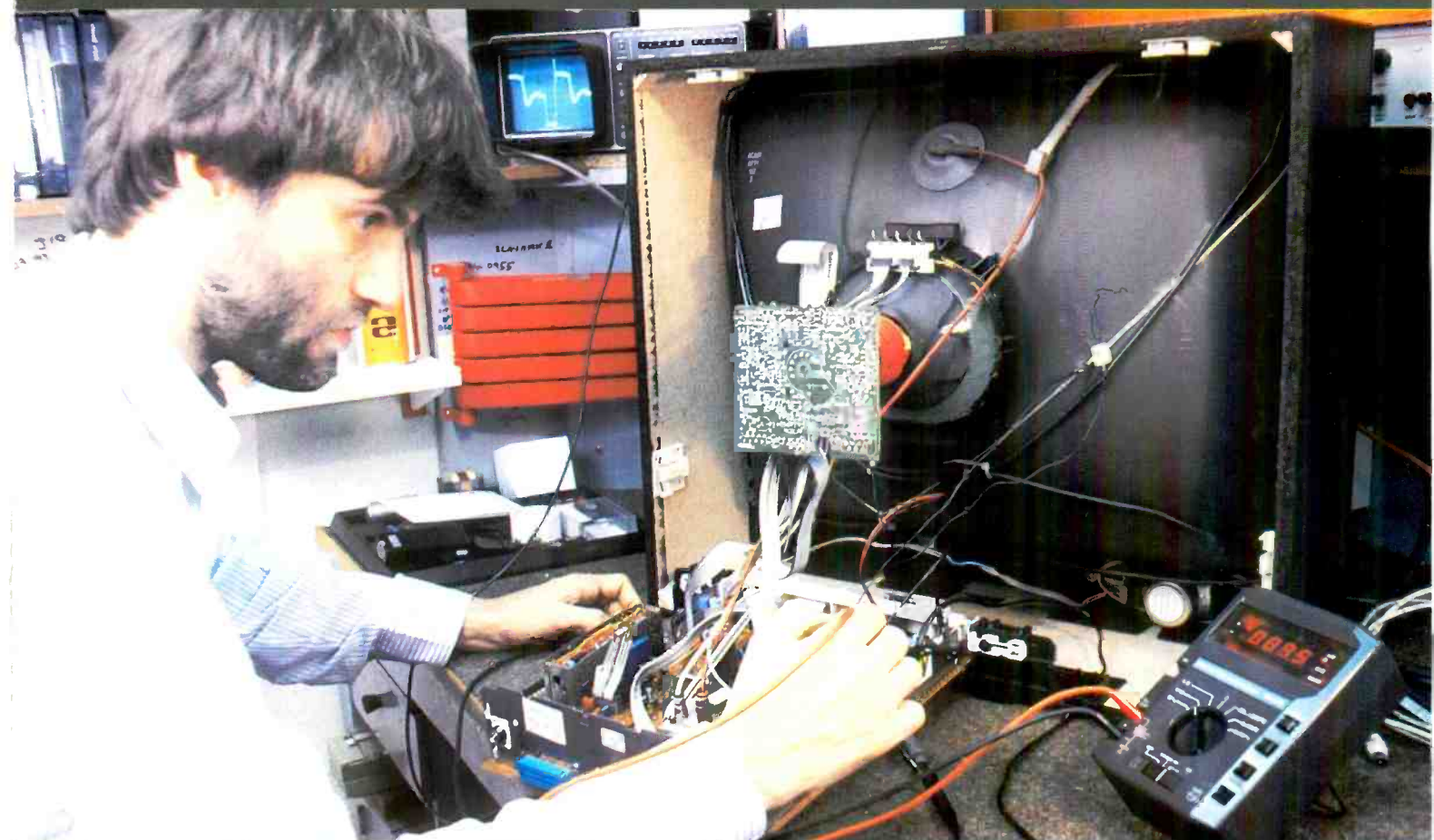


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BC143	20p	BDX45A	20p	TY29	25p	PCF806	80p	AN7254	150p	AN7255	150p	LA3300	140p	NE582P	140p	STK4331	810p	STR50130A	600p	TD6359P	200p	TDA3730	550p
BC147	8p	BDW23	55p	TIP30	25p	PCF806	80p	AN7310	90p	AN7310	90p	LA3350	110p	SA5550	110p	STK4332	410p	STR50131	600p	TD6360P	200p	TDA3740	300p
BC148	8p	BDW39	50p	TIP30C	25p	PCF806	80p	AN7311	90p	AN7311	90p	LA3361	100p	SA5550	110p	STK4332	410p	STR50132	600p	TD6360P	200p	TDA3740	300p
BC151	8p	BDY92	100p	TIP31C	22p	PCF806	80p	AN7312	90p	AN7312	90p	LA3370	300p	SA1010	400p	STK4372	570p	STR52041	650p	TD6360P	200p	TDA3760	470p
BC159	8p	BDY92	100p	TIP31C	22p	PCF806	80p	AY3-1015	800p	AY3-1015	800p	LA4031	140p	SA1024	250p	STK4392	890p	STR50213	600p	TD6360P	200p	TDA3791	600p
BC160	30p	BF137	35p	TIP32	24p	PCF806	80p	AY3-1270	800p	AY3-1270	800p	LA4031	140p	SA1025	250p	STK4392	890p	STR50213	600p	TD6360P	200p	TDA3800A	500p
BC171	10p	BF167	30p	TIP32A	24p	PCF806	80p	AY3-1500	800p	AY3-1500	800p	LA4032	140p	SA1961	400p	STK4773	1100p	STR50343	650p	TD6360P	200p	TDA3810	300p
BC172	10p	BF180	16p	TIP32C	28p	PCF806	80p	AY3-8910	110p	AY3-8910	110p	LA4061	160p	SA1075	350p	STK4793	1100p	STR50441	600p	TD6360P	200p	TDA3810	300p
BC178	14p	BF183	20p	TIP33C	60p	PCF806	80p	BA301	350p	BA301	350p	LA4100	85p	SA1124	200p	STK4803	710p	STR505041	600p	TD6360P	200p	TDA3810	300p
BC179	14p	BF195	7p	TIP34	50p	PCF806	80p	BA311	300p	BA311	300p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC182	14p	BF199	8p	TIP34C	50p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC183	7p	BF225	30p	TIP36C	65p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC183L	7p	BF240	16p	TIP41A	100p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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BC184L	7p	BF245	25p	TIP41C	22p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC212	7p	BF255	12p	TIP42C	22p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC213	7p	BF255	12p	TIP42C	22p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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BC237	7p	BF263	25p	TIP53	120p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC238	7p	BF264	140p	TIP54	140p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC239	7p	BF273	15p	TIP105	65p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC300	20p	BF311	21p	TIP106	65p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC301	20p	BF336	21p	TIP107	65p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC302	20p	BF337	21p	TIP108	65p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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BC304	25p	BF362	30p	TIP112	40p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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BC328	7p	BF374	12p	TIP116	45p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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BC338	7p	BF490	52p	TIP120	37p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC441	28p	BF991	99p	TIP121	40p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC446	8p	BF103	30p	TIP122	47p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC449	15p	BFX29	20p	TIP122	47p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC461	28p	BFX84	20p	TIP126	56p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC477	18p	BFX85	20p	TIP127	56p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC478	18p	BFX85	20p	TIP127	56p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
BC516	22p	BFX88	20p	TIP137	30p	PCF806	80p	BA313	80p	BA313	80p	LA4110	120p	SA1251	280p	STK4833	810p	STR50601	600p	TD6360P	200p	TDA3810	300p
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1423CA 550p	25A1264 280p	25C763 105p	25C1775 20p	25C2429 900p	25C3042 300p	25C3685 450p	25C3685 450p	25D 864 200p	25D 1443 200p	25K 511 450p	6264 10 210p	280BCTC 200p
UPC1470 200p	25A1283 60p	25C783 105p	25C1776 40p	25C2431 100p	25C3043 100p	25C3687 850p	25C3687 850p	25D 866 120p	25D 1444 140p	25K 513 325p	6502 300p	280BCTC 200p
UPC1504C 400p	25A1283 60p	25C792 80p	25C1789 100p	25C2437 1000p	25C3058 1500p	25C3688 750p	25C3688 750p	25D 866 120p	25D 1445 60p	25K 517 750p	6502 300p	280BCTC 200p
UPC1505C 400p	25A1284 60p	25C805 225p	25C1809 40p	25C2440 350p	25C3059 900p	25C3691 150p	25C3691 150p	25D 866 120p	25D 1446 140p	25K 518 500p	6502 300p	280BCTC 200p
UPC 150p	25A1285 60p	25C805A 25p	25C1810 25p	25C2458 40p	25C3060 1100p	25C3693 100p	25C3693 100p	25D 868 450p	25D 1451 280p	25K 524 700p	6502 300p	280BCTC 200p
UPC 200p	25A1290 150p	25C812 55p	25C1812 55p	25C2459 150p	25C3061 1100p	25C3695 120p	25C3695 120p	25D 871 450p	25D 1453 140p	25K 537 900p	6502 300p	280BCTC 200p
UPC 250p	25A1294 450p	25C829 25p	25C1819 140p	25C2461 400p	25C3068 60p	25C3715 120p	25C3715 120p	25D 879 60p	25D 1455 25p	25K 539 1100p	6800 210p	280BCTC 200p
UPC1520CA 250p	25A1295 500p	25C839 25p	25C1826 60p	25C2462 50p	25C3070 120p	25C3717 120p	25C3717 120p	25D 880 40p	25D 1457 220p	25K 555 400p	6802 220p	280BCTC 200p
UPC1536C 550p	25A1299 500p	25C869 120p	25C1827 120p	25C2470 65p	25C3074 200p	25C3719 150p	25C3719 150p	25D 882 100p	25D 1460 250p	25K 556 500p	6803 500p	280BCTC 200p
UPC1536C 550p	25A1302 300p	25C898 275p	25C1832 400p	25C2482 40p	25C3075 150p	25C3729 450p	25C3729 450p	25D 882A 100p	25D 1468 60p	25K 560 600p	6808 500p	280BCTC 200p
UPC1536C 550p	25A1303 400p	25C900 300p	25C1834 50p	25C2483 120p	25C3088 150p	25C3746 120p	25C3746 120p	25D 895 200p	25D 1487 225p	25K 569 650p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1304 110p	25C930 20p	25C1834 50p	25C2484 240p	25C3088 150p	25C3747 120p	25C3747 120p	25D 895 200p	25D 1487 225p	25K 571 300p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1305 320p	25C930 20p	25C1834 50p	25C2484 240p	25C3088 150p	25C3747 120p	25C3747 120p	25D 895 200p	25D 1487 225p	25K 571 300p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1306 280p	25C930 20p	25C1834 50p	25C2484 240p	25C3088 150p	25C3747 120p	25C3747 120p	25D 895 200p	25D 1487 225p	25K 571 300p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1307 160p	25C943 160p	25C1845 20p	25C2495 1900p	25C3099 100p	25C3769 700p	25C3769 700p	25D 900 450p	25D 1494 300p	25K 572 1200p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1309 50p	25C944 140p	25C1846 100p	25C2498 50p	25C3101 750p	25C3771 150p	25C3771 150p	25D 916 130p	25D 1497 350p	25K 575 1200p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1310 215p	25C945 20p	25C1847 120p	25C2500 50p	25C3102 2800p	25C3773 200p	25C3773 200p	25D 921 320p	25D 1507 60p	25K 578 600p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1311 340p	25C945 20p	25C1847 120p	25C2500 50p	25C3102 2800p	25C3773 200p	25C3773 200p	25D 921 320p	25D 1507 60p	25K 578 600p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1312 510p	25C945 20p	25C1847 120p	25C2500 50p	25C3102 2800p	25C3773 200p	25C3773 200p	25D 921 320p	25D 1507 60p	25K 578 600p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1313 30p	25C959 225p	25C1856 50p	25C2509 800p	25C3105 3600p	25C3779 75p	25C3779 75p	25D 923 360p	25D 1509 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1318 30p	25C980 120p	25C1861 400p	25C2516 125p	25C3112 35p	25C3790 120p	25C3790 120p	25D 946 120p	25D 1511 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1321 80p	25C982 60p	25C1865 70p	25C2517 60p	25C3114 40p	25C3795 200p	25C3795 200p	25D 946 120p	25D 1511 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1340 60p	25C982 60p	25C1865 70p	25C2517 60p	25C3114 40p	25C3795 200p	25C3795 200p	25D 946 120p	25D 1511 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1341 2150p	25C982 60p	25C1865 70p	25C2517 60p	25C3114 40p	25C3795 200p	25C3795 200p	25D 946 120p	25D 1511 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1342 1250p	25C982 60p	25C1865 70p	25C2517 60p	25C3114 40p	25C3795 200p	25C3795 200p	25D 946 120p	25D 1511 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1352 300p	25C1000 60p	25C1875 260p	25C2534 150p	25C3122 50p	25C3807 120p	25C3807 120p	25D 951 350p	25D 1541 350p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1353 100p	25C1001 950p	25C1881 200p	25C2535 150p	25C3130 100p	25C3812 200p	25C3812 200p	25D 951 350p	25D 1541 350p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1354 35p	25C1002 225p	25C1904 125p	25C2536 150p	25C3130 100p	25C3813 200p	25C3813 200p	25D 951 350p	25D 1541 350p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1355 100p	25C1010 225p	25C1904 125p	25C2537 150p	25C3130 100p	25C3813 200p	25C3813 200p	25D 951 350p	25D 1541 350p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1356 100p	25C1012 75p	25C1906 30p	25C2540 1900p	25C3149 180p	25C3815 250p	25C3815 250p	25D 970 170p	25D 1566 100p	25K 581 500p	6810 150p	280BCTC 200p
UPC1536C 550p	25A1357 100p	25C1013 175p	25C1907 75p	25C2542 300p	25C3150 200p	25C3815 250p	25C3815 250p	25D 970 170p				

SONY FLYBACK TRANSFORMERS

Part No.	Models	Price
1-439-216-00	KV-2022E 2010E 2200E 2015 1820E 2010SE	£14.00
1-439-256-11	KV-2012ME 2016ME 2015ME 2010ME	£40.00
1-439-286-21	KV-2704EC 2704UB 2704ET 2704EA 2704E	£30.50
1-439-289-21	KV-2215UB 2217UB 2215E1 2215E2 2215E1 2215E2	£40.00
1-439-303-00	KV-2705F 2705FE 2705UB 2705E 2706UB 2720EC	
	KV-2054EC 20P51 20B2ME7 2056EC 2063SA	
	KV-20B2(E)SP1	£22.75
1-439-311-00	KV-1440AEC 1440AS MP2 143003 CPV-14C02	£22.00
	KTX-1350NF KTX-1430UB	£30.50
1-439-332-21	KV-2756 2730CE 2730FE 2764EC 2752UB 2752F	£22.00
1-439-333-00	KV-1882EC 1882UB 1882F 1882CH 1882AEB 1882AM	£30.50
	KV-1882ME3 1882HK 1882AS 16TR1 882C(PS) 1770R	£14.00
1-439-363-21	KV-19HT1A 19FX1M1 18G2 1602M7 1602GE ADM-16B	£22.00
	KV-2092UB 2096GB	

FLYBACK TRANSFORMERS

Model	Price
000-4208-001	TX9
000-4-208-000	TX9
000-4-235-002 01G	TX900
000-4-247-001	TX90
000-4-247-001 HT1	TX90
060-3-093-001	TX100
1110-060-3-087-001	TX100
1110-060-3-084-001	TX100
060-3-088-001	TX100

Model	Price
29201-018-05	£8.00
29201-024-11	£14.00
29201-024-04	£14.00

Model	Price
PS 140-1712	G11
PS 140-10306	G04E
PS 140-10353	G06B
PS 140-10151	K12
PS 140-10283	K30 K30111
PS 140-10246	K40
PS 140-10247	KT4
PS 140-10149	KT2
PS 140-10161	KT3
PS 140-17033	SB
PS 140-17089	G9
PS 140-10328	NC3

Model	Price
CV20	£11.50
CV25	£11.50
CV30	£11.50

Model	Price
CPT 1444	£15.00
CPT 2174 CPT2176	£18.00
CPT 2178	£18.00
HM6251 (REF 2370551)	£5.50
HM6232	£5.50

IDLERS & PULLEYS REPLACEMENTS

Model	Price
VS1-2 VS4-5 VS15	FF-REW IDLER M1327773
VS3 6 12 56 58 59	BV327815
VS1-2 VS4-5 VS15	T-UP IDLER BV327815
VS3 6 12 56 59	BV321979
V8700	IDLER M2369602
VS125 126 155	REEL IDLER PU47752
VS165 240 244 245 247 248 250 512 515 516	UP IDLER PU46381
VS32 38 105 112 115 116 205 220	UNLOADING IDLER PU46380
VS7100 VS9300	REW IDLER BV327815
VS9500 VS9800	REW IDLER BV327815
VS9500 VS9800	REEL IDLER BR347731
VS77 VS10	REEL IDLER ML373043
VS76	CLUTCH VS9700
VS1 3 4 9 12	FF IDLER BV321762
VS15 58	REW IDLER VS9700
VS23 35 37 53 55	
VS86 75 VS477	

Model	Price
VR1700	IDLER 150280
TVR1 VCR4500	CLUTCH 150873
VCR4600 VCR5200 VCR9000	
TVR1 VCR4500	GEAR HOLDER 151284
VCR4600 VCR5200 VCR9000	REF CLUTCH
VCR4500 VCR6100	CLUTCH 153202
VCR4500 VCR9000	CLUTCH
VCR4500 VCR4600	MOD KIT (TAPE CREATING)
VCR4700	
MOD KIT TAPE CREATING FOR AMSTRAD	
VCR4500 4600 4700	

Model	Price
3V00 3V01 3V16	T-UP IDLER PU47752
3V22 3V29 8901 8904 8906	T-UP IDLER PU49280
3V16 3V22 8902	T-UP IDLER
8903 8908 8912 8922	REEL IDLER PU496967
3V23 3V29 3V30	REEL IDLER PU49042A
3V31 3V32 3V35 8923 8924 8929 8930 8931 8940	T-UP IDLER 8941 8942
3V29 3V31	T-UP IDLER 51402
3V32 3V35 3V36 3V38 3V39 3V49 8930 8931 8940	REEL IDLER 8941 8942
3V32 8901 8931 8940 8941 8942	T-UP CLUTCH PU55374
3V35 3V36 3V38	REEL IDLER PU55373
3V39 3V49 8943 8944	1-UP CLUTCH PU55375
3V35 3V36 3V38	IDLER ARM PU58645
3V58 3V59 3V64	IDLER ARM PU58645
3V65 FV10 FV11 FV12 FV13 FV14 FV20 FV21 FV22 FV26	CLUTCH ASSY PU57658
FV30 FV32 FV33 8950 VC141	
3V42 3V43	CLUTCH ASSY PU58643-1-4
3V42 3V44 3V45	CLUTCH ASSY PU58643-1-5
3V48 3V53 3V54 3V55 3V57 8947 8948	SUPPORT CLUTCH PU43681
3V42 3V43 3V44	LOADING IDLER
3V45 3V48 3V53 3V54 3V55 3V56 3V57 8947 8948	LOADING IDLER
3V00 3V01 3V16	REW IDLER PU46308
3V22 3V29 8901 8902 8903 8904 8906 8909	IDLER PU49281
8912 8922	IDLER PU49283
3V00 3V01 3V16	REW IDLER
3V22 8901 8901 8904 8906	IDLER
3V16 3V22 8902	IDLER
8909 8912 8922	IDLER
3V16 3V22 8902	IDLER
8909 8912 8922	IDLER

Model	Price
FVHP420 520 530	FF-REW PULLEY H1638531
FVHP425 618 620	COMP IDLER ASSY F1143042040030
FVHP420 710 711 FVHP720 721 722 FVHP725 730 830	IDLER
FVHP840 905 906 FVHP908 910 911 FVHP915 916 918	GEAR IDLER ASSY F1143049040090
FVHP615 618 620	REEL T-UP ASSY F11430410400900
FVHP622 710 711 FVHP720 721 722	
FVHP725 730 830 FVHP840	
FVHP615 618 620	REEL T-UP ASSY F11430410400900
FVHP622 710 711 FVHP720 721 722	
FVHP725 730 830 FVHP840	
FVHP905 906 908	GEAR IDLER ASSY F11430490402400
FVHP910 911 915 FVHP916 918	IDLER F11430420400700
FVHP975 980 990	
FVHP999 5000 5005	
FVHP650 5075 5100	
FVHP40 10 20	REEL DRIVE ROLLER
FVHP975 980 990	GEAR CLUTCH F11430510404200
FVHP975 980 990	CLUTCH
FVHP420 520 530	IDLER
FVHP420 520 530	TAKE UP IDLER
FVHP990	LOADING GEAR
VSS3500	REEL DRIVE PULLEY
VSS7000	REW IDLER

Model	Price
GHV1221 1232 1240	CLUTCH GEAR 4350384
GHV1241 1242 1243 GHV1244 1245 1246 GHV1247 1248 8000	IDLER
GHV8200 8210 8215 GHV915 VCP100 4130	CLUTCH GEAR
GHV1221 1232 1240	IDLER
GHV1241 1242 1243 GHV1244 1245 1246 GHV1247 1248 8000	CLUTCH GEAR
GHV8200 8210 8215 GHV915 VCP100 4130	CLUTCH GEAR

Model	Price
VXL3 VXL20	REEL IDLER 40000009
VXL2	IDLER
VXL4 VXL35	IDLER
VXL4 VXL12 VXL25	LIMITER POST
VXL30 VXL35 VTV300	CLUTCH
VXL5 VXL6	GEAR HOLDER
VXL5 VXL6	CLUTCH
VXL7 VXL8 VXL9	CLUTCH

Model	Price
VT11-33 VT63-64	CLUTCH ASSY 6879515
VT12 17 19 38 57 86 88 34 35 52 61	
62 65 85 330 640 VT165	
VT120 220 100 110	CLUTCH ASSY 6886824
VT11 113 115 118 120	CLUTCH ASSY 6886972
125 128 130 135 138 145 150 175 225 250	
255 258 260 VTL30	
V78000-8300 7000	FF-REW IDLER 6413663
V78000-8300 7000	PLAY IDLER 6414221
V78500-8700	
V78000-8300 7000	FF-REW PULLEY 6038351
V78500-8700	
V79300 9500 6500	FF-REW IDLER 6681471
V7680 6800 9700 9900	
V79300 9500 6500	PLAY IDLER 6681482
V7680 6800 9700	6681481
V79900	
V79300 9500 6500	IDLER 661505
V79900 6500 680 6800	IDLER 687043

Model	Price
VT11-33 VT63-64	FF-REW OLIER 6886971
VT12 17 19 34 VT35	38 39 52 61 62
V765 85 86 88 330 640	
VT100 110 111	FF-REW ARM 6887974
VT115 118 120 125 128 130 135 138 145 150	
VT175 220 225 250 255 258 260 VTL30	
V7400 405 410 413	FF-REW ARM 6897094
VT414 418 420 425 428 429 430 431 435	
VT438 450 498 510 518 520 525 526 530 535	
VT536 540 545 546 548 570 575 576 580 585	
VT588 VT625 626 630 635 636 640 645 646	VT580 85
VT414 418 420 425 428 429 430 431 435	6896951
VT438 450 498 510 518 520 525 526 530 535	
VT536 540 545 546 548 570 575 576 580 585	
VT588 VT625 626 630 635 636 640 645 646	VT580 85
V73000	T-UP IDLER (LARGE)
V73000	REW IDLER
V73000 6500 6800	FS-BRAKE 6861505
V7300 3900	

Model	Price
VR1700	IDLER 150280
TVR1 VCR4500	CLUTCH 150873
VCR4600 VCR5200 VCR9000	
TVR1 VCR4500	GEAR HOLDER 151284
VCR4600 VCR5200 VCR9000	REF CLUTCH
VCR4500 VCR6100	CLUTCH 153202
VCR4500 VCR9000	CLUTCH
VCR4500 VCR4600	MOD KIT (TAPE CREATING)
VCR4700	
MOD KIT TAPE CREATING FOR AMSTRAD	
VCR4500 4600 4700	

Model	Price
HR1700	IDLER 150280
TVR1 VCR4500	CLUTCH 150873
VCR4600 VCR5200 VCR9000	
TVR1 VCR4500	GEAR HOLDER 151284
VCR4600 VCR5200 VCR9000	REF CLUTCH
VCR4500 VCR6100	CLUTCH 153202
VCR4500 VCR9000	CLUTCH
VCR4500 VCR4600	MOD KIT (TAPE CREATING)
VCR4700	
MOD KIT TAPE CREATING FOR AMSTRAD	
VCR4500 4600 4700	

Model	Price
HR1700	IDLER 150280
TVR1 VCR4500	CLUTCH 150873
VCR4600 VCR5200 VCR9000	
TVR1 VCR4500	GEAR HOLDER 151284
VCR4600 VCR5200 VCR9000	REF CLUTCH
VCR4500 VCR6100	CLUTCH 153202
VCR4500 VCR9000	CLUTCH
VCR4500 VCR4600	MOD KIT (TAPE CREATING)
VCR4700	
MOD KIT TAPE CREATING FOR AMSTRAD	
VCR4500 4600 4700	

Model	Price
HR1700	IDLER 150280
TVR1 VCR4500	CLUTCH 150873
VCR4600 VCR5200 VCR9000	
TVR1 VCR4500	GEAR HOLDER 151284
VCR4600 VCR5200 VCR9000	REF CLUTCH
VCR4500 VCR6100	CLUTCH 153202
VCR4500 VCR9000	CLUTCH
VCR4500 VCR4600	MOD KIT (TAPE CREATING)
VCR4700	
MOD KIT TAPE CREATING FOR AMSTRAD	
VCR4500 4600 4700	

Model	Price
HS337 338 411 421	IDLER 552801501
HS200	TAKE UP IDLER (LARGE) £3.50
HS200	UNLOADING IDLER £4.00
HS200	REW IDLER £6.00
HS306 307 318 319	SUPPLY REEL 522A00101
HS400 410 710	DISK 522A00102
HS306 307 318 319	TAKE UP REEL 522A00102
HS400 410 710	DISK 522C00601
HS337 338 411 421	REEL DISK 522C00601
HS306 307 318 319	PULLEY 522C00601
HS306 307 318 319	GEAR WHEEL 641D71101
HS400 410 710	GEAR WHEEL 641D71101
HS306 307 318 319	GEAR WHEEL 641D71101
HS400 410 710	GEAR WHEEL 641D71101

Model	Price
N830 N831 N832 N833	TAKE UP CLUTCH £2.25
N830 N831 N832 N833	TAKE UP IDLER £1.45
N830 N831 N832 N833	REEL IDLER £2.85
N830	TAKE UP IDLER SMALL £6.00
N911 N915 N916 N917	REEL DRIVE PULLEY £2.25
N9012 9013 9014 9018	REEL DRIVE PULLEY £1.50
N9510 9520 9530 9610	9033 9034 9054 9055 9066 9110

Model	Price
NV322 NV600 NV688	IDLER UNIT VXP0163
NV777 NV788 NV332 ABG100 6200 6800 6810	IDLER ARM VXL0997
NV300 NV333 NV340	
NV300 NV330 NV333	IDLER UNIT VXP0401
NV340 NV366	
NV300 NV330 NV333	PLAY IDLER VXP0433
NV340 NV366 NV620	
NV300 NV332 NV333	ACTION GEAR VDG0016
NV340 NV366 NV600 NV777 NV788 NV2000 NV2010 3000 7000	
AG6010 AG6015	LOADING GEAR VXP0325
NV333 NV366 NV2000	INTERMEDIATE GEAR VXP0017</

VIDEO SERVICE KITS

AMSTRAD

VC7000
Contents
 BELT SET, PINCH ROLLER, REEL IDLER, VIDEO LAMP
 Order Code: SK41 £5.50

FERGUSON & JVC

3V42/43
 HRD455 HRD725
Contents
 BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND
 Order Code: SK37 £17.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, SUPPLY CLUTCH, TAKE UP CLUTCH
 Order Code: SK38 £9.50

3V58/59/64/65
 HRD170/180/210/230/300/320/370/400/430/530/700/750
 HRSS000
Contents
 BELT SET, PINCH ROLLER, IDLER ARM, TENSION BAND
 Order Code: SK44 £8.50

3V29/3V30
 HR7200/7300/7350
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
 Order Code: SK05 £6.00

3V35/36/38/39/49
 HRD110/111/120/121/225
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
 Order Code: SK04 £5.50

3V31/3V42
 HR7600/7610/7650/7655
Contents
 BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP
 Order Code: SK33 £12.00

Economy Kit Contents
 BELT SET, T/U REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH
 Order Code: SK34 £5.50

3V35/36/38/39/49
 HRD110/111/120/121/225
Contents
 BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER, REEL IDLER, TENSION BAND
 Order Code: SK35 £10.50

Economy Kit Contents
 BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, T/U CLUTCH, T/U IDLER TYRE, REEL IDLER TYRE
 Order Code: SK36 £6.50

3V29/3V30
 HR7200/7300/7350
Contents
 BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER, T/U CLUTCH, T/U IDLER, TENSION BAND, VIDEO LAMP
 Order Code: SK31 £11.50

Economy Kit Contents
 BELT SET, T/U REEL IDLER TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, REEL IDLER TYRE, T/U IDLER TYRE, T/U CLUTCH
 Order Code: SK32 £5.60

3V43/45/48/53/54/55/57
 HRP50/HRD140/150/158/160
 HRD250/257/565/566/755
Contents
 BELT SET, PINCH ROLLER, CLUTCH MECHANISM, TENSION BAND
 Order Code: SK39 £15.00

Economy Kit Contents
 BELT SET, PINCH ROLLER
 Order Code: SK40 £9.50

FISHER

FVHP905/906/907/908/910/911/916/918
Contents
 BELT SET, PINCH ROLLER, IDLER, GEAR, IDLER UNIT, TENSION BAND
 Order Code: SK57 £13.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK58 £5.00

FVHP615/618/620/622/710/711/715/716/720/721/722/725/730/830/840
Contents
 BELT SET, PINCH ROLLER, IDLER, GEAR, IDLER UNIT, TENSION BAND
 Order Code: SK68 £12.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK69 £3.60

HITACHI

VT11/VT33
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
 Order Code: SK08 £6.00

VT11/33
Contents
 BELT SET, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE, PINCH ROLLER, FF/REW IDLER, CLUTCH PLATE, TENSION BAND
 Order Code: SK45 £15.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, FF/REW IDLER TYRE, T/U REEL TABLE TYRE, SUPPLY REEL TABLE TYRE
 Order Code: SK46 £4.50

VIDEO SERVICE KITS (Cont.)

