

SOUTHLAND NEWS
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TELEVISION

SERVICING·VIDEO·SATELLITE·DEVELOPMENTS

Servicing the Philips 10CX1120/Pye 25KX1201

A REED BUSINESS PUBLICATION

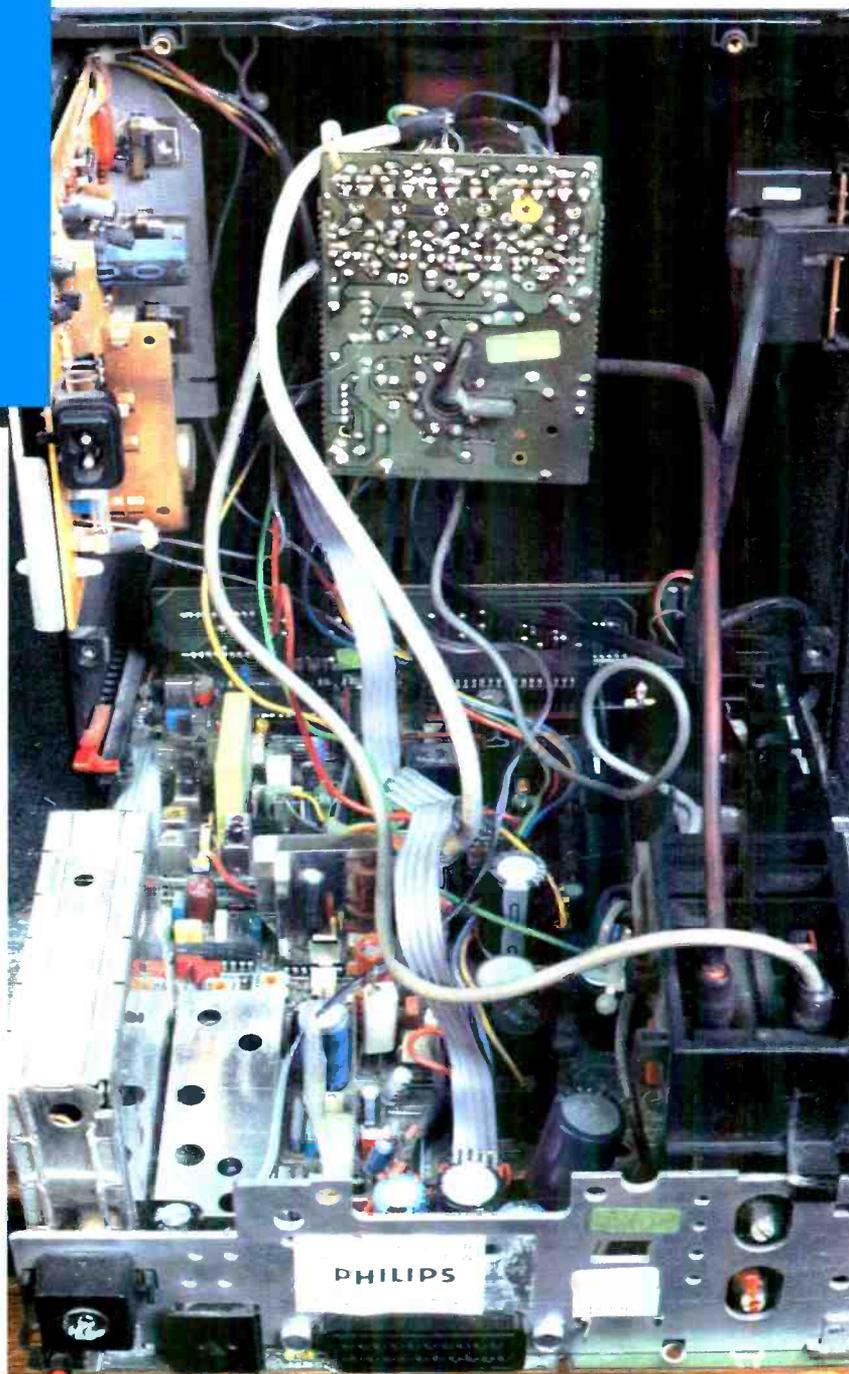
**Buying second-hand
TV and VCR stock**

Camcorder Faults

**Servicing Audio
Power Amplifiers**

**Review: Wordperfect
6.0 for Windows**

Uniden 8008 LNB Mod



CONFESSIONS OF A TLO



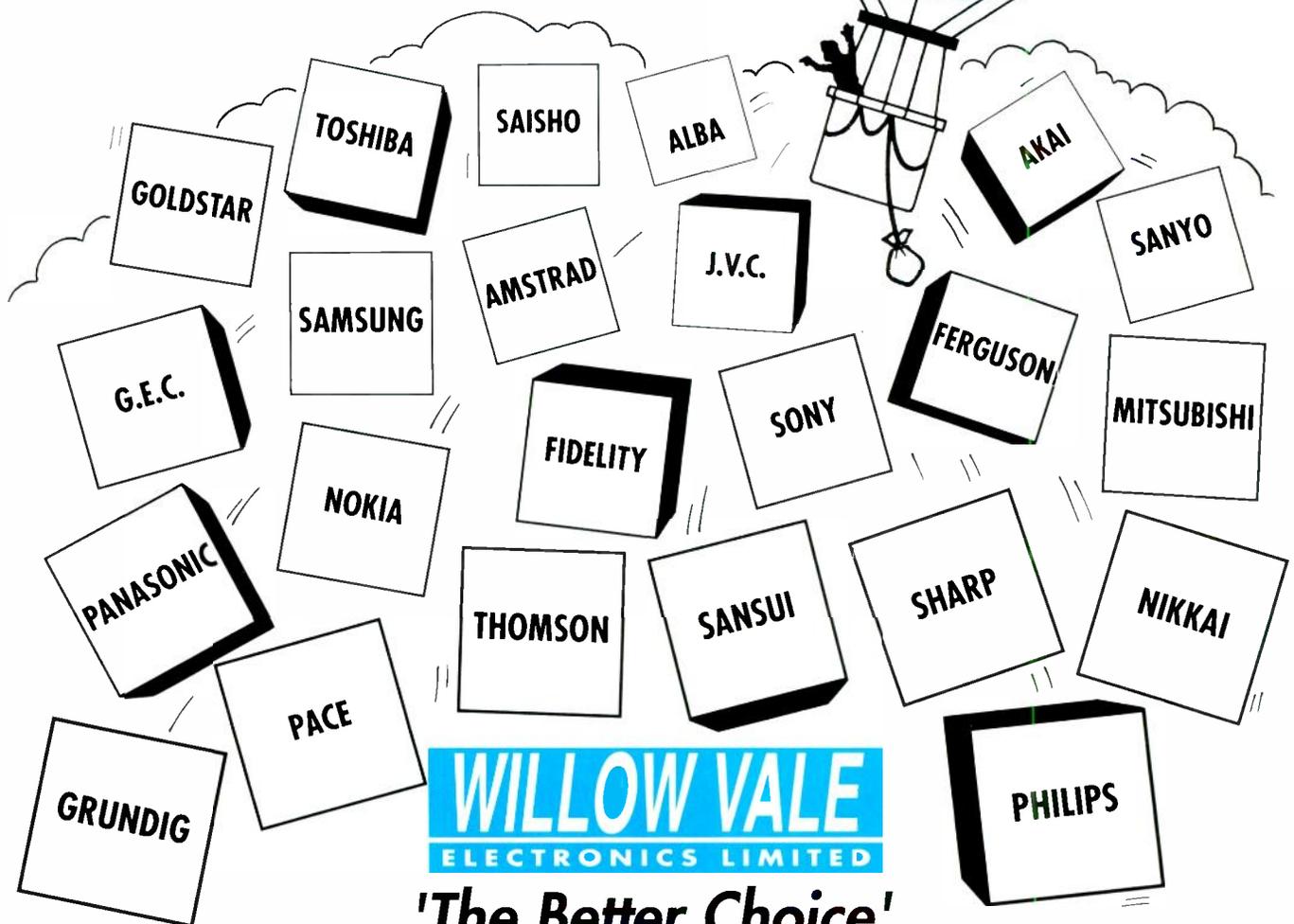
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TELEVISION

JANUARY 1995

On Sale

December 21st

Vol. 45, No. 3

Issue 531

166 Servicing the Philips 10CX1120

Richard Newman

This set also appeared as the Pye 25KX1201. It was a popular small-screen (10in.) colour portable that can be operated from a 12V battery. Performance and reliability are good apart from one or two known problems. How to deal with these plus an outline of the circuitry employed.

178 Servicing Audio Power Amplifiers

Joe Cieszynski

Although audio power amplifier circuitry is reasonably straightforward, the extensive use of d.c. coupling means that servicing and fault finding present many problems. Discrete bipolar, i.c. and f.e.t. power amplifier circuits are covered, with recommended servicing procedures.

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2SB596	50p	2SC1162	60p	2SC1834	50p	2SC2335	75p	2SC2826	200p	2SC3352	200p	2SC4237	650p	2SD882A	100p	2SD1384	50p	2SD1959	280p
2SB600	500p	2SC1165	75p	2SC1845	15p	2SC2344	150p	2SC2832	300p	2SC3355	50p	2SC4301	550p	2SD894	35p	2SD1390	350p	2SD1961	50p
2SB646	40p	2SC1166	100p	2SC1846	35p	2SC2347	60p	2SC2834	400p	2SC3356	120p	2SC4301	550p	2SD895	200p	2SD1391	250p	2SD1978	50p
2SB647	20p	2SC1170	180p	2SC1847	45p	2SC2353	120p	2SC2837	250p	2SC3358	50p	2SC4769	300p	2SD896	200p	2SD1392	150p	2SD1984	450p
2SB648	25p	2SC1172	150p	2SC1855	85p	2SC2360	120p	2SC2839	40p	2SC3361	50p	2SD198	140p	2SD900	400p	2SD1395	150p	2SD2012	25p
2SB649	35p	2SC1173	210p	2SC1856	700p	2SC2361	150p	2SC2853	70p	2SC3376	300p	2SD199	195p	2SD905	450p	2SD1396	120p	2SD2012	25p
2SB688	90p	2SC1195	40p	2SC1865	700p	2SC2362	50p	2SC2877	120p	2SC3377	50p	2SD200	180p	2SD916	130p	2SD1397	120p	2SD2012	25p
2SB703	90p	2SC1212	35p	2SC1870	700p	2SC2365	280p	2SC2878	20p	2SC3378	120p	2SD201	260p	2SD917	300p	2SD1398	120p	2SD2012	25p
2SB705	200p	2SC1213	15p	2SC1875	220p	2SC2369	100p	2SC2879	3200p	2SC3383	80p	2SD205	195p	2SD921	320p	2SD1400	280p	2SD2012	25p
2SB707	200p	2SC1214	15p	2SC1881	70p	2SC2371	25p	2SC2883	60p	2SC3387	550p	2SD213	25p	2SD924	120p	2SD1402	150p	2SD2012	25p
2SB716	20p	2SC1215	25p	2SC1890	15p	2SC2373	210p	2SC2889	200p	2SC3393	80p	2SD215	75p	2SD947	100p	2SD1405	60p	2SD2012	25p
2SB718	60p	2SC1216	200p	2SC1904	125p	2SC2383	50p	2SC2899	50p	2SC3399	50p	2SD235	35p	2SD950	300p	2SD1407	60p	2SD2012	25p
2SB727	200p	2SC1222	15p	2SC1906	15p	2SC2389	45p	2SC2909	60p	2SC3400	35p	2SD230	65p	2SD951	290p	2SD1408	125p	2SD2012	25p
2SB754	80p	2SC1226	75p	2SC1907	20p	2SC2407	110p	2SC2911	80p	2SC3401	50p	2SD348	300p	2SD957A	520p	2SD1409	170p	2SD2012	25p
2SB755	310p	2SC1252	850p	2SC1913	90p	2SC2408	120p	2SC2912	120p	2SC3402	40p	2SD357	40p	2SD958	60p	2SD1412	75p	2SD2012	25p
2SB772	25p	2SC1279	30p	2SC1921	15p	2SC2412K	50p	2SC2921	650p	2SC3409	40p	2SD358	40p	2SD958	60p	2SD1413	60p	2SD2012	25p
2SB775	100p	2SC1306	90p	2SC1923	10p	2SC2440	200p	2SC2922	480p	2SC3412	800p	2SD371	240p	2SD958	60p	2SD1415	190p	2SD2012	25p
2SB791	280p	2SC1308K	350p	2SC1929	180p	2SC2458	10p	2SC2928	550p	2SC3416	30p	2SD380	650p	2SD965	35p	2SD1417	125p	2SD2012	25p
2SB795	60p	2SC1312	15p	2SC1941	27p	2SC2459	50p	2SC2929	280p	2SC3417	90p	2SD381	150p	2SD965	35p	2SD1425	260p	2SD2012	25p
2SB825	115p	2SC1318	10p	2SC1942	350p	2SC2470	65p	2SC2934	75p	2SC3419	120p	2SD388	150p	2SD965	35p	2SD1426	260p	2SD2012	25p
2SB861	180p	2SC1325	400p	2SC1944	350p	2SC2481	120p	2SC2937	250p	2SC3420	80p	2SD389	60p	2SD965	35p	2SD1427	180p	2SD2012	25p
2SB866	90p	2SC1327	20p	2SC1945	350p	2SC2482	20p	2SC2938	235p	2SC3422	75p	2SD400	14p	2SD965	35p	2SD1428	220p	2SD2012	25p
2SB890	180p	2SC1328	15p	2SC1946	1500p	2SC2483	120p	2SC2939	400p	2SC3423	60p	2SD401	50p	2SD965	35p	2SD1429	410p	2SD2012	25p
2SB951	190p	2SC1342	15p	2SC1947	450p	2SC2484	185p	2SC2944	300p	2SC3446	150p	2SD402	120p	2SD965	35p	2SD1430	280p	2SD2012	25p
2SB1009	110p	2SC1345	15p	2SC1957	70p	2SC2491	200p	2SC2958	50p	2SC3447	200p	2SD415	55p	2SD965	35p	2SD1431	400p	2SD2012	25p
2SB1077	180p	2SC1346	100p	2SC1959	10p	2SC2495	1900p	2SC2962	800p	2SC3456	200p	2SD424	350p	2SD965	35p	2SD1432	400p	2SD2012	25p
2SB1109	100p	2SC1358	170p	2SC1967	1300p	2SC2498	50p	2SC2979	160p	2SC3457	125p	2SD426	150p	2SD965	35p	2SD1433	750p	2SD2012	25p
2SC1182	75p	2SC1359	250p	2SC1969	160p	2SC2500	25p	2SC2987	250p	2SC3459	180p	2SD427	350p	2SD965	35p	2SD1438	140p	2SD2012	25p
2SC372	25p	2SC1360	70p	2SC1970	100p	2SC2502	200p	2SC2988	150p	2SC3460	180p	2SD438	35p	2SD965	35p	2SD1443	165p	2SD2012	25p
2SC380	10p	2SC1364	25p	2SC1971	400p	2SC2519	60p	2SC2995	60p	2SC3461	350p	2SD467	180p	2SD965	35p	2SD1445	280p	2SD2012	25p
2SC382	50p	2SC1383	25p	2SC1972	600p	2SC2527	300p	2SC2999	50p	2SC3466	225p	2SD468	15p	2SD965	35p	2SD1450	60p	2SD2012	25p
2SC388A	60p	2SC1384	20p	2SC1973	150p	2SC2534	150p	2SC3001	1400p	2SC3468	70p	2SD471	20p	2SD965	35p	2SD1451	260p	2SD2012	25p
2SC394	60p	2SC1393	20p	2SC1983	75p	2SC2535	300p	2SC3012	300p	2SC3481	300p	2SD525	50p	2SD965	35p	2SD1452	350p	2SD2012	25p
2SC403	25p	2SC1394	15p	2SC1984	150p	2SC2538	100p	2SC3019	320p	2SC3482	275p	2SD526	70p	2SD965	35p	2SD1453	140p	2SD2012	25p
2SC454	15p	2SC1398	55p	2SC1985	100p	2SC2540	190p	2SC3025	500p	2SC3486	275p	2SD545	18p	2SD965	35p	2SD1454	250p	2SD2012	25p
2SC458	10p	2SC1400	50p	2SC1986	100p	2SC2542	300p	2SC3026	550p	2SC3488	275p	2SD545	18p	2SD965	35p	2SD1455	160p	2SD2012	25p
2SC460	10p	2SC1403	500p	2SC2001	15p	2SC2545	55p	2SC3030	300p	2SC3503	100p	2SD549	120p	2SD965	35p	2SD1456	250p	2SD2012	25p
2SC461	15p	2SC1407	550p	2SC2002	15p	2SC2546	25p	2SC3037	125p	2SC3504	120p	2SD551	300p	2SD965	35p	2SD1457	165p	2SD2012	25p
2SC495	45p	2SC1413	150p	2SC2003	20p	2SC2547	65p	2SC3038	125p	2SC3505	240p	2SD555	500p	2SD965	35p	2SD1459	120p	2SD2012	25p
2SC496	25p	2SC1419	50p	2SC2004	20p	2SC2550	50p	2SC3039	80p	2SC3506	250p	2SD557	20p	2SD965	35p	2SD1468	60p	2SD2012	25p
2SC497	85p	2SC1429	50p	2SC2021	10p	2SC2551	70p	2SC3040	260p	2SC3507	650p	2SD575	530p	2SD965	35p	2SD1479	200p	2SD2012	25p
2SC515	100p	2SC1444	275p	2SC2022	110p	2SC2552	60p	2SC3042	300p	2SC3509	750p	2SD575	530p	2SD965	35p	2SD1487	225p	2SD2012	25p
2SC535	30p	2SC1446	55p	2SC2023	180p	2SC2553	200p	2SC305											

VCR BELT KITS / REPLACEMENT VIDEO LAMPS

Model	Price	Model	Price	Model	Price	Model	Price
HRD520, 600, 620, 637, 641, 650, 830 HRD540, 550, 580, 660, 860, 960, HRSS500	95p 130p	VR6010, VR9010 VR6020, VR6022, VR6023, VR6028, VR7730 VR6024 VR6520, VR6540, VR6560 VR6710, VR6720, VR6735, VR8720 VR6720, VR6730, VR6760, VR6775, VR6780	70p 75p 75p 90p 130p 160p	Models & Description UNIVERSAL VIDEO LAMP 9V 80mV (310mm WIRES)	Order Code VL01	Price 25p	ON/OFF MAIN SWITCHES GRUNDIG PART NO: 29703, 29102 USED ON: C7500, C7500TT, C8500, C8502, C8712, C8714, C8894, M68-190, M68-190/99, M70-195, P40-345, ST66-1602, T55-340, V7722 PRICE: £3.00 ITT PART NO: 13/1074 USED ON: CP0200, 0211F, 0323, 0323/1, 0341/14, 0345F, 0351/1, 0361, 0861/1, 9350, CT0500, 0500/1/T, 0500T PRICE: £3.25 PART NO: LFC 005 USED ON: CVC40 PRICE: £3.00 MATSUI/SAISHO USED ON: MATSUI-2190, SAISHO-PST2130TX PRICE: £3.50 PHILIPS USED ON: K30, K35, K40, KT3, KT4 PRICE: £1.00 SONY PART NO: (POWER SWITCH + REMOTE SWITCH) USED ON: KV1612 MK1, KV1612 MK2, KV1614, KV2052, KV2056, KV2062, KV2068, KV2212, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV2752PE3, KX20PS1, KX20PS2, KX27PS1 PRICE: £3.50 PART NO: (POWER SWITCH + REMOTE SWITCH) USED ON: KV2022, KV2024 PRICE: £3.25 PART NO: (POWER SWITCH) USED ON: KV1810 MK1, KV1810 MK2, KV1820, KV1822, KV2000 MK1 PRICE: £8.00 PART NO: (POWER SWITCH 26mm) USED ON: KV1400, KV1440, KV2040, KV2060 PRICE: £2.00 PART NO: (POWER SWITCH 21mm + REMOTE SWITCH) USED ON: KV2020 PRICE: £2.50 PART NO: 2 PIN (FUNCTION SWITCH) USED ON: KV1612 MK1, KV1612 MK2, KV2052, KV2056, KV2212, KV2215, KV2216, KV2252, KV2256, KV2704, KV2705, KV2706, KV275PE3, KV2756PE3 PRICE: £0.45 PART NO: (4 PIN FUNCTION SWITCH) USED ON: VARIOUS PRICE: £0.50 REPLACEMENT IDLER TYRES AKA M132773 IT01 M2366960J2 IT02 GOLDSTAR VXP0521 IT17 HITACHI 6861471 IT03 6861482 IT04 6886971 IT05 JVC/PU 48967B IT06 FERGUSON PU 51380 IT07 PU 51402A IT08 PU 55373 IT09 PU 55374 IT10 NATIONAL VXP 0329 IT11 PANASONIC VXP 0343 IT12 VXP 0344 IT13 VXP 0401 IT14 VXP 0433 IT15 VXP 0463 IT16 VXP 0521 IT17 VXP 0581 IT18 SANYO 1430662T15620 IT19 SHARP NIDL005GEZZ IT20 NIDL0006GEZZ IT21 NPLY0107GEZZ IT22 PRICE 22p EACH 18p EACH FOR A PACK OF 5 FOR EACH MODEL 15p EACH FOR A PACK OF 10 FOR EACH MODEL GRANDATA LTD Tel: 081-900 2329 Fax: 081-903 6126
KENWOOD KV901 KV903	70p 90p	SAISHO VR2000, VHL3 VR3800	90p 75p	PANASONIC VIDEO LAMPS	VL02	35p	
LOEWE OC11, OC40 OC410, OC420, OC440, OC460 OC50, OC55, OC60, OC65, OC70, OC75	95p 130p 120p	SALORA SV6500 SV6600 SV8000 SV8100 SV8500, SV8520, SV9500 SV7407, SV8400, SV8420, SV8550 SV6700, SV8710, SV8750, SV9700 SV6800, 6900, 8810, 8820, 8870, 8910, 8920, 8970 SV8600, 8620, 8700, 8720, 8830, 9600, 9810	100p 150p 120p 60p 150p 120p 120p 95p 130p	SHARP VIDEO LAMPS	VL02	35p	
LOGIK VR955	180p	SAMSUNG SV716, 717, V1616, V1621, V1626, VX616, SV7407, VX619, VX626, VX627, VX629 BV520, 510, 610, 616, 617, 619, 620, 626, 627, 629, V1510, 520, 611, 616, 621, 626, VX510, 520 VB300, VB910, V1900, V1910 PK380, 981, 982, SE9001, SV9001, SV2407, 322, VB770, 8220, 8225, V1770, 730, 8220, 8225, VK8220, VPK31, VX750, VX790, 8220, 8225 SVX301, 303, 305, SX7301, VB710, 971, V1730, 710, VX712, VX720, 730, 970, 971, 972 VX9880	100 110 130p 130p 230p 110p	HITACHI 5381682 (VT63, VT64) VIDEO LAMPS	VL04	135p	
LUXOR 9245, 9251 9252 9253 9254 9255 9256 9270, 9271, 9273, 9274 9272, 9280 9281, 9284, 9285, 9292, VR3701, 3721, 3731, 3761, 3781	130p 140p 140p 100p 130p 130p 115p 140p 95p	SIEMENS VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50 VTC5300, VTC5350, VTC5400, VPR5800 VTC5500 VTC6100, VTC9300 VTC1100, F1300, 1500, 1100, 1150, 1200, 1300, 1500 VHR2100, VHR2300, VHR2500, VHR2700 VHR3100, 3300, 3310, 3400, 3700, 3800, VHR5000, 700 VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHR4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700	100p 100p 220p 90p 150p 110p 100p 100p 150p 80p 70 150p 115p	AKAI, AKAI, ALBA, AMSTRAD, BLAUPUNKT, FERGUSON, FIDELITY, FISHER, FUJITSU, FUNAI, G.E.C., GOLDSTAR, GRANADA, GRUNDIG, HINARI, HITACHI, ITT, JVC (HRD SERIES), MATSUI, MITSUBISHI, NEC, ORION, NATIONAL, PHILIPS, SAISHO, SALORA, SAMSUNG, SANYO, SHARP, SIEMENS, SONY, TELEFUNKEN, THOMSON, TOSHIBA	VL05	150p	
MATSUI VX850	75p	SANYO VTC5000, 5150, 6000, 6500, VTCM10, 11, 20, 21, 30, 31, 50 VTC5300, VTC5350, VTC5400, VPR5800 VTC5500 VTC6100, VTC9300 VTC1100, F1300, 1500, 1100, 1150, 1200, 1300, 1500 VHR2100, VHR2300, VHR2500, VHR2700 VHR3100, 3300, 3310, 3400, 3700, 3800, VHR5000, 700 VHR4100, 4150, 4200, 4300, 4350, 4770, 5100, 5200, 5300, 5350, 5700, 7100, 7200, 7500, 7530, 7540, 7800, 7810, 8100, 8200, 8250, 8500, VHR4400, 4410, 4500, 4600, 4610, 4710, 4890, 6700	100 110 130p 130p 220p 90p 150p 110p 100p 100p 150p 80p 70 150p 115p	AKAI, GRANADA (VHSTJ2), HITACHI (VT3000), ITT (VR3912), VRP3833), JVC (HR2200, 3300, 3330, 3660), MITSUBISHI (HS200), TELEFUNKEN (VR510, 519, 610), THOMSON (VK300, 305, 306, 3301), FERGUSON (3V00, 16, 22, 24, 3292, 8900, 8901, 8902, 8903, 8909, 8912, 8922, 8925)	VL01	25p	
MITSUBISHI HS200 HS300, 301, 302, 307, 310, 337, 338, 347, 349, 411, 412, 421, HSB10, 20, 30, HSE10, 20, 30, 70 HS303, HS304, HS306, HS307, HS330, HS400, HS700 HS318, HS319, HS410	200p 347p 150p 150p 150p 130p	SHARP VC200, 384, 385, 386, 388, 390, 9300, 9500, 9700 VC300, VC7700, VC7750, VC7800, VC8000 VC8300 VC900, 387, 471, 473, 481, 482, 483, 486, 488, 496, 8481 VC402, 500, 571, 573, 581, 582, 583, 584, 585, VC85F1 VC600, 651, 682, 584, 685, 693, 783, VC6F3, VC6V3 VC772, 779, 781, 782, 785, 786, 793, 800, 7810, 7822, VCA100, VCA102, 104, 131, 140, 170, 202, 203, 234, 501, 602, 5011, VCDB06, 810, 815, VCH80, 865, 910, VCS1000, VCT310, 410, VCT1314, VCT5312	100p 150p 150p 80p 70 150p 115p	BLAUPUNKT, ORION (VH1, 2A), NATIONAL (NV200, 2010, 3000, 7000, 8150, 8200, 8400, 8600, 8610, 8620), SHARP (VC2300, 6000, 6200, 6300, 7300, 7700, 8000, 8300)	VL02	40p	
N.E.C. NB30, NB31, NB32, NB33 NB95 PVC2300, PVC2400 DX1000, 1600, 2000, 3000, N9012, 9013, 9014, 9016, 9033, 9034, 9053, 9054, 9055, 9065, 9110, 9120, 9510, 9520, 9530, 9610	100p 80p 180p 130p 150p 150p 125p	SIEMENS FM350, FM352, FM355 FM484, FM485 FM391, FM392, FM394, FM462 FM461, FM464, FM468, FM561 FM361, FM362, FM363, FM364	60p 55p 100p 150p 120p	AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL06	40p	
NATIONAL PANASONIC NV300, NV332, NV333, NV340, NV366 NV777, NV788 NV2000, NV2010, NV3000 NV7000, NV7200, NV7600 NV8600, NV8610, NV8620 NV230, 250, 280, 430, 431, 433, 450, 460, 465, 470, 730, 770, 810, 870, 890, AG1000, 1050 NV370, NV380, NV480, NV630, NV780, NV830, NV850 NV600, NV688, AG6010, AG6015 NV67, 10, 12, 14, 15, 18, 30, 130, 400, NVH70	125p 100p 130p 145p 150p 125p 100p 110p 70p	SONY SLC6, SLJ10, SLT6ME SLC5, SLC7, SLJ7, SLJ9 SLC9, SLR8000, SLR8080, SLT50 SLR8000E, SLR8080E, SLR8200, SLR8600 SLV255	140p 140p 165p 175p 95p	AKAI (VS10), GRANADA (VHSXJ3), ITT (VR3993, 3994), JVC (HR2650, 7600, 7610, 7650, 7655), TELEFUNKEN (VR530, 535, 539, 550, 630, 650), THOMSON (V309, 316, 357, VK309, 411, TX8000), FERGUSON (3V31, 8941, 8942)	VL07	40p	
NOROMENDE V100, V140 V1000M, 1005M, 1205, 1215, 1235, 1245, 1305, 1403, 1405, V1500P, 1503, 1505K, 1805K, 20000, 2405, 2500H, 3000H, V3405H, 3105, 4405H, 5000, 8005, 900, 905 V1001, 1005, 1015, 1025, 1035, 1041, 1055, 1065, 1105, 3005, 304, 5005, 502, 503 V101, V102, V103, V112, V141, V142, V301, V302 V110, V333 V1500T, V2000B, V2000P, V400H V250, V460, V9460, V20035642, V20035643 V300, V303, V380 V500	70p 130p 65p 80p 90p 95p 130p 75p	TELEFUNKEN VR400, VR410, VR440, VR449 VR450, VR540, VR549, VR640 VR520, VR529, VR620, VR920 VR530, VR535, VR539, VR550, VR630, VR650 VR640, VR1925, 1930, 1940, 1950, 2960, 325, 330, 940, 950 A920, VR1970, 1980, 2920, 2925, 2930, 2970, 7921, 7926, 7931, 7970, 7971, 7980, 970, 7981, 975, 980 A1200, 930, 932, 935, 960, 980, 990, VR2931, 2935, 2941, 2971, 3935, 3945, 3950, 3965, 3975, 4935, 4940, 4942, 4945, 496, 5VR4970, 6000, 7932, 7959, 7979 VR1935 VR2915	100p 140p 140p 165p 175p 95p 75p 90p 100p 65p	Authentic (N850), DECCA (VR8300), GRANADA (VHSTJ3, WJ1, WJ3), ITT (VR3913, 3914, 3963), JVC (HT7200, 7300, 7350, 7700), TELEFUNKEN (VR450, 520, 529, 540, 549, 620, 640, 920, 1920), THOMSON (V4100, VK308, 309, 312, 410), FERGUSON (3V23, 29, 30, 8923, 8924, 8929, 8930, 8931, 8940)	VL08	60p	
ORION COMB15000, 16000, NEVHM, TYP230RC, 900MVH1012, VH1030, 1040, 1060, 1070, 1100, 1120, 1440, 1500, 1660, 1800, 2150, 2308, 2400, 2500, 2600, 2700, 2960, 300, 358, 360, 362, 4010, 4015, 4016, 4020, 4300, 5010, 5015, 530, 535, 536, 630, 635, 640, 730, 735, VP220, 225, 245, VR1032, 2966, 2980, 821, 925, VXL25 NEVHL, VCP, VH1204, 2004, 2204, 3050, 3080, 4008, 400, 4012, 412, 512, 600, 666, 744, 774, 7905, 800, 820, 900, 974, VP200, VR2949, 2956, 2957, VXL120 VC150, 180, VH1000, 200, 201, 205, 212, 250, 254, 288, 300, 303, 3030, 312, 33, 3312, 404, 555, 700, 704, 708, 712, 770, 780, 844, 900, VHF2, VH3 VH1, VHA2	30p 30p 90p 80p 150p	THOMSON SV1000, V410, 430, 450, 510, 520, 530, 540, 620, 630, 640, 4240, SV5540 TX600, V309, V357, VK411 TX8500, V342, 343, 351, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, 5500, 6000, 8564 V320, V321, V323, V326, V4200, V4300 V333 V340 V4100, VK308, VK309, VK410 VK300, VK301, VK302, VK303, VK305, VK3301 VK312	65p 75p 90p 90p 100p 120p 135p 65p	GRANADA (VHSA33), SHARP (VC200, 381, 384, 385, 386, 388, 390, 393, 9300, 9500, 9700)	VL08	60p	
PHILIPS VR6460, VR6920 VR6540 DV186, 286, 291, 292, 468, 471, 562, 571, 761, VR201, 202, VR20DV1, 20DV2, 20RW7, 25B01, 25B02, 302, 303, 305, VR300V2, 35B02, 35B03, 635B7, 715B4, 715B5, 715B8, VR865B2, 915B2, 925B3, VR6180, 6185, 6285, 6290, 6291, 6293, 6367, 6390, 6391, 6393, 6467, 6468, 6470, 6561, 6570, 6581, 6670, 6676, 6760, VR685B4, 865B1, 925B3 VR5442, VR6542 VR2025, VR2580 VR445B9, BR445B920, VR445B922, BR6843 VR6548, VR6648, VR495B620, VR44869S	170p 100 100p 90p 85p 70p 100p 100p 110p	TOSHIBA V55, V57 V33, V31, V51, V53, V9600, V9680 V61, V63, V65, V66, V67 DV80B, DV80D, V71, 73, 74, 75, 81, 83, 85, 86 V108, V109, V199, V209, V609 V91G, V95G	85p 85p 150p 120p 120p 115p	PANASONIC MODE SWITCHES NV2000, 2010, 7000, 7200, 7800 (VSS0048) £2.25 NV2300, 260, 430, 810, 870, 2300, 4300 (VSS0110) £2.25 NV830 (VSS0091) £2.10 NV300, 333, 340, 366, 688, 777, 778 (VSS0060) £3.75 NVG21, 25, NVH65, NVD80 (VSS0175A) £2.00			
SABA VR6420, 6435, 6440, 6460, 6480, 6620, 6770, 7200, 8420, 2A10, 70, 2B20, 3B20, 4A10, 4B20, 6A10, 6A70, 6B20, 8B20 VR6004, 6005, 6011, 6014, 7004, 7011, 7014, 8011, 8014, BERLIN VR2000, VR6000, VR6012, VR7000, VR7720, PVR6068 VR5005, VHR7000 VR6006, 6007, 6008, 6009, 6015, 9016, 9018, 6038, 7006, 7007, 7016, 7018, 9006	65p 90p 130p 135p 85p						

