components were o.k., IC101 was indicted. A new one restored the set's tuning ability but its memory, like mine, was impaired. This directed me to the memory chip IC102. As there's no voltage table for this one the only thing I could do was to fit a replacement. This cured the memory problem and the set produced an excellent, crisp picture.

In spite of their cheap price and their initial strangeness, to me anyway, I've come to like these little 10in. sets and have managed to repair all the ones that have come my way – which is quite a lot. The picture quality is impressive.

In the fullness of time Quiet Norman returned to collect his set.

"Hi, Norman. How are you?" I greeted him.

"Hungry Don" he replied, and out came his knife and a steak and kidney pie.

An Unknown Grundig

The next job in the workshop was a Grundig v.h.f./u.h.f. monochrome portable. It was dead, except that the tube's heater was alight. I'd never seen one of these sets before and didn't have a circuit diagram. The obvious thing to do was to check the h.t. voltage. As this seemed to be healthy I moved on to the line output stage. The line output transistor was o.k. so I got my Hameg HM203-6 scope with component tester, a handy device once you get used to the shapes it conjures up, and checked the diodes in the line output stage. It soon sniffed out a short-circuit diode (D384). After fitting a replacement I switched on and waited expectantly for a raster to appear. But it didn't.

I was in danger of running out of steam now, and peered around the panel searching for ideas. Standing erect in the centre of the panel there was what looked like a coiled spring wearing a ferrite bead collar. I wondered what it was doing. There was a trace of solder at its top and, looking more closely, I saw that there was a pitted blob of solder on top of the nearby transistor TR382. This transistor looked like a BD238, with a metal back that projected above it. The pitted blob matched the solder on the spring, so I re-united the two. The set sprang to life and behaved itself on soak test. Another success.

The Amstrad Printer

I decided to have a go at my PCW9512 word processor printer, and assembled it all together on the bench. After setting it printing I watched it drub and falter away for twenty seconds before it started to print, apparently normally, though nothing appeared on the paper. When I directed hot air from a hairdryer on to the printing head mechanism it started, within half a minute, to print properly. I turned off the heat and the printing grew fainter. After a few lines it disappeared.

I thought that perhaps a mechanical coupling had loosened, or the mechanism was dry and stiff. So I carefully opened it up, examined it for anything obvious and gave the mechanism a good squirt with Servisol switch cleaner. Then I reassembled it and tried again. It was no better, and when I tried it again later I found that it would no longer accept a sheet of paper. When I used the keyboard to ask it to print, a message on the screen declared that the printer was active – a severe overstatement! Willow Vale tell me that Amstrad no longer offers any service backup on these machines. So it looks as if I'm stumped. Any ideas anyone?

Mrs Squirter's Toshiba

Then Mrs Squinter called with another portable, this time a 14in. Toshiba 145R7B.

"Hello Mr. Butcher" she cried, giving me a wink. "I wish you hadn't gone to Spain the other week. We upset some water into this set whilst you were there and took it to Snoddies. They fitted a new tube base panel or something. It works, but it's nothing like as good as it was. We've taken it back twice, but they say it's all right."

The picture wasn't very special. Rather as though the tube was a bit low – on the dull and bleary side. I took the back off and sure enough the tube's base panel had been replaced. I made for the first anode supply potentiometer on the line output transformer and saw that it had been adjusted. I turned it up even higher to increase the brightness, and since the picture lacked bite I adjusted the focus control too. To my surprise it changed the brightness rather than the focusing, so I turned the set off and felt the line output transformer to see if it had a temperature. It hadn't.

As I'd varied the focus control setting I decided to check

the focus voltage and was astonished to find that there wasn't any at any setting of the control. I then studied the tube base panel and noticed that its earth print was connected to chassis via a colourful thick green wire. Further investigation showed that the black focus wire from the line output transformer had been soldered to the earth print on the tube base and that the focus electrode wasn't connected to anything. When the focus lead had been connected to the focus electrode the picture was transformed into a good one. Setting up the first anode and focus voltages correctly made it exceptionally good.

Thinking about it afterwards I was surprised that the set had tolerated the fault so well. The line output transformer and the focus circuit had been loaded down but the focus, while not excellent, was nothing like as bad as I would have expected. Mrs Squinter was delighted.

A Ferguson TX10

So delighted that she recommended me to her neighbour, who called in later with a 26in. Baird "StereoText" set. I couldn't see a model number but the chassis was obviously the Ferguson TX10. The problem was that the set would come on, shut down several times then refuse to work for ten minutes, after which the performance would be repeated.

I've had two or three of these sets in with such symptoms and have in each case found that the 12V regulator chip IC621 at the top right edge of the rear fold-down signals panel was visibly footloose. So I headed straight for it. But a rigorous inspection with my giant magnifying glass convinced me that the joints were perfectly sound.

Still driven by suspicion and prejudice I next pulled out the main chassis and studied the joints around the line output transformer. As they too were good I headed for the power supply circuit on the other side. A very careful examination failed to reveal anything amiss, so I resorted to conventional fault tracing, something I should always but seldom do. There it is: a confession!

It was a slow job, with the set coming on and going off at the rate it did, but my tests gradually took me back to IC621 on the signals panel. Here my meter told me in no uncertain manner that I'd reached the faulty stage. After remaking the joints the trouble had been cured. I'd spent well over an hour to wind up where I'd started.

Later TX9 Chassis

The 16in. portable that was next in line was fitted with the Ferguson TX9 chassis. But it was one that was new to me, the version with the chopper power supply (PC1044 main panel). It was dead, giving merely a brief chirp at switch-on. Having checked the mains input I decided to check for 335V across the bridge rectifier's reservoir capacitor C140. This was present and correct, as was the start-up supply at pin 9 of the TDA4600 chopper control chip IC57. I next checked the power supply's outputs at PL17. The 115V h.t. was present at pin 2, but the 18V supply at pin 4 was down to just 1·5V.

The 18V rectifier circuit is simple, consisting of a rectifier diode, a reservoir capacitor and an anti-radiation choke, L103. It was the tiny choke that proved to be the stumbling block. I removed it carefully, cleaned and retinned it, then refitted it. This provided a complete cure. Why was the set dead? Well the 12V supply for the timebase generator chip and other parts of the circuitry is obtained from a regulator that takes its feed from the 18V line.

ECONOMIC DEVICES PO BOX 15, WOLVERHAMPTON, WV2 4AZ

1580H	3.72
1585R	3.72
17052	4.50
17053	5.61
17074	9.30
17089	3.45
17127	2.50
17376	1.58
1N4001	0.04
1N4002	0.06
1N4003	0.06
1N4004	0.05
1N4005	0.05
1N4006	0.08
1N4007	0.06
1N4148	0.03
1N4448	0.05
1N5401	0.11
1N5402	0.13
1N5403	0.18
1N5404	0.10
1N5408	0.16
1N914	0.04
1S555	0.18
1S44	0.10
1S921	0.10
2N2219A	0.29
2N3053	0.35
2N3054	0.99
2N3055	0.75
2N3442	1.16
2N3702	0.10
2N3703	0.18
2N3705	0.15
2N3706	0.14
2N3707	0.16
2N3711	0.11
2N3771	1.55
2N3772	1.55
2N3773	1.61
2N3819	0.40
2N3823	1.17
2N3904	0.50
2N4101	1.33
2N4240	2.68
2N4444	1.66
2N4905	9.99
2N5293	0.50
2N5294	0.50
2N5296	0.55
2N5297	0.50
2N5298	0.61
2N6109	1.58
2N6130	0.85
2N6133	1.25
2N6292	0.60
2SA220A	0.65
2SA1208	0.26
2SA769	0.99
2SA771	0.75
2SA968	2.44
2SA1006	1.50
2SA1011	0.99
2SA1015	0.20
2SA1020Y	0.36
2SA1027R	0.39
2SA473	0.54
2SA766S	4.95
2SC1173Y	1.25
2SC1474	1.25
2SC1509	1.35
2SA1095	3.45
2SA1103	5.74
2SA329	0.40
2SA489	1.17
2SA490	1.32
2SA493	2.25
2SA562	0.57
2SA564	0.97
2SA614	4.88
2SA628	0.37
2SA639S	0.76
2SA659	0.49
2SA673	0.28
2SA684	0.97
2SA697	0.80
2SA699	1.25
2SA748	1.95
2SA835	2.50
2SA836	0.49
2SA844	0.65
2SA872	0.99
2SA884	2.15
2SA937R	0.97
2SA940	2.23
2SA950	0.50
2SA951	1.75
2SA966-Y	0.85
2SA999	0.75
2SB186	0.40
2SB688	2.10
2SB774	0.44
2SB185	1.13
2SB400	0.40
2SB405	1.03
2SB511	0.99
2SB54	1.39
2SB546	0.74
2SB56	2.80
2SB618A	5.82
2SB631	2.00
2SB643	0.58
2SB681	3.96
2SB695	3.43
2SB774	0.65
2SB819	0.60
2SC1089	1.45
2SC1101	3.22
2SC1128	0.66
2SC1307	5.06
2SC1449	0.50
2SC1941	0.56
2SC558	3.69
2SC1096	0.47
2SC1114	3.25
2SC1116	4.95
2SC1129	1.65
2SC1131	0.72
2SC1158	3.33
2SC1162	0.55
2SC1172	2.22
2SC1195	6.09
2SC1213	0.30
2SC1226	1.46
2SC1306	1.98
2SC1317	0.50
2SC1364	0.49
2SC1383	1.20
2SC1391	2.45
2SC1398	0.41
2SC1413A	2.27
2SC1447	2.07
2SC1475	0.60
2SC1505	1.00
2SC1514	1.76
2SC1573Q	1.10

2SC1583	0.34
2SC1617	3.89
2SC1678	1.98
2SC1741	0.21
2SC1810	1.75
2SC1815	0.20
2SC1826	0.69
2SC1829	3.35
2SC1875	4.50
2SC1893	3.85
2SC1921	1.37
2SC1923	0.30
2SC1929	2.35
2SC1942	2.17
2SC1959	0.20
2SC1957	0.95
2SC1953	1.93
2SC1962	1.93
2SC1969	1.79
2SC1983	1.32
2SC1985	0.60
2SC2009	0.34
2SC2029	1.15
2SC2028	2.11
2SC2063	0.99
2SC2078	1.10
2SC2073	2.73
2SC2085	1.65
2SC2091	1.30
2SC2141	1.30
2SC2166	0.87
2SC2216	0.69
2SC2233	1.20
2SC2236	1.69
2SC2278	1.14
2SC2314	0.87
2SC2335+Kit	7.00
2SC2551	0.29
2SC2565	4.65
2SC2570	0.46
2SC2577	1.34
2SC2578	6.75
2SC2671	0.91
2SC288A	1.85
2SC3153	3.20
2SC372	1.40
2SC373	1.16
2SC383	1.33
2SC388	0.45
2SC394V	0.81
2SC403C	0.60
2SC458	0.19
2SC495	0.92
2SC515A	1.85
2SC536	0.13
2SC537	0.54
2SC605L	1.16
2SC620	1.46
2SC643A	1.54
2SC668	0.67
2SC681	4.40
2SC682	1.88
2SC684	1.65
2SC693	0.63
2SC710	1.15
2SC711A	0.25
2SC717	1.28
2SC734	0.20
2SC783	3.98
2SC790Y	3.65
2SC828	0.28
2SC867A	4.54
2SC876	0.96
2SC930	0.54
2SC935	1.15
2SC940	4.68
2SD299	9.47
2SD355	0.64
2SD467	0.55
2SD869	3.75
2SD1128	0.94
2SD1138	0.95
2SD1273	1.48
2SD1453	1.50
2SD152K	2.64
2SD198	3.87
2SD234	0.47
2SD235	0.60
2SD24	2.29
2SD257	1.98
2SD313	0.55
2SD325D	2.26
2SD350	2.35
2SD401	1.40
2SD414	1.98
2SD471	2.13
2SD560	1.50
2SD600	2.98
2SD601R	0.65
2SD613	0.74
2SD636	0.20
2SD639-R	0.34
2SD655	0.98
2SD657	2.80
2SD661A	0.80
2SD731	1.95
2SD773	0.60
2SD811	6.84
2SD837	0.90
2SD841	1.37
2SD856	0.69
2SD857Q	1.84
2SD882	0.35
2SD894	1.75
2SD898	2.88
2SK105H	2.15
7805-T022	0.63
7808	0.45
7812-T022	0.35
7815	0.64
7905	0.80
AD140	1.06
AD143	1.93
AD145	1.60
AD161	0.84
AD162	0.84
AF114	2.47
AF115	5.94
AF118	1.20
AF127	0.57
AF139	0.40
AF178	1.45
AF179	0.36
AF180	0.55
AF181	0.53
AF186	1.32
AF239	0.53
AF279	0.88
AN115	3.98
AN155	1.89
AN206	2.58
AN208	3.55
AN210	1.56
AN211	3.25

AN214Q	2.40
AN235	4.65
AN236	3.33
AN240P	0.99
AN241	1.71
AN245	5.48
AN253	1.80
AN260	3.85
AN272	7.92
AN295	7.63
AN301	2.45
AN302	3.99
AN305	8.88
AN315	2.46
AN316	4.95
AN318	7.16
AN320	5.47
AN321	2.25
AN322	7.62
AN337	5.37
AN340P	1.53
AN355	1.65
AN362	1.50
AN370	3.95
AN5111	3.43
AN5120N	4.50
AN5132	5.08
AN5250	5.04
AN5256	4.40
AN5612	2.20
AN5613	4.20
AN5630	3.95
AN5701N	1.66
AN6250	1.75
AN6300	4.40
AN6310	4.54
AN6340	5.62
AN6341	2.22
AN6363	16.00
AN6531	1.95
AN6551	0.69
AN6552	0.68
AN6610	1.18
AN7111	1.14
AN7115	2.52
AN7145	2.17
AN7146	9.90
AN7151	2.37
AN7156	2.70
AN7158	2.67
AN7218	0.80
AN7223	4.99
AU107	7.72
AU110	5.69
AU113	14.63
AY106	2.80
BA524	8.94
BA310	0.14
BA1310	1.50
BA1320	1.30
BA1322	3.95
BA1330	2.75
BA145	0.19
BA148	0.11
BA154	0.40
BA155	0.12
BA156	0.05
BA159	0.09
BA182	0.19
BA222	1.15
BA302	1.24
BA311	0.65
BA312	1.45
BA313	0.76
BA317	0.04
BA318	0.09
BA328	2.22
BA333	1.37
BA335	6.27
BA5102A	1.49
BA511	1.95
BA514	1.00
BA521	1.20
BA524	8.94
BA526	7.98
BA527	2.98
BA532	1.20
BA536	1.56
BA6209	1.27
BA656	1.51
BA7100	11.35
BA841A	9.27
BA843	3.96
BA854	5.76
BAV18	0.06
BAV19	0.24
BAV20	0.36
BAV21	0.10
BAW62	0.11
BAX12	0.49
BAX13	0.11
BAX18	0.94
BC107B	0.19
BC108B	0.15
BC109B	0.14
BC113	0.14
BC119	0.36
BC126	0.20
BC132	0.14
BC135	0.14
BC137	0.18
BC138	0.34
BC139	0.33
BC140	0.30
BC141	0.32
BC142	0.26
BC143	0.34
BC147	0.14
BC148B	0.13
BC148C	0.11
BC149B	0.13
BC153	0.14
BC154	0.14
BC159	0.16
BC160	0.40
BC161	0.28
BC168	0.36
BC169C	0.16
BC170	0.16
BC171	0.07
BC172B	0.27
BC173	0.17
BC174B	0.27
BC177	0.35
BC178	0.26
BC179	0.17
BC182	0.07
BC182LB	0.14
BC183LB	0.09
BC184	0.09
BC184LB	0.13
BC186	0.25
BC187	0.28
BC204	0.35

BC207	0.19
BC212B	0.26
BC213L	0.10
BC214	0.10
BC225	0.40
BC237	0.10
BC238	0.10
BC238B	0.08
BC239B	0.25
BC251A	0.31
BC294	0.50
BC300	0.38
BC301	0.34
BC302	0.53
BC303	0.48
BC307A	0.13
BC308A	0.11
BC309	0.17
BC317A	0.13
BC327	0.09
BC328	0.11
BC337	0.09
BC338	0.12
BC368	0.17
BC440	0.69
BC441	0.39
BC454	0.36
BC460	0.42
BC461	0.47
BC462	0.51
BC463	0.30
BC478	0.32
BC479	0.41
BC532	0.28
BC546	0.08
BC547	0.10
BC548	0.28
BC549	0.10
BC550	0.19
BC556	0.13
BC557	0.08
BC558	0.10
BC559	0.10
BC560C	0.20
BC635	0.22
BC637	0.24
BC638	0.20
BC639	0.20
BC640	0.24
BCX34	0.55
BD115	0.36
BD116	0.70
BD124	1.31
BD131	0.42
BD132	0.42
BD133	0.53
BD135	0.36
BD136	0.36
BD137	0.41
BD138	0.28
BD139	0.23
BD140	0.35
BD144	1.43
BD150	0.75
BD157	0.67
BD160	1.60
BD163	0.71
BD166	0.69
BD175	0.28
BD179	0.30
BD181	0.99
BD182	0.99
BD183	0.99
BD184	1.21
BD187	0.80
BD189	0.65
BD190	0.55
BD201	0.41
BD202	0.60
BD203	0.46
BD204	0.45
BD207	1.73
BD222	0.52
BD225	0.46
BD228	0.63
BD229	0.80
BD231	0.50
BD232	0.49
BD234	0.39
BD237	0.36
BD238	0.28
BD239	0.45
BD240	0.57
BD241	0.39
BD242	0.37
BD243A	0.62
BD243C	0.49
BD244	0.42
BD244C	0.58
BD245	1.38
BD246	0.95
BD253	1.05
BD278A	0.70
BD317	1.40
BD318	2.72
BD375	0.42
BD380	0.39
BD410	0.33
BD433	0.39
BD434	0.37
BD435	0.49
BD436	1.14
BD437	0.29
BD438	0.52
BD441	0.69
BD442	0.50
BD509	1.64
BD510	1.08
BD519	0.78
BD529	0.93
BD530	0.94
BD533	0.67
BD534	0.52
BD535	0.38
BD536	0.50
BD537	0.50
BD538	0.67
BD544B	0.75
BD677	0.40
BD679	0.43
BD680	0.49
BD681	0.45
BD696	2.47
BD699	0.80
BD700	3.70
BD707	0.60
BD709	0.80
BD710	0.80
BD809	0.45
BD810	0.57
BD879	0.74
BD895	2.18
BD901	0.56
BD902	0.58
BDW83C	1.20
BDW84C	1.34
BDX32	1.65
BDX53A	0.45
BDX538	3.35