HITACHI

VT52/61/62/63/64/65/85/86/640
Contents
 BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND
 Order Code: SK49 £14.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, FF/REW IDLER
 Order Code: SK50 £3.25

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/38/450/498/510/520/25/26/530/35/36/540/545/46/48/570/75/576/580/85/88
Contents
 TIMING BELT, PINCH ROLLER, FF/REW ARM, CLUTCH BASE, TENSION BAND
 Order Code: SK52 £11.50

VT100/110/111/113/115/118/120/125/128/130/135/138/145/150/175/220/225/250/255/258/260/ATL30
Contents
 BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE, TENSION BAND
 Order Code: SK51 £15.00

PANASONIC

NV2000/NV2010
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
 Order Code: SK03 £6.25

NV7000/NV7200/NV7800
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRES
 Order Code: SK02 £5.50

NV300/NV330/NV333/NV340/NV366
Contents
 BELT SET, PINCH ROLLER, TENSION BAND, IDLER TYRE
 Order Code: SK01 £5.50

NV2000/NV2010
Contents
 BELT SET, PINCH ROLLER, FF IDLER, PLAY IDLER, TENSION BAND, VIDEO LAMP
 Order Code: SK13 £9.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE, PULLEY TYRE
 Order Code: SK14 £4.50

NV7000/NV7200/NV7800
Contents
 BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND
 Order Code: SK11 £10.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE, CLUTCH TYRE
 Order Code: SK12 £4.20

NV300/NV330/NV333/NV340/NV366
Contents
 BELT SET, PINCH ROLLER, IDLER UNIT, PLAY IDLER, TENSION BAND
 Order Code: SK15 £8.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK16 £4.00

NV67/NV69/NV70/NV71/NV72/NV74/NV75/NV76/NV78/NV79/NV80/NV81/NV82/NV83/NV84/NV85/NV86/NV87/NV88/NV89/NV90/NV91/NV92/NV93/NV94/NV95/NV96/NV97/NV98/NV99/NV100/NV101/NV102/NV103/NV104/NV105/NV106/NV107/NV108/NV109/NV110/NV111/NV112/NV113/NV114/NV115/NV116/NV117/NV118/NV119/NV120/NV121/NV122/NV123/NV124/NV125/NV126/NV127/NV128/NV129/NV130/NV131/NV132/NV133/NV134/NV135/NV136/NV137/NV138/NV139/NV140/NV141/NV142/NV143/NV144/NV145/NV146/NV147/NV148/NV149/NV150/NV151/NV152/NV153/NV154/NV155/NV156/NV157/NV158/NV159/NV160/NV161/NV162/NV163/NV164/NV165/NV166/NV167/NV168/NV169/NV170/NV171/NV172/NV173/NV174/NV175/NV176/NV177/NV178/NV179/NV180/NV181/NV182/NV183/NV184/NV185/NV186/NV187/NV188/NV189/NV190/NV191/NV192/NV193/NV194/NV195/NV196/NV197/NV198/NV199/NV200/NV201/NV202/NV203/NV204/NV205/NV206/NV207/NV208/NV209/NV210/NV211/NV212/NV213/NV214/NV215/NV216/NV217/NV218/NV219/NV220/NV221/NV222/NV223/NV224/NV225/NV226/NV227/NV228/NV229/NV230/NV231/NV232/NV233/NV234/NV235/NV236/NV237/NV238/NV239/NV240/NV241/NV242/NV243/NV244/NV245/NV246/NV247/NV248/NV249/NV250/NV251/NV252/NV253/NV254/NV255/NV256/NV257/NV258/NV259/NV260/NV261/NV262/NV263/NV264/NV265/NV266/NV267/NV268/NV269/NV270/NV271/NV272/NV273/NV274/NV275/NV276/NV277/NV278/NV279/NV280/NV281/NV282/NV283/NV284/NV285/NV286/NV287/NV288/NV289/NV290/NV291/NV292/NV293/NV294/NV295/NV296/NV297/NV298/NV299/NV300/NV301/NV302/NV303/NV304/NV305/NV306/NV307/NV308/NV309/NV310/NV311/NV312/NV313/NV314/NV315/NV316/NV317/NV318/NV319/NV320/NV321/NV322/NV323/NV324/NV325/NV326/NV327/NV328/NV329/NV330/NV331/NV332/NV333/NV334/NV335/NV336/NV337/NV338/NV339/NV340/NV341/NV342/NV343/NV344/NV345/NV346/NV347/NV348/NV349/NV350/NV351/NV352/NV353/NV354/NV355/NV356/NV357/NV358/NV359/NV360/NV361/NV362/NV363/NV364/NV365/NV366/NV367/NV368/NV369/NV370/NV371/NV372/NV373/NV374/NV375/NV376/NV377/NV378/NV379/NV380/NV381/NV382/NV383/NV384/NV385/NV386/NV387/NV388/NV389/NV390/NV391/NV392/NV393/NV394/NV395/NV396/NV397/NV398/NV399/NV400/NV401/NV402/NV403/NV404/NV405/NV406/NV407/NV408/NV409/NV410/NV411/NV412/NV413/NV414/NV415/NV416/NV417/NV418/NV419/NV420/NV421/NV422/NV423/NV424/NV425/NV426/NV427/NV428/NV429/NV430/NV431/NV432/NV433/NV434/NV435/NV436/NV437/NV438/NV439/NV440/NV441/NV442/NV443/NV444/NV445/NV446/NV447/NV448/NV449/NV450/NV451/NV452/NV453/NV454/NV455/NV456/NV457/NV458/NV459/NV460/NV461/NV462/NV463/NV464/NV465/NV466/NV467/NV468/NV469/NV470/NV471/NV472/NV473/NV474/NV475/NV476/NV477/NV478/NV479/NV480/NV481/NV482/NV483/NV484/NV485/NV486/NV487/NV488/NV489/NV490/NV491/NV492/NV493/NV494/NV495/NV496/NV497/NV498/NV499/NV500/NV501/NV502/NV503/NV504/NV505/NV506/NV507/NV508/NV509/NV510/NV511/NV512/NV513/NV514/NV515/NV516/NV517/NV518/NV519/NV520/NV521/NV522/NV523/NV524/NV525/NV526/NV527/NV528/NV529/NV530/NV531/NV532/NV533/NV534/NV535/NV536/NV537/NV538/NV539/NV540/NV541/NV542/NV543/NV544/NV545/NV546/NV547/NV548/NV549/NV550/NV551/NV552/NV553/NV554/NV555/NV556/NV557/NV558/NV559/NV560/NV561/NV562/NV563/NV564/NV565/NV566/NV567/NV568/NV569/NV570/NV571/NV572/NV573/NV574/NV575/NV576/NV577/NV578/NV579/NV580/NV581/NV582/NV583/NV584/NV585/NV586/NV587/NV588/NV589/NV590/NV591/NV592/NV593/NV594/NV595/NV596/NV597/NV598/NV599/NV600/NV601/NV602/NV603/NV604/NV605/NV606/NV607/NV608/NV609/NV610/NV611/NV612/NV613/NV614/NV615/NV616/NV617/NV618/NV619/NV620/NV621/NV622/NV623/NV624/NV625/NV626/NV627/NV628/NV629/NV630/NV631/NV632/NV633/NV634/NV635/NV636/NV637/NV638/NV639/NV640/NV641/NV642/NV643/NV644/NV645/NV646/NV647/NV648/NV649/NV650/NV651/NV652/NV653/NV654/NV655/NV656/NV657/NV658/NV659/NV660/NV661/NV662/NV663/NV664/NV665/NV666/NV667/NV668/NV669/NV670/NV671/NV672/NV673/NV674/NV675/NV676/NV677/NV678/NV679/NV680/NV681/NV682/NV683/NV684/NV685/NV686/NV687/NV688/NV689/NV690/NV691/NV692/NV693/NV694/NV695/NV696/NV697/NV698/NV699/NV700/NV701/NV702/NV703/NV704/NV705/NV706/NV707/NV708/NV709/NV710/NV711/NV712/NV713/NV714/NV715/NV716/NV717/NV718/NV719/NV720/NV721/NV722/NV723/NV724/NV725/NV726/NV727/NV728/NV729/NV730/NV731/NV732/NV733/NV734/NV735/NV736/NV737/NV738/NV739/NV740/NV741/NV742/NV743/NV744/NV745/NV746/NV747/NV748/NV749/NV750/NV751/NV752/NV753/NV754/NV755/NV756/NV757/NV758/NV759/NV760/NV761/NV762/NV763/NV764/NV765/NV766/NV767/NV768/NV769/NV770/NV771/NV772/NV773/NV774/NV775/NV776/NV777/NV778/NV779/NV780/NV781/NV782/NV783/NV784/NV785/NV786/NV787/NV788/NV789/NV790/NV791/NV792/NV793/NV794/NV795/NV796/NV797/NV798/NV799/NV800/NV801/NV802/NV803/NV804/NV805/NV806/NV807/NV808/NV809/NV810/NV811/NV812/NV813/NV814/NV815/NV816/NV817/NV818/NV819/NV820/NV821/NV822/NV823/NV824/NV825/NV826/NV827/NV828/NV829/NV830/NV831/NV832/NV833/NV834/NV835/NV836/NV837/NV838/NV839/NV840/NV841/NV842/NV843/NV844/NV845/NV846/NV847/NV848/NV849/NV850/NV851/NV852/NV853/NV854/NV855/NV856/NV857/NV858/NV859/NV860/NV861/NV862/NV863/NV864/NV865/NV866/NV867/NV868/NV869/NV870/NV871/NV872/NV873/NV874/NV875/NV876/NV877/NV878/NV879/NV880/NV881/NV882/NV883/NV884/NV885/NV886/NV887/NV888/NV889/NV890/NV891/NV892/NV893/NV894/NV895/NV896/NV897/NV898/NV899/NV900/NV901/NV902/NV903/NV904/NV905/NV906/NV907/NV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NV332
Contents
 BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND, FF/REW TYRE
 Order Code: SK29 £13.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, PLAY IDLER TYRE
 Order Code: SK30 £5.10

NV230/250/260/280/430/450/460/470/650/810/890/AG1200PK/AG1500PK
Contents
 BELT SET, PINCH ROLLER, IDLER, TENSION BAND
 Order Code: SK23 £7.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK24 £3.50

NV600/NV688
Contents
 BELT SET, PINCH ROLLER, PLAY IDLER, FF/REW IDLER, TENSION BAND
 Order Code: SK25 £13.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK26 £6.50

NV730/NV770
Contents
 SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER UNIT, TENSION BAND
 Order Code: SK19 £7.00

Economy Kit Contents
 SLOT IN BELT, LOADING BELT, PINCH ROLLER, IDLER TYRE
 Order Code: SK20 £4.30

NV370/380/480/630/780/830/850/AG2100PK/AG2200PK
Contents
 BELT SET, PINCH ROLLER, IDLER, TENSION BAND
 Order Code: SK21 £7.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK22 £3.50

NV777/NV788
Contents
 BELT SET, PINCH ROLLER, IDLER UNIT, TENSION BAND
 Order Code: SK17 £7.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, IDLER TYRE
 Order Code: SK18 £4.00

VIDEO SERVICE KITS (Cont.)

SHARP

VC381
Contents
 BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND, VIDEO LAMP
 Order Code: SK47 £9.00

Economy Kit Contents
 BELT SET, PINCH ROLLER, REEL IDLER TYRE
 Order Code: SK48 £5.00

VC500/VC571/VC581/VC582/VC583/VC584/VC585
Contents
 BELT SET, PINCH ROLLER, REEL IDLER, TENSION BAND
 Order Code: SK60 £9.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, REEL IDLER
 Order Code: SK61 £6.50

VC781/VC782/VC782A/VC785/VC786/VC793/VC800/VCA100/VCA102/VCA104/VCA202
Contents
 BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND
 Order Code: SK64 £13.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE
 Order Code: SK65 £6.25

VC681/VC682/VC684/VC685/VC693/VC699/VC6F3/VC700
Contents
 BELT SET, PINCH ROLLER, REEL DRIVE UNIT, TENSION BAND
 Order Code: SK62 £13.50

Economy Kit Contents
 BELT SET, PINCH ROLLER, REEL DRIVE UNIT TYRE
 Order Code: SK63 £6.25

THIS MONTH SPECIAL OFFERS

STK461	£6.00	STK7563F	£8.00
STK5332	£1.80	STK73410	£4.00
STK5333	£2.40	TA8205AH	£3.75
STK5422	£4.20	TA8210AH	£3.75
STK5476	£4.00	TA8215H	£3.75
STK7338	£3.50	TA8216H	£3.75
STK7348	£3.20	TIPL791A	£0.80
STK7358	£4.40		

VIDEO REEL MOTOR PU51381V £15.00

3v29, 3v30, 3v31, 3v32, 3v39, 8930, 8931, 8941, 8942, HR7200, HR7300, HR7600, HR7610, HR7650, HR7655

HITACHI VIDEO HEAD
 VT11, VT14, 16, 30, 33, 34, 330, 340, 503, 640, 5030

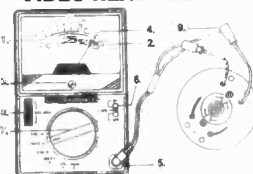
MITSUBISHI VIDEO HEAD
 HS303, 304, 320, 700
 HS306, 318, 710
 HS300, 301, 302, 310
 HS337, 347

PHILIPS

CASSETTE LIFE ASSEMBLY 69120366 £11.00
 DV186, 90, 286, 471, 522, 761, VR6180, 6182, 6185, VR6285, 6290, 6291, 6293, 6362, 6367, 6393, VR6467, 6468, 6470, 6551, 6670, 6200, 5761, 6870, 6970

PRESSURE ROLLER ASSEMBLY £5.00
 DV186, 3V190, DV226, DV486, DV471, DV582, DV571, DV761, JRB180, VR6182, VR6185, VR6285, VR6290, VR6291, VR6293, VR6352, VR6367, VR6390, VR6391, VR6393, VR6467, VR6458, VR6470, VR6561, VR6570, VR6581, VR6670, VR6676, VR6760, VR6761, VR6762, VR6870, VR6890, VR6905, VR6861, 63S87, 68S84, 71S84, *2S88, 92S31

VIDEO HEAD TESTER



- Mechanical Position of Pointer
- Scale Plate
- Pointer Adjusting Screw
- Pointer
- Measuring Socket
- Power ON/OFF and Battery Check Switch
- Range Selector Rotary Switch
- CAL. ADJ (calibration volume)
- Measuring Clip

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 YF-225 VHS £30.00+VAT
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AKAI VSF600, VSF650	3800P
AMSTRAD VCR8800, VCR8804, VCR9340	2400P
JVC HRD330, HRD337, HRD440, HRD637, HRD641, HRD660, HRFC100	2200P
MITSUBISHI HSE12, HSE22, MX1 HS411EZ, HS411GZ	2400P 2900P
NATIONAL NV8050, NV8051	2800P
N.E.C. DX2000 DS6000	3400P 3500P
SAMSUNG VM1560, VN1561	2200P
SANYO VHR7900	3600P
SHARP VC585, VC685 VC90ET VFH815	2300P 3900P 2800P
SONY SLV373UB	3000P
TOSHIBA V660 V880MS V700G V500G, V509G V9680 V300G, V301, V305, V309G V61, V63 V110, V120, V130, V140, V210, V220	2350P 2600P 3700P 2500P 2900P 2550P 1700P 1800P

TELEVISION ON/OFF MAINS SWITCHES

Baur, Normende, Nova, Pioneer, Quelle, Saba, Salora, TEC, Thomson & Vega

GRUNDIG TP160E TP200, TP300 TP400 TP590-600 TP390, TP610 TP621 TP630, TP650 TP660 TP661	1050P 1000P 850P 1050P 1050P 1050P 1000P 1050P 1050P
HITACHI CLE800-CLE830 A617402/655602 A512120/230 A514790 A5088470 A518612 SCL002 C2096 A511940 655602H	900P 1000P 1000P 1000P 1000P 1000P 1000P 1000P 1000P
ITT IFB13, 14, 15 FS4 RG305 RG306 FS9/1-10/1 VS5 RUK VS4-1 MULTICONTROL (17C20)	900P 850P 900P 900P 900P 900P 900P 1000P
KORTING 18279, 18396, 18460, 18521 SE 40540 VTS	1000P 1000P
LOEWE DC11	1000P
MATSUI 010270601 VX770	1000P 1000P
METZ JAVA COLOR (6890) COLOR (7156) JAVA (7180)	1000P 1000P 1000P
MITSUBISHI 939P/03607, 939P/03609	900P
NOKIA SATELLITE	1000P
NORDMENDE TC2336 CMC1, TC3519	1050P 1050P
OCEANIC 390C9500	1000P
ORION RC53	1000P
PANASONIC EUR51200 TC2200 VSQ0357/NV730 TNQ1621	900P 900P 1050P 1000P
PHILCO CARVEL, CONCORDE, MERCURY TELESTAR TC10	1000P 1000P
PHILIPS RC5002, 5154 KT3 NON TEXT 69117032 69117194 RC5991 UNIV RC3B KT3 TEXT RC5352 RC5375 RC5 STANDARD RC5901 RC5903	900P 900P 1050P 1050P 850P 900P 900P 900P 900P 900P 900P 900P
SABA T6772 TC319-320 TC356 TC358 TC360 TC365	1000P 1050P 1050P 1000P 1000P
SALORA SERIES L 86173	1000P 1000P
SANYO RC218, RC222, RC228, RC238 JXGE JXDE VHR2300 RC628	900P 1000P 1000P 1000P 1000P

SHARP G0121CESA, 123CESA, 204, 251	900P
SIEMENS FC616 FC631 FC742	1000P 1000P 1000P
SONY RM604, RM605, RM606 32 CHANNEL RM613 RM632, RM636	900P 900P 900P 900P
TATUNG FXA RC70 FX70 FASTTEXT	1000P 900P 850P
TELEFUNKEN FB632 FB639	1000P 1000P
THORN/FERGUSON 3V35-42 3V31-32 3V57-58 TX10 TEXT TX10 STEREO TEXT TX9-90-100 3V55, FV11 TX100 FASTTEXT TX100 STEREO FASTTEXT PROFESSIONAL	900P 900P 1050P 850P 850P 1050P 900P 900P 850P
TOSHIBA CT937 CT9117 201R4B	1000P 1000P 1000P

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Controls up to 4 different devices which use infra red remote controls including TV, audio, VCR and satellite. (Need original remote control to program)
Order code: IR100R Price: 1950P

We stock Remote Controls for over 5000 different models. Ring for further details on 081-900-2329.

LINE OUTPUT TRANSFORMERS

Description	Price	Order Code
HITACHI 2433752	1500P	LOT01
ORION 3714002	1500P	LOT02
FIDELITY ZX300	1500P	LOT03
FE TX100 90 DEG	1500P	LOT04
SABA 490007182	1500P	LOT05
FE TX90 WHITE	1650P	LOT06
ITT D307/37 EQ	1600P	LOT07
BLAUPUNKT 210	1600P	LOT08
GRUNDIG 2922010	1600P	LOT09
ITT CVC800/1/3	1500P	LOT10
ITTD218/37 EQ	1600P	LOT11
NORMENDE 5255	1600P	LOT12
SABA 81000 200	1600P	LOT13
SALORA T236 EQ	1650P	LOT14
SABA 811-50-24	1600P	LOT15
SABA 770223500	1600P	LOT16
TELEFUNKEN AT1	1450P	LOT17
TELEFUNKEN EQ	1400P	LOT18
SALORA FM0218B	1600P	LOT19
NORMENDE 5255	1600P	LOT20
ITT CVC 1150/1	1500P	LOT21
ITT COMPACT 80	1500P	LOT22
FE TX100 GREEN	1450P	LOT23
HINARI CT4/5 5113	1500P	LOT24
SELECO 6320410	1600P	LOT25
BLAUPUNKT 8667	1600P	LOT26
ITT COMPACT B1	1450P	LOT27
ITT CT3326 MUL	1500P	LOT28
ITT D066/37 EQ	1600P	LOT29
ITT 3546 EQ	1500P	LOT30
LUXOR 5810110	1600P	LOT31
SABA 849380920	1600P	LOT32
HITACHI 2434141 CP	1450P	LOT33
FE TX100 110 D	1700P	LOT34
HANTAREX 28021	1600P	LOT35
SHARP C3700 EQ	1600P	LOT36
HITACHI 2432981 CP	1500P	LOT37

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VIDEO SPARES

3V23 TAKE UP IDLER	£1.00
3V23 FF REW IDLER	£2.00
3V5965 V10/14 IDLER	£1.50
3V23 LOADING ROLLER BAR	£3.99
SHARP 0005 & 0006	£5.99
FISHER VC651 ASSEMBLY	£6.99
VT11417 IDLER	£1.99
VT11 CLUTCH ASSEMBLY	£2.99
VT100225/260 IDLER	£6.99
NEC 9013 IDLER	£3.99
SANYO VHR3300 IDLER	£1.99
AKAI VS105250 CLUTCH ASSEMBLY	£11.99
SAISHO VR380 CLUTCH	£2.00
MITSUBISHI H5337 FF IDLER	£2.70
ALBA SENTRA PULLEY	£1.25
MATSUI LIFTER POST	£1.25
PANASONIC NV370 IDLER	£1.99
FISHER 615 IDLER	£3.50
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AMSTRAD PINCH WHEEL MOD KIT	£4.99
UNIVERSAL TRIPLER	£7.99
UNIVERSAL TRIPLER WITH FOCUS	£7.99
HITACHI MODULE HM6251	£6.99
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TENSION BAND FOR MOST MOD. FROM	£1.99
CIRCUIT PROTECTOR ICP	50p
TX10 FOCUS UNIT	£7.99
PHILIPS BACK-UP BATTERY	£1.50
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TV SWITCHES FOR MOST MOD. FROM	£1.00
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VIDEO BELT KITS

AKAI

VS1/25	1.75
VS2/35	2.00
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ALBA	
VC4000	1.50
AMSTRAD	
VC4600	1.80
VC6000	1.30
VC7000	1.00
FERGUSON	
3V22	1.80
3V29/30/33	1.00
3V42/65	0.85
HRD520/830	1.20
RSHER	
FYH915/725	1.10
FYH906/510	1.10
GRUNDIG	
CP11474	1.45
VS300	1.90
VS380	1.75
HINARI	
VXL3-20	1.25
VXL4-35	1.50
HITACHI	
VT11/133	1.30
VT52/65	1.75
VT110/220	1.80
MITSUBISHI	
HS306/307	1.75
PHILIPS	
YR6548	2.40
YR6367	1.50
SAMSUNG	
VX5105/20	1.50
SANYO	
VHR1300	2.15
VHR3300	2.05
SHARP	
VC381	1.30
VC651/681	1.25
VC9300	1.50

LINE OUTPUT TRANSFORMERS

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TX85	19.99
TX90	19.99
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WHITE SPOT	14.95
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TX100	29.95
GREEN	14.95
SPOT	14.95
BLUE SPOT	14.95
YEL/LOW	14.95
SPOT	21.99
FST	21.99
ICC 5	19.99
RSHER	
KT3	13.99
KT5	13.99
K40	19.99
2A	19.99
3A	19.99
3B	19.99
CTXK	19.99
CTXS	19.99
SAISHO	
CPT1444	21.99
CPT1453	19.99
CPT1456	19.99
CPT1457	19.99
CPT1473	29.99
CPT1474	35.00
CPT1475	35.00
CPT1493	35.00
CPT2028	21.99
CPT2078	19.99
CPT2174	19.99
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CPT2178	19.99
CPT2234	19.99
CPT2248	19.99
CPT2274	19.99
CPT2278	19.99
CPT2508	39.99
CPT2808	39.99
CVC20	13.99
CVC26/32	9.99
CVC1215	19.99
DIG1310	19.99
DIG130	19.99
CT3315	19.99
CT3835	19.99
FX3448	19.99
FX3548	19.99
FX3652	19.99
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FX3689	19.99
FX3690	19.99

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FX3689	19.99
FX3690	19.99

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AAA (PK1 of 4)	1.15
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N SIZE (MN9100)	.95
PHILIPS MEMORY 1V2	2.10
PHILIPS MEMORY 2V4	3.20
PP3	1.10

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63v	
1uf at 63v	.12
4 7uf at 63v	.12
4 7uf at 63v	.18
100uf at 63v	.22
220uf at 63v	.35
250v	
1uf at 250v	.20
4 7uf at 250v	.25
10uf at 250v	.35
22uf at 250v	.40
33uf at 250v	.55
47uf at 250v	.65
100uf at 250v	1.25
400v	
1uf at 400v	.23
4 7uf at 400v	.30
10uf at 400v	.70
22uf at 400v	.85
(All PCB Mounting)	

DIODES

R2M	.95
BY133	.15
BY227	.20
BY229 800	.95
BY299 800	.35
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IN4007	10
IN5408	20
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5v6, 6v8, 7v5 12v 15v	
24v, 33v, 68v, 120v 130v	1.00

AKAI VIDEO SPARES

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BELT KIT	1.95
PINCH ROLLER	3.95
REEL IDLER UNIT	6.95
TAKE UP CLUTCH	8.95
TENSION BAND	2.95
VIDEO HEAD VS1/5	17.95
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VCR4000	
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CAPACITOR BACK-UP	1.85
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REEL IDLER	3.95
REEL PULLY	1.95
REPAIR KIT	11.50
TENSION BAND	2.50
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VCR5000	
BELT KIT	1.95
PINCH ROLLER	3.95
REEL IDLER	3.95
REEL PULLY	1.95
TENSION BAND	2.50
VIDEO HEAD	16.95
VCR6000	
BELT KIT	1.95
CLUTCH ASSEMBLY	4.50
PINCH ROLLER	3.95
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TENSION BAND	2.50
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GEAR ASSEMBLY	9.95
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PINCH ROLLER	3.50
VIDEO HEAD	14.95
VCR4600BELT KIT	1.95
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VCR7000	
BELT KIT	1.95
LAMP	.95
PINCH ROLLER	3.95
REEL IDLER	3.95
REEL MOTOR	14.95
VIDEO HEAD	15.25
VCR6000	
BELT KIT	1.95
PINCH ROLLER	3.95
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DECCA L20130	7.95
GRUNDIG CUC2410 14	18.75
GRUNDIG CUC2410 22	17.95
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FUSES

20mm A/S (PKTS OF 10)	1.30
250MA, 315MA, 500MA, 630MA	
800MA, 1A, 1.6A, 2A, 2.5A,	
3 15A 4A, 5A, 6 3A, 8A	1.20
20mm Q/B (PKTS OF 10)	0.80
500MA 630MA, 800MA, 1A	
1.6A 2A 2.5A, 3 15A	.60

ICs

CNX62A	3.30
CNX83A	3.95
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MSM5840H/84RS	12.95
SA1293 02	5.95
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STK4332	4.95
STK5331	4.50
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STK5421	4.95
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BC337	10
BC547	10
BC548	10
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BF460	90
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BU280	3.30
BU426A	1.45
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BU508D	1.95
BU508DF	2.50
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BU536	2.25
BU807	2.25
BU908	2.95
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TX90/100 STANDARD

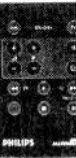
TX90/100 STANDARD	1.50
TX90/100 REMOTE	1.75

SHARP VIDEO SPARES

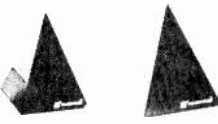
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REEL IDLER GENUINE	3.95
REEL MOTOR GENUINE	16.95
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FM BUG BUILT AND TESTED SUPER 9v operation. £14.00 ref 14P3R

COMPOSITE VIDEO KITS. These convert composite video into separate H sync, V sync and video. 12v DC £8.00 ref 8P39R

SINCLAIR C5 MOTORS 12v 29A (full load) 3300 rpm 6"x4" 1/4" O/P shaft. New. £20.00 ref 20P22R. Limited stocks

As above but with fitted 4 to 1 inline reduction box (800rpm) and toothed nylon belt drive cog £40.00 ref 40P8R. 800 rpm

ELECTRONIC SPEED CONTROL KIT for C5 motor. PCB and all components to build a speed controller (0-95% of speed). Uses pulse width modulation. £17.00 ref 17P3R. Potentiometer control

SOLAR POWERED NICAD CHARGER. Charges 4 AA nicads in 8 hours. Brand new and cased £6.00 ref 6P33R. 2x C cell model £6.00

ACORN DATA RECORDER ALF503. Made for BBC computer but suitable for others. Includes mains adapter, leads and book. £15.00 ref 15P43R

VIDEO TAPES. Three hour superior quality tapes made under licence from the famous JVC company. Pack of 10 tapes. New low price £15.00 ref 15P4

PHILLIPS LASER. 2MW HELIUM NEON LASER TUBE. BRAND NEW FULL SPEC £40.00 REF 40P10R. MAINS POWER SUPPLY KIT £20.00 REF 20P33R READY BUILT AND TESTED LASER IN ONE CASE £75.00 REF 75P4R.

12 TO 220V INVERTER KITS supplied it will handle up to about 15w at 220v but with a larger transformer it will handle 80 watts. Basic kit £12.00 ref 12P17R. Larger transformer £12.00 ref 12P41R

25 WATT STEREO AMPLIFIER IC STK043. With the addition of a handful of components you can build a 25 watt amplifier. £4.00 ref 4P69R (Circuit dia included)

BARGAIN NICADS AAA SIZE 200MAH 1.2V PACK OF 10 £4.00 REF 4P92R, **PACK OF 100 £30.00 REF 30P16R**

FRESNEL MAGNIFYING LENS 83 x 52mm £1.00 ref B0827R

12V 19A TRANSFORMER Ex equipment £20 but OK.

POWER SUPPLIES Made for the Spectrum plus 3 give +5 @ 2A, +12 @ 700mA & -12 @ 50mA. C8 ref 08P3

UNIVERSAL BATTERY CHARGER. Takes AA's, C's, D's and PP3 nicads. Holds up to 5 batteries at once. New and cased, mains operated. £6.00 ref 6P36R

IN CAR POWER SUPPLY. Plugs into cigar socket and gives 3, 4, 5, 6, 7, 5, 9, and 12v outputs at 800mA. Complete with universal spider plug. £5.00 ref 5P167R

QUICK CUPPA? 12v immersion heater with lead and cigar lighter plug £3.00 ref 3P92R. Ideal for tea on the move!

LED PACK. 50 red, 50 green, 50 yellow all 5mm £8.00 ref 8P52

IBM PRINTER LEAD. (D25 to centronics plug) 2 metre parallel. £5.00 ref 5P186R. 3 metre version £6.00 ref 6P50

COPPER CLAD STRIP BOARD 17" x 4" of 1" pitch "vero" board. £4.00 a sheet ref 4P62R or 2 sheets for £7.00 ref 7P22R

STRIP BOARD CUTTING TOOL. £2.00 ref 2P352R

WINDUP SOLAR POWERED RADIO! FM/AM radio takes rechargeable batteries. Complete with hand charger & solar panel. 14P200R. Set of 2 AA nicads £2 ref L2P9

BENCH POWER SUPPLIES Superbly made fully cased (metal) giving 12v at 2A plus a 6V supply. Fused and short circuit protected. For sale at less than the cost of the case! Our price is £4.00 ref 4P103R

SPEAKER WIRE Brown twin core. 100 feet for £2.00 REF 2P79R

720K 3 1/2" DISC DRIVE FOR £99 Brand new units made by JVC complete with tech info just £9.00!! they have a metal tab instead of a button and you may want to fit an led. Combined power and data cable easily modified to IBM standard. ref L9P2

MONO VGA MONITORS £59 Standard IBM compatible monitor made by Amstrad. Ex display. Our price just £59. Ref 59P4RB

CAR BATTERY CHARGER Brand new units complete with panel meter and leads. 6 or 12v output £7.00 ref J7P2

CUSTOMER RETURNED SPECTRUM +2 Complete but sold as seen so may need attention £25.00 ref J25P1

CUSTOMER RETURNED SPECTRUM +3 Complete but sold as seen so may need attention £25.00 ref J25P2

AMSTRAD 1640DD BASE UNITS

BRAND NEW AND CASD

TWO BUILT IN 5 1/4" DRIVES

MOTHER BOARD WITH 640K MEMORY

KEYBOARD, MOUSE & MANUAL

OUR PRICE JUST

£79!!!!

SCART TO D TYPE LEADS

Standard Scart on one end, Hi density D type (standard VGA connector) on the other. Pack of ten leads only £7.00 ref 7P2R

OZONE FRIENDLY LATEX 250ml bottle of liquid rubber sets in 2 hours. Ideal for mounting PCB's. Fixing wires etc. £2.00 each ref 2P379R

VIEWDATA SYSTEMS Brand new units made by TANDATA complete with 1200/75 built in modem infra red remote controlled qwerty keyboard BT approved. Prestel compatible. Centronics printer port. RGB colour and composite output (works with ordinary television) complete with power supply and fully cased. Our price is only £20.00 ref 20P1R

COMMODORE 64 COMPENDIUM Pack consisting of a Commodore 64 computer, power supply, data recorder and software. All for £69 ref Q69P1

PPC MODEM CARDS Made for the Amstrad PPC1640/1512 range these are plug in modules that operate at 2400 baud. No data. £15 ref Q15P5

AMSTRAD LQ3500 PRINTER ASSEMBLIES Entire mechanical assemblies including print head, platen, cables, stepper motors etc. etc. In fact everything bar the electronics and case! Our price just £10 ref Q10P3

AMSTRAD DMP4000 PRINTER ASSEMBLIES Entire printer assemblies including print head, platen, cables, stepper motors etc. Everything bar the electronics and case. Our price just £20 ref Q20P2

TOROIDAL TRANSFORMER 146VA with tappings at 8v, 10v and 32v will give 50v at 3A or 32 at 4A etc. Centre tapped primary £9 ref Q9P2. Fixing kit is £2 ref Q2P1

AERIAL BRACKETS Wall plate 7.5" sq complete with rawl bolts. 10" stand off brackets with standard tube clamps. Will take up to 2" mast. Substantial bracket (would take body weight) £7 ref Q7P1

TV SOUND RECEIVERS Popular units that with the addition of a speaker act as a tv sound receiver. Ideal as a stand alone unit or for connecting into Hi Fi!! £12 ref Q12P4

2,000 COMPONENTS FOR £3 Yes that's right! just send us £3 and you can have 1,000 resistors plus 1,000 capacitors! Our choice of value. Order ref Q3P1

ETRI FANS Mains, 11 watt 80mm diameter £6. Ref Q6P3

LIGHTGUNS Originally made for the Spectrum+2 but may have other uses (good stripper). £2 Ref Q2P3

GX4000 GAMES CONSOLES Complete with motor racing game, psu and joystick. £15 ref Q15P3. Extra 4 games £12 ref Q12P2

VCR RABBIT SYSTEM Lets you control your VCR from a second set using the VCR remote control. Retail £99 ours £39!!

CAMERAS Customer returned units. 3 for £10 ref L10P2

STEAM ENGINE Standard Mamod 1332 engine complete with boiler piston etc. £30 ref 30P200

HANDHELD TONE DIALLERS Small units that are designed to hold over the mouth piece of a telephone to send MF dialling tones. Ideal for the remote control of answer machines. £5.00 ref 5P209R

AMAZING TALKING CONBOX! Fully programmable talking, lockable conbox BT approved, retail price is £79 ours is just £29! ref J29P2

ANSWER PHONES £15 Customer returned units with 2 faults one we tell you how to fix the other you do your self! £18 ref J18P2 or 4 for £60 ref J60P3 BT approved (retail price £79.95!! each)

COMMODORE 64 MICRODRIVE SYSTEM Complete cased brand new drives with cartridge and software 10 times faster than tape machines works with any Commodore 64 setup. The original price for these was £49.00 but we can offer them to you at only £25.00! Ref 25P1R

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SOME OF OUR PRODUCTS MAY BE UNLICENSABLE IN THE UK

90 WATT MAINS MOTORS Ex equipment but ok. Good general purpose unit £9.00 ref F9P1

HI FI SPEAKER BARGAIN Originally made for TV sets they consist of a 4" 10 watt 4R speaker and a 2" 140R tweeter. If you want two of each plus 2 crossovers for £5.00 ref F5P2

EMERGENCY LIGHTING SYSTEM Fully cased complete with 2 adjustable flood lights. All you need is a standard 6v lead acid battery. Our price is just £10 ref J10P29

AMSTRAD 464 COMPUTERS Customer returned units complete with a monitor for just £35! These units are faulty non returnable

WOLSEY DMAC DECODERS Made for installation in hotels etc as the main sat receiver no data but fully cased quality unit. £20 ref K20P1. Suitable psu £8 ref K8P3

REMOTE CONTROLS Brand new infra red CONTROLS originally made for controlling WOLSEY satellite receivers £2 ea ref K2P1 or 20 for £19 ref K19P1

DOS PACKS Complete set of PC discs with DOS 3.2, basic, gemdesktop & gem paint. No manuals. 5 1/4" discs £10 ref K10P2

CORDESSIE THE CLIP MICROPHONE transmits between 88-108MHz FM 5.2cm x 2cm. uses L44 watch battery. Complete with wire aerial & battery. £16 ref K16P1

CHASSIS MOUNT TRANSFORMERS 240v primary. 12v secondary 20VA £2 ref K2P2

240v primary. 16v secondary 10A (split winding) £10 ref L10P1

100 RED LED PACK (5MM) £5 REF K5P2
12V STEPPER MOTOR Ideal for models etc. 3" dia £2 ref J2P14

CAPACITOR BARGAIN PACK 100 CERAMICS £2 REF J2P2.

SPECTRUM JOYSTICKS TWO FOR £5 REF J5P2.

AMSTRAD PC CASE, POWER SUPPLY AND 720K FLOPPY DRIVE ALL THIS FOR £30 REF Q30P15

USEFUL POWER SUPPLIES. 18v 900mA dc output (regulated) fully cased with mains cable and DC out cable. £6 ref K6P1

UNCASD PC POWER SUPPLIES. Standard PC psu without case, fan etc. Good for spare or low cost PC! £4 ref L4P6

RADAR DETECTORS. Detects X and K bands (ie speed traps). Not legal in the UK so only available if you intend to export it. £59 ref J59P1

100 WATT MOSFET PAIR. Same spec as 2Sk343 and 2SJ413 (8A 140v 100w) 1N channel and 1P channel. £3 a pair ref J3P9

LOW COST CAPS. 1,000 capacitors £3 (33uF, 25v) ref J3P10

VCLCRO. 1 metre length 20mm wide. blue. £2 ref J2P16

JUG KETTLE ELEMENTS. Good general purpose heating element just £3 ea ref £3P8 or 5 for £10 ref J10P3

VERY BIG MOTOR. 200v induction 1.1kw 1410 rpm 10"x7" GEC 1" keyed shaft. Brand new. £95 ref J95P1

BIG MOTOR. 220-240v 1425rpm 2.8A 5/8"th keyed shaft GEC 6.5" x 8" complete with mounting plate. £38 ref J38P1

SMALL MOTOR. Electroflux 160 watt 3,000 rpm, 220-240v 5/8" shaft. precision built £18 ref J18P1

EPR0MS 27C64 PACK OF 10 £7 REF M7P1. 27C256 PK OF 10 £9 REF M9P1. 27C512 PK OF 10 £10 REF M10P1.