VIDEO SERVICE KITS

AMSTRAD

VCR700

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

HR55000

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

HRD110/111/120/225

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

£5.80

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

£11.00

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

£5.10

3V44/45/48/53/54/55/57

HRP50/HRD140/150/158/160

HRD250/257/565/568/755

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

VIDEO SERVICE KITS (Cont.)

VT11/VT33

Contents

BELT SET, T/U REEL TABLE
TYRE, SUPPLY REEL TABLE
TYRE, PINCH ROLLER, FF/REW
IDLER, CLUTCH PLATE,
TENSION BAND

Order Code: SK45

£14.00

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

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

VT400/405/410/13/14/15/18/420/25/26/28/430/31/35/48/450/498/
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/VTL30

Contents

BELT SET, PINCH ROLLER, FF/REW ARM, CLUTCH PLATE,
TENSION BAND

Order Code: SK51

£14.00

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

£8.00

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

£8.50

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

£7.50

Economy Kit Contents

BELT SET, PINCH ROLLER,
IDLER TYRE, PLAY IDLER
TYRE

Order Code: SK16

£4.00

NVG7/NVG9/NVG10/NVG11/NVG12/NVG14/NVG15/NVG16/
NVG18/NVG30/NVG120/NVG130/NVG400/NVH65 (PX/AC)/
AG1810 (PK)

Contents

LOADING BELT, CAPSTAN
BELT, PINCH ROLLER, IDLER
TENSION BAND

Order Code: SK27

£8.00

Economy Kit Contents

LOADING BELT, CAPSTAN
BELT, PINCH ROLLER, IDLER
TYRE

Order Code: SK28

£4.00

NV332

Contents

BELT SET, PINCH ROLLER,
PLAY IDLER, FF/REW IDLER,
TENSION BAND, FF/REW TYRE

Order Code: SK29

£12.00

Economy Kit Contents

BELT SET, PINCH ROLLER,
PLAY IDLER TYRE, FF/REW
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

£6.00

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

£12.00

Economy Kit Contents

BELT SET, PINCH ROLLER,
PLAY IDLER TYRE, FF/REW
IDLER TYRE

Order Code: SK26

£6.00

NV730/NV770

Contents

SLOT IN BELT, LOADING BELT,
PINCH ROLLER, IDLER UNIT,
TENSION BAND

Order Code: SK19

£8.50

Economy Kit Contents

SLOT IN BELT, LOADING BELT,
PINCH ROLLER, IDLER TYRE

Order Code: SK20

£4.00

NV370/NV380/480/630/780/830/850/AG2100PK/AG2200PK

Contents

BELT SET, PINCH ROLLER,
IDLER, TENSION BAND

Order Code: SK21

£6.00

Economy Kit Contents

BELT SET, PINCH ROLLER,
IDLER TYRE

Order Code: SK22

£3.00

NV777/NV788

Contents

BELT SET, PINCH ROLLER,
IDLER UNIT, TENSION BAND

Order Code: SK17

£7.00

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

£4.75

VC500/VC571/VC581/VC582/VC5

IDLERS & PULLEYS REPLACEMENT					
AKAI					
VS1-2, VS4-5, VS15	FF-REW IDLER	M1327773	400p		
VS3, 6, 12, 56, 58, 59	T-UP IDLER	BV327815	500p		
VS1-2, VS4-5, VS15	T-UP IDLER	BV327815	500p		
VS5, 6, 12, 59, 58	IDLER	BV321979	600p		
V9700	IDLER ASSY	MZ366960J2	900p		
VS125, 126, 155	REEL DRIVE PULLEY				
VS166, 240, 244, 245, 247, 248, 250, 512, 515, 516	T-UP IDLER	PU47752	E4.50		
VZ22, 38, 105, 112, 115, 116, 205, 220	T-UP IDLER	PU46381	E4.00		
VP7100, VS9300	UNLOADING IDLER	PU46381	500p		
VS9500, VS9800	REW IDLER	PU46381	500p		
VP7100, VS9300	REEL TABLE	BR347731	450p		
VS9500, VS9800	REEL TABLE	BR347731	450p		
VS1, 3, 4, 9, 12	CLUTCH	ML373043	1100p		
VS15, 58	FF IDLER	BV321761	E3.20		
VS23, 35, 37, 53, 55	CLUTCH	ML373043	1100p		
VS66, 75, VSA77	FF IDLER	BV321761	E3.20		
VS9700	REW IDLER	W321762	E4.25		
VS9700	REW IDLER	W321762	E4.25		
AMSTRAD					
VCR7000	IDLER	150280	E1.50		
TVR1, VCR4500	CLUTCH	150873	E3.75		
VCR4600, VCS200, VCR9000	GEAR HOLDER	161284	E3.50		
VCR4600, VCR5200, VCR9000	REF CLUTCH		E3.50		
TVR1, VCR4600	REF CLUTCH		E3.50		
VCR5200	CLUTCH	153202	E3.80		
VCR6000, VCR6100	CLUTCH		E4.00		
VCR4500, VCR9000	CLUTCH		E4.00		
VCR4500, VCR4600	MOD KIT	(TAPE CREASING)	300p		
VCR4700	CLUTCH		E3.00		
MOD KIT TAPE CREASING FOR AMSTRAD					
VCR4500, 4600, 4700					
FERGUSON					
3V00, 3V01, 3V16	T-UP IDLER	PU47752	E4.50		
3V22, 3292, 8900, 8901, 8904, 8906	T-UP IDLER	PU48280	E5.50		
3V16, 3V22	T-UP IDLER	PU48280	E5.50		
8903, 8909, 8912, 8922	REEL IDLER	PU48967	175p		
3V23, 3V29, 3V30	ROLLER ASSY	PU493042A	350p		
3V31, 3V32, 3V35, 8923, 8924, 8929, 8930, 8931, 8940, 8941, 8942	T-UP IDLER	51402	100p		
3V23, 3V31	T-UP IDLER	51402	100p		
3V29, 3V30, 3V31	T-UP CLUTCH	PU51380	200p		
3V32, 3V35, 3V36, 3V38, 3V39, 3V43, 8930, 8931, 8940, 8941, 8942	REEL IDLER	PU55374	200p		
3V35, 3V36, 3V38	T-UP CLUTCH	PU55373	150p		
3V29, 3V49, 8943, 8944	IDLER ARM	PU56646	E2.25		
3V35, 3V36, 3V38	IDLER ARM	PU56646	E2.25		
3V39, 3V49, 8943, 8944	REEL DRIVE PULLEY	PU43681	E4.00		
3V58, 3V59, 3V64	REEL DRIVE PULLEY	PU43681	E4.00		
3V65, FV10, FV11, FV12, FV13, FV14, FV20, FV21, FV22, FV26	CLUTCH ASSY	PU55822	1200p		
FV30, FV32, FV33, 8950, VC101	CLUTCH ASSY	PU57658	1050p		
3V42, 3V43	CLUTCH ASSY	PU57658	1050p		
3V43, 3V44, 3V45	CLUTCH ASSY	PU57658	1050p		
3V48, 3V53, 3V54, 3V55, 3V57, 8947, 8948	T-UP CLUTCH	PU56043-1.4	240p		
3V42, 3V43, 3V44	SUPPORT CLUTCH	PU56044-1.5	160p		
3V45, 3V48, 3V53, 3V54, 3V55, 3V56, 3V57, 8947, 8948	LOADING IDLER	PU43681	E4.00		
3V00, 3V01, 3V16	REW IDLER	PU46380	500p		
3292, 8900, 8901, 8904, 8906	IDLER	PU49281	E1.70		
3V16, 3V22, 8902	IDLER	PU49281	E1.70		
8909, 8912, 8922	IDLER	PU49281	E1.70		
FSHER					
FVHP420, 520, 530	FF-REW PULLEY	H638631	80p		
FVHP615, 618, 620	COMP IDLER ASSY	FI1430420400300	E220p		
FVHP622, 710, 711, FVHP720, 721, 722, FVHP725, 730, 830	GEAR IDLER ASSY	FI1430490400900	380p		
FVHP840, 906, 906, FVHP908, 910, 911, FVHP915, 916, 918	GEAR IDLER ASSY	FI1430490400900	380p		
FVHP615, 618, 620	GEAR IDLER ASSY	FI1430490400900	380p		
FVHP622, 710, 711, FVHP720, 721, 722	REEL T-UP ASSY	FI1430410400900	E5.50		
FVHP725, 730, 830, FVHP840	REEL T-UP ASSY	FI1430410400900	E5.50		
FVHP615, 618, 620	REEL T-UP ASSY	FI1430410400900	E5.50		
FVHP662, 710, 711, FVHP720, 721, 722	GEAR IDLER ASSY	FI1430490400900	380p		
FVHP725, 730, 830, FVHP840	GEAR IDLER ASSY	FI1430490400900	380p		
FVHP910, 911, 915, FVHP916, 917, 918, 919	IDLER	FI1430420400700	300p		
FVHP975, 980, 990	IDLER	FI1430420400700	300p		
FVHP998, 5000, 5005	REEL DRIVE ROLLER		E6.00		
FVHP050, 5075, 5100	REEL DRIVE ROLLER		E6.00		
FVHP10, 20	CLUTCH	FI2430510404200	E9.50		
FVHP375, 980, 990	IDLER		E2.80		
FVHP420, 520, 530	TAKE UP IDLER		E2.90		
FVHP420, 520, 530	LOADING GEAR		90p		
FVHP990	REEL DRIVE PULLEY		250p		
VBS3500	IDLER		95p		
VBS3500	REW IDLER		95p		
VBS7000	REW IDLER		95p		
GOLDSTAR					
GHV1221, 1232, 1240	CLUTCH GEAR	435038A			
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8900	IDLER		110p		
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130	CLUTCH GEAR		110p		
GHV1221, 1232, 1240	IDLER		110p		
GHV1241, 1242, 1243, GHV1244, 1245, 1246, GHV1247, 1248, 8900	CLUTCH GEAR		110p		
GHV8200, 8210, 8215, GHVP51, VCP4100, 4130	CLUTCH GEAR		110p		
HINARI					
VXL3, VXL20	REEL IDLER	40000009	110p		
VXL2	IDLER		110p		
VXL4, VXL35	IDLER		110p		
VXL4, VXL35	CLUTCH		E6.50		
VXL4, VXL12, VXL25	LIMITER POST		E1.30		
VXL30, VXL35, VTV300	CLUTCH		E3.75		
VXL5, VXL6	GEAR HOLDER		E3.50		
VXL5, VXL8	GEAR HOLDER		E3.80		
VXL7, VXL8, VXL9	CLUTCH		E3.80		
HITACHI					
VT11-33, VT63-64	CLUTCH ASSY	6879515	E7.50		
VT14, 17, 19, 38, 57, 86, 88, 34, 35, 39, 52, 61, 62, 65, 85, 330, 640, VT165	CLUTCH ASSY	6886824	E7.50		
VT120-220, 100, 110	CLUTCH ASSY	6886972	E7.50		
111, 113, 115, 118, 200	CLUTCH ASSY	6886972	E7.50		
125, 128, 130, 135, 138, 145, 150, 175, 225, 250, 255, 268, 269, VT180	FF-REW IDLER	6413663	E2.80		
VT8000-8700	PLAY IDLER	6414221	290p		
VT8500-8700	PLAY IDLER	6414221	290p		
VT8000-8300, 7000	FF-REW PULLEY	6383531	80p		
VT8500-8700	FF-REW PULLEY	6383531	80p		
VT9300-9500, 6500	FF-REW IDLER	6861471	250p		
VT680, 6900, 9700, 9900	PLAY IDLER	6861482	230p		
VT9300, 9500, 6500	PLAY IDLER	6861481	230p		
VT9900	IDLER	681505	230p		
VT9300, 9500, 9700	IDLER	687043	E3.80		
VT11-33, VT63-64	FF-REW IDLER	6886971	125p		
VT14, 165, 17, 19, 34, VT35, 38, 39, 52, 61, 62	CLUTCH		E3.25		
VT65, 85, 86, 88, 330, 640	CLUTCH		E3.25		
VT1000, 110, 111, 113	FF-REW ARM	6886792	240p		
VT115, 118, 119, 120, 125, 128, 130, 135, 138, 145, 150	FF-REW ARM	6887094	E1.30		
VT175, 220, 225, 255, 255, 261, VT130	FF-REW ARM	6887094	E1.30		
VT400, 405, 410, 413	FF-REW ARM	6887094	E1.30		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH		E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH		E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH		E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	6896951	E3.25		
VT536, 540, 545, 546, 548, 570, 575, 576, 580, 585	CLUTCH	6896951	E3.25		
VT638, VT8625, 626, 630, 635, 636, 640, 645, 646, VTS80, 85	CLUTCH	6896951	E3.25		
VT400, 405, 410, 413	CLUTCH	6896951	E3.25		
VT414, 415, 418, 420, 425, 426, 428, 430, 431, 435	CLUTCH	6896951	E3.25		
VT438, 450, 488, 510, 518, 520, 525, 526, 530, 535	CLUTCH	68969			

REMOTE CONTROLS

Description	Order Code	Price	Description	Order Code	Price
GRUNDIG			PHILIPS (continued)		
TP160E	RC 107	900p	RC38	RC 301	875p
TP200, TP300	RC 380	800p	KT3 TEXT	RC 5301	800p
TP400	RC 401	800p	RC5352	RC 5352	800p
TP590-600	RC 600	850p	RC5375	RC 5375	850p
TP390, TP610	RC 610	850p	RC5 STANDARD	RC 5534	850p
TP621	RC 621	850p	RC5901	RC 5901	850p
TP630, TP650	RC 650	850p	RC5903	RC 5903	800p
TP660	RC 660	850p			
TP661	RC 661	850p	SABA		
HITACHI			T6772	RC 149	900p
CLE800-CLE830	RC 140M	850p	TC319-320	RC 328	875p
A617402/655602	RC 192	875p	TC356	RC 356	875p
A512120/230	RC 900	800p	TC358	RC 358	850p
A514790	RC 901	850p	TC360	RC 360	800p
A5088470	RC 902	800p	TC365	RC 365	800p
A518612	RC 903	900p			
SCL002	RC904	850p	SALORA		
C2096	RC 905	850p	SERIES L	RC 190	875p
A511940	RC 906	800p	86173	RC 882	850p
655602H	RC 907	850p	SANYO		
ITT			RC218, RC222, RC228, RC238	RC 140M	850p
IFB13, 14, 15	RC 143	875p	JXGE	RC 878	850p
FS4	RC 148	850p	JXDE	RC 884	850p
RG305	RC 305	825p	VHR2300	RC 890	850p
RG306	RC 306	825p	RC628	RC 865	900p
FS9/1-10/1	RC 307	850p	SHARP		
V55 RUK	RC 308	825p	G0121CESA, 123CESA, 204, 251	RC 140M	850p
VS4-1	RC 310	850p	SIEMENS		
MULTICONTROL (17C20)	RC 311	800p	FC616	RC 130	850p
KORTING			FC631	RC 132	850p
18279, 18396, 18460, 18521 SE	RC 108	850p	FC742	RC 164	900p
40540 VTS	RC 108	900p	SONY		
LOEWE			RM604, RM605, RM606	RC 140	850p
DC11	RC 146	850p	32 CHANNEL	RC 140M	850p
MATSUI			RM613	RC 141	850p
010270601	RC 889	850p	RM632, RM636	RC 160	850p
VX770	RC 892	850p	TATUNG		
METZ			FXA	RC 877	850p
JAVA COLOR (6890)	RC 166	850p	RC70	RC 883	750p
COLOR (7156)	RC 183	850p	FX70 FASTTEXT	RC 894	850p
JAVA (7180)	RC 184	850p	TELEFUNKEN		
MITSUBISHI			FB632	RC 632 ST	850p
939P/03607, 939P/03609	RC 140M	850p	FB639	RC 639 ST	850p
NOKIA			THORN/FERGUSON		
SATELLITE	RC 550	850p	3V35-42	RC 342	850p
NORDMENDE			3V31-32	RC 344	850p
TC2336	RC 351N	850p	3V57-58	RC 628	900p
CMC1, TC3519	RC 356	875p	TX10 TEXT	RC 732	750p
OCEANIC			TX10 STEREO TEXT	RC 738	750p
390C9500	RC 339	900p	TX9-90-100	RC 740	750p
ORION			3V55, FV11	RC 783	900p
RC53	RC 892	850p	TX100 FASTTEXT	RC 785	800p
PANASONIC			TX100 STEREO FASTTEXT	RC 789	800p
EUR51200	RC 200	850p	PROFESSIONAL	RC 790	800p
TC2200	RC 201	850p	TOSHIBA		
VSQ0357/NV730	RC 202	875p	CT937	RC 950	850p
TNQ1621	RC 203	900p	CT9117	RC 951	850p
PHILCO			201R4B	RC 952	850p
CARVEL, CONCORDE,	RC 108	850p			
MERCURY, TELESTAR			UNIVERSAL PROGRAMMABLE REMOTE CONTROL		
TC10	RC 152	900p	Controls up to 4 different devices which use infra red		
PHILIPS			remote controls including TV, audio, VCR and satellite.		
RC5002,5154	RC 134	850p	(need original remote control TC program)		
KT3 NON TEXT	RC 135	825p	Order code: IR100R Price: 1950p		
69117032	RC 178	875p	We stock Remote controls for over 5000 different		
69117194	RC 180	875p	models. Ring for further details on 081-900-2329.		
RC5991-UNIV	RC 300	850p			

VCR ALIGNMENT KIT

CONTAINS:

SET OF 7 HEAD & TAPE PATH ALIGNERS	SET OF 8 ALLEN KEYS
* RCA TYPE AUDIO & CONTROL HEAD POSITIONING TOOL	* 0.77mm
* RCA ADJUSTMENT TOOL FOR TAPE GUIDE POSTS	* 0.90mm
* RCA TYPE BACK TENSION TOOL	* 1.27mm
* TENSION ADJUSTMENT TOOL FOR VARIOUS USES	* 1.50mm
* VCR ADJUSTMENT TOOL	* 1.60mm
	* 2.00mm
	* 2.40mm
	* 3.00mm

3 Reversible Screwdrivers Circlip Pliers
Spring Hook Micro Screwdriver

VCR Head Extractor

Order Code: TOOL10 Price: 3000p

FUSES

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

FUSES

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

ALL THE ABOVE PRICES ARE FOR PACKS OF 10 FUSES

I.C. PROTECTOR

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

Price: Only 30p each

AUDIO CONTROL HEAD
Amstrad Original No: 150751
Used on Amstrad TVR1.2.3, VCR4600, 4600MII, 4700
Funai V25, VCR4600, 4800, 5200, 5600, 6600, VIP3000, 5000
Also fits: Fidelity, Funai, Hinar, Protine, Schneider, Towada, Ultravox

Order Code: AH01 Price: £13.50

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

Order Code: AH02 Price: £14.50

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Satellite PSU Repair Kits

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

MAKE & MODEL	ORDER CODE	PRICE
PACE PRD800, PRD900	SATPSU1	670p
PACE SS9000, 9200, 9010, 9020, 9220	SATPSU2	670p
AMSTRAD SRD510, SRD520	SATPSU3	670p
AMSTRAD SRD500	SATPSU4	670p

Replacement Video Heads

MAKE	MODELS	PRICE
HITACHI	VT570, VT575, VT576, VT580, VT585, VT588, VTF70	3100p
I.T.T.	VR3761	3100p
JVC & FERGUSON	HRD950, HRD960, HRD980, FV46	5000p
LUXOR	VR3761	3100p
MITSUBISHI	HSE51	3000p
NATIONAL PANASONIC	NVFS200, NVFS90, NVV8000 NVHD100, NVHD101, NVHF100 NVSD AG7330, AG7350, AG7355, AG7450 NVFS100	4600p 3100p 1400p 5000p 5000p
N.E.C.	D5600	3500p
SANYO	TLS1000P, TLS1001P, TLS1100 VHR7800, VHR7810, VHR8000SP, VHR8015P, VHRD4800	3100p 3100p
SHARP	VCH80, VCH81, VFH815 VCA33, VCA36, VCA43, VCA44, VCA46, VCA49 VCA55, VCA63	2800p 1500p 2200p
SONY	SLV656, SLV715, SLV757, SLV777, SLV815, SLV825 SLV353UB CCDF340E, CCDF500E, CCDV90E, CCDV95E, CCDSP5E	4600p 3200p 4800p

Original Video Heads

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

Audio Control Head

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

AMSTRAD ORIGINAL NO: 153134
Used on: AMSTRAD DD8900, 8904, VCR2000, 6000, 6100, 8600, 8602, 8603, VCR8604, 8700, 8704, 8714, 8800, 9005, 8244
Also fits: ANITECH, BONDSTEC, CASIO, CROWN, FIDELITY, GOLDHAND, GRANADA, HINARI, MARQUANT, OMEGA, PROFEX, SCHNEIDER, SEG, SENTRA, SHINTOM, TASHIKO, TATUNG, TOWADA, UNIVERSUM ORDER CODE: AH02 PRICE: 1450p

Replacement Audio Control Video Sound Head for National Panasonic

PART NUMBER	MODELS	PRICE
VBR 0091	NVG7 etc	875p
VBR 0050	NV300, NV340 etc	875p
VBR 0061	NV777 etc	875p
VBR 0103A	NV250, NV450 etc	625p
VBR 0125		625p