BDX54B	0.33
BDX63A	2.09
BDX63A	1.96
BDY20	1.98
BDY81	1.18
BF115	0.39
BF117	0.66
BF118	0.67
BF121	0.25
BF123	0.13
BF127	0.13
BF137	0.29
BF153	0.58
BF154	0.26
BF157	0.33
BF158	0.18
BF159	0.18
BF160	0.31
BF167	0.38
BF173	0.34
BF177	0.55
BF178	0.40
BF179	0.36
BF180	0.36
BF181	0.32
BF182	0.34
BF183	0.39
BF184	0.43
BF185	0.39
BF194	0.14
BF195	0.14
BF196	0.17
BF197	0.24
BF198	0.17
BF199	0.17
BF200	0.37
BF218	0.36
BF224	0.17
BF237	0.65
BF240	0.19
BF241	0.17
BF245	0.50
BF245B	0.49
BF246A	2.67
BF255	0.20
BF256	0.15
BF257	0.34
BF258	0.33
BF259	0.30
BF262	0.57
BF263	0.57
BF271	0.34
BF273	0.20
BF274	0.34
BF324	0.32
BF336	0.33
BF337	0.31
BF338	0.34
BF355	0.45
BF362	0.99
BF363	0.50
BF371	0.50
BF391	0.25
BF419	0.65
BF422	0.15
BF423	0.33
BF435	2.61
BF450	0.35
BF451	0.11
BF457	0.41
BF458	0.49
BF459	0.66
BF460	1.24
BF469	0.33
BF470	0.26
BF471	0.25
BF472	0.33
BF479	0.61
BF480	0.89
BF491	0.50
BF506	0.43
BF532	0.45
BF596	0.18
BF597	0.27
BF694	0.22
BF757	0.34
BF759	0.29
BF761	0.43
BF762	0.34
BF869	0.49
BF870	0.30
BF960	0.47
BF966	0.51
BF970	0.49
BFR39	0.63
BFR61	0.92
BFR62	0.50
BFR79	0.29
BFR81	0.29
BFR89	1.63
BFR90A	0.63
BFX29	0.34
BFX84	0.37
BFX85	0.31
BFX86	0.36
BFX87	0.55
BFX88	0.34
BFY50	0.30
BFY51	0.33
BFY90	1.16
BLY49	2.20
BR100	0.23
BR101	0.78
BR103	0.79
BR303	1.20
BRC84	2.08
BRX44	0.60
BRX45	0.81
BRX46	0.30
BRX49	0.56
BRY39	0.85
BRY44	0.34
BSS38	0.24
BSTB0140G	4.93
BSTC0246	6.99
BSTC0233	6.12
BSTC1233	4.34
BSTD1043	2.85
BSV57B	3.69
BSW68	0.60
BSX19	0.34
BSX20	1.12
BSY52	0.50
BT106	1.18
BT108	1.45
BT119	1.76
BT120	2.17
BT121	2.48
BT123	1.98
BT151-800R	1.07
BTT6018	1.36
BU106	2.48
BU110	2.57
BU111Y	4.16
BU124	1.48
BU125	2.48

BU126	1.10
BU204	1.58
BU205	1.15
BU206	1.27
BU207	1.65
BU208	1.12
BU208	2.35
BU208A	1.12
BU208D	2.06
BU209	1.75
BU226	2.55
BU326A	0.99
BU406	1.24
BU406D	1.24
BU407	0.54
BU412	5.29
BU426A	1.67
BU500	1.53
BU508A	1.50
BU536	1.53
BU608	1.54
BU705	2.67
BU806	0.98
BU807	0.55
BU826A	1.95
BUW84	0.68
BUX84	0.50
BUX85	0.69
BY126	0.13
BY127	0.09
BY133	0.15
BY164	0.64
BY176	0.93
BY179	0.85
BY182	1.05
BY187	0.79
BY189	1.76
BY198	1.62
BY207	0.17
BY208	1.86
BY210-400	0.18
BY210-600	0.35
BY210-800	0.19
BY223	1.68
BY224-600	4.95
BY226	0.15
BY227	0.20
BY228	0.60
BY229-600	1.28
BY229-800	0.90
BY255	0.11
BY295-600	1.23
BY298	0.20
BY299	0.20
BY407	0.90
BY409	1.49
BY448	1.40
BY713	1.12
BYW56	0.19
BYX55-600	0.19
BYX71-600	0.85
BYX71-350	0.88
BYY56	1.48
BZY93C30	1.65
C20	1.95
C106M	0.76
CA3046	1.55
CA3089	1.24
CA3090AQ	3.25
CA3094	1.72
CA3131EM	3.12
CD4001	0.19
CD4002	0.27
CD4008	1.35
CD4011	0.20
CD4012	0.24
CD4013	0.33
CD4016	0.25
CD4017	0.30
CD4020	0.75
CD4021	0.39
CD4023	0.28
CD4025	0.64
CD4028	0.84
CD4040B	0.45
CD4047	1.06
CD4049	0.24
CD4052	0.35
CD4066	0.29
CD4069	0.29
CD4070	0.24
CD4081	0.14
CD4093	0.40
CD4511	0.44
CD4528	0.52
CD4556	1.47
CRD2AM-8	1.70
CV12E	4.19
CX095D	3.14
CX104	8.77
CX108	5.52
CX109	7.20
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CX135	7.50
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CX139	11.83
CX157	5.52
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CX177	8.80
CX187	5.26
CX755	12.95
CX885A	6.85
E1222	0.40
E5024	0.28
E5386	0.25
GD243	5.03
GF758	1.07
HA11215	1.75
HA11211	2.53
HA11225	4.29
HA11229	2.15
HA11235	3.14
HA11244	2.97
HA1125	4.29
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HA1138	3.75
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HA1156	1.16
HA1160	5.77
HA1166X	6.73
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HA11703	3.45
HA11701	3.37
HA11710	3.45
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HA11716	6.10
HA11725	18.26
HA11725MP	16.00
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HA11781	21.15
HA1180	5.15

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HA1377	1.59
HA1388	1.87
HA1389R	2.05
HA1389	2.69
HA1392	2.22
HA1394	3.19
HA1397	2.75
HA1398	2.55
HA1406	2.07
HA1452	0.85
HA1457W	2.23
HD38702-A2	2.99
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HD38750A-7	8.53
HD38800A50	14.12
HD44801A05	14.07
HISH1010	14.60
HISH1002	9.50
HM6211	14.55
HM6231	12.30
HM6232	7.20
HM6251	5.69
HM7103	2.97
HM9032	4.00
HM9012	3.22
HT4207	11.99
HT4208	2.75
ICH281	1.20
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KC581C	7.92
KC582C	4.85
L200CV	1.27
LA1201	0.75
LA1210	1.56
LA1230	1.18
LA1231	3.04
LA1357N	3.06
LA1363	1.05
LA1364	3.02
LA1365J	0.70
LA1385	1.53
LA1387	3.18
LA3350	1.43
LA3361	1.00
LA3390	5.52
LA4032P	2.35
LA4100	1.25
LA4101	1.30
LA4102	0.75
LA4112	1.35
LA4125	2.25
LA4138	3.10
LA4140	0.70
LA4192	1.23
LA4220	1.25
LA4420	1.72
LA4422	1.28
LA4430	1.47
LA4440	1.99
LA4445	1.52
LA4460	1.50
LA4461	1.37
LA5112N	1.18
LA7020	13.86
LA7025	11.97
LA7027	10.92
LA7040	9.20
LA7042	4.05
LA7800	1.36
LA7801	3.21
LA7820	2.95
LB1274	1.90
LC7800	9.20
LD3120	1.13
LD3150	2.75
LM383	1.10
LM1017N	1.81
LM1877	1.88
LM2808	5.94
LM2877	7.45
LM324N	0.36
LM339N	0.43
LM340K	11.85
LM348N	2.15
LM380N	1.50
LM6402A093	10.15
LM6416	11.08
LM748	1.82
LM8360	3.87
LM8361	2.95
LR3419	9.37
LR3471	9.37
LU1141	7.27
LU52012	20.62
LU52011	14.95
LU03112	12.37
M21C	1.32
M23C	1.98
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M293	7.09
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M51203L	3.15
M51231P	1.68
M51301P	4.53
M51353P	6.93
M51381P	5.98
M51393AP	4.50
M51394P	14.50
M5142P	6.85
M5144P	8.25
M51515BL	2.75
M51516L	1.95
M51521L	1.50
M5192	3.13
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M5231L	1.05
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M54532P	1.45
M54544L	1.61
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MB3712	1.85
MB3713	1.69
MB3730	2.31
MB3731	2.48
MC13002	2.99
MC1310P	1.95
MC1327P	1.33

MC1330P	1.98
MC1350P	1.56
MC1351P	1.25
MC1352P	1.40
MC1357P	2.15
MC1358P	1.48
MC14493P	3.99
MC14497	7.10
MC14511BCP	1.10
MC1458P	5.18
MC15428BCP	2.15
MC1712	3.88
MC3340	1.40
MC5192	19.50
MC7724CP	3.49
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MCR220-7	1.25
ME0411	0.75
ME6002	0.26
ME6102	0.28
ME9002	0.45
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MEM4956	2.50
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MJE2955	0.84
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MJE340	0.49
MJE520	0.49
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ML926	3.45
MM5314N	8.99
MM5316N	3.50
MM5318N	3.11
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MM5841N	6.93
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MN1435VX	13.20
MN1455	14.04
MP1192	5.07
MP2794	4.00
MPC13355C	1.98
MPF256C	0.60
MPS6570	0.48
MPSA42	0.22
MPSA55	0.15
MPSA56	0.11
MPSA92	0.15
MPSU05	0.86
MPSU10	2.84
MPSU56	1.25
MPSU60	2.21
MR818	0.33
MR854	0.46
MR914	0.80
MRF477	24.77
MSM5840H	12.09
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NE542	2.75
NE555	0.35
NE556	0.65
NE565N	1.18
OA202	0.11
OA47	0.16
OA91	0.14
OA95	0.16
OC28	9.07
OC35	1.06
OC36	7.53
OC44	1.95
OC45	0.18
OC72	0.44
OC75	0.44
ON236	1.06
ON782	1.65
OT121	1.45
PT6042	3.58
PT8504	5.65
R1038	2.19
R1039	2.19
R2008B	1.33
R2009	1.98
R2010B	2.98
R2029	1.33
R2030	1.33
R2257	2.38
R2265	1.49
R2306	1.36
R2322	0.67
R2323	0.76
R2354A	0.60
R2354B	2.01
R2441	1.36
R2461	0.95
R2540	1.65
R2540X	3.30
R2615	0.67
RCA2060	2.00
RGP01-15	0.70
RGP10	0.27
RGP30M	0.29
RM11C	0.85
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S2055AF	3.75
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S2802	2.90
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S6080B	9.98
SA8063	15.55
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SAA1020	5.77
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SAA5012	5.50
SAA5020	5.78
SAA5030	6.33
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SAB3021	5.70
SAB3024	6.36
SAB3209	5.82
SAB3210	3.21
SAF1032P	4.27
SAF1039	1.95
SAS5010	8.39
SAS560S	1.91

SAS560T	5.42
SAS570T	5.42
SAS570S	1.95
SAS580	2.85
SAS6600	1.33
SAS660	2.97
SAS6700	1.33
SAS670	3.96
SAS6710	2.21
SBA750	1.61
SC84203	19.35
SDA2006	17.10
SDA2010	20.50
SDA21122	11.77
SG264A	9.25
SG613	12.37
SG629	8.27
SG6533	9.00
SI163HD	27.87
SKE2F1/04	1.25
SKE2G3/04	0.73
SKE4F1/06	0.30
SKE4F2/08	1.07
SKE4F2/06	0.85
SKE4F2/10	0.99
SKE5F3/10	1.36
SKE4G1/04	0.54
SKS1/10	2.15
SL1310	3.14
SL1430T	2.31
SL414	3.69
SL432A	3.44
SL439	2.48
SL471	4.45
SL480	7.24
SL490	2.37
SL901B	8.32
SL918A	9.07
SN16861AND	0.82
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SN7440N	0.27
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SN7474N	0.44
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SN74LS26N	1.45
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SN76110N	0.90
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SN76226DN	2.17
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SN76242	5.23
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SN76707N	1.23
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SN76730	5.54
SN76810N	0.60
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SP5422	1.83
STA401	2.75
STA441C	3.13
STA471C	8.70
STK0029	5.70
STK0039	5.25
STK0040	7.17
STK0050	11.96
STK011	5.08
STK014	12.25
STK031	12.95
STK040	13.34
STK054	9.35
STK058	27.50
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STK1039	5.75
STK2110	11.95
STK2145	13.77
STK2240	10.95
STK2250	18.95
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STR1096	4.78
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STR454	4.96
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STR6020	6.16
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T6049	1.45
T6052V	0.87
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T9013V	4.95
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T9017V	1.25
T9019V	1.00
T9034V	1.34
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TA7027	4.80
TA7050	1.74
TA7051	1.74
TA7054	2.55
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TA7061AP	1.27
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TA7072P	2.57
TA7074P	1.98
TA7076P	7.50
TA7089P	3.10
TA7092P	9.94
TA7093P	3.99
TA7108P	1.61
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TA7120P	0.64
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TA7124P	2.34
TA7129P	1.90
TA7130P	1.27
TA7136AP	1.89
TA7137P	1.21
TA7146P	5.18
TA7149P	3.26
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TA7207P	1.68
TA7208P	2.15
TA7210P	1.45
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TA7230P	1.35
TA7233P	1.98
TA7240AP	2.20
TA7245P	1.95
TA7310P	2.15
TA7313AP	0.60
TA7314	3.50
TA7323P	3.15
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TA7340P	5.95
TA7607AP	1.95
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TA7611AP	2.32
TA7616P	5.25
TA7622AP	8.94
TA7628P	1.73
TA7629P	2.51
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TAA550	0.39
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TAA970	2.83
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TBA520	1.20
TBA530	1.30
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TBA560C	1.40
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TBA673	2.60
TBA700	1.85
TBA720	4.32
TBA730	3.55
TBA750D	4.12
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TBA810P	0.98
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TBA820	0.66
TBA820M	0.82
TBA890	3.50
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TBA940	1.87
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TBA970	3.60
TBA990	1.98
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TCA650	3.05
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TCA750	2.25
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TV106	1.76
TY60108	2.97
ULN2204	8.50
UP1360C	2.30
UP1366	1.63
UPA81C	0.61
UPC1003	5.95
UPC1009C	6.32
UPC1025H	2.90
UPC1028H	2.00
UPC1032H	0.82
UPC1043C	4.29
UPC1156H	3.94
UPC1161C	4.68
UPC1182H	2.19
UPC1186H	1.05
UPC1181H	0.95
UPC1185H	1.50
UPC1188	2.99
UPC1212C	0.80
UPC1225H	2.82
UPC1230	1.88
UPC1238	1.52
UPC1278H	2.15
UPC1351C	1.81
UPC1350C	1.38
UPC1353	1.65
UPC1363	4.20
UPC1362	1.80
UPC1365C	1.65
UPC1360C	2.30
UPC1378H	1.75
UPC141C	4.95
UPC1458	1.85
UPC151C	2.95
UPC2002	1.48
UPC30C	2.51
UPC324C	4.70
UPC32C	4.94
UPC339C	2.95
UPC41C	2.99
UPC4558C	0.51
UPC474	5.11
UPC554C	1.85
UPC575C2	1.55
UPC580C	2.73
UPC587C2	1.34
UPC592H	2.15
UPC595	2.95
UPC596	1.98
UPD1514C	4.76
UPD2819C	4.98
UPD553-164	12.19
UPD8049C-1	11.50
XO022CE	5.75
XO029CE	7.09
XO031CE	6.38
XO035TA	6.60
XO040TA	5.52
XO042CE	3.19
XO043CE	2.75
XO055GE	5.02
XO057GE	6.00
XO065CE	6.35
XO074GE	17.14
XO077GE	14.60
XO079CE	4.95
XO092CE	10.31
XO096CE	6.60
XO109CE	13.61
XO113CE	10.31
XO195CE	9.60
XO204CE	11.96
XO261CE	8.98
2PY120	4.77

IF YOU DON'T SEE IT LISTED ASK FOR QUOTE. GIVE MAKE, MODEL, LOCATION. REMEMBER TO ADD £1.00 POST & HANDLING U.K. MAINLAND ONLY. HANDLING CHARGE TO ALL EXPORT ORDERS AT COST. ADD 17½% VAT TO TOTAL

TV Fault Finding

Reports from Philip Blundell, AMIEIE, Ed Rowland, Richard Flowerday, J.C. Priest, Stephen Leatherbarrow, Michael Dranfield, Steve Cannon, Roger Burchett and J.K. Carter

Philips K40 Chassis

When this set was switched on from cold there would sometimes be no picture or sound while the power supply would emit a squealing noise because the over-voltage crowbar was operating. If the line output stage was disconnected and a dummy load was substituted the voltages would be normal and the crowbar wouldn't operate. A weak arcing noise from the line output transformer could be heard when the fault occurred, and for a short time before the crowbar operated there would be interference to neighbouring TV sets. We suspected a flyback tuning fault, so the tuning capacitors were checked using a bridge. C2163 (9·1nF, 2kV) was found to be open-circuit.

If you have a similar problem with a 3A chassis set suspect the same cause. In this case however the relevant capacitor has a value of 8·2nF and a different circuit reference number. **P.B.**

Grundig CUC52 Chassis

This set was dead because the power supply relay didn't pull in, but instead of the usual standby display there was gibberish. The 29504-003-42 tuning module is used in this particular set, and the SC84203 was permanently in reset. C2358 (0·1μF) was leaky. **P.B.**

Ferguson TX99 Chassis

The customer complained that the picture usually disappeared shortly after switch-on, though the set would sometimes run all evening without trouble. We put the set on soak test but it ran all day without the fault showing up. Next day we switched on and within minutes the picture had disappeared, the sound continuing. Removal of the back cover while the fault was present showed that the c.r.t.'s heaters were out. This was due to dry-joints on the line output transformer: resoldering restored normal operation. **E.R.**

Philips 2A Chassis

When the set was first switched on there was intermittent squealing from the line timebase. It ceased once the set had been running for a few minutes. Resoldering the line output transformer pins provided a complete cure. **E.R.**

Ferguson TX10 Chassis

This set was dead with the line output transistor TR831 and the chopper transistor TR701 short-circuit and the d.c. fuse FS702 (1·25A) shattered. We assumed that the line output transistor had failed first taking the other items with it. So two new transistors and a new fuse were fitted and the set was switched on. Lovely. Up come the sound and raster, and apart from the tube being a bit low everything seemed to be o.k. We switched off in order to refit the chassis and rear cover, then switched on again. There was a quiet "phut" and the set went dead. This time the line output transistor was intact but the chopper transistor had shorted, blackening FS702. At this point we decided to examine the line output stage, looking for dry-joints. Sure enough, several of the output transformer's pins were found to be in need of attention. When we were satisfied that all was well in this area we fitted a new transistor and fuse and switched on once more. A bright flash from FS702 heralded the demise of the chopper transistor and despair began to set in.