MODEMS FOR £1.25? These modems are suitable for stripping only hence they are only 4 for £5 ref J5P3

SOLAR POWERED WOODEN MODELS. Complete with solar panel, motor and full instructions. £9 ref J9P2. 3 diff £20 ref J20P3

SOUND OPERATED LIGHT. Clap your hands and light comes on. Turns after preset delay. (4 AA's req'd) £2 ref J2P3

FERGUSON SRB1 REMOTE CONTROLS. Brand new units ideal for a spare or have two remotes! £4 each

5 1/4" 360K DISC DRIVE Made for AMSTRAD 1640/1512 machines. White front. Our price just £9 ref Q9P1

PC CORNER

PC CASES Desktop case +psu £51.60 ref BPCC1. Deluxe slimline case +psu £60.00 ref BPCC2. Minttower case +psu £51.60 ref BPCC3. Deluxe midi case +psu £90.00 ref BPCC4

MONITORS Mitac 14" SVGA 39DP £174 ref BPCM02. Mitac 14" SVGA 28DP £202 ref BPCM01

MEMORY 256K Simm 70ns £8.40 ref BPCM1. 1MB Simm 70ns £26.40 ref BPCM2. 4MB Simm 70ns £96 ref BPCM3

MICE 2 button serial mouse with 3.5" s/ware £8.40 ref BPCM6. 3button serial mouse with 3.5" s/ware £9.60 ref BPCM7

KEYBOARDS 102 AT UK standard keyboard £18.60 ref BPCM4. Deluxe keyboard 102 AT UK £26.40 ref BPCM5

SOFTWARE MS DOS V5 OEM version £39.60 ref BPCM8. MS WINDOWS V3.1 OEM version £42 ref BPCM9

MOTHERBOARDS 286-16 Headland chipset £46.80 ref BPCMB1. 386SX-33 Acer chipset £82.80 ref BPCMB2. 386SX-40 UMC with 64K cache £110 ref BPCMB3. 486SX-25 UMC with 64K cache £191 ref BPCMB4. 486DX-33 UMC with 256K cache £378 ref BPCMB5. 486DX-66 UMC with 256K cache £515 ref BPCMB6

FLOPPY DRIVES 1.44mb 3.5" drive £32.34 ref BPCDD05. 1.2MB 5.25" drive £38.40 3.5" mounting kit £5 ref BPCDD07

HARD DRIVES 42MB IDE 17ms £99 ref BPCDD01. 89MB IDE 16ms ref BPCDD02. 130MB IDE 15ms £215 ref BPCDD03. 213MB IDE 14ms £298 ref BPCDD04

VIDEO CARDS 256K C&T 8 bit SVGA card £19.20 ref BPCVC01. 512K Trident 9000 16 bit SVGA card £31.20 ref BPCVC02. 1MB Trident 8900 16 bit SVGA card £45 ref BPCVC03. 1MB Cirrus AVGA3 16.7M colours £48 ref BPCVC04. 1MB Tseng multimedia £82.80 ref BPCVC05

ADD ON CARDS Multi I/O card 2 serial, 1 parallel, 1 game, 2 floppy. 2 IDE hard drives. £11 ref BPCA001. ADLIB sound card with speakers £37 ref BPCA002. Orchid sound card with speakers £63 ref BPCA003

EXAMPLES OF COMPLETE SYSTEMS

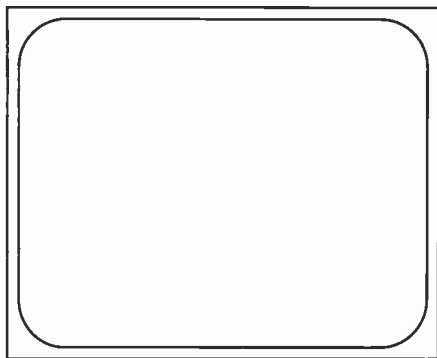
386SX-33 SYSTEM
 386SX-33 board at £82.80. case £51.60. 2MB ram £52.80. 42MB drive £99. 512K SVGA card £31.20. 3.5" FDD £32.34. multi I/O card £11. SVGA colour monitor £174. 102 kboard. £25 build fee if required. Total £579.34

486DX-33 SYSTEM
 486DX-33 board £378. case £51.60. 2MB ram £52.80. 89MB drive £166. 512 SVGA card £31.20. 3.5" FDD £32.34. multi I/O card £11. SVGA monitor £174. 102 kboard £18.60. £25 build fee if required. Total £939.84

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TELEVISION

Market at the Crossroads

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COVER PHOTO

This month's cover photograph shows a Philips CP110 chassis receiving attention – see article on pages 574-6.

A prolonged, deep recession is hardly the best time to launch innovative new products and set markets alight. There are certainly many new and newish products around right now. CD-I arrived in the spring of 1992 and is due for a boost this autumn when full-motion video will become available. The DCC and Mini Disc systems were launched late last year. More recently we've had the videophone and the first personal digital assistant, Amstrad's Pen Pad. So far none of them have made other than the feeblest of impacts on the market. It's not that manufacturers aren't trying. As the Brown Goods and Cable & Satellite Shows reported on elsewhere in this issue bear witness, there is any amount of ingenious innovation around at present – ways of adding value, usefulness and features to existing products, and completely new ways of doing things. But the customers aren't biting the bait laid out for them.

The question that arises is whether the public is simply short of cash or just isn't interested. We've heard much about green shoots recently, and the UK's economy does seem to be on the turn. That's not going to be terribly helpful for international corporations such as Philips, Matsushita and Sony, to whom the UK is just one of many medium-sized markets. Japanese manufacturers have been experiencing particularly difficult conditions in their own home market, and there are at present few signs of any green shoots there. In this situation previously unthinkable things are happening. Sanyo has decided to buy in more manufactured items rather than make everything itself, while Matsushita has just entered into an agreement with Sony to have a product manufactured for it on an OEM basis. For many years the Japanese consumer electronics market went from strength to strength, rejecting only the more outlandish products offered by its industry. Now the manufacturers are having as never before to look to export markets – and the traditional ones won't fill the gap. The current strategy seems to be to concentrate on manufacturing in and for developing markets, which means that the call is for standard rather than new, innovative products.

What about our own little market then? As the latest BREMA figures (see page 550) show, sales held up well last year despite the recession – but only, it seems, because prices were reduced. This doesn't augur well for new products, where traditionally the price has started high in order to recoup as much as possible of the development costs while the product has the appeal of one upmanship, before the manufacturers go on to try for success by seeking maximum market share. When demand is weak, as at present, it's tricky trying to get new lines to move.

In fact movement is exactly what isn't happening so far with CD-I, DCC and the Mini Disc in the UK. All right, so the compact disc and VCR markets were slow to start with. Maybe we shall see vibrant sales for CD-I and the other new products developing. But there lurks this feeling that the public has lost its appetite for new electronic goodies. Camcorders have done reasonably well, but only at such prices that no one is able to make a worthwhile profit. At present no one is making anything much at all out of CD-I, the DCC and the Mini Disc (the videophone and other new items are too fresh on the scene for assessment, but are unlikely to take off in the immediate future). If this situation is to be overcome, a massive sales and educational effort will be required. It might work out, but the portents are not too bright. The public seems to feel that there are better ways of spending £500 than on a CD-I, DCC or Mini Disc player, £400 on a videophone or £300 on a Pen Pad. One feels that it will take something more basic, like up-graded (digital) TV services, to rekindle interest. Meanwhile the market will be left in the doldrums, not knowing which way to go.



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RETAIL SCENE

According to BREMA's annual report, brown goods retailers sold more in 1992 than in the previous year but at lower average prices. Estimated sales/rentals of large-screen TV sets rose seven per cent to 1.78m, the average price falling four per cent to £416. Small-screen CTV offtake rose nine per cent to 1.82m, with a two per cent drop in average price to £177. Nicam-equipped sets fell four per cent in average price to £416 on offtake up 31 per cent to 705,000. In the video field VCR offtake rose two per cent to 2.22m, the average price falling five per cent to £295. Camcorder sales rose 20 per cent to 610,000 with a 12 per cent drop in average price to £629.

This squeeze on prices meant that 1992 was not a happy year for manufacturers. Sales started to rise significantly during the latter half of 1992. BREMA is not too optimistic about the outcome for 1993 in view of the rising Treasury budget deficit. Verdict Research however, in a report entitled *Verdict on Electrical Retailers*, expects consumer spending on all types of electrical goods to increase by 24 per cent over the next three years, twice the rate of retail sales as a whole. But it doesn't expect a clear upturn in demand until the last quarter of the current year. It considers that market leaders Dixons and Comet are both in a strong position: Clydesdale is mentioned as being the fastest-growing electrical retailer, with a market share of 1.5 per cent.

DIGITAL TV

The Moving Picture Experts Group of the International Standards Organisation and the International Electrotechnical Commission, meeting in Sydney, Australia, in April, has agreed a new digital video and TV standard. The Group has already set a standard for digitally coded pictures at data rates below 1.5Mbits/sec, suitable for CD recording. The new standard, known as MPEG2, covers data rates in the range 2-15Mbits/sec, appropriate for broadcast-quality signals including widescreen/HDTV. Equipment designed to the MPEG2 standard will also be able to handle the lower data-rate standard. Both are compatible with an existing standard for digital videotelephony, making possible link-ups with various computer equipment, CD-I equipment and future tape and disc systems. Proposals were also accepted for audio coding. This gives a wide range of options ranging from seven different languages to full five-channel surround sound with bass enhancement to match the latest digital cinema systems. The group says that it's on target to produce a final draft by this November. Meanwhile the current agreement will enable manufacturers to start producing prototype equipment.

National Transcommunications has demonstrated a complete video compression system using the MPEG standard in operation via the Eutelsat I F4 satellite. System 2000 is a state-of-the-art product developed by NTL at Winchester. The main data rate used for the demonstration was 8.44Mbits/sec, which enables four standard-definition TV channels to be transmitted via a single transponder. Perfectly acceptable pictures were also demonstrated at a data rate of 4Mbits/sec, which would enable eight TV channels to be broadcast via a single Astra transponder. The system uses decoding chips from US compression chip specialist C-Cube: the encoder is mainly built from programmable components – the C-Cube

CL4000 single-chip MPEG encoder will probably be used when it becomes available. As part of a joint marketing agreement between NTL and Scientific Atlanta, the first System 2000 units have now been delivered.

Philips Consumer Electronics has extended an agreement with ASIC chip specialist LSI Logic covering the design and development of chips for digital TV and audio, including video compression chips.

SATELLITE TV

Continental Research has published its final monthly *Financial Times* satellite monitor – the series was started in 1988. The company will continue to carry out research and publish regular reports. It gives as the reason for stopping monthly reports the difficulty of arriving at accurate figures as the market has grown. According to John Clemens, Continental Research's chairman, monthly reports lead to unnecessary controversy as different market research groups produce different figures because of different definitions and sampling errors. To mark the final monthly monitor, Continental Research commissioned separate surveys from NOP and RSGB. Continental estimates that 3.33m households are now capable of receiving satellite TV channels: the RSGB figure was 3.37m while NOP came up with 2.99m.

There seems to have been some fall in the number of dish installations being carried out. GkK, which is sponsored by the ITV Association, estimates that dish installations were running at around 39,000 a month earlier in the year – GfK doesn't cover Northern Ireland, the Isle of Man and the Channel Islands. Its assessment of churn – the number of viewers who give up direct from satellite reception – suggests that the figure rose from 78,000 in the first half of 1992 to 142,000 in the second half. It thinks that 40-50 per cent of those with BSB aerials didn't convert to Astra.

Pace Micro Technology Ltd. is to start in-house production of its satellite receivers and other products. A new 60,000 sq. ft assembly plant employing the latest in automated manufacturing processes is being built at the company's headquarters in Shipley, West Yorkshire at a cost, partly funded by the DTI, of £4.5m. Pilot production is expected to start this month (June). Pace will continue to use UK subcontract manufacturing for much of its output. The company expects to produce over a million units this year. Annual turnover has increased from £6.5m in 1988 to over £80m in the year to August 1992.

The Japanese manufactured Maspro ST8 satellite receiver with integrated VideoCrypt decoder has been launched in the UK by ElectroTech and Satellite Solutions. It has a suggested price of around £250.

VIDEO NEWS

Panasonic plans to launch a 3DO-format player in the USA this October, with a UK launch next year. Panasonic's parent company Matsushita is a member of the 3DO consortium which is developing the system as a competitor to CD-I, using 32- instead of 16-bit processing. There seems to be some confusion as to whether Panasonic will also be launching CD-I players and, if so, in which markets. Matsushita has also announced that it will be introducing a high-definition laser disc player which will be produced by Sony on an OEM basis (that's one for the record books!).

An interesting range of camcorder accessories, under the Sima brand, has been introduced by Prisma (Europe) Ltd., Pitsford Street, Birmingham B18 6LX (021 554 5540). The SL6B at a suggested price of £30 is a 15W light for use with camcorders that have a rear-mounted battery pack: it plugs

into the back of the camcorder, carrying the battery piggy-back style. The unit has a LED battery-strength indicator and an accessory shoe into which the light or other accessory can be fitted. At £50 the SSM3 stereo mixer enables two VCRs or a VCR and a camcorder to be connected together. It has four slider controls and comes with an omnidirectional microphone and two sets of cables. Power is provided by a 9V battery. There is also a headphone/microphone combination for monitoring and narration while shooting or editing. There are two Nicad battery dischargers. The PowerMax Auto Select SPM7 at £23 can condition 8mm and VHS-C Nicad batteries rated at 6V, 7.2V and 9.6V. The PowerMax Mini SPM6 at £20 is for use with 6V batteries only.

TRAINING

Satellite Solutions is running a series of one-day u.h.f. training courses in conjunction with Teleste (Labgear). The courses cover transmission techniques, optimising reception, obtaining in and out of area signals, filtering, diplexing, ghost elimination, signal distribution and other relevant matters. Unfortunately some of them will have been held by the time that this appears. You can still catch up with the courses at Leeds (May 20th), Newbury (May 27th), Northampton (June 3rd) and Edinburgh (June 10th) however. For details contact Satellite Solutions UK Ltd., 35 Quarry Park Close, Moulton Park, Northampton NN3 1QB (0604 670 900).

Steve Beeching is to run weekend training courses on VCRs or Camcorders (whether one or the other will depend on demand) on the 24-25th July and the 11-12th September. The fee for the two-day course is £50 plus VAT. For details contact Steve Beeching at Grove Farm, Long Lane, Barnby in the Willows, Newark, Notts NG24 2SG (0636 626 327, fax 0636 626 767).

UPDATES/CORRECTION

The prices of the Philips Scopemeter models (see review in last month's issue, page 497) will be increased from June 1st. The new prices are as follows: Model 93 £995, Model 95 £1,195, Model 97 £1,395. The hard case goes up to £83 and the soft case to £93. These prices are exclusive of VAT. Incidentally, our apologies for the error in the heading (word Scopemeter omitted) and one or two similar errors elsewhere: the computers in the office and at the printers are still not understanding each other fully.

There are two resistors with the reference number R19 in Fig. 1, page 432 (April), the electrolytic capacitor ESR meter circuit diagram. The one connected between C4 and the junction of R1/R2 etc. should have been shown as R21: its value is 100kΩ.

IN BRIEF

BBC Radio 1, 4, 5 and the World Service are now available via the Astra 1B satellite's transponder 23: tune to UK Gold (11.552GHz horizontal) and select the appropriate subcarrier - 7.74MHz for Radio 1, 7.56MHz for Radio 4, 7.92MHz for Radio 5 and 7.38MHz for the World Service (above the vision carrier). The Wegener Panda 1 system is used. . . BBC Television would like to run BBC-3, -4 and -5 with commercial partners via Astra. . . Huanyu is closing its TV assembly plant at Corby, Northamptonshire. It will move to London and operate as an international trading company. EC anti-dumping duties have hit the company's Chinese TV kits badly.

Next Month in TELEVISION

SERVICING THE PHILIPS VR6462

This popular VCR was on sale in the mid-Eighties and appeared under various guises - the Finlux VR1010, Pye DV464, GEC V4006 and Tatung VRH8490. It introduced several innovations such as built-in test programs. Chris Watton provides guidance on servicing and a quick fault check list.

INTRODUCING PANASONIC'S DIGITAL CTV CHASSIS

A guide to the features incorporated in Panasonic's first CTV chassis to use digital signal processing and the built-in servicing aids which mean that fault-finding is not going to be as daunting a prospect as one might suppose. The chassis uses a custom chip developed by Matsushita in conjunction with ITT: its eight-bit processing gives much improved resolution. R. Meadows reports.

TEST REPORT: THE MAXCOM ALL-IN-ONE

The Maxcom MX9000 incorporates a triple power supply, function generator, 8-digit frequency counter and comprehensive digital multimeter in one case. All operate independently. Eugene Trundle has given one an extended workshop test.

DEVELOPMENTS IN DIGITAL TV

Digital technology confers many advantages in the TV field and work on the development of practical systems for broadcasting is progressing at an impressive rate. Geoff Lewis takes a look at the present state of the art.

MORE ON COLOUR SIGNAL PROCESSING

Following this month's look at basic PAL colour signal decoding Eugene Trundle examines more recent techniques such as noise reduction, aperture correction and colour transient improvement.

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TV Fault Finding

Reports from Philip Blundell, AMIEIE, Brian Storm, Adrian Farnborough, J. LeJeune, Geoff Fardon, Alan Smith, Chris Watton, Richard Newman, Ramesh C. Patel, Alfred Damp, Nick Beer and Michael Dranfield

Philips Anubis B-AA Chassis

This set worked but the alarm LED was flashing and ER4 was displayed on the screen. The ER4 display indicated a teletext fault, and when text was selected only lines came up. After checking the supplies to the text board and finding that everything was o.k. we checked the oscillators. 1701 (27MHz) wasn't working: a new crystal put this right. **P.B.**

Mitsubishi CT2153/5, 2553/5 and 2965

For ghosting, ringing or an intermittently blank raster suspect problems with the tuner/VIF pack. The fault is often due to dry-joints around the SAW filter or the nearby coils L4 and L5. If resoldering these doesn't solve the problem a modification will be needed. Ask Mitsubishi spares department for modification kit AFT1. **P.B.**

Grundig CUC3600 Chassis

If you can't find the cause of no picture on the RGB module – possibilities here are incorrect supplies or absence of the sandcastle pulse – check the brightness and contrast control voltages at pins 2 and 16 of the TDA8442 bus interfacing chip IC350 on the main panel. If they are low and refuse to increase when the controls are operated there's a good chance that the TDA8442 chip is faulty. **P.B.**

Philips G90AE Chassis

There was no picture, just a blank raster, though the teletext worked all right. Checks around the TDA3561A colour decoder chip showed that the voltage at the contrast control pin (pin 7) was slightly negative instead of the 3.4V specified in the manual. The negative voltage came from the beam limiter via D6326: C2560 (33nF) was open-circuit. **P.B.**

Grundig CUC5301 Chassis

This set was dead: the chopper transistor T644 was short-circuit and the fuse in its 300V supply had blown. To reduce the chances that a new transistor would go the same way as its predecessor, I decided to monitor the drive waveform from the chopper control chip with T644 removed. The manual shows that a 10V drive pulse is present under normal conditions – but what would you get with no load? A comparison check with a stock set showed that you get very little! In fact with T644 removed you get a negative-going needle pulse of about 0.1V amplitude at a slow rate. As this pulse was present in the faulty set I decided to investigate the power supply outputs. D681 (BYV38) was found to have a leak of about 200Ω. **P.B.**

Panasonic TX25A2 (Alpha 3 Chassis)

This set worked at switch on but after a few minutes there was a lapse into sullen silence, with no sound and a dark, blank raster. As the main microcontroller and memory chips can be responsible for this condition we decided to carry out

some checks in this area. We eventually found that C1251 in the microcontroller reset circuit was leaky. You've probably already guessed that it's a 10nF ceramic capacitor. **B.S.**

Panasonic TC1785 (Z3 Chassis)

The tuning was at best unreliable – the set drifted from station to station at will. You could retune and store the stations, but you still had to retune from cold. As expected a new tuner unit made no difference at all. Checks in the tuning voltage circuit soon brought us to a likely culprit: the 10nF ceramic capacitor C17 was leaky. **B.S.**

Panasonic TX28G1 (Alpha 2 Chassis)

The picture would bow in from the sides when the set had spent half a day on the soak test bench. Fortunately the fault became a permanent one after a couple of days, enabling us to discover that the culprit was a small, yellow capacitor connected to the base of transistor Q751 in the EW circuit: C754 (180pF) was leaky. **B.S.**

Toshiba 2512DB

EW modulator problems seem to afflict Toshiba sets. The problem with this one was lack of width. Our starting point in the search for the cause was the DPC panel, which sits on the right-hand side of the chassis when viewed from the back. Scope checks were unnecessary as R425 was obviously open-circuit. Some d.c. checks then showed that there was no voltage at the collector of Q422. At this point we recalled a similar problem we'd had with a 285T8BZ (see September 1992, page 785). We removed the loading coil L423 and, as a temporary measure because we didn't have the correct Toshiba part, fitted the coil (L702) from the diode modulator board in the Ferguson TX100 chassis. With this and a new safety resistor the set worked correctly.

It seems that these coils have a weakness: as before, slight scorching of the windings could be seen when a magnifying glass was used.

There are no presets on the main PCB in Model 2512 for adjustment of the width, parabola and trapezium waveforms etc. Control of the set's operation is done via a central bus and microcomputer chip. In the unlikely event of an adjustment being necessary, this can be done by using the remote control unit, as outlined in the service manual.

We would like to compliment Toshiba on the ready availability of spares, which normally arrive next day after a phone call with our account number. **A.F.**

Finlux 3024F (3000 Chassis)

This set was dead with a short-circuit line output transistor. A check on the h.t. voltage and a look around for dry-joints didn't reveal anything amiss so a new transistor and insulator were fitted. The set then worked for two hours after which the transistor again failed. Some further resoldering was done in case of dry-joints and the scan coil plug was checked. But again nothing wrong could be found. This time I added a 47Ω

resistor in series with the supply to the new line output transistor so that I could monitor the results. Surprisingly there was only a quarter inch reduction in the width.

The set worked all day but the line output transistor ran hot. Experience has showed us that it usually runs cold. I next monitored the line drive waveform and discovered that when the set had been on for about an hour there was a peculiar wiggle and a large negative-going spike during the switch-off period. A new BC637 line driver transistor (Tz3) put that right. And no I didn't forget to remove the 47Ω resistor!

The useful thing about inserting a resistor in the feed to the line output stage is that you can monitor conditions here. All sorts of faults can be observed without blowing the line output transistor – even dry-joints. This technique can be employed with most sets. C.W.

Ferguson Model C51N (ICC8 Chassis)

The teletext picture was very bright and was shifted to the right on the screen. Cause of the problem was the 5V regulator TP03 on the teletext/scart board: an internal short-circuit put 7V on the 5V rail. J.LeJ.

Ferguson ICC7 Chassis

Two of these sets have given us problems recently. The power supply in the first one didn't work although the start-up supply was present at pin 16 of the TEA2261 chopper control chip IP01. The cause of the trouble was an internal breakdown within IP01, as a result of which there was no voltage at pin 15. This pin provides the supply for the chopper drive stage within the chip.

The BSR51 line driver transistor TL17 was short-circuit in the second set. When this had been replaced we found that there was field collapse. The cause was failure of the BA157 diode in the field output stage: it had gone short-circuit, putting 65V on the 24V line. J.LeJ.

Ferguson MM02 Monitor

Uncontrollable brightness was the problem with this monitor. We found that the voltage at the slider of the brightness control RV40 changed very little when it was rotated. The voltage here should have been around -70V but was in fact -1.7V. R28 (120kΩ, 0.25W) was open-circuit. Ferguson didn't make many of these excellent little monitors and information on them is comparably scarce. J.LeJ.

Hitachi CPT2078

This set would switch on and work normally for a period that varied from ten seconds to about ten minutes. Then the seven segment display would go out, the picture and sound would disappear and the three LEDs on the front would light up. A check in the fault condition showed that there was no 5V supply at pin 20 of the MAB8422 microcontroller chip. This supply comes from a bridge rectifier and voltage regulator on the CITAC panel. The 7805 regulator had only 3V at its input. Substitution revealed that the bridge rectifier diodes were breaking down, though they read o.k. when cold. A.S.

Philips 3A Chassis

With these sets the geometry and various options are controlled digitally: adjustment is via a service remote control unit with the set in the service mode. It's unusual to

have to carry out any adjustments unless major repairs have been carried out in certain areas. This set had very bad geometry and when it had been put in the service mode it seemed that all the options had been changed. But the set hadn't been anywhere for repairs.

When the geometry had been readjusted and the parameters had been stored in memory all seemed to be well. But the same thing happened a few weeks later. The parameters are stored in an X2404 EEPROM, IC7900, which we decided to replace. After doing this you have to reprogram the entire set: all the system options – Nicam, teletext, channel and program numbers etc. have to be stored in the memory. Since doing this the set has not been back. R.N.

Philips G110 Chassis

Sometimes you jump to conclusions that give you extra work. As this Nicam set had what sounded like severe crossover distortion in the left-hand channel I went straight for the TDA1521 output amplifier IC7270. A replacement failed to cure the fault and I then discovered that the distortion was present only with Nicam reception: mono f.m. from a signal generator produced perfect results. The obvious thing to do was to check the audio stages in the Nicam section. There are two LM833 operational amplifiers, IC7350 and IC7351, one for each channel. They receive their inputs from the TDA1543 DA converter chip. Checks with a signal tracer showed that the distortion was present at the first stage amplifier in the left-hand channel. As luck would have it I didn't have an LM833 so a new TDA1543 was tried. This cured the fault. R.N.

Philips GR2.1 Chassis

This set was a nightmare as it had received third-party attention. The causes of various faults had been found and cured but the most interesting one, a reluctance to start up from standby, remained. When the set was brought out of standby the red LED would go out then, a few seconds later, it would flicker at a fairly fast rate. If the set was left for a minute or so it would come on and work normally.

Time was spent going through the power supply, but the cause of the fault was not here. In fact in the fault condition the h.t. was correct at 95V. I found that the root of the trouble was that the line timebase didn't start up. Line drive is generated by a TDA2579B chip which had already been replaced. It seemed that this chip was faulty however: the start-up supply, though about a volt low, was present at pin 16 but there was no line drive output at pin 11. I then noticed that a TDA2579 without the B suffix had been fitted. Could this be the cause of the problem? When a TDA2579B was fitted the set worked faultlessly. I proved the point by fitting a TDA2579, which brought the fault back. Moral: always fit exact replacement parts, and take note of suffixes. R.N.

Sony KV2060

There was an uncontrollable rolling picture, the field hold control being set at one end of its travel. R524 (80kΩ) was found to be very high in value at around 140kΩ. G.F.

ITT TX3835 (Compact 80 Chassis)

At switch on there was a rustle of e.h.t. with the channel indicator numbers showing 1, then the set went into the standby mode. If the set was switched off then on again fairly quickly the time before reverting to standby was

quicker. If the set was left for a while it took two-three seconds to switch to standby.

The way in which the set was acting made us think about capacitors. But which one? Use of freezer led us to C703 (10 μ F, 50V) which is next to the chopper transformer. Freezing it made the set chatter. **G.F.**

Fault Summary

Ferguson A10R (TX80 chassis): The cause of an intermittently red picture can be an open-circuit track between RV110 and the emitter of TV101. I've had three sets in recently with this fault: you can't see the track break.

Sony K VX2932: One of these sets had no e.h.t., with the line scan drive at approximately 10V. The cause of the fault was on the scart PCB where D1504 was leaky. It caused many hours of head-scratching.

Samsung CI3312: For drifting off channel check whether R124 (33k Ω), R116 or RR26 (both 120k Ω) is open-circuit. They are in the a.f.c. circuit. When the picture is locked there should be approximately 2.5V at pin 9 of the micro-controller chip RIC01.

Panasonic TX24T1 (Alpha 2W chassis): The cause of faulty EW correction was L752 being short-circuit.

Sony K VX25TU: L806 being short-circuit was the cause of intermittent failure of the line output transistor.

Panasonic TC1485 (Z3 chassis): If one of these sets trips - tries to start then shuts down - check whether the value of R560 (270k Ω) or R552 (27k Ω) has gone high.

Samsung CI3312: The PCD8572 chip RIC02 can be the cause of loss of memory. Symptoms are that if you tune in everything the picture comes back but if you change channels or switch off all channels are lost. **R.C.P.**

Hitachi G7P Mk 2 Chassis

No results was the problem. The set was kind to us. A quick cold check on all likely high-value resistors showed that R920 (100k Ω) was open-circuit. **A.D.**

Ferguson SRV1

The problem with this satellite receiver was patterning, so the tuner was suspect. Sure enough C416 (2.2 μ F) was open-circuit - failure of this component has been reported before in these pages. There's another electrolytic capacitor of similar type in the centre of the tuner, designated C413 (47 μ F). This was leaky. Replacing both capacitors cleared the picture. **A.D.**

Ferguson TX90 Chassis

A low h.t. fault is beginning to occur with these sets. The symptoms are that the h.t. preset won't increase the h.t. voltage above 93V while verticals cog and bow dependent on beam current. In the regulator section of the circuit there's a chain of 270 Ω resistors numbered R206, R207, R211 and R212. In all the cases we've had so far one of them has read anything from 6k Ω to open-circuit. **A.D.**

Rediffusion Mk 3 Chassis

The problem with this old set was that the volume would intermittently increase violently. I found that the control itself was as smooth as silk when rotated. The cause of the problem was traced to a high-impedance earth connection on the plug and socket that connects the volume control to the i.f. board. **N.B.**

Hinari CT5

This set sounded, as Les Lawry-Johns once so perfectly described it, like a bee sprayed with freezer. It was dead as the line output stage wasn't running though the power supply was. No overload then. The cause of the problem was no line drive as there was no supply to the line driver stage due to a break in the print in the front left-hand corner of the chassis, where it fits in the runners. As a result the feed resistor R401 didn't receive its supply. **N.B.**

Sony KVM14U

There were varying symptoms due to grey-scale drift. The auto-clamping circuit didn't work well though it was all right itself. The main symptom was that the green level varied from fairly acceptable to very high. When adjusted the first anode voltage control had a very odd effect on the picture. The cause of the trouble was a faulty tube. **N.B.**

Hinari CT5

The symptom with this set was crossover distortion, i.e. cramping across the centre of the screen. Checks on the field output transistors Q301/Q310 and the associated biasing components failed to reveal anything amiss, though the d.c. conditions were slightly high. The cause of the trouble was the 2.2 μ F tantalum field linearity feedback capacitor C307. **N.B.**

B and O LX2500 (37XX Chassis)

The initial problem was that the mains switch didn't latch. When it was replaced the standby LED didn't light up. This chassis has a simple standby supply circuit - a novelty for B and O! The rectified d.c., which should be around 11V, was low at 6.5V because the 470 μ F, 16V reservoir capacitor C14 was open-circuit. **N.B.**

Hitachi CPT1444

This set was dead because there was no supply to the line driver stage. Feed resistor R710 was open-circuit. **N.B.**

Hitachi CPT2078 (NP83CQ Mk 2 Chassis)

There was a blank (black) screen, no sound and the green video LED at the front of the set lit up. The cause of the trouble was that the 12V rail was low at 6V. We found that R716, which is connected to pin 3 of the line output transformer as a surge limiter, read 72 Ω instead of 2 Ω as specified in the manual. It's the first time we've come across a change of value with a safety resistor. **M.Dr.**

Huanyu 37C-3

Take care when replacing C907 (2.2 μ F, 160V) in the power supply: in the set we had in for repair the - and + markings on the PCB were transposed. We just managed to switch the set off before our replacement exploded. The correct way round is with the positive terminal connected to the cathode of D905. **M.Dr.**

Sharp C1495

In the event of field collapse check both R511 (15k Ω) and R512 (1.2k Ω). You'll probably find that R512 is open-circuit. **M.Dr.**

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Extended Infra-red Remote Control

Alan Beech, B.Eng., GM1BXG

With the growing amount of domestic AV equipment that's become available over the last few years many enthusiasts will have arranged to pipe their signals around the house from the main installation in the living room. This provides a good-quality aerial feed for the kitchen, bedroom etc. and enables signals from sources such as a VCR, satellite receiver and laser disc player to be fed into the distribution system.

Programme source selection from a remote location has always been a problem however, one that's been made worse by the advent of satellite TV. A VCR can be switched to play before you retire to bed, and left to switch itself off. But satellite TV introduces a greater range of choice: if some thirty channels are available it's a pity to restrict yourself to just one in the bedroom. You can make an 'urgent call' to change channels of course, but landings and stairways can get cold at night!

Several devices that provide remote control from a remote location are available commercially. But they tend to be rather expensive. So the system described here was developed, mainly from items in the junk box. Its cost is a fraction of that of similar commercial units. Several have now been built, proving that the design is repeatable and effective.

The SL486 Chip

The heart of the system is the readily available SL486 IR preamplifier chip, which is designed for use as a full IR reception front end. It has a differential input amplifier, automatic gain control, noise reducers, pulse stretchers and an on-board voltage regulator. Quite an impressive chip! Some buffer transistors, a power supply and IR detector and emitter diodes are all that are required to complete the system – the circuit is shown in Fig. 1. Operation of the SL486 chip is described in some detail in an RS data sheet. Not all of its features are used in this present application: though based on the recommended circuit, the one used here differs in several respects.

The SL486 can be operated directly with supplies in the range 4.5-9V. Above 9V the manufacturer recommends use of the internal regulator. Although this was tried with a prototype, I found that the suggested circuit added a d.c. pedestal to the output pulse train. This was difficult to

remove without complicating the external circuitry. Much better results were obtained by using an external 78L05 regulator. With this the output at pin 9 consists of a series of 5V pulses that correspond with those received by the IR detector diode.

The pulse stretcher circuit, between pins 10 and 11, is not used: it's intended to provide clean pulses for microcontroller decoding systems. In this application we need the response of the unit to be as linear as possible, with minimal effect on the characteristics of the pulses passing through.

The values of the a.g.c. reservoir and gyrator decoupling capacitors (those connected to pins 2, 3 and 8) were determined by experiment. If you find that the unit has a poor response with a particular remote control system some further experimentation may be needed.

I used a BPW41N IR detector diode, mainly because I had a number of them in stock. Most other types of IR detector diode should be suitable. The diode is connected to the differential amplifier's input pins 1 and 16. During tests I found – quite by accident – that with some remote control handsets the unit's performance is significantly improved when pins 1 and 2 of the chip are connected together as shown. This appears to increase the reverse bias applied to the diode. No adverse effects have been noted with use of the diode in this way. If you connect the diode's cathode to the 5V supply its sensitivity is greatly reduced.

Drive Circuitry

A fairly high-impedance output is provided at pin 9 of the SL486 chip. It's buffered by an emitter-follower transistor and is then applied via a current limiting resistor to the output stage. This consists of two transistors in the Darlington configuration, used to drive the IR emitter LEDs. Any general-purpose npn transistors could be used in these positions, but bear in mind that the instantaneous output current can be in the order of 1A or so.

Use of three series-connected IR emitter diodes gives good coverage without creating an excessive voltage drop in the output stage. The type of diode used in this position is not critical – several different types have been tried with no obvious difference in the performance of the system.