4 way Preprogrammed Universal Remote Control

A single remote control to operate Televisions, Videos and Satellite Receivers. Plus Auxiliary Options!!
* Replaces up to 8 remotes with one * Simple 4 digit setup routine
* Controls 1000s of models * Teletext functions with Fastext
* Clear (large key) layout * Code Search Facility
* Stylish and easy to operate * Replace broken or lost remotes
* Original Remote not required
Order Code: RCWB0200 Price 1500p + VAT

Replacement Video Cassette Housings

MAKE	MODELS	CODE	PRICE
AKAI	VS35, VS53, VS55, VS56, VS75	CH18	2600p
GRANADA	VHSDP1 VHSYJ2	CH05 CH01	1100p 2600p
GOLDSTAR	GHV1290P, 1291P, 1295P, 9400, 73401, GSE1295P, GSE1891P, 20001Q, 20051Q, VCP4200, 4300, 4301, 4305, VCP4306, 4311, 4315, 4316, 4320, 4321, 4325 GHV51, 1221, 1232, 1240, 1241, 1242, 1244, 1246, 1248, GHV8000/8200	CH25 CH26	2000p 2900p
FERGUSON & J.V.C.	3V38, 3V39, 8943, 8944, 8951, 3V35, 3V36, 3V49, HRD110, 111, 120, 121, 225 3V42, 3V43, 3V44, 3V45, 3V48, 3V53, 3V54, 3V55, 3V57, 8945, 8947, 8948, HRD140, 141, 150, 157, 158, 160, 250, HRD257, 455, 565, 566, 725, 755 8948, 8950, FV10B, 12L, 13H, 14T, 20B, 21R, 22L, 26, 395, HRD230, 430, 530 3V58, 3V59, 3V64, 3V65, FV11R, 8950, 8951, HRD170, HRD180, HRD370 FV31R HRD515, 520, 527, 540, 550, 580, 600, 610, 620, 660, 670, HRD830, 840, 850, 860, 4050, 6600, FV37H HRD540, 580, 830, 860, 910, 960, HRD970, HRDX20, FERGUSON FV57H	CH01 CH02 CH03 CH04 CH19 CH20 CH27	2600p 2600p 2600p 2600p 4300p 2400p 2400p
I.T.T.	VR3605, VR3905 VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948 VR3916, 3926, 3946, 3948, 3976, 3986, 3995, 3997, 6948	CH01 CH02 CH02	2600p 2600p 2600p
NATIONAL PANASONIC	NV730	CH06	4300p
N.E.C.	N830EG, N831EG, N832, N833EG N895	CH01 CH02	2600p 2600p
PHILIPS	CASSETTE LIFT ASSEMBLY (69120366) DV186, 190, 286, 471, 562, 761, VR6180, 6182, 6185, 6285, VR6290, 6291, 6293, 6362, 6367, 6393, 5467, 6468, 6470, VR6561, 6670, 6760, 6761, 6870, 6970 VR6443 VR6448 49SB6	CH05 CH22 CH23 CH24	1100p 2900p 2500p 2500p
SHARP	VCA100, VCH851, VCH852 VCA103, 103GV, 106, 106GVM, 254GVM VCS211, 244, 5055, 605, VCB230, VCD806G, 810G, VCT212, 310, 410G, 610	CH23 CH24	2500p 2500p
TELEFUNKEN	VR2970	CH02	2600p
THOMSON	V320, 321, 323, 326, 4200, 4300 V342, 343, 352, 353, 360, 364, 368, 4210, 4230, 4260, 4400, V5500, 6000, 8540	CH01 CH02	2600p 2600p
TOSHIBA	V55, V57 V65, V66	CH01 CH02	2600p 2600p

Service Aids

DESCRIPTION	VOLUME	CODE	PRICE
VIDEO HEAD CLEANER	75ML	SP01	140p
SWITCH CLEANER	176ML	SP02	150p
SILICONE GREASE	200ML	SP03	170p
FREEZE IT	170ML	SP04	200p
FREEZE IT	400ML	SP16	350p
FOAM CLEANER	400ML	SP05	170p
ANTI STATIC	150ML	SP06	170p
AEROKLEANE	135ML	SP07	140p
AERO DUSTER	150ML	SP08	200p
AERO DUSTER	400ML	SP17	425p
PLASTIC SEAL	200ML	SP09	200p
GLASS CLEANER	250ML	SP10	160p
COLDKLENE	250ML	SP13	160p
EXCEL POLISH 80	250ML	SP18	150p
ADHESIVE 120	400ML	SP19	190p
LABEL REMOVER 130	200ML	SP20	240p
REFURB 140	400ML	SP21	240p
TUBE SILICON GREASE	50 GRAMMES	SP11	200p
TUBE SILICON SEALANT WHITE	75ML	SP22	280p
TUBE SILICON SEALANT CLEAR	75ML	SP23	280p
TUBE HEAT SINK COMPOUND	25 GRAMMES	SP12	150p
DRIVE CLEANER	200ML	SP24	150p
SCREEN CLEANER	200ML	SP25	150p
COMPUTER CARE KIT		SP26	2100p

All the above items are manufactured by Servisol
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SONY OPTICAL PICK UP
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Fits most Sony, Akai & J.V.C. Portable Hi-Fi and Midi Systems

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CFD100, 105L, 120, 300, 440, 454, 455, 50, 500, 55, 58, 60
CFD68, 750, 755, 760, 765, 770, 775, 440S, W100, 100S 2200p

Cassette DC Motors

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

Cassette Tape Heads

HEAD TYPE	PRICE
MONO HEAD	90p
STEREO HEAD	110p
MINI HEAD	150p
AUTO REVERSE HEAD	200p

Soldering Accessories

DESCRIPTION	CODE	PRICE
ANTEX SOLDERING IRONS		
25 WATT 240 VAC (XS25W 240V)	S101	900p
15 WATT 240 VAC (XS15W 240V)	S102	900p
25 WATT SPARE ELEMENT	S103	450p
15 WATT SPARE ELEMENT	S104	450p
SOLDERING STAND & SPONGES		
SOLDERING STAND (MADE BY ANTEX)	S108	350p
SPARE SPONGE	S109	55p
SOLDER		
18 SWG 500 GRAMMES	S110	500p
20 SWG 500 GRAMMES	S111	650p
22 SWG 500 GRAMMES	S112	700p
DESOLDERING AIDS		
SOLDER MOP STANDARD GAUGE 1.2mm x 1.5M	S107	60p
SOLDER MOP 1.2mm x 10M	S113	300p
DESOLDERING PUMP	S105	320p
SPARE NOZZLE	S106	60p

Transistors & ICS

BU 508A (PHIL)	80p	MJE 13009	100p	2SC 3885A	350p
BU 810	110p	MJE 18004	125p	2SD 633	70p
BUZ 90A	180p	STK 6982H	600p	2SD 1680	225p
CXA 1044F	550p	STK 7253	450p	2SK 793	400p
HA 13408	350p	TDA 2030H	100p	2SK 956	1400p
IRFBC40	400p	TEA 2019	200p	2SK 1023	550p
L272	200p	TMP 47CA34N	1250p	2SK 1342	750p
LG210	250p	SAA 1300	200p	2SK 1358	600p
MC 3423P	100p	2SA 1540	55p	68000	500p
MJ 15015	250p	2SC 3788	60p	82S147	450p
MJ 15016	350p	2SC 3885	350p		

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3V23 LOADING ROLLER BAR £3.99p
SHARP 0005 & 0006 £1.95p
FYHP615/725 £1.95p
VT11/14/17 IDLER £1.95p
VT11 CLUTCH ASSEMBLY £6.99p
VT100225/260 IDLER £2.75p
NEC 9013 IDLER £4.99p
SANYO VHR3300 IDLER £3.99p
AKAI VS105/250 CLUTCH ASSEMBLY £11.99p
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Technological Salvation

Terrestrial digital TV transmissions could be nearer than one had suspected if the BBC's plans come to fruition. The Corporation would like to start a regular service by the end of 1997. It seems that the technology required has reached an advanced stage in its development cycle. So there would, technically, be little in the way of a start to such transmissions. If the BBC did manage to get going at an early stage in the digital TV era, it would doubtless reap benefits in having some of its work accepted in the standard adopted. And here of course, as usual, lies the rub: it's unlikely that anyone will be allowed to start digital transmissions until agreement on a standard has been reached, in Europe at any rate. The DVB, Europe's digital broadcasting standards body, has reached a measure of agreement on the actual transmission system, but there remains a problem with conditional access (CA). This was the subject of a recent meeting (at the end of November) at the EBU, but the argument on the specification for a compulsory CA system continues. It shouldn't however be beyond the wit of the authorities to sort this out before too long.

There is also the question of money, since someone is going to have to find the funds to go digital. Nevertheless the exciting prospect of digital TV is within sight. We shall then have a period akin to the 405/625 dual-standard era. At

that time one thought there would be a bit of a to do when the time came to end 405-line transmissions and retire the sets. In practice it all went surprisingly smoothly: by the time the agreed date arrived, the vast majority of 405-line sets had long since been retired. The BBC has suggested a ten-year period of digital/analogue dual-standard operation. Today's sets have a greater life expectancy than those back in the largely valve era, so many will probably remain healthy when the end of analogue transmissions comes about. But we are used to add-on set-top converters and so on, which will be able to give them extra life.

Digital TV has to come about, for spectrum economy reasons if for nothing else. Other services – Nicam and teletext for example – have proved the remarkable robustness of digital transmissions. Once the authorities have sorted out the standards problem, which will hopefully not take them too long, we could be in for a boom period in the consumer TV/video field. New techniques, new chip sets, new receivers – all something to bring a smile back to the long suffering brown goods industry.

This could well require some careful public relations work. Once in large-scale production, those digital TV decoders (we will still have tubes with analogue drive) will probably be quite cheap. The public might be reluctant to pay much more unless it can be

persuaded of the definite benefits to be had from new technology. If interactive TV and all the other prospective services are to be sold, a rather better job will be required than with some previous systems. But the opportunities are there for a sort of technological salvation for the industry. The early years of the next century could be exciting ones in the TV/video field.

Television Index and Faults Discs

Version three of the computerised index to *Television* is now available from Video Interface Products Ltd. It covers Volumes 38 to 44 (November 1988-October 1994) and has over 6,000 references to TV/VCR etc. fault reports and articles, a spares guide and other features. Price is £30. Earlier version discs can be upgraded.

In addition there are now three Fault Report Discs, for Volumes 42 (November 1991-October 1992), 43 (November 1992-October 1993) and 44 (November 1993-October 1994). These provide the full text of the TV, VCR, camcorder, satellite TV and CD player fault reports published in the specified volumes. They cost £15 each.

For further details of the discs and the services provided by Video Interface Products Ltd. turn to page 199.

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COVER PHOTO

This month's cover photograph shows the chassis used in the Philips 10CX1120/Pye 25KX1201 small-screen colour portables. See servicing article on pages 166-169.

Servicing the Philips 10CX1120

Richard Newman

The Philips 10CX1120, which was also released as the Pye 25KX1201, appeared during the mid-Eighties. The sets proved to be popular because of their small size, the video and RGB inputs via a scart socket and, amongst caravanners, because they could be run from a 12V car battery. The Philips model was black, the Pye version red, the latter being dubbed the 'Red Box'. The chassis is of basically Loewe Opta design.

Many of these sets seem to have found their way on to the second-hand market. They are well worth repairing. The PCB is of the 'ground plane' type, and problems arise with earthing points. As a result you can get a variety of intermittent faults, some of which can be quite unusual.

The following notes should be used in conjunction with the service manual. We shall also deal with the 12V power supply.

Access

Four screws hold the back cover. When this has been removed the whole PCB can be slid out after lifting the red tab at the bottom left corner. The 12V supply is on the left-hand side of the cabinet.

The c.r.t.s used in these sets seem to be quite good – I've not so far had to change one. If you do however you have to remove the main cabinet. There are four screws, accessible from the rear, right at the front of the cabinet. When these have been removed the cabinet can be lifted clear. After this the c.r.t. can be removed, observing the usual safety precautions.

The Mains Power Supply

The chopper circuit is based on a TDA4600-2 chip (I611), see Fig. 1. T623 (BU508) is the chopper transistor and L622 the chopper transformer, which provides the usual mains isolation. There are two outputs on the secondary side of the circuit, 27V and 8V. A 5V supply is derived from the latter via an L387 regulator (I661).

Similar circuits have been described in these pages before, so we'll just cover the basic points here. A start-up voltage is applied to pin 9 of the chip via resistor R629 and resistor R628. While this voltage is rising towards 12V, T623's base coupling capacitor C624 is beginning to charge and a reference voltage is being generated at pin 1 of the chip. This later voltage sets the operating voltage for the rest of the circuitry

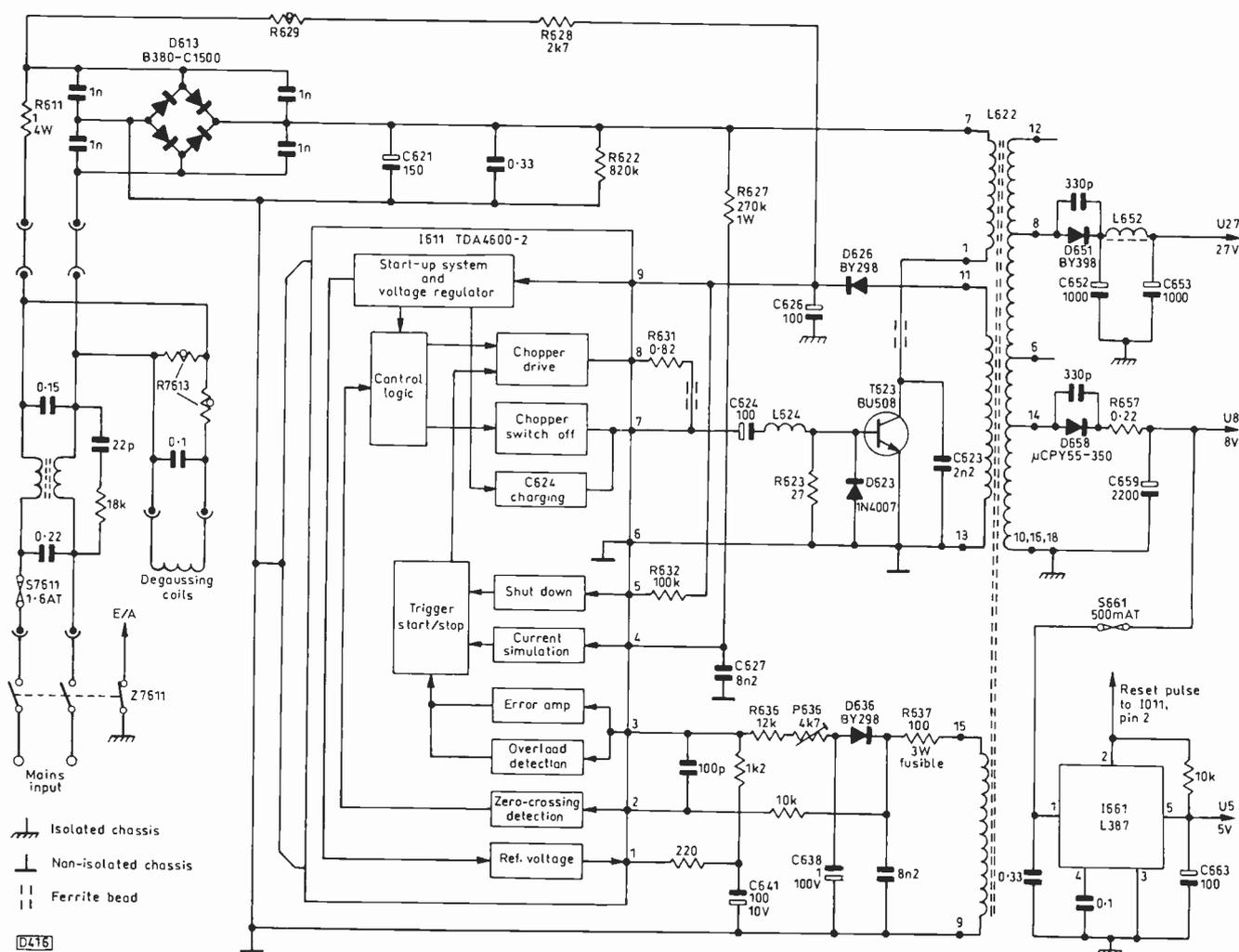


Fig. 1: The power supply circuit used in the Philips Model 10CX1120/Pye Model 25KX1201.

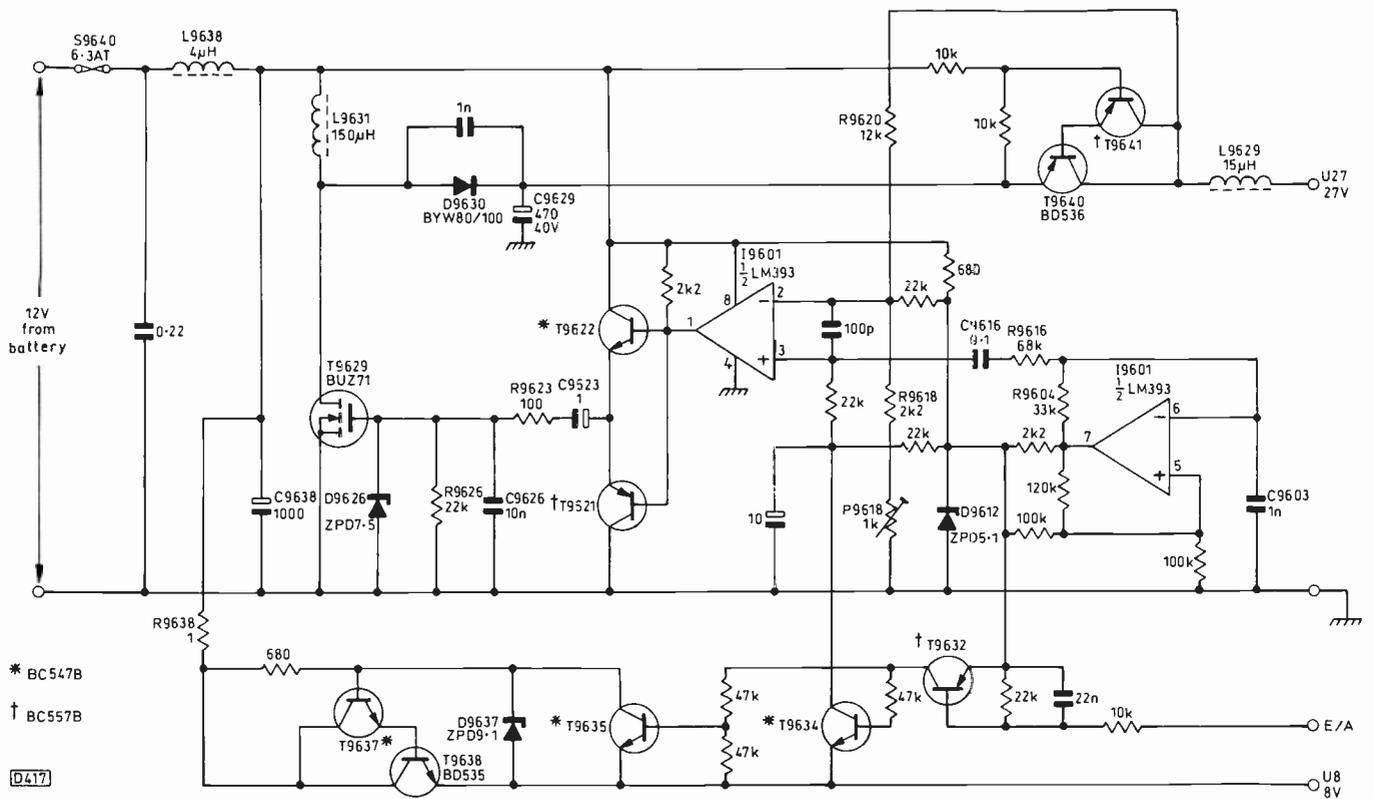


Fig. 2: The 12V battery supply circuit.

in the i.c., apart from the control logic. When the voltage at pin 9 reaches 12V, the control logic switches on. This arrangement provides a start-up delay, so that the charge developed across C624 is sufficient for the chopper transistor T623 to be switched on safely. Once the power supply has started up, winding 13-11 of the transformer provides, with D626, the supply for the chip.

If there's an overload, for example a short across the secondary side of the circuit, the voltage at pin 9 of the chip will fall. If it drops below 7.4V the voltage at pin 5 will, via sensing resistor R632, fall below 2.2V. This will cut off the chopper transistor's base drive via the protection circuit within the i.c. In the protection mode the power supply's consumption is about 8W.

Fault Finding

The power supply is fairly reliable and should not present too much of a problem in the event of a fault.

If the set is dead with a blown input fuse (S7611, 1-6AT), give the power supply a good visual check. Look at the chip to see whether it's physically damaged – a hole blown in the side perhaps! Major damage like this means that R627 (270kΩ) is probably high in value or open-circuit and the BU508 chopper transistor short-circuit. In this event I usually replace the chip, R627 and T623, also the two 100µF capacitors C624 and C626 as they tend to dry out. R623 (27Ω) and D623 (1N4007) are also worth checking as they can both suffer damage when T623 goes short-circuit.

Another possible cause of a blown fuse is the degaussing posistor R7613.

If the set is dead with no physical damage, the fuse being intact and T623 o.k., the cause is likely to be the start-up posistor R629.

Few other faults seem to occur. Unless you are very unlucky, once the components mentioned above have been replaced as necessary the power supply should work.

You can get some strange effects when earthing points on

the secondary side of the circuit go LHM-resistance. This is particularly the case around pins 10, 16 and 18 of the chopper transformer and pin 3 of the 5V regulator. The voltage at the latter point can rise to 0.5V or more, which is enough to upset the reset pulse developed at pin 2 of the microcontroller chip 1011. As a result 88 is displayed by the front LED system and there are no functions. The tuner's earth should also be checked.

Plated-through earthing points between the print and the top earth plane can cause trouble. Careful print tracing will reveal the earth point concerned; it can then be remade. You may sometimes feel inclined to hardwire to another earth point, but be careful. If you take the wire to an inappropriate earth point you can end up with more problems (random channel changing, crackles on sound etc.).

The 12V Battery Supply

The 12V battery supply circuit is shown in Fig. 2. Note that a power f.e.t. (type BUZ71) is used. The circuit provides 27V and 8V outputs from a battery input voltage between 10.5V and 14.5V.

The 8V supply is basically a series regulator, consisting of T9638 (BD535) and T9637 (BC547B) with the ZPD9-1 zener diode D9637 providing the reference.

A d.c. converter is used to generate the 27V supply. 19601 (LM393) is used as a voltage comparator and an oscillator. The section connected to pins 5, 6 and 7 is the oscillator, with R9604 and C9603 determining the frequency (around 20kHz). The sawtooth-shaped waveform produced by the oscillator is fed to pin 3 of the comparator section of the chip via R9616 and C9616. The d.c. conditions are stabilised by the ZPD5-1 zener diode D9612. A voltage divider consisting of R9620, R9618 and preset P9618 feeds a proportion of the 27V output to pin 2, the comparator's inverting input. Under the control of its two inputs the comparator produces a squarewave output at pin 1. Adjustment of P9618 enables the 27V output to be set up correctly. T9621 and T9622 form a

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driver stage for the f.e.t., with output via C9623.

R9623, R9626, D9626 (ZDP7.5) and C9626 provide limitation against excessive voltage at the gate of T9629. When T9629 switches on, energy is stored in coil L9631. When it switches off, this energy is released and is rectified by D9630 to provide, with its reservoir capacitor C9629, the 27V supply. This is taken to the output via the Darlingtons pair T9640 and T9641 (T9641 is omitted in some sets).

When battery power is switched off via the set's on/off switch, the auxiliary contact in the switch supplies a low level at point E/A. T9632, T9634 and T9635 then switch on, effectively short-circuiting zener diodes D9612 and D9637 and thus the reference voltages for the 8V and 27V supplies. The supply circuits switch off and under these conditions a quiescent battery current of approximately 35mA flows.

Faults

The most common fault that occurs with the 12V battery supply is a short-circuit BUZ71 f.e.t. This would almost certainly be caused by reversed battery connection – there's no polarity protection apart from the fuse (S9640) and this does not always blow quickly enough to prevent damage. I normally replace I9601, the BUZ71 f.e.t. and check all the diodes and transistors before switching on.

When fault finding it helps to have a variable bench power supply able to provide an output of at least 4A. The actual current consumption of a working set operated with a 12V input is 3.3A. The voltage limits are 10.5V-14.5V. Failing this a car battery will have to be used.

If you get a complaint that the set doesn't work with a 12V input but it proves to be o.k. when tested on the bench, check on the supply cable being used: a long run of inadequate cable will soon drop the supply below 10.5V. Try to operate the set as close as possible to the 12V source, using the minimum amount of cable.

Signal Circuits

Two types of tuner were used in these sets. One is quite large, the other is smaller and doesn't use lead and plug ST12. In this case the frequency divider connections are made directly via the PCB.

The i.f. amplifier section consists of a TDA3541 chip, a SAW filter and a few peripheral components. I've only ever had one fault in this area: the i.f. response was very poor, with ghosts and uncertain tuning, the cause being the SAW filter. This is the only time I've come across a SAW filter that has failed.

Between the i.f. section and the colour decoder chip there's a scart interface and AV switching chip, I251 (TEA2014). Auto AV switching is provided via pin 8 of the scart socket. There's also a manual AV switch at the rear of the set: this is used when equipment that doesn't provide a switching voltage is connected to the scart socket.

The TDA4190 audio chip also contains the sound i.f. section, internal/external switching, muting and electronic volume control. The audio output is 4W.

A TDA3301 colour decoder chip (I311) is used. This part of the set follows conventional lines. If you have a no-colour fault the colour killer can be overridden by applying 12V to pin 5 of the chip. This will help in determining where the fault lies. The 4.43MHz crystal Q341 sometimes fails.

The RGB output stages are on the c.r.t. base panel. A very common problem here is a varying grey scale. This is caused by defective potentiometers and they should all be changed. I use ones supplied by RS components and never get any further problems.

The Line Timebase

A TDA2594 chip (I511) provides synchronisation and generates the line drive. It also contains an interference suppressor, a phase discriminator, time-constant correction for VCR operation, a sandcastle pulse generator and a mute circuit. Line drive pulses are present at pin 3 and are fed to the line driver transistor T534.

The line driver and output stages are conventional. The design is such that a separate EW correction circuit is not required.

The Field Timebase

The field timebase is based on a TDA1770A chip (I561). It contains the field oscillator, sawtooth generator, output stage and blanking. A circuit protects the c.r.t. in the event of field collapse. It works as follows. In normal operation flyback pulses at pin 3 of the chip are rectified by D572 (via R572), charging C571 (22 μ F). As a result D571 is cut off. If there are no pulses at pin 3 of the chip, C571 discharges via R571 and D571 becomes conductive. This takes the base of T3383 on the c.r.t. base panel low. As the bases of the RGB driver transistors are also taken low the c.r.t. is cut off.

Intermittent height and/or linearity problems are likely to be caused by the relevant preset potentiometer.

The Control System

A fairly simple control system is used, consisting of an MC6805 microcomputer chip (I011) and a TMS3757 chip (I061) which acts as a frequency synthesiser with DA conversion. In early sets the microcomputer chip was 'piggy-backed' with an MCM2802 EEPROM (I0021) for storage of channel and analogue control information. The MC6805 chip was mounted in a holder, with the EEPROM beneath it.

The MC6805 and TMS3757 chips communicate via an I2C bus and form the control and tuning sections of the set, with the 4MHz crystal Q061, connected between pins 26 and 27 of I061, determining the clock frequency. I011 also drives the numeric LED display, via transistors T032-T038. The set-mounted keyboard is scanned directly.