There was only one thing to do, ring our old friend Jack who lives in Manchester. He spent quite a few years with the Thorn group and there's not a lot he doesn't know about Ferguson sets. When I told him of my problem he said "yes, you'll probably find that R724 has gone open-circuit – if so it's a pint you owe me". He was right. R724 was open-circuit and a replacement cured the fault. It's a 1·2kΩ resistor that provides a load at the drive output from the TDA2582 chopper control chip IC801. **E.R.**

ITT Digi-3 110 Chassis

The customer's complaint was that this set "kept going off, now dead". The line output transformer, a common problem with this and other ITT chassis, had been replaced by a field technician a month or so previously. When the set came into the workshop we found that the chopper transistor was short-circuit. This was replaced and the set was put on soak test. After a while the picture and sound disappeared and a loud humming noise came from the set. The new chopper transistor had failed. We eventually found that the culprit was C714, which decouples the start/run l.t. supply to the non-isolated section of the power supply. It was going open-circuit intermittently. **R.F.**

Ferguson ICC5 Chassis

This set would trip three items then shut down completely, as it's supposed to do under overload conditions. We disconnected the various supplies obtained from the line output transformer in an attempt to isolate the cause of the overload but had no luck. Replacing the transformer itself cured the fault. **R.F.**

TDA4600/4601 Power Supplies

If a chopper transistor in a set that uses a TDA4600 or TDA4601 chopper control chip has gone short-circuit always check the high-value resistor(s) connected to pin 4 of the chip. If this has gone high in value or open-circuit a replacement transistor will bite the dust immediately at switch on. Check the rectifier diodes and surge limiting resistors as well. They may have been damaged by the transistor. **R.F.**

Saisho CT206

If the set is dead with no channel LEDs lit and the fuses are o.k., check the 5V supply. The small transformer bolted to the side of the chassis has an internal thermal cutout which cannot be reset. The transformer's a.c. output feeds rectifier D170 (DSF10B) and regulator IC105 (L78M05) via circuit protector ICP101 (N5). Although the rectifier and regulator have given trouble the more usual cause of lack of the 5V supply is a duff circuit protector.

If the set is dead and the LEDs are lit, check the ceramic 5·6Ω, 5W surge limiter resistor R501. It will go open-circuit

if any of the bridge rectifier diodes D501-4 are faulty but the more usual cause is failure of the STK50103 chopper chip IC501. When this item has to be replaced the R2M diode D508 should be changed at the same time. Under order code MASTR50103AKIT CPC supply a kit that consists of the chip, the resistor and an SR2M diode. **J.C.P.**

Hitachi NP81CQ Chassis

A case of intermittent loss of colour, with the action of the colour control being very coarse, was caused by failure of C718. This 2,200μF, 16V electrolytic is the reservoir capacitor for the 12V supply derived from the line output transformer. **S.L.**

Amstrad CTV2000

This set suffered from reduced height with a degree of foldover. The field output stage is conventional, using a pair of transistors that are fed from a high-voltage supply. The supply decoupler C720 (4·7μF, 160V) was open-circuit. **S.L.**

Sony KV27RXTU

This set led us a merry dance, the fault symptom being a snowy picture. The obvious items were checked or replaced, including the tuner, but the fault persisted. We then disconnected the a.g.c. feed to the tuner and instead fed a variable voltage to the a.g.c. pin. The idea was to prove whether the fault was in the a.g.c. circuit. As the picture continued to be snowy at any voltage setting the a.g.c. circuit was eliminated. The cause turned out to be the SWAF, SWF101. When we replaced this we obtained a nice, clean picture. **S.C.**

Sharp DV1600

For a dead set with the standby light only on, check the 10μF, 100V capacitor C715 in the power supply – you'll find that it has dried up. As space is very limited it's best to get the correct replacement from Willow Vale.

For intermittent tripping into standby, check for a dry-joint at the collector of the 2SD869 line output transistor. **M.Dr.**

Samsung CI3312Z

The fault with this 14in. portable was intermittent loss of colour on changing channel. It was cured by replacing the 8·8MHz reference oscillator crystal X501. Unfortunately the manual gives no information on how to set up this circuit. The correct procedure is as follows. Short together pins 1 and 6 and pins 21 and 22 of IC501, then set CV01 for floating, locked colour. Finally remove the shorts. **M.Dr.**

Matsui 2580

This set was tripping out. It needed a new BU508A line output transistor as the old one had never been fastened on to its heatsink. At switch on the picture appeared without EW correction: the EW loading coil L901 then melted. The cause of this was a dry-joint on one of the EW modulator diodes. A replacement coil was obtained from Mastercare and fitted. The EW correction was now right but the picture needed a slight adjustment to its height. Now this chassis is a digital one that uses the ITT Digi chip set, so no board adjustments are possible. To enter the service mode you hold down the service switch inside the set and press the channel button on the remote control unit. Press the full button to select from the on-screen menu the adjustment required. For height, press the volume up/down button. To store, press normal then standby. **M.Dr.**

Sony KV2217UB (YE2 Chassis)

If you are faced with intermittent colour or poor ident after replacing the line output transformer in one of these sets, increase the value of the 220pF capacitor C390 on board A. 470pF usually works but you may have to use up to 680pF for correct working under very cold starting conditions. **M.Dr.**

Hitachi NP6C Chassis

Over the years we've had many of these sets in for repair, especially the portables. The usual fault is intermittently going dead or failure to start from cold. To cure the latter, change C914, C916 and C919 to 4·7μF, 63V. For intermittently going dead when switched on fit a 2SC1815 transistor in position TR908 and a 2SA562 transistor in position TR909.

Next comes the bit that will give these sets another ten years of trouble-free life and is possibly the biggest cause of intermittent faults. You'll find oxidised print under the solder of the high-wattage resistors in the power supply - R908, R909, R918, R924 and R935. Use a solder sucker to remove the solder from the legs. This will reveal a black patch to which you can't resolder. Some emery cloth should be used to rub the print, restoring it to nice shiny copper, then resolder the resistors back in circuit. Don't even think of just heating up the old joint and applying more solder: it won't work.

After replacing transistors TR908/9, which form an electronic trip, check the trip operation by shorting together pins 2 and 4 of CP902 with the set switched on. It should go dead. Switch off, wait thirty seconds or discharge C932, then switch back on. Everything should work again. **M.Dr.**

Vega 342

Field collapse with this Russian made portable is usually caused by failure of the 4,000μF scan coupling capacitor C11A. It's a tag-ended radial electrolytic that's held to the chassis by a clip – a white wire from the scan coils goes to it. On the circuit diagram the lead from connection 16 on the timebase board Y2 is shown as going to "R52 volume control". This is actually the connection to the scan coils and then to chassis via C11A. All very confusing at a first glance. Full marks to Kevin at Technical and Optical Equipment (London) Ltd. for sorting me out on this one. **R.B.**

Sony KV6000

My Sony KV6000BE developed loss of colour – it could be restored briefly by rapid rotation of the colour control. I hoped that the cause would simply be a defective potentiometer but it wasn't of course. A non-too-hopeful inspection then revealed that the capacitor soldered across the print side of the adjacent board, looking like an afterthought, was dry-jointed. I'm not in the trade and would like to claim this one for the dabblers! **J.K.C.**

Sony's Mini Disc Format

George Cole

Next year will be an interesting one in the consumer electronics market since four new formats are due to appear in high street stores, CD-Interactive, Photo CD, the digital compact cassette and, the latest to be announced, Sony's Mini Disc. Sony first released details of the Mini Disc (MD) at the end of May. It's a system that stores up to 74 minutes of digital sound on a 2·5in. magneto-optical (MO) disc. The discs are erasable and can thus be used like audio tape, i.e. they can record, playback, erase and re-record sound. Many newspaper reports have portrayed the MD as a threat to the compact disc. It's basically designed for the portable audio market however, and in this context is more a challenger to audio tape formats. MD could nevertheless in the long term turn out to be a rival to the compact disc.

Basic Specification

The MD is stored in a caddy that measures 72 × 68 × 5mm. This provides protection against dust and damage. Sony says market research has shown that users prefer to carry small discs around in a caddy. Disc and caddy are half the weight of an analogue audio cassette.

The MD stores two-channel digital stereo sound which has been compressed by a factor of five. Frequency response is 5-20,000Hz and the dynamic range 105dB. The audio signal conforms to the CD standard, i.e. 16-bit linear with a sampling frequency of 44·1kHz. Also like CD, the MD format uses eight-to-fourteen modulation (EFM) and cross-interleaved Reed-Solomon error correction (CIRC). The intention is to incorporate the Serial Copy Management System (SCMS), an anti-copy arrangement, as with the DAT format. Sound quality is described as "near CD quality". The disc speed is 1·2-1·4m/sec and, like all CDs, the disc rotates at a constant linear velocity.

Four new technologies are used in the MD system: an ATRAC audio compression system; an MO overwrite system; a dual-function type of laser; and a shock-proof system based on the use of i.c. memory. We'll look at each of these in turn.

The ATRAC System

ATRAC stands for Adaptive Transform Acoustic Coding. It's five times more efficient than the coding system used by the CD and DAT formats. A real-time digital recording system such as the one used by the CD format is wasteful because data is used even when there's no signal present. With the CD format sixteen bits of data are used every 0·02msec regardless of whether or not there's anything to record.

The ATRAC encoder on the other hand takes a snapshot of the audio every 20msec (see Fig. 1), each snapshot consisting of approximately 1,000 samples. These undergo a complex mathematical process known as Fourier Transform (FT) analysis, enabling non-sinusoidal waveforms (like digital pulses) to be broken down into signal components that vary in frequency, amplitude and phase. The various signals are analysed, and only those that are above a level specified by the FT algorithms are encoded.

These algorithms are based on psychoacoustic research into human hearing, and rely on two effects, the threshold of hearing and masking. Fig. 2 shows the threshold of human hearing. As you can see, the ear is most sensitive at frequencies around 3kHz. Since signals below this threshold can't be heard they are not encoded. The effect of masking is shown if Figs. 3 and 4. The soft sound A in Fig. 3 is audible. But if soft sound A is mixed with a louder sound B of similar frequency it will be pushed below the hearing threshold and thus doesn't need to be encoded – see Fig. 4.

Fig. 5 illustrates the ATRAC encoding/decoding process. Incidentally the digital compact cassette (DCC) system, which puts digital audio on to normal-sized cassettes, also uses these effects. With DCC however the sound spectrum is divided into 32 sub-bands which are analysed in real time.

Recording and Playback

MO discs have been used mainly in the computer industry, for storing data: their erasability means that data can be changed and updated. Large amounts of data can be stored in such discs. It's held in the form of magnetic flux reversals in the magnetic recording layer. The

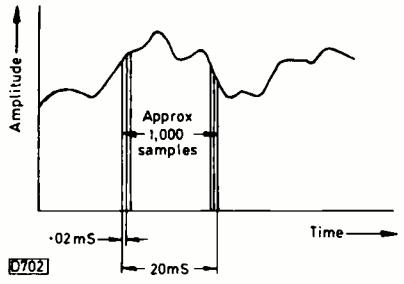

Fig. 1: ATRAC waveform sampling.

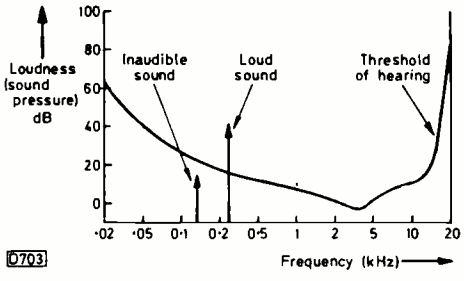

Fig. 2: The threshold of hearing. Only sounds that are above the threshold can be heard.

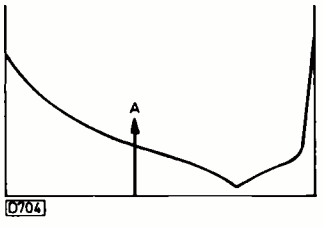

Fig. 3 (left): Soft sound A is audible.

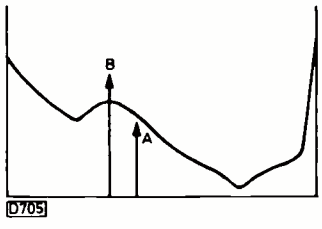

Fig. 4 (right): The masking effect. Loud sound B at a close frequency to soft sound A distorts the threshold of hearing, so that the soft sound is no longer audible and is in consequence not recorded.

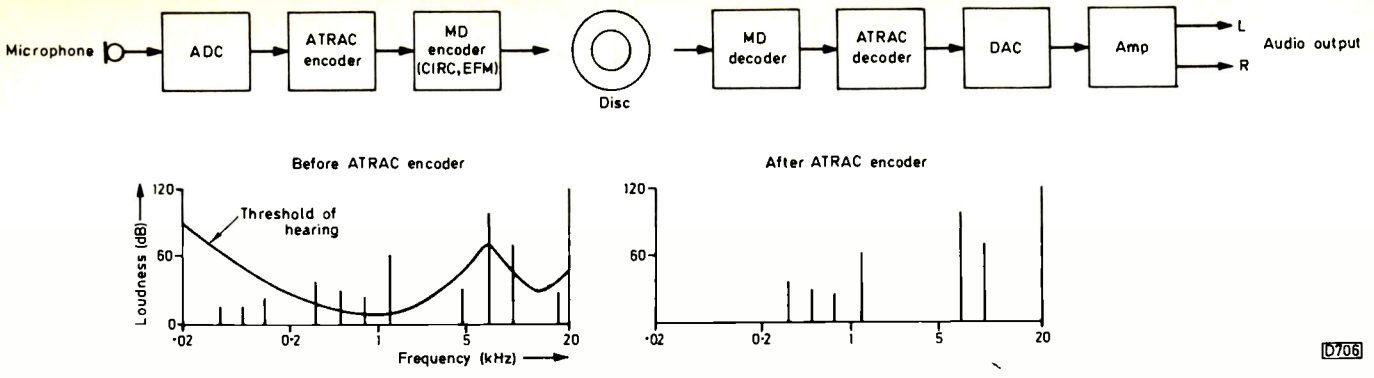

Fig. 5: The ATRAC encoding and decoding processes. The graphs show the filtering effect.

orientation of the flux's north pole, i.e. whether it points upwards or downwards in the recording layer, is used to represent a binary one or zero.

With a conventional MO system the disc sits above a drive magnet which bathes it in a constant magnetic field. Heat from a high-power laser is used to raise the temperature above the magnetic layer's Curie point, i.e. the point at which coercivity is lost. By using the digital signal to modulate the laser beam, i.e. switch it on or off, the magnetic field can be used to change the polarity of the recorded bits.

MO systems use the Kerr effect for playback: it twists the reflected beam from a polarised light source, i.e. the laser, either clockwise or anticlockwise depending on the bit's polarity.

Some conventional MO recording systems use a low-power laser for playback and a high-power one for recording. Others use a two-step system in which the disc is rotated in a powerful magnetic field while being heated by a high-power laser: recording takes place during a second rotation. Both methods use a lot of power and the disc tends to get rather warm.

The Mini Disc's magnetic layer consists of a terbium/ferrite/cobalt mixture however. Its polarity changes when a coercive force of just 80 oersteds is applied, around a third of the force required with a conventional MO disc. Thus less lower is required and over-heating is avoided. The MD's overwrite system carries out erasure and recording during a single rotation of the disc: the laser power is held constant while the digital signal modulates the magnetic field (see Fig. 6).

The laser used with the MD system can read both conventional compact discs and Mini Discs. This means that software producers can use existing CD production plants to make MD titles. An 0·5mW laser is used to read

A prototype Mini Disc player and a prerecorded disc.

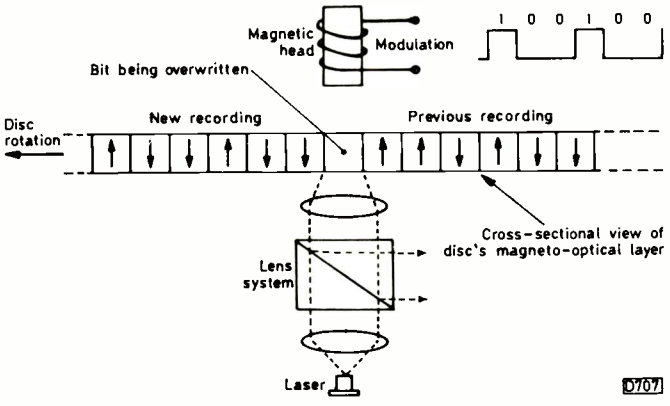

Fig. 6: The over-writing record process.

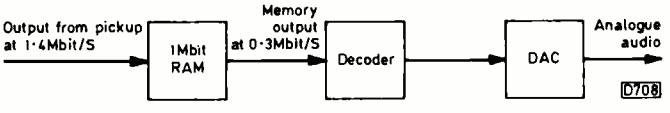

Fig. 7: Use of i.c. memory to provide shock-proofing.

both types of disc, with a beam splitter to direct the reflected light on to two photodiodes.

With an MD one photodiode will receive more light than the other depending on the direction of polarisation. The two electrical signals produced by the photodiodes are subtracted, a positive or negative result representing a zero or one reading.

Compact discs are also read by varying the amount of light received by the two photodiodes. In this case when the laser light falls on a smooth part of the disc most of it is reflected back, less light being reflected when the beam strikes a pit. The signals are summed, the difference representing the binary number.

Shock-proof System

Contrary to popular belief, conventional portable CD players are not designed for use when jogging. With nearly all of them, skipping and muting occurs under these conditions as the laser mistracks.

The MD format uses a "shock-proof" system to overcome this deficiency. Fig. 7 shows how it works. Although the off-disc data transfer rate is 1·4Mbit/s, for playback the ATRAC decoder needs a data rate of only 0·3Mbit/s. Thus the data can be stored before it reaches the decoder. A 1Mbyte RAM that stores three seconds of music is used for this purpose. The RAM acts as a buffer or "dam". Thus provided the laser's mistracking lasts for less than three seconds there's time to relocate the lost position before the listener notices anything. This is possible because address information is assigned every 13ms, the

system using this information to find the correct position.

The shock-proof system certainly works. In one demonstration the player was dropped on to a cloth-covered table from a height of eighteen inches without interruption to the playback sound. In theory a disc could be removed from the player and, provided it was replaced within three seconds, the sound would continue normally. It's likely that the system will be improved even further as the cost of RAM chips falls.

Prospects

The MD will face stiff competition from analogue and digital compact cassettes. You can buy a quality personal stereo system for less than £20 today. MD players will initially cost around £300, while the price of the discs has yet to be announced. Prices will fall however, and the MD offers several advantages compared with tape systems. In the longer term better compression techniques could result in improved sound quality with the Mini Disc, which could even store text, graphics and pictures. The MD could even begin to challenge the conventional compact disc. Some suggest that the CD is here to stay, and that magneto-optical disc systems will never become competitive with tape from the price point of view. But then some people predicted that the Walkman tape player would be a commercial flop. Sony nevertheless went on to sell over sixty million Walkman units and revolutionise the way some people listen to their music!

Acknowledgement

Thanks are due to Eric Kingdon of Sony UK for his assistance in the preparation of this article.

Test Report: The Periswitch Link Unit

Eugene Trundle

The Scart, Peritelevision or Euroconnector system has been with us for over eight years now. Though it doesn't provide many of the features it should have done it's nevertheless a useful means of interconnecting TV, video and satellite TV equipment. To realise its full potential a hi-hi stereo VCR must be connected via AV links, while all the advantages of MAC TV are thrown away unless the satellite TV receiver's outputs are fed to the main TV set in RGB form and the high-quality audio is passed to good amplifiers and loudspeakers.