If you intend to use IR emitter/detector diode combina-

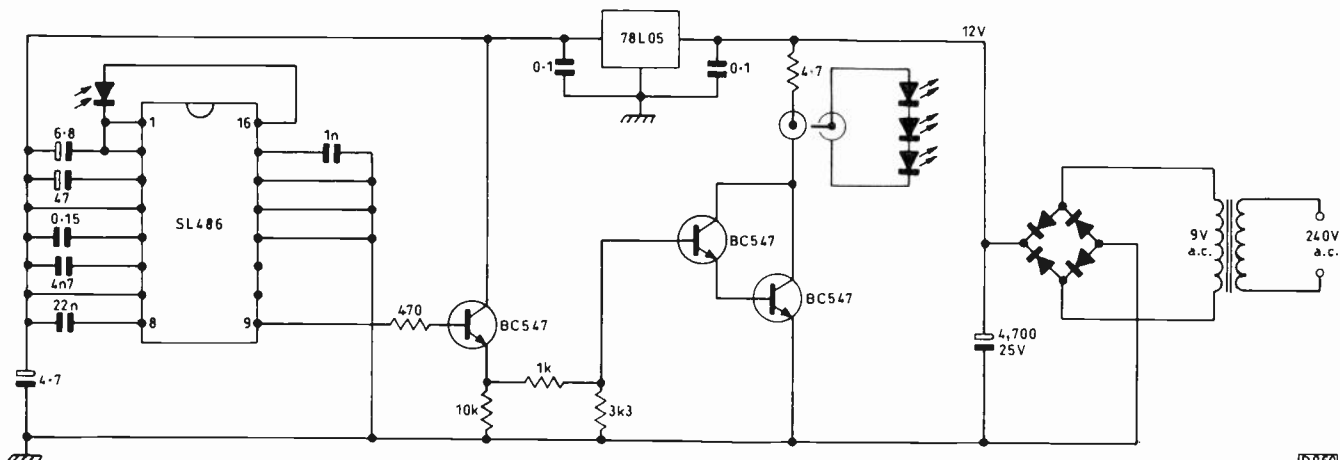


Fig. 1: Circuit diagram of the IR relay system.

tions from the junk box, remember that their peak sensitivities may lie in different parts of the IR spectrum. The BPW41N is available from RS and Farnell. RS also sell a matched high-powered emitter diode.

Power Supply

A simple power supply is used, with a 9V transformer to generate a 12V supply for the output stage. As mentioned above, the SL486 is supplied via a 78L05 regulator chip. For optimum stability ensure that the regulator is adequately decoupled. As the unit is likely to be powered continuously it's best to use a good quality transformer.

Construction

Construction should present no problems: the circuit can easily be built on a small piece of Veroboard. Layout is not critical, but the preamplifier chip should be kept away from the mains transformer.

I use two general-purpose ABS boxes. The detector, amplifier and transformer will easily fit into a box with dimensions of approximately 100 x 80 x 35mm. Cut a small square hole where the IR detector diode is to be mounted. It can be held in place with a dab of glue or suitably stood off from the Veroboard. Make sure that it's orientated correctly before you fix it!

A phono socket is used to connect the three IR emitter diodes, which are mounted in a small, lightweight box.

Although the RS data sheet recommends that the SL486 chip is enclosed in a tinplate screening box this has not been found to be necessary in practice. You may however find that if the detector unit is positioned near a TV set's line output stage its sensitivity falls: a quick scope check will show that the unit is busy repeating 15.625kHz IR pulses!

Unit Positioning

When it's used in the bedroom the best position for the detector unit is probably on a bedside cabinet – its receiving range is best at about 1.5-3m (5-10ft). As noted above it should be kept away from a TV set. When used in a kitchen keep it away from sources of interference such as a microwave oven, an electronic washing machine and fluorescent fittings. It should be above the work surface to prevent the face of the detector being soiled. To prevent condensation, avoid positioning the unit beside a cooker, window or sink.

The emitter diodes in their lightweight box can be easily

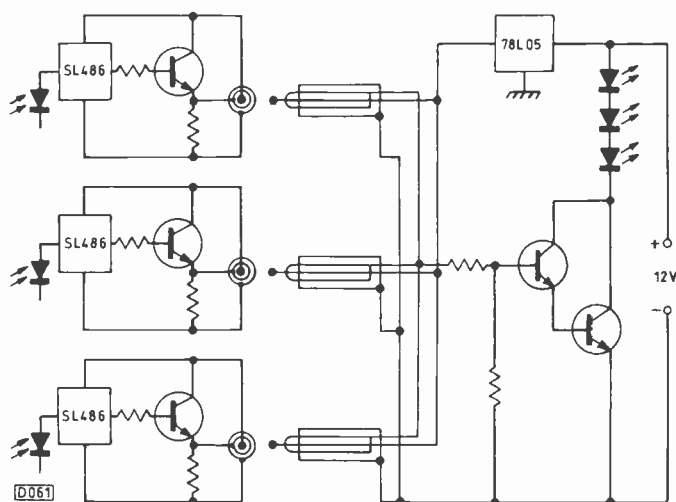


Fig. 2: Possible multipoint system.

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and unobtrusively positioned in the living room. Ensure that they have a good light path to all the equipment to be controlled. Sticky pads are ideal for mounting this box, but carry out some tests first to ensure proper coverage. Typical transmission ranges are up to 5m (15ft), but this depends on the sensitivity of the controlled equipment and the orientation of its IR receiver with respect to the relay unit.

Multipoint Relay System

The circuit we've described provides a single point-to-point IR relay system. If you require control from more than one location the arrangement can be altered slightly. Each receiving site will require its own IR detector, SL486 preamplifier and buffer stage. These sites can be linked to the IR emitter diodes housed in a larger box that also contains the power supply for the whole system – see Fig. 2. Two-core screened cable and appropriate connectors will be required to interconnect everything. As shown, the Darlington stage and the emitter diodes can be common to the whole system. It should be all right to connect all the IR receiver outputs together. This arrangement (Fig. 2) has not been tested however.

Practical Tests

It has obviously not been possible to try out the system with every model that uses IR control. The systems built so far have been found to work well with various equipment including a Sony TV set, VCR and midi hi-fi, a Panasonic VCR, Philips and Pace Astra receivers, Ferguson and ITT/Nokia BSB receivers, Philips and Decca TV sets and Technics and Denon CD players.

Test Report: ITT VX600S Signal Analyser

Nick Beer

I've recently had the opportunity to test the ITT VX600S, which is officially known as a "TV Measurement Receiver – with SAT band and f.m. range". It's difficult to think up a brief name for an instrument that has such a wide range of facilities, but there will be those who call it a signal-strength meter!

Description

The instrument is self-contained in a case measuring 307 x 141 x 345mm. There's an in-built 7Ah battery that gives two-three hours' use and an internal charger. The unit can be externally powered from a 12-18V d.c. supply at 1.5A or a 127/220/240V $\pm 10\%$, 50Hz mains supply, taking 40VA. Some advertisements I've seen make the unit look rather too colourful: in practice its appearance is very pleasing.

It comes with a soft carry case that has a protected channel/frequency list inside the lid. This brings us to the question of weight, which is quoted as 9kg – it's heavy! One wouldn't expect something of this sort, with an internal battery and charger, to be light but it still comes as a shock when you pick it up. Its weight could be tiresome when the unit is used in a typical fault-finding role – around an MATV system in a block of flats – but all such instruments will be similarly heavy.

The unit contains a signal-strength meter for the v.h.f. and u.h.f. bands, including Hyperband and f.m. radio, i.e. a range of 46-860MHz. The S version reviewed here also covers 950-1,750MHz for satellite TV reception. All signal connections for measurement are via BNC connectors. There's a built-in 6in. monochrome monitor and a speaker,

enabling channels to be viewed and listened to: an earphone socket with its own volume control is also provided. The monitor screen is also used for the spectrum analyser function. With a TV transmission the line sync pulse can be displayed to the left of the video scan. This is very useful for tracing the cause of poor sync, especially when intermittent, that has been proved not to be due to either the TV set or VCR. It's common to find that corrupted or distorted sync pulses are present all the time, degrading further intermittently to cause problems.

The d.c. voltmeter included covers the range 0-30V, using the bar-graph display. This caters for most amplifier supplies and the standard tuning voltage range.

Finally the zoom feature can be used to enlarge the picture so that, for example, the grain content can be seen more clearly.

We will now look at the basic features in greater detail.

A white bar graph that crosses the top of the c.r.t. screen is used for signal strength and voltage readings. There's a scale encribed on the front protective screen. The audio tone range finder is useful in certain circumstances but should of course always be confirmed with the meter.

You select the carrier or i.f. using first a coarse potentiometer then a geared-down fine potentiometer. A digital LCD is provided for the readout. A switchbank can be used to select attenuation on any band: a second LCD shows the attenuation selected.

Facilities and information on the front panel relating to satellite use are highlighted in yellow. This greatly simplifies use.

A cursor with the spectrum analyser display eases frequency adjustment. The expansion facility enables you to inspect the area around the selected carrier more closely.

The scart socket on the side panel allows, for example, a D2-MAC decoder to be connected.

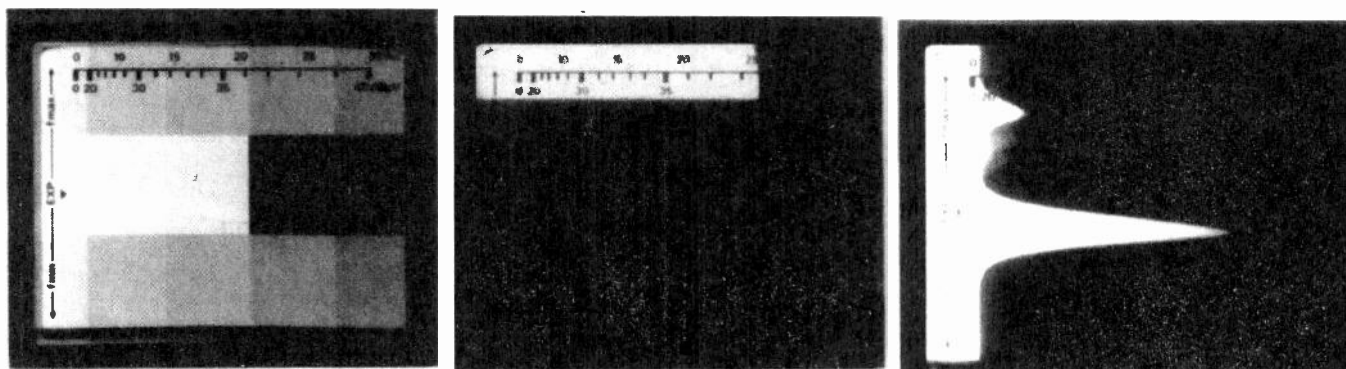
On Test

Once I had become used to it I found the instrument easy to use in all its modes. I was initially apprehensive about the bar graph but found that it gives quick, accurate readings. A correction factor from graphs on the front panel then has to be applied.

The satellite TV tuner in the sample unit I had for evaluation had an intermittent fault – low gain. I was however able to get a feel for its action when the fault was not present.

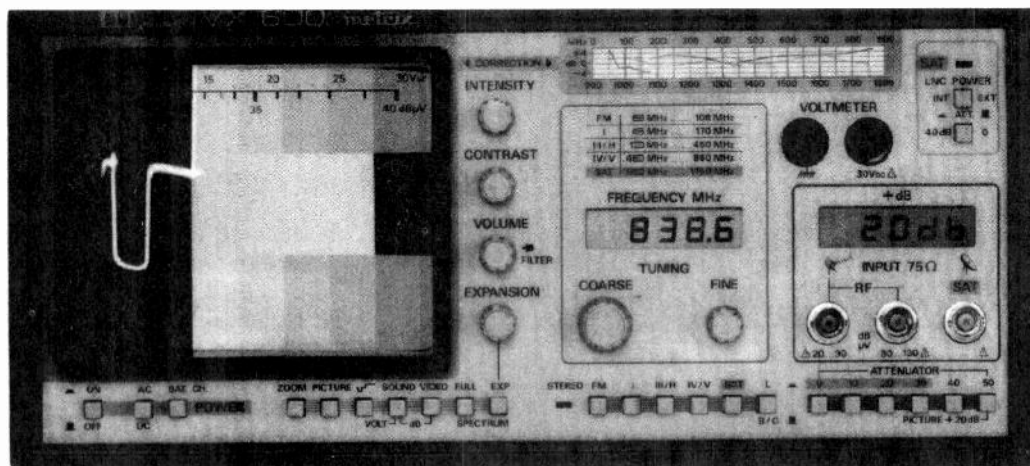
One slightly annoying problem I had with the monitor was inability to set the brightness and contrast levels for a constantly acceptable video display. The picture varied from scene to scene between being over-bright and over-contrasted. It was as if the clamping was poor.

I was surprised by the quality of the coaxial leads, plugs



Typical screen displays. Left: monitor display for system assessment. Centre: a bar-graph display. Right: a typical spectrum analysis display.

Front panel layout. The monitor screen is displaying the line sync pulse on the left-hand side with the video display shifted to the right - this facility can be selected by means of a front-panel pushbutton.



and couplers supplied. The leads are very thin and the plugs and couplers seemed to be too small.

Terrestrial Use

Anyone purchasing an instrument of this calibre would know what they are going to do with it! One thing I discovered is that you find yourself using various facilities when you would least expect to do so. One recent purchaser I spoke to said he used the spectrum analyser when installing a loft aerial. The point here is that though this may look like over-kill it does make the job easier and more precise. With the spectrum analyser you get a much more detailed picture of what you are doing and what is lurking nearby.

One thing that's making life difficult for all of us nowadays is r.f. spacing - especially between channels 30 and 40. Computers, VCRs and satellite receivers are all demanding space in this congested section of the band. Should Channel 5 transmissions in analogue form ever become a reality it will add to the problem.

Setting the spacing is in many circumstances critical. Here in North Devon we have situations like this. Our main transmitter is Huntshaw Cross, using channels 55, 59, 62 and 65. Relays around Barnstaple use channels 30, 40, 43 and 46 and 21, 24, 27 and 31. Say you need to fit in a VCR and a satellite receiver. Despite careful aerial alignment you can find that signals picked up from the back or reflections are strong enough to cause patterning, buzzes etc. The beauty of having a spectrum display is that you can see in graphical form exactly what's present at what level and

Table 1: Brief specification.

Bands: TV 46-170, 170-450, 450-860 and (plus satellite version) 950-1,750MHz. Bandwidth ± 350 kHz, display resolution 0.1MHz. F.M. band 88-108MHz, ± 50 kHz bandwidth, 0.01MHz display resolution.

Sensitivity: At v.h.f./u.h.f. from 20dB μ V to 130dB μ V. Attenuation in steps of 10dB from 40 to 130dB μ V (0dB μ V = 1 μ V at 75 Ω). Satellite sensitivity from 30dB μ V to 110dB μ V with attenuation in three steps.

Attenuation accuracy: ± 1 dB from 20dB μ V to 90dB μ V, ± 2 dB from 90dB μ V to 130dB μ V.

Input impedance: 75 Ω .

bandwidth. You can then plan where to place an additional signal and put it there accurately.

Many modern devices have modulators with less than perfect r.f. outputs - rubbish appears for miles around the main carrier, causing major problems. Again a spectrum display makes it easier to deal with this sort of thing.

A spectrum analyser to install a VCR? This may sound like madness and the need is the exception rather than the rule, but the use of a spectrum display does make the job easier and more successful.

The instrument's main intended use is with CATV/communal and rebroadcast systems. The same principles apply here. You cannot install and maintain such systems effectively without an instrument of this type. It fits the bill with an installation consisting of a receiving aerial and a distribution system: broadcasters would generally require greater resolution but would have to pay many times more for it.

Satellite Use

The instrument can provide 13V or 18V at 400mA to power an LNB, making it ideal for all TV installations. Sound can be tuned over the range 5.5-7.5MHz, which is perfectly acceptable for testing purposes.

The facilities provided by the instrument make it ideal for multi-satellite installations. Satellite identification becomes a formality, as does polar-mount peaking. It's important to be able to monitor the results accurately when a motorised dish is a long way from the receiver (a 500 yard walk in one case recently).

The importance of accurate installation of terrestrial distribution systems has already been mentioned. The same applies with satellite signal distribution at the first i.f. It's even greater when you want to downconvert the satellite signals for distribution at u.h.f. This instrument provides a superb, convenient and economic package for checking, alignment, calibration and fault finding with such systems.

Availability

The instrument can be purchased from any ITT Instruments distributor, for example RS Components or Thurlby-Thandar Ltd. For further details contact ITT Instruments, 344 Edinburgh Avenue, Slough, Berkshire SL1 4TU (telephone 0753 511 799, fax 0753 694 983. Current list prices for the systems I and L version are £1,595 basic, £1,825 with satellite facilities; for systems I and B/G they are £1,650 basic, £2,095 with satellite facilities. A front panel switch gives system selection.

My thanks to Peter Rummer and Alison Wells of ITT Instruments who arranged to supply the review instrument.

Servicing the Toshiba XR9017

John Coombes

This popular CD player was on sale during the period 1987-8. Before dealing with particular repairs and adjustments we'll give some general guidance on CD player servicing.

Basic Checks

The first thing to check is the operation of the laser. If this is all right, check the setting of the focus and tracking controls. Check visually that the motors work. To prove their mechanical operation they can be disconnected and tried out using a low-voltage battery. Use a signal injector to check the audio side.

Check all other possibilities before condemning the laser assembly. Ensure that the lens is clean, that the power supplies are correct and that the system control works properly. Then check the laser and focus settings, including the laser power output. A number of adjustments should be checked before you advise the customer that a replacement laser unit is required. Is there a carriage drive fault perhaps, or maybe the spindle motor is faulty? Look at the r.f. eye pattern: if all the adjustments have been set up correctly but the eye pattern is incorrect, replace the laser assembly.

Fault Notes

No display: Ensure that the power supplies are present and correct. Trace back to source if any one is missing. Check the conditions around the TMP47C420AF microcontroller chip Q201, including the clock and output data. If necessary check Q201 be replacement.

Tray inoperative: First check the operation of the tray motor (see basic checks above). If it's o.k., check the supplies and the drive circuit – check the supply to the TA7354P driver chip Q301 then the chip itself by replacement. Check the belt or for a clogged tray. Finally if necessary check the operation of the TMP47C420AF microcontroller chip Q201: use a scope to monitor the input and output ports.

Disc doesn't rotate: The disc motor is best checked by replacement. First however check the supplies to the TA8102P driver chip Q313. If necessary check the supplies to the microcontroller chip Q201 and the conditions at its data input and output ports: if suspect, check Q201 by replacement. There might be a servo control fault and the conditions at the input of the focus driver circuitry should be checked.

Disc doesn't rotate and pickup doesn't move to the outer track: Check that the power supply lines are all correct then check whether the pickup unit is clogged: it may be necessary to turn the pickup feed gear manually and check for a break or misalignment. Check that the microcontroller chip Q201 is providing correct information: if necessary check the chip by replacement. There may be a fault in the servo circuitry: check that the TC9201BF processor is supplied and the d.c. conditions at its pins – if incorrect, check the chip by replacement. Ensure that the feeder drive inputs are present at the TA8102P driver chip Q311: if so but the outputs are missing replace Q311.

Disc doesn't rotate, lens is stuck (doesn't move up or down): As with all faults, first check that the power supply outputs are correct. Then see if the lens is clogged: it may be necessary to move the lens carefully, using pincers, to free it. Next suspect is the microcontroller chip Q201: check its supplies and the d.c. conditions at its pins. If incorrect voltages are found check Q201 by replacement. Finally check the supply to the servo processor chip Q307 (TC9201BF): if this is correct, replace the chip.

Disc doesn't rotate, no focus search: Carry out a visual check – the most likely cause of the fault is a defective laser unit. To prove this, check the focus error signal. If there is a small-amplitude offset check for a fault in the servo circuit. The focus driver is the TA8102P chip Q312. Check its input, then the d.c. conditions or scope the inputs and outputs, and if necessary check the chip by replacement.

Disc doesn't rotate, no laser light: Check the l.t. lines, then suspect the laser unit whose output power may be low. Check by replacement or use of a laser power meter. There may be a fault in the a.p.c. circuitry: check each output very carefully. Possible faults here are Q102 (NJM2904D) and zener diode D101 (04A22.42) which can go short-circuit. The start limit switch S102 may be faulty. As a test try cleaning it: it must be replaced if defective.

If necessary check the supplies to the microcontroller chip Q201, then the d.c. conditions at the pins and finally try a replacement chip. Carry out the same checks on the TC9201BF servo processor chip Q307 if necessary.

High-speed disc rotation: This also means that the player won't read the table of contents. The main suspect is the laser unit. It may be worth checking the focus error signal offset. If this is all right a replacement laser unit is required. Before condemning the laser unit however check whether the lens is clean, ensure that the focus and tracking balances are adjusted correctly and for low a.f. signal amplitude (the disc may be faulty).

Track skipping: A faulty disc or laser unit are the main possibilities. C307 was changed from 12pF on earlier players to 7pF. This seems to cure the problem.

Incorrect display: Check the power supply output voltages then suspect the TMP47C420AF microcontroller chip Q201.

No sound but very noisy: Check the conditions in the demodulator circuit and the waveforms around the DA converter. Ensure that the shape and amplitude of the 1kHz waveform is correct. Make sure that there is a data input to the DA converter.

Sound drops, also no search: This may be caused by a tracking error due to misadjustment. The laser unit may be responsible however and may have to be replaced to prove the point. Check for a defective tracking error signal or driver circuit offset. Noisy potentiometers are a possibility. Another possibility is incorrect servo gain: check and adjust as necessary the focus gain and/or tracking gain circuits.

Modern TV Receiver Techniques

Part 6

Eugene Trundle

During the last couple of months we've been considering TV sound systems. Before that we traced the path of the received video signal up to the video demodulator. Whatever type of demodulator is used, it provides a composite video output consisting of the black-and-white picture information, which is referred to as the luminance signal; time markers for the line and field timebase generators, i.e. the sync pulses; and a subcarrier that provides the colouring information, referred to as the chrominance signal. This output is sometimes called CVBS – composite video, blanking and sync. Fig. 1 shows one TV line of composite video as it would appear on an oscilloscope – in this case the line carries a colour-bar signal.

The luminance signal, commonly known as the Y signal, makes the main contribution to what you see on the screen: it controls the brightness level and provides the picture detail. The colour information is superimposed on this, with little detail since the human eye is not very sensitive to colour detail. The luminance signal conveys brightness information as changes in voltage level: a low voltage for black, high for white, and voltages in between for the various shades of grey. Note however that the signal has to be inverted when, as is nearly always the case, the video signals are used to drive the tube's cathodes rather than its grids: a negative-going signal at a cathode increases the

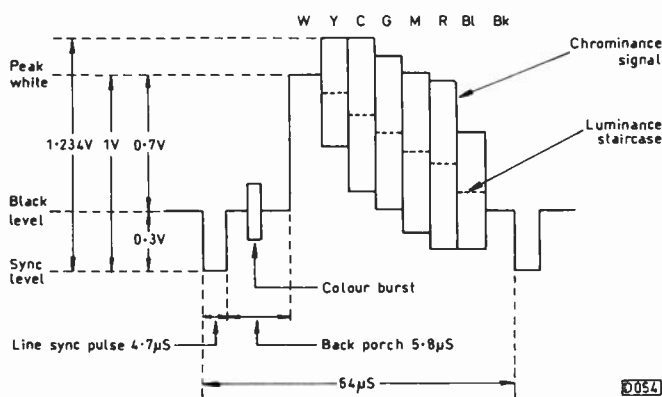


Fig. 1: One line of composite video, in this case for a colour-bar signal.

beam current, because we are increasing the potential difference between the cathode and the other tube electrodes which are held at fixed positive voltages.

A sudden voltage level change in the luminance signal corresponds to a vertical edge in the picture. For these edges to be sharp, the bandwidth of the circuits through which the luminance signal passes, from the video demodulator right up to the picture tube's cathodes, must be relatively wide.

The transmitted luminance signal frequencies range up to 5.5MHz (System I), but only a monochrome receiver can take full advantage of this. With a conventional colour transmission the colour subcarrier and its sidebands are superimposed in the h.f. part of the channel. A colour receiver removes this part of the video spectrum within its luminance channel. This is not really noticeable: only the largest domestic picture tubes have enough screen elements (more on this later) to resolve fully the signal detail transmitted.

The Luminance Channel

Luminance signal processing is a relatively simple matter: Fig. 2 shows in block diagram form a luminance signal channel. The first thing that has to be done is to get rid of the 6MHz (System I) sound carrier output from the video demodulator so that it doesn't produce beat patterns in the picture. A ceramic notch filter takes care of this, leaving just the vision signal (luminance and chrominance). If the chrominance signal carrier is allowed to pass through the luminance channel it will produce a dot pattern, i.e. an unwanted increase in picture brightness, in highly coloured parts of the picture. So it too is removed by a sharply tuned notch filter, which provides over 20dB of attenuation at the chrominance carrier frequency (4.43MHz).

The luminance signal is next passed through a wideband delay line. This is done to ensure that the luminance and the decoded colour signals coincide in time when they are later added to produce the RGB tube drive signals. The need for luminance signal delay, which is typically 330nsec, is because of the much narrower bandwidth of the chrominance signal path. As a narrow bandwidth delays signal rise and fall times, the colour and luminance signals would fail to coincide in the picture were it not for this compensating delay in the luminance channel.

The luminance signal has to be clamped, to ensure that regardless of picture content, tuning errors, signal strength variations or any spurious modulation the picture's black level remains constant: otherwise black and grey will not be correctly presented on the screen. Without clamping, vertical shading effects may be present. Clamping is done by restoring the luminance signal when it's at a fixed level (during the back porch, i.e. the 5.8µsec period that follows the line sync pulse at the start of each line) to a preset voltage. To prevent any black-level shift following the action of the clamp, d.c. coupling is used in the following circuitry. The clamping level is set by the user's brightness control.

The luminance signal is next blanked for the duration of the sync pulses and porches. At these times the scanning

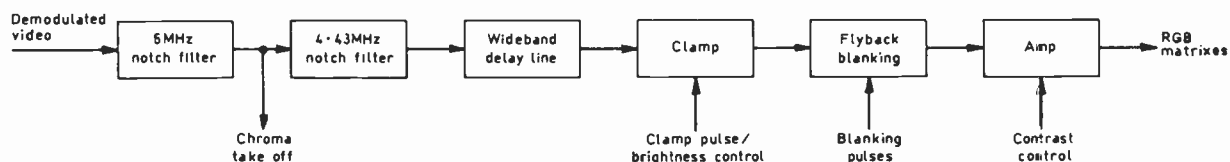


Fig. 2: The operations required in the luminance channel. The order of some of them may vary from chassis to chassis.

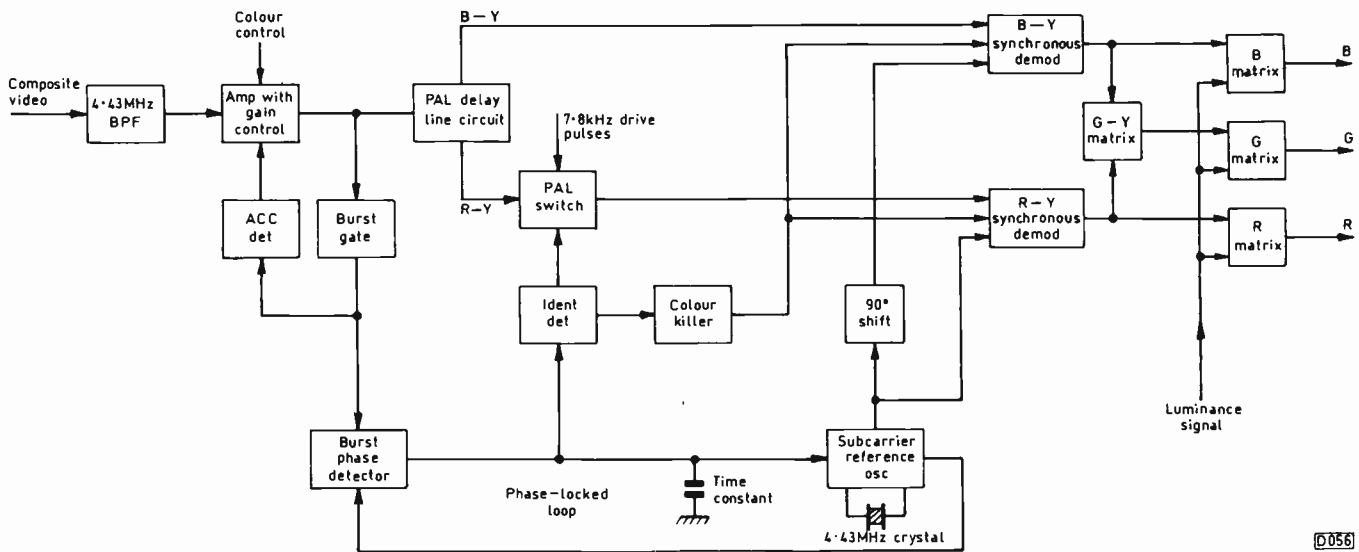


Fig. 3: A basic PAL colour decoder block diagram, showing the essential signal processing stages required. Again variations may be found in practical designs.

spots are making their retrace or flyback strokes before starting the next line or field: the tube must be cut off during these times to prevent unwanted illumination of the screen by the colour burst, teletext and other signals present in the line and field blanking periods.

Picture contrast is controlled by varying the gain of the luminance amplifier: the greater the gain the brighter the white parts of the picture, always rising from the black level established by the clamp. In a monochrome TV receiver a transistor voltage amplifier increases the amplitude of the luminance signal to around 70V peak-to-peak (black to peak white) to drive the picture tube's single cathode. In a colour set the luminance signal is added separately to each of the colouring signals to produce RGB drive signals for the tube's three cathodes.

PAL Decoding

To conserve broadcast spectrum space and ensure that both monochrome and colour receivers can work with the same signals, conventional terrestrial and satellite transmissions use colour encoding systems that enable the luminance and the chrominance (colour) signals to share the same frequency band. With NTSC, PAL and SECAM transmissions the chrominance information is conveyed by a subcarrier whose frequency is near the upper end of the luminance spectrum. Two artifices are used to minimise interference to the luminance signal by the chrominance signal: suppression of the subcarrier itself, leaving just its sidebands to carry the information; and careful choice of the subcarrier frequency, so that the chrominance signal sidebands interleave with those of the luminance signal (because of the scanning process there are gaps between the sideband components of the luminance and chrominance signals).

Fig. 3 shows the basic PAL chrominance signal decoding process in block diagram form. At the input a 2MHz wide bandpass filter centred on the 4.43MHz subcarrier frequency is used to extract the chrominance signal from the composite video output from the video demodulator (in practice there will be a buffer stage between the video demodulator and the following circuits, to prevent the latter loading the demodulator's output). It's next necessary to regulate the signal level so that tuning and propagation errors don't vary the level of the chrominance signal presented to the chroma demodulators. Regulation is carried out by a gain-controlled amplifier.

For reference purposes a burst of ten cycles of the chrominance subcarrier is transmitted during the back porch period immediately following the line sync pulse – see Fig. 1. This is known as the burst signal. Since it's transmitted at constant amplitude it can be used as a measure of received signal strength. Thus automatic chrominance control is based on detecting the level of the burst signal and adjusting the gain of the controlled chrominance amplifier as necessary.

Decoder Reference Signal Chain

There are two main elements of the chrominance signal: the picture information that's present during the active line period, and the colour burst just mentioned. The latter can be considered as the key to decoding the colour signal. It is extracted by a gate that's opened by a suitably timed pulse obtained from the line timebase. The primary purpose of the burst signal is to synchronise the subcarrier oscillator, which provides timing reference signals for the chrominance signal demodulators. For stability a crystal oscillator is used: its phase is locked to the average phase of the burst signal by a phase-locked loop. This consists of a phase detector which compares the burst and oscillator signals, producing an error voltage output to control the oscillator. Outputs from the oscillator act as reference signals for the chrominance demodulators – more on this in a moment.

With a PAL transmission the burst has a second function – that of identifying the lines on which the R – Y (red colour-difference signal) is inverted. In Part 1 we mentioned why the colour information is transmitted in the form of two colour-difference signals, B – Y and R – Y. With a PAL transmission the R – Y signal is inverted (180° phase shifted) on alternate lines: this is done so that spurious phase shifts in the transmission path can be averaged out (see

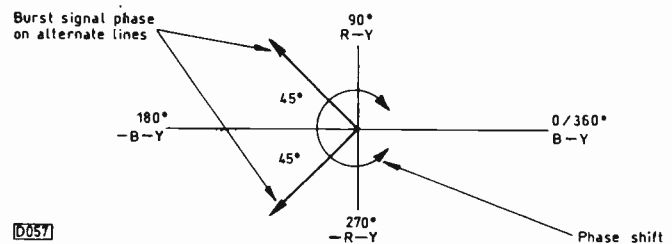


Fig. 4: How the phase of the chrominance subcarrier varies to represent different B and R hues.

later). The inversion has to be cancelled in the decoder, and for this to be done correctly we have to be able to identify the line on which it was done.

Nominally the phase of the burst signal is on the $-B - Y$ axis, see Fig. 4. We should perhaps recap on basic colour to point out that the chroma subcarrier is modulated in both phase and amplitude, the phase at any particular instant indicating the colour hue (amplitude indicates its strength). Thus to decode the colour signal we have to be able to check on its phase and amplitude. Fig. 4 shows that with the 360° of phase shift available, $0/360^\circ$ represents $B - Y$, 90° $R - Y$, 180° $-B - Y$ and 270° $-R - Y$. We need positive and negative colour signals to be able to add and subtract from the luminance signal so that the three beams produce colour whilst maintaining the correct brightness level. Back to the burst: whilst nominally on the $-B - Y$ axis, the effect of the alternate line $R - Y$ signal inversion at the transmitter is to advance and retard the phase of the burst by $\pm 45^\circ$ on alternate lines. This gives rise, at the burst phase detector's output, to a ripple signal at half-line rate (7.8kHz). Known as the ident signal, this ripple is used to control a switch whose function is to restore phase normality to the $R - Y$ signal, i.e. cancel out the PAL switching. A long time-constant is given to the error signal used to lock the subcarrier oscillator so that it is not affected by the presence of the 7.8kHz ripple.

Whether or not the ident signal is present is an infallible indication of the presence or absence of colour in the broadcast picture. It can thus be used to perform the colour-killing function. This consists of muting the chrominance channel during monochrome transmissions to prevent confetti and cross-colour effects marring the picture. But it does depend on the broadcaster remembering to mute the colour burst, something that in practice seldom seems to happen!

To summarise, the outputs from the reference section of the decoder are threefold: subcarrier outputs, 90° apart, to act as reference signals for the chrominance demodulators; an ident signal to control the PAL switch; and a mute indication to control the colour killer. These are all made use of in the chrominance signal section of the decoder, our next subject.

Chrominance Signal Processing

To build up a colour picture from a monochrome one it's necessary for information on both the hue and strength of the colour to be transmitted continuously in synchronism with the luminance signal. There is no need for high definition with the colour part of the signal, because the human eye is relatively insensitive to colour detail. So the bandwidth of the chrominance signal is limited to about 1MHz. Its phase at any particular instant indicates the hue at the relevant point in the picture being scanned out on the screen, while its amplitude represents the colour saturation (strength). Thus by sampling the chrominance signal at the $R - Y$ and $B - Y$ phase positions (Fig. 4) once per subcarrier cycle we can ascertain the amount of blue and/or red information present at that instant. It is for this reason that the chrominance demodulators are fed with reference signals: these serve to switch on the demodulators to perform sample-and-hold operations at the relevant times. There's a 90° shift in the reference signal feed to one of the demodulators in order to establish the correct sampling times. This quadrature system ensures that there is no crosstalk (interference) between the two demodulated colour-difference signals.