The LED display also shows the analogue values for brightness, contrast, colour, volume and fine tuning within 64 possible steps (0-63). The receiver does not use a.f.c. If programme 0 is selected, a switching voltage is fed from pin 18 of the TMS3757 chip via T066 and D066 to the TDA2594 chip to adjust the time-constant for VCR operation.

Modifications

In later sets an EF6805US chip is used as the microcomputer (I011) with an ER5911A as the EEPROM (I0021). The peripheral components associated with the earlier EEPROM were deleted and the new EEPROM is mounted alongside the microcomputer chip instead of the two being piggy-backed.

The field timebase chip was changed to a TDA1872 in later sets. While the basic circuit remains the same the pin connections are different and the following component changes were made: C562 changed to 330nF, R562 to 7.5k Ω (1%), R579 to 1.5k Ω with R576 (1.8k Ω) added in series, and R578 (2.2k Ω) added between pin 11 and the U12 supply.

In Conclusion

These little sets give a good account of themselves. Some tend to be condemned because of the intermittent nature of certain faults. It's hoped that the notes above will avoid this.

Teletopics

BBC's Digital Plans

The BBC has announced that it would like to start terrestrial digital TV transmission by the end of 1997, with coverage of up to eighty per cent of the UK. By using digital TV transmission, broadcasters could provide twelve new channels alongside the present four analogue TV channels – the digital channels would include provision for the 16:9 format. While the BBC feels that it can initiate a move to terrestrial digital TV, a final decision to proceed in this direction would require the agreement of the other UK TV broadcasters. What the BBC is proposing to do initially is to run a public technical trial in a couple of months' time, followed by a limited regional trial later in the year or early next year. The BBC's view is that once terrestrial digital TV transmissions have started there will be a period of ten-fifteen years during which analogue and digital transmissions will run simultaneously. Then digital transmissions will take over.

The BBC has also announced that it will be launching a digital audio broadcasting service this September.

Interactive TV

Several interactive TV trials have been launched or announced. BT is to start consumer trials of an interactive TV service, which includes video-on-demand, amongst 2,500 households in Colchester and Ipswich this summer. It follows a successful trial involving sixty employees at Kesgrave, near Ipswich. The system uses a set-top box developed by Apple Computer and a modified Macintosh operating system. Asymmetric Digital Subscriber Loop (ADSL) technology will be used to deliver MPEG-1 grade video pictures via copper telephone lines in one direction, at 2Mbits/sec, with a 9.6kbits/sec bi-directional control channel and the ordinary analogue telephone service. Suppressed-carrier amplitude and phase modulation is used for the broadband signal, with two carriers that are displaced by 90° with respect to each other: this is similar to the technique used for the NTSC/PAL chrominance signal, but with the digital signal modulating the phase and amplitude of the carriers (the 2Mbits/sec data stream is split into two prior to carrier modulation).

Users will be linked to a server system based on a computer developed by nCube running database software developed by Oracle. The initial tests have shown that ADSL is more robust than expected: it functions at distances of up to about 6km with excellent resistance to noise and other anomalies. The combination of ADSL and MPEG coding works well. The consumer trial will use the same equipment as the tests, though Asynchronous Transfer Mode (ATM) technology will be employed at the switching/combination stage to increase the number of subscribers able to use the system at the same time.

Customers will have access to 600 hours of TV programming, 400 hours of films and 2,000 hours of music programmes, which will be updated regularly. There will be shopping facilities provided by several major retailers, educational programmes, home banking (National Westminster) and magazines on demand from IPC. Various other prospective service providers are developing or evaluating offerings, and games on demand will be introduced

during the trial.

Later in the year Two Way TV proposes to launch an interactive TV system that uses conventional TV transmission plus an ordinary telephone line. It overlays graphics and text information on ordinary TV programmes so that viewers can interact with what's happening on the screen, making use of the field blanking interval to send the data. The developers claim that this makes the system cheaper and easier to use than other interactive TV systems which require cable or telephone transmission facilities. The company has some impressive backing. Partners include DBI, which holds the ITC licence to broadcast data during the field blanking interval.

Subscribers would use a set-top box that plugs into the TV set and telephone socket (the phone can be used in the normal manner). It will come with four remote control handsets to allow multiple use. The system will work with recorded or live programmes. When the programme is recorded a tape is made available before transmission so that the extra text and graphics to accompany the programme can be produced. The system can be used with up to six programmes at a time.

The set-top box tunes in automatically while the handset has four response buttons and a fingertip pointer to move an on-screen cursor. Data can be sent back to the programme supplier via the telephone line.

Two Way is at present running a trial with forty households in the Midlands. A full trial is to take place at Oxford in February. Central Television is expected to be the first to offer the service. Two Way TV plans to transmit 20-30 hours of interactive programming a week, the main focus initially being on game shows, sports and soaps. There are plans to use the system for educational and documentary programmes, with Tele-voting and interactive advertising being further possibilities. Cost of the set-top box would be about £180, plus a £6 monthly subscription. A rental alternative is proposed.

Cambridge-based Online Media, an offshoot of Acorn Computers, began interactive TV trials at the end of September, using ATM technology. The service is being carried by Cambridge Cable and is backed by several companies including ITN and Anglia Television. It involves only a dozen or so households initially but a larger test with thousands of households is expected to start later in the year.

Microsoft has developed a software system for interactive TV to connect TV set-top boxes and PCs with a wide variety of services including video-on-demand. It's to be tested in a trial run by Tele-Communications, the largest US cable TV operator, at Seattle. Microsoft has announced agreements with other network operators including Deutsche Telekom and Telstra in Australia. Nippon Telegraph and Telephone and Rogers Cable systems are amongst others who have announced plans to use Microsoft's technology.

AT&T, which has been carrying out interactive TV trials in the USA, has discovered that entertainment rather than information gives members of the public the greatest interest in having such services in their homes. While people said that they used the service for news and information, their records showed that they had spent most of their time playing games. It's also important that the service is easy to use. AT&T found that the instruction books were still in their shrink-wrapped covers in forty per cent of homes. In half the homes people said that their children had taught them how to use the service. The rest had muddled through. In a move to increase its involvement in interactive media services AT&T is acquiring The ImagiNation

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TBA1353			

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Satellite TV

The digital, 150-channel satellite pay-TV system in the USA is ready to go and is now being actively marketed. It uses two Hughes Galaxy 601 satellites, DBS-1 and DBS-2, with services provided by DirecTV and US Satellite Broadcasting. Each satellite has sixteen 120W ku-band transponders. DSS (Digital Satellite System) receiving equipment is being produced by RCA/Thomson Consumer Electronics. The basic RCA brand system, which has a suggested price of \$700 (about £450), consists of a 46cm dish, a digital receiver with a built-in modem and interactive remote control. There is also a version for use with a distribution system. Installation is extra. Charging is based on a subscription plus payment for individually selected programmes.

Philex Plc, 110-124 The Broadway, West Hendon, London NW9 7BP (081 202 1717) has introduced a frequency converter unit to enable older satellite receivers to be used with the new Astra 1D transmissions. Its use assumes that the LNB can handle the 1D signals. The converter is connected between the output from the LNB and the input to the receiver and has a single slide switch for frequency shifting. Either manual or remote control operation is possible. The unit, with a suggested retail price of £25, is designed for DIY installation.

Satellite Solutions, 1 Hartburn Close, Crow Lane Industrial Park, Northampton NN3 9UE (0604 787 888) is marketing, primarily for SMATV system use, a 1m dish that can be used to receive signals from up to nine satellites simultaneously. Its arc-shaped face (an 'adapted parabola') enables each individual LNB to see the equivalent of a high-quality standard 1m dish. The dish, manufactured by Swedish Microwave, is made of ABS. When used with Satellite Solutions' 22kHz tone switches, new two-input satellite receivers can receive signals from up to nine different satellites.

Ghost Cancelling System

The ITC and NTL have developed an experimental system that can considerably reduce ghosting. It grew out of work, which was later abandoned, for the PALplus system. The ITC decided to continue development however.

A Ghost Cancellation Reference (GCR) signal is inserted on line 318, during the field blanking interval. It's ignored by a standard receiver but is compared, by a set that incorporates ghost-cancelling circuitry, with a signal held in memory. Digital filtering is then activated to cancel out spurious signals.

A similar technique has been used for several years by the Japanese ClearVision system. The ITC/NTL system has undergone trials by SC4 at Wenvoe and has recently been added for a trial period to the Channel 4 transmissions from Crystal Palace. As a result of this development work the GCR signal has been accepted as an international standard for 625-line PAL/SECAM systems. A number of companies, including Philips, are understood to be interested in using the system. Add-on boxes for existing receivers could appear later this year, with sets that incorporate ghost-cancelling circuitry being launched in 1996.

NVQs

There have been developments in the attempt to establish National Vocational Qualifications in the electrical and

electronics servicing field. An adviser has been appointed, and meetings have been held. But the task is still considered to be difficult and the Electronics Examination Board feels that it will be at least six months before a submission can be made to the NCVQ.

Video News

A US company, Virtual I/O, has developed a Personal Display System (PDS) that enables appropriate video and TV material to be watched in 3D form. It consists of glasses with LCD screens that provide left and right images for the eyes. Each eye receives one of two interlaced fields that are supplied sequentially. As a result, a 3D image is seen. US cable operator Tele-Communications Inc. expects to distribute suitable signals later this year, and will also be supplying 3D-enhanced video games. An advanced version of the system would incorporate a tracking device to follow head motion with video games, so that the image moves in sync with the user's head movements.

Wide-screen TV sets have been making gains in the Japanese market. Sales have apparently risen from 60,000 in 1992 to 300,000 in 1993 and are estimated to have reached 1.5m in 1994. To put this in perspective, one in five sets sold in Japan in 1994 is thought to have been of the wide-screen variety. By the year 2000 the EIAJ expects wide screen to have become the dominant format.

Sharp and Sony have both launched televidoes (combined VCR/TV sets) in the UK recently. Sony's KV-V1410 at £450 has a 14in. TV set and VHS deck. Sharp's similar VT3705H, also with a suggested price of £450, includes a VideoPlus timer system.

Trade News

Roberts Radio, which was founded in 1932, has been bought by Glen Dimplex. It's understood that the firm will continue to be run as an independent business, possibly adding TV sets and VCRs to its range – and maybe resurrecting the Dynatron brand.

We have received several queries recently about spares for the Cascade TV Model TV510. Our thanks to John Pitt-Francis who tells us that spares are available from Ross Consumer Products, Emlyn Street, Farnworth, Bolton, Lancs BL4 7EB (0204 862 026). Apparently Ross has recently taken over Cascade Electronics. There is only a limited stock of spares.

Philex Plc, 110-124 The Broadway, West Hendon, London NW9 7BP (081 202 1717) has been appointed a distributor for HR Diemen line output transformers. It can supply over 3,000 types for the replacement market, for both TV sets and computer monitors. HR Diemen is an OEM for some of the largest European electronics companies, including Philips.

Multimedia/CD-ROM News

Sony has released details of its Play Station games system. It uses a 32-bit RISC processor and has 16Mbits of main RAM, 8Mbits of VRAM and 4Mbits of audio. There's 24-bit colour and the system can flat shade over 1.5m polygons per second. The sound processor can provide up to 24 channels of 16-bit audio. JPEG compression is used to provide full-screen video and up to 35 minutes of video can be stored on a CD-ROM. Data can be stored on a memory PCB. Outputs include composite, RGB and S-video and phono stereo. The system is now on sale in Japan at the equivalent of about £260. Black CD-ROMs that cost around



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£38 each are used. No UK launch date has been announced. Sony has developed a digital multimedia set-top decoder for 'information superhighway' use and is making decoders for the US DirecTV satellite TV services (see above).

Atari has joined forces with the UK group Virtuality Group to offer a home virtual reality system by Christmas 1995. The system works with Atari's 64-bit Jaguar games console. Virtual Group will develop the Head Mounted Display (HMD) which is expected to be offered at around £135. The Jaguar console would add a further £150.

Virtuality Group is also working with IBM on an integrated immersive VR system for the consumer market. The PC-based system is expected to be available next year.

Nintendo is to show its Virtuality Boy system at the January Las Vegas CES. It goes on sale in Japan this spring. The player uses a 32-bit RISC processor and cartridge-based games which will cost around £50 each. The HMD has two high-resolution mirror-scanning LED displays which create full-sized red 3D images against a black background.

US company VictorMaxx is to introduce its CyberMaxx headset in the UK later this year at around £500. It works with a PC.

GoldStar has launched a 3DO machine priced at around \$400 (£270) in the USA. In the UK Creative Labs is to offer a system to enable PC users to play 3DO games. There will be two versions at around £200 and £400, the latter including a CD-ROM drive. Forty 3DO titles are expected to be available in the UK by the end of the year. The 3DO company says that over 250,000 players have now been sold worldwide.

Panasonic has developed a combined rewritable optical

disc and quadruple-speed CD-ROM drive. It uses a 10mW laser for writing – half the power used by conventional CD recorders. A European launch is due later this year. Yamaha has also announced a quadruple-speed CD recorder. There are two versions at £2,800 and £3,100 plus VAT.

Nimbus has set up an MPEG-1 compression service for transferring full-motion video on to a CD.

In Brief

Cable franchises are now officially known as local-delivery franchises. They allow local operators to distribute TV and telecommunications services via frequencies in the 40GHz band as well as cable.

Radio Rentals has introduced an easy payment scheme for the Closed Captions (see December issue) caption reader. There are now some 300 closed-captioned tapes.

The price of *The Setmakers, a History of the Radio and Television Industry*, has been increased to £25. It's still worth every penny of the price with its 464 pages and lavish illustrations. The book is published by BREMA and is available from John F. O'Neill, 13 Green Curve, Banstead, Surrey SM7 1NS (0737 373 545, fax 0737 357 587). Orders at the previous price will be honoured until February if accompanied by a leaflet giving the original price.

Savoy Hill Publications, Seven Ash Cottage, Seven Ash, Combe Martin, North Devon EX34 0PA (0271 882 665) has a set of brochures which are available free to readers of *Television*. The company has an extensive library of information on vintage equipment and can supply various stylis and cartridges.

Test Case 385

During her five years as receptionist and girl Friday in the test case workshop our Pam has heard of most TV picture faults. This one she didn't believe. Bright coloured stripes down the picture? What colour were they she asked? All the correct colours, and moving from right to left, she was told: what's more they move from left to right when we play a video. Pam put the lady on hold and told Sage about the coloured stripes. Sage, who at the time was working on a CD player whose music seemed to come out backwards, was ready to believe anything. And, as he pointed out, Mrs. Munn was a rental customer. So they would have to go anyway. Technocrat was dispatched to check it out.

When he arrived he found that the picture really did have vertical stripes of colour, and that they really did move slowly from right to left on all four broadcast channels. They moved slowly in the opposite direction on tape playback, just as the lady had said. There were actually three colourless vertical bars spaced by three full-saturation bars. The basic luminance image appeared to be perfectly all right.

Technocrat decided to turn down the colour using the remote control unit. He was surprised to find that it had no effect on the saturation of the bars of colour and that they became narrower the longer he held down the colour-minus key, finally disappearing altogether to produce a black-and-white picture. Next he tried the colour-plus key. This brought the bars of saturation back. They still drifted slowly from right to left, but this time became progressively wider the longer he held the key down. After a few seconds the vertical stripes became wide enough to

unite, leaving a fully saturated colour picture on the screen.

The other remote control functions all worked perfectly, as did every other aspect of the set's operation. It seemed plain to Technocrat that this one wasn't going to be solved in five minutes on site or, in all likelihood, by any of the mundane bits and pieces he carried in his service kit. So a loan set was installed and the coloured-stripes set went into the van. Mrs. Munn grumbled about the replacement set's lack of teletext. She rented a teletext set she said, and she needed it for bingo. Can you play bingo on teletext? It's not an interactive system thought TC as he drove away. Mind you, she was right about the coloured stripes. . .

The TV set in question was a 21in. Hitachi Model CPT2198 (G8Q chassis). It's not necessary to have the circuit to hand or to have an intimate knowledge of the set's workings to get an idea of the area in which the cause of the fault lay. A knowledge of circuit principles helps though. This was, it seems, distinctly lacking in the man who picked up the set in the workshop. He decided that it probably had to do with the pulses fed to the TDA3562 colour decoder chip – and it did, in a roundabout way! The only significant pulse feed to the chip is the sandcastle at pin 7. It was all right and was certainly locked to the line rate, which is more than the drifting vertical bars of colour were!

To try to gain further clues the technician switched to teletext. He found that the text display's colours were correct and locked. The mix function was next selected. Back came the horizontally-drifting columns of fully saturated colour, superimposed on the locked picture and correctly-coloured text display. How many clues were needed in the hunt for the cause of this fault? Strange though it was, a bit of logical thinking would have led us straight to the cause – wouldn't it? Here's a belated clue: it couldn't have happened with a fully bus-controlled TV set. For the solution, turn to page 205.

Canon A10E

The customer complained that his camcorder "made a noise like a helicopter". And so it did! When the machine played back its own recordings the picture was normal but there was a distinct 'beating' noise with the sound. The effect varied with picture content, and seemed to be even more noticeable when a recording was played back via another camcorder. Playback of a test tape was fine. The cause of the symptom was excessive record audio signal level. Adjustment of VR103 in accordance with the instructions in the manual cured it. **D.C.W.**

Sharp VLC750H

This camcorder was dead: no functions were available, there was no power up and no semblance of life. We found that there was a dead short across the d.c.-d.c. converter unit's input connections. The 2.5A ceramic fuse link (on the right-hand case PCB) had of course also failed. **D.C.W.**

Panasonic NVMC30

There was a flickering picture when this machine played back one of its own recordings. Playback of a test tape was fine. We found that one of the record head switching transistors, QR5002, had failed. Thus only three of the four heads were active in the record mode. A replacement transistor cured the problem. **D.C.W.**

Sony CCDF350E

A 'no-operation' fault with this camcorder was cured by replacing the mode encoder switch – it's not a common fault with Sony camcorders. There was a second fault: the zoom motor couldn't be controlled by the W/T buttons. This was cured by replacing IC810 on PCB CV9. **D.C.W.**

Chinon VC1000

One of these camcorders came in recently with a tape stuck in the mechanism and 'EMG LDM' displayed in the viewfinder. The supply guide pole was jammed in the pole base assembly just out of its operating position, at the point of transfer between the cast pole base and the plastic guide rail. This fault occurs during unlacing and is also sometimes experienced with JVC camcorders that use a similar mechanism. Replacement of the guide pole assembly and guide rail cures the problem. Check for possible damage to other parts as a result of the mechanism having been strained. **D.C.W.**

Sony CCDF330E

We were told that a tracking fault was present with playback of a known good tape, the symptom clearing gradually over a period of about five minutes. On test we found that playback of a new recording made by the machine itself produced the same effect, plus coloured flashing lines, the symptoms again clearing gradually to give almost perfect results. The symptoms were present only when the machine was first switched on from cold: once it

had warmed up the fault was no longer present. It took approximately half an hour for the machine to cool sufficiently for the fault to reappear.

Fortunately a check on the playback f.m. signal from the head amplifier circuitry provided us with a clue: 'signals' were present at the f.m. test point in the stop mode! As the machine warmed up these 'signals' cleared to leave, as you would expect in this mode, no output. The 'signals' actually consisted of noise, the cause being inefficient decoupling of the supply to the head amplifier circuitry. Because of the position of the head amplifier module we decided to replace all the miniature can electrolytics within it – they are of a type that has been causing problems with many camcorders, particularly the Sanyo VMD3P. This blanket replacement (five capacitors) provided a complete cure.

With odd symptoms like this we generally start by making scope checks on the supply lines to see whether any noise is present. Much time can be saved by doing this. **D.C.W.**

Philips VKR6830

This camcorder, an early JVC GRC7 clone, was intermittent in operation and eventually ground to a complete standstill! Before this happened however we noticed that the counter display would occasionally flicker or show the battery-low symbol etc. The cause of the fault was loss of the 5V output from the main d.c.-d.c. converter and failure of CP1. The other outputs from the converter were o.k. **D.C.W.**

JVC GRC1

We still get these old-timers in occasionally. Despite our years of experience with them, this one produced a fault we'd not seen before. The symptoms were as follows. When play was selected the tape would load but the picture would appear to be in the pause mode: the machine would then default into the emergency mode. The cause of the trouble was simply that the pinch roller didn't move into its play position because its bearing had seized up. As a result a tooth from its diecast base had sheared off, leaving the assembly stationary. A pinch roller assembly from a written-off mechanism saved the day. **D.C.W.**

Sony CCDF335E

The report with this camcorder stated that there was anything from noise bars on the playback picture to a complete mechanism jam-up with subsequent shut down. The cause of the symptoms was easy enough to see: one of the plastic pegs that hold the tape in its correct position had broken off the moulding on the chassis assembly, allowing the cassette to sit where it pleased. Unfortunately this plastic peg, which incidentally is quite tough, cannot be replaced on its own: the complete chassis had to be changed! This involves transferring all the mechanical parts from one chassis to the other, a time-consuming and expensive job – one to be undertaken during a quiet period! **D.C.W.**

What a Life!

Donald Bullock

Flicking through my paper the other day I noticed that Borneo was in the news. Before the editor seizes his blue pencil let me say that it reminded me of a minor TV mystery that happened to us about thirty five years ago.

My service workshop had graduated from our garden shed to the ground floor of a former terrace house in the city centre. We paid the enormous rent of £1.50 a week for it. At first we carried out our repairs in the front room and made our tea in the back room. But we soon learnt that there was a market for reconditioned TV sets. They sold for £35 to £40 each and had 14 or 17in. screens. So we moved the workshop to the back room and tidied up the front room to provide a display area.

We built in a few deep shelves, bought a bit of thin carpet (a discontinued line), got hold of a few ivy plants in pots and made a hardboard-faced counter. One evening, just before we went home, I painted it. Next morning I was astonished to see the hardboard in mint condition. I ran my eyes down in disbelief. At the bottom, where the hardboard met the carpet, there was a strip of piping: the paint had slid down into a neat roll. So we papered it instead.

We got our sets working and sold a few. But it wasn't long before the place became scruffy – there was no woman about to keep things in order. Dirty tea mugs proliferated on the shelves, the paper peeled off the counter, the carpet scuffed up, the ivy died (we didn't know about watering) and, because we needed the odd valve, tube or line output transformer quickly, most of our sets soon hung sadly from their cabinets, with parts temporarily pirated.

Enter the Governor

While opening our post one morning we were surprised to find an airmail letter, on heavily crested notepaper, that appeared to be from the Governor of Sarawak, a country we'd never heard of. It was a British colonial territory in North Borneo and the Governor was an important man – titled and big. He told us in his letter that he was shortly to retire and would be settling in Cheltenham. He'd heard about our excellent TV services and said we would be just the people to supply him with a good set. When he returned he would be in touch.

This mystified us. We'd run a twelve-word classified advertisement in the local paper for a few weeks but found it hard to believe that many copies were sold in Borneo – for a start it didn't do particularly well at home. We decided that the letter was a hoax from the competition. We had our detractors in the trade, since for one thing we offered a nine to nine call-out service seven days a week.

We did our own aerial work then. When we both had to be out we got our neighbour to keep an eye on the place and answer the phone. He was scruffy and unprepossessing and didn't contribute to the welcome our customers received, though he was in fact a rough diamond.

One day we skipped of out and, it seems, the Governor called in. "Good God!" he cried on entering. "I expected a dashed big shop." Then he looked around our showroom with its pulled about sets, dead ivy plants and peeling counter paper. "Something wrong" he exclaimed, "I'm off!" We learnt later that he used our insurance company for his cover. They'd recommended us, as one client to another.

That was the only time we nearly met a real live British Colonial Governor. Wish we'd handled it better.

Ivor's Saisho

Ivor is a sort of handyman. He called the other day to put up a couple of shelves and while about it brought in his Saisho CT141X for repair. There was no sound or vision, just a noisy raster. This told us that in the absence of any signals the a.g.c. system was working overtime. We measured the tuner's voltages and checked that the varicap tuning voltage varied as we tuned the set. It did. Then we slipped the side off the tuner, took the outer off our aerial coaxial plug, connected a capacitor to its central conductor and popped the end into the r.f. section. Up came a noisy picture.

"Your tuner's up the creek" Ivor I said. We found a second-hand replacement and fitted it. Just then Frau Schmidt entered.

An Hitachi CPT1646

"Is kaput" she hissed as she presented her Hitachi CPT1646 to us. "I font it mended, quick unt cheap."

We soon found the cause of the trouble in her set. Its BU806 series regulator transistor Q902 had failed. This is a hefty device rated at 8W. In the past I've often found that when it fails the little thyristor Q901 (M21C) across on the other side of the chassis also dies. This time it was o.k. So I replaced Q902 and gingerly started up the set via our variac.

The welcome rustle of e.h.t. came up but there was no picture, just a milky raster. The monitor/TV switch at the rear had become pressed in. When it was released we had a noisy raster but the set wouldn't tune and its LED was out. Then the raster became intermittent. Slight movement of the chassis affected these symptoms, and I spent a long time looking for a crack in the print or a bad joint. Eventually I discovered that one end of the 1A fuse FS902 was loose in its socket. Having attended to this I found that the picture kept going snowy and the sound noisy. This was because the tuner's aerial socket flange was almost detached.

Mrs Rhino's Salora

As I was boxing up the Hitachi our door was suddenly kicked open and Mrs Rhino barged in, carrying a 22in. Salora set as though it was an empty tea-chest. I looked at the back door anxiously. First because of Mrs. Rhino, and secondly because the Saloras I've had here have either frightened or exasperated me.

"Dead as a doornail" she announced.

It was a 21M87. There are two large heatsinks on the right-hand side of the flat chassis. The S2000AF line output transistor is fixed to the one nearest the LOPT. It was short-circuit base-to-collector. I replaced it – a fiddlesome job – then started the set up with the variac. Up came an excellent picture. Then the set spluttered and died, though it at no time drew excessive current. The new S2000AF was short-circuit, like the original one. Time to look for further trouble. I soon found it. There were lots of dry-joints around the line output transformer. After resoldering them and fitting another transistor the set worked well enough. Don't ask me why I didn't check for dry-joints first!

The Matsui 1580

I pulled over a Matsui 1580, which is the same as the Saisho CT159TX and the Bush 2020. This one was also

dead. The BU508D line output transistor and the BU508A chopper transistor were both short-circuit. But replacements failed to restore the set to life. So we looked in the manual and checked the h.t. voltage at TP44: instead of being 110V it was nearly 160V! We switched off quickly and brought the variac into play. It's a TDA4601 type power supply, which should regulate on the primary side of the circuit. Maybe it wasn't being properly loaded.

We checked the TDA2579 timebase generator chip IC401 and found that its supplies were missing. This led us back to rectifier diode D805 and the surge limiting resistor R811 (1Ω) which was open-circuit. A replacement restored normal results, but the TDA4601 chip was sluggish in starting up. A check showed that the start up voltage at pin 9 was only 8.6V, which is not enough for reliable operation. The feed resistor R817 (2.7kΩ) had gone high in value. Putting that right completed the repair.

Vic's Philips Set

Then Vic the Vet called in with his Philips 21CE4559/05R TV set (2B chassis). The sound was perfect but the picture was warped, fading and unstable. We suspected either ripple on the supply to the signal circuits or perhaps trouble in the i.f. strip.

The supply was o.k., so we concentrated on the rather large tuner/i.f. module. A signal fed to it from our signal generator produced perfectly good, stable vision. As we could see nothing wrong with the module we resigned ourselves to fitting a new one. But the quotation was £60 plus VAT! We then phoned David Whitworth (Sendz Components) who for once wasn't out fishing. It's always interesting to talk to Dave. He looked us out a mint replacement and sent it to us for a tenner plus VAT. It worked a treat.