Even with ordinary VCRs and satellite TV tuners connection via the Scart system has many advantages. It avoids patterning due to "carrier clash" around channel 36, gives better sound and vision quality, avoids the need for tuning and the errors and quality loss associated with this, and forestalls the risk of interference from the proposed Channel 5 terrestrial TV transmitters. The Scart system also has the advantage that it carries control and switching commands for automatic selection of the AV or RGB mode in the TV set.

There are two reasons why the Scart link is not used to its full potential in many homes. One is that dealers and manufacturers have not promoted it very well – even MAC receivers were supplied without Scart connecting leads. The other is that as the number of Scart-equipped black boxes in use has increased it has become more difficult to interconnect them whilst maintaining all record/play-back/viewing/listening options. Many switch boxes and splitters have been marketed to assist with such problems.

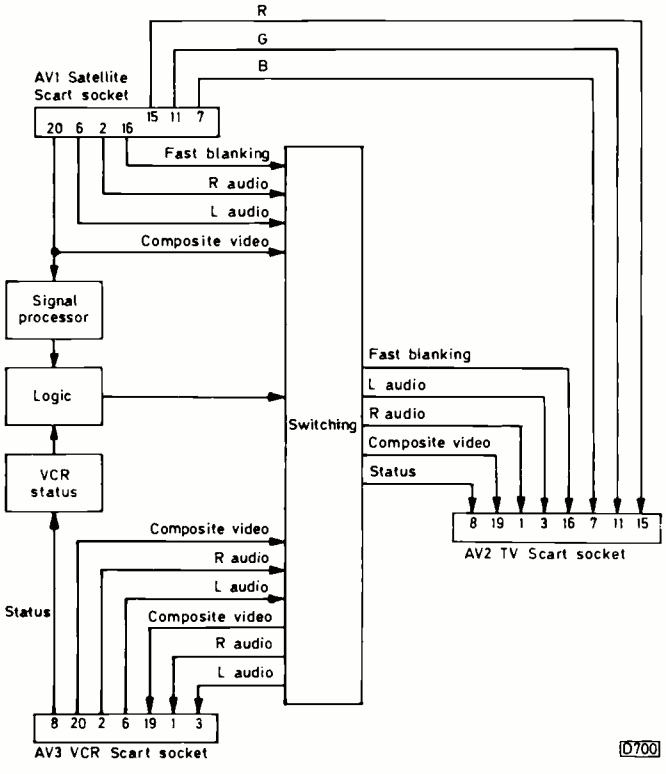

Fig. 1: Simplified block diagram of the Periswitch.

Principle of the Periswitch

Using a "truth table" based on likely viewer behaviour, it's possible to design an automatic switch box that's driven purely by the presence or absence of status voltages and video signals in the Scart system. It can be devised to route video and sound signals and to switch the TV set between its internal tuner, AV and RGB sources. This is what the Periswitch does. The basic concept is that if you key play on the VCR you want to watch and hear a videotape playback, that if you switch on a satellite TV receiver you do so to see a programme, and that if the VCR and satellite TV box are in stop/standby and the TV set is on you're watching a terrestrial TV programme. Thus the Periswitch needs no remote control or front-panel keys and switches: it works unobtrusively and can be hidden away.

Use Possibilities

While maintaining this principle, the switch-box design takes into account the following possibilities: that you might want to watch terrestrial TV while recording a satellite TV programme or vice versa; that you might want to see two pictures at once with a picture-in-picture receiver; that there are radio programmes on satellite carriers; and so on.

The Periswitch caters for the following options:

(1) Watching video playback only.

(2) Watching a terrestrial TV broadcast while recording a terrestrial broadcast.

(3) Watching a satellite TV transmission.

(4) Watching a satellite TV transmission while recording it.

(5) Watching a satellite TV transmission while recording a terrestrial TV broadcast.

(6) Watching a terrestrial TV broadcast.

(7) Listening to a satellite radio programme and, if wished, recording it.

(8) Recording a satellite transmission without monitoring it.

(9) Using a PIP VCR in the record or monitor modes.

(10) Watching video playback with a satellite receiver or computer left on.

Full wideband stereo capability is maintained in all directions with the sound paths, and the satellite input port accepts both composite video and RGB feeds which are passed to the TV set intact – RGB is not relevant with VCRs of course. Optionally available adaptors enable a camcorder or computer to be used as a signal source instead of a satellite receiver. Even VCRs without Scart connectors – most of them will be over six years old now – can be used with AV adaptors, but for full versatility it's necessary to find a status indicator such as a PLAY 12V line.

Physical Features

The Periswitch was not designed to be visible: it's generally hidden behind the VCR or TV set. The presentation is plain black, the box being 260 × 120 × 40mm with three 21-pin sockets on its rear face. There's a fair-sized fibreglass PCB inside, with three 16-pin i.c.s and about 150 discrete components on it. The mains power unit is a separate block with a moulded on three-pin plug. Electronically the box consists of a series of logic switches, signal amplifiers and buffers. Fig. 1 shows the arrangement in block diagram form and Fig. 2 shows hook-ups.

The package comes with three Scart connector leads, a comprehensive instruction book and a one-year guarantee. The latter is extendable to five years for a fee of £20 plus VAT. Six types of optional lead adaptors are available for camcorders and VCRs without Scart ports.

Practical Test

In use in my living room I found that the Periswitch did all that was claimed for it, with automatic switching between satellite, VCR and terrestrial TV, steered entirely by the existing remote control handsets. It's very convenient to be able to get the programme you want at the touch of a single remote control key. As far as I could tell, the switching is transparent so far as the signals that pass through are concerned, whether they are L/R audio, composite video or, most important, RGB from MAC TV. I tried all the viewing/recording/routing options described above and found that they all worked as specified.

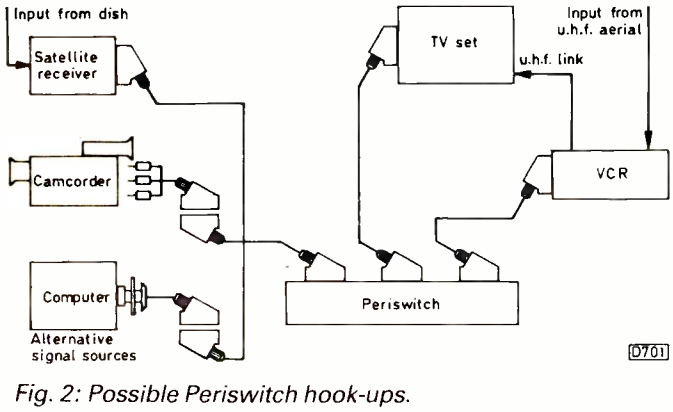

Fig. 2: Possible Periswitch hook-ups.

On then to the workshop and stock room, where there's a wide variety of TV sets, VCRs and satellite tuners, to check the Periswitch's compatibility. I found that in general the Periswitch worked with all Scart-equipped gear, with just a few exceptions as follows.

Some of the first TV sets to be equipped with Scart sockets had to be manually switched to AUX operation. Some later and current sets won't relinquish the AV mode manually once forced into it by the Scart status symbol, e.g. when recording satellite TV and attempting to watch BBC/ITV. This can be cured by snipping pin 8 in the TV set's Scart connector, but the TV set will then have to be switched into and out of the AV mode using the remote control handset, as with some of the early Scart-equipped sets. Note that snipping the lead to pin 8 doesn't affect the Periswitch's automatic signal switching.

Early Astra satellite receivers without a standby switch were intended to be left switched on and tuned in permanently. Thus they keep the Periswitch in the satellite mode – the status here is controlled not by a "flag" but by the presence or absence of a video signal. Selecting an empty s.h.f. channel in most cases (but not quite all!) flips the system back to terrestrial TV reception.

All the Scart-equipped VCRs I tried worked happily with the Periswitch, as did the four types of Marco Polo satellite TV tuner. I hooked a Nicam VCR to a stereo (non-Nicam) TV set via the Periswitch and obtained both broadcast and playback stereo. An additional output port for audio hook-ups, ideally in two phono form, would have been useful.

As a final test I fed test patterns and audio tones through the Periswitch. No loss of quality or frequency response – up to 4·5MHz for video and 20kHz for audio – could be detected.

The Periswitch is not designed for use with the Y/C video connection system used by S-VHS VCRs, even where the signals pass through Scart pins as some manufacturers arrange. Though the Periswitch is unable to keep luminance and chrominance signals separate it does not impair the bandwidth when used with high-band recording systems, thus retaining many of the benefits of S-VHS and Hi-8 video.

Conclusion

In conclusion, the Periswitch design is clever. It has many advantages in convenience of use and the maintenance of picture and sound quality. Many users will feel that it's worth the £99.95 (including VAT) price tag, which typically represents eight per cent or less of the cost of the TV/video equipment used with it. The odd operational snags I encountered with old and non-standard equipment were generally easy to overcome, and the manufacturer has an advisory service that can be called upon. Substantial discounts from the retail price are of course available to bona fide dealers and spares account holders. Overseas readers should note that the Periswitch can be used with signals of any TV standard.

The Periswitch is available from Hoopwell Ltd., Unit B9, Larkfield Trading Estate, Larkfield, Maidstone, Kent ME20 6SW. Telephone 0622 882 285, fax 0622 882 287.

Service Briefs – Samsung VCRs

The following information on Samsung VCRs has been compiled from recent Samsung Service communications. Notes on CD players, microwave ovens and TV receivers were included in our August issue, see pages 730-1.

Models VI510 and VI520

If the unit returns to stop after a few seconds' use, check for the presence of reel pulses at connection 132 in the syscon section. Suspect a faulty reel sensor, DN6838.

If the machine laces but the drum and capstan don't rotate then the emergency mode is entered, suspect switch B in the cassette housing. It's the switch in the centre, part no. 63569 700 330.

If the clock/counter runs backwards, check the voltage at pin 40 of the uPD7538 chip on the timer PCB. If the voltage is high, replace the chip; if it's low, suspect Q3.

If the drum runs too fast, check the FG pulses at C28 in the servo section. If the pulses are missing suspect the drum motor; if they are present suspect IC2.

Suspect Q2 in the timer circuit if the clock runs fast when the machine is in operation but is all right in standby.

If the machine laces immediately after a tape is inserted then enters the emergency mode the alignment of the front loading motor is incorrect.

For no colour or capstan lock, check whether the 50Hz signal is present at pin 5 of IC4. If incorrect replace the AN6342 chip in the YC circuit.

No E-E 12V in stop but present in record, D3 in the syscon section is faulty.

If the machine won't switch on or off, check the power switching signal at connection 43 – should be high for on, low for off. If this is o.k., suspect the MP9432 chip in the syscon section.

Failure of Q5 will remove the 5V, −24V and 50V supplies. The usual cause of its failure is leakage in C7, C12, C13 or C14.

For poor reset/erratic functions/unstable drum servo change the value of C3 in the regulator circuit to 2,000μF, 16V.

Only genuine Samsung idlers should be used in these machines, otherwise jamming in one position will occur because of incorrect arm moulding. The motor pulley and the drive surfaces of the supply and take-up spools should be thoroughly cleaned when the idler is replaced.

The original reel motor is no longer available. A new deck plate must be used with the replacement type supplied in order to provide mounting holes for the motor. Part nos. are: motor 64769 052 081; idler spring 66674 601 830; two screws 67004 100 810; deck plate 66120 100 610. An M4 nut and M3 × 8 bolt are also required, otherwise the post to attach the capstan bracket to the new deck plate will be too short: use the nut to space the post and the bolt to fix it.

Models VI611, VI616, VI621 and VI626

Note that not all the following items relate to every model.

For patterning on E-E signals and therefore recordings when the signal strength is low, check for ripple on the 12V supply to the tuner (pin BU). If ripple is present, add a 470μF capacitor from pin BU to chassis. Otherwise, the machine uses syscon panel 3005 004 023B with single-sided print. Proceed as follows. Cut the earth return as shown in Fig. 1, taking care not to cut the earth connection to pin 12 of plug CNG. Re-route the lead to CN-K04 (tuning voltage and supplies) in front of the loading chips down the right-hand side of the machine. Realign vision i.f. transformer T101 and the a.f.c. transformer T102. Finally, if fitted remove the earth lead from the print side of the syscon PCB to the mechanism.

For poor picture search, first clean the pinch roller thoroughly. If still poor after this check with a scope at pin 10 or 11 of the BA6303 chip IC0211 in the servo section during search. The 75Hz squarewave should be sitting on a d.c. voltage of 0·1-0·2V and be of 3·3-3·5V amplitude. If the d.c. voltage is too high but corrects itself after 10-15 minutes or when the chip is heated, try the following modification before replacing the chip: add a 47kΩ resistor between pin 7 of IC0211 and the 5V rail; change C0231 to 0·01μF ceramic and C0232 to 0·47μF polyester.

For poor audio/sound-on-vision/high-pitched buzz for ten minutes after switch-on, only when the a.f.c. is switched on, add a 3·3μF or 4·7μF capacitor (16-50V) between the junction of C0402 and R0404 and chassis (negative lead to chassis).

The reset circuit was modified during production, see Fig. 2. Q614, C615 and D614 were added on a sub-panel, C608 was changed to 1nF 50V and a 47kΩ resistor replaced D605. Pin 1 on the sub-panel goes to pin 32 of IC0602, pin 2 to pin 49 and pin 3 to pin 52.

If the machine works all right but when switched off the power and channel LEDs stay on, the KSA634H transistor Q2 in the regulator circuit is short-circuit. Part no. 62149 101 150.

To improve the quality of recordings, remove C0308 and change the value of C0364 from 220pF to 150pF.

If there's no record colour but playback is o.k., check at pin 6 of IC0303. The d.c. voltage should be −0·2V and the waveform must have a peak-to-peak amplitude of 8V. If the conditions are incorrect, replace C0347 (56pF).

Replace the audio/control head (part no. 64079 503 052) if playback is o.k. but the machine won't record the CTL track.

For intermittent colour with a timer recording, replace VR0313 (20kΩ, part no. 61243 110 014) and set up the chroma circuit.

Two different reel motors have been used, with different

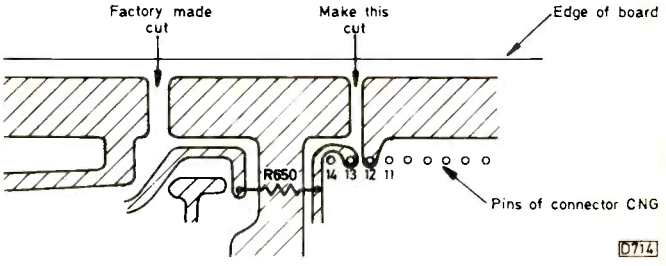

Fig. 1: Syscon panel 3005 004 023B (VI611 series models) modification for E-E/record patterning.

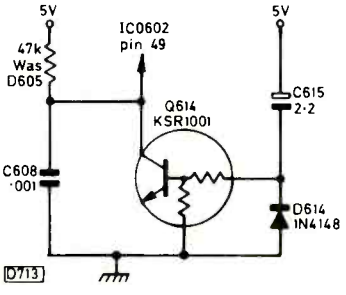

Fig. 2 (left): Reset circuit modification, VI611 series machines.

idler springs. The Sankyo JPA1B05 motor is part no. 64769 052 080 with spring 66674 601 820; Sankyo motor JME1B91 is part no. 64769 052 081 with spring 66674 601 830.

Models VI710, VI711 and VI730

Note that not all the following points apply to every model.

If the 50Hz signal at pin 10 of the main microcomputer chip IC801 is poor replace wire link W605 with a 100kΩ, ⅛W resistor and add a 10nF capacitor from pin 10 to chassis.

Failure of the remote control handset to transmit can be due to a high-resistance or open-circuit IR diode. Part no. 62309 112 030.

In the event of intermittent tuning for ten seconds after power-on and no signals displayed on a TV monitor for two minutes, the channel indicator being o.k., add a 220nF capacitor between the tuner's BU and VT pins and a 1nF capacitor between the tuner's clock line and chassis. Applies with tuner ECU5883PLC.

Tuner ECU5883PLE can be responsible for inability to tune or excessive patterning on channel 40, 43, 46 or 50.

For failure to erase due to the bias oscillator not starting, solder the leads directly to the erase head, i.e. remove the plug and socket. Also change Q0501 to type KSD1008Y, part no. 62149 310 431.

Chroma patterning occurs when the oscillator block L0504 fails. A short in L0504 results in a burn-up. Peaking coil L0503 then develops shorted turns, the result being ripple on the REC 9V supply. Both items should be replaced therefore. Oscillator blocks supplied by Samsung have a 12kΩ resistor between pins 4 and 8 instead of 6·8kΩ. To improve reliability, solder the leads directly to the erase head. Some VI730 machines were modified in production, with the 12kΩ resistor fitted across the print: this resistor should be removed if a block of the modified type is fitted. If Q0501 has failed, always solder the leads from the block to the erase head directly to prevent a recurrence.

For no tuning, replace link W627 with a 1kΩ resistor.

Two different types of TV/Aux switch have been fitted. The type with six evenly-spaced pins is part no. 63510 102 72; the type with eight pins, six bunched, is part no. 63519 102 071.

With older boards replacement of IC201 (SD3624A) results in LP operation only. To cure, link pins 26 and 27 with solder.

The a.g.c. voltage requirement varies with different tuners. With the SEM type ECC2885PLE the range should be 4·7V ±0·1V; with the Sharp VTSA-1SZ3PL the range should be 5·3V ±0·1V.

Ensure that the correct type of capstan motor is ordered when a replacement is required – the pulley sizes differ. Type VCM4730AL is part no. 64769 052 025; types VCM4730BL and R4322-74382A are part no. 64769 052 015.

The mains transformer part nos. differ. With the VI710 and VI711 the part no. is 63379 600 070; with the VI730 the part no. is 62869 190 203.

To cure a popping noise during load/unload, remove C119 from the Main A PCB – it's in the collector circuit of Q109.

The part no. for the mode switch on its own is 63599 016 057.

If the bottom edge of the tape gets creased at the supply impedance roller, remove the washer at the bottom of the assembly, beneath the spring.

For no E-E sound change R130/1 from 10Ω to 3·3kΩ: these resistors are in the PB 5V switching circuit.

For intermittent tape ejection when play is selected, change the value of R611 from 330kΩ to 100kΩ.

Background whistle on sound with recordings can be cured by adding a wire link from pin 4 of CN401 to the tuner earth lug land on the Main A PCB.

Buzz on sound can be removed by redressing the lead from CN703 to CN602 (clock PCB to syscon PCB).

Whistle on sound can be removed by redressing the lead from CN402 to CN701 (clock PCB to Main A PCB) away from the upper Main B PCB.

For whistle on LP record or playback sound cut the wire link between pin 24 of IC0501 on the Main B PCB and the print near VR3303. If this link is not fitted, check for and remove the earth wire between the mechanism and the point on the Main B PCB where the insulation sheet is fixed.

Switching between the SP and LP modes can be caused by low amplitude CTL pulses: at pin 7 of IC203 the pulses should be 0·96V peak-to-peak in the SP mode and 0·8V peak-to-peak in the LP mode. If the pulses are incorrect, suspect a misaligned (zenith and height) or worn CTL head.

Failure to switch on or eject occurs when the case of C702 (22μF) shorts pin 3 of IC701 to chassis. C702 is on the print side of the function timer PCB.

Models VI750 and VI770

For inability to search tune with location one (jumps to location two) press the store button then search on channel one.