Prior to the demodulators the chrominance signal passes through the PAL delay line circuit. The delay line itself has

a delay time of one line, approximately 64µsec. It is thus able to make available continuously the chrominance signal at the same point along the previous line. By adding and subtracting the direct and delayed signals, in conjunction with the PAL $R - Y$ signal inversion on alternate lines, phase errors are converted to minor amplitude variations which are much less noticeable than a colour shift. In addition the circuit acts as a signal separating filter (a comb-response filter), with the result that the $B - Y$ and $R - Y$ signals are separated prior to the demodulators, further reducing any possibility of crosstalk.

The $B - Y$ and $R - Y$ signals represent, respectively, the difference between the luminance signal and the B and R primary-colour signals picked up by the camera. By adding or subtracting (depending on whether the demodulator produces a positive or negative voltage output) these colour-difference signals to/from the luminance signal, the appropriate B and R brightness drive signals are obtained for the tube. The third (G) primary-colour signal is obtained literally by deduction, based on state of the B, R and Y signals: if colour is present and it's not blue or red then it must be green.

Single Chip Decoder

For many years now the luminance and chroma signal processing circuitry in colour receivers has been combined in an integrated circuit that requires only a few peripheral components – the crystal, the delay lines, capacitors for tuning and clamping etc., pull-up resistors and so on. In many modern sets other sections of the receiver, for example the timebase generators, are integrated into a single chip with the colour decoder. To round off our treatment of colour decoding this month however we'll take a look at a typical single luminance-chrominance signal processing chip, the widely used TDA3562A. Though now several years old it's representative of most contemporary analogue colour signal decoders. Fig. 5 shows a simplified block diagram of the device. There are one or two interesting differences from the PAL decoder arrangement previously described.

After passing through its delay line the luminance signal is capacitively coupled to pin 8. It is then clamped and passed to the B, G and R matrixes.

After passing through its selectivity bandpass filter the chrominance signal is capacitively coupled to pin 4. The first stage applies automatic chrominance control, the a.c.c. reservoir capacitor being connected to pin 3: gain is regulated in accordance with the received burst level, which is measured by a peak detector that receives its input from the ident detector. Saturation is then adjusted by a voltage-controlled attenuator. This is gated on during the active line period only, so that the burst signal passes through without coming under the influence of the saturation control. The voltage at pin 5 determines the saturation level, which is set by the user's colour control – whatever form it takes.

The chrominance signal, with the burst, leaves the chip at pin 28 where it's applied to the PAL delay line circuit. This produces separate $B - Y$ and $R - Y$ outputs that enter the chip at pins 22 and 23 respectively where they go to the chrominance demodulators and the burst demodulator. Once demodulated the $B - Y$ and $R - Y$ signals go to the B and R matrixes and also to the G - Y matrix which feeds the G matrix. These matrixes are also fed with the luminance signal, producing R, G and B signal outputs.

Unlike the previous arrangement the burst signal accompanies the chrominance signal through the circuitry to the detectors. This means that the burst detector has to be gated

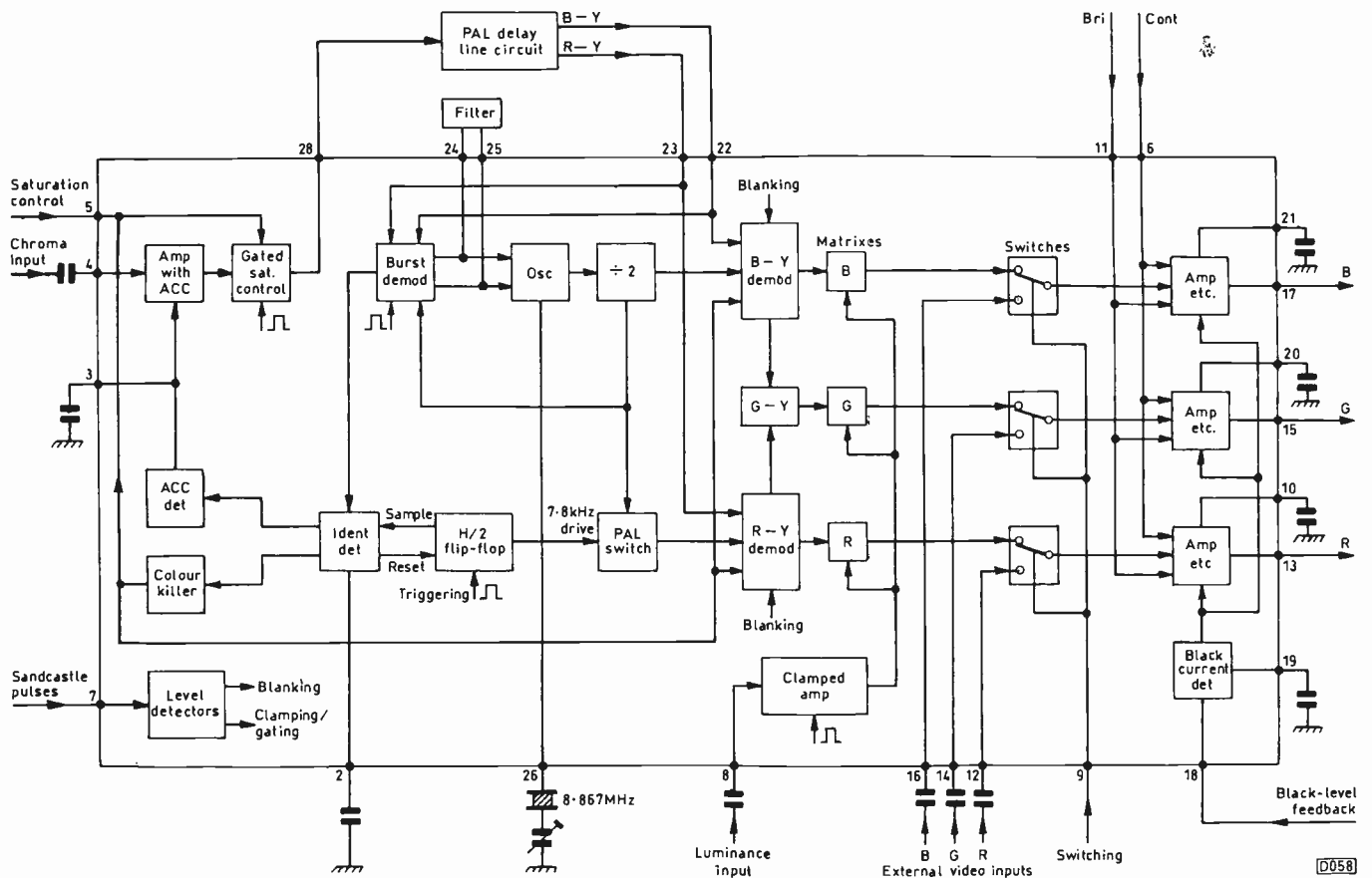


Fig. 5: Simplified block diagram for the TDA3562A luminance-chroma signal processing chip.

so that it operates only when the burst signal is present at its inputs. Another difference is that the oscillator runs at 8.867MHz, twice the PAL subcarrier frequency. Thus its output has to be divided by two before it can be used to control the demodulators. Running the oscillator at this frequency confers the advantage that, after division-by-two, correctly timed demodulator control signals are obtained without the need for external L, C or R phase shifters. On its way to the R - Y demodulator the control signal passes through the PAL switch which inverts it on alternate lines.

The H/2 flip-flop is triggered by line-frequency pulses, acting as a times-two divider to produce the required 7.8kHz output to drive the PAL switch. The PAL switching has to be synchronised, and this is done by the ident detector which compares the switch phasing (flip-flop status) with the ripple output from the burst demodulator. If the conditions are not correct, the ident circuit produces a pulse which resets the flip-flop. As soon as correct PAL synchronisation is established the colour-killer enables the chrominance synchronous demodulators and colour appears on the screen.

This chip is capable of NTSC as well as PAL operation, though the sections relevant to this are not shown in Fig. 5. Briefly a switching voltage applied to pin 25 selects the NTSC mode, with the PAL switch disabled and the time-constant of the oscillator's phase-locked loop shortened. External switching transistors enable a 7.16MHz (NTSC) or the 8.86MHz (PAL) crystal to be selected. By doing this switching separately, 4.43/NTSC as produced by some VCRs and Laserdisc players can also be accommodated. A hue control can be switched in across pins 24 and 25 for NTSC operation.

The outputs from the R, G and B matrixes are passed to switches that enable the demodulated or external signal inputs to be selected. A switching voltage applied to pin 9

changes the state of the switches, enabling RGB signals from a teletext decoder, a home computer or whatever to be passed to the output stages. These external signals arrive at pins 12, 14 and 16. All signals come under the influence of the contrast and brightness controls which act on the post-switch circuits. The d.c. voltages provided by these controls appear at pins 6 and 11 respectively, adjusting the gain and d.c. operating point of the R, G and B channels in parallel. On their way to the RGB output pins 13, 15 and 17 these signals pass through a clamping amplifier, blanking and buffering stages.

Automatic Grey-scale Correction

A feature of this chip is that the penultimate clamping amplifiers automatically regulate the black level for each colour, thus compensating for ageing and drift in the picture tube's guns and the external amplifiers that drive them. This is sometimes called automatic grey-scale correction or tracking and removes the need for manual cut-off adjustments throughout the life of the tube and the set.

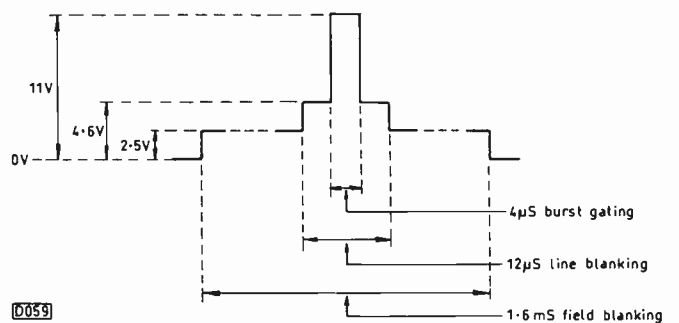


Fig. 6: The sandcastle pulse required by the TDA3562A chip.

Pulse generators within the chip drive each gun of the tube in turn to just above the cut-off point for the duration of one line during the field flyback interval. The measured tube cathode current during these lines is fed back to the chip at pin 18. Three pulses are received back in quick succession and are directed to the appropriate RGB clamps. In each case the measured current is converted to a control voltage which is stored in the separate clamp reservoir capacitors connected to pins 10 (R), 20 (G) and 21 (B). Thus the black level for each gun is continuously set in accordance with its own need as determined by feedback, the three guns cutting off at exactly the same point on the reproduced grey scale. The less commonly required and less noticeable need for manual adjustment of the individual gun-drive levels to neutralise high-light tinting remains.

The Sandcastle Pulse

The pulses required within the chip for clamping, gating and blanking are all obtained from the composite sandcastle pulse that enters at pin 7. It's shown in Fig. 6. The lowest level provides field-rate blanking and the middle level line blanking. The the top level consists of a short line-rate pulse that's timed to coincide with the colour burst. The sandcastle pulse is generated by the sync/timebase generator chip elsewhere in the set, and is sorted out by level-detectors inside the colour decoder chip for routing to the relevant circuits.

Next Month

In the next instalment we'll look at alternative decoder chips, electronic delay lines, colour transient improvement and the RGB amplifiers that drive the tube's cathodes.

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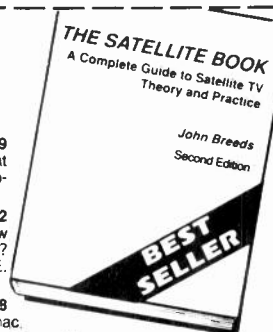
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Long-distance Television

Roger Bunney

March was another poor month for DX-TV reception. Now that April has arrived however there's the prospect of increased Sporadic E propagation, especially as the sunspot count is now falling. Perhaps by the time that this appears in mid-May there will be SpE signals aplenty.

As for March, here's the dismal story. Iain Menzies (Aberdeen) logged two early evening auroras on the 11th and 12th. The former produced unidentified signals in channels E2 and R1. There was a slight tropospheric lift on the 9th, with Band III/u.h.f. reception from Sweden. The 12/13th again produced tropospheric propagation across the North Sea, with signals from the Benelux countries and Germany being received in coastal resorts along the east coast. There was evidence of ducting on the 26th, with Band III/u.h.f. reception from Germany including the Brocken transmitter. The minimal SpE log was as follows:

13/3/93	TVE (Spain) chs. E2 and 3.
18/3/93	ARD (Germany) E2; DR (Denmark) E3.
25/3/93	TVE E2.
31/3/93	NRK (Norway) E2.

In the Australian *Yagi Bulletin* Robert Copeman reports possible reception of a US f.m. station in Hawaii at 93.9MHz. If confirmed, the distance in excess of 4,000 miles is perhaps a record for multiple-hop SpE f.m. propagation.

Tim Anderson suggests that short-wave radio may be of interest at times like this when there are so few DX-TV signals. Check at 25.87MHz (f.m.) for WFLA Tampa, Florida – the frequency is used for production/cue purposes by this medium-wave a.m. station. The 100W transmitter is heard in the UK from about 1630 GMT. TV station KHOU-TV, Houston, Texas (ch. A11) transmits f.m. sound at 26.15MHz while WLW Cincinnati transmits at 26.45MHz.

Here's yet another intruder into the 49MHz band. A well-known mail order company is selling a portable two-way intercom door chime. When the bell is activated the occupier can converse with the caller via the radio intercom before opening the door. Range is claimed to be 150ft, but baby alarms with this claimed range have been known to

radiate for over half a mile at high levels. Perhaps we should start long-range baby alarm DXing!

News Items

Switzerland: A new channel 'S PLUS' is to be launched towards the end of August at a frequency around the ch. 35-38 spectrum. Sound will be in both German and French.

France: TF1 has started a full Ceefax-based teletext service which will be run in parallel with the Antiope service until December when it will take over. RIP Antiope.

Germany: A new TV Centre plus prestigious tower is to be set up by Mitteldeutscher Rundfunk (MDR) at Leipzig as a major news focal point for Eastern Europe.

Belgium: BRT-TV has the new identification 'BRTN' atop its PM5544 test pattern with either 'TV1' or 'TV2' below as before.

Australia: Community TV stations MCT (Melbourne Community Television) and CTS (Community Television Sydney) have now been licensed and should be broadcasting programmes from June onwards. Both stations will use ch. 31.

In brief: A 20kW u.h.f. transmitter has been commissioned at Phnom Penh, Cambodia for the 'Channel 5' service. . . The Italian Telepiu third channel (Tele+3) is to be closed and replaced with a state-owned open-access service.

DAB Update

The Crystal Palace transmitter is to start digital audio broadcasting tests late this autumn. The UK will use a 12.5MHz section of Band III, at around 230MHz (ch. E12), for DAB. It will be divided into seven 1.75MHz blocks each of which will contain six national stereo channels. Two blocks will provide national coverage for BBC and independent commercial services, the remaining blocks being used for local stations (up to a dozen in large cities, six elsewhere). Though ch. E12 is clear in the UK many Continental stations will have to move to u.h.f.

Satellite TV

EBU news feeds currently downlinked for the Eurovision network via Eutelsat II F4 at 7°E, using mainly sound-in-synchs, are to change to digital video within twelve months. Seventeen EBU member countries including the UK and Ireland are at present installing digital earth stations based on a Scientific Atlanta digital system.

The first SISLink transatlantic circuit, between New York and the UK via the Pas 1 (PanAmSat) craft at 45°W, was inaugurated on March 29th.

Intelsat is to lease capacity on the shortly to be launched



Left: Test pattern used by the Thailand Ch. 3 network. It has been received on several occasions in Western Europe on ch. E2 via F2 propagation. Photograph taken by Gareth Foster during a holiday in Malaysia. Centre: VTR clock used by TVE-1 Madrid. Right: A friendly test pattern received via Intelsat K at 21.5°W.

Russian 'Express' satellites (see later). The Intelsat 801 and 802 craft will be launched over the Pacific by Arianespace in 1996: they will feature a C-band transponders running at up to 36dBW.

Eutelsat II F5 is to be launched by the end of the year into the slot at 36°E, with sixteen Ku-band transponders running at up to 50W output and widebeam coverage from the Canaries to Moscow. Eutelsat II F6 is expected to be operational by mid-1994 at 13°E, alongside II F1, providing up to sixteen more TV transponders.

Have a listen across the UK Gold audio subcarriers (Astra 1B, transponder 23 – 11.552GHz horizontal). You should find BBC Radio 1 at 7.74MHz, Radio 4 at 7.56MHz, Radio 5 at 7.92MHz and the BBC World Service at 7.38MHz. The services started on April 3rd.

TV Polonia opened on March 31st via Eutelsat II F3 (16°E) at 11.08GHz.

More satellite TV channels are planned by Kinnevik which is joining with US Paramount and MCA to offer 'The USA Network' and 'The Sci-Fi Channel' via Astra 1C or Eutelsat in clear PAL with advertisement financing. Ted Turner is to launch his Cartoon Network channel in early September via Astra 1C in the clear. By the time that this is read Astra 1C should have been launched, making an extra sixteen TV channels available across Europe. Discovery Channel Europe, Filmnet, TCC and two Spanish channels have leased transponders. Canal Plus is due to have dropped use of both the Telecom 2A and 2B satellites, being present on only 2A at 8°W

The Japanese BS-3N satellite is to be launched by Arianespace next spring, providing three DBS-level TV channels.

PAY-TV is to start in Australia from autumn 1994 using satellite instead of terrestrial MMDS transmission. Digital video compression will be used.

Bandula Gunasekera (Sri Lanka) tells us that the two Ekran u.h.f. TV channels (51 and 54) at 99°E have been in operation recently using PAL colour. Channel 51 has been leased to PTI (India).

The Russian Gorizont satellites are to be replaced with an upgraded type known as 'Express'. Each will have ten C band and two Ku band transponders. They will be phased in during the coming year, the one at 40°E being above the horizon in the UK. Express satellites will have improved station keeping capability and a life expectancy of about seven years (the Gorizonts lasted for typically three years).

It's possible to receive occasional TV signals from the Russian MIR space station via the Loutch SSSRD-2 satellite at 16°E, the transponder frequency being 10.835GHz. Transmissions are few but can be clearly seen if you are lucky enough to come across signals at that frequency whilst DXing. PAL is used for the signals generated on board MIR but they are converted to Secam before downlinking – the transmissions are in the clear. There's a permanent data downlink from 16°E at 11.375GHz, with right-hand circular polarisation.

Dish Tracking Noise

Last month we mentioned Andrew Sykes' noise problem with his wall-mounted, motor-driven dish – neighbours complained that they were kept awake if the dish was used at night. Jamming cloth into the support tube reduced the noise by a third. Colin Paton (Greenock) has had the same problem with his 90cm dish. He reports that the noise has been "almost completely silenced" by spraying liquid expanding-foam down inside the support mast – after taping across the lower end. The tape was then removed and a

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Aerial Techniques

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further application was made from the lower end upwards to fill any gaps. Once the foam has expanded and solidified any excess at either end can be cut off with a hacksaw. The foam comes in an aerosol can and is obtainable from builders merchants/DIY outlets – it's intended for filling gaps around windows, door frames, etc. Our thanks for this helpful suggestion.

Gavin Taylor (Peterborough) says that motor noise can be reduced substantially by slowing the tracking rate. To do this, insert 15Ω, 20W resistors in the motor power leads. Bypass switches can be wired across the resistors to give fast/slow (noisy/quiet!) control.

There will still be a degree of radiated noise from the motor system whether an actuator arm or H-to-H drive unit is used. Has anyone found an effective housing or method of suppressing noise from this source? Something which ensures that rain water isn't absorbed and that insects are kept out.

Wiring that avoids RF Interference

There's considerable debate amongst those who carry out commercial installations about the type of wiring to use in offices and industrial buildings to comply with the new EMC (Electro Magnetic Compatibility, i.e. interference radiation) standards laid down by EC legislation. These were adopted by the DTI at the end of October 1992: the EEC directive for EMC guidelines becomes mandatory on January 1st, 1996.

Computer radiation is taken seriously by banks and other organisations that handle confidential information. Many advocate the use of STP – screened twisted pairs – but other

wiring experts suggest that correctly-installed, unscreened twisted pairs may produce less radiation. One problem with screened pairs is that the cabling ends in the total system must be connected correctly otherwise the mass of wiring with screening may radiate far more than an unscreened system. Magnetic screening becomes more difficult as frequency increases – earthing a screened system at one end may produce radiation similar to that from an end-fed aerial, while earthing both ends can produce earth loops and, again, radiation!

Careful laying of twisted pairs and sensible use of ferrite/baluns will reduce radiation, but the basic routing, length, separation and earthing of cables all play their part. Equipment connected to a cabling system must be correctly matched and terminated to ensure that mismatches and standing waves are not produced – these would again radiate harmonic interference across the cabling system.

The DTI has an EMC helpline for assistance with interference problems. Phone 061 954 0954 (071 2125 1408 in London).

TEST CASE 366

It's a shame that the position of Ferguson seems to be on the decline at present. One of the oldest surviving brand names in the business, it still has a lot of loyalty amongst our older customers. We preferred the TV designs before the Thomson take over, though some of them are now getting rather long in the tooth. John Marchant, the landlord of the village pub here, is no spring chicken: neither is the Ferguson TV set that sits in the corner of his snug bar, relaying football and soap operas to the regulars. It has developed some nasty habits, switching to standby and changing channels at random so that one moment it shows Eastenders and the next Rugby League, then nothing at all. After calling time early one afternoon he staggered the two hundred yards up the hill to our workshop with the set in his arms. It's a large-screen, remote control model fitted with the TX10 chassis.

As the fault was intermittent (most faults seem to be intermittent nowadays) the set was hooked up to run on one of the soak test benches, under the watchful eye of Dylan. As soon as a commercial break came along the set switched itself to BBC-1. Maybe it didn't like commercials. Dylan trotted off to the stores: when he returned there was just snow on the screen – the set had switched itself over to channel 7, which wasn't tuned to anything. Maybe the remote control unit was talking when it shouldn't have been? Dylan flicked back to BBC-1 and hid the handset in the drawer. But this made no difference: the set continued to change channels at random. After a further period of operation the second fault occurred – the set went into the standby mode.

Dylan got the appropriate circuit diagram out and studied it. There seemed to be little doubt that the channel-change instructions were coming from the SAA5012 control chip. Still pursuing the idea of spurious remote-control commands, he disconnected the infra-red preamplifier module and left the set to run. At first it seemed that this had cured the problem, but after a few more hours the channel had changed again. Back to the circuit diagram. The obvious thing to do was to change the control chip, so in went a new SAA5012. There was very little change in the set's behaviour.

At this point Roger appeared in the workshop. He'd worked for Nationwide Rentals for ten years he said and there was nothing he didn't know about TX10s. Brandishing a soldering iron he carried out some sort of modification that involved an earth link wire beneath the control PCB. He was so confident that he proposed to run the set straight back to the Red Lion, no doubt with an ulterior motive. Service Manager insisted that the set had to have at least a day's soak test however, and it was just as well that he did: the channel changing continued, though not nearly as frequently as before. Once again Roger claimed to have the answer. Replace the focus unit he said, it's likely to be sparking inside.

So they fitted a new focus unit and were much miffed when they discovered that the fault was still present. In their suspicion of the focus unit, through which the e.h.t. passes, Dylan and Roger weren't in fact far out. Sage, who had never worked for Nationwide Rentals, finally found the answer to this one. What was it? The set is back in the Red Lion now, staying put on whichever channel it has been told to stay on. For the solution, turn to page 576.

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Panasonic NVS5

Intermittent zoom operation was the problem with this palmcorder. So it was left on test with the side casings removed. When the fault did put in an appearance, touching the main or the process PCB immediately cured it for the day! Many days later the flexi-cable between the main and the process PCBs was declared guilty. Part no. VWJ0495. **B.S.**

Panasonic NVMS1B

This S-VHS camcorder produced a nice sepia monochrome camera picture. Checks on the various power supply lines didn't reveal anything amiss so, as things became more technical, out came the scope. Checks around the CCD 1H and 2H delay line chip IC308 revealed some abnormalities so a replacement was fitted. This put matters right – part no. VCR0256. **B.S.**

Panasonic NVS5

We've had no auto-focus or zoom operation a couple of times with this model. On both occasions the focus motor was faulty. Part no. VEM0314. **B.S.**

Fisher FVHP701

There was no mechanical operation, even eject. We found that the 5V supply to the capstan and loading drive circuits was missing because ICP F4001 (type ICPF10) was open-circuit. This was in turn due to the fact that the surface-mounted reservoir capacitor C4011 (10 μ F, 16V) was leaky both electrically and physically – I had to remove many surface-mounted components to clean under them. **N.B.**

Sony CCDTR55E

The problem with this Handycam type camcorder was lack of date/time and title retention when the battery pack or d.c. supply was removed despite the fact that a perfectly good 3V lithium back-up cell was permanently in place. The unit display flashed, also the viewfinder display, for the first few seconds, suggesting that the lithium battery was low or faulty. A new one had been fitted.

The lithium pre-end detection circuit is based on two dual-transistor devices, Q565 (XN6401) and Q566 (XN6501). I found that the d.c. conditions here were haywire despite the fact that the 3V from the lithium battery reached the UPD7503 graphics chip. The cause of the problem was a short-circuit between the two transistor collectors in Q565. **N.B.**

Sony CCDTR55E

This one caused us some headscratching. Not because of an electronic fault but because it is difficult to see what's going on in the compact mechanism. The fault note said that it was impossible to insert a cassette and that 'a mechanical scrunching noise' accompanied a rather tortured loading sequence. . . On inspection we immediately noticed that the

back-tension guide (arm assembly TG1) was in the wrong position – it was permanently in the play or record mode condition.

When the LS deck assembly had been removed we saw that there was heavy wear on the plastic guide base (base TG1 cam) because, in turn, of wear on arm assembly 314. Now this arm has a peg (cam follower) that sits in the related cam gear. It was very worn, allowing the back-tension arm assembly to go its own way. What would we do without Sony's excellent mode-selector fitment? **D.C.W.**

Canon A10E

There were no functions with this camcorder. It's shaped more like a Polaroid instant camera than a camcorder but is comfortable to use. On inspection we found that the 2A Wickman-type fuse was open-circuit. Now anything that blows a fuse with this rating has to be a pretty hefty short-circuit. There are three other lower-rated circuit protectors, none of which had failed. Unusual – especially as no short-circuits could be found!

With some trepidation we fitted a lower-rated fuse and connected an analogue ammeter to show quickly (we hoped!) whether there was a destructive overload – before any damage could be done. When we switched on all functions worked. In fact no fault showed up during a long soak test.

Before refitting the case we decided to dismantle and carefully inspect the sections where a fault of this sort would be likely to occur. To cut a very long story short, the culprit turned out to be a tiny screw that normally secures the deck to the plastic frame. It had fallen out and lodged inside the main d.c.-d.c. converter can, where it intermittently shorted the d.c. input to chassis. If it had lodged elsewhere – well, that doesn't bear thinking about! **D.C.W.**

Sony VO4800PS (U-Matic)

This is not a camcorder but is part of a kit with a separate camera. There were no functions at all: button pushing produced no response and no LEDs were alight. The machine just sat there. Some quick checks showed that the power supply was o.k. We then noticed that the loading mechanism was in the loaded position despite the fact that a cassette hadn't been inserted. What had happened was that the mechanism had stalled between modes and was thus unable to operate. A mechanical service, belt replacement etc. restored normal operation. **D.C.W.**

Ferguson FC28

This full-sized VHS camcorder suffered from intermittent capstan speed changes accompanied by a shift to the right of the colour information in the picture. The problem was caused by the fact that the value of C240 (0.0033 μ F) in the video section was varying. It feeds the 4.43MHz subcarrier signal to the servo/mechacon section where it's used as the reference for the digital servo circuitry. You could see the level of this signal varying widely. A replacement capacitor restored stable operation. **D.C.W.**

What a Life!

Donald Bullock

I was the eldest child in our family. Next came Terry. There was such a difference between us that everybody called him Sunny. He's just as Sunny today, though a bit prune-faced. Everybody likes Sunny, who's kindness itself. Nothing is too much trouble for him. He calls on every member of the family every week, just to see whether their tellys, videos, radios and electrical bits and pieces are o.k. When they're not he brings them to me, to mend for nothing. Then he nags and nags until they're done.

A Philips CTX-E

The other day Terry appeared and asked me to carry in a set from his car. It was a 16in. Philips portable, Model 16CT2216/25S (CTX-E chassis). "It's aunt Gertie's" he announced. "Poor old soul, no money at all and crippled with arthritis, but she won't complain. Fix it for her will you? I'll take it back to her tomorrow. Got one to lend her meanwhile?"

I pushed an old set towards him, but he motioned me towards his car with it. "You carry it, will you? – my knees are bad today."

The Philips set turned out to be dead. Ever an optimist, I resoldered the pins of the line output and driver transformers and, whilst at it, the chopper transformer's pins as well. Then I switched on. The set was still dead so, hoping that I'd get there without having to think too much or consult the circuit diagram, I connected my Cirkit meter, switched to the low ohms range, across the main 4.7Ω, 4W surge limiter resistor R3291 that's close to plug M7. It was open-circuit. As I was replacing it Terry waltzed back. He was in time to see me switch on the set. It sprang to life and so did he.

More Requests

"Ah, good" he said. "I'll pop it back to her. By the way Uncle Clem picked this up at a sale last week." He started to undo a large parcel. "Some of the wires are wonky. Since you've got plenty here I thought of you. Pop a few bits in for him will you? He's eighty you know, bent up like a crackerjack, can hardly see and stone deaf." I was studying the contents of his parcel.

"I don't repair bloody harps!" I said. "Listen, do a quick deal with Clem and take music lessons, 'cos nice helpful chaps like you sometimes come to sticky ends at the hands of their nasty big brothers." But he wasn't listening.

"Here – can you mend fruit machines?" he asked. "The one in our club moans and groans every time I see it. It's terrible. . ."

Miss Blossom

My next caller Melody Blossom is the perfect antidote to Terry. She's Mexican and a trainee doctor here.

"I'm having a little trouble. He's Turkish" she said, frowning slightly. "He was so sparkling, then he hissed and went off. Now he is terrible trouble." British decency welled up within me and my upper lip stiffened.

"The swine" I cried. "I've heard about the Turks and their ways. Where can I buy a cheap revolver?"

"No, not a person" she explained. "My television set. He says 'Made in Turkey'." I crumpled back into my usual heap.

The set was a Bush Model 2514T, and sure enough it was Turkish. I had no circuit but opened it up, trying to look clever while she waited. A sturdy wirewound resistor (R601) close to the line output transformer had burnt away completely apart from its legs, one of which sat in a little well of charcoal. I looked at the underside of the chassis and saw that some of the print between this resistor and the line output transformer had burnt away.

"It needs surgery" I said decisively. She smiled and left and I settled down to the set. First I cleaned away all the soot and charcoal. Then I fitted jumper leads over the missing print and cleaned off two blackened capacitors (C600 10μF, 250V and C603 0.047μF, 250V) near R601.

A phone call to Bush/Alba brought the usual cheerful response, the information that R601 is a 10kΩ, 2.5W wirewound resistor and the advice to check whether C603 was short-circuit. It was, actually o.k., but I replaced it along with R601 and switched on. This produced another firework display, another burnt out resistor and more print damage. So I decided to order a new line output transformer from CPC.

It arrived next day. I repaired the damage, fitted it and this time started the set up via a variac. The results were exceptionally good, and I was sorry about the nasty thoughts I'd had about Turks. They can make excellent TV sets anyway.

Return of Old Abe – with a Philips 2A

Old Abe called in with something wrapped up in an old blanket tied with binder twine. As I've mentioned before Abe shares a hut on the banks of the Severn with two old 12V portables, a car battery and a screwdriver. Every time he's pulled a set to pieces he brings it in to me and uses the other one until it's mended. Then he starts to pull the second one to pieces. But he's a good customer and pays. He touched his forelock and grinned.

"Mornin' sir" he said. He undid his parcel and took out a gleaming Philips colour portable. "Went into a line across the screen, then went dead. It ain't mine. Belongs to Pinky 'Ubbard, the farmer who charges me battery." Then off he shuffled.

I pulled the set on to the bench. It was fitted with the 2A chassis, so the first thing I did was to check the BUT11A chopper transistor which was dead short. I disconnected the 140V output and wired a 60W bulb across the smoothing capacitor C2701, then got to work on the power supply. As most of the problems with this power supply are on the primary side I made a thorough check on anything likely to be faulty. Everything seemed to be all right here. Turning to the secondary side of the circuit I found that one of the l.t. rectifier diodes, D6711 (1N4148), was short-circuit.

I replaced this and the BUT11A and wound the set up via the Variac. To my delight the lamp came on. So I removed the lamp, reconnected the 140V supply and tried again, expecting the set to work. It didn't. Further checks showed that the 140V supply rectifier diode D6696 read short-circuit both ways whilst in circuit, though it was all right when removed. Why should this be? The reservoir capacitor C2697 was o.k. Maybe the BU508V line output transistor was short-circuit. It was. Why hadn't I tried this before?

A new line output transistor restored the brightness, but it was squeezed into a collapsed frame. Now for some fun. The TDA3654 field output chip is powered by a 26V supply which is obtained from the line output transformer. A check on this produced a reading of 0V. When its load was disconnected the supply rose to 40V, then dropped back to zero. Goodness me! Further checks showed that the rectifier diode and its reservoir capacitor were o.k. Then the voltage came up again. I reconnected the field output chip but there was still no frame. Perhaps a new TDA3654 would put matters right? No, and again no voltage. Then plenty – over 50V, followed by a dancing frame and a clicking from the line output stage.

I switched off and ran a finger down the case of the line output transformer. It was hot. Surely these bizarre happen-

ings had to be the result of fireworks within its windings? Cruel experience has taught me to keep a spare 2A line output transformer in stock. When it was fitted a perfectly stable picture was produced.

I telephoned Abe's well-to-do family and asked them to get word to him that the set was ready. A few days later he came in with his blanket, his binder twine and a small paper bag of browns.

'Pinky 'Ubbard said to thank 'ee and pay, Mr. Bullock sir" he said as he enclosed the set in the blanket and got weaving with the twine. "Er – one of my sets be under the weather, Mr. Bullock. Some of the bits inside pulled themselves about a bit – like they do. I must bring 'im in next week, 'cos I'll need 'im when the other one plays up again."

CD Player

Philips CD150: Quickie Remedies

Tray doesn't open/close: Check and replace as necessary the tray motor drive transistors on the front panel. They are prone to failure. The correct types must be used.

No sound: Check the 12V supply to the audio amplifiers. You may well have to replace the MC78M12 regulator chip IC6316. If necessary check the SAA7030 filter chip by replacement.

Distorted sound: Check the -18V supply at pin 11 of the TDA1540 DAC chips. If the supply is high or low, replace the MC7918 regulator chip IC6315 and its associated 33µF smoothing capacitor C2414.

If the supply is o.k., check by replacement IC6311 (SAA7000) and/or IC6312 (SAA7030). The SAA7030 filter chip can also be responsible for distorted or no sound from one channel. Distortion in one channel is often caused by a leaky capacitor associated with the relevant TDA1540 DAC chip. Use a hairdryer/freezer to check the capacitors connected to pins 12, 13, 14, 18, 19, 20, 21, 23, 24 and 25.