Mr Sirr's Hitachi

Our final visitor that day was Mr Sirr, who's a schoolteacher. He brought in his Hitachi set and told us that the picture was very poor. Because, he explained, there was no red content.

He was right. There was no red though the tube's red drive was o.k. The tube's base voltages were all correct, but the emission of the tube's 'good' guns was awful. The picture was dim. Who was going to tell Mr. Sirr? The answer was me.

"Got a second-hand tube then?" he asked. We found a scrap set and changed the tube. This produced an excellent picture apart from the fact that the height was reduced by about a half. We took out the field module and resoldered its joints, using the big iron. Whilst at it we replaced the nearby electrolytic capacitors that go low in value to cause problems of this sort. All this made no difference.

What else could we do? We decided to borrow the scrap set's scan coils. Fitting these produced a perfect picture. Why? The resistance of the original field scan coils could have been high, or the coils could have been dry-jointed. In either case they might have been able to handle the worn out tube's severely depleted beam current but not the replacement tube's much greater beam current. There was a way of finding out, but no way were we going to swap over the tubes again.

We explained it all to the schoolmasterly Mr Sirr when he returned to pick up his set. "Learn from these things, I always say" he commented as he wrote out his cheque. "You've learnt a lot today lads. Well done! Now open my car door for me will you Donald? And Steven, you carry the set out and put it on the seat. Carefully, mind. It's just been repaired. . ."

Next Month in TELEVISION

SERVICING THE ITT COMPACT 80R CHASSIS
Start of a series by Chris Watton on ITT chassis from the CVC1200 to the Digi 3. The first article deals mainly with the Compact 80/80R, which was derived from the CVC1200/CVC1210 series chassis.

TEST TAPES AND CASSETTES

Eugene Trundle describes the test tapes and cassettes available and their use. Because alignment tapes are expensive, DIY test tapes can be recorded to serve most fault-finding and mechanical adjustment purposes, leaving the factory-standard alignment tape for sorting out more obscure problems and electrical adjustments. Also some simple cassette adaptations that are useful for carrying out certain checks.

CD PLAYER SERVICING

Les Austin on cleaning laser lenses, a method of soldering surface-mounted chips and faults experienced with the Ferguson CD07 and CD08.

QUICKIE PROJECTS

John Pitt-Francis describes a couple of modifications that provide helpful features cheaply. A BSB satellite receiver converted for D2 MAC can be modified to provide an output that enables many older monitors to be checked. Secondly a modification that gives continuous playback with most VCRs.

LOSS ADJUSTMENT INCOME

Robert Blair on a source of extra income for TV/video service engineers - loss adjustment on insurance claims. Insurance companies require the services of experienced engineers for this work. It won't make you a fortune, but can be a worthwhile sideline. How to go about it.

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Servicing Audio Power Amplifiers

Joe Cieszynski

Power amplifier circuits date from the earliest days of electronics, many of the concepts in use having been evolved in the days of thermionic valves. Indeed those who service professional stage equipment often find themselves, even today, tackling valve circuits.

Servicing power amplifiers is not always as straightforward as it might seem: problems frequently arise when incorrect procedures have been followed. In this article we'll look at the sort of problems that might be encountered and ways of avoiding them. Because of the many variations in circuit detail found in practical circuits it will not be possible to cover every eventuality. We will however cover the basic principles of servicing solid-state power amplifier circuits.

Discrete Component Output Stages

From the late Seventies discrete transistor power output stages were used less and less in domestic equipment as

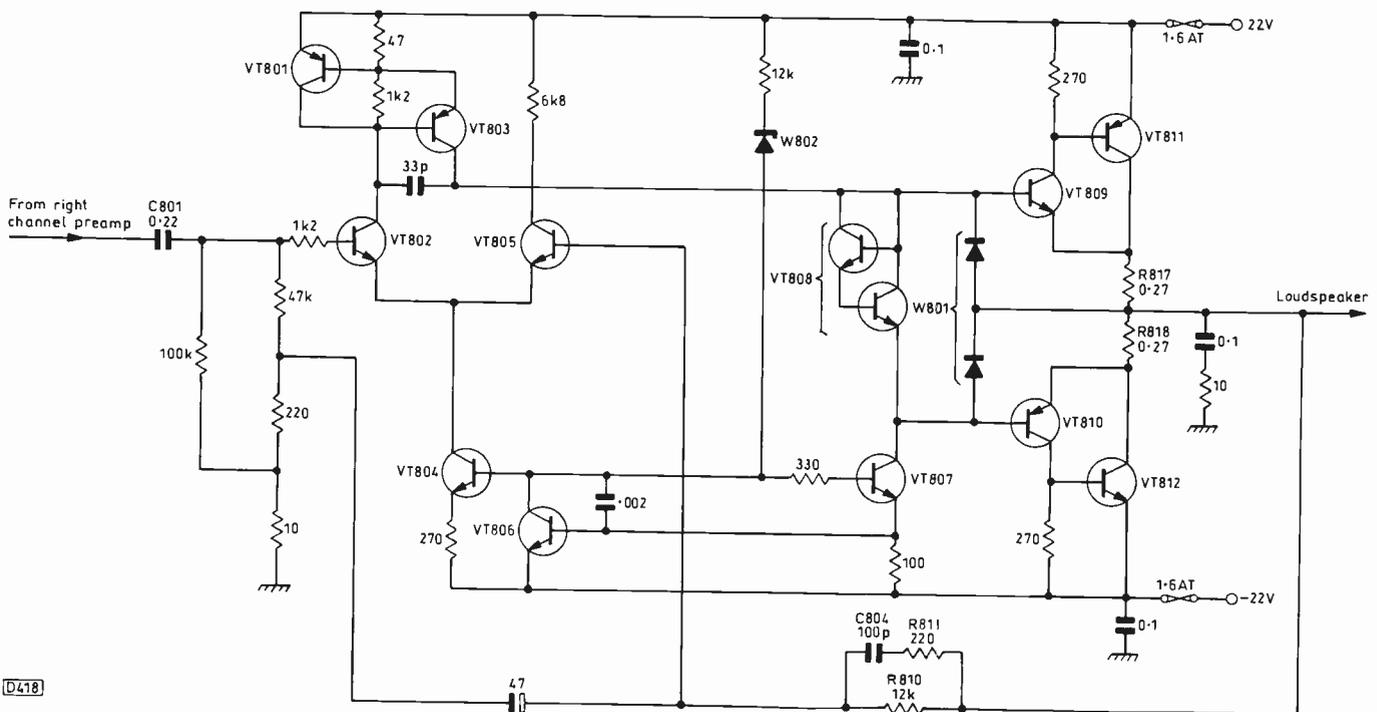
silicon chip technology took over. I cannot say that I was sorry about this, as I often found (and still do) discrete component output stages tedious and frustrating. Certain approaches need to be adopted when servicing transistorised power output stages. For my part, I am eternally grateful to Inowe San for his patience when teaching me the art of power amplifier servicing while I was undertaking my apprenticeship at Sharp UK in the early Seventies. The following paragraphs outline some well-proven tactics.

When a power amplifier fails, the symptoms produced are well defined. There may be distorted sound or no sound, fuse blowing or an uncontrollably loud 100Hz hum which is usually accompanied by smoke and eventual fuse failure. Patience is the first requirement. If you rush over the repair of a discrete device power amplifier you will only end up with a pile of blown transistors.

The design of a quality class B power amplifier quickly becomes more complex as additional circuitry is included to overcome the two classic problems associated with such amplifiers, i.e. crossover distortion and thermal runaway. A typical discrete transistor class B circuit is shown in Fig. 1. It was used in the Thorn 80 series 25W amplifier and was subsequently modified to produce 45W by raising the supply rail voltages and fitting higher-rated transistors in positions VT811/VT812.

The first thing to note is that d.c. coupling is used throughout the circuit. As a result a single component failure can have a domino effect. The reason for using so much d.c. coupling is to maintain constant bias current over a wide range of operating temperatures. If this is not achieved the circuit will be prone to thermal runaway and/or crossover distortion.

At the input, VT802/VT805 are connected as a differential amplifier. The signal is fed via C801 to the base of VT802 while VT805's base is connected via



D478

Fig. 1: The Thorn series 80 power amplifier circuit which was used in many of the company's models in the Seventies. It provided a 25W output and reflects typical design trends with discrete transistor power amplifiers. Note the split supplies (+22V and -22V) and the complex current regulation and biasing arrangements. VT802 and VT805 form a differential amplifier at the input, with VT804 and VT806 providing a constant-current source for this stage. VT803 is the driver transistor while VT801 provides drive current limiting. VT807 is a constant-current load for VT803. VT808 (two cross-connected transistors) act as a pair of bias diodes for the output stage, with dual-diode W801 providing output current limiting. The output stage consists of two compound pairs, VT809/VT811 for the positive-going half-cycles of the audio waveform and VT810/VT812 for the negative-going half-cycles.

R810/C804/R811 to the centre point of the output stage, i.e. the junction of resistors R817/R818. The output from this stage, taken from the collector of VT802, is the difference between the two inputs. It controls the output stage bias via the driver transistor VT803. This arrangement is used to maintain the d.c. output at the junction of R817/R818 at 0V. Because of the d.c. feedback loop you can appreciate that failure of any of the transistors around the differential amplifier input stage could result in excess current through the output transistors, leading to their destruction. Voltage checks in such a circuit under a fault condition simply cause confusion: invariably all the voltages throughout the circuit will be incorrect and will mean very little. The task of testing is often further hampered by the fact that the fuses blow as soon as the amplifier is powered.

When you have an output stage that's dead or blowing the fuses the natural thing to do to start with is to remove the power transistors and test them for being short- or open-circuit or leaky. But experience has taught me that this is not enough. On many an occasion I've found that there have been other leaky transistors farther back in the circuit. These would have resulted in the destruction of a new output pair. Because of this I have on many occasions simply replaced every d.c.-coupled transistor in the circuit, on the principle that if you have to remove each one to test it you might as well fit a replacement. As the majority of the transistors are small-signal devices they add very little to the final repair bill and you will have eliminated the chance of a leaky device not being detected.

In this day and age the only difficulty about trying to replace every transistor is lack of availability. This leads us to the next important point: equivalent transistors.

Use of equivalent transistors is common practice in most service departments. Generally there are no problems. When it comes to servicing power amplifiers however my experience suggests that it is inadvisable simply to look through your equivalents book for a handful of devices which ought to be suitable substitutes for the ones you are replacing. In a circuit such as that shown in Fig. 1 the biasing is critical and must remain stable over a range of operating temperatures. In many cases the characteristics of so-called equivalent transistors listed in data books are similar but not close enough to satisfy the critical needs of a power amplifier circuit. For example VT808 in Fig. 1 consists of two transistors which are connected so that they act as a couple of diodes to maintain a specific bias voltage between the bases of VT809/VT810. Replacing them with equivalents could cause a shift in this bias voltage, resulting in distortion or intermittent destruction of the output transistors. In brief, there are no substitutes like the correct, specified devices. Where possible these should be fitted, even if it means placing an order with the manufacturer.

Where the original transistors are no longer available I can only advise care in the selection of equivalents. If there's slight distortion when an equivalent has been fitted, or maybe thermal runaway every few weeks, there's a good chance that the devices you are fitting are simply not suitable.

Where equivalent transistors have had to be used and thermal runaway persistently occurs after a few hours' use, it may be possible to solve the problem by reducing the bias current. Be careful not to introduce crossover distortion if you do this.

On numerous occasions an amplifier that has just undergone a major rebuild has been brought to me because the output transistors continue to fail. The cause of the problem has often turned out to be the fact that one or more of the transistors has been fitted incorrectly. This is sometimes

easy enough to do. Equivalents often have a different encapsulation, and the output PCB is not always easy to get at. I can only emphasise the need for caution when replacing large numbers of transistors. Don't rush, and try not to let anything interrupt you.

At this point it's relevant to mention the output stage bias adjustment, where provided. After any work has been carried out the bias should be checked and adjusted in the

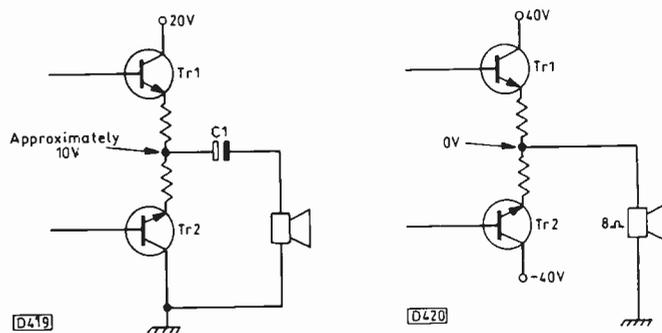


Fig. 2 (left): The mid-point voltage should be roughly half the supply voltage. If it's higher, either Tr1 is passing excessive current, in which case it will run hot, or Tr2 is not conducting, in which case the output stage will be cold. If the mid-point voltage is lower than half the supply voltage, either Tr1 is not conducting (cold output pair) or Tr2 is passing excessive current (output pair overheating).

Fig. 3 (right): The use of split supplies (e.g. +40V and -40V) ensures that the d.c. voltage across the loudspeaker is zero and removes the need for an output coupling capacitor (C1 in Fig. 2). Should either output transistor go short-circuit however the loudspeaker will be directly connected across one side of the power supply. The result will be high-power dissipation in the loudspeaker coil.

way described in the manufacturer's service manual – assuming that adjustment is possible. Adjustment usually involves connecting an ammeter in the main current path of the output pair of transistors then switching on and adjusting for an idling current of around 10-30mA (after allowing about ten minutes for the circuit to warm up).

Another important thing to check when short-circuited output transistors are being replaced is the value of the emitter bias resistors (R817 and R818 in Fig. 1). The value of these resistors is never more than a few ohms but is critical: any slight change, even a fraction of an ohm, can result in thermal runaway in the output pair. Where I have to order parts from the manufacturer I normally include the emitter bias resistors in my order as a matter of course to save any bother at a later stage. These resistors should always be tested carefully and, if you are in any doubt, replaced.

I said earlier that d.c. voltage readings are not very helpful when working on a d.c. coupled amplifier. Although this is true of the actual amplifier circuit, the supply rail voltage(s) should be checked (note that the driver stages may operate from a separate, lower-voltage rail).

Another thing that should be checked at an early stage in your investigations is the output stage mid-point voltage. This will tell you a lot about the nature of the fault. The mid-point voltage is that between the two output transistors (between R817 and R818 in Fig. 1) and chassis. Because the two output transistors conduct equally, the voltage should be approximately half the supply potential. Fig. 2 provides some useful guidelines.

The series 80 circuit (Fig. 1) also illustrates a feature that's common to most modern audio output stages, the use

of dual power supplies (+22V and -22V in this case). Early push-pull transistor output stages relied on a large-value electrolytic capacitor to provide current for the negative-going half-cycles of the audio signal fed to the loudspeaker. There were two major drawbacks with this. First the capacitor's high reactance at low frequencies produced a fall off in the bass response. Secondly the charging current at switch on produced a 'thump' in the loudspeakers. This was considered to be an annoyance to the listener and didn't do the bass units a lot of good either.

Although more expensive, dual power supplies eliminate these problems. A danger with this type of supply is that when one of the output transistors goes short-circuit the loudspeaker will be connected across one section of the supply, see Fig. 3. Most amplifiers of this type incorporate protection in the form of fuses or thermal cut-outs. Beware of those that don't! I have lost more than one bench test speaker when this occurred. I should add that this problem is not restricted to discrete device output stages: power chips can produce the same fault condition.

Integrated Circuit Output Stages

Low-power audio output i.c.s have been around for many years, the TBA800 for example. It was not until the mid Seventies however that higher-power devices became readily available. When they did, audio servicing became much simpler.

At present the majority of domestic amplifiers, from cheap 10W models to high-quality 70W systems, incorpo-

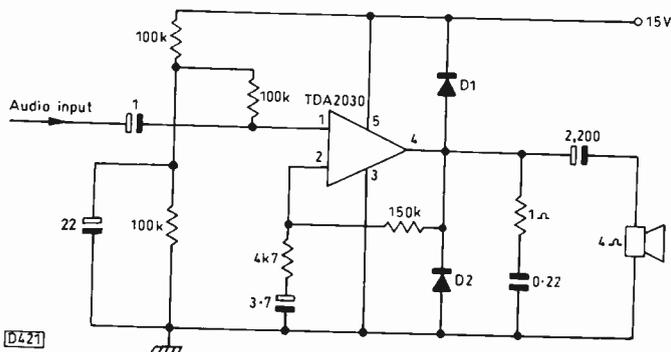


Fig. 4: Suggested circuit arrangement for the popular TDA2030 single-channel audio output chip. Input pins 1 and 2 are connected to an operational amplifier (basically the differential amplifier shown in Fig. 1). The signal is fed to pin 1 while pin 2 is used for feedback. The chip can deliver a maximum of 21W to a 4Ω loudspeaker, though the circuit shown here is a 10W version. The chip is supposed to be short-circuit proof, but in my experience whenever a short occurs across the speaker output (usually because the customer has tampered with the leads) the chip is reduced to a pile of ashes.

Should the i.c. fail in a circuit of this type it's wise to check diodes D1 and D2 for being short-circuit or leaky.

rate stereo power output chips. My own feeling is that the integrated circuit output stage is only marginally more reliable than the discrete device counterpart. But when failure does occur the repair is much simpler and faster.

From the servicing point of view dealing with chips is much the same as dealing with discrete devices. The fault symptoms are the same, i.e. no sound, distorted sound or an uncontrollable, loud 100Hz hum, sometimes accompanied by fuse blowing. In an extreme case the chip may have a hole in its side where thermal runaway has taken its toll.

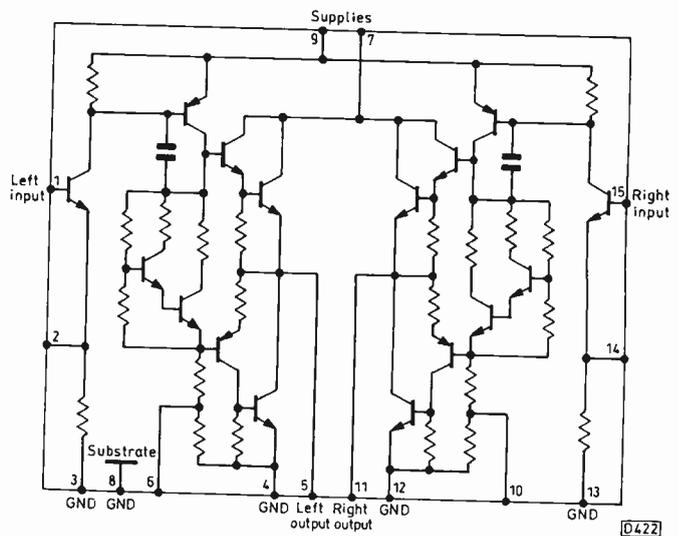


Fig. 5: Circuitry within the STK433 stereo power output chip. This type of chip began to replace discrete device circuitry during the late Seventies. Despite integration the circuit configuration remains similar to its discrete forerunners, making it vulnerable to the same types of failure. Such devices are particularly unforgiving should the pins be shorted accidentally whilst carrying out checks. It's also quite common for internal breaks in the substrate to occur. This results in symptoms you would normally expect to be produced by a dry-joint.

When you have to work without a circuit diagram, testing is not difficult with this range of chips. The inputs are generally the two centre or the two outer pins: 'buzzing' the input pins will generally indicate whether or not the chip is operational.

Diagnostic checks are fairly straightforward. For no or distorted sound a signal can be injected directly at the chip's input pin. You can use a signal generator or the DIN output from another piece of audio equipment, but in most cases it's sufficient simply to inject 50Hz pick-up from your body via a small screwdriver. Voltage checks at the chip's pins will be about as useful as with discrete component circuitry. The only useful checks are those on the supply rail(s) and at the output pin (equivalent to the mid-point voltage with a discrete transistor circuit).

I've come across occasions where defective discrete components have led to failure of a new power i.c. So I recommend that when an i.c. has failed completely, especially with fuse blowing, a careful visual check is carried out on the surrounding resistors and diodes for any signs of burning. In addition I usually carry out a quick in-circuit check on any diodes.

You occasionally get an intermittent sound fault with power chips, giving the impression that there's a dry-joint. In other words the sound may come and go when the equipment is tapped. There may in fact be a dry-joint, the most likely place being at one of the chip's pins, but the fault can also be caused by the chip itself being intermittent.

Figs. 4, 5 and 6 show some representative i.c. power output circuits.

MOSFETs

One problem with bipolar transistors is the difficulty in designing a device that's capable of handling high currents. Amongst other problems, a bipolar transistor is prone to developing hot spots in its crystal structure when it passes a high current: these hot spots can lead to its destruction. Field effect transistors do not suffer from this, making them

ideal for power applications (other factors relating to power f.e.t.s were covered in my article on Switch-Mode Power Supply Developments, *Television* February 1992).

Power f.e.t.s are not new to audio output circuit design – they have been with us for about twenty years. Because of their high cost however they have generally been confined to the higher quality (and power) end of the hi-fi market. As they are infinitely more reliable than their bipolar counterparts it's rare to have to replace them. When they do fail they tend to go short-circuit rather than open-circuit, resulting in fuse failure.

Should you have a MOSFET output stage amplifier that produces no sound from one channel I would advise against going straight to the output devices. If there are no signs of overheating or fuse blowing, check for the obvious things such as breaks in the PCB or loss of a supply, then investigate the preamplifier and pre-driver stages. Also watch out for muting circuits that may have become active, especially where the equipment is controlled by a microcomputer chip.

Service Hints

The following tips apply to all types of solid-state power amplifiers (bipolar, f.e.t. and i.c.).

I've already mentioned that in most instances d.c. voltage readings, apart from supply and mid-point checks, are of little assistance for fault diagnosis. I should in addition emphasise the need for care when measuring voltages in power amplifier circuits. It should go without saying that when carrying out any measurement you should ensure that the meter probe doesn't short out any other part of the

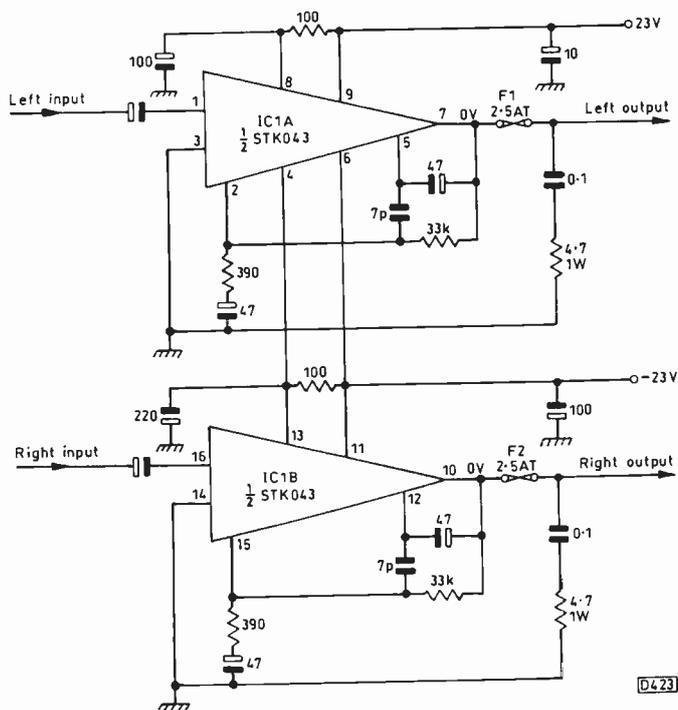


Fig. 6: A practical STK043 stereo power amplifier circuit. The encapsulation is similar to that of the STK433 (Fig. 5), but this chip uses dual power supplies.

Note the output protection provided by the 2.5AT fuses F1 and F2. Should one of the integrated power output transistors go short-circuit, the relevant loudspeaker will be connected across a 23V supply (see Fig. 3). Unfortunately, should an 8Ω loudspeaker be used the d.c. may fail to exceed 2.5A. Thus the fuse won't blow and the loudspeaker coil may burn out. Thermal cut-outs provide a more effective form of protection.

circuit. With some circuitry you often get away with such accidents when they do (inevitably) occur, but with a power amplifier it's rare to come off scot free. Almost immediately the output devices are likely to go into the thermal runaway condition and you will hear the ominous hum followed soon after by the flashing of fuses. Should this happen you might try to be philosophical and reflect that at least you won't have to carry out all those ohms checks in the output stage since the whole thing now needs to be rebuilt!

Where both output stages (left and right) are defective it's best to tackle them one at a time. Disconnect the power feeds to one channel and work on the other. When this has been repaired I suggest that you then disconnect the power feeds to the working channel before starting work on the other one. I recommend this power supply disconnection because on a few occasions I've had a working channel fail while working on a powered defective channel, presumably because the biasing conditions have been upset as a result of the faulty channel affecting the supply voltage.

One reason for repeated failure of power devices is lack of heatsink compound. Always ensure that there is sufficient compound when you replace a power device. When the device is very old you often find that the compound has dried up and is flaking. In this case clean the compound off the heatsink with methylated spirit then apply new compound liberally. Heatsink compound should not be regarded as an optional extra put on by the manufacturer. The application of compound by the service engineer may well avoid equipment bounce back after a short period.

It's also advisable to check the condition of the insulating washers, spacers etc. when replacing power devices. A mica washer can be cracked when a defective device is removed. I've also known the screws to split the insulating spacers between the device and the heatsink, resulting in a short-circuit or high-resistance path between the two. With an insulated transistor I generally check the resistance between its collector and the heatsink before making any connections to the device. Any resistive leaks will show up at this point.

Be on the lookout for open-circuit safety resistors and circuit protectors, which are being incorporated in increasing numbers to make equipment comply with safety regulations. Though it can be a pain at times, the correct replacements should be fitted. A carbon resistor is no substitute for a safety type, and a roll of 22 s.w.g. wire is not a circuit protector.

Peripheral Arrangements

As with most modern equipment, the power amplifier is surrounded by other high-tech circuits that can also give trouble.

Most quality amplifiers now employ switch-mode power supplies (these are often referred to as pulse power supplies when used in audio applications). The reasons for this are obvious – greatly improved efficiency, better regulation, smaller and more effective smoothing, and improved amplifier l.f. response because of the elimination of the 100Hz mains ripple.

The use of switch-mode power supplies affects servicing of course. Their reliability tends to vary from model to model, as with TV sets. When a SMPS fails, the best approach is to treat it in the same way as you would the equivalent section of a TV set.

Another fairly newcomer to the amplifier scene is the optocoupler. When compact disc players and DAT were first introduced the signal had to be coupled from the deck to the amplifier in analogue voltage form. This was in

essence about as silly as having to connect a VCR to a TV set via the aerial system. As with TV/video however it was necessary at the time because of the existing hardware limitations. Just as the scart connector has revolutionised TV sets, so the optocoupler is changing the way in which audio equipment is interconnected.

Basically the digital-to-analogue converters are now housed within the amplifier and all the inputs, from the CD or DAT deck or any other digital signal source, are optically coupled in digital form, thus removing the possibility of pick-up via the leads.

If failure of an optocoupler is suspected – it can occur – an oscilloscope is probably the best diagnostic tool. A clean data stream should be displayed at the output from the optocoupler. If not, or the display is mushy, there's clearly a fault in the optical link – this of course assumes that the signal source is performing correctly.

No sound output problems are not always the result of amplifier circuit failure. Complex mute circuits are incorporated in modern audio equipment, designed to cut out objectionable sounds that occur at power up, power down and on function change. These circuits are often controlled by a microcomputer chip which for various reasons may perma-

nently activate the sound mute. Bear this possibility in mind if you can't obtain any output from an audio system.