The wow performance can be improved by carrying out the following modifications: change R246 to 220kΩ, R247 to 8·2kΩ, R248 to 150kΩ, C239 to 100nF and C240 to 2·2nF. Finally, add a 47kΩ resistor between the base and emitter of Q217 in the servo section.

Models VI770 and VI790

If no or only some functions are working, the 30V supply is low or missing. Replace Q903 (part no. 62149 301 751) and ZD901 (part no. 62129 502 002).

An incorrect combination of microcomputer, clock and memory chips IC501, IC102 and IC103 can result in no communication between them and a number of symptoms. The types were changed during production, the change involving other circuit modifications. If the clock and memory chips are not correct, stations will not be stored.

Model VI910

If a machine with syscon PCB SVS866 cuts out while playing, check the PG pulses at pin 32 of the servo chip. The correct amplitude is 800mV peak-to-peak. If you find that the amplitude is excessive at 2V peak-to-peak check R35 on the syscon PCB – it should be 22kΩ but might be 56kΩ.

There are some incorrect part nos. in the service manual. Correct ones are as follows: d.c. socket 63334 104 021; mains transformer 63379 600 046; D1, type 2KBP02, 62169 901 080.

Models VI8220/1

Shutting down during playback can be caused by ripple at the servo chip IC201's FG input. Add C234 (22nF) between the junction of C226 and R234 off pin 56 of IC201 to chassis.

Models VI8220/5

For black spots on the edge of the playback picture carry out the following modification: change R0368 to 220Ω, R0340 to 330Ω, C0334 to 27pF and L0306 to 27μH. These components are all on the Main B PCB.

Model SX7230

To improve the preset tracking change the value of C202 on the servo PCB to 82nF (part no. 61507 121 581).

General information

Some useful semiconductor device equivalents are as follows:

uPC1524 = HA11745
uPC1534 = HA11744
uPC1536 = HA11741
A143 = KSR2001
A144 = KSR2004
C143 = KSR1001
C144 = KSR1004

TEST CASE

345

Each month we provide an interesting case of TV/video servicing to exercise your ingenuity. These are not trick questions but are based on actual practical faults.

It's easy to become nonchalant about TV and video servicing. This is especially so when you find yourself faced with a symptom you've seen, or think you've seen, scores of times. When the usual treatment fails to cure the trouble the result can be a fit of frustration and pique. So it was with a JVC HRD140 VCR that appeared on the Test Case workbench. Its trouble, as described by the owner, was that when asked to play it would click and whirr and, after five seconds, shut down. Now this is a very common symptom with the HRD140 and associated models. It's usually because a slipping loading belt prevents completion of the loading cycle. So we changed the loading belt and cleaned and lubricated the shafts of the underdeck loading pinions before we even switched on.

At switch on loading took place in the usual way and the loading motor stopped when it was complete. There was no movement of either the capstan or the tape reels however: the tape was then smartly retracted into the cassette and the syscon went into the alarm mode. The engineer went into the alarm mode too. From the moment he'd pressed the play key the drum motor's speed had risen steadily to a high-pitched whine, which only now started to die away.

There are four little circuit protectors in the power supply in this machine. When one of them goes open-circuit all sorts of odd symptoms can occur. On this occasion however all four were intact, so an experiment was tried. Since the drum had started to run out of control during the lace-up, it was restrained with a finger. This produced a wobbly semblance of a picture on the monitor before the machine once more shut down. Thus it seemed that the primary cause of the trouble was excessive drum speed. Attention was therefore turned to the drum servo and drive circuits.

The early form of digital drum servo used in this machine is generally reliable and trouble-free. So the first check that was made was on the supply to the drum motor – 12V at pin 3 of CN2. It was correct. The servo error voltage is generated in IC402 on the servo board and is then amplified in IC404. Voltage checks in this area were made difficult by the fact that the machine shut down within a few seconds of starting to play, but we easily established that the supplies to the two chips were correct. As this is a digital servo, a clock pulse drive is required. It's derived from the 4·43MHz crystal in the chroma section of the machine. This waveform enters IC402 at pin 9: a scope check here showed that it was present and correct.

What next? In some circuits it's difficult to know which way the error voltage should move to drive the motor faster, so a check on this was not conclusive, especially as the automatic shut-down barely gave the meter time to settle before it was all over. There is one point however that should have been checked at the outset, long before wandering into the servo section. Had this been done the cause of the fault would have been diagnosed quickly and easily. What was it? Where should the scope probe have been parked? Answer next month.

ANSWER TO TEST CASE 344
– page 746 last month –

The Sony KV2204 that was the subject of last month's test case now stands resplendent in the window of Tower Road Television, with a three-month guarantee and a price tag so outrageous for such an old set that we cannot mention it here! You will recall that it had been fitted with a replacement Trinitron tube in the workshop, after which it showed nothing but a green raster despite the fact that its three guns were correctly biased and fed with R, G and B video drive signals.

All Trinitron tubes have convergence electrodes at the top end of the gun assembly. They are used to deflect the outer (red and blue) beams, and carry a potential similar to that at the first anode. The few hundred volts difference is set for correct convergence of the beams by the H-STAT control in the HV block. In this vintage of the Trinitron tube, the e.h.t. connector is a "double" type with the convergence voltage conveyed by the inner conductor and the e.h.t. by the outer one. These separate voltages are coupled to a special coaxial-cavity socket in the tube's bowl.

Unless the rubber-capped connector is applied to the tube carefully all the beams land on the green phosphor stripes. This is what had happened, the cause of the trouble simply being misapplication of the connector. When Service Manager replaced the cap he got it on correctly!

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LA1235	£2.50
LA1260	£1.75
LA1403	£3.75
LA3160	£1.90
LA3210	£1.90
LA3220	£1.00
LA3350	£1.50
LA3361	£1.50
LA3600	£3.50
LA3700	£2.50
LA4100	£1.90
LA4102	£1.20
LA4125	£2.00
LA4140	£0.70
LA4160	£1.25
LA4182	£2.10
LA4183	£2.75
LA4192	£1.70
LA4422	£1.30
LA4440	£2.70
LA4445	£2.50
LA4460	£1.70
LA4461	£1.80
LA4500	£2.70
LA4507	£2.70
LA4570	£2.20
LA5522	£2.20
LA5527	£1.95
LA6358	£5.00
LA7016	£2.50
LA7096	£4.00
LA7210	£3.10
LA7305	£6.90
LA7309	£3.75
LA7507	£4.00
LA7520	£3.25
LA7800	£1.50
LA7801	£1.25
LA7820	£1.90
LA7830	£2.50
LA7913	£1.30
LM1011N	£3.00
LM1017/M192B1	£2.30
LM1035	£5.75
LM1036N	£3.70
LM1112CN	£3.30
LM13600	£5.00
LM1868N	£1.50
LM1894N	£5.75
LM317T	£1.00
LM324	£0.80
LM339	£0.80
LM339N	£0.75
LM384	£1.20
LM386N	£0.80
LM556CN8	£2.50
LM6402G-2003	£10.00
LMLM6417	£1.80
LM748CN 8 PIN	£1.25
LM748N	£2.00
M104	£7.00
M29381	£11.00
M490BB1	£12.50
M491B/BB1	£11.50
M50127AP	£6.00
M50431-101SP	£6.50
M50453-012P	£6.20
M50560-01P	£2.70
M51014L	£1.95
M51164	£1.40
M51356P	£5.00
M51381P	£1.50
M51393	£4.25
M51513	£10.00
M51515L	£3.10
M51516	£4.00
M51903L	£3.50
M5213L	£3.10
M52184	£1.00
M52314	£1.10
M54519P	£1.00
M54543	£1.75
M54544L	£1.85
M54548L	£4.50
M58478P	£4.75
M58655P	£6.50
M58839	£8.00
M708	£5.50
M709	£4.75
MA150-E	£2.20
MB3106	£1.00
MB3730	£2.75
MB3731	£3.25
MC13002P	£5.00
MC1310	£1.25
MC1330P	£2.95
MC14001BCP	£1.10
MC14093B	£1.50
MC14426P	£2.20
MC14429P	£2.20
MC14497P	£5.50
MC14511BCP	£2.00
MC14516BCP	£2.00
MC1458/UPC1458	£1.95
MC3359	£1.10
MCU2632	£1.90
MDA2061	£7.00
MDA2062	£3.50
MEA2050	£4.60
MEA2901	£3.00
MH27316	£3.00
ML232B	£4.50
ML237 (BTT6018)	£3.50
ML238B	£7.50
M293	£4.00
ML923	£4.50
ML923DP	£4.50
ML926	£4.20
MM314APL	£1.75
MM53108N	£1.25
MM5387	£2.90
MM5402	£1.50
MM5405N	£3.50
MM5456	£2.25
MM5457N	£2.50
MM5458N	£2.50
MM55108	£2.65
MM7317	£3.75
MM74C901	£1.10
MPD4011C	£2.00
MPD4069C	£1.10
MPD4081	£1.10
MPD4514BC	£5.00
MPD5521066	£11.00
MSL9378RS	£3.50
MSM5840H-84RS	£14.50
SAA1006	£2.50
SAA1025	£5.80
SAA1124	£3.95
SAA1174	£6.50
SAA1250	£2.60
SAA1251	£8.50
SAA1276	£4.50
SAA1290-02	£10.70
SAA1293	£7.00
SAA1293-02	£9.75
SAA3027	£6.00
SAA5000	£3.00
SAA5010	£5.80
SAA5012	£6.60
SAA5020	£5.80
SAA5030	£9.00
SAA5040A	£5.00
SAA5040B	£9.90
SAA5041	£9.50
SAA5050	£14.00
SAA5231	£9.00
SAB3013	£4.50
SAB3037	£11.00
SAF1032P	£6.00
SAF1039P	£2.00
SAS560	£3.50
SAS570	£3.00
SAS580	£3.50
SAS590	£3.50
SL1430	£2.80
SL1431	£2.80
SL1432	£1.10
SL471DP	£2.20
SL480	£3.30
SL490	£3.00
SL901B	£3.00
SL917B	£2.50
SN76670N	£1.25
SSA1075	£5.90
SSA1250	£3.50
ST082	£12.00
ST1195	£5.50
STA401A	£3.75
STA441C	£3.00
STK0029	£4.30
STK043	£10.00
STK082	£12.00
STK2029	£8.50
STK2125	£12.00
STK2250	£9.20
STK3041	£5.70
STK40090	£8.00
STK4121 II	£8.75
STK4141 II	£6.90
STK4142 II	£10.00
STK4151	£11.50
STK4171 II	£9.00
STK430	£6.00
STK4311	£10.20
STK433	£7.50
STK435	£8.00
STK4352	£5.80
STK437	£10.00
STK4392	£7.00
STK441	£10.50
STK459	£11.00
STK461	£10.50
STK463	£14.50
STK465	£12.00
STK5315	£6.50
STK5322	£6.50
STK5325	£5.50
STK5331	£6.00
STK5332	£3.50
STK5333	£12.00
STK5338	£6.00
STK5361	£6.25
STK5421	£6.50
STK5422	£5.00
STK5434	£6.50
STK5451	£5.30
STK5471	£5.25
STK5476	£6.00
STK5481	£5.00
STK5482	£5.20
STK5720	£7.00
STK5730	£5.25
STK6962	£3.20
STK6972	£6.00
STK7216	£6.10
STK7308	£5.75
STK7309	£7.00
STK7348	£5.00
STK7356	£6.50
STK7358	£6.50
STK772B	£4.75
STR1096	£3.60
STR3125	£5.50
STR40090	£8.00
STR4211	£5.95
STR440	£5.00
STR441	£5.00
STR451	£4.95
STR454	£4.85
STRS0020	£7.90
STRS0103A	£5.50
STRS412	£5.95
STRS8041	£6.75
STR6020	£4.90
STR8050	£14.15
SVM993C	£2.00
TA4180	£3.00
TA4193	£5.00
TA4194	£5.50
TA4301	£4.50
TA4345	£3.40
TA4350	£6.00
TA7120	£1.25
TA7137	£1.25
TA7176	£2.50
TA7176AP	£2.40
TA7193AP	£4.00
TA7193P	£6.00
TA7205	£1.75
TA7205AP	£1.25
TA7222	£2.25
TA7223	£2.50
TA7227P	£2.30
TA7230P	£1.65
TA7232P	£1.50
TA7233P	£2.10
TA7240	£2.50
TA7241	£2.50
TA7241AP	£3.00
TA7243	£3.30
TA7245	£4.50
TA7267P	£2.80
TA7270P	£2.50
TA7271P	£3.25
TA7274	£2.60
TA7280	£3.00
TA7280P	£3.00
TA7281	£2.75
TA7281P	£2.75
TA7299P	£3.00
TA7302	£1.30
TA7303	£1.10
TA7310	£1.75
TA7312	£1.75
TA7313	£0.90
TA7313AP	£1.40
TA7314	£2.00
TA7323	£3.25
TA7325	£2.00
TA7325P	£1.50
TA7328	£2.00
TA7335	£1.50
TA7335P	£4.20
TA7342	£2.10
TA7343	£1.75
TA7350	£2.10
TA7358	£1.50
TA7607	£3.50
TA7607AP	£2.40
TA7609P	£2.70
TA7614	£2.50
TA7628P	£2.40
TA7629	£4.00
TA7629P	£2.75
TA7630P	£2.00
TA7640	£2.00
TA7658	£2.00
TA7668	£2.00
TA7680	£4.80
TA7681AP	£5.75
TA7687	£2.00
TA7698A	£6.85
TA7698AP	£7.50
TA7705P	£1.50
TA7709	£2.50
TA7738	£2.50
TA78L010P	£1.75
TA8101N	£4.25
TA8102P	£4.25
TA8644	£5.50
TAA310A	£2.00
TAA550	£2.10
TBA120S	£0.50
TBA530	£1.00
TBA560	£1.00
TBA750Q	£4.20
TBA800	£0.85
TBA820M	£0.45
TBA920S	£1.00
TCA640	£3.75
TCA650	£3.95
TCA660B	£3.50
TDA1005	£2.50
TDA1010A	£1.10
TDA1011	£1.20
TDA1013	£2.75
TDA1013A	£1.90
TDA1015	£1.20
TDA1020	£2.50
TDA1022P	£4.50
TDA1035	£1.90
TDA1035T	£1.90
TDA1037	£2.90
TDA1044	£2.50
TDA1044U	£1.50
TDA1057	£2.00
TDA1082	£3.50
TDA1083	£1.70
TDA1151	£1.50
TDA1154	£2.70
TDA1170S	£1.20
TDA1180	£1.80
TDA1180P	£3.00
TDA1190	£1.90
TDA127DM	£4.10
TDA1365	£4.90
TDA1412	£1.00
TDA1470	£5.00
TDA1501A	£3.20
TDA1506	£8.50
TDA1510	£3.20
TDA1510A	£3.20
TDA1512	£1.00
TDA1515A	£2.50
TDA1520	£3.95
TDA1670A	£2.60
TDA1701	£3.00
TDA1770A	£3.00
TDA1870A	£2.60
TDA1905	£1.40
TDA1908A	£1.75
TDA1940	£1.80
TDA1950	£2.50
TDA2002	£1.40
TDA2003	£1.30
TDA2004	£1.70
TDA2005	£1.70
TDA2005S	£2.95
TDA2006V	£1.95
TDA2020	£3.50
TDA2030	£1.10
TDA2030H	£2.00
TDA2030V	£1.75
TDA2040	£2.00
TDA2151	£3.00
TDA2161	£1.75
TDA2170	£3.00
TDA2190	£10.00
TDA2270	£2.20
TDA2320	£0.90
TDA2510	£4.30
TDA2521/3	£9.75
TDA2522Q	£10.75
TDA2530	£4.75
TDA2530Q	£4.25
TDA2532	£3.00
TDA2532Q	£3.00
TDA2540	£2.75
TDA2541	£2.00
TDA2543	£5.25
TDA2560	£3.75
TDA2560Q	£1.10
TDA2576A	£2.90
TDA2577	£2.80
TDA2578	£3.00
TDA2578A	£2.80
TDA2579	£3.50
TDA2581Q	£2.50
TDA2582	£2.55
TDA2590	£2.00
TDA2591	£2.70
TDA2593	£1.50
TDA2594	£3.00
TDA2600	£6.80
TDA2611A	£1.00
TDA2640Q	£3.50
TDA2653A	£2.75
TDA2822	£2.00
TDA3190	£0.95
TDA3303	£15.00
TDA3330	£5.50
TDA3540	£4.00
TDA3541	£2.25
TDA3560	£3.40
TDA3561	£2.50
TDA3562A	£5.00
TDA3565	£3.00
TDA3571BQ	£5.50
TDA3590	£3.00
TDA3651	£3.00
TDA3651AQ	£6.50
TDA3652	£7.50
TDA3653	£1.50
TDA3654	£2.80
TDA3810	£2.90
TDA3950	£3.00
TDA440	£2.00
TDA4420	£2.45
TDA4422	£3.95
TDA4500	£3.80
TDA4501	£4.00
TDA4503	£4.50
TDA4505	£3.95
TDA4510	£4.40
TDA4600	£2.60
TDA4600-2	£2.60
TDA4601	£2.10
TDA4610	£4.50
TDA5101	£2.00
TDA7250	£5.50
TDA7270	£6.00
TDA7607AP	£2.40
TDA8180	£6.00
TDA8190	£3.80
TDA8341	£3.00
TDA9503	£2.55
TDA9513	£2.95
TEA1009	£2.00
TEA1014	£2.00
TEA1039	£2.00
TEA2018	£2.10
TEA2018A	£2.10
TEA5101	£6.00
TLO11CP	£2.00
TL072CP	£2.00
TMM 2114AP	£5.75
TMS1944AN2L	£2.00
TMS1952	£2.50
TMS1956	£2.30
TMS1965NL	£2.00
TMS3450	£2.10
TMS3615	£1.75
U410B	£1.60
U410B	£1.60
U416B	£1.60
UA767PC	£1.20
UA78 10	£2.00
UA78M15	£2.00
UAA1008DP	£2.00
UC38445	£5.00
UPC1185H2	£2.50
UPC1225H	£2.75
UPC1230	£3.00
UPC1238V	£2.10
UPC1263	£2.20
UPC1288V	£2.95
UPC1361C	£3.90
UPC1362C	£4.50
UPC1363	£1.90
UPC1365	£3.50
UPC1377C	£2.20
UPC1378H	£2.00
UPC1379	£2.20
UPC1382	£1.50
UPC1394	£1.70
UPC1420A	£7.00
UPC1458	£1.95
UPC1513HA	£2.00
UPC1520CA	£2.48
UPC339C	£0.70
UPD4011	£1.75
UPD4066	£1.95