Disc spins too fast at TOC reading: Carry out thorough resoldering around the regulators in the power supply circuit and clean the laser lens. If the fault persists it's likely that the laser unit is faulty.

Intermittent problems: If the machine starts to play then stops after a short while, or the tray opens of its own accord while the machine is playing, or the display appears to lock up, check all the plugs that link the front panel to the main board and the servo board. These plugs are often poorly crimped, the result being a multitude of weird, intermittent faults.

Permanent or intermittent display segment problems: These are usually caused by the display assembly itself rather than the front control chip. **M.L.**

Sharp DX620H

This machine was brought in because there was no display and no other operation. The cause was simply that the mains transformer (part no. RTRNP1190AFZZ) was open-circuit.

Reports from Mike Leach, Nick Beer and Philip Blundell, AMIEE

When a replacement had been fitted the machine appeared to be all right. We left it on soak test and found that after it had been playing for a short time, i.e. the length of a disc, it was very reluctant to play track one again. Track two could be selected but not track one.

As the laser unit used in this model is so expensive we decided to explore every other possibility before fitting a new one. Initially we thought that a mechanical fault in the sled mechanism could be the cause. But the fault was still present after servicing it. We then went through the setting up procedure and discovered that the PLL frequency was slightly adrift. The machine worked perfectly once the PLL had been set up. **M.L.**

Technics SLP320

The problem with this player was intermittent failure to read or play a disc. We found that the lens was heavily coated with dirt. Cleaning it increased the r.f. by 300mV, but the cause of the trouble was dry-joints on the traverse drive transistor Q181. It's part of a complementary pair (Q181/2). **N.B.**

Philips AK601

The fault note read "dead, but the display comes on when the open button is pressed". Sure enough there was no activity anywhere when I switched the unit on, but the display came on for an instant when the open button was pressed – nothing else happened. I took off the top, pulled out the drawer to remove the tray fascia, removed the cabinet front then tried again. This time the player worked, but if the tray was in at switch on it still refused to work.

Everything became clear when I found that removing the tray motor belt cured the fault. At switch on the player pulses the tray motor to make sure that the drawer is shut. If the tray is in, the motor stalls and extra current is drawn from the power supply. A check on the rails confirmed that the 5V supply fell, as a result of which the microcontroller chip ceased to operate. The ripple at the input to the 5V regulator seemed to be excessive. A check on its frequency produced a reading of 50Hz. This from a bridge rectifier? Yes, one of the bridge rectifier diodes was open-circuit. I replaced all four to be on the safe side. **P.B.**

ECONOMIC DEVICES 32 TEMPLE STREET, WOLVERHAMPTON, WV2 4AN

1585R	3.84	2SC1318	0.10	2SD525	0.77	BC1098	0.15	BD140	0.24	BF959	0.18	CD4001	0.14	MS1102L	1.77	SKSF310	1.68	TA7214P	3.74	TD4170P	0.00	TEA1014	1.87
17052	3.20	2SC1364	0.29	2SD551	5.81	BC109C	0.00	BD168	0.76	BF960	0.27	CD4011	0.21	MS1231P	2.03	SKL430	1.41	TA7217AP	1.27	TD41506	4.59	TEA1039	2.19
17053	2.38	2SC1384	0.50	2SD613	0.63	BC117	0.14	BD175	0.29	BF966	0.61	CD4013	0.34	MS1383AP	4.04	SKL431	1.70	TA7222	1.24	TD41510	3.23	TEA2018A	1.45
17088	2.38	2SC1398	0.80	2SD636	0.14	BC119	0.00	BD179	0.34	BF970	0.30	CD4016	0.14	MS1432	2.81	SKL432	1.90	TA7222AP	1.27	TD41512	3.17	TEA2164	2.68
17089	3.39	2SC1413A	1.36	2SD637	0.12	BC139	0.33	BD189	0.41	BF939	0.45	CD4021	0.43	MS1521L	0.54	SKL471	1.70	TA7227P	2.02	TD41515A	2.54	TEA2165	5.23
17127	1.77	2SC1509	0.39	2SD667	0.26	BC140	0.21	BD190	0.31	BF941	0.34	CD4052	0.22	MS218L	0.42	SKL490	2.31	TA7230P	1.37	TD415160	3.33	TC1060	0.55
1N4001	0.04	2SC1520	0.54	2SD669	0.55	BC141	0.34	BD201	0.40	BF979	0.00	CD4053	0.20	MS231P	0.55	SN297644N	1.47	TA7233P	1.35	TD415180	3.32	TC1166M	0.60
1580H	3.83	2SC1573	0.26	2SD669A	0.81	BC147A	0.06	BD203	0.46	BF979	0.51	CD4066	0.30	MS232P	1.48	SN7474AN	0.38	TA7240AP	0.00	TD41670A	2.81	TC45	0.59
1580H	3.83	2SC1573Q	0.26	2SD716	1.11	BC148	0.12	BD232	0.28	BF90A	0.77	CD4069	0.17	MS453Z	0.00	SN76013ND	7.99	TA7240P	2.21	TD41701	4.86	TIL00	0.52
1585R	3.84	2SC1675	0.09	2SD718	1.45	BC148A	0.06	BD234	0.25	BF91	0.43	CD4070	0.14	MS4543L	1.32	SN76227N	1.07	TA7241	2.30	TD41770	0.00	TI110	0.36
17052	3.20	2SC1685	0.14	2SD734	0.24	BC148B	0.04	BD237	0.30	BF96	0.53	CD4082	0.88	MS4544L	1.87	SN76666N	1.26	TA7243P	0.00	TD41870	3.37	TI12	0.30
17053	2.38	2SC1740	0.12	2SD762	1.66	BC149	0.04	BD238	0.11	BF9Y2A	0.48	CD4083	0.43	CR3CM	2.62	SN76705AN	1.70	TA7250	4.03	TD41904	1.21	TI12H	0.58
17088	2.38	2SC1741	0.17	2SD774	0.24	BC149C	0.04	BD239	0.29	BFX85	0.55	CD4092	0.55	CR02AM	2.17	SR2M	0.00	TA7267P	2.02	TD41905	0.94	TI120	0.57
17089	3.39	2SC1815	0.14	2SD787E	0.26	BC157	0.13	BD241	0.41	BFY50	0.34	CD4122	0.34	CV12Z	2.70	SM4648L	5.51	TA7270P	1.68	TD41908A	1.14	TI121	0.42
17127	1.77	2SC1826	0.72	2SD837	0.90	BC159	0.06	BD243	0.39	BFY51	0.37	CD4124	0.34	CV109	7.05	SM4898AP	16.94	TA7271P	1.68	TD41940	2.77	TI126	0.48
1N4001	0.04	2SC1827	0.77	2SD841	1.61	BC160	0.00	BD243A	0.43	BR100	0.17	DTA124EF	0.13	MS4885P	5.95	ST4441C	2.80	TA7271P	1.90	TD41950	1.86	TI132	0.46
1N4002	0.07	2SC1845	0.20	2SD856	0.87	BC161	0.27	BD243C	0.55	BR101	0.98	DTA144EF	0.17	MB3730	2.38	STK0029	5.88	TA7273P	0.00	TD41902	0.85	TI137	0.48
1N4003	0.05	2SC1846	0.51	2SD869	3.28	BC162	0.42	BD244A	0.34	BR103	0.39	ET1400	2.15	MB3731	2.04	STK0039	7.45	TA7274P	2.72	TD42003V	0.00	TI2955	0.83
1N4004	0.07	2SC1923	0.14	2SD870	3.07	BC177B	0.14	BD244C	0.42	BR303	1.22	HA11235	1.68	MB3732	2.47	STK0040	3.83	TA7280	2.11	TD42005A	1.27	TI29C	0.30
1N4005	0.06	2SC1942	3.33	2SD871	5.08	BC177	0.14	BD245C	0.72	BRX44	1.02	HA1124A	1.21	MC1300Z	0.00	STK0059	9.75	TA7281	0.00	TD42006	1.27	TI2955	0.47
1N4006	0.06	2SC1959	0.11	2SD880	0.34	BC178	0.11	BD246E	0.71	BRYS6	0.17	BRYS6	0.17	MC1300ZP	5.74	STK025	9.66	TA7282	2.34	TD42006	1.06	TI2955	0.71
1N4007	0.06	2SC1969	2.15	2SD882	0.43	BC182	0.06	BD278A	0.56	BSS38	0.23	HA11423	2.02	MC1310P	0.85	STK043	0.00	TA7313AP	0.62	TD42009	2.29	TI30C	0.17
1N4148	0.04	2SC1983	0.87	2SD898B	2.97	BC182A	0.07	BD317	0.87	BT120	1.28	HA11440	2.92	MC1327AP	1.62	STK3042	5.08	TA7317P	0.93	TD42020	3.72	TI31	0.00
1N4448	0.06	2SC2001	0.14	2SD904	5.95	BC182B	0.06	BD318	1.10	BT129	3.26	HA1166K	3.43	MC1330AP	1.26	STK3062	8.88	TA7325P	0.45	TD42030	0.00	TI31A	0.32
1N5061	0.23	2SC2029	0.00	2SD973	0.38	BC182LB	0.06	BD380	0.34	BT13960M	0.95	HA11713	1.24	MC1350P	1.82	STK4131	7.79	TA7343AP	0.72	TD42030H	0.61	TI31B	0.30
1N5402	0.09	2SC2073	0.51	TA1S00	0.21	BC183	0.09	BD433	0.27	BT151/500R	0.34	HA11741	6.77	MC1352P	1.45	STK4141	8.25	TA7358P	0.78	TD42030V	0.73	TI32C	0.39
1N5404	0.13	2SC2078	0.77	7805	0.24	BC184	0.06	BD434	0.09	BU205	1.15	HA11745	1.15	MC1358P	1.59	STK4142	8.21	TA7358P	0.68	TD42040	0.00	TI32A	0.39
1N5406	0.12	2SC2141	1.48	78051022	0.00	BC184L	0.04	BD435	0.38	BU205	1.07	HA13001	2.78	MC14493P	0.00	STK4162M	9.51	TA7607AP	1.11	TD42170	2.55	TI32C	0.38
1N5408	0.12	2SC2166	0.96	7808	0.30	BC184LC	0.10	BD436	0.32	BU206A	1.16	HA13108	1.76	MC14528BCP	1.70	STK4171	10.50	TA7609P	1.95	TD42270	1.68	TI32P	0.30
1N914	0.04	2SC2168	0.85	7812	0.30	BC204	0.37	BD437	0.32	BU206B	1.53	HA13118	1.87	MDA2062	2.21	STK4181H	12.85	TA7630	0.00	TD42520	0.00	TI33A	0.92
1S1555	0.22	2SC2236	0.25	7815	0.40	BC204B	0.23	BD438	0.31	BU326A	1.36	HA13119	2.03	MJ2955	0.97	STK4181A	12.46	TA7630P	1.87	TD42530	4.76	TI33C	0.98
1S2076	0.29	2SC2271	0.22	7818	0.41	BC207B	0.23	BD439	0.31	BU326A	1.36	HA13129	2.03	MJ2955	0.97	STK4181B	12.46	TA7630P	1.87	TD42540	4.76	TI33C	0.92
2N2219A	0.27	2SC2274	0.22	7905	0.34	BC212	0.06	BD441	0.34	BU406	0.79	HA13403	4.66	MJ802	2.29	STK4352	5.54	TA7640AP	4.28	TD42540	0.38	TI34	0.40
2N2222	0.17	2SC2274K	0.22	7912	0.43	BC212E	0.06	BD442	0.29	BU406D	1.02	HA1374A	0.00	MJ1300S	0.82	STK4352	1.70	TA7676P	0.95	TD42541	0.72	TI34C	0.89
2N2905	0.21	2SC2314	0.33	AA119	0.36	BC212L	0.06	BD510	1.34	BU407	0.93	HA1377	1.60	MJ2955	0.68	STK437	8.30	TA7680AP	4.52	TD42560	2.55	TI41A	0.38
2N2926G	0.27	2SC2314	0.33	AA119	0.36	BC213	0.11	BD529	0.97	BU410	0.57	HA1388	2.63	MJ3055	0.51	STK4392	6.31	TA7698AP	5.93	TD42576A	5.95	TI41B	0.31
2N3053	0.36	2SC2458	0.09	AA127	0.13	BC214	0.00	BD530	1.10	BU425A	0.96	HA1389	2.52	MJ340	0.40	STK441	10.28	TA7705P	1.68	TD42577	0.00	TI41C	0.37
2N3054	0.38	2SC2458	0.09	AA127	0.13	BC214L	0.09	BD535	0.43	BU426E	2.13	HA1392	1.61	MC1237B	0.00	STK459	10.27	TA7769P	1.43	TD42577A	4.25	TI42A	0.34
2N3055	0.58	2SC2482	0.34	AC141K	0.46	BC217	0.05	BD536	0.48	BU500	1.09	HA1397	2.63	MC923	10.66	STK461	9.27	TA8205	3.65	TD42578A	2.55	TI42C	0.77
2N3442	0.75	2SC247E	0.24	AC176K	0.30	BC230	0.08	BD675	0.30	BU508A	0.95	HA1398	2.33	MN1405VNF	11.08	STK4843	11.10	TA8210H	4.66	TD42579	0.00	TI42P	0.51
2N3702	0.11	2SC2565	0.40	AC187	0.16	BC237B	0.05	BD677	0.32	BU508AF	1.27	HA1452	3.36	MN1435VX	14.35	VSTK5211	15.78	TA8215	5.67	TD42581	10.15	TI42P191A	1.66
2N3704	0.14	2SC2577	2.13	AC188	0.30	BC238B	0.05	BD678	0.51	BU508DF	1.49	HM6251	9.52	MN650	2.50	STK5325	6.85	TA8550	1.00	TD42582	1.95	TI011CP	1.36
2N3713	1.02	2SC2655	2.45	AC188K	0.67	BC238	0.04	BD679	0.51	BU508E	1.16	HM7103	14.07	MPS442	0.23	STK5326	5.08	TA8626	0.05	TD42591	1.15	TI071CP	0.38
2N3819	0.34	2SC2632	0.29	AD149	0.52	BC252B	0.07	BD902	0.51	BU526	1.41	CH281	0.26	MPS456	0.12	STK5331	3.02	TBA120	0.93	TD42592	1.75	TL494	1.57
2N3904	0.11	2SC2655	0.25	AD161	1.02	BC300	0.48	BD911	0.65	BU536	1.60	CA1201	0.66	MPS493	0.09	STK5332	2.74	TBA120AS	0.50	TD42594	2.21	TMF47CA32AP	11.24
2N4444	2.68	2SC2671	0.58	AD162	0.96	BC301	0.24	BD912	0.63	BU608	1.44	KB108	0.47	MPSU10	0.00	STK5333	4.28	TBA120S	0.89	TD42595	2.16	TMF47CA34N	35.55
2N6292	0.62	2SC2688	0.30	AF124	0.77	BC302	0.36	BD958	1.16	BU705	1.61	KSR1004	0.09	MR854	0.14	STK5372	5.28	TBA120T	0.59	TD42600	3.08	TMF47CA34N	11.24
2SA1015	0.10	2SC2785	0.17	AF127	0.59	BC303	0.28	BD984C	1.28	BU806	0.82	L200CV	1.13	MSM5840H	15.36	STK5421	2.60	TBA120U	0.39	TD42611A	0.64	TMF47CA34N	16.50

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TDA 4601D x 2	2.95	TBA 120S x 5	1.55
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BU 208A x 5	3.60	TDA 3562A x 2	3.99
14BU 508A x 5	3.50	VIDEO FAULT FINDING GUIDE	10.29
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'F' CONNECTOR (SCREW TYPE) x 25	3.00	BU 508AF x 5	5.00
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		STR 5404 x 2	7.50

2SA1016	0.17	2SC2791	5.44	AF139	0.29	BC307	0.06	BD9W33C	0.59	BU806A	0.80	LA1201	0.56	MWS240	0.53	SKS422	5.74	TBA2800	0.68	TD42611AQ	2.03	UC3844	1.78
2SA1020	0.43	2SC3150	1.44	AF239																			

Servicing the Philips CP110 Chassis

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Richard Newman

The Philips CP110 can be regarded as the Big Brother of the CP90, which we dealt with in an article in the March issue. Most of the signal circuitry, including the microcomputer chip and the teletext decoder, is the same. The main differences are in the power supply, which will be the main subject of this article. The following notes are intended to be used in conjunction with the Philips service manual part no. 4822 727 15947.

The Power Supply

As with other Philips chassis of the period the power supply is of the SOPS type – Fig. 1 shows the circuit diagram. Unlike earlier designs that used discrete component circuitry throughout this one uses a chip, type TEA1039, to take care of most of the functions. The optocoupler method of feedback for regulation purposes is retained, and the chopper transistor Tr7665 is again a BUT11AF. The main trouble you get is failure of this transistor. Engineers tend to replace it and are then rewarded, at switch on, with a loud bang and another dead BUT11AF. Certain other components must be changed/checked before you switch on – see later. First we'll take a brief look at the operation of the circuit.

Circuit Action

Fig. 2 shows a simplified circuit of the start-up system. The electrolytic capacitors C2656 and C2661 are connected in series across the 285V supply. At switch on the voltage across each is inversely proportional to its capacitance value: approximately 11V is available at their junction to feed pin 9 of the TEA1039 chip to get it going. The chip contains an oscillator that runs at about 30kHz, and produces a sawtooth output waveform at pin 8. After shaping, this waveform is used to drive the chopper transistor. Once the circuit gets going the voltages induced across windings 6-7 and 6-8 of the transformer are rectified by D6670 and D6671. After smoothing by R3661 and C2661 approximately 18V is available as a supply for the TEA1039 chip.

This chip contains the circuitry required for correct operation of the chopper transistor, including excess current protection. Its main elements are an oscillator and a voltage comparator which provide the two inputs to a pulse-width modulator, a driver stage and protection and start circuitry. It's not the purpose of the present article to go into how all this works: what we are concerned with is the key points for servicing.

Transistor Tr7666 shapes the drive for the BUT11AF. Tr7671 is part of the slow-start circuit and in addition helps to control the pulse-width modulator within the chip in the standby mode. The time-constant for the slow-start action is provided by C2664 and R3664. There's a snubber network that consists of D6661, R3657 and coil S5655. It's connected to pin 5 of the chopper transformer. The other end of the winding connected to pin 5 appears to go

nowhere: in fact there's internal capacitance coupling to pin 4.

Regulation

In normal operation the optocoupler monitors the 15V rail via R3668, D6676, R3671, R3670 and R3669: R3670 is the set-h.t. control that adjusts the current flowing in the diode section of the optocoupler. The optocoupler's output is fed to pin 3 of the chip, where it forms one input to the voltage comparator stage. It thus controls the h.t. supply generated by the chopper circuit. Beam current information is fed via R3673 to the junction of R3671 and D6676.

Standby Mode

During normal operation D6726 is reverse biased, the voltage at its cathode being higher than that at its anode. Under the control of the microcomputer chip transistors Tr7726 and Tr7727 are off while Tr7739 is on. When the standby command is given Tr7739 is switched off so that Tr7726/7 switch on. As a result the 32V rail is linked to the junction of D6674 and R3730: D6674 is now reverse biased and D6726 is forward biased. The voltage increase produces a greater current flow in the diode section of the optocoupler, hence a greater light output. By feedback action all the output voltages from the chopper circuit are reduced considerably. The 32V rail is now in control, but is at a lower level of approximately 11V. The 6V rail, which powers the microcomputer circuit, is held constant by the action of the series regulator transistor Tr7728.

The 6V regulator circuit also provides a reset pulse and a power fail detection output for the microcomputer.

Repairs

The most common failure is the BUT11AF transistor going short-circuit. This usually happens after the set has been put in the standby mode, and will take the mains fuse and the bridge rectifier diodes as well. Philips recommend that the following procedure is adopted to prevent further failures in the standby mode:

Replace the BUT11AF transistor, the bridge rectifier diodes and the TEA1039 chip; check and replace if necessary R3658 (120Ω) and R3659 (100Ω); remove C2657 (1.5nF) if fitted; increase the value of C2661 from 1,500μF to 2,200μF.

C2657 is fitted in only some sets. It is near the degaussing resistor Th3653 and is not shown in the circuit diagram, though its position is marked on the PCB. From experience I would recommend replacement of the CNX62 optocoupler as being a standard part of the repair.

Before trying the set spend a few minutes going over any dry-joints, particularly around the chopper transformer T5654 (there will be some!). Also check that transistors Tr7666 and Tr7671 are all right. R3660 sometimes fails when the BUT11AF transistor goes short-circuit: it has the

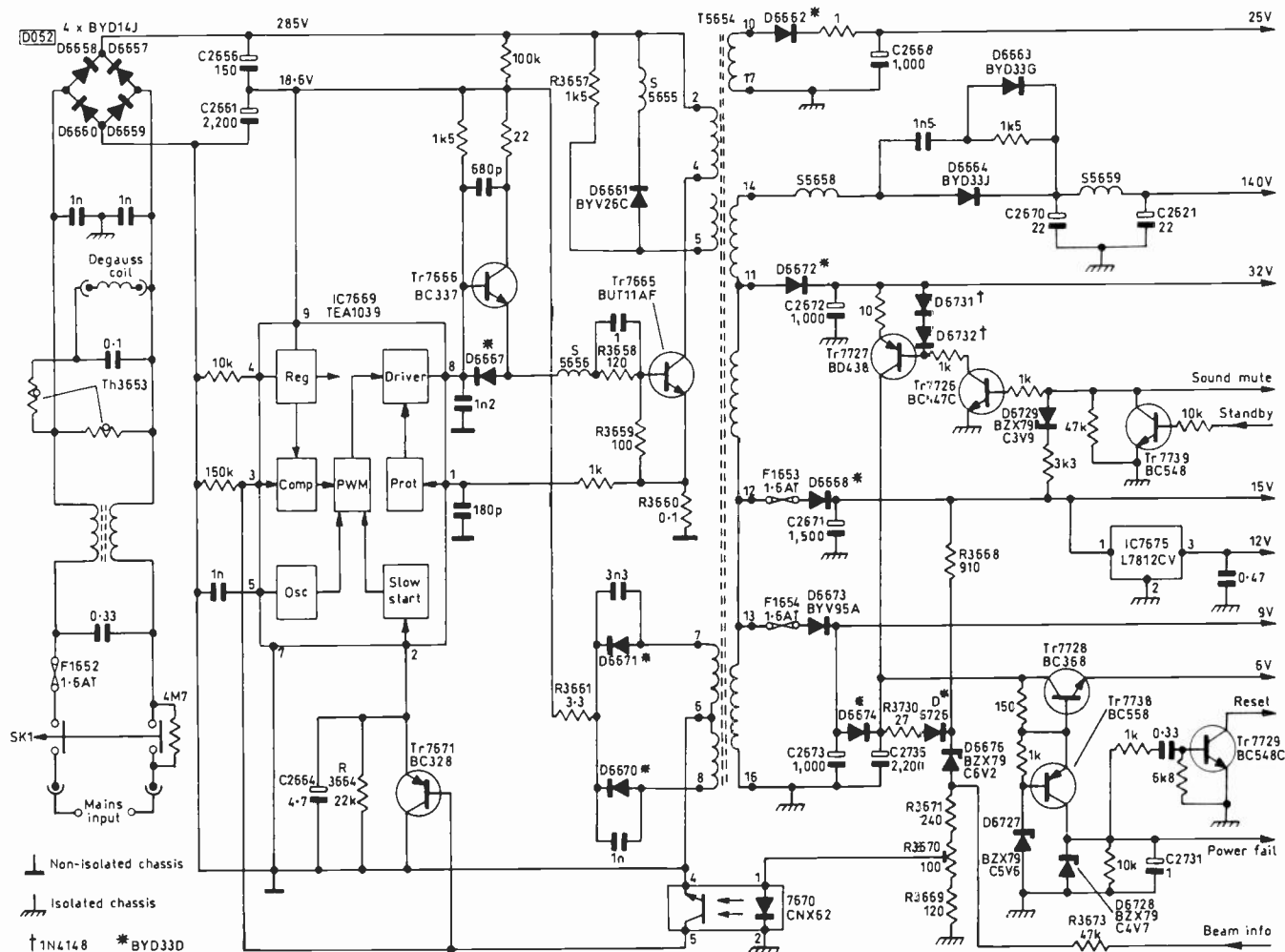


Fig. 1: Circuit diagram of the power supply used in the Philips CP110 chassis. See under modifications for changes.

very low value of 0.1Ω, being used for current sensing. Next unplug connector R13 by the line output transformer to disconnect the line output stage: as a dummy load connect a 60W bulb across the 140V line (C2621 is a good place), with a meter in parallel. Finally connect the set to the mains supply via a variac.

Testing

Because of the start-up system in the power supply you can't, as with previous models, wind up the input voltage slowly. Set the variac to about 130V and then switch the receiver on. If all is well the lamp should glow and the

meter should read about 140V. If the lamp is very dim and the meter reads about 55V the power supply may be in the standby mode (standby LED alight). Press the program + or - button on the front of the set or use the remote control unit to give a programme number command. The lamp's brightness should then increase and the meter should read about 140V. Sometimes the lamp will glow fairly brightly for a second or so then dim down. This is normal and simply means that the microcomputer chip has remembered its last command and put the set into the standby mode. Follow the procedure just mentioned to cancel the standby command.

If nothing happens when you switch on, switch off, increase the variac setting to 150V, switch on again and follow the procedure just outlined. If the power supply is still dead there's another fault and you should check the circuit again. If the h.t. rail reads 140V you can slowly increase the output from the variac until the full mains voltage is applied to the set, watching the meter as you do so to ensure that the chopper output is stabilised. If the supply doesn't stabilise, the h.t. voltage increasing as the setting of the variac is advanced, switch off and check the optocoupler circuit. Failure of fuse F1653 will cause this situation as the 15V rail won't be present for the optocoupler to monitor.

Once the supply is correct, remove the dummy load, the meter and the variac and refit plug R13. If the supply shuts down when R13 has been reconnected the line output stage should be checked. Faults in this stage are usually confined to the BU508A output transistor going short-circuit or dry-joints around the transformer - these should be attended to as a matter of course.

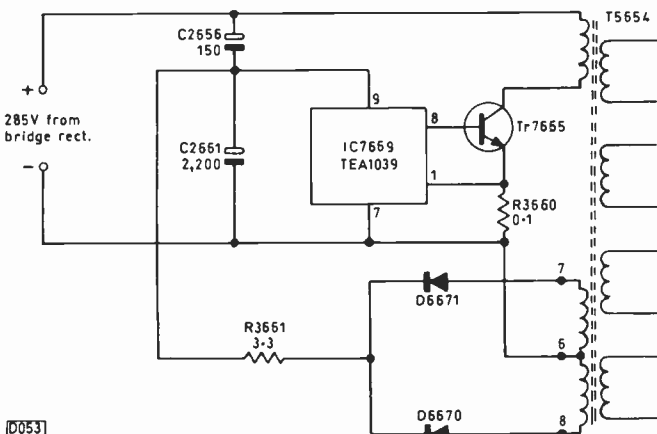


Fig. 2: Simplified diagram showing the operation of the start-up circuit.

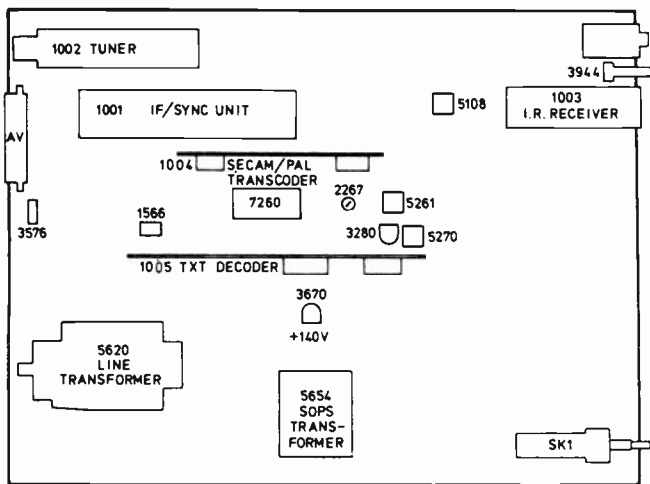


Fig. 3: Basic CP110 chassis layout. 1566 vertical centring; 2267 8-86MHz oscillator; 3280 PAL phasing; 3576 height; 5108 sound demodulator coil; 5261 chroma trap; 5270 PAL phasing; 7260 PAL decoder chip.

Check the h.t. voltage once the set is working normally: if necessary adjust for 140V with R3670.

If the supply refuses to start, check the voltage at pin 9 of the TEA1039 chip. If this is low or missing at switch on check that the main reservoir capacitor C2656 (150µF) is in good order. I've known this component to go virtually open-circuit, thus removing the start-up voltage. Make sure you changed the previously mentioned components.

If the set tends to trip when in operation, check that the thin black lead from the Aquadag earthing is attached to its tag on the metal frame, next to the line output transformer. It's common for this to break: if so it will need to be resoldered.

Modifications

There were inevitably a few circuit changes during production. Later sets are fitted with an over-mains protection panel (circuit reference 1006) on the primary side of the power supply and an over-voltage module (circuit reference 1005) on the secondary side, in the 15V supply. Not all sets have both these modules however. They are not suitable for fitting in earlier sets because of the different print layout. Nor are they intended to be serviced. The part numbers are 4822 212 23274 and 4822 212 23099 respectively. Experi-

ence has however shown that the small 100µF capacitor on the over-mains panel can dry out with the result that the set shuts down.

Some later sets also have a mains transient suppression panel that's fitted after the on/off switch. This can be fitted to earlier sets. Instructions come with the panel, which is part no. 4822 212 23808.

A further modification, to reduce the likelihood of BUT11AF failure, consists of an additional 39Ω resistor that's connected in parallel with coil S5656. It can be added in earlier sets.

Other Circuits

The tuner and i.f. modules are the same as in the CP90 chassis. The line output stage is also virtually the same, though the EW modulator circuit differs. Earlier sets use a TDA3562A colour decoder chip, later ones a TDA3566 with circuit changes. Unlike the CP90 chassis there are no grey-scale adjustments as this is done automatically in the colour decoder chip – there's additional circuitry on the c.r.t. base panel to supply the feedback required.

Tube Base Panel

A couple of odd problems have been encountered with the c.r.t. base panel. D6401 (1N4148) can become leaky, the result being brightness variations. When R3415 (470kΩ) goes open-circuit the picture flicks on and off at fairly regular half-second intervals.

In Conclusion

It's hoped that the above notes will be of help to engineers who are not familiar with these sets or have had difficulty in carrying out a reliable repair. There are a good many of these sets about. With care, the power supply should not be too much of a problem.

ANSWER TO TEST CASE 366

– SEE PAGE 568 –

Three technicians, lots of theories and a ten-year old set that changed channels by itself. It's jobs like this that sort out the men from the boys when it comes to diagnosis!

The remote-control system in the Ferguson TX10 chassis is rather vulnerable to interference that seems to find its way easily into the SAA5012 remote control decoder chip. The modification carried out by Roger was primarily intended to prevent mains-borne interference causing problems. In this case however the spikes that were triggering the chip, with the result that it gave false commands, were coming from within the set. The focus unit is often responsible for this, due to intermittent internal discharges.

What Sage discovered was that the discharge was at the earthy end of the e.h.t. supply system: the outer conductive coating of the picture tube was not properly earthed. All was well whilst steady pictures were being displayed, but any sudden change in screen brightness produced a 'brushing' effect at the tube's earthing connection. The resulting transient upset the operation of the SAA5012 chip. That's why the jump-cuts so common in TV commercials were most likely to trigger the channel changes.

Sage remade the connections at both ends of the lead that links the tube's earthing straps to the base PCB and cleaned the nicotine deposits from the bowl.

MODEL LIST

Philips

24CE3270/05B
24CE3270/05S
24CE3271/05B
24CE3570/05B
24CE3578/05B
24CE3588/05B
25CE6270/05B
25CE6570/05B
27CE3290/05B
27CE3590/05B
27CE3598/05B
28CE6590/05B

Pye

59KE3702/05M
59KE3715/05M
59KE3775/05M
59KE3785/05M
63KE6722/05M
63KE6725/05M
68KE3902/05M
68KE3915/05M
68KE3985/05M
70KE6925/05M

Brown Goods Shows 1993

George Cole

As in previous years, during early April many consumer electronics companies staged shows at various London hotels to display their latest products. Though 1992 wasn't a great year for consumer electronics sales, many companies were upbeat and there were lots of interesting products to be seen.

Video Recorders

GoldStar's RDD10i caused the biggest stir in this field: it's a combined Video 8/VHS machine with a four-head VHS deck for playback and record and a two-head Video 8 section for playback only. GoldStar says that the RDD10i is a niche product designed for video enthusiasts who want to transfer their Video 8 camcorder shots on to VHS cassettes. Other features include a one year/eight event timer, long play and audio dub. The machine should be available in the shops this September at a price of around £600. GoldStar also showed the P500i, a playback-only VHS machine priced at £170.

Nearly all the video companies showed VCRs with built-in VideoPlus timer systems. There's no doubt that VideoPlus is now the de facto standard timer system: even companies like Panasonic which developed bar code timers and Mitsubishi which developed the easy-to-use One Key Programming system have taken up VideoPlus. The cheapest VideoPlus machines were shown by GoldStar (Model RQ203i at £280) and Sharp (Model VCA44HM at £299). Most other companies launched budget-priced VideoPlus recorders at around £330.

Ferguson introduced a large new range of machines, many of which use the new R3000 chassis. The company says that this has 21 per cent fewer components than the previous deck and is the first consumer electronics product to achieve the BS 57PO (Part 1) safety standard. Servicing is based on the modular approach: the power supply forms one unit for example. There are diagnostic points at the bottom of the chassis. The new VCRs certainly look different. They feature an identity tagging system: the owner can key in his or her post code so that in the event of the machine being stolen and recovered the police can easily check the code, which can be changed only by using a four-digit PIN number. Some models feature Intelligent Long Play (ILP), which means that at the start of a timer recording the deck checks to see whether there is enough tape left to complete it in the SP mode, switching to LP if not. Toshiba and Samsung have similar systems called Just Timer Recording and Automatic Tape Speed Select (ATSS) respectively. Ferguson has also been working with an ergonomist who has tidied up its on-screen Instant Help Programming system: the VCRs use an Intelligent VideoPlus system, which basically means that the user checks his settings on the TV set's screen rather than on a handset LCD.

The first of the new-style Ferguson VCRs is Model FV70B, which includes a one year/four event timer, a 49-channel tuning system and child lock. Models FV71LV and FV72LV include VideoPlus, ILP and trick-play facilities:

the FV72LV has in addition an extra scart socket.