Field Output Stage Comparison

It's worth mentioning that many of the fault location techniques suggested here are also applicable to field output stages: after all a class A or B field output circuit can be considered as an audio output circuit with additional feedback for linearity correction. A classic case was the old Indesit T24EGB 24in. monochrome receiver which had two subpanels that each housed a TBA800 chip and peripheral components with identical values. One was the audio output stage the other the field output stage. They were interchangeable, as the circuit differences required were accommodated on the main PCB.

Acknowledgements

My thanks to Hamlets Audio and TV Service of Bredbury, Stockport for giving me access to service information and to Bill Wilcock of Sharp Electronics UK Ltd. for assistance in the preparation of this article.

LNB Modification for the Uniden UST8008

Brian William Ewan

The modification described in this article enables the Uniden UST8008 satellite receiver to be used with a standard- or bullet-type LNB.

To carry out the modification you will need a Phillips screwdriver (a fine point is preferable), a pair of sidecutters, a pair of long-nose pliers, an instrument driver (or fine-bladed screwdriver) and a small quantity of solder. The components required are as follows: a 7812 regulator, a 20mm 200mA anti-surge fuse, a 1Ω 1W resistor and a 68Ω 0.5W resistor. Also three lengths of wire (3cm, 26cm and 43cm). Fig. 1 shows the circuitry involved.

Procedure

With the unit in front of you take off the top of the case after removing four screws (two on the left-hand side and two on the right). Then find the tuner/i.f. unit which is mounted between the two central chassis supports, towards the rear of the case (see Fig. 2). The LNB connection is made to the tuner through the rear of the case.

I have encountered two different types of tuner in these receivers. First there's a narrow Sharp type with the identification number BSF A75 G04 (F 9H 31). It's located slightly left of centre and the connections are made at the side via a ten-pin plug which is fitted to the socket marked

J101 on the main board. Secondly there's a wide type with the identification number BSF 7CC 6YG (F 9F 29). This is located dead centre. The connections are made at the rear of this tuner, via a seven-pin plug to socket J113 on the main board.

Next remove the tuner. Note that all work carried out inside the receiver must be done with the mains supply disconnected. Remove the nut that secures the LNB connector and tuner/i.f. unit at the rear of the case, the two Phillips screws that secure the tuner/i.f. unit's top plate to the central chassis supports and the plug that connects the tuner/i.f. unit to the main board (socket J101 or J113 depending on tuner). Slide the tuner back until the LNB connector is clear of the case, then lift it out. The next step depends on the tuner type.

With the narrow type, view the side and find the pin nearest to the LNB connector. Follow the print path back about 2cm then, using the fine-bladed screwdriver, scratch away the green surface and the actual copper print so that the connection between the pin and the wire attached to the plug that goes to the main board is broken.

With the wide type, view the rear (side farthest from the LNB connector) and find the left-most pin. Follow the print path back 2-3cm then, using the fine-bladed screwdriver, scratch away the green surface and the actual copper print so that the connection between the pin and the wire attached to the plug that goes to the main board is broken.

With both types of tuner connect the 26cm length of wire to the pin identified above. Replace the tuner/i.f. unit and secure it with the two Phillips screws on the top plate and the LNB nut at the rear of the case. Reconnect the plug to socket J101 or J113.

Now add the extra components required. Don't handle

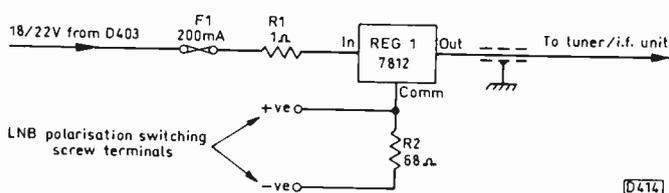


Fig. 1: Added circuitry required.

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them whilst soldering - they get very hot. Solder one end of the short 3cm length of wire to one end of the fuse (F1) and one end of the 1Ω 1W resistor (R1) to the other end of the fuse. Solder the 43cm length of wire to the free end of R1. Cut the surplus parts of the resistor's leads as short as possible.

Solder the 3cm length of wire from F1 to the leg marked '+' on D403 (it's on the main board). Form F1 and R1 into an L shape (see Fig. 2) at their junction. Feed the 43cm length of wire through the hole in the top left-hand chassis support then across to the right-hand side. Ensure that R1 and F1 float free of other components in the power supply.

Relocate panel PF 130 AA which is near the LNB polarisation switching terminals (two screw terminals at

rear right of the case). To do this, remove the screw at the top right-hand side of the outer chassis then slide the panel back - take care not to dislodge the wires that connect it to the main board. Secure the subpanel by means of a screw through a new hole at the same level but farther towards the front of the receiver.

Solder the 68Ω resistor R2 between the internal legs of the LNB switching terminals.

Mount the 7812 regulator midway along the right-hand central support as shown in Fig. 2, with a mica washer and an isolating ring for the screw so that the metal part of the regulator is isolated from the chassis. Use a 4BA nut. The chassis will act as a heatsink.

Solder the remaining, 26cm length of wire to the side of R2 that's connected to the positive LNB switching terminal. Solder the other end to the regulator's centre pin. Solder the lead from the tuner to the regulator's output pin (nearest the rear of the receiver) and the lead from R1 to its input pin (nearest the front of the receiver).

Replace the receiver's top and refit its securing screws.

Testing and Setting Up

Connect a Marconi LNB and the mains power supply. With the dish correctly aligned, select an Astra channel. Press the polarisation button inside the control flap twice. A change in picture quality, e.g. total disappearance of the picture, will indicate that polarisation switching has occurred. Press the button again. Return of normal reception will indicate that polarisation switch back has taken place.

Set up the receiver for all available Astra channels.

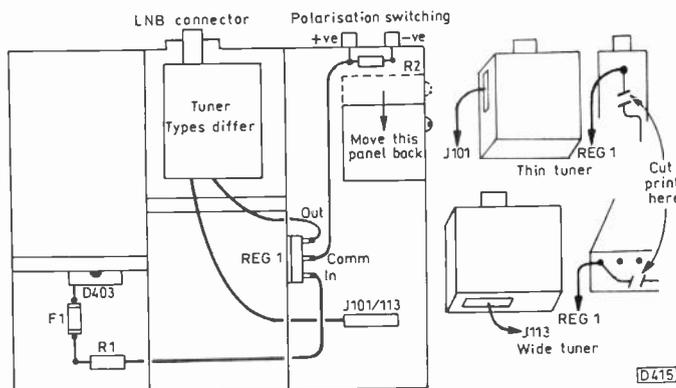


Fig. 2: Physical layout, showing the implementation of the modification.

Long-distance Television

Roger Bunney

A high-pressure system centred over Western Europe during mid-October produced excellent tropospheric reception, with signals literally pouring in on the 13/14th. The tropospheric enhancement disrupted many terrestrial TV services, also v.h.f. communications for emergency services. I was particularly pleased to receive a new test pattern, RTBF's 16:9 version, on ch. E3 and also in Band III and at u.h.f.

Denmark was well received here at Romsey on chs. E7 and 8. Numerous German, French and Benelux stations were received during the opening, which began to tail off on the 15th. For those in the north and east reception from Scandinavia was predominant. Earlier in the month, as the high-pressure system moved in, the usual Spanish signals were received in the south west, also RTE (Ireland) in Band III.

Otherwise there was enhanced MS (meteor scatter) reception and some minor Sporadic E openings occurred. The more prominent SpE reception is listed below:

6/10/94	TVE (Spain) chs. E2, 3.
7/10/94	DR (Denmark) E3.
8/10/94	RAI (Italy) IA.
10/10/94	TVE E2, 3.
17/10/94	RAI I, B, TVE E2, 3, 4.
24/10/94	RAI I, B; TVE E2, 3, 4.
25/10/94	NRK (Norway) E2, 3, 4.
26/10/94	NRK E2.
27/10/94	DR E3.
28/10/94	DR E3.
29/10/94	TVE E2, 3.
30/10/94	ARD (Germany) E2; +PTT (Switzerland) E2; RAI IA, B; TVE E2, 3, 4.

My thanks to David Oliver (Birmingham), David Glenday (Bridgend), Peter Schubert (Rainham), Roger Fussell (Torpoint) and Garry Smith (Derby) for sending in reception reports.

The Irish Radio Transmitters Society publishes a monthly newsletter that contains social, short-wave reception and satellite news, Gaelic items and general information for radio amateurs and enthusiasts in Ireland. Aidan Murphy (EI5HW)

edits the satellite TV section. For more information contact Dave Moore, EI4BZ, 12 Castle Avenue, Carrigtwohill, Co. Cork (021 883 555).

Aircraft Flutter

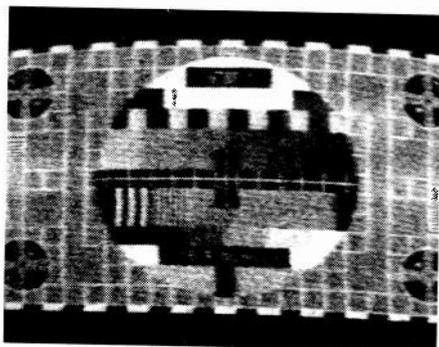
David Glenday now lives near Bridgend on the West Scottish coast, with a main west-bound air corridor en route for North America overhead. When an aircraft is at 10-20° above the SE horizon he receives fluttery u.h.f. signals from the Black Hill transmitter, the effect lasting for about ten seconds. The same effect has produced signals in the London area from as far as the nearer Continental stations. It was covered in great depth in a November/December 1966 RSGB bulletin entitled *A Little Flutter on VHF*, by P.W. Sollom. The effect starts with rapid fluttering, then gradually slows to produce a steady signal, the flutter finally increasing as the signal fades away. I would be pleased to receive any other reports of such reception.

Satellite Sightings

It's been a busy few weeks in space. Events in the Middle East produced numerous news feeds in the telecom band via Eutelsat II F3 at 16°E. Unusually, JCS (Jerusalem Capital Studios) used the FSS band at 16°E on October 20th – check at 10.98GHz H for JCS if news is expected from Israel. Various elections during October also produced news feeds. I caught an election relay from the Newsforce SNG truck in Mozambique via an EBU leased transponder on Eutelsat II F4 at 7°E, a pleasing DX catch. Newsforce uplinks from Africa in Band C, using digital compression: the signal is then retransmitted across Europe for network acquisition in conventional analogue form (usually with sound in syncs). The elections in Germany on the 16th produced numerous regional hook-ups that were carried by Eutelsat II F4 and Kopernikus (DFS) – unfortunately the Kopernikus 1-3 birds at 33.5, 28.5 and 23.5°E are hidden behind trees at my location. Whereas DFS-3 at 23.5°E is used heavily for TV programme downlinks the other two satellites are underused and tend to be fired up only for OBs and news coverage.

The volley of shots fired at the White House produced heavy coverage on the Reuters-leased east-bound feeds via Intelsat K at 21.5°E. It's worth checking transponders between 11.465-11.682GHz on this satellite. Readers have occasionally seen Canal Hollywood test programming at around 12.698GHz V. These are all on spot beams directed at Europe, with generally high signal levels.

A couple of readers have commented on the appearance of the French music channel MCM via Eutelsat II F1 at



Left: The RTBF 16:9 test pattern, received at Romsey during the October tropospheric opening. The identification at the top is RTBF-1, at the bottom 16/9 PALplus. Centre: A French news feed caption from the TF1 Moscow bureau, received by John Locker. Right: An unidentified caption seen via Gorizont at 11°W, 11.525GHz.

13°E on 11-617GHz V, a channel often used by BT. This daytime reception has used clear PAL.

Bandula Gunasekera in Sri Lanka reports that numerous Band C news feeds are present via Intelsat 505 at 55°E, including NHK Tokyo, NHK Paris and WTN London at 3-975GHz, NTSC. Asia Television Network (ATN) is testing a 24-hour entertainment channel via an unknown satellite at 142.5°E. The Ekran ch. E54 transponder now carries NAM TV, a Tamil based channel.

That old favourite on Intelsat 601 (27.5°W) EBU New York (11-475GHz V) moved suddenly for a day or so to the 11-017GHz Atlantic Express transponder then disappeared! The general feeling is that the EBU is still on this satellite but using digital compression and thus, in effect, invisible. Alternatively it could have moved to Band C.

We mentioned DRS Trading (telephone 0932 355 527) last month as a source of surplus and second-hand manually tuned satellite receivers and other satellite receiving equipment. Apparently Alba/Bush and Best receivers have been available for as little as £10 while the company has been known to sell 1.8m dishes for £55. Other items are available at knock-down prices.

News Items

UK: The BBC is to launch a DAB service in the London area in September 1995, operating in the 217.5-230MHz band. It is hoped that by 1998 the service will have been extended to cover 60 per cent of the population.

LAN (local area networking), which is common in office and industrial complexes, is changing to wireless technology. Typical WLAN coverage has been 180m but the MASE company has just introduced transmitting equipment that can increase the coverage to 2km. Frequency is not known and more information is being sought.

Ireland: Tony Jones (Bangor) reports that the projected Gaelic-language TV channel Telefis na Gaeilge is unlikely to be on air until 1996 at the earliest. It will operate for three hours a day initially, at u.h.f. The four proposed TnG stations that are likely to be best received in Wales and the North West are Kippure ch. E59, Three Rocks ch. E55, Cairn Hill ch. E50 and Clermont Carn ch. E68.

Australia: Robert Copeman reports that community TV has started in Melbourne, from Mount Dandenong on ch. E31. A similar channel is planned for Sydney. The community licences extend only till 1997, when a government review is to assess the TV situation in Australia and the future use of channel allocations.

Satellite TV

Sky pirate blocker cards are being sold at pubs, clubs and even via mail order flyers. One flyer I have received offered to reactivate switched-off Sky smart cards and block any switch-off instructions sent by Sky. Sky has been very active recently with Electronic Counter Measures (ECM) in attempts to switch off pirate cards. These have been successful to an extent – even switching off officially authorised cards in the latest campaigns! The company is seeking to prosecute sellers/distributors and their customers in the courts. Canal Plus and CineCinemas have also started up ECMs recently to kill off the pirate D2MAC cards that are widely available. Meanwhile RTL is running encrypted periods via Telecom 2b at 5°W (12-732GHz V) and from November 7th Tele Monte Carlo (12-648GHz V) will also hit the encryption button.

The French news channel LCI on Telecom 2a at 8°W

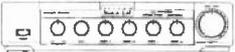
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Aerial Techniques

should stay in the clear until January 1995 when a digitally compressed service that includes LCI is due to open on Telecom 1c at 3°W.

David Thorpe reports that the Russian Express-1 satellite now at 70°W is to move to 14°W to replace the ageing and inclined Gorizont. The new satellite will have ten Band C and two Ku band transponders – check at 11-525 and 11-675GHz.

Intelsat 804, due up in mid-1996 at 21.5°W, will be devoted to communications needs across Africa. It will have both Band C and Ku band transponders. India is to launch a dedicated world satellite service, Doordershan World Service, using Eutelsat and PanAmSat facilities.

Record ATV Reception

In the early afternoon of July 11th in Southern California ATV enthusiast Mike Henkosi (KC6CCC) received 435MHz (70cm) TV signals from Paul Leib (KH6HME) in Hawaii, a distance of 2,518 miles. This appears to be a new World ATV DX record which was apparently achieved through careful attention to weather conditions. For several years Paul had believed that tropospheric ducting would enable pictures to be sent to mainland USA. His transmitter was sited atop the Moana Loa Volcano and ran at 10W. Another South Californian ATVer Gordon West, received the signals at a distance of 2,508 miles. Given appropriate conditions even low-power signals can be trop ducted over vast distances, both via tropospheric and ionospheric propagation. The recent tropospheric opening in Europe demonstrated this

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A DX Reception Aid

Ivor Nathan

I recently purchased from Display Electronics a modestly priced unit which I have since used to receive various channels that couldn't previously be resolved, including foreign stations when the atmospheric conditions have been favourable. It's advertised as the Telebox and comes in three versions, ST, STL and MB. All have a built-in power supply, being mains powered. The version I obtained was the MB, which is a multi-band version. Although the unit is described as a TV sound and vision tuner that can be used to convert a computer colour monitor into a quality colour receiver, it can also be used for receiving long-distance TV signals, being a slightly modified version of a Rediffusion-built frequency translator.

The units supplied are unused and in

immaculate condition. They were originally intended for use with Rediffusion cable services, especially in conjunction with the Rediffusion Mk. 1 and Mk 3 series colour receivers and all monochrome cable receivers. Two Rediffusion leaflets (installation and operating instructions) accompany them, also Display Electronics' own Telebox User Guide leaflet. The ST is the standard version for composite video output (15,625Hz) to a computer colour monitor or VCR, the STL is the same with an integral loudspeaker while the MB is as the ST but with multi-band capability including the hyperband (see below).

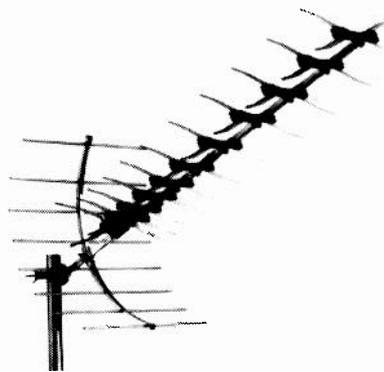
The unit resembles a modern VCR and has eight push-buttons on the tuner control unit. They are above a hinged flap which, when lowered, reveals eight tuning knobs (when closed the flap activates an a.f.c. switch). The first tuning knob is labelled 'c', being originally intended for the selection of cable services. The others are labelled 1-7. Band coverage is as follows: low v.h.f. 48-25-112-25MHz; high v.h.f. 119-25-294-25MHz; hyperband 303-25-423-25MHz; u.h.f. 431-25-855-25MHz (chs. E21 to E69).

Each tuning knob has band selection: push the knob inwards to engage a three-position band switch (hyperband is

when several of the new Polsat relay transmitters were received in the Netherlands.

New Aerial Range

There has been little change in domestic TV aerials in recent years. Now the Danish company Triax has come up with a new full-wave (X) director u.h.f. range which features a curved (parabolic) reflector design. It replaces the well respected Unix 24/44/92 series. The new Models Unix 32, Unix 52 and Unix 100 are available in group A, B and CD/W versions. Gain is similar to the earlier models though the 100 better the 92 by 0.5dBd at the top end of



The Triax Unix 52 high-grain u.h.f. aerial array. Note the parabolic reflector design.

the spectrum and has a slightly improved front-back performance. Peak gain of the Unix 100 centre trombone supported aerial is 17dBd, with a front/back ratio of 27dB. The full range of new Triax u.h.f. aerials should be in stock at main distributors, including Aerial Techniques, by the time that this magazine is on sale.

selected by switching to high v.h.f. then activating a toggle switch at the rear of the unit – the toggle switch has no effect on the other band settings). Tuning adjustments can be carried out by applying a small screwdriver to the hollow centre of each knob.

As I don't have a computer monitor I connected the translator's video and audio outputs (phono sockets at rear) to a VCR's inputs, with the VCR connected to a TV set in the usual way. The appropriate aerial has to be connected to the unit's 75Ω coaxial input socket. A wide-band aerial array covering approximately 48-855MHz could be used or the outputs from individual aerials can be switch selected – either method avoids the wear and tear that occurs with constant plugging and unplugging at the input.

Under favourable conditions I've received low v.h.f. band signals from TVE (Spain) here at Southgate, North London, using a home-made horizontal indoor dipole cut to resonate at about 50MHz. The signals remained steady for half-hour periods during several consecutive days.

The Rediffusion frequency translator is extremely useful for the television hobbyist. It's available from Display Electronics, 32 Biggin Way, Upper Norwood, London SE19 3XF (telephone 081 679 4414, fax 081 679 1927).

Confessions of a TLO

Mark Paul

This article is dedicated to that increasingly rare breed in the consumer electronics industry, that rather special employee known as the technical liaison officer – TLO for short. This fine breed of men – I've never come across a female in the role – were long part of the industry's vanguard. Some might see them as a kind of storm trooper, but they were probably more akin to members of a suicide squad. This was especially the case when the TLO had to step into a commercial breach between the manufacturer and dealer and take the flak.

Liaison Work

An example of this was the dubious honour of having to rubbish those nasty rumours that would circulate in the retail trade from time to time about a fundamental change in a manufacturer's policy – and continue to do so right up to the last minute before the change became a fact! Then there was the challenge of having to try to interpret to the dealer the technical untruths (poetic licence?) that the sales representative had told in order to clinch a sale.

There was also the privilege of facing Mrs McGinty, her four foot from the ground to shoulder Irish wolfhound and her three and a half times nuclear family allowance when they were all desperately in need of a visual fix from the TV. Oh yes and her unemployed husband, attired in a torn vest and with 'love' and 'hate' motifs tattooed on huge 19in. biceps as they rested on the arms of the easy chair opposite the dead TV. One glimpse was enough for the experienced TLO to be able to interpret clearly the man's body language. He's had no racing results for days and his mood is oscillating between a strong desire to kill someone and recollection that his next-door neighbour is a policeman.

And why is the ever smiling TLO in this delightful atmosphere so laced with excitement? Simply to advise the valued customer that the fault is a "very intermittent and rare one" so that the set will have to be returned to the manufacturer's main service department in London for the third time for investigation.

Flexibility

What are the special characteristics of the TLO, those which lead him into situations that any normal, sensible person would do anything to avoid?

The TLO is very, very flexible in all things – with the exception of expenses of course. He can thus be all things to all men. Some TLOs are so good at this chameleon state that they have to sleep with their Filofax to hand so that they can check, first thing in the morning, who they are and where from, things most people take for granted. This daily initialising is essential, in the same way that i.c.s require reset pulses.

Hope

Then there's hope, which is the very warp and woof of the TLO, as essential as Castrol GTX to a Morgan.

Each morning, after that piece of science fiction writing called the itinerary, the TLO has to set out his stall. And each

day starts with hope. Hope that the company has finally paid the last three garage bills, as the car is to go in for a short service and it could be a long day if it's impounded yet again.

Hope that the number of dealers who promised to turn up for the training session will actually do so to avoid the embarrassment of once again having to spend all day with three trays of chicken drumsticks, four of mixed sandwiches, two of assorted canapes, two of sausage rolls, three bowls of crisps and nuts, two of pizza pieces, two of cheese and pineapple, not to mention the sausages laced through with sticks and the obligatory Black Forest gâteau. All this with barely enough present to have a four-hand at whist.

Hope also to get an answer to at least the first twenty of the hundred or so outstanding questions about policy, engineering design problems, dealer service queries etc. that the Service Director has promised, and promised, to come back on. Even to be able to speak to someone at Head Office in a position to listen, let alone give an answer, is a manifestation of hope being rewarded. Just anyone who isn't at the eternal 'meeting'. It may be a little known fact but it's true that Vodaphone, after extensive research, set its call charges on the basis that the person called is likely to be at a meeting.

Hope also that the spare part ordered for the next to be visited dealer will have gone through the processing and arrived, and that the company's Accounts Department will finally, after six months, have sorted out its invoice error so that we can avoid the monthly ritual of the dealer's service account being closed.

And perhaps just a touch of hope that today a greasy-spoon lay-by caravan that sells bacon rolls will take Visa and supply a 'good' receipt.

Yes, hope always starts afresh every morning with the belief that today will not turn out to be as yesterday. But it usually does!

A Special Gift

Then there's that special gift for trouble-shooting, a misnomer if ever there was one. In all too many cases the only trouble that needs shooting is the lovely sales-order-signing, keep-you-in-a-job dealer.

"I've tried everything. It must be a design fault."

"O.K. Have you got the service manual and can we go through the circuit together?"

The dealer dives into a dark corner of the tiny underground workshop and rummages loudly through various half-eaten scrolls while muttering all the while that he never receives regular mailings of service literature.

"How about a Sony STV5001 diagram. Will that do?" he asks moodily. "The power supply looks the same and the fault is definitely in the power supply."

This lack of the relevant technical information adds credence to the claim that "it must be a design fault".

The trouble-shooting, sonic-screwdriver-carrying, answer-to-all-your-problems TLO has several options in a situation like this. He can tell the dealer to get "\$@*&%\$£d", he can arrange for a manual to be sent which on average will delay the next visit by some months during which time this particular dealer will hopefully have gone bust, he can offer to have the particular unit

uplifted for service in the almost certain knowledge that it will be damaged in transit and have to be replaced, or he can exit again into the heavy rain and trudge off back to his car, which he had to park several blocks away, to get a service manual.

A Difficult Decision

A number of factors have to be weighed in arriving at a decision to this conundrum. And this leads us to one of the most frustrating aspects of the TLO's life. The tension lies in having to decide whether to do what's logical or what's expedient. It would be nice to tell the dealer exactly what one thought of him, and emotionally satisfying to see the dealer's face on having been told the truth. But you have to be diplomatic and consider the economic consequences of such an act. You don't want to upset your sales colleagues, and then there's the job and the car and – well, expediency wins. With a flash of discernment, prompted by the vision of mortgage foreclosure and a for-sale sign outside his house, your TLO will go off for the service manual and get wet.

On returning to the fray, in the bowels of the shop, the smirking dealer may offer the TLO a compensatory cup of coffee. Some excuse, such as the fact that his hepatitis A inoculation is up for renewal, has to be dreamt up to refuse the offer. With the correct service information however the damp TLO can proceed to guide the dealer gently through the inner secrets of the product.

The TLO is now in his element and can soar like an eagle to the heights. His service manual is a sort of secret book full of powerful signs and symbols with a deeper meaning that only the TLO can decipher for the open-mouthed, wide-eyed dealer. All this mystique is shattered when the TLO asks his student for the storage scope, which is essential for the next step.

There's a deathly hush before the dealer hands over his pride and joy: a Taylor meter with a bent pointer that gives a 20 per cent error in either direction and a movement that intermittently and randomly sticks. Hasn't he got anything else? Well, there's the calibrated neon screwdriver. . .

But the TLO is a committed person. Once he's made the decision he must follow through to the bitter end – though option one is beginning to push its way to the fore.

Imagination

Another basic characteristic of the TLO, one that helps in a situation like this, is imagination. The company he works for won't supply test equipment either, and all he has is his aged AVO. What now?

Fortunately a recent new stock delivery to the dealer has had the usual accident, with one receiver suffering transit damage. Similar receiver, similar chassis. Change over the chassis and serial numbers, dust off and clean up the faulty one, insert it into the new broken cabinet and return it for credit. Easy when you know how.

It's important to understand that adopting this course does not mean that the TLO has been defeated. Oh no! The move enhances the TLO's image in the dealer's eyes, especially when he explains that only he has the power to do such a thing. Only he has the secret knowledge of the all-important chassis codings.

Training

Another aspect of the TLO's life that makes heavy demands on his personality is training – organising and

delivering technical information to the trade.

The challenge begins when a venue that will meet the Company's needs is being sought. It must have good parking, be geographically central, have state-of-the-art audio-visual equipment, boardroom seating for twenty trainees and a good training atmosphere. A three-course buffet with soft drinks must be provided, plus tea/coffee, and all for £3.75 a head. A six-month delay in paying the account must be acceptable. A marquee on the top level of a city-centre multi-story car park, using candle-powered projectors and open-fire cooking, is unacceptable – they'd want payment up front, which of course is out of the question. In any case, have you ever tried driving pegs into concrete?!

Once venues have been sorted out the question of what is to be the subject matter of the seminars comes up for discussion. The brinkmanship involved in the preparation of the material makes the 'just-in-time' technique sound positively medieval.

Engineering Division has this new design. But only a limited, mainly hand-built production run has so far taken place. As these few units are currently with Marketing and Advertising they are not available. By the way the cabinets are only mock-ups and don't represent the final presentation. TLO training is out of the question at this time, because of the pressure on R & D, but some early design notes are available. It's true that they are not complete or even accurate, that up-dating notes are not available, and it's a pity the information is not in usable order. But then TLOs are experienced operators, used to 'playing it by ear', aren't they? Service manuals? Impossible! Handouts? Are you kidding? Visual aids? Who do you think we are, CNN? Oh well, such is life.