TRANSISTORS

2N3773	£1.90
2SA1095	£5.50
2SA1102	£1.90
2SA1112	£0.95
2SA1124	£0.35
2SA1220	£1.10
2SA1386	£4.70
2SA564	£0.40
2SA673	£0.20
2SA942	£0.35
2SA985	£0.95
2SB1016	£1.50
2SB772	£0.40
2SB775	£1.60
2SB819	£0.55
2SB965	£2.30
2SC1413A	£2.50
2SC1826	£1.80
2SC1942	£2.10
2SC1983	£1.30
2SC2003	£0.25
2SC2027	£4.50
2SC2230	£0.50
2SC2238	£0.75
2SC2331	£1.00
2SC2335	£1.50
2SC2531	£0.26
2SC2564	£3.04
2SC2570	£0.55
2SC2577	£1.50
2SC2592	£0.95
2SC2621	£1.25
2SC2631	£0.30
2SC2632	£0.30
2SC2655	£0.60
2SC2958	£2.50
2SC2979	£3.00
2SC3153	£3.40
2SC3402	£0.40
2SC3519	£4.60
2SC3678	£1.25
2SC3715	£4.80
2SC458	£0.20
2SC789	£2.50
2SD1047	£2.75
2SD1051	£0.85
2SD1128	£1.50
2SD1138	£0.85
2SD1159	£0.75
2SD1207	£0.75
2SD1273	£1.00
2SD1275	£1.30
2SD1288	£1.70
2SD138	£0.85
2SD1391	£4.20
SDC1397	£3.75
2SD1398	£2.25
2SD1426	£4.50
2SD1453	£1.60
2SD1455-2SD1730	£3.10
2SD1496	£4.00
2SD1497	£2.60
2SD1497-02	£5.95
2SD1497-06	£5.95
2SD1650	£3.50
2SD1877	£2.30
2SD639	£0.35
2SD667	£1.00
2SD725	£3.70
2SD787E	£0.30
2SD811	£2.95
2SD836	£1.10
2SD837	£0.80
2SD845	£2.70
2SD868	£3.50
2SD869	£3.00
2SD870	£3.50
2SD871	£4.50
2SD895	£2.00
2SD898	£2.75
2SD898B	£2.75
2SD900B	£4.00
BC107B	£0.10
BC108	£0.10
BC108B	£0.10
BC115	£0.16
BC118	£0.12
BC147A	£0.07
BC159	£0.09
BC171	£0.09
BC172	£0.09
BC172C	£0.07
BC182L	£0.09
BC183	£0.09

A.Z. ELECTRICS

Stock items despatched by return — ***Access & Visa Accepted***

DA8180 ORIGINAL £9.50

ANSISTORS		BD244	£0.30	BU406	£0.90
2184	£0.09	BD244C	£0.30	BU406D	£1.50
2212	£0.09	BD278A	£0.80	BU407	£0.50
2213	£0.09	BD434	£0.80	BU426A	£1.00
2214A	£0.07	BD508	£0.90	BU500	£1.00
2214B	£0.07	BF195	£0.07	BU508A	£1.00
2214L	£0.09	BF196	£0.15	BU508AF	£1.70
2237	£0.07	BF197	£0.15	BU508D	£1.00
223B	£0.07	BF198	£0.07	BU806	£0.75
2307	£0.12	BF199	£0.14	BU807	£0.75
2308B	£0.07	BF244	£0.40	BUT11	£0.95
2327-25	£0.07	BF259	£0.22	BUT11AF	£1.95
2328-40	£0.05	BF422	£0.15	BUW84	£1.65
2337	£0.07	BF458	£0.22	BUX84	£0.60
2372	£0.95	BF459	£0.22	SD12659	£0.75
2392	£1.50	BF469/BF471		T9064V	£2.28
2441	£0.25		£0.25	TIP110	£0.45
2461	£0.25	BF471	£0.25	TIP112	£0.45
2547	£0.07	BF472	£0.25	TIP29	£0.30
2548	£0.07	BF870/BF472		TIP30	£0.45
2549	£0.07		£0.25	TIP31	£0.30
2557	£0.30	BU108	£0.75	TIP32	£0.30
2559B	£0.07	BU126	£0.70	TIP41	£0.27
639	£0.18	BU208	£1.00	TIP42C	£0.40
640	£0.30	BU208A	£1.00	TIP47	£0.98
1131	£0.50	BU208D	£1.00	TIPL791A	£1.20
1132	£0.40	BU208T	£1.00	ZTR604	£0.55
1137	£0.35	BU208T		ZTX650	£0.70
237	£0.22	(TOSHIBA)			
238	£0.22		£1.00		
243B	£0.30	BU326A	£1.00		
243C	£0.40				

ODES AND THYRISTORS

157	£0.07	BY206 (BYB96R)		OA91	£0.20
1400	£0.20		£0.55	OT112	£2.20
4001	£1.40	BY210/800/BYV96		RGP15G	£0.45
4003	£0.75		£0.55	RGP15J	£0.55
4003	£1.50	BY227	£0.20	RGP15K	£0.35
4956	£0.75	BY228	£0.50	RGP30K	£0.70
5116	£2.50	BY229	£1.15	RHI	£1.30
5128P	£4.50	BY299	£0.50	RM11C	£0.45
5129P	£4.50	BY96D	£0.30	SG264	£8.50
5151/800R		BYV96D	£0.55	SG613	£12.00
	£1.75	BYW56	£0.50	SKB/02	£0.60
5126	£0.20	BYW96E	£0.50	SKB/08	£1.20
5127	£0.08	BYX10	£0.50	SKB2/02	£0.90
5133	£0.20	BYX55/600	£0.55	SKB2/08	£1.10
5164	£0.90	FB2506	£1.50	SKE1/02	£0.60
5164/SKB2/02		IN4001	£0.06	SKE1M15	£0.65
	£0.90	IN4002	£0.06	SKE2G2/02	£0.75
5179	£1.10	IN4004	£0.10	SKE2G3/04	£1.30
5179/SK2/08		IN4005	£0.10	SKE4F1/04	£0.45
	£1.10	IN4006	£0.08	SKE4F1/06	£0.45
5184	£0.65	IN4007	£0.08	SKE5F3/10	£2.20
5189	£2.00	IN4148	£0.10	SR2M	£0.75
5190	£2.00	IN5408	£0.25	T9053V	£1.40
5223	£2.00	KBL08	£1.95	T9064V	£2.28

ASK FOR SEMICONDUCTORS NOT LISTED

VIDEO HEADS

ISTRAD

SSR-VCR7000 (Saisho/Orion)	£18.00
F1-VCR4500,5200,9000	£15.00
F2-VCR4600,4700	£15.00
F3-VCR6000	£21.50

AGUSON

SSV-2 Head universal	£7.50
SSVA-3V42,44,45,46 etc	£20.00
SS4VB-3V32/HR7655	£25.00
SS4VC-3V48/HRD565	£26.00
18,58,59,65,FV10,11, 13,14,20,21,26	
l most other Fergusons	POA

ACHI

SSHA-VT8000,9000 series	£17.00
SSHB-VT11,33 etc	£17.00
82-VT120,220	£29.00
81-VT130,135	£30.50

IASONIC

SSN-2 Head universal	£7.50
SSU1N-NV100,370,380/Philips VR6460	£11.00
SSU2N-NV230,470,480,G9,10, 15PX	£21.00
SSU3N-NV430,460	£16.00
SS3N-NV777,330	£18.50
SS4NB-NV730	£26.00
SS4NA-NV366	£24.00
330,33,40,45,46,130, & most er Panasonics	POA

IYO

SSSY-VHR1100,1110,1300	£20.00
SS3SY-VHR1500	£34.00

IRP

SSP-VC9300,9500,9700,381,481, 483,486 etc	£17.00
SSPB-VC581,583,651,670 etc	£17.00
000,8000 series (Brass)	£42.00

IER MAKES

4000, Goldstar 8000, Sentra 8000, Solavox 0	£22.50
er FVHP510,520,530,615,710 etc	£18.00
er VBS7000,9000 etc	£25.00
iri VXL2,4,3,20,25	£18.00
iri VXL5,6,20H	£15.00
ubishi HS306,710	£30.00
n VC150,180,VH1,2,3 etc	£18.00
ho VR100,605,705,805,905	£18.00
isung Universal 2 Head	£24.25
s h i b a ,73,74,75,81,82,83,84,85,87	£20.00
iiba V93	£21.00

ASK FOR VIDEO HEADS NOT LISTED
e above heads are new and replacements.

BELT KITS

Belt Kits for most models are stocked. Some examples are:

AKAI

VS1,2,5	1.20
VS4,6,9,15	1.10

Ask for models not listed.

AMSTRAD

TVR1,2,3, VCR4600, 4700,5200	1.90

Ask for models not listed.

FERGUSON/JVC

3V00/3V16/3V22 etc.	1.60
3V29/3V30	1.20
3V35/36/38/39	1.10
3V42/43/44/45/48/53/54/ 55/57	1.00

Ask for models not listed. Loading belts on certain models also available.

FISHER

FVHP520/530	1.00
FVHP615/620/622/710/711/ 715/716/720/721/725/830/ 840	1.00
FVHP905/906/907/908/910/ 911/915/916	1.20

GRUNDIG

VS400/410/440/450/ 460	0.65
VS180/200/220/262/ 265/267	2.20
VS310/315/320/380/ 385	2.40

Ask for models not listed.

HITACHI

VT11/14/17/19/33/34/35/ 38/39/88	1.30
VT8000/8500	1.00
VT9300/9500/9700	1.00

Ask for models not listed.

PANASONIC

NV230/250/280/370/380/ 430/450/460/465/485/630/ 810/830/850/870/890	1.60
NV300/330/332/333/430/ 366	1.60
NV7000/7200/2000/ 2010	1.50

Ask for models not listed.

PHILIPS

VR6367/6467/6561/6751/ 6760/	2.25
VR6460/6920/6520	2.40

Ask for models not listed.

SANYO

VTC5000/5150/6500	0.65
VHR1100/1300/1500	1.00

Ask for models not listed.

SHARP

VCF3/VC402/500/571/581/ 582/583/584/585	1.10
VC9300/9500/9700	1.95
VC8000/8300	1.95

Ask for models not listed.

Many other belt kits in stock. Examples are Alba, Funai, GEC, Goldstar, Granada, Grundig, Hinari, ITT, Mitsubishi, NEC, Orion, Saisho, Samsung, Schneider, Sony, Tensai etc.

NEW LINES

Universal Video Head Puler £16.00
Video Idler Spring Kit £5.95
Video Washer and E Clip Kit £5.00

LINE OUTPUT TRANSFORMERS

Decca 100	9.50
ITT CVC20	12.50
ITT CVC25/30/32	9.50
ITT Compact 80 Series 110	16.75
ITT Compact 80 Series 90	19.75
ITT CVC45	18.00
ITT 1109F	14.00
ITT CVC1204	11.50
ITT CVC800/1/3	21.50
ITT CVC1100	16.50
ITT CVC1150/1175	20.00
ITT 6325	18.50
ITT 3546	18.50
ITT 1200/1	20.00

Other ITT transformers available

Fidelity all models up to 20" ZX3000	10.50
Fidelity Panel for ZX2000	1.00
Fidelity 22" ZX3000	24.50
Hinari CT4/5 & TVA1	14.75
Philips KT3	12.95
Rank Bush T20A	11.50
Thorn TX100 Green Spot 110	16.75
Thorn TX90 Mains Trans	18.85
Ferguson TX90 LOPT	17.75
Ferguson 3V35/36 Mains Transformer	23.00
Ferguson 3V44/44/45 Mains Transformer	18.85
Sony – Please state model for price	
Universal Tripler	4.75
Universal Tripler with focus unit	9.50
Decca 120/130 series tripler	8.50
Thorn TX10 Focus Unit Kit	9.00

VIDEO MOTORS

REEL MOTORS

Ferguson 3V29/30	£20.00
Ferguson 3V58,59,65,FV10,11,12,13, 14,20,21,22	£17.25
Ferguson FV260	£14.50
Hitachi 8000,8300,8500	£8.50
Sanyo VTC5000,5150,5400,5300,6500	£7.50
Sharp VC9300, 9500 etc. Original	£15.00
Panasonic NV333,366 Original	£13.20
All other Panasonics	POA

DRUM MOTORS

Ferguson/JVC (Mechanical models)	£23.00
Sharp 7000 series Original	£24.63
All Panasonic Original	POA

CAPSTAN MOTORS

Ferguson 3V35,36 Original	£22.50
Ferguson/JVC (Mechanical models)	£20.00
Hitachi VT11 Original	£30.00
Hitachi VT33 Original	£32.00
Hitachi VT64 Original	£19.75
Hitachi VT8000 series Original	£34.50
Hitachi VT9000 series Original	£34.50
Sharp VC7000 series Original	£30.50

MODE CONTROL MOTORS

Ferguson 3V42,43,44,45,48,49,52,53	£6.00
Ferguson 3V58,59,65,FV10,11,12,13,14, 20,21,22,26	£4.50

IDLER ASSEMBLIES

FERGUSON

Take up Clutch (Mechanical models)	£5.00
3V29/30 Take up Idler	£2.00
3V29/30 Take up Clutch	£2.85
3V29/30 Reel Idler	£3.00
3V35 Reel Idler	£3.00
3V35,36,38,39 Take up Clutch	£2.85
3V58,59,64,65,FV10,11,12,13,14 Idler Arm Clutch Assembly 3V44,45,48,49,52,53, 54,55	£1.80 £14.00
Clutch Assembly 3V42,43	£14.00

FISHER

FVHP615,905,910, Idler Assembly Original	£5.00
FVHP615 Gear Idler Assembly	£4.35
FVHP905,910 Gear Idler Assembly	£5.00
FVHP520,530 Idler	£3.00
FVHP520,530 Pulley	£0.70

HITACHI

VT11,33 etc. Original Idler Arm	£2.50
VT11,33 etc. Idler Replacement	£1.75
VT9300,9500 etc. Play Idler	£3.65
VT9300,9500 etc. F/F Idler	£2.95
VT9300,9500 etc. Idler	£2.95
VT8000,8500 etc. F/F Rew Idler	£2.95
VT800,8500 etc. Play Idler Assembly	£3.00
VT8000,8500 etc. FF/Rew Pulley	£0.70
VT11,33 etc. Clutch Assembly	£8.00

PHILIPS

VR6460,6920 Idler Arm (Original)	£3.00
DV464,6462,6463,650 etc. Idler Mod. Kit	£4.50
VR6542,6843 Reel Idler	£6.50
VR6542 Reel Drive Pulley	£7.75
VR6843 Reel Drive Pulley	£9.50

PANASONIC (All Original)

NV370 Idler Arm Unit VXP0521 Gen.	£3.00
NV8600,8610 Play Idler VXP0243	£0.95
NV332,777,788 Idler Unit VXP0463	£3.00
NV600,688 Idler VXP0515	£3.00
NV333,366 Idler Arm 2 Unit VXL0997	£10.50
NV8400,8600,8610 etc. VXP0245	£0.95
NV333,366 etc. Idler VXP0401-NV700,7200, 7800 Idler VXP0344	£0.90
NV2000,3000 Play Idler VXP0331- NV2000,3000 Idler Unit VXP0329	£1.10
Back Tension Bands	From £1.50
All Panasonic Maintenance Kits	POA

QUOTE PANASONIC PART No. FOR PARTS NOT LISTED

SANYO

Idler VHR1100,1300,1500	£5.50
Idler VHR2100,2300,2500,2700	£5.50
Reel Drive Pulley Unit VTC5000,5150,6500	£5.00
Idler Roller Assembly VTC5000,5150,6500	£2.25

SHARP

Idler VC9300,9500 etc.	£1.75
Idler VC481,581 etc.	£1.95
Idler (original) VC9300,481,581 etc.	£3.50
Idler Assembly (original) VC651,681,685	£6.50
Idler Assembly (original) VC780,781,785,787, 793,VCT72	£6.50

AMSTRAD

4500,4600 MOD KIT INCLUDES PINCH ROLLER AND IDLER CLUTCH	£5.00
Limiter Post Assembly	£1.80

Makes & Models: Hinari VXL4, Matsui VX730,735,735A,755,770, 800A,810,820,880,990. Saisho VR1100,1200,1200HQ,1600,2500, 3200,3300,3300X,3500, 3600,3700

IDLERS FOR AKAI, SAMSUNG, MITSUBISHI, NEC, ETC. IN STOCK

REMOTE CONTROLS

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New Additions

Universal Remote Control	£25.00
Sony type RC670, RM670, RM673	£15.50
Sony type RC661, RM652, RM654, RM657, RM663, RM664, RM651	£15.50
Panasonic Models TC2110, 2255, 2655, 2680, TX1752, 2251, 2656, 5500	£14.50
Panasonic Models TC1632, 1642, 2232, TX2034, 2044, 2200, 2234, 2244, 2636, 3300	£14.50

TV ON/OFF SWITCHES

ITT, Philips, Decca, Thorn, Fidelity, Grundig, Sony and Hitachi. State model for price.

PINCH ROLLERS

A range of Pinch Rollers is in stock, most of them @ £2.80. Makes include Akai, Amstrad, Ferguson, Fisher, Funai, GEC, Goldstar, Grundig, Hinari, Hitachi, ITT, JVC, Marantz, Mitsubishi, NEC, Nordmende, Orion, Panasonic, Philips, Samsung, Sanyo, Schneider, Sharp, Sony, Tensai, Thomson, Toshiba etc. Please state model and make.

Philips Pinch Roller for models VR6180, 6185, 6285, 6362, 6367, 6467, 6468, 6470, 6561, 6670, 6760, 6761, 6870 ..... £6.90

OTHER SPARES

Universal Video Copying Kit	£4.25
Universal Copying Kit (Scart)	£5.20
Universal Camcorder Kit	£6.90
Video Cassette Lamps from	£0.50
CRT Anode Caps	£0.60
Video Tape Splicing Kit	£6.95
Hitachi TV Frame Module HM6251	£5.50
Hitachi TV Frame Module HM6232	£5.50
Cassette Housing Assembly Ferguson 3V35,36,38,39,42,43,44	£25.25
Cassette Loading Roller Assembly 3V23,3V31, 3V32	£3.50
Philips 1.2V Back up Battery	£1.75
Philips 2.4V Back up Battery	£2.80
5.5V Back Up Cap	£1.85
Degaussing Positor Blue	£1.55
Degaussing Positor White	£1.30
Cassette Housing Assembly Hitachi VT11	£19.50
End Sensor for Hitachi VT63,64,65 (Pair)	£2.75
Cassette LED Sensor for Panasonic etc	£1.60
I.C. Circuit Protectors	£0.60
Clear Service Cassette	£5.90
Push Button Unit Thorn TX90	£12.75
Matsui/Saisho Limiter Post	£1.75
Cassette Housing Modification Kit for Sharp VCA113HM Series. Includes cassette switch and star sensor PCB. Fault, symptom No eject & intermittent load/unload	£6.50

Cassette Housing assemblies for Philips available.