Model FV68TX combines VideoPlus with Startext Programme Delivery Control. Ferguson is using the terms Startext and PDC because of user confusion about them. I was under the impression that Startext was the name given to PDC by BREMA because it would be more readily understood by users. Not so says Ferguson, pointing out that some PDC VCRs do not have teletext. Anyway the main point is that Ferguson appears to be the first company to combine VideoPlus and PDC: when you make a VideoPlus timer recording Startext PDC is automatically switched in (other companies with VCRs that offer VideoPlus and PDC don't have them working together like this – you must choose one timer system or the other). Startext PDC can be turned off, and there are also two Startext PDC Instant Recording Timer (IRT) facilities. The first is used for recording a programme currently being transmitted: the Startext PDC instructs its IRT facility to keep on recording until the PDC stop flag is detected. The 'next' facility tells the IRT to start recording when the next PDC start flag is transmitted. The FV68TX uses the earlier chassis because the new one doesn't have enough space for both PDC and VideoPlus! Incidentally there are rumours that the ITV companies will start PDC transmissions this year: there's no date for the BBC to do so.

Model FV74LX also has this combined timer system. Ferguson says that it is the first VCR to offer full satellite compatibility, i.e. the VCR and a satellite tuner are combined as a single unit.

Because these new models will not be released until later this year Ferguson has not announced prices. Fluctuating currency rates have forced many other companies to adopt this approach.

Panasonic's NVSD30 and NVSD40 VCRs feature the Super Drive system that enables the deck to go from stop to playback in half a second. Incidentally the system doesn't use the half-load tape-wrap system. Other features include VideoPlus, a jog/shuttle dial and a high-efficiency head which uses a new ferrite combination that's claimed to reduce the video noise level by 3dB. A Picture Clear circuit employs a filter to improve the video signal-to-noise level by 2dB. The decks are designed to simplify servicing, incorporating a service information display. If a fault occurs the user can turn the shuttle ring towards FF and press the eject button: a fault code number that can be passed on to the service engineer is then displayed. These models follow this year's video design fashion, dispensing with lots of covers and flaps and having just a few buttons on the fascia. Suggested prices are £400 for the NVSD30 and £460 for the NVSD40.

Samsung showed four new VCRs including the VI375, a low-cost Nicam model that includes LP, an LCD remote control unit, front-mounted AV sockets and ATSS. Suggested price is £350.

Mitsubishi's latest VCRs feature VideoPlus and an Intelligent Rental Position (IRP) that cuts out the blank section at the beginning of a prerecorded tape: when the user inserts a cassette and presses the IRP button the machine goes fast forward to the start of the sound track and also sets the picture sharpness. Unfortunately IRP can't remove those irritating adverts and trailers. . . Models range from the HSM48V, which at £380 features twin scart sockets and a jog/shuttle dial, to the £800 HSM1000, an S-VHS machine that incorporates a new dynamic digital comb filter and has twin scart sockets, dual flying erase heads, insert edit, audio dub and NTSC playback. Mitsubishi also launched a professional machine, Model BV2000E, whose features include multi-system compatibility, chroma phase control, twin

flying erase heads and an RS232 interface. Price is £2,200 plus VAT.

Sony's new SLVE6 includes VideoPlus, PDC, NTSC playback and an Optimum Picture Control system that records a two-second test signal to check on the tape's characteristics. It will be available later this summer at around £450. Model SLVE7 at £500 features Nicam and hi-fi sound. Model SLVE8, which is available now at around £550, has Nicam and hi-fi sound, VideoPlus and PDC.

Toshiba showed a wide range of VideoPlus recorders including the V423B at £380, the V513B which also includes PDC at £400, and the budget Model V213B at £340. These models will be available later this year. The V703B and V813B are Nicam models with VideoPlus: the V813B also has PDC. Both models have narrow LP heads – only 0.28µ wide compared to the usual 0.3µ. Suggested prices are £480 and £530 respectively.

JVC announced the new J range of VCRs with mid-mount decks. Several are midi-sized and feature VideoPlus. The series ranges from the HRJ200EK which has a one year/eight event timer to the HRJ700EK which includes hi-fi stereo, Nicam, PDC, hyper bass sound and lots of editing facilities. No price details were released.

Nokia has also redesigned its VCRs. They look sleeker and, you guessed it, incorporate VideoPlus. The UFO feature stands for User Friendly menu Operation. The new line-up includes the budget VR3724VP, the VR3744VP with 16:9 auto-switching and the VR3784VP which has Nicam.

Camcorders

A number of companies didn't show any camcorders, one comment being that "the camcorder market isn't worth bothering with at present because you can't make any money from it". Fortunately not everyone agrees with this view. Sony showed a number of machines including the mighty CCDVX1, a Hi-8 model which has three CCDs and a built-in neutral-density filter. Other features include a x12 zoom, Programmed AE (assemble editing), the RCTC time-code system and a pop-up sensor for 360° remote operation. Suggested price is £2,500. Sony also showed two camcorders with colour LCD viewfinders. Model CCDTR33 at £800 has a 103,000 pixel viewfinder, x10 zoom and a remote control handset. Model CCDTR1 at £1,200 uses a lithium-ion battery and has a 120,000 pixel viewfinder.

Remember those record-only VHS-C camcorders from Amstrad and JVC? Panasonic has entered this field with the NVC1, which the company says is for those who are confused by camcorders and want a simple model. Lots of features have been stripped out with the result that the NVC1 has few buttons. It's designed to be foolproof: recording takes place only when the record button is pressed. There's a built-in battery and an optical viewfinder. Other features include a self-timer, tally light, x3 zoom and a wide-angle lens that's equivalent to a 28mm lens with a 35mm film camera. The improved power consumption gives a recording time of 70 minutes with a NiCad battery. Alternatively six alkaline batteries can be used, giving a recording time of an hour. The NVC1 is a nice idea but at £600 seems rather expensive for such a basic model.

Sanyo's VME30P combines a palmcorder with a 2in. colour LCD monitor, editor and remote control unit. The handset has a simple assemble edit system which enables the user to program up to five edit points that can be copied on to a VCR. It's pre-programmed with twenty six IR operating codes for VCRs, enabling it to be used with all the major video manufacturers' machines. Other features of the

camcorder are a x10 zoom, insert edit and Program AE. The VME30P weighs 760g without the battery and cassette, the handset-monitor weighing 230g. Suggested price is £750.

Sharp showed the ViewCam, which was first presented at the Las Vegas Consumer Electronics Show (see *Television* March 1993). It combines an 8mm camcorder and a 4in. colour LCD monitor that swivels through 180°. Sharp plans to launch it in the UK this autumn.

Canon's UC2 Hi includes hi-fi stereo sound, a x12 zoom and a new LCD panel. It uses digital signal processing to improve the picture quality.

Two new VHS-C palmcorders were announced by JVC. Model GRAX35 includes a x10 zoom, Programmed AE and LP operation. Model GRAX55 has in addition a built-in video light and Random Assemble Editing (RAE), which enables the user to program up to eight edit points and copy them on to a VCR. It comes with a remote control unit that will operate a wide range of VCRs.

JVC's technical information officer Mike Matthews was on hand to demonstrate JVC's new Service Support System. The company's camcorders all now include an EEPROM that stores service information. This enables the camcorder to be connected to a PC via a special cable so that, using special software, its service history can be called up on the screen. The information can also be stored on disc. It's possible to carry out automatic soak testing and to make certain adjustments to the camcorder's EEPROMs (resetting the white balance for example) without opening up the machine. JVC is also introducing a collimator, Model YTU92001B. This is a small telescope that enables a variety of bench tests to be performed with a subject or test pattern just six inches away from the lens. Handy if there isn't much room in your workshop.

Television

Companies were divided over the merits of wide-screen TV. Toshiba doesn't believe that the UK market is ready for it. Neither does JVC, though the company showed its impressive Panorama system using a wide-screen NTSC set. There's some distortion when a 4:3 picture is stretched to 16:9. The Panorama system uses 'variable stretch' to reduce the distortion.

Ferguson's new wide-screen Models WS28 and WS32 (the numbers denote the screen diameter in inches) have the IDC2.2 digital chassis, multi-standard compatibility and four scart sockets, including one for D2MAC.

Nokia plans to launch three models, the 28in. SFN7264, 32in. SFN8294 and 36in. SFN9294, with the Eurodigi II chassis. They have three scart sockets and can be fitted with satellite tuners.

Grundig's wide-screen offering is the 27in. Model M70-169/9 at £1,300. Features include Nicam, an active audio system and three scart sockets.

Samsung showed a prototype 32in. wide-screen TV set using a Thomson tube. It may be launched next year.

Ferguson's three new 4:3 Nicam sets, Models C51NX, C59NX and C68NX, feature Automatic Picture Control: this uses a photosensor to detect the room light level, automatically adjusting the brightness and contrast for optimum picture quality. Ferguson says that the system is subtle rather than dramatic: it can be switched off if desired.

Sony showed some interesting TV sets. The KVS3412S at £2,000 has a Super Trinitron tube, a 100-channel tuner and an advanced speaker system. Described as the ultimate portable the KVM11220 at £500 is an 11in. model with full PAL/SECAM compatibility. It can also accept an NTSC input via its video input socket. In addition to the 60-



The Sanyo CDP55A personal CD player.

channel tuner there's a temporary memory that can store a further 40 channels when the set is used away from home. This memory is retained for up to four days when the set is not powered. Other features include a security system that uses a six-digit ID code, child lock and an alarm clock.

Mitsubishi's latest range includes six Nicam models. Amongst them the 29in. Model CT29BSTX features a light-sensing picture control system that works like the Ferguson one. It will be available in the autumn at around £880. The 37in. Model CT37C2STX at £3,011 features multi-standard reception and an on-screen graphics equaliser.

Toshiba's latest range includes the 21in. Model 2132DB with Nicam, Fastext, a 40-channel tuner, twin scart sockets and an S terminal.

New Finlux sets include the Unix U40 which is available in 25 and 28in. versions. Optional extras include PIP, a subtitle recording module and a satellite tuner.

JVC showed the new GS1 series of Nicam sets, including the 28in. Model AV28GS1 which has a digital comb filter, dome speakers, two scart sockets, an S terminal and automatic 4:3/16:9 switching.

Grundig had on show the 32in. Model ST82-775/9 and 38in. Model ST95-775/9 which have Nicam, multiple scart sockets, a three-way active audio system and a new tuning system. There are 100Hz equivalents, Models M82-102 and M95-102 respectively.

Nokia's Models SFN5554 (25in) and SFN6363 (28in.) include Nicam, Fastext and Black Planigon tubes. The company showed a PAL Plus set, with pictures sourced from a D1 broadcast digital VCR. Results were impressive. Nokia says that its first PAL Plus receivers are likely to be launched in 1996.

Satellite

Satellite products weren't much in evidence, probably because the Cable & Satellite Show (see elsewhere in this issue) was running at the same time.

The Ferguson FS60 system has Wegener stereo sound, a VideoCrypt decoder, a one year/eight event VCR timer, a 199-channel tuning system, on-screen menus and a 60cm black-mesh dish.

Nokia's SAT2202 receiver caters for PAL and D2MAC signals and has a built-in Eurocrypt decoder and two smart-card slots. Price is £435 excluding dish. At £360 without dish the company offers the SAT5918, a stand alone MAC decoder with two smart-card slots for D and D2MAC Eurocrypt transmissions. It includes D2MAC teletext, an S terminal and remote control. Nokia introduced three new colour sets with built-in satellite receivers and VideoCrypt decoders. All have Nicam and Fastext. Model numbers are

SFN5515 (21in.), SFN6315 (25in) and SFN7115 (28in.). They will be available in the autumn.

Two new receivers will be available from Hitachi in August, Model SR1050D60 at £300 with a 60cm dish and Model SR1050D80 which is an 80cm dish version at £330. Both have a 199-channel tuning system, a dual card reader, two LNB inputs, three scart sockets, Wegener stereo and a one month/eight event VCR timer.

Dolby Sound

Home Cinema is the latest buzz term in home entertainment: there were lots of Dolby Pro-Logic surround sound systems on show. I forget how many times I saw and heard excerpts from the films *Indiana Jones*, *Lethal Weapon 3*, *Terminator 2* and *Always!* Dolby Pro-Logic uses four sound channels, left, right, centre (speech) and rear – ordinary Dolby surround uses three. Some systems use Dolby 3 stereo, with front speakers that project sound towards the rear of the room.

Hitachi mounted a very impressive demonstration of its new Pro-Logic system, featuring the C2574TN 25in. set. This will be on sale in July at around £850 including the speakers. Systems with 28in. and 29in. receivers will follow.

Toshiba has long championed the cause of Dolby surround sound. The company plans to launch two new sets with Dolby Pro-Logic, the 29in. Model 2939DB at £1,000 and 25in. Model 2539DB at £900. They will include digital signal processing and have as an option Dolby 3 for use in rooms that lack the space for a rear speaker.

JVC showed its Panoramic Sound system, which has motor-driven speakers that move according to the surround sound setting. The Adagio G9 system includes Dolby Pro-Logic, Dolby 3 and DSP. It sounds very good.

Technics had the SCCH950 Dolby 3 system while Sony showed its TAAV570B Dolby Pro-Logic AV amplifier which sells at about £400.

Audio

Sharp showed the world's smallest Mini Disc player, Model MDD10E. It measures just 84 x 30 x 109mm and weighs 330g with battery. It looked great and sounded good too.

Sony launched the MDS101 at £700, a mini-sized unit designed for editing Mini Disc recordings, and at £600 the ZSM1, a Mini Disc recorder with built-in speakers and a digital tuner.

Panasonic showed the RQDP7 portable DCC player which is to be launched later this year. Features include text display with scroll facility, a headphone remote control unit and track skip.

Clearly with its sights on potential DCC buyers, Sony showed a £400 DAT Walkman that gives up to four hours' recording time from two alkaline batteries. Sony also has a range of Dolby S analogue cassette decks that offer near CD-quality sound. The cheapest model, at £250, is the TCK511S.

Sanyo showed the amazing CDP55A personal CD player, which has a suggested price of £170. It uses the same anti-shock system as the Mini Disc, which employs ATRAC signal compression. The audio data is fed into a memory chip that provides a three-second buffer against the effects of jolts and shocks. To increase the data rate the CD rotates at twice the normal speed. The anti-shock system can be switched off when the player is used on a stable surface, prolonging battery life.

VCR Clinic

Reports from Eugene Trundle, Steve Cannon, Nick Beer, John C. Priest, K.E. Fellingham, Michael Dranfield, John Edwards, Richard J. Avis, Hugh Allison, Ian Bowden and Stephen Leatherbarrow

Mitsubishi HSB11/31/41

The cause of failure to play or record (doesn't lace up fully), either permanently or intermittently, can be the fact that the loading motor is being stalled because the pinch roller has jammed against the top of the capstan tower. The pinch roller arm assembly slides up and down a vertical pole which can become sticky. Clean and lubricate it, and use Philips' Molykote lubricant to grease the spiral cam that drives it. **E.T.**

Tatung TVR6122

This quite new model suffers from a tendency to sound flutter – it's a longitudinal sound track machine. The trouble is usually worst during playback of its own recordings, and sometimes gets worse as the machine warms up. Don't be misled into checking the pinch roller or capstan department: replace the reel drive clutch, part no. 250814. **E.T.**

Hitachi VT520

We've had the direct-drive capstan motor fail in a very misleading way in a couple of these machines: the on-board drive chip gets too hot to touch after running for a few minutes. You might find that the unstabilised 16V line is as high as 23V. Even so the motor itself is the cause of the fault, which often shows up as intermittent stopping and starting of the capstan. **E.T.**

Sanyo VHR3300

Now that these machines have a few years under their belts they are beginning to produce a new fault – the loading mechanism jammed, with the half-load pole failing to get out of the way of the entry guide on its way back towards the cassette during the unthreading process. Replace the lever assembly – no. 79 in the mechanical parts (2) diagram. You'll find that its metal pin has become loose or strained. **E.T.**

NEC N9033K

A common fault with this machine is failure of the reel brakes to disengage. The resulting drag either stops the tape moving or slows it, depending on the condition of the brake pads and the deck generally. A common symptom is slurred sound and cyclic mistracking. The cause of the fault is shorting turns in the 'pull' coil section of the brake solenoid – you'll often find that the coil-drive transistor has been wrecked. SEME has a repair kit which is available at about £20. It contains the solenoid, a transistor, a diode and modification details. **E.T.**

Panasonic NVF65

In the E-E mode, and also with the customer's own recordings, the sound would intermittently go off. We've had a few faults on the TV demodulator pack in this range of VCRs, so our suspicions were immediately directed to this area. Fault finding on the upright panels, especially with an

intermittent fault, can be nigh on impossible. Our suspicions were soon proved to be correct: we found another NVF65 and swapped the TV demodulator packs over, the fault transferring with the pack.

No obvious cracks or dry-joints could be seen on the defective pack, but when the copper side was attacked with freezer we found that we could instigate the fault. The audio defeat transistor Q713 was being turned on in the fault condition, connecting the normal audio output line to chassis. We traced the reason for this to IC7651: voltage checks here showed that the 12V supply to pin 3 disappeared. This was due to a faulty surface-mounted device, in fact a link. It's not shown on the circuit diagram and was going open-circuit intermittently. Once a proper wire link had been fitted in its place the machine worked normally. **S.C.**

Panasonic NV7200

This quite ancient machine would unlace about a second after lacing up in either the play or the record mode. After we'd checked various bits and pieces we came to suspect the supply Hall-effect sensor. I was about to find a scrap machine to rob it of its sensor when Pobs had the bright idea of checking with a magnet. His idea was to take the supply spool off, select play and move the magnet back and forth to the sensor. Why? Because he'd had exactly the same fault with an Hitachi machine and had found that the magnet on the underside of the spool rather than the sensor was the cause of the trouble. When the magnet was used the machine played happily. So we 'borrowed' a supply spool from a scrap machine. Pobs became Workshop Sage for the day. **S.C.**

Amstrad VCR6100

This machine had been in storage and now chewed tapes. We found that the larger of the two half-loading belts had decomposed, causing erratic drive – particularly when unloading. A new pair of belts, fitted in the rather clumsy way made necessary by the ridiculous design of this part of the mechanism, cured the problem. **N.B.**

Panasonic NV370

According to the job card there were lines across the picture – it was right. Tracking bars that the control couldn't remove were present. The cause of the trouble was insufficient back tension because the pad had dropped off the brake band. Watch out for this with all Panasonic machines that use the metallic band. **N.B.**

Sony SLV373

This machine would play back prerecorded tapes perfectly in either the SP or LP mode but with one of its own recordings only the blue mute raster was present – there was no vision signal on the tape. Scope checks showed that the f.m. luminance plus chroma signal was present at pin 18 of the

head amplifier/switching chip IC001, but there was no output to any of the heads. The d.c. switching conditions around the chip were correct but at whichever outputs were selected the d.c. voltage was high – 3.5V instead of 2.2V. There were also incorrect (low) voltages at pins 16 (head select) and 26 (25Hz pulse input). The chip was faulty. **N.B.**

Samsung SI7220

There was no r.f. output because the supply to the modulator was missing. This comes from the regulator transistor Q105 which was without its 15V input. A choke and diode deliver this supply. The latter (D114), which is in the power supply section of the main PCB, was open-circuit. A new 1N4002 restored the signals. **N.B.**

Panasonic NVF70B

We've mentioned before that these machines can switch off when the review motor is called upon to do any work. You find that the 0.9Ω resistor R6035 has gone high in value or open-circuit because the motor drive chip and/or the motor itself is faulty. In this case however exactly the same symptom occurred when the tape was unloaded from stop-2 to stop-1. The cause of the trouble was that release lever 160 (part no. VML2200) was stuck on its pivot because of deteriorated plastic. A new lever cured the problem. **N.B.**

Panasonic NVF65B

No signals was the complaint with this Nicam/hi-fi machine. On the bench we found that although a test signal could be obtained and the record/playback/search functions operated correctly it was impossible to tune in any local channels. There was a lively E-E raster and as we had already confirmed that there was an r.f. output from the combined r.f. amplifier-tuner module attention was turned to the tuner voltages.

The 12V regulated supply was present at pin 2 (BM) and the tuning voltage at pin 7 (BT) cycled nicely through its range in the preset/tuning mode. But no pictures appeared on the screen. What was missing was the u.h.f. enable at pin 8 (BU). This should be at 11.5V, the supply coming from pin 12 of the AN5043 chip IC7652. When pin 12 of this chip was isolated and 12V from a separate source was fed to pin 8 of the tuner signals could be tuned in though the machine wouldn't lock on to them when set to scan through the band. A replacement AN5043 was obtained and fitted but made not one jot of difference.

Feeling somewhat miffed, we delved further into the circuit and eventually followed the Band-U feed to pin 10 of IC7652 back via the audio board to the timer panel, where IC7502 (MN12C261D) was found buried under the display. Amongst its other functions this chip passes the v.h.f./u.h.f. switching from the timer/control microcomputer chip IC7501 to the TV demodulator. Although the voltage at pin 5 (U out) was correct at 2.1V, as there is nothing else between IC7501 and IC7502 we decided to obtain a replacement MN12C261D. Fitting this restored correct tuning.

It's a pity that the manual for this machine is rather vague regarding the functions of some of the control chips. **J.C.P.**

Sharp VC386

There was intermittent colour in both the record and playback modes. IC501 proved to be defective, but its replacement cleared only the no playback colour fault. Because of chip tolerances the a.f.c. adjustment was wrong. There's no

setting-up procedure in the manual but we found that rotating the a.f.c. adjustment control to give 4.7V at pin 29 of IC501 provided a complete cure. **R.J.A.**

NEC N9077

The reported fault was that a tape was stuck in the machine. Checks showed that the supplies from IC1 (PQ12R04) were missing. A replacement was obtained from SEME under part no. 37101407. **R.J.A.**

NEC N9077

In the May 1991 issue reference was made to the following fault with this machine: fast forward and rewind very slow and the machine shuts down in the playback and record modes. In addition to replacing the reel braking solenoid it's necessary to obtain and fit a kit of three transistors and one diode. This is available from SEME. Part nos. are 35543418 (2SC1741A), 355D1931 (2SC2785), 35S62518 (2SD1227) and 36001026 (1S133). **R.J.A.**

Alba VCR4000

'Occasional streaky pictures' it said on the job card. When the covers were removed the innards looked like new. It was obvious that the tape path was incorrectly aligned, and a general re-tweak as per the manual soon had everything working correctly. So out with the cassette, reload it and check again. The problem was back. "Oh drat" I said and looked for any loose mechanical bits. None.

I'll spare you the agony of what happened next. Eventually I spotted an eighth of an inch of thin plastic sleeving lodged in the end of the fixed part of the tape loading guide (the right-hand side one): it was held in firmly by the grease used to lubricate the loading runners. Swift removal with a pair of tweezers plus one final mechanical realignment restored a reliable, grade one picture. **H.A.**

Hitachi VT86

There was no play mode with this machine because the drum wouldn't rotate. Another dealer had asked us to look at it as he'd run out of ideas. The machine would accept a cassette and lace up when play was selected, but because the drum remained stationary it then unlaced and went to stop. The STK5451 regulator chip and the drum stator PCB had been renewed. While checking through all the functions, on the basis that it's important to find out what does work as well as what doesn't, I found that the machine worked normally when record was selected. So it was a playback only fault.

When playback is selected Q608 (2SA673C) in the servo section of the main PCB should switch on to provide the PB12V supply to various parts of the servo circuit. A check showed that its collector remained at 0V, which is correct for the record mode. The cause of the problem was a dry-joint at the base of Q608. **J.E.**

Hitachi VTM830

It was sometimes difficult to see the fault symptom on this machine: the customer's complaint was of poor colour playback. It could best be seen with a dark picture, where coloured snow was present. Much of the colour processing is done on a subpanel. As luck would have it we had another of these machines in, for drum replacement. I therefore swapped over the subpanels, proving that this is

where the cause of the fault lay. A check on the waveforms at R326 (270Ω) proved to be useful as the waveform at the end connected to the 2H delay line CP303 did a nose dive, being hardly visible. When we replaced CP303 we were rewarded with a very good picture. **K.E.F.**

Hinari/Orion VXL35

This machine was dead with no clock display. Replacing Q02 (2SD1207) restored normal operation. **K.E.F.**

ITT VR3929

If the display appears at switch on but goes out as soon as a deck function is selected, after which there is no further operation, replace the two 47μF capacitors on the subpanel in the power supply unit. **K.E.F.**

Samsung VI1260

We've had a number of these machines in for repair. The usual fault is that the machine laces up then switches back to standby. The cure is to replace D109 or D110, but as both can give trouble I now replace the two of them. Note that the fault can be and often is intermittent. **K.E.F.**

JVC HRD610

This machine worked well in play until a trick function (search or pause) was selected. The picture then had lines about every 3mm across it. Wet finger checks soon established that the cause of the fault was IC301 – it's a small subpanel. When a replacement was fitted all was well again. **K.E.F.**

Proline DX3300

There was a tape stuck inside this machine. When a function was selected the display would give the appropriate indication but nothing else happened. I hadn't seen one of these machines before, though the deck looks like an Amstrad one. A check on the two fuses in the power supply came up trumps: Z502 (1AT) was open-circuit. That saved the cost of a service manual! A long soak test proved that Z502 had failed of its own accord. **M.Dr.**

Akai VS22

If the problem with one of these machines is that TR10 and TR11 in the power supply are either overheating or short-circuit, replace the following electrolytics: C7 (100μF, 10V); C6 (220μF, 10V); and C21 (47μF, 16V). We use replacements rated at 25V or above. It seems that excessive ripple upsets things and results in TR10 and TR11 conducting when they shouldn't. **M.Dr.**

JVC HRD540

The customer told us that a cassette had got stuck in this machine and that he'd removed it himself. When we plugged the machine in we found that the cassette loading motor would start to run with no cassette inserted. Then, after a few seconds, the machine would switch to standby. If a cassette was inserted and the machine was switched on the cassette would load down then immediately be ejected: the housing motor would continue to run.

We decided to load a tape manually and thread it up. The result was some operation but the capstan motor didn't

rotate and there was thus no reel drive. The machine sat happily in pause however. Attention was turned to the capstan motor, which was found to be without its 12V supply. Tracing the source of this back we came to an open-circuit circuit protector (CP5, type ICPN38) on the main PCB. A replacement was fitted and the machine was given a good soak test. This proved that there was no underlying cause for the failure of CP5. **M.Dr.**

Ferguson FV42L

The complaint was of a noisy picture during playback of the machine's own recordings. After many hours we saw the fault. White dots washed across the picture, at times looking almost like a test pattern of vertical lines of dots. The symptom was also present in the E-E mode whilst a recording was being made. We noticed that there was a slight delay between the machine starting to record and the appearance of the dots. The cause of the problem was spikes produced by the audio bias/erase oscillator appearing on the 12V supply to the tuner etc. The culprit was CS29 (10nF) which is connected between the base of the oscillator transistor (TS26) and chassis. **I.B.**

Panasonic NVD80

This machine came in for service with various complaints, the main ones being of a poor playback picture and noisy hi-fi sound. A new upper drum put that right. We then noticed that with SP recordings there were noise bars across the picture in the cue and review modes instead of noise-free horizontal 'cuts' – the LP results looked fine. The cause was discovered after some searching around the signal paths in the video preamplifier area. There was a break in the print on the underside of the main PCB between pin 8 of connector BP3001 and pin 17 of the servo pack connector. This is a feed from the preamplifier called 'enve. select'. During normal playback there should be a voltage high here, becoming a square-wave in SP cue/review. The squarewave is used by the servo PCB to produce an output called 'h.amp switch' at pin 16. It returns to the video preamplifier PCB. **I.B.**

Philips VR6870

There were no displays while the power supply produced stressful noises. Scope checks on its outputs showed that there was enough mush present for us to wonder about possible damage to the rest of the machine. The machine was therefore disconnected and cold checks were started. We soon found that D4, a 10V zener diode, was leaky. **S.L.**

Ferguson FV30

A recent case of intermittent shutdown, with the tape remaining laced up and all the motors stopped, was cured by fitting a new reel optocoupler and mode switch. **S.L.**

Panasonic NV333

This machine was dead because the STR1096 power supply chip didn't produce a 6V output at pin 5. There was a normal 15V input at pin 1 and a 9V output at pin 4, thus switching problems were ruled out. A new STR1096 provided a complete cure. As the customer wanted the machine serviced we fitted one of the excellent full refurbishment kits available from SEME and others. Fit only original Panasonic parts, clean, grease and lubricate as per the manual and no problems will arise. **S.L.**

Letters

THE TWO MR BIGGS

It was a nice day. A Thursday, somewhere between a Wednesday and a Friday. The customer was Mr. Bigg, one of my regulars. He clutched a Panasonic NVG18B in one hand as he squeezed through the door into my shop. "Somebody lent me a dirty film" he said. "It's messed up my VCR. Can you check it out to see whether it's worth repairing? My father will phone back in a couple of hours to find out the cost."

The dirty film turned out to be *Tommorrow's World* on an old tape that had been repaired at the beginning with Sellotape. This had stuck to the head drum, but there was surprisingly little damage. After a good clean up around the tape path the machine played as well as new.

Then the trouble started. The VCR cut out as though the power had been switched off, then came back on again. I checked the three-pin plugtop for loose connections and the cable for breaks then turned my attention to the power supply panel. Bending this made the machine cut out and come on again, so I removed it and got to work on the many dry-joints you find on a circuit of this age. After three unsuccessful goes at the board I finally noticed the huge crack across it. A bit of bridging wire soon put matters right.

Just then the phone rang. It was Mr. Bigg senior. "It's all finished" I said, "£30.55 altogether."

"WHAT! HOW MUCH?!" He sounded genuinely surprised that anything could cost that much. So I explained what had been involved and how much time I'd had to spend on it.

"Oh. Well, don't you have any cheap ones for sale?"

"We don't sell secondhand videos" I replied.

"Don't you ever get any that customers don't want?" he persisted.

"Well we do have this nice Panasonic NVG18B. It's only £30.55."

"I'll take it" he cried.

"Don't be daft. It's yours. Now do you want it back or not?"

Mr. Bigg junior phoned back later to agree the price and subsequently called to collect his video. He said it had always been cutting out but he hadn't thought it important enough to mention. Nice chap really, and he did brighten up my day. I expect that I'm a bit like his dad - becoming unravelled at the edges as time catches up on me.

*John Hopkins, The TV Workshop,
Felixstowe, Suffolk.*

MANUFACTURERS' SERVICE

I feel that I must add my voice to what must be a growing number of qualified engineers who run their own businesses but can no longer get technical information and advice from manufacturers - Sony, Grundig, Ferguson, Samsung, Hitachi, ITT/Nokia and Panasonic to name but seven. These manufacturers now give technical advice only to account holders, and to hold an account you need to spend an average of £500 a year with them.

Grundig did last year introduce a system that enables one, for a payment of £50 a year, to receive technical bulletins and technical advice from Rugby. I have applied for this service twice and am still waiting for a reply.

I can understand the problem that technical lines become

clogged up with calls from unqualified engineers who ring about every faulty unit they get before even taking the covers off, getting the technical departments to do their diagnostic work for them. This happened to me when I was Senior Engineer/Part Time Instructor with Mastercare after this firm took over technical advice for Rank Bush Murphy products. But surely the manufacturers can come up with some system for weeding out the time wasters and giving help to qualified engineers they have in some cases trained (whilst with Mastercare I attended courses run by all the major manufacturers). A possible system is that used by Sharp for microwave oven parts: engineers are issued with numbers without which parts cannot be obtained. We are, after all, repairing their products.

*G.P. Kitching, Spondon TV Services,
Spondon, Derby.*

Like Brian Davidson of Greenock (April letters) I too believe that Alan Dyson is providing a valuable service. It strikes me as a little odd however that payment for an independent advice service is considered to be acceptable while manufacturers are expected to provide advice free.

Grundig has for some time now been offering a Technicover Service at £50 a year. For this sum Technicover members receive all service literature, advice by phone and access to genuine Grundig spares, including photocopies of service manuals where the originals are no longer available. Perhaps the answer lies in the fact that we assess all accounts, including Technicover, in line with our requirements under the Consumer Protection Act, 1987. And incidentally what's wrong with a manufacturer insisting on its approval for under-guarantee repairs for which it pays the bill?

*Paul Goldring, General Service Manager,
Grundig International Ltd., Rugby.*

SAFETY TESTS

One or two points have been raised since my article on the Electricity at Work Act in the September issue. Jim Garrod points out that a.c. testers can 'fail' microwave ovens because of filter capacitors being connected across earth and the two poles. The portable appliance testers (PATs) mentioned in my article use d.c. insulation tests. The only one I have seen reference to that uses a.c. for insulation tests is the Match APT2400, which is listed by AWI and Willow Vale Electronics.

A vital point is that the results of PAT tests need to be interpreted by a competent person. There have been a number of cases where companies offering PAT services have failed whole office-fulls of computer equipment because the testers were not competent at interpreting the readings, i.e. didn't understand the effects that input circuits in UPS, monitors etc. would have on PAT voltage readings.

*N. Beer,
Bideford, Devon.*

TRAINING INADEQUACIES

As a postscript to the Cowboys saga I'd like to voice an opinion that is shared by a number of engineers of a similar age to myself (27). I sat the City & Guilds examinations in 1984/5/6 for the 224/1/2/3 course, this being the recognised path to becoming a qualified engineer in our profession. But many of the items in the syllabus were obsolete even then (glass vacuum diodes!). Others were too theoretical - when was the last time you had to refer to atomic valency numbers in order to diagnose a faulty transistor?!

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Far too much emphasis is placed on paper qualifications. While they may be relevant for design or development work, hands-on experience is often more important. After the shaky start provided by the 224 course, it has taken job experience for me to become a competent engineer – with an expanding business that provides an efficient service at a reasonable cost.

*Andrew Woods, Proprietor,
The Video Repair Company of Nottingham.*

AERIAL INPUT CIRCUITS

In Part 2 of his series on Modern TV Receiver Techniques (February) Eugene Trundle describes a typical u.h.f. tuner with a bipolar transistor r.f. amplifier stage, pointing out that the input is untuned “to give best noise performance and optimum impedance matching over the very wide input frequency range (470-860MHz)”. The question of noise versus bandwidth is interesting.

In early Thorn u.h.f. tuners for example the aerial is connected straight to the emitter of a grounded-base r.f. amplifier transistor. This meant that a good enough match was achieved between the 75Ω aerial feeder and the r.f. amplifier’s input. In the interests of attenuating out-of-band signals etc. it’s desirable to provide a tuned input circuit, as in the old valve v.h.f. tuners. But costs have to be taken into account. The input tuned circuit would have to be ganged to the others in order to track across the band. A further consideration that’s often overlooked is that in a TV system the aerial is actually the first tuned circuit. There’s no reason why the 75Ω output of the correct aerial for the channels required shouldn’t be coupled in without additional tuned circuits. It’s certainly cheaper!

Another point is that a bipolar device produces a lot of noise. The higher the gain, the more noise. So the gain is kept low – and anyway you don’t get a lot of gain from a grounded-base transistor. It’s more a matching device than an amplifier. As it also acts to prevent the oscillator’s output reaching the aerial it could be called a buffer stage too.

With a wideband system there has to be a compromise between noise, bandwidth and cost. In general u.h.f. TV transmitters are plentiful and front-end gain is not needed. In the old v.h.f. days transmitter ranges were greater: the tuners usually had switched coil-packs that could be tuned individually.

*Brian Williams, GWOGHF,
Penarth, South Glamorgan.*

PHILIPS ICE

We too have experienced the problem described by G. Davies (letters, March) with Philips car radio-cassette players. Maybe the following suggestion will help.