Venues booked and subject selected, now comes the really tricky bit – successfully delivering the training. The 'wish I had never started this training session' TLO has a number of problems to contend with. First there's the 'horse to water' factor. Some engineers come along for the wheeze, the food, the drink, the freebies and little else. Then there's the 'pick and mix' factor. The TLO picks the dealers, on the basis of their turnover, and they in turn send their engineers to the mix of trainees. This mix can be a real challenge.

There are the greying, been there, seen that, done this, pipe smoking engineers who think in terms of electron flow and/or conventional current flow through valves, condensers and body-tip-spot resistors. To them a switch-mode power supply is really no different from a vibrator. When the lecture subject matter gets around to microprocessors their eyes swivel upwards to display that disturbing white that all lecturers know indicates temporary brain death.

Interleaved with these more senior engineers there are the bright young sparks who nod so enthusiastically and have an insatiable appetite for information which they absorb at a frightening rate. Their obvious keenness is both an encouragement and a threat to the TLO. Sure the TLO is there to teach, but who wants to contend with a smart Alec, especially after lunch when the usual itinerary would involve a two-hour sleep in the car in some quiet lay-by?

But teaching and the TLO go together like Haggis and mashed turnip (what?!). He revels in this atmosphere. It's the fix his ego needs. As he swings his pointer about and struts around centre-stage he's the master of the situation. On entering a training session every TLO can instinctively pick out the potential trouble-makers who will try his patience.

There's a Wild West flavour to this scenario. Some

young buck will want to be the one to pick off the experienced 'master' and so claim some sort of glory. The secret of successful lecturing, known well to the TLO, is three-fold. First identify and belittle those who pose a threat to the proceedings of the day. Secondly keep one paragraph ahead of this enemy. And finally there's the TLO's reassuring authority – after all he knows and they don't. The smart Alects don't have a chance. If things do get a bit tricky the experienced TLO can create a diversion, showing his maturity by opening up such subjects as the terminal decline of the industry, the number of unemployed service engineers around, the pointlessness of apprenticeships and, strictly in

confidence, the over the horizon chassis design that will be unrepairable. Thoughts such as these will sharply focus the young mind and defuse any trying situation.

In Conclusion

There are many other things that we've not time to linger on here. Trade Shows, special investigations, entertaining dealers, having fun with Hams and so on. Let me finish with the fact that the TLO, if nothing else, is a survivor. This article salutes him – and, on reflection, sympathises with the service engineers and dealers who have to put up with him!

Launch of Astra 1D

George Cole

Astra 1D, the fourth in the Astra satellite family, was launched at 00.37 GMT on November 1st from the Arianespace centre at Kourou, French Guiana. It will be the first Astra satellite to transmit digital TV channels. I was fortunate to witness the launch and find out what's in store for European satellite TV viewers.

First a little background. SES (Societe Europeene de Satellites) owns the Astra craft. It's a private company, based in Luxembourg, earning its income by renting satellite transponders to broadcasters such as BSkyB. The first Astra satellite, 1A, was launched in December 1988. 1B followed in March 1991 and 1C in May 1993. There will eventually be six satellites co-positioned at 19.2°W so that their signals can be received using a single, fixed dish.

Reception from Astra 1D

Astra 1D operates in the 10.7-10.95GHz, the 10.95-11.7GHz (FSS) and the 11.7-12.1GHz (low BSS) bands. This increased bandwidth means that owners of existing Astra equipment will need to upgrade their equipment for reception from the 1D satellite: a receiver with an i.f. bandwidth of 950-2,050MHz is required and, probably, an LNB with a local oscillator that operates at 9.75GHz. In addition to providing extra channels, 1D will be used as a back-up for 1B and 1C, enabling the Astra family to offer up to 64 analogue TV channels and numerous radio services. SES claims that over 54 million homes in Europe can receive services from Astra via dish, cable or shared dish systems.

Launch Details

The launch rocket used, an Ariane 4, weighs 470 tonnes and can launch payloads of up to 4,270 tonnes. Next year sees the arrival of Ariane 5 on the scene: this will have double boosters and be able to launch payloads that are double the mass of those carried by Ariane 4. It will also be more reliable: Arianespace predicts a launch failure rate of one in ten years of operation.

The Kourou Space Centre is 5° north of the equator, giving clients a choice of trajectory – due north into a synchronous orbit or due east into a geostationary transfer orbit.

Astra 1D is a Hughes HS601 type spacecraft with a lift-off mass of 2,924kg. It can generate 3.4kW of electricity and offers 66 Ku band channels via 18 transponders. Estimated life is 13 years, which is longer than that of many satellites of similar type because it uses a system called perigee

velocity augmentation (PVA). This uses extra satellite propellant to enable the on-board motors to reduce the normal perigee (farthest distance from earth) from 35,975km to 31,053km.

The press were two miles from the launch, the conditions being ideal with clear skies. It was a spectacular affair and we were able to track the rocket for several minutes. Within twenty minutes of the launch Astra 1D was in orbit. This is always a time for celebration for Arianespace, since responsibility is then handed over to the satellite's owner, in this case SES.

Astra 1D will be tested for a couple of months and be ready for operation in January.

Digital TV

Celso Azevedo, SES's technical director, refers to Astra 1D as "a stepping stone to digital TV". With the use of digital compression, between four and eighteen channels can be transmitted by a single transponder (the number depends on the picture quality required – it can range from HDTV to VHS, ten being reckoned to be the optimum number).

SES is offering free digital testing facilities to hardware developers and programme makers and has no immediate plans to charge extra for digital operation, even though users will get more channels per transponder. In the long term however SES is likely to charge by bit-stream capacity rather than the number of transponders rented. Companies likely to be testing digital compression systems include NTL, Thomson and Scientific Atlanta.

The good news for viewers is that, because the European Digital Video Broadcasting consortium has agreed on the use of the MPEG-2 standard, it won't be necessary to have lots of different add-on boxes for digital TV. There is still some work to be done on deciding upon a common conditional access system however. It seems that digital decoders will be able to use two systems, Simulcrypt and Multicrypt.

Celso Azevedo says that digital broadcasting could start in January. But the hardware has to be available. NTL and Pace are jointly developing a digital receiver that's expected to be released in December at about £350. The first broadcaster to opt for digital TV is Canal Plus, which has booked four transponders on Astra 1E (to be launched in early 1995) and two on 1F (for launch in 1996). It won't be long before others follow this lead. But even the 500 new channels that Astra will be able to offer will not, Celso Azevedo feels, be enough to satisfy the demand. SES is already thinking about putting satellites in other orbital positions.

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Review: The Grundig GRD250 Satellite Receiver

Ian Martin

A range of satellite receiver-decoders manufactured at the company's Llantrisant factory in South Wales has been introduced by Grundig Satellite Communications Ltd. Models include the GRD150 and the GRD250, which come in three different cabinet colours. I have had an early one for review.

The two main selling points of these receivers are ease of use and a low f.m. threshold tuner. The former should be easy for the customer to appreciate: the latter should become apparent with use – it means better pictures under adverse weather conditions.

Features

The GRD150 and GRD250 have similar specifications, the main difference being the fact that the 150 has 150 programme memories while the 250 has 250. The latter also has a second LNB i.f. input and an external decoder loop. All versions have a stylish, curved-front case with a pull-down flap that covers the VideoCrypt card slot and the local controls. Only four push-buttons are provided: power on/standby; authorise (for the forthcoming Sky pay-per-view services); programme up and programme down. There's a three-digit green display adjacent to the flap.

The 250's rear panel has scart connectors for TV, VCR and an external decoder. There are also a pair of phono sockets for the audio output and a receptacle for the detachable mains lead. Grundig is at last using an F connector for the i.f. input rather than the TV aerial type connector previously used. However TV aerial type connectors are provided for the r.f. loop through. A small preset potentiometer allows the modulator to be adjusted between channels 32 and 42.

The static f.m. threshold is 6dB or less. The Astra 1D ready i.f. input bandwidth is 950-2,050MHz, with tone switching and thirteen audio subcarrier modes including 50µsec and J17 de-emphasis. Instead of true Panda noise reduction a Grundig state-of-the-art noise reduction system is incorporated.

The remote control unit marks a significant change, particularly in Grundig designs, with clear, well-spaced keys and an ergonomic layout for the main functions. While the numeric and programme up/down keys are arranged

as a conventional keypad, the menu and function keys are arranged in sloping rows. This makes 'one-thumb' operation very easy. With so many other satellite receivers offering similar features at attractive prices a full-sized, ergonomically laid out remote control unit could well be a feature that clinches a sale.

All functions are selected by menus, with full on-screen displays. The receiver comes pretuned, with all the Astra transponders in order, for example programme 001 is RTL2 while programme 064 is RTL5. Although logical, this 'all-channel' mode is not convenient in normal use. So a second 'Sky multi plus' mode is provided. This recalls the twenty most popular channels for UK viewers. A third 'favourite' mode is available, holding the ten most popular channels.

Inside

To remove the top cover you simply release three torx screws at the rear edge. This reveals a large base panel with a smaller top-mounted decoder panel for the VideoCrypt circuitry. Being an early model my sample also had a sub-panel that housed a ROM-less microcontroller chip and external EPROM. Later production models will instead have a mask-programmed microcontroller on the main panel.

The main components are as follows: an STV0020 satellite receiver chip; an NE555N oscillator; an SDA2586-5 non-volatile RAM (one in the 150, two in the 250); an IP3842N chopper chip; a 74HC4052 logic chip; an LM317T voltage regulator; an SFH506-38 IR receiver; a Salcomp i.f. unit; and an SDA20562 microcontroller chip (the subpanel used instead in early versions has an SDA30562 microcontroller, an M27C256B EPROM and a 74LS373BI latch). The VideoCrypt system uses a Thomson chip set and a Siemens card verifier processor. An SFH415 chip is used in the remote control unit.

While many of the components are conventionally mounted on top of the main panel some, including the STV0020 chip, are surface mounted on the underside. One of the first things you notice when the top cover is removed is the amount of empty space: because of the high level of integration and the bottom-mounted receiver chip what's

visible is mainly jumper wires. The wide component spacing should make servicing easier and prevent thermal problems – my receiver was very cool in operation.

Performance

Operation was easy. In the Sky multi-channel mode only one key depression is required to bring the unit out of standby on your favourite channel. To change the parameters is not quite as easy but once set they need not be touched again. For example to adjust the tuning you press the menu key to call up the user menu then select the tuning option, after which the programme up-down keys adjust the tuning. The left and right keys step up and down through the options. Press the menu key again to exit.

Picture quality is excellent, with all the UK channels free of sparklies. Even reception of UK Gold, which can be problematic in this area, was clean. The only channel to show any sparklies was the German Pro 7, but they were much less obvious than with an older Astra receiver.

A factor I consider to be important is low 'line tilt'. This is a change in the d.c. bias along each video line, between the start and the end points. It's not normally noticed, but when a line is cut and rotated, as it is with VideoCrypt systems, the gentle tilt becomes a step. When this happens on every line and each has a different cut point, the result is smeary, horizontal flickering. It was frequently seen with early Astra receivers that had a separate VideoCrypt decoder but, thanks to improved receiver design and integrated decoders, has now been largely eliminated. In this respect the Grundig receiver performs very well.

In Conclusion

The GRD250's performance is good and its large, friendly remote control unit makes it easy to use. Its large case is reminiscent of a VCR, but this would be a plus point if you want to stack it under the TV set with other AV products. The performance and features of these receivers should ensure their success despite the fact that they are being offered in the most competitive section of the satellite TV market.

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1N4001	0.04	ZSC2335	1.56	ZSD965	0.67	BC338	0.06	BFR91A	0.92	CD4066	0.30	M192B1	1.86	SG264A	13.59	TA7281P	2.98	TA02040H	2.11	TEA2164	2.96
1N4002	0.07	ZSC2458	0.14	ZSD973	0.63	BC368	0.25	BFR96	0.55	CD4070	0.21	M293	20.65	SG3F344	7.28	TA7288P	2.04	TA02170	5.00	TEA2165	4.27
1N4003	0.05	ZSC2482	0.35	ZS1115	6.41	BC369	0.17	BFY51	0.39	CD4081	0.15	M491	7.94	SL1430	1.53	TA7299P	2.65	TA02270	3.43	TEA2165A	9.58
1N4004	0.07	ZSC2570A	0.30	ZSK1117	3.06	BC372	0.62	BR100	0.21	CD4093	0.32	M494B1	5.65	SL1431	1.70	TA7317P	0.93	TA02540	1.10	TEA5101A	3.95
1N4006	0.06	ZSC2581	0.25	ZSK192A	0.36	BC461	0.31	BR103	0.53	CD4093	0.36	M51387P	10.68	SL1432	8.54	TA7609P	4.92	TA02541	1.80	TEA5115	3.25
1N4007	0.06	ZSC2603	3.08	ZSK794	6.41	BC517	0.14	BR303	1.22	CXK62A	3.83	M51393AP	4.64	SL471	1.70	TA7680AP	4.55	TA02576A	4.95	TIC1060	0.82
1N4148	0.02	ZSC2655	0.31	ZSK88	1.54	BC546A	0.07	BRX44	0.43	CXK82A	3.23	M5218L	1.59	SN76705AN	1.70	TA7698AP	5.97	TA02577A	5.25	TIC106M	0.75
1N5061	0.39	ZSC2705	0.22	ZAL5247	0.62	BC546B	0.09	BRX49	0.09	CXK83A	2.65	M5231L	2.36	ST434M	3.35	TA7769P	3.01	TA02578A	2.96	TIC225M	1.02
1N5401	0.14	ZSC2724	0.19	Z805	0.78	BC547	0.11	BRYS5	1.20	CR02AM	3.16	M54519P	1.37	ST4441C	4.51	TA7784P	2.25	TA02581Q	4.72	TIC2260	0.68
1N5402	0.12	ZSC2979	2.74	Z806	0.60	BC547A	0.04	BRYS6	0.43	CR21A	0.24	M54543L	1.97	ST4442C	6.70	TA8201	3.93	TA02582	3.93	TIC2260	0.68
1N5404	0.13	ZSC3117	0.60	Z808	0.72	BC547B	0.11	BSR50	1.75	DTA124EF	0.13	M54544L	2.41	ST4443C	8.89	TA8205	3.93	TA02581Q	7.56	TIP110	0.64
1N5406	0.12	ZSC3153	2.40	Z809	0.69	BC548	0.11	BS38	0.77	DTA144EF	0.43	M54548L	4.95	ST4441H	12.46	TA8205AH	4.10	TA02582	2.35	TIP110	0.36
1N5408	0.12	ZSC3156	6.61	Z812	0.30	BC548B	0.18	BT13960M	1.87	DTA144ES	0.18	M54648L	6.87	ST4441V	11.03	TA8207	2.74	TA02582	0.76	TIP112H	1.71
1N914	0.04	ZSC3179	0.82	Z815	0.82	BC548C	0.12	BT151500R	1.44	DTC124ES	0.18	M58655P	4.96	ST4441V	9.40	TA8210H	4.79	TA02594	2.21	TIP121	0.42
2N2222	0.22	ZSC3182	2.49	Z805	0.26	BC549	0.11	BT151800	1.15	DTC144ES	0.18	MB3730	2.85	ST4441H	10.68	TA8215H	4.79	TA02595	3.19	TIP127	0.47
2N2224	0.23	ZSC3199	0.43	Z8M05	0.17	BC550	0.15	BU205	1.43	HA11423	2.84	MB3732	14.89	ST4441H	13.20	TA8216H	8.01	TA02600	3.83	TIP132	0.65
2N2369A	0.34	ZSC3225	0.50	Z905	0.35	BC550C	0.05	BU205	1.07	HA13001	1.89	MC13002P	7.69	ST4441H	15.79	TA8220H	7.06	TA02611A	0.64	TIP137	0.48
2N2907	0.20	ZSC3242	0.19	Z915	0.63	BC556A	0.06	BU208A	1.44	HA13108	3.59	MC1310P	0.85	ST4441H	6.49	TA8221H	7.01	TA02611AQ	2.57	TIP2955	0.83
2N3053	0.38	ZSC3310	2.12	AA119	0.36	BC556B	0.15	BU208AT	1.25	HA13117	2.58	MC13177P	7.51	ST4463	15.69	TA8221L	7.19	TA02653A	3.26	TIP29C	0.31
2N3055	0.86	ZSC3311	0.29	AA143	0.13	BC557	0.09	BU2080	1.61	HA13118	3.32	MC1391P	2.02	STK5211	16.12	TA8410L	4.27	TA02655B	14.61	TIP29E	0.94
2N3440	1.77	ZSC3330	0.26	AC127	0.11	BC557A	0.15	BU326A	1.36	HA13119	2.05	MC14426P	1.71	STK5331	2.87	TA86910M	7.01	TA03190	1.27	TIP305E	0.47
2N3442	0.00	ZSC3355	0.96	AC151	0.42	BC557B	0.06	BU406	0.68	HA13403	5.98	MC3357P	2.14	STK5332	2.99	TA8550B	0.24	TA03301B	14.00	TIP30C	0.17
2N3707	0.12	ZSC3358	0.69	AC153K	0.50	BC558B	0.08	BU406G	1.02	HA1377	2.62	MDA2062	3.89	STK5333	2.97	TA8550C	0.30	TA03330	9.29	TIP31A	0.33
2N3773	0.32	ZSC3420	0.55	AC178K	0.44	BC560C	0.06	BU407	0.53	HA51338SP3	7.69	MJ15003	3.91	STK5338	4.99	TA8120S	0.89	TA03505	4.87	TIP31C	0.77
2N3819	0.55	ZSC3423	0.60	AC18K	0.30	BC560	0.19	BU407D	0.97	HM6232	10.46	MJ15004	5.08	STK5342	5.00	TBA120C	0.65	TA03541	0.98	TIP32A	0.41
2N3904	0.22	ZSC3502	0.45	AC188K	0.82	BC636	0.14	BU426A	1.03	HM6251	9.57	MJ2955	0.98	STK5372	3.51	TBA120S	0.89	TA03560	2.96	TIP32C	0.40
2N4123	0.30	ZSC3656	0.18	AD149	0.52	BC637	0.15	BU500	2.00	KA2206	1.32	MJ3001	1.56	STK5372H	6.84	TBA120T	0.51	TA03561A	4.19	TIP36C	???
2N5296	0.69	ZSC3679	3.59	AF124	1.75	BC639	0.18	BU505DF	1.35	KA2223	0.60	MJ4502	1.84	STK5421	2.62	TBA120U	0.40	TA03562A	5.16	TIP41C	???
ZSA1013	0.52	ZSC3788	0.77	AF125	0.57	BC640	0.06	BU506DF	1.68	KA2263	0.55	MJ802	2.40	STK5466	5.66	TBA8200	0.51	TA03562ATF	4.93	TIP41C	???
ZSA1015	0.11	ZSC3795	1.97	AF126	1.12	BC679	0.40	BU508A	0.95	KA8301	1.46	MJ13005	0.86	STK5471	4.87	TBA820M	0.69	TA03565	2.95	TIP42A	???
ZSA1015GR	0.11	ZSC3795B	3.88	AF127	0.77	BC7Y1	0.27	BU508AF	1.37	KB10L	1.27	MJ1800A	1.80	STK5473	3.51	TBA920	2.75	TA03566	3.40	TIP42C	???
ZSA1016	0.26	ZSC3807	0.84	AF139	0.29	BC131	0.34	BU508APH	1.99	KI6210AH	1.15	MJ2955	0.68	STK5476	5.03	TBA950	1.68	TA03567B	9.98	TIP1761A	7.58
ZSA1020	0.44	ZSC3883	5.92	AN5265	1.76	BD132	0.21	BU5080	1.29	KSR1101	6.15	MJ2955T	0.68	STK5481	8.53	TC4270S	2.75	TA03576	5.92	TIP1791A	1.25
ZSA1029	0.26	ZSC3892A	4.74	AN5435	1.46	BD177	??	BU5080F	1.88	KSR1004	0.14	MJ3055	0.52	STK5482	6.41	TC8000Q	1.65	TA03650	9.91	TL062	0.69
ZSA1048	0.17	ZSC3953	0.72	AN5512	1.83	BD136	0.20	BU5080V	1.65	KSR2001	0.14	MJ3055T	0.74	STK5490	7.69	TA01004A	4.35	TA03653B	1.86	TL071	0.69
ZSA1286	0.55	ZSC4106	2.05	AN5515	2.79	BD137	0.46	BU526	1.61	KSR2004	0.14	MJ3400	0.50	STK6962	2.80	TA01011	1.27	TA03653C	1.37	TL071CP	0.60
ZSA1370	0.43	ZSC4242	2.19	AN5521	2.16	BD139	0.41	BU536	1.65	L200CQ	2.19	M6506	3.23	STK7226	6.14	TA01013A	1.56	TA03677	???	TL072	1.03
ZSA1489	2.40	ZSC4517	0.40	AN6610	0.94	BD140	0.24	BU608	1.46	LA1230	1.95	MPSA06	0.35	STK7253	5.30	TA01015	1.37	TA03654	1.89	TL072CP	0.53
ZSA1706	0.52	ZSC4517A	2.52	AN7161N	3.85	BD203	0.47	BU801	1.37	LA1503	1.29	MPSA06E	0.23	STK7308	5.98	TA01035T	4.14	TA03654Q	2.81	TL074	1.04
ZSA562	0.17	ZSC458	0.72	AN7171K	4.68	BD232	0.35	BU806	0.82	LA2621	2.29	MPSA43	0.15	STK7343A101I	6.41	TA01044	1.43	TA04420	1.29	TL082CP	0.43
ZSA564	0.33	ZSC4742	4.70	BA154	0.06	BD233	0.41	BU807	0.51	LA4270	2.73	MPSA55	0.26	STK7348	4.91	TA01060	1.73	TA04427A	3.98	DD00000	0.00
ZSA608	0.24	ZSC536	0.14	BA157	0.09	BD234	0.34	BU826A	2.40	LA4282	3.59	MPSA56	0.12	STK7356	8.31	TA01082	4.27	TA04500	4.66	TPU2732	10.30
ZSA673	0.12	ZSC639	0.56	BA158	0.07	BD237	0.30	BU908	1.17	LA4422	1.36	MPSA92	0.18	STK7358	5.81	TA01085C	2.29	TA04501	5.95	TPU2735-45	12.05
ZSA684	0.60	ZSC710	0.12	BA159	0.15	BD238	0.24	BUK444500B	2.40	LA4440	2.40	MRS54	0.65	STR40090	8.71	TA01170	2.14	TA04501H	2.57	UA741CN	0.28
ZSA733	0.17	ZSC828	0.29	BA540E	2.12	BD239	0.29	BUK454600C	3.28	LA4445	2.01	MRS56	0.21	STR4211	10.53	TA01170N	2.05	TA04502A	7.62	UAZ2001	3.81
ZSA769	1.29	ZSC867A	7.13	BA5410	2.57	BD243	0.39	BUK455600C	2.54	LA4460	1.49	N5454B	3.20	STR441	15.95	TA01170S	1.35	TA04503	3.40	UC3842	2.05
ZSA844	0.26	ZSC945	0.18	BA5412	2.48	BD243C	0.44	BU111	1.20	LA4461	1.49	N5555N	0.37	STR451	29.90	TA01180Z	1.69	TA04505E	4.87	UC3844	4.19
ZSA872	0.35	ZSD0171	4.31	BA6109	1.85	BD244A	0.34	BU111A	0.85	LA4475	3.09	NE556	0.43	STR50020	9.02	TA01270	1.79	TA04505M	8.97	UC3844N	1.91
ZSA872A	0.35	ZSD1128	1.02	BA6209	1.46	BD244C	0.42	BU111AF	0.96	LA4476	2.78	NE592N	1.91	STR50103	6.92	TA01420	3.04	TA04508	10.05	ULN2003AN	1.58
ZSA916	1.14	ZSD1191	1.49	BA6209N	1.27	BD245C	0.92	BU112A	1.13	LA4508	2.13	NE646N	4.45	STR54041	5.99	TA01510	3.40	TA04600	2.29	UPA81C	1.12
ZSA919	1.00	ZSD1207	0.35	BA6219	2.46	BD246C	0.97	BU112AF	1.39	LA4700	4.27	DA200	0.22	STR5412	6.15	TA01515A	2.57	TA04600/2/3	2.72	UPC1181H	5.08
ZSA940	0.82	ZSD1246	0.30	BA6219B	1.46	BD433	0.29	BU118AF	1.37	LA6358S	0.62	DA90	0.64	STR58041	9.30	TA015160	3.59	TA04602D	1.27	UPC1230	2.82
ZSA950	0.18	ZSD1265	1.08	BA6222	3.16	BD434	0.34	BU1556A	1.19	LA6510	2.94	DA201	1.03	STR59041	9.68	TA015180	3.35	TA04601	4.80	UPC1230H	3.95
ZSA965	0.52	ZSD1266	0.68	BA6247	1.95	BD435	0.38	BU156AT	2.78	LA7520	2.77	P600A	0.33	STR6020	10.25	TA01519	4.23	TA04601D	2.42	UPC1238V	1.87
ZSA965E	0.54	ZSD1275	1.23	BA718	1.08	BD436	0.32	BUV46A	0.84	LA7800	1.46	PC814	1.27	STR7???	???	TA01519A	2.74	TA04605	3.03	UPC1278H	2.66
ZSA970	0.36	ZSD1276	1.39	BA143	0.11	BD437	0.32	BUV48	1.93	LA7801	1.63	RZ0M	1.15</								

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BU508A	X5	£3.60	BU426A	X5	£3.75	3V3/36 etc. Belt kit	X5	£4.25
BU508AF	X5	£5.00	TDA4601	X2	£2.55	VT11E etc. Belt kit	X5	£5.50
BUT11A	X5	£2.25	TDA3654	X2	£2.50	Standard video sensor lamp	X10	£2.50
Philips type 1.2 volt Back up battery	X5	£4.50				Standard video sensor lamp + plug	X10	£4.00
Philips type 2.4 volt Back up battery	X5	£3.75				Thorn TX9/10 Remote control	each	£7.49
Scart - Scart lead 1.5m Fully wired	X2	£2.90				Thorn TX16 Green spot LOPTX	each	£14.95

.....and now ask for a full price list.

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Satellite PSU Repair/Refurb kits

Experience in one of the largest repair centres has shown that all repairs to Power supply units require special treatment with not only the obviously faulty parts being replaced but a number of others also changed to ensure a satisfactory repair. Experience shows that up to 50% of all power supply repairs 'bounce' unless the correct procedure and the correct precautionary changes to certain components are made.

At last 4 repair kits are available to cover the majority of all Amstrad and Pace receivers each with a simple to understand instruction sheet to guide you through the correct way of repairing and refurbishing satellite receiver power supply units.

	MANUFACTURERS	MACHINE NO.		PRICE
SATKIT1	PACE	PRD800	PRD900	£6.95
SATKIT2	PACE	SS9000	SS9200	£6.95
		SS9010	SS9210	
		SS9020	SS9220	
SATKIT3	AMSTRAD	SRD510	SRD520	£6.95
SATKIT4	AMSTRAD	SRD500		£6.95

all + £1.00 handling and + VAT

IMPORTANT ANNOUNCEMENT

ALL SATELLITE RECEIVERS purchased before MAY 1994

It is almost certain that if you purchased your satellite receiver before May 1994 you will be unable to receive all the projected channels when they become available on ASTRA 1D neither will you be able to receive the lower two channels on ASTRA 1C. The lower two channels on ASTRA 1D are Filmet Movies (H - 10.921) and RTL-5 (V - 10.934). These are broadcasting now. If you wish to receive these two channels now and the projected possible 16 channels on ASTRA 1D when it is launched later this year, you will need to purchase extra equipment. The SUPER 'D' CONVERTOR is a clever, low cost frequency converter which can be purchased now. Millions of satellite receivers will need converting in Europe so it is good advice to buy now while stocks are readily available.