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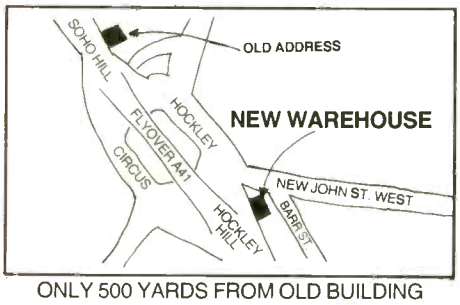

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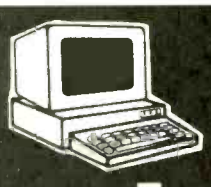

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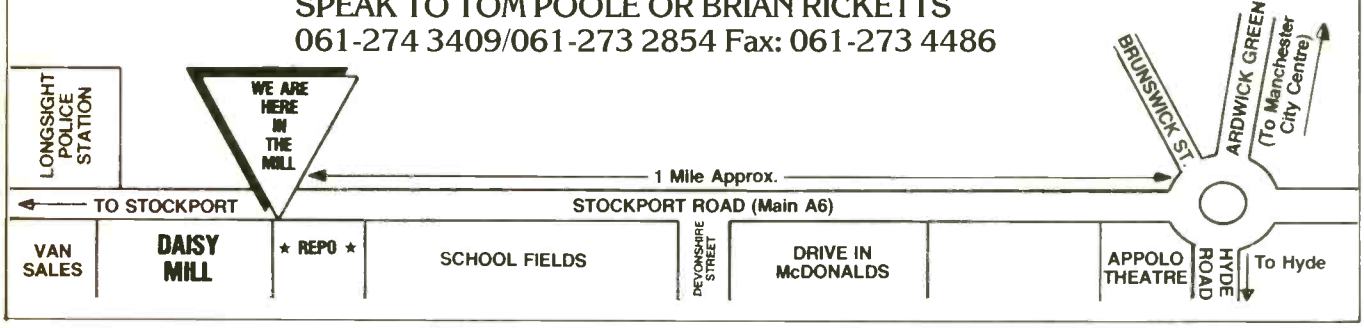

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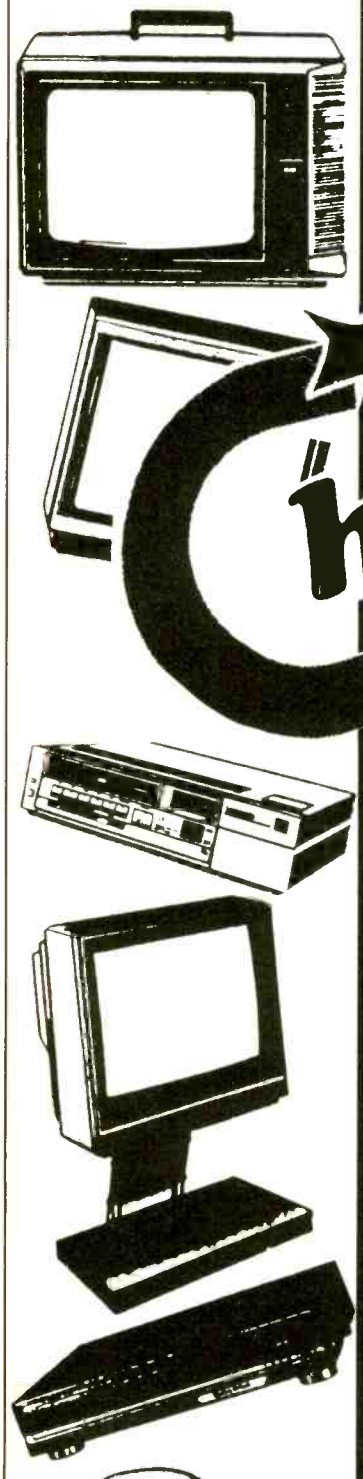

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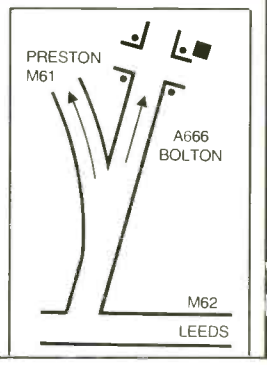

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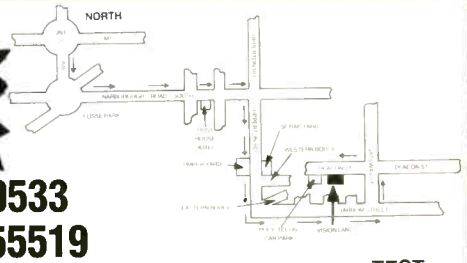

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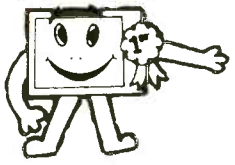

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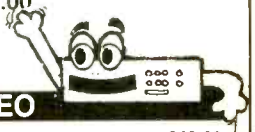

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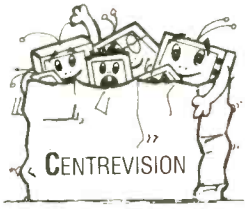

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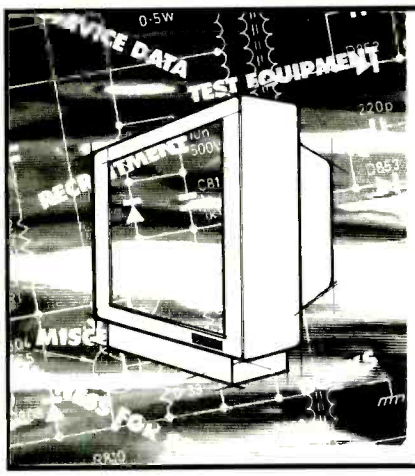

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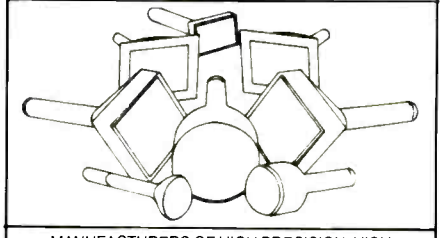

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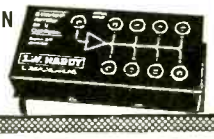

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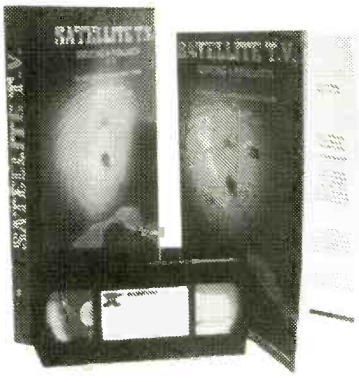

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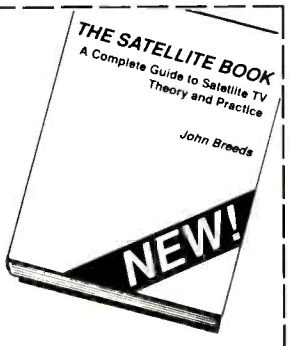

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GP20G	5p
GRP84G (TX10)	30p
XK 3102	50p
BYV 28/200	20p
Bridge TX10 800/3 amps	30p
KBPC3502 Bridge	£1.50
Bridge Rec. D35B10	40p

International Rectifier EHT Diodes G7/H/J/34 6KV		3 for 8p
6A/600V Stud Diodes	20p	
6A/1000V Stud Diodes	20p	

K35 Decoder	£8.00
K35 Sound OP	£4.00
Thick Film Daughter KT3 3122-127-43891	£3.00
12 C.H. K30 Tex Rec Front Panel with I.C.	£5.00
K35 IF	£5.00

Plug In

K4 Focus Pot	£1.00

Fidelity Tube Base with transitor & focus pot	£1.50
Bush Tube Base on panel	£1.00
TX10 Tube Base on Panel	£3.00
1100 L.O.P.T. Green Spot	
TX100 Thorn	

Line Transformers

G8 Lopt	£5.00
G9 Lopt	£4.00
6 Diode Tripler, Mullard	75p
Line O.P. Trans. Mono T.X. 12"-14"	
Philips G8	
27482	£10.00
4822	£10.00
10273	£10.00
Thorn 1690 LOPT	£7.50
2 J/Pots 3,500 1 off each type	£3.00
G8 Trans. Philips	£7.00
G11 Split Diode	£12.00
CVC820 Split Diode ITT	£10.00
Thorn B/W AD5308F + Stik + Lead	£1.50
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GEC 2110	£7.00
Mullard AT 2036	£1.50
Pye 169 Line Trans	£3.00
Pye mono	£3.00
Rank mono T704A	£3.50
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Rank L.O.P.T. Z970	£3.00
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CVC825 Split Diode	£10.00
CVC 45	£5.00
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GEC Portable G10T2046	£3.00
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3500 L.O.P.T. & HT Trans	each £2.00
LOPT Rank Z763	£5.00

Universal Tripler

with small focus pot. Green type £7.00

Black Triplers

KT3 Triplers	£6.00
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11 TGA	£2.00
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Rank 11TCP A823	£3.50
TU 25 30K Rank	£3.00
11 TEZ Rank	£3.00
G9 Philips	£4.00
GEC 2110	£4.00
3500 Thorn	£3.00
8500 Thorn	£4.00
9000 Thorn	£7.00
9500 Thorn	£4.50
9600 Thorn	£4.00
2040 GEC	£3.50
GEC TVM25 Tripler	£2.00
Universal Tripler	£5.00
G8 Tripler	£5.00
CVC20-32	£5.00
Decca 80/100	£4.50
Grundig TVK 52	£2.50
11TBQ Pye 731	£3.00
11THY	£4.00
D22 for Pye 18" colour portable	£4.00
LP 1193/63	£4.00
BG 100/41	£3.25
ERO Tripler print type with fuses PO7	
BG2087	£5.00
Ttext ultrasonic rec'r panel	£14.00
12-14V. 20 for £5.00 200 for £25.00	
GEC 8 touch unit assy complete with all I.C's + pots	£4.00
G11 E.W. Transformer	50p
G11 E.W. coils	£1.00
G11 Transient Suppressors 245V	20p
G11 Scan Coils	£5.00
G11 100K tuner pots 12 for	£1.00
KT3 IF panel	£6.00
KT3 line OSC transformer	£1.00
KT/VK30 infra-red receiver head	£1.00
K30 drawer unit with IC's (home)	£10.00
K30 drawer unit with IC's (export)	£10.00
KT3 AE Sockets	50p
KT3 receiver panel	£8.00
KT3 line driver transformer	50p
Pye, K30, GEC, etc. Pre-mains stand-by switch	£1.00
Decca 80/100 IF panel	£5.00
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5 button touch tuner BBC1/2 ITV1/2 video with ic SAS 560T/570T	£7.00
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G11 8 touch button unit replaces old 6 P.B.U.	£24.00
Tube base + base unit for 820 Euro chassis	£4.00
GEC Line O/P Trans. & Rec Stick for Portable	£3.00
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Voltage Regulators

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+6V/78M06c	£30p
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LM 337	30p
LM 342/18	30p
LM 340T5.0	50p
+12V LM 340T12	50p
+18V/MC78M18	20p
+24V/78M24	£30p
MC 7724cp	40p
MC 7824	40p

TIS 90	10p
TIS 92	20p
TIS 93	20p

U 19885	40p
U 3832	15p
U 3845	15p
MR 500	10p
MR 501	10p
MR 502	10p
BCW 71R	30p
BYF 1202	10p
BYF 1204	10p
BYF 3126	40p
BYF 3214	40p
BYX 10	10p
BYX 36/600	35p
BYX 38/300	25p
BYX 39/600R	75p
BYX 55/350	10p
BYX 55/600 (Bead)	10p
BYX 71/350	20p
BYX 71/600	50p
BYX 72/300	20p
BYX 36/600	50p
BYV 95B	10p
BYV 95C	12p
BYV 96D	10p
BYZ 106	10p
BPW 41	15p
BYW 56 2A/1000v G11	8p
BYW 29/50	15p
BYW 95C	10p
BZU 15/24	54p
BZY 93c75	50p
BZW 15/18	30p
BZW 15/30	30p
BZW 70dtw2	10p
BZW 79.3v	10p

Bush Thyristor RCA 76122	£1.00
Transformer 240v/20v-500Ma Chassis type Transformer	75p
240v/12 Volts 500ma/a	75p
CVC 20 tube base	£2.00
Tube Base Rank & G11	£1.20

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KBL 02	30p
KBP04	30p
W02	15p
W04	15p
W05	20p
800V Bridges 2½ Amp	30p

G11 Drawer ASS 3 pots Mains Switch and Lead	£2.00
K30 Drawer Ass with pots cable formie	£1.00
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Radio Telescopic Aerial	£1.00
Philips Silicon Grease	£1.50 each
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Contact Cleaner Philips	£1.50 each
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Flat Red LED and Green	5p
500gm 60/40 Solder reel	£6.00
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K30 Thermistor 2322/6298009	75p
De-solder Pump	£2.50
Portasol Flameless Gas Soldering Iron	£16.00
Green and Red LED pack mixed	100 for £1.00
Hill Meter Leads, S/Rubber and Probes	£4.00

CV 8617	10p
Y 716	10p
Y 729	30p
Y 730	10p
Y 827; 6A/1KV	20p
Y 860	30p
Y 933	5p
Y 969	50p
Y 997	30p
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R 1038	40p
R 1039	40p
R 2009	80p
R 2010G	£1.00
R 2029	50p
R 2210	60p
R 2257	60p
R 2265	50p
R 2305	50p
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R 2322/2323	pair 80p
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R 2396	50p
R 2461	80p
R 2030	50p
R 2433=BD124	30p
R 2540	£2.00
R 2737	40p
R 2738=TIP41	30p
R 2775=TIP41c	40p
R 3129=TIP47	40p
T 6068V	50p
R 4050	£1.00
S 2008b	80p
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2SC1942	£1.00

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STR6020	Kit £6.00
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2SC940	£1.00
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BU 124	50p
BU 126	80p
BU 180a	65p
BU 204	60p
BU 205	75p
BU 206	£1.00
BU 207	£1.00
BU 208	80p
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BU 208D	90p
BU 222	£1.00
BU 326	£1.00
BU 407	60p
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BUW 11	50p
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BYW 20-08-9	£1.00
BYW 95	10p
BUX 39 25A-150V	£1.00
BUX 84	50p
BUX 85	50p
BUY 49	20p
TIC 106a	30p
TIC 116m	30p
TIC 116n/Y 1003	30p
TIC 126N	30p
TIC 225S	30p
TIC 226E	30p
TIC 226m	30p
TIC 230m	30p
TAG 226/600	30p
TICV 106D (TI92 case 2A/400V)	10p
TIP 29	25p
TIP 30	25p
TIP 30A	25p
TIP 30B	25p
TIP 30C	25p
TIP 31	25p
TIP 32	25p
TIP 33B	50p
TIP 33C	70p
TIP 34A	50p
TIP 34B	60p
TIP 34C	70p
TIP 35B	50p
TIP 35C	70p
TIP 35D	80p
TIP 36	50p
TIP 36C	70p
TIP 41	15p
TIP 41B	40p
TIP 41D	70p
TIP 42	10p
TIP 42/BRC 6109	10p
TIP 48	40p
TIP 49	30p
TIP 57	30p
TIP 100	30p
TIP 102	30p
TIP 110	20p
TIP 115	50p
TIP 117	50p
TIP 125	35p
TIP 126	40p
TIP 127	40p
TIP 130	30p
TIP 131	6p
TIP 136	30p
TIP 140	50p
TIP 142	80p
TIP 640	50p
TIP 2955	35p
TIP L761A-1000V/4Amp	75p
T6032	30p
T6036	40p
T6040	40p
T6047	40p
T6049	40p
T6051	40p

Philips Handset IC	£3.00
SAA3010P	£3.00
MAB8361WO63	£3.00
MAB 8420P-C031	£3.00
MAB 8400B-6	£3.00
MAB 8440P-D070	£3.00
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MAB 8441P-T001	£3.00
MAB 8441P-T132	£2.00
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ITT 8 and 6 Push Button	£1.00
Pye 725 LOPTs	£6.00
Pye 731 LOPTs	£6.00
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CMC 301 front panel	£5.00
CMC 303 front panel	£5.00
CMC 302 Panel with TC mains switch etc	£5.00
CMD 800 Decoder	£8.00
C7 Hand Set	£6.00
3 I.C. Power Supply G11 Full Remote Receiver Panel	£3.00
Meters Hills 520	£17.00
Meters Hills 420	£10.00
Hills HD5000 Digital Meter 1000V DC 750AC 10 Amp 20 MEG Rangers	£28.00
HT100 Multimeter	£6.75
HT300 Multimeter	£7.75
HT500 Multimeter	£9.00
HT700	£15.00
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HD1200 Low Cost Digital	£13.00
HD2500	£18.00
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Works at 24 feet — Sound repeater.
Works off 9 volt battery £8.00
Fits in top pocket.

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Repaired Handsets

Philips K4-K35, RC5350-RC5300, RC5370, RC5375, repaired same day £10.00

RC4000 Full Remote KT3 K30 Teletext Handsets exchanged £15.00

GEC Full Remote Infra-red, 1983 models £15.00

TOSHIBA HAND SETS

CT9185 CT9176 CT9133 CT938
CT995 CT9144 CT9185 CT9193
CT9383 CT9384 £4.00 each

Rediffusion MK3	£5.00

TOSHIBA HAND SETS

24 Button CT938 Fullremote	£5.00
32 Button CT983 Videotext	£6.00

THORN

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Large type ITT TV and V.C.R. Handset	£15.00
GEC Ultrasonic 8CH Full Remote	£10.00
G11 Full Remote Ultrasonic	£10.00
G11 Ultrasonic Teletext Handset	£10.00
8 CH. Ultrasonic GEC Full Remote C20141/C22191	£15.00
New Replacement for G11 Ultrasonic Full Remote	£12.00
Thorn 4000 insert with 7 buttons	£5.00
Decca RC 11	£14.00
Decca RC 12	£14.00
G11 Infra-red full teletext	£20.00
Dynatron-Full remote CTV 62, 63, 64	£19.00
Hitachi infra red handset	£18.00
Philips full remote KT3, 16C928/20C934; 7228/7324; K12 26C 797/1ST 66K 1826	£12.00
GEC infra red full remote 8 channel (I.C SAA1250)	£14.00
Philips infra red full remote 9 channel for 60 CP2605	£6.00
Philips infra red full remote 12 channel for 60 CP2605	£12.00
K35	
KT3/K30 T/Text	£12.50
KT3/K30 Full remote	£15.00
KT3 Power supply	£4.00
GEC infra-red 2236-202e	£4.00
GEC 8 button full remote	£14.00
GEC push pad handset button blobs 10p each	

Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5171-RC5177.