We find that it’s often easier to remove the whole main PCB from the chassis, including the front PCB, instead of removing only the front PCB by desoldering. The lamps are then easy to replace and the radio can be tested before reassembly (some pins of the cassette socket will need to be shorted first). This may sound rather drastic, but PCB removal becomes simple with some practice (ideally on a scrap machine). A T-8 Torx-driver is essential, and don’t forget to check that you’ve removed all the bolts and the on/off locknut before attempting to remove the PCB.

Remove the audio amplifier chips in these models by snipping all the pins then holding the pins with tweezers while melting the solder. Clear the holes before fitting the replacement.

We hope that these methods will help other engineers

who, as we’ve done in the past, spend more time repairing damaged print than repairing the original fault.

*W.J. Maines,
Liverpool.*

AKAI POWER SUPPLIES

In the January and February issues there were references to the power supply in the Akai VCR Models VS22/23/25. How engineers find time to remove and test numerous components in this power supply I’ll never know.

It’s a waste of time as such a repair only returns the power supply to its original state, and this is never reliable. A far better repair method is to fit an approved modification kit from Akai UK (part no. 99002208). It costs around £12 and includes all the components that usually fail plus a limit PCB and capacitors to add to the power supply to prevent further failures. Alternatively an already modified power supply, less the mains transformer, is available at about £20.

As to the cost, well this is passed on to the customer. And after all we didn’t design the thing in the first place, so why rebuild it? Would a garage put a new cog in a gear box?

*D. Larter,
Lowestoft, Suffolk.*

POLARISER MODIFICATION

I would like to draw attention to the circuit for converting the Salora 5902/Nokia SAT1100 to provide voltage polariser drive – Nick Beer’s column in the January issue. I recently carried out this modification, using the LM317 regulator version, with most satisfactory results. The system now works with both voltage and current polariser drive, one for each input. This is an important point, making expansion of the system very flexible. Thanks Nick.

*Brian Webb,
Havant, Hants.*

CASIO WARNING & PHILIPS VR6542

I feel that I should warn others in the trade about accepting Casio items for repair. After spending time on the equipment they’ll probably find that Casio is unwilling to supply spares. Even for a simple component you receive an invoice quoting a high price and indicating that the equipment should be returned to Casio for servicing. In a recent case I was forced to tell the owner of a TV1400 pocket TV set which required only a replacement back-light tube that it was beyond economic repair. It always reflects badly on a repair establishment when a customer has to be told “we can’t get the parts”. He naturally assumes that we are to blame and takes his future business elsewhere.

In the March VCR Clinic Roger Burchett was correct about the mode-switch problems with the Philips VR6542. This machine is a Sharp clone (Model VC651H) however, not a Panasonic one.

*Dave Mackrill,
St. Leonards-on-Sea, East Sussex.*

HELP WANTED

Wanted: circuit diagram for the Amtron power supply Model UK682. J.E. Harley, 19 St. Peter’s Way, Mickle Trafford, Chester, Cheshire CH2 4EJ. 0244 300 967.

Wanted: circuit or cheap source of a PAL to SECAM

At The 1993 Cable & Satellite Show

Ian Martin

This year's Cable & Satellite Show, held at Olympia on April 5-7th, was well attended with a record number of familiar and new companies appearing. As always, representatives of many of Europe's satellite broadcasters and satellite and cable operators were present, along with reception equipment manufacturers and distributors. Several new products were on display, some of which we'll look at below.

Receiving Equipment Manufacturers

No visitor could miss the Pace stand. It was right inside the main entrance and had two storeys. The complete product range was on display, the company's new generation receiver-decoders being of particular interest. There are three models in the range, the MRD950, 955 and 960. They all have two LNB inputs, full PAL and D/D2MAC capability and Eurocrypt M and S decoding. In addition Model MRD955 has mechanical and ferrite polariser control while Model 960 has a 199 - channel memory and two Eurocrypt card slots. The MSP991 dish positioner and stand-alone VC100 VideoCrypt decoder were also on show, along with Pace's range of SMATV and new Cryptovision products.

Pace's real show-stopper however was the MSS1000 PAL/VideoCrypt IRD with built-in Dolby Pro-Logic decoder and four-channel 6W amplifier. This unit has two LNB inputs and a built-in dish positioner; it supports voltage-switched and polarised feeds and has slots for four VideoCrypt cards. Taking advantage of the recent increased interest in home theatre, Pace set up a Pro-Logic demo room with surround sound and large-screen TV. It drew the crowds continuously throughout the show.

Amstrad had also been busy since last year's show. A number of new products were introduced, including the SRX550 and SRX350 PAL satellite receivers. The 550 is aimed at the UK market, with VideoCrypt decoder, two LNB inputs with the i.f. extended to 2GHz, three scart sockets and on-screen displays. The dual extended-i.f. inputs make the receiver suitable for SMATV installations. The 350 is similar, being aimed at Continental markets and without VideoCrypt. Amstrad also showed off the existing SRX330 which, with two tuners, is aimed at the German market, and the SRX600 for the UK market. This latter receiver is the only one currently available that can receive and decode PAL VideoCrypt and all the MAC Eurocrypt variants, using the appropriate smart cards.

Two new TV/IRDs were demonstrated. Both are stereo models with a 21in. FST display and a rear-mounted VideoCrypt card slot. The STV2100S receives stereo only with satellite transmissions and via its two AV inputs however: the STV2100N has the addition of a Nicam decoder for terrestrial stereo sound and, fitted to the top of the cabinet,

a 'superwoofer'. Both models have a much better specification and styling than their predecessor, Model STV20.

A completely new product from Amstrad is the DSR100 digital satellite radio receiver. This is capable of receiving 128 satellite and cable digital radio channels with CD quality, providing both analogue and digital audio outputs. Such broadcasts are already available from the TV-SAT and Kopernikus satellites and are planned for Astra and Intelsat VI.

DSR receivers were also being demonstrated by Technisat (Model 5000DSR) and Digital Music Express (DMX) – the latter is a Scientific Atlanta receiver. According to DMX a 30-channel line up has already been decided for Intelsat VI.

The high-profile brand Chaparral had a few new products on show including some LNBs and feeds and an add-on video threshold extender, Model VTE4.0, for its famed Monterey receivers. A demonstration of this, using weak Arabsat signals, was very impressive. The 3dB threshold improvement is sufficient to bring otherwise unsynchronised and unrecognisable signals up to CCIR grade 2-3 standard.

Other receiving equipment manufacturers included Cambridge, Connexions, Nikko and Strong.

Satellite Operators and Channels

Satellite operators were represented by Astra, Eutelsat and French Telecom. The latter displayed wide-screen pictures. Representatives of several of the satellite channels were around the operators' stands, including Sky, Eurosport, The Children's Channel, TV Asia, The Adult Channel and, coming soon from Astra 1C, Turner's 'TMT & Cartoon Network'. Launch of this new channel is planned for September, initially in the clear, with a daytime schedule of cartoon favourites and a nighttime schedule of classic movies. It will use transponder 47, with horizontal polarisation.

Hardware Manufacturers

LNB and aerial manufacturers GEC, Channel Master and Racal were present, also Lenson-Heath who showed a new 1.8m solid dish and multi-LNB holder. Celtel demonstrated the SK8000 home security system which uses wireless links between the sensors and the control box. Fox showed multi remote replacement handsets and Martek a radio remote that converts infra-red signals to f.m. radio signals. Willow Vale has a very interesting 'home automation' system that can include a security system.

Others

All the big distributors were present, taking the opportunity to release new trade catalogues and present special offers.

Two new products were shown by cable and master aerial system equipment manufacturer Global Communications. There was a terrestrial and satellite distribution system that can selectively bar individual customers from receiving satellite signals, subscription information being loaded or edited by connecting a personal computer to the control box. The other new product was a satellite combiner that uses band shifting. This comes in four variants. Basically it allows signals from two dishes or polarisations to be combined on one cable and tuned by a receiver with an extended i.f. input while remaining compatible with the company's 'Magic switches' and other r.f. distribution products.

Many magazines and book publishers were represented, including the interesting 'Asian Sources' series of periodicals and the useful U-View service manual compendiums.

The Videophone

In addition to the company's extensive range of satellite products the Eurosat stand featured the new GEC-Marconi videophone – Eurosat has exclusive mainland European distribution rights. Using video compression techniques the videophone can send colour motion pictures of the caller via normal analogue telephone lines to a compatible receiver – this is in addition to the normal telephone sound of course. Because of the bandwidth limitations of analogue lines the picture refresh rate is 10Hz, but this is quite acceptable for the flip-up, 3in. colour LCD screen. A full review is planned in due course.

Video Projector

Another interesting new product was the LCD video projector on the stand of the Danish company Satellite Trading. The projector, which is roughly the same size as a Super-8 movie projector, can produce an image from 30 to 100in. diagonal. As the image comes from a single LCD

light shutter there are no colour registration or convergence problems – and none of the lengthy setting-up alignment procedures associated with three-tube projectors. The unit can handle PAL and NTSC signals and should prove useful for home cinema and video presentations. A very competitive price is promised in comparison with existing products.

Summary

Many other interesting items that merit comment were on show, such as the Egis biaxial dish rotator that allows both azimuth and elevation tracking for use with non-geostationary satellites. Superjack showed a similar prototype.

Scala demonstrated a video information channel for cable networks. Computer-generated images, logos and messages can be inserted on live video images for advertising purposes. Many sophisticated effects can be created and the images can be manipulated.

In summary it seems that the trend for more sophisticated products to be introduced to the marketplace continued this year. In addition new business possibilities are opening up as new products and services come along. We look forward to Cable & Satellite 1994.

Dealing with Liquid Spillage on PCBs

Ian Stellar

Liquid spillage can cause many strange faults. When we encounter unusual symptoms it's our policy first to examine the PCB(s) with our large magnifying glass and to sniff around for any distinctive smells.

Amongst the most common culprits are children who spill orange juice etc. on to and into equipment, tipsy people who do likewise with beer and, worst of all, errant pets.

It's best to remove any PCBs that have been affected and, before treatment, to disconnect all plugs and sockets etc. Where this is not practical, hinge the panel as far out from the cabinet as it will go and tilt it in such a way that cleaning fluid will run out of the cabinet.

Procedure

The first step is to clean off any dust etc., using a large artist's brush. Next spray the affected area with a foam cleaner such as Servisol Foam 30. Allow it to foam up, and scrub it well into the board, around and under components. It's not usually necessary to remove components, but large items such as electrolytic capacitors and bridge rectifiers can be removed to make access to the PCB easier.

Leave the cleaner on the board until foaming subsides, then wash it off using copious quantities of clear water, scrubbing thoroughly with the large artist's brush.

A second application will normally be necessary when the contamination is caused by animal urine. This is because such a PCB can become impregnated and hence conductive, forming a sort of very large thick-film resistor.

Leave the board to dry for several days after washing the cleaner off. If you are in a hurry a hairdryer can be used. Inspect plug and socket connections as pockets of water can

collect here and remain even when the rest of the board has dried out. To drive out every last trace of water use a hairdryer to heat the board from the print side.

When the board is still hot spray a demoisuriser such as WD40 on to the component side, brushing it well in around and underneath components. Leave the PCB for five to ten minutes for the WD40 to sink into the surface, then use the hairdryer to apply heat, brushing any excess WD40 off the edge of the board on to a suitably placed cloth. Don't dry off the WD40 completely: leave a thin film that covers the board. Although this will attract dust it's necessary for continued protection.

Refit any large components to the PCB (remember to clean them first), and check that any plugs are clean and dry before reconnecting them.

All being well you should find that the mysterious faults have now disappeared. In most cases no further fault-finding will be required. You will sometimes however find that some component legs have corroded through so that component replacement is necessary. Similarly some very thin PCB tracks may have been corroded away and need to be replaced with lengths of wire.

In Conclusion

It's vital to make sure that the customer is aware of the cause of the problem so that any further trouble is prevented. Tell the customer that if another accident does occur the equipment should be brought in for attention immediately, even though it may appear to be working normally, otherwise corrosion will set in on component legs, tracks etc.

Finally, don't use trichloroethylene PCB cleaner as this can affect electrolytic capacitors etc.

A Western – with Cowboys of course

Chris Watton

This is the tale of a quite reasonable Ferguson TX9 TV receiver, a 3V29 VCR, an Amstrad SRX400 satellite TV receiver and a very distressed lady customer. The equipment is used in an area where the terrestrial signal strength is good, and there are no obstructions in front of the dish. The result? – poor pictures on all channels!

I was called in and told that since a satellite TV receiver had been fitted the ITV (Yorkshire) picture was not so good. When I arrived I couldn't believe it. I could only just make out that a programme was present, and the other stations weren't much better.

Three firms had attended to the system but couldn't get to the bottom of the problem and told the customer that they didn't know what to do. The basic cause of the trouble is that unless the terrestrial signal is impeccable very strong herring-bone patterning that obliterates the picture occurs on ITV (Channel 25). Depending on the strength of the signal from the terrestrial TV aerial the patterning will be more or less apparent. I don't know whether this occurs in areas that don't use channel 25, but it does in the Belmont transmitter area. The interference comes from the VideoCrypt decoder, and occurs whether this is a separate unit or is integral with the satellite TV receiver. If there's a good aerial signal however there should be no problems.

The Cowboys

Back to the expert installers who didn't seem to understand the nature of the problem and in an attempt to wriggle out of their predicament told the customer all sorts of things like "yer telly's no good" and "it's atmospheric" (sounds technical, that).

The first two men who brought the dish and receiver and fitted them presented the customer with a bill for £75 and wanted to be off. But the customer wasn't happy. The dish was so low over the path that people would have to duck to get past it, while the cable wasn't clipped up properly and hung in loops. When it was pointed out to him that this wasn't very good the chief installer offered to alter things for an additional £50. Needless to say the offer was declined. At this the installers departed, leaving a poor picture behind them.

Next day the customer phoned the shop where she'd bought the TV set (a High Street multiple, not a TV shop) to complain about the picture. She was told that it would be

put right pronto. Enter team number two.

The previous team had come from Huntingdon. This team came from Nottingham. They were true professionals. Their first words were "those other fellows are useless, we'll put it right". But this was not to be. All they did was to pull out the tuner drawer and break it. As the drawer wouldn't go back in they advised that it was "best to leave the drawer sticking out – makes the set easier to tune with the knobs". They finished with the comment "anyway your set is too highly tuned and we can't do anything with that".

Another phone call was made to the shop and, yes, another team of installers was booked to attend. They came from foreign parts (London). Impressive, eh? Londoners coming all the way up to Lincolnshire to sort out our tellys for us. These two paid such a short visit that it was hardly worth their while getting out of the van. They told the customer that "your TV's no good for satellite reception - no good for anything really" and were soon on their way. Good service? But at least with a smile this time.

Sorting it Out

The solution to the problem was elementary. I'd expect any second-year student engineer to be able to sort it out without too much headscratching. This is the course I took.

I first disconnected the Amstrad satellite receiver and concentrated on the TV receiver-VCR set-up. There are several connections of course: wall socket, flylead, VCR input socket, VCR output socket, second flylead and TV aerial socket. Most of these connections were poor: aluminium coaxial plugs were loose and dirty, the TV socket was loose and the braid in the wall socket wasn't connected. Sorting this out took about a quarter of an hour. The pictures produced by the four terrestrial TV channels were then good – and a smile was coming back to the customer's face.

The Amstrad receiver was then reconnected. Except for the video channel the pictures were still good. Simple: the VCR's output frequency was too close to that from the satellite receiver and Channel 4 (on ch. 32). I set the VCR's output to about ch. 35/36 and the satellite receiver's output to about ch. 39/40. This removed the interference. A further check showed that all stations were clear though sparklies were present on some satellite TV channels. As the dish was so close to the ground I simply moved it to obtain the best picture.

The owner can now watch the westerns on the Movie Channel, which was the main reason why she bought the satellite TV system. I'm sure she simply melts when Gary Cooper is "shootin' them up" or Randolph Scott is having a mosey into town and hope she wasn't put off by the other cowboys.

It's worrying to think that firms are operating in this way. They give satellite TV a bad name. This customer, and many others presumably, was told that satellite TV is no good, ruins the telly and costs a fortune. I hope that after a few weeks with clear pictures she'll forget the difficulties and have years of pleasure. Also that in the future she'll buy her TV sets, VCRs and satellite systems from a TV shop rather than a washing machine/cooker shop.

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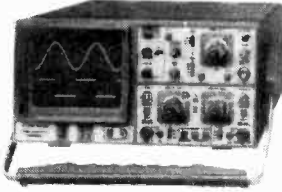
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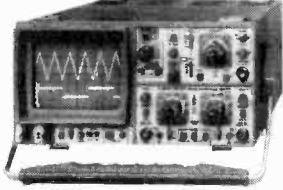
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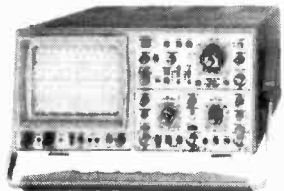
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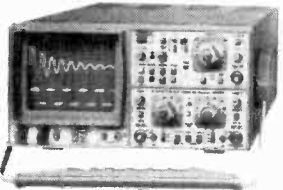


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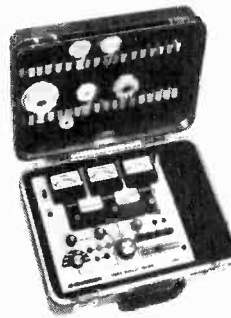
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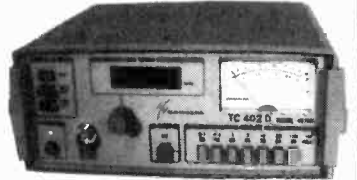
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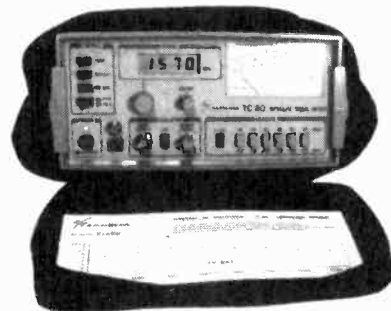
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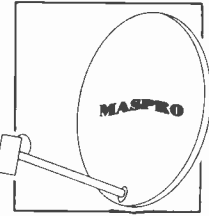
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AN6344	£4.75	HA12005	£3.20	LA7806	£1.50	STK4121H	£6.95	STR50020	£4.20	TD43560	£3.90	BD940	£0.50	2S9918	£1.00
AN6346N	£6.50	HA12047	£3.50	LA7808	£2.50	STK4131H	£6.75	STR50103	£4.50	TD43561A	£3.95	BD940	£0.50	2S9918	£1.00
AN6350	£3.85	HA13001	£1.90	LA7910	£1.75	STK4132H	£6.75	STR50113	£5.70	TD43562A	£4.50	BD940	£0.50	2S9918	£1.00
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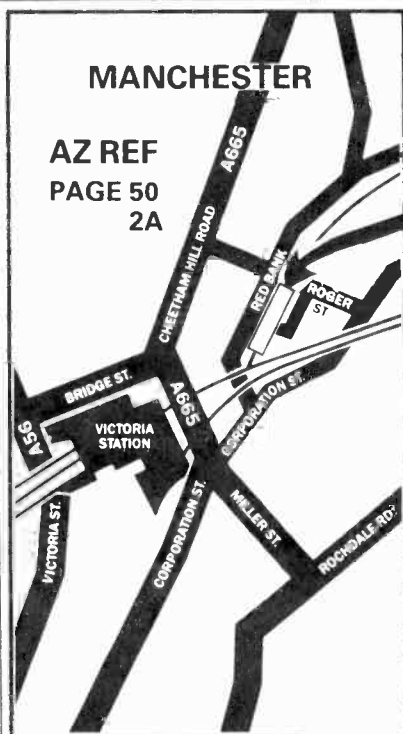
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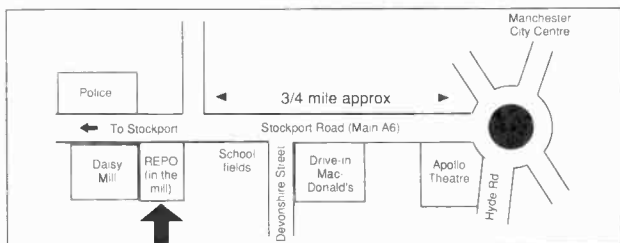
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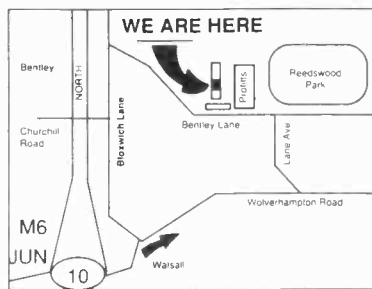
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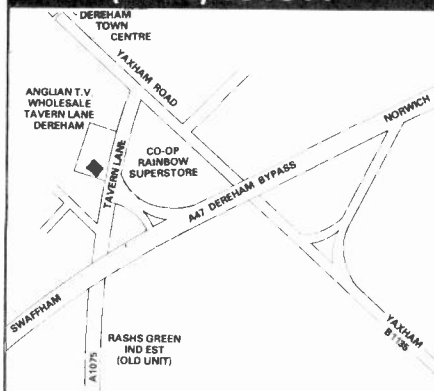
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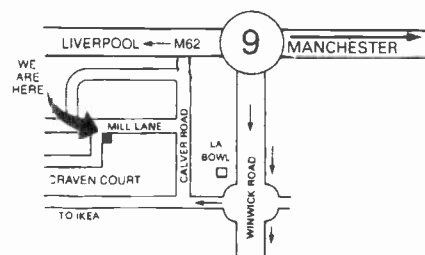
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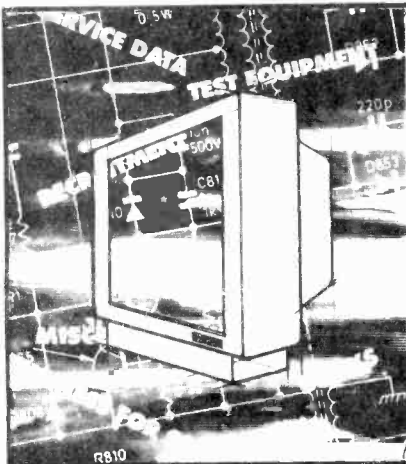
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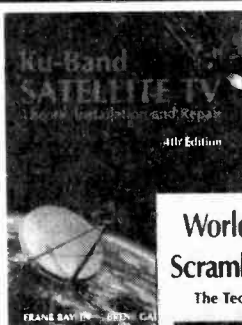
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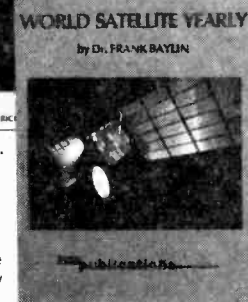
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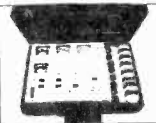
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TV06/93

MARCONI COMPACT L.N.B. 1.2DB £30 10.7 TO 11.7GHZ		60cm BACK MESH DISH £25, £5 post	VIDEO AMSTRAD HANDSETS (EXPORT) £3.50 WILL WORK IN HOME MARKET 6.000 and 4.600 PB500 Panic and Button Transmitter 180MHz £1.00 G11 CAP 250V, 470M £1.35	SEND FOR DATA D2 MAC SATELLITE RECEIVER, LNB AND DISH. £50 (£10 Post) TELEPHONE BATTERY SANYO 3.6V 250/MA - £3 VARTA 3.5V 280M/A - £3 PHILIPS STEREO HEADPHONE £4.00 PHILIPS C.D. MECH. 691-30212 £14.00
SATELLITE RECEIVERS - New Ferguson BSB Chassis with Tuner, Modulator etc Hand Set £10 £1.50 £4 Post	60cm SATELLITE DISH £35 Postage £5	Replaces 90% of Philips Handsets Philips Video R7V Handsets with LDC display AV5661 AV5659 £6	SATELLITE FINDER KIT AND LNB TESTER WITH METER BOX £25 BSB or D2-MAC 35cm DISH and LNB 11.7 to 12.7 £15	NOT WORKING SATELLITE NO HAND SET METAL CASE WITH METER, DOLBY CHANNEL C WITH POLARIZER SUPPLY £20 £5 post SEND FOR DATA AND PHOTO
SMALL SATELLITE TUNERS (950 to 1750 MHz), L.F. frequency 4000MH £9.00 each VHF UHF S. BAND TUNER £3.00 NEW PLASTIC CASE 32 C.H. SAT-RECEIVER (no hand set) £35 (Post £5) NEW METAL CASE SAT-RECEIVER, 32 C.H. WITH DOLBY B & CHANNEL C (no hand set) £35 (Post £5) DAM MAINS CHASSIS AMSTRAD MONITOR C £10 UNIVERSAL TRIPLER, NEW TYPE £4.00 VIDEO LEADS £8.00 AMSTRAD Line O.P. Transistors with Diode 2SD/453 £1.00 BU208A £1.00 VIDEO LAMPS: Long Lead £2.00 HITACHI & GEC FRAME, Thick Film £2.00 FIDELITY SPLIT DIODE FCC2215AE £20 FCC2015BE £10 FCC2215BE £10 K30 FRONT PANEL TEL-TEXT TYPE £5.00 NEW G11 LINE OF PANEL £8.00 PHILIPS YEARS AHEAD THE CREDIT CARD CALCULATOR Solar Powered £3.75 NEW PHILIPS SBC 1833 Solar & Battery Powered Calculator £8.00 THORN PANEL TX9 REC & REMOTE PANELS with Mains Trans £5.00 TX10 REC & REMOTE PANELS with Mains Trans £5.00 TX100 FRONT PANEL £5.00 TX10 TUBE BASE ON PANEL £3.00 TX9IF £2.00 THORN PANEL No.515-83, 548.02, 545.01, 509/102, 519/173, 508/161 £5.00 THORN TX STEREO SOUND O.P. PANEL (I.C. TA7227P) £1.00 THORN VIDEO AERIAL AMP 01 M4-597-401 £6.00 ULTRASONIC TRANSDUCER 15p IN LINE 12-35 VOLT SUPPRESSOR 4.00 MRD 20p	CAMCORDER SANYO NP22 6v 1300mah Rechargeable Battery Pack £6.00	SATELLITE UNIT Video Out/Audio Out, L and R Polariser ± 35M/A and Decoder Socket £10	Gas Soldering Irons New Type £10.00 Variety Nickel Cadmium Batteries (various Telephone Type to Sub-C.50p per cell quantity in pack 6, 12, 18) HITACHI UHF VHF SMALL TUNER ETS98 £5.00 ETS99 £5.00 (6D4-025-40) Mains output choke for TX9 L4 THORN M494B1 on Remote Panel £5 THORN IC TDA 3652 IS OBSOLETE REPLACEMENT TDA 3654 £2.00	
TX100 REMOTE PANEL No.56413IC M293B/and SAA5012 £10 etc	Philips Stereo Headphones No. SBC 3140 144MHz Changed Over Relay Aerial £4.00 50p	PHILIPS UNIVERSAL BATTERY TRANSFORMER SBC 1695 £5.00 BATTERY CONVERTER FOR THORN FERGUSON TX85 £8.00 O.M.T.C. K35 Basket £9.00 REGULATOR FOR SUP. 500M/A 1.5V-12V DC switched + & - £5.00 CAN-HIP module 2 UK £10.00 KT3-K30 IF £5.00 STR5481 £5.00	SALORA 19" RACK MOUNT SAT RECEIVER with Variable Tuning £30.00 Post £15.00 STEREO SOLAR RADIO VHF AND MW £10.00 100V AC 100V DC ETC. PHILIPS METER ANALOG £11 G11 470 MFD 250v £1.35	
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LARGE Foacs Pots. Fits Pye, GEC, ITT, Decca	PHILIPS NEW TYPE U/V HANDSET £10	TX100 FRONT PANEL £5 8 Button	DECODER C-CAM PHILIPS MADE FOR K40 CHASSIS IC No. TDA 3590 £5.00	
BSB SAT/REC HALF COMPLETED. CHASSIS, TUNER AND MOD £5 + Post £3	MIXED TOSHIBA HANDSETS FIVE FOR £12	EACH 10 off £1.00 MDA2062	56420A 20A/600V THYRISTOR £1.75	
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G11 LOPT Panel £4.00 G11 Tip Switch £20.00 G11 IF Panel £3.00 G11 Decoder Panel £2.00 G8 Push Button Unit £2.00 G8 Con/Pancl New Back Type £4.00	FERGUSON CHASSIS IKC-7000 £2 TX10 Chassis 8 PUSH BUTTON £1.4 TX86 Chassis AND REMOTE £1.5 TX90 White Spot 20" Post each, £5	TX90 White Spot 20" REMOTE £2.0	ITB BG2032-642A TRIPLER £5.00	
GEC, HITACHI DECODER PANEL TBA210AS, TBA12B, HA1215A, UPC1365 £10	SCART TO SCART LEADS TX90 REMOTE PANEL IC TMS1000 AND M293 £12	5 Mixed AMSTRAD VIDEO MOTORS £5.00	ITT/NOKIA RF IF MODULE £20	
SATELLITE TUNER UNIT 2427611 with Base Band, Video Out £15.00	TX10 8 way button unit £8.00 24v O.24v 3amp MAINS TRANSFORMER £5.00 10 MIXED FERGUSON CIRCUIT DIAGRAMS MSHIFCP99 £7.??	SALORA SAT RECEIVER CONVERSION KIT For models 24M60, 25M90, 28M90, SB1206E, SB1365 £15	COAX PLUG TO PHONO LEADS £1	
TX100 FRONT PANEL £5 8 Button	TX90 TO TX100 8 BUTTON UNIT £4.00	TX85 2435701 £10 2434393 £10 2435016 £10 2435014 £10 2435064 £15	SCART TO SCART LEAD £1	
2433752 £20 2432984 2432871 2432301 2435016 2433952 2434393 2432211 79048A DST8B243 TFB3069D K41-L.O.P.T K35-L.O.P.T K40 2433452 2432904	SPLIT-DIODE 2433752 £15 TX100 Green Spot £15.00 TX100 Yellow Spot £10.00 L.O.P.T £10.00 TX90 White Spot £15.00 L.O.P.T £15.00 Split Diode 11P £12.50 Onon 6S-3M GEC 85-9793-6 TX90 Thorn 2432101-2 £5 2434141 EACH 2434492 2435066 2434493 £10	DST 8IN243 36781 TFB4023AD £10.00 36881 MSHIFBWT27 £12.00 26921/2010 DST186N243 £10.00 37051 CTK Lopt 36212 36551 36072 36362 36482 TOSHIBA DST 186N243 £10 36761 TFB-4023AD £10 36832 CP90 Philips Split Diode £10.00 36833 36921/79 36922/79	TRANSFORMERS 2435701 £10 2435012 £10 FERGUSON 47003481 £10 AMSTRAD TVR3 LPTS £10 TFB3069D EQU £10 TFB4009AN	
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TAA7750 HA 411485 UPC1373 MS8657P M4911B1 MS0441/550 MS8658P	50p £1.00 50p £3.00 £1.00 £1.00	Monitor Astec UM1233 50p	Turntable Satellite Modulator Sound 5.5MHz MPM 1000T £1 Sound 6.0MHz MPM 1040 £1	AMSTRAD TVR2 £4 LINED/P TRANS £14
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6 Push button switch ITT GEC CVC45 ETC	£3.00	We have all parts for Philips Handsets	KT3/K30 T/Text £12.50 KT3/K30 Full remote £15.00 Pye & Philips handset KT3-K30 chassis. No RC5150-RC5176-RC5071-RC5177. Special Price RC4001 KT3 and Teletex £13.00 TX10 Hand Set Text £14.00 TX9 with Text £12.50 TX9 & TX10 button print £12.50 TX10 Focus Pots £5.50	HAND SETS FOR 6000 SERIES AMSTRAD FOREIGN ORIGIN £4 WITH LED
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12 C11. K30 Tex Rec Front Panel with I.C.	£5.00	S.W. Filters HW2011 50p S.W. Filters HW2013 50p SW185 £1.00 SW453 50p SW153A 50p SW150 £1.00 SW154 50p HW2013 50p SW173 50p RW303 50p F1035B 50p SY2153 50p F1045A 50p	THORN HAND SETS 9000 - 9600 - TX9 - TX10 - TX100 Text and Non-Text £10.00	AMSTRAD VIDEO FRONTS WITH FLAP LONG CHASSIS ALL MODELS MADE IN 1991 TO 1992 AND DECCA PRO LINE £4
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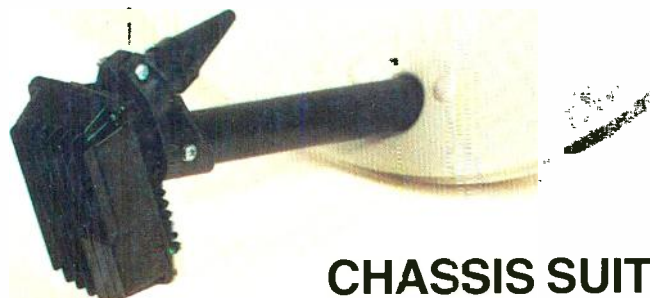
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bridge	20p			MA1250BJC	£1.00	IBA2020	£1.00
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				SA0121	£3.00	IBA2020	£1.00
				SA0122	£3.00	IBA2020	£1.00
				SA0123	£3.00	IBA2020	£1.00
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				SA0125	£3.00	IBA2020	£1.00
				SA0126	£3.00	IBA2020	£1.00
				SA0127	£3.00	IBA2020	£1.00
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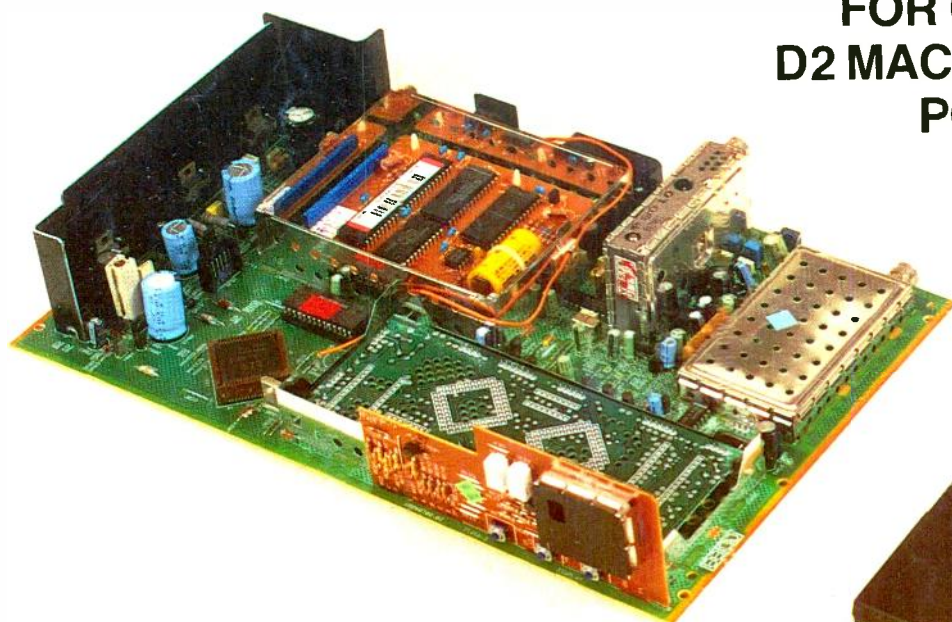
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