Special Price	£13.00
RC4000 KT3 and Teletex	£14.00
IT CVC 32 handset repaired	£15.00
CVC 32 Hand Set	£15.00
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TX9 & TX10 button print	£2.00
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ITT

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KT3 — K45

We have all parts for Philips Handsets

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Replace Hand Set for
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PHILIPS

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Min. UHF Tuner 40dB gain 2" x 1½" x 1½	£1.50
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GEC 2110 V/Cap	£5.00
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ELC2003	£4.00
GEC Tuner V/Cap Hitachi After 1979 ET548, ET547, ET541B	£8.00
ET546	£6.00
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VHF/UHF EG522F	£6.00
ASTEC UM1183	£10.00
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V334	£4.00
U321	£6.00
U322	£8.00
U341 UHF	£6.00
U342 (UHF)	£5.00
U343 Phono	£5.00
U343C	£6.00
U344C	£10.00
U411 UHF	£4.00
UVF10	£8.00
U.V. 411 Tuner	£8.00
U.V. 412	£8.00
U.V. 417	£5.00
U.V. 617	£6.00
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HITACHI 20 Turn Pot	40p
U321 on panel	£6.00
Tuner unit VHS Sylvania GTR Videon	
MTS 900	£2.50
Mullard Video Modulator. Application. video tape recorders. TV cameras, video games, closed circuit TV, C.C.T.V. system. Data supplied	£10.00
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T85 250v AC mains filter 0.1 + (03x2) HF leader & earth clip	25p
NEW U321 Mullard	£4.00

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The Sweep Tuning System	
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GEC & Philips	5p
Mullard 5 Watt Amps. LPH162 New	75p

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SW453	50P	SW153A	50P
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HW2013	50P	SW173	50P
RW303	50P	FI035B	50P
SY2153	50P	FI045A	50P

BF694	10p
BF758	30p
BF760	30p
BFT34	15p
BFT43	10p
BFT84	8p
BFW11	20p
BFX29	30p
BFX84	25p
BFY50	15p
BFY52	20p
BFY90	25p
BLY49	25p
BPW41	25p
BRC116	25p
BRX43	15p
BRX48X	10p
BRY56	30p
BSS68	10p
BSY79	10p
BSY95a	10p
BTY98	20p
BSX19	17p
BSX20	17p
FT3055	30p
TCE62	30p
TCE520	30p
2N930	5p
2N2221	8p
2N2222	8p
2N2906	10p
2N3055	40p
2N3566	10p
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2N5278	20p
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2SA437	20p
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2SB686	75p
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2SC1061	30p
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2SC2229	15p
2SC2688	20p

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2SC3973B	30p
2SC7350	15p
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2SD200	£2.00
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2SD716	£1.00
2SD787	30p
2SD789	30p
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2SD868	75p
2SD880	30p
2SD1264	£1.00
2SD1266	£1.00
2SD1415	£1.00
2SD1427	£1.00
2SD1432	£1.00
2SD1576	£1.00
2SD1577	£2.00
2SD1878	£1.00
2SK30A	10p
BC107	10p
BC108	10p
BC109	5p
BC113	10p
BC114	10p
BC115	10p
BC116	10p
BC117	20p
BC119	20p
BC125	10p
BC126	10p
BC139	10p
BC140	30p
BC141	25p
BC143	25p
BC147	10p
BC148	10p
BC149	10p
BC153	10p
BC154	10p
BC157a	10p
BC158	10p
BC159	10p
BC160/16	25p
BC171	5p
BC172	5p
BC173	5p
BC174	5p
BC183	5p
BC184	5p
BC204	5p
BC207	5p
BC212	5p
BC213	5p
BC214	5p
BC237	5p
BC238	5p
BC239	5p
BC250	5p
BC251	5p
BC252	5p
BC262	10p
BC263b	20p
BC294	30p
BC298	10p
BC300	30p
BC301	30p
BC303	30p
BC307	7p
BC308	7p
BC309	10p
BC327	10p
BC328	10p
BC328/338 pair	15p
BC337	10p
BC338	10p
BC347	10p
BC349b	10p
BC350	20p
BC365	10p

BC368	10p
BC369	10p
BC384	10p
BC394	10p
BC413	10p
BC414	10p
BC416	10p
BC440	30p
BC454	10p
BC455	10p
BC456	10p
BC460	25p
BC462	10p
BC463	10p
BC478	10p
BC527	10p
BC532	10p
BC546	10p
BC547	10p
BC548	10p
BC556	10p
BC557	10p
BC558	10p
BC559	10p
BC635	10p
BC636	10p
BCX31	25p
BCX32	25p
BD116	25p
BD124	30p
BD124 (metal)	30p
BD130Y	25p
BD131	30p
BD132/238	30p
BD135	25p
BD136	30p
BD138	30p
BD140	30p
BD176	25p
BD182	£1.00
BD183	70p
BD202	30p
BD204	30p
BD207	60p
BD221	20p
BD222	30p
BD228	30p
BD226	20p
BD233	30p
BD234	25p
BD235	30p
BD238	30p
BD239	15p
BD240	50p
BD243C	30p
BD244	50p
BD250a	30p
BD252	20p
BD253B	50p
BD331	20p
BD373b	20p
BD416	25p
BD433	25p
BD437	25p
BD438	30p
BD439	30p
BD544D	40p
BD650	50p
BD678	30p
BD681	30p
BD682	30p
BD507	50p
BD508	30p
BD509	30p
BD517	30p
BD519	30p
BD534	30p
BD535	30p
BD544D	30p
BD562	30p
BD610	40p

BD646	50p
BD676A	30p
BDM17	20p
BD826	50p
BD933	30p
BD939	30p
BD948	30p
BDT31A	50p
BDX75	20p
BDV64B	50p
BDU65	50p
BF761	30p
BF769	30p
BF788	20p
BFR19A	30p
BF858	30p
BF869	30p
BFR71	30p
BFR52	7p
BFR81	15p
BFS60	10p
BFT42	20p
BFT57	20p
BFW13	30p
BFX85 400V. lamp	30p
BSD215	50p
MR1366	20p
AN6350	£2.00
BRC-M-200	40p
BRC-M-300	50p
BRC 1693	£1.00
BRC 3064	£1.00
BTT822	£1.00
BTT6016	£1.20
BTT6018/ML237B	£1.50
BTT6218	£1.50
BTT8124	£1.00
BTT8224	£1.00
BUJ922A	£1.00
CA270AE	50p
CA270CW	50p
CA270CE	50p
CA920AE	£1.00
CA1310	50p
CA3046	50p
CA3065Q	50p
CA3094AE	50p
CA3123	40p
CA3146	£1.00
CA3189	40p
CBF16848	50p
CD4510	30p
CD4555BE	30p
DM7492	50p
HA1124A	40p
HA1196	40p
HA1370	£2.00
HA1377	£3.00
HA11223	40p
HA11423	£1.00
HA11440	50p
HA11484	£3.00
HA11485 Ant	£1.00
HA17458	50p
HEF4001	10p
HEF45108	25p
HEF4011AF	30p
HEF4013B	30p
HEF4066BP	20p
HEF4528	20p
HD3800C	£3.00
K571D 100102	£1.00
LA3220	50p
LA4102	£1.00
LA4261	£1.00
LA7830	£2.00
LA7831	£2.00
LM1111N	£1.00
LM1017N	25p
LM8361	£3.00
PCF8571P	£5.00
M913	£2.00
M1024=SAA	£2.00
M1025=SAA	£2.00
M5840A-84RS	£3.00
MC476p	£1.00
MC1307	75p
MC1312	
MC1330 GN76530	£1.00
MC1352	£1.00
MC1358	£1.00
MC1496	50p
MC14002	15p
MC14013	25p
MC14016	25p
MC14066	30p
MC14514	50p
MC1748	80p
MEM4956	£1.00
ML231	£2.50
ETT6016	£2.00
ML232	£1.00
ML236E	£1.00
ML237B	£1.00
ML238B	£4.00
ML239	£2.00

Thyristors

Philips Kits OT121	50p
IR106A	30p
BT151/500	30p
IR106 Plastic	30p
IR106 Metal	£1.20
BT119	£1.00
BT120	£1.00
BRC4443	75p
GET Thyristor	60p
Deeco 8H100	60p
2N4444	£1.00
MCR72-6	25p
OT122	£1.00
TI320M	£1.00
IR3441	£2.00
17052	£2.00
17088H	£2.00
17089R	£2.00
17053R	£2.00
SP2M	50p
RCA Line Thyristor	
CQ2040T	£2.00
CQ2040R	£2.00

Thermistors

PTH8G180M	75p
GS Degaussing	35p
Philip type VA1104	70p
FTP2Z6A12	15p
PTH451AOR	15p
PTVP Pts Pve & PT34	20p
Degaussing Thermistor (fits most sets)	20p
PCS 100 Philips	50p
PDS 400 Philips	50p

THORN	
ML926	£1.00
MAB8400B-C	£2.00
MAB8440P-D070	£2.00
MAB8441 PT001	£3.00
MAB8420PC035	£2.00
MAB8422P-Q005	£2.00
MAB8440P	£2.00
MAR8401XX	£3.00
M70LB1	£2.00
MM5387	£1.00
MM5611	£1.00
MM5840	£3.00
PCD8571P	£3.00
K35 Philips Receiver IC	
MA1250 BJC	£3.00
M491BB1	£3.00
MS8401-84RS	£5.00
MM5290N-4	75p
MM5340BN	£4.00
MN650	£1.00
MN1250BJC	£2.00
MR1366	20p
N6410D	£1.00
NE555P	60p
NE555	60p
NE556	50p
NE646	50p
HD38980C	£3.00
LL-1	20p
OPT600	20p
OPT601	20p
PH2369	10p
PCD8571P	50p
PCD8572P	£2.00
SAA611	£1.00
SAA661	£1.75
SAA1021	£4.00
SAA1024	£2.50
SAA1073	£3.00
SAA1074	£3.00
SAA1075	£3.00
SAA1121	£2.00
SAA1130	£2.50
SAA1174	£3.00
SAA1176	£2.00
SAA1250	£3.00
SAA1251	£4.00
SAA1272	£3.00
SAA1274	£3.00
SAA1276	£3.00
SAA1292	£10.00
SAA1293	£3.00
SAA3027P	£4.00
SAA5000A	£1.50
SAB3013	£2.00
SAB3037	£2.00
SAB3205	£3.00
SAB3210	£2.00
SAB4209	£2.00
TBO0124	£1.00
SAA3088P	£3.00
SAA5000A	£2.00
SAA5010	£2.20
SAA5012A	£5.00
SAA5020	£3.50
SAA5025D	£3.00
SAA5030	£4.50
SAA5040	£2.00
SAA5040A	£3.00
SAA5042A	£3.00
SAA5043	£4.00
SAA5050	£4.50
SAA5051	£2.00
SAA5052	£2.00
SAA5053	£2.00
SAA5240	£5.00
SAA5241 P/A TEX IC	£5.00
SAF1032p	£2.50
SAF1039	£2.00
SAS570H	75p
SAS660	£1.00
SAS670	£1.00
SAS580	75p
SAS590	75p
SAS5210	£2.00
SL437F	£4.00
SL471	50p
SL480	£1.00
SL901B	£4.50
SL971B	£3.00
SL918	£4.50
SL1430	£1.00
STK4793	£3.00
STK5471	£3.00
STR58041	£5.00
TA7122	£1.15
TAA320A	50p
TAA470	£1.50
TAA570	75p
TAA611B	£1.00
TAA621	£2.00
TA7108P	£1.00
TA7117	50p
TA7120P	50p
TA7315AP	50p
TA7137P	50p
TA7193AP	£3.00
TA7241AP	£3.00
TA7265	£3.00
TA7609P	50p
TA7227P	£1.00p
TA7265AP	£3.00
TA7045AP	£3.75
TA7688AP	£3.00
TA7750P	50p
TBA120A	40p
TBA120AS	50p
TBA120SA	40p
TBA120B	40p
TBA120SB	50p
TBA120U	50p
TBA120SQ	£1.00
TBA120U	75p
TBA120Q	30p
TBA120C	40p
TBA1440	£1.00
TBA1441	£2.00
TBA231	75p
TBA395Q	50p
TBA396Q	£1.00
TBA396	75p
TBA440P	£1.00
TBA1440C	£1.00
TBA480Q	£1.00
TBA520	£2.00
TBA530	£2.00
TBA540	£1.00
TBA560CQ	£1.00
TBA570	£1.50

TV Crystals

4MHz	
4.433-619	
6MHz	
8.867238	
11.059.000	
Large or small	50p each
Antistatic Isolators	
Disc Type Black	10p

Filters

CSA 3.97M		15p
6MEG	CDA	25p
6MHz	SFE	12p
SFE 5.5MHz		20p
SFD460B		15p
CSB455A		15p

TBA625	50p
TBA651	£2.00
TBA673	£1.00
TBA750Q	£2.50
TBA780	£1.50
TBA800	50p
TBA810AP	60p
TBA810S	60p
TBA820	60p
TBA820M	25p
TBA920	£1.50
TBA920Q	£1.50
TBA990Q	£1.00
TMS1000NL	£2.00
TMS1943 N2L (clockchip)	£1.00
TMS9980	£4.00
TMS9901	£1.00
TMS2708JG45	45p
TMS2716JL	£1.00
TMS3539	£1.00
TMS3720ANS	£3.00
TMS4014	70p
TX-012	£1.00
TMS9902	£1.20
ULN2004P	£1.50
ULN2216	75p
UPC566H	£1.00
UPC585C	£1.00
UPC1008C	£2.00
UPC1031H	£2.00
UPC1353C	£1.00
UPC1363C	£2.75
UPC1364C	£2.00
UPC1365C	£2.00
UPC1366C	£1.00
UPC1378H	£2.00
UPC1514C	£3.00
UPC2002	35p
UPD1943G	£2.00
UPD8049HC	£2.00
SN2848	50p
SN2970BN	£2.00
SN2977BN	£2.00
SN2977ZN	£2.00
SN7600J	£1.00
SN7601JND	£2.00
SN7610	£1.00
SN7610N	£1.00
SN7615AN	50p
SN7631	50p
SN7641N	£1.00
SN7622o	£1.00
SN7622N	£1.00
SN7628N	£1.00
SN7670	£1.00
SN76532N	£1.00
SN76545N	£3.00
SN7646	£3.00
SN7650	30p
SN7652	30p
SN7670	£1.00
SN7672o	50p
SN7672N	40p
SN7672OAN	50p
SN7676o	£1.00
SN7676N	£1.00
SN7677N	75p
SN7678AN	75p
SN7679o	£1.00
SN7679N	£2.00
UA783P3C	40p
BT100A302	40p
BT138/10A	70p
BT146	50p
TBA540Q	£1.50
TCA270	£3.00
TCA270Q	£3.00
TCA270S	£1.00
TCA270SQ	£1.00
TCA740	£1.00
TCA800	£1.50
TCA830	£1.00
TCA940	£1.00
TCEP100	£1.00
TCE120CQ	£1.00
TCE520	30p
TD6306P	£3.00
TDEA440Q	50p
TDA1003A	£1.00
TDA1010	£1.00
TDA1013	£1.00
TDA1012	£1.00
TDA1013A	£1.00
TDA1060A	£1.50
TDA1035SB	£1.00
TDA1072	£1.00
TDA1150	50p
TDA1151	30p
TDA1154	50p
TDA1170S	£1.00
TDA1180	£2.00
TDA1190	£1.00
TDA1200	75p
TDA1270	£1.50
TDA1327A	69p
TDA1365	£3.00
TDA1512	£2.00
TDA1540P	£3.00
TDA1670A	£2.00
TDA1908A	£1.00
TDA2002	£1.00
TDA2003	25p
TDA2004	£2.00
TDA2008	£2.00
TDA2010	£1.00
TDA2020	£1.00
TDA2030	£2.00
TDA2140	£3.50
TDA2160	£1.00
TDA2320	50p
TDA2545A	£1.00
TDA2611	£3.00
TDA2640	£2.00
TDA2522	£5.00
TDA2530	£1.50
TDA2532	£1.00
TDA2540	80p
TDA2541	£1.00
TDA2542	£1.00
TDA2545	£2.00
TDA2546	£2.00
TDA2556	£1.00
TDA2560	75p
TDA3565	£3.00
TDA2575A	£1.00

TDA2577A	£2.00
TDA2578A	£2.00
TDA2579A	£2.00
TDA2581	£2.00
TDA2591	£1.00
TDA2593	£3.00
TDA2560	50p
TDA2556	£1.50
TDA2600	£3.00
TDA2611A	£1.00
TDA2611AQ	£1.00
TDA3651A	£1.00
TDA3652	£2.50
TDA2653	£4.00
TDA2640	£2.00
TDA2593	£1.00
TDA3047	£1.00
TDA3048	£3.00
TDA3083	£2.00
TDA3180	£1.00
TDA3300B	£5.00
TDA3301	£3.00
TDA3505	£3.00
TDA3506	£3.00
TDA3561	£3.00
TDA3560	£4.00
TDA3561A	£3.00
TDA3662ZA	£3.00
TDA3566	£3.50
TDA3564	£4.00
TDA3565	£3.00
TDA3571A	£2.75
TDA3581	£3.00
TDA3590	£3.00
TDA3591	£4.00
TDA3592A	£3.00
TDA3650	£7.00
TDA3651	£3.00
TDA3651AQ	£3.50
TDA3652	£3.50
TDA3653AQ	£2.00
TDA3654	£2.00
TDA3654Q	£2.00
TDA3710	£3.50
TDA3810	£4.00
TDA3180	£2.00
TDA4260	50p
TDA4501	£3.00
TDA4505N4	£3.00
TDA4420	£2.00
TDA4600/2D Dil	£1.00
TDA4600-2 Flat	£3.00
TDA4601	£2.00
TDA8190	£3.00
TDA9003	£1.50
TDA9503	£3.00
TDB2033	£1.00
TDD1610S	50p
TD6306P	£2.00
TDA1060	£3.00
TEA1009	50p
TEA1039	£2.00
TEA1060	£2.00
TEA2017	£2.00
TEA5114	£1.00
TDA3300B	£6.00
SIL4516	50p
SN16861NG	50p
SN16862AN	£1.00
SN16964AN	50p
SN29764AN	£1.00
UA721	40p
UA7800	40p
MPS43A	25p
MJ13005	30p
MJE5IT	25p
MJE340	28p
MJE660	25p
MJE661	25p
MJE3055	£1.00
MJE2901	30p
MJE2955	50p
MJE13005	50p
Sanikon Diode	30p

Transistors

A1222	25p	BF181	20p
A1223	25p	BF182	20p
AC106	25p	BF184	20p
AC121	25p	BF194	10p
AC124	25p	BF195	10p
AC128	25p	BF196	10p
AC137	25p	BF197	12p
AC151	25p	BF198	10p
AC131	25p	BF199	10p
AC138	25p	BF200	20p
AC152	25p	BF222	10p
AC153K	25p	BF224	15p
AC142K	25p	BF238	20p
AC169	25p	BF240	16p
AC176	25p	BF244	40p
AC178K	25p	BF245b	20p
AC179	25p	BF255	20p
AC186	25p	BF256	20p
AC188	25p	BF257	20p
ACY21	25p	BF258	25p
AD143	50p	BF262	15p
AD149	50p	BF263b	25p
AD161/162 pair	40p	BF264	15p
		BF271	10p
		BF273	30p
AF17A	25p	BF274	10p
AF139	25p	BF324	25p
AF181	£1.00	BF337	50p
AF239	25p	BF355	30p
AF367	25p	BF362	20p
AL102	£1.75	BF363	15p
AU110	£1.50	BF367	15p
BLY49	50p	BF391	15p
BF115	20p	BF394	10p
BF121	20p	BF419	30p
BF127	20p	BF422	15p
BF137	20p	BF423	15p
BF157	20p	BF448	30p
BF160	20p	BF470	30p
BF161	20p	BF471	30p
BF164	60p	BF597T	10p
BF179	20p	BF694	10p
BF180	20p		

Thorn Transformers

DT2076/78	£10.00
90D3485/01B	£10.00
90D4-1064/03	£1.00
90D3484/00B	£5.00
OT204/30	£3.00

I.C.s

MA721PC	£1.00	UPD114LC-2	£1.00
M5043045505P	£1.00	MN1250BJC	£1.00
TD6359P	£1.00	M5041-5505P	£1.00
M5865?P	£1.00	M491BB1	£2.00
PCD8572	£1.00	HA513365	£1.00
HD7418C86P	£1.00		