Can I receive

ASTRA 1D



YES!

Method 1

- 1) Purchase an enhanced satellite receiver with tuning range of 950 - 2050 MHz
- 2) Purchase an LNB with a conversion frequency of 9.75 GHz
- 3) Book an engineer to install the equipment

TOTAL COST AROUND £200

Method 2

- 1) Purchase a SUPER 'D' convertor
- 2) Install the SUPER 'D' convertor - All by yourself.

TOTAL COST EXACTLY £29.95

What is a SUPER 'D' convertor ?

The super 'D' convertor is a small box (110mm x 60mm x 50mm) which is inserted into the down lead from the satellite dish at the rear of the receiver (no power supply is required). A suitable connecting lead is supplied together with end user simple instructions. At the flick of a switch or in most cases a touch on the remote control, channels on ASTRA 1D can be tuned in when available. The bottom 2 channels on ASTRA 1C which up to now you may not have been able to tune in, will be immediately available.

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TV Fault Finding

Reports from Philip Blundell, AMIEEIE, Terry Lamoon, Denis Foley, Eugene Trundle, Andrew J. Finn, David Belmont, John C. Priest, Mike Leach and Chris Watton

Grundig CUC70 Chassis

This set displayed a blank raster with flyback lines. Checks on the RGB module showed that the supplies were o.k. and that a video signal was going in, but the sandcastle pulse was misshapen: it looked more like a high-rise block of flats than a sandcastle! A scope check in the deflection module showed that the amplitude of the line flyback pulses was low at 20V instead of 80V. C514 (150pF) was open-circuit. **P.B.**

Philips GR1-AX

For weak sound check the disc ceramic capacitors around the sound i.f. chip. The main suspect is C2033 (22nF). **P.B.**

Lite-On CM1414EN Colour Monitor

When this monitor was switched on you could hear the e.h.t. rustle up then fade away. No display appeared. I checked the supply to the line output stage and found that it was high at 140V. Obviously the X-ray protection circuit was in operation. When resistor checks were carried out in the power supply we discovered that R821 (220k Ω) was open-circuit. After replacing it the monitor worked and the e.h.t. could be set to 25kV in accordance with the instructions on the label inside the back cover.

A circuit diagram would have been useful: does anyone know of a source of monitor circuit diagrams? **P.B.**

Philips CTX-E Chassis

For no sound or vision with a screaming noise coming from the line output transformer (the BU508 line output transistor will go short-circuit if the set is left on for more than a few seconds) try replacing C2351 (4.7 μ F). It's in the chopper transistor's base drive circuit. **P.B.**

Matsui 1436X

This set refused to come on. A look in the power supply showed that R651 and R653 both had burn marks on them. When I replaced them, and also IC650, the set still refused to work though there were no burn ups. Cold checks showed that C655 was short-circuit and R652 open-circuit. Replacing these items restored normal operation. **T.L.**

Sony KVM14U

The customer who brought this set in said that the picture had been very poor then the set had started to smoke. When the back was removed R852 and D852 in the tube's first anode supply were seen to be burnt out. Replacements brought back a perfect picture. **T.L.**

Matsui 1091

This 10in. portable blew fuses every three-four hours for no apparent reason. A check on the current consumption

showed that it was not particularly high. When I replaced the third fuse I noticed that the holder was slightly loose. I retensioned it, fitted a new fuse and the set then worked happily. It appears that the loose holder generated just enough heat to melt the fuse connections – it was so gentle you couldn't see that the fuse had gone. **T.L.**

GoldStar CIT2190F

There was no sound but a good picture. As I could get hum from the audio output chip I ruled this item out and changed the TDA120T sound demodulator chip. Still no sound. I then did what I should have done to start with and got the circuit out. Voltage checks didn't reveal much so I looked for a muting circuit and found that pin 7 of IC401 produced a muting output. When I desoldered this pin and switched on there was full sound. A new chip in the IC401 position put matters right. **T.L.**

Matsui 1436X

A smeary picture appeared when this set was switched on. As I took the back off the fault started to come and go, so I started a tapping session. This led me to a dry-joint around R513 on the c.r.t. base panel. After soldering all the connections around the base the set was just fine. Another quickie. **T.L.**

Ferguson 59G2 (TX100 Chassis)

No power with only the red standby light showing said the note with this set. It's always worth tapping these sets as they tend to suffer from poor connections. This one was no exception, the set reacting to my taps around the line output transformer. On inspection I found that a couple of the transformer's pins were severely dry-jointed. The set worked perfectly when these had been cleaned and resoldered. **T.L.**

Sony KV2562

This set worked perfectly for twenty minutes. Then the colour started to flicker and finally disappeared. I reached for the magical freezer and squirted it in the appropriate area, eventually getting a reaction from IC301. On replacing this the set had been cured of its ailments. Wonderful stuff, freezer. **T.L.**

Philips CP90 Chassis

The complaint with this set was that it went off intermittently. I put it on test and after ten minutes it did exactly as reported. A visual check on the PCB showed that there was a perfect dry-joint at pin 9 of the line output transformer. After resoldering all the pins I gave the set a soak test for a couple of days then declared it cured. **T.L.**

Sony KV2096 (XE4 Chassis)

The symptom was ragged verticals across the middle of the screen. It was present when the set was cold, disappearing after ten minutes. The cure was to resolder the heatsink on the field output chip – it acts as a link between earth lands. **D.F.**

Sony KV2096 (XE4 Chassis)

There was intermittent loss of the picture (a blank raster, with an on-screen display of the volume control still visible). The cure was to discard IC003's holder on the teletext decoder panel and solder the chip (type SAA5240A) directly to the PCB. **D.F.**

Bang and Olufsen MX1500

Very intermittently, at intervals that varied from a few minutes to many days or weeks, this set would suddenly start off up the band, searching and seeking through the v.h.f. and u.h.f. channels, then just as suddenly stop and behave itself. The cause of the fault was eventually traced to leakage in the momentary-contact start-up switch associated with, and mouted alongside, the mains on/off switch. **E.T.**

Fidelity ZX1410/ZX1411 etc Chassis

If the power supply in one of these sets doesn't seem to be running, check first whether the BY299 h.t. rectifier D21 is short-circuit. It's mounted between the back cover and the chopper transformer and will shut down the power supply quicker than the eye can see. Fortunately it does no other damage. **A.J.F.**

Finlux 3000 Chassis

If the picture is shifted to the right to the extent that the line scanning starts in the middle of the screen, check RZ19 in the line output stage. Its value is 27k Ω but you will find it open-circuit. It forms part of the pulse feedback system. **A.J.F.**

Matsui 2180TT/Saisho FST212T

When one of these sets came in we found that R512 (0.47 Ω) and R518 (1 Ω) in the power supply were open-circuit. On replacing them the STR58041 chopper chip IC501 and the 5-6 Ω surge limiter R502 promptly died. After putting this right there was a raster full of snow with no channel number showing. There was no tuning voltage supply because the L5631 30V regulator IC104 was faulty. Replacing this finally got the set working. **A.J.F.**

Panasonic TX24A1 (Alpha 2W Chassis)

This set came in with field collapse. We soon discovered that the TDA2579A timebase generator chip IC501 was not producing any field drive output. A new TDA2579A chip appeared to put that right, but two weeks later the set was back again with the same fault. This time C403 (0.01 μ F) which is connected to pin 2 (field feedback) of IC501 was found to be leaky. We've had no further trouble since this item was replaced. **A.J.F.**

NEI 1451

If one of these sets comes in with the BU508 chopper transistor Q800 short-circuit, before fitting a replacement and

switching on check R809. You'll find that this 270k Ω resistor is open-circuit. **A.J.F.**

Philips KT30 Chassis

When this set had warmed up the top two inches of the picture would be lost – on the left-hand side there was a three inch loss. Swing the chassis out and the fault disappeared. Swing it back and the fault returned. Panel swapping was tried but did no good. We eventually noticed that adjusting the convergence potentiometer on the scan coils made the fault worse and that no convergence correction took place. A scrap set was raided for a set of AT1260/10 scan coils for the A56-540X tube. Thus cured the fault completely. **A.J.F.**

Ferguson TX85 Chassis

The power supply was running but there was no line drive and no display. A check on the two voltage regulators on the small board to the left of the chassis revealed some fine dry-joints. **A.J.F.**

Tatung/Decca 190 Chassis

When the complaint with one of these sets is 'no go' and the mains fuse is o.k., check the two 15k Ω start-up resistors R802 and R803. They tend to go open-circuit. **A.J.F.**

Hitachi C2558TN

The fault report said that there was no sound and the picture goes white. A check showed that the voltage on the 12V line was low at 9.5V. Regulator IC952 was responsible. **D.B.**

Matsui 2580

This set sometimes failed to come out of standby. Diode D118 was going open-circuit intermittently. **D.B.**

Logic 4298 (Ferguson TX100 Chassis)

Random channel changing and going to standby was cured by resoldering L20 in the power supply. It had become dry-jointed. **D.B.**

Sanyo CBP2572 (ED1 Chassis)

This set had a strange EW fault. Scope checks showed that only some information was coming out of the digital signal processor unit. The DPU2553/75 chip was responsible. **D.B.**

Panasonic TX28W2 (Alpha 3 Chassis)

Very intermittently there would be complete loss of picture and sound. Dry-joints around the prescaler chip inside the tuner were the cause, a good solder up putting an end to the trouble – proved by a lengthy soak test. **D.B.**

GoldStar CT2190/Matsui 2090

There was no line drive because D401 was open-circuit. Replace it with a 1N4007 diode. **D.B.**

Toshiba 2927DB

The original fault with this set was no sound. By the time it arrived on my bench it was also tripping. A check on the h.t.

voltage revealed that it was very high. The cause of this was the optocoupler IC826. We cured the sound problem by replacing the headphone socket. **D.B.**

Hitachi CPT2508 (G7P Mk II Chassis)

This set came in dead. Replacing the TDA4601 chopper control chip and the usual high-value resistors (R931 and R932) failed to produce a cure. We then found that the chopper transistor Q901 has a 1N4148 diode (D904) connected between its base and emitter. It had gone short-circuit, a replacement restoring the set to life. **D.B.**

Panasonic TX24A1 (Alpha 2W Chassis)

The power supply squealed and little else happened. You usually find that the line output transistor is leaky and its fusible feed resistor open-circuit, the basic cause of all this being dry-joints at the pins of the line driver transformer. All four pins should be resoldered, otherwise the set will bounce. This is becoming a common fault. **D.B.**

Mitsubishi M Chassis (CT21M1BM etc)

A fairly common fault with this chassis is a 'popping' or 'motorboating' noise from the loudspeaker when the set is in standby, with no problem when the set is on. The cause of the noise is the fact that the 20V supply is not being switched off when the power supply is in the standby mode.

In this chassis the main (and only) power supply runs in a burst mode during standby. On receipt of a low from pin 10 of the microcontroller chip IC701 via pin 2 of connector PB Q951 (JC501), the power switch 2, turns off. Its collector voltage rises, turning off Q950 (2SA950), the power switch 1, Q952 (2SA950), the power switch 3, and the 12V regulator IC953. This removes the main 5V, 12V and 20V supplies, leaving only the standby 5V supply for the microcontroller chip, the -30V supply for the EAROM IC702 and the 115V supply for the line output stage.

Loss of the 12V supply turns off the jungle chip IC501, with the result that there's no drive to the line output stage. Without drive Q551/Q552 switch off, removing the load from the 115V supply. The voltage tries to rise, but this rise is monitored by the chain R950/VR951/R951 and fed back via Q953 (the error amplifier) and the optocoupler PC951 to the chopper control chip IC901. This then goes into the burst mode, producing a chopper drive at about 100Hz. As the line output stage is inoperative there's no drain on the 115V supply.

Faults around Q951, Q952 and connector PB can result in the 20V supply not being turned off. As a result the audio output chip IC361 remains powered in the standby mode. The popping sound is heard because the 20V supply is being pulsed at 100Hz. Dry-joints around Q951, Q952, R954, R974 and R985 can be responsible, but the most common culprit is Q951. If in any doubt about it – a faulty transistor can read o.k. out of circuit – fit a replacement. My usual treatment now is to replace Q951 (JC501-Q, part no. 260P543050) and Q952 (2SA950-Y, part no. 260P255040) and do a blanket resolder in the area. **J.C.P.**

Salora 24L57

Loss of sound was the problem with this set. The audio output stage was o.k., as the speaker was being driven. I decided to check the ceramic filters to make sure that the set wasn't a stranger from abroad. No problems here: the filters

were originals and British! The cause of the fault was found almost immediately, which makes a change these days: CB133 (22nF) was open-circuit. It's connected between pin 15 of the TDA4505 chip ICB101 and one leg of the 6MHz ceramic filter. **M.L.**

Hitachi C2558TN

There was excessive width and no EW correction. Voltage readings around the TEA2031A raster correction chip IC651 suggested that it was faulty. First we checked for dry-joints, but the soldered connections were all o.k. So a new chip was fitted. Unfortunately this made no difference. When further checks were carried out around the line output stage we found that D705 (BYW96D) was short-circuit and C714 (27nF) was burnt. Both items were replaced, but the fault was still present. I had the idea to replace the chip again, after which the set performed perfectly. This suggests that the capacitor and diode were knocking out the chip – one to watch out for! **M.L.**

Matsui 1420

This set came in dead and we found that the SR2M over-voltage protection diode D508 was short-circuit. Checks in the power supply failed to reveal any defects and when a replacement SR2M had been fitted the set ran for days. Then the diode again went short-circuit. The power supply was not of the STR type but had a transistor on a sub-panel. This was blameless however. The cause of the problem was an intermittent line driver transformer. When the line drive ceased the h.t. rose and D508 failed. **C.W.**

Hitachi CPT1556 (Salora L Chassis)

No luminance isn't a common problem these days. But in this set it was caused by the same old fault, an open-circuit luminance delay line. As the delay line is a small can I didn't take off one winding to repair it as I might have done twenty years ago! **C.W.**

Philips K40 Chassis

The LED display went off after a few minutes. If the channel was changed however, either using the remote control unit or the buttons on the set, the display would return for a few minutes. After a lot of messing about with the display itself I resoldered the pins of the memory module on the search tuning panel. This provided a complete cure. **C.W.**

Matsui 2190

This set was dead though the power supply was working. Checks in the line output stage showed that there was 140V at the collector of the line output transistor, but there was no line drive at its base. So we moved back to the line driver stage where the 24V supply was missing. It comes from the emitter of TR803 in the power supply. This transistor acts as a stabiliser, in conjunction with a ZPY24 zener diode (D804) in its base circuit. D804 was short-circuit and TR803 open-circuit. We used a TIP41C to replace the transistor. **C.W.**

Solavox 20S09 (ITT CVC1175 Chassis)

The line sync was twitchy – sometimes sync would be lost completely. We found that flexing the h.f. module affected

the fault. Resoldering the unit's case/frame to the PCB, and where the screens cross the tuner section within the module, cured the trouble. C.W.

Sony KV2060

At switch on the power supply could be heard and the channel indicator light came on. But within two seconds the set went dead, with a slight whisp of smoke from the horizontal shift control. After checking the power supply with a bulb as a dummy load, and testing many components in the shift and pincushion correction circuits, we decided to replace the line output transformer. This put an end to the trouble. C.W.

Matsui 2580

This set was brought in because it was 'dead'. The standby light was on however, and a check on the 150V h.t. rail produced a reading of 78V. After about thirty seconds the h.t. voltage rose rapidly to 175V or so. When the handset's on button was held down the 24V supply came up and the h.t. voltage squegged between about 70V and 100V, still with no picture. I disconnected the scan coils and tested the power supply with a light bulb as the load. Still the h.t. wobbled, so it was time for component tests in the power supply. A check on the capacitors soon brought me to C808 (1µF, 63V) which was open-circuit. A replacement restored the set to life. C.W.

Luxor A2 Chassis

This set was dead. We disconnected the supply to the line output stage and ran the power supply with a lamp as the load. This proved that it was o.k. The line output transistor was then found to be faulty, and the tripler short-circuit. The basic cause of all this was the fact that the 6.8nF, 2kV flyback tuning capacitor CH05 was open-circuit. C.W.

Matsui 2580

The picture would sometimes break up on a channel change, as if the a.f.c. was locking out. Also line sync would occasionally be lost on channel change when the set had been on for a long time – once the picture had locked it would run perfectly, provided the channel wasn't changed. Fortunately we had another of these sets in at the time, so I tried swapping over the plug-in chips. This proved that the MDA2062 memory chip IC1503 was faulty. C.W.

Amstrad CTV1401

There were bands of interference across the screen. The interference was also being radiated to other sets in the workshop, and was more severe on some channels than on others. We suspected the tuner, but this was not the cause. Eventually we found that the mains switch was responsible: a.c. voltage readings at each side of the switch showed that 9V less came out than went in. C.W.

Ferguson TX10 Chassis (PC1560 Version)

This set came in with a blown field output chip. We replaced it and put the set on soak test. After a short time the sound started to bang and the set then started to trip. Checks in the power supply revealed that the value of R813 (121kΩ) drifted as the set warmed up. Replacing this resistor cured all the faults. C.W.

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A Purity Problem

Les Austin

In a letter in the July issue Michael Dranfield mentioned a purity problem with the Samsung Model CI5012Z. An official modification suggested the addition of a second degaussing posistor in parallel with the original one, fitting it on the underside of the chassis. Michael Dranfield asked whether he would have been labelled a cowboy had he done such a thing. He must bear in mind the important answer to the question "when is a bodge not a bodge?" Answer, "when the manufacturer does it".

About a year ago a nearly new Tatung set, still under guarantee, developed a burn-up and hole in its PCB. We returned it to Telford. When it came back we found that a piece of PCB about two inches square had been cut out and an identical piece, connected by wire links, had been fitted in its place. In accordance with our test this was obviously not a bodge. But we don't think that we could have got away with the same thing with impunity. And anyway how do you order the corner of a PCB from the manufacturer?

But back to the Samsung purity problem. Simply switching off at the mains occasionally to activate the degaussing action, as suggested by Mike, instead of switching in and out of standby all the time would probably not have restored the purity. Samsung had a problem. The usual symptom was a purity loss which generally showed up as a yellow patch at the side of the screen, in the lower half.

Samsung's first suggested cure was the additional posistor mentioned by Mike. The original posistor was type A180N, which has a cold resistance of 18Ω . The instruction said fit another identical posistor in parallel on the underside of the PCB. A subsequent bulletin suggested replacing the original A180N posistor with a type 2D100M, which has a cold resistance of 10Ω . The idea of either of these modifications was to create a stronger degaussing field. They undeniably did this, but frequently failed to provide a cure.

We had a large number of these sets, which were 'manufacturer's returns' and were thus probably the worst examples. Many had already had a second posistor added, unsuccessfully. On receipt of the second bulletin (we never received the original one) we ordered and fitted 2D100M posistors, again to no avail. At this point we realised that there was a definite problem. I carried out a number of tests on one particularly bad set: these are described below.

Tests

The set was positioned so that it faced towards the south and was switched on. It was then manually degaussed. After this the set, while still switched on, was rotated to face east. Purity was lost, but was restored when the set was again manually degaussed. The set was next switched off, the degaussing plug was disconnected, the set was turned to face south, switched on again then manually degaussed. This time when the set was rotated to face east no purity errors occurred. The set was switched off again, the degaussing plug was refitted, the set was turned to face south and was again manually degaussed. This time there were severe purity errors when the set was switched on. These tests were all repeated later. The results were similar but never quite the same.

Comparisons were carried out with previous sets that didn't suffer from the problem. We found certain differ-

ences. The good sets had tubes with the familiar blue Samsung identification sticker. The others had a red label that bore the type number (51GGB91X). There was no manufacturer's name or country of origin. In the earlier sets there were two degaussing coils, one above and the other below the tube neck, in a fairly common arrangement. The later, troublesome sets had a single longer coil that was folded into a non-symmetrical figure-of-eight shape: the larger part ran around the top of the tube and down under the tube neck, the smaller loop being entirely beneath the tube neck.

It was instructive to draw out the field produced by these two coil arrangements. With the two separate windings the field around the horizontal section through the middle of the tube will be weaker because of the interaction (interference) between the coils. With the figure-of-eight arrangement however the horizontal section about a third of the way from the bottom of the tube will have a double-strength field because of reinforcement.

Different Degaussing Circuits

The next step was to consider the degaussing circuit. We reviewed the methods used in the past. The usual arrangement twenty five years ago consisted of a posistor, a VDR and the coils, all in series, with a bleed resistor in parallel with the VDR and the coils. The resistor was included to keep the posistor hot, while the VDR reduced the current in the coils when the steady state was reached. A high ratio of initial to final current was thus obtained. The ubiquitous three-legged, blue double posistor came into use in about 1972. It again provided a high current ratio. We have now moved on again and this Samsung and many other current production sets use a two-legged posistor such as the A180N and 2D100M. Can a single, two-legged series posistor achieve satisfactory results, or is it a more complex device?

Investigation

I took home to my workshop one each of the degaussing coils and one each of the posistors. With my analogue storage scope, a current probe and an amplifier to process the signal I obtained the information shown in Table 1. To give some idea of the current decay time, the time the current

Table 1: Test results obtained.

Coil	Posistor	Initial Current	Final Current
Double type	A180N	3.5A p-p	12mA p-p
Fig.-of-8	A180N	5A p-p	15mA p-p
Fig.-of-8	2D100M	7.5A p-p	24mA p-p

took to fall to 0.2A p-p was 0.2, 0.8 and 0.8 seconds respectively.

The shape of the current waveform at the rapidly reached steady-state condition was interesting. Instead of a simple 50Hz sinewave the positive part was displaced upwards and

the negative part downwards: hysteresis was clearly present in both directions, with the current overshooting from zero each way. This suggested to me that the device provides a VDR action as well as being a posistor. This probably explains how it achieves what it does.

As the table shows, the 2D100M with a figure-of-eight coil passes twice the final current passed by an A180N posistor with the original double coil. Comparing the fields however there will be four times the magnitude with the modified circuits than with the earlier trouble-free sets.

Solution

We developed the following scheme to deal with the problem sets. It was successful with the very bad test set and most of the others. Just a few sets were improved but were never completely satisfactory.

Ensure that an A180N posistor is fitted. Place the set on the table, in the centre of a clear area with no nearby metal-work, facing east. Switch on then manually degauss. Carry out a full purity and convergence adjustment, paying particular attention to ensuring that the scan coils are left in the position that's in the middle of the axial range over which a

completely pure raster can be obtained on the screen. A surprising amount of adjustment was required in some cases, suggesting that insufficient care had been taken during manufacture.

Conclusions

When we reflected on the problem with these sets we came to the conclusion that there was a manufacturing fault with the tubes. It seemed probable that the cause could have been to do with the hardness of the shadowmask steel: it may have been slightly too soft.

If you think of audio tape recording, you may have an a.c. bias of say 80V p-p with audio modulation of say just 1V p-p. When the tape is played back there's no sign of the bias: only the audio bit remains.

Our explanation is that the residual current in the degaussing coils, reinforced by the figure-of-eight shape, provided a magnetic bias to carry any external field, either from the earth's own field or from any other nearby source. Since there are other TV sets about with similar coil layouts and the same posistor, it seems that the tube itself must have been the underlying cause of the problem.

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Test Report: WP6.0 for Windows

David Botto

A personal computer complete with a high-tech wordprocessing program is fast becoming indispensable in the modern service department. WordPerfect Corporation's new WP6.0 for Windows is probably the world's most powerful wordprocessing program. It's also a comprehensive information handler.

Installing WP6.0

A PC with a mouse and a 386 (or higher) microprocessor chip is essential to run the program. You must also have the Microsoft Windows 3.1 program installed. A minimum 4Mbytes of RAM is required in the PC: WordPerfect recommends 8Mbytes – with only 4Mbytes the program runs irritatingly slowly. With 8Mbytes or more the program runs at speed.

The program files are contained in twelve 1-44Mbyte high-density 3.5in. discs. Installing the program is easy: load the first disc into your A drive and follow the on-screen instructions. Be sure that you purchase the latest, WordPerfect 6.0a, version. For a full installation 27Mbytes of hard disc space is required. A minimum installation – suitable for a lap-top PC with limited hard-disc space – occupies 8Mbytes. You then lose many of WP6.0's best features however.

WordPerfect 6.0 comes with five easy-to-read instruction manuals. There's a Getting Started book and a Learning WordPerfect book. The hefty 986-page Reference volume is just that: you use it to look things up. A comprehensive Drawing Program book helps you to master the program's powerful drawing features.

Nicely laid out four-colour keystrips list the purpose of each function key. Considering the program's power however I think it would be a good idea to supply complete keyboard overlays instead.

There's a choice of three pre-defined keyboard setups: WPDOS compatible, WPWIN 6.0 and Equation editor. When you select the keyboard editor function a picture of the keyboard appears on the screen. This enables you to create and edit your own keyboard setup, assigning functions and features to any key you choose to use.

Menus

Pull-down menus and QuickMenus make it easy to find and use program features. When you highlight these programs, using a mouse pointer, a Help Prompt that describes the item appears at the top of the screen. An alternative (short-cut) keystroke method that a skilled, high-speed touch typist might prefer to use is also sometimes shown. You can 'customise' the pull-down menus to get quick access to the features you use most often.

Button Bar

The button bar gives instant access to any feature. To 'push' a button you place the mouse pointer over the button bar icon and click once: the button 'pushes in' and the pictures feature is activated. You can place the buttons in any position on the screen you want, and can create your own button bars – as many as you like – and display up to three rows of buttons. Any Windows program or file can be placed on a button bar for fast access and selected from within WordPerfect. WP 6.0 comes with an impressive range of button bars – all you're ever likely to need. The button bars can be displayed with icons (little pictures), text or both.

Click the right mouse button on a button bar and a QuickMenu of other button bars appears on the screen. A practical feature is the document information button bar. 'Push' it and a table that lists the number of words, average length or words, number of sentences, paragraphs, pages, average sentence length and longest sentence length in your document appears.

The Power Bar

The Power Bar contains icons that give fast access to common format-

ting tasks such as paper size, margins, line spacing, paragraph spacing, headings and footers. You can adapt the Power Bar, choosing from eighty one selections. When the mouse pointer is placed over a Power Bar icon an explanatory help message appears at the top of the screen.

Ruler Bar

The Ruler Bar sets and moves tabs and margins quickly. It makes paragraph adjustments, positions columns and moves columns and margins in tables. The scroll bars move you quickly to any desired point in a document.

Once you've set up a document you probably won't want bars on the screen cluttering up the text. The hide bar command removes all the bars, leaving you with a full screen on which to write and edit your text. Press the escape key and the bars reappear.

Templates

Templates save the engineer hours of time, providing a fast, easy way to create professional-looking documents. WordPerfect 6.0 comes with ExpressDocs, a set of more than forty five pre-defined templates. These include fax forms, memos, nicely headed letters, newsletters, balance sheets, inventories, expense reports, quarterly cash flow, cost estimate forms, invoices, credit applications, packing lists, income statements, sign templates, certificates of achievement, weekly planner sheets and a whole lot more.

Select the calendar template, specify the month and the year and you can create and print out a calendar for the month. You can edit any of these templates or create your own to suit the service department and the sales side of the business. An

easy-to-understand ExpressDocs manual shows you how.

Watermark Feature

The Watermark feature gives your documents a definite 'one-up' look. It adds a faint background drawing, clip art image, headline size text or your company logo to the printed document.

QuickMenus

Click the right mouse button and a QuickMenu appears at the mouse pointer position. It enables you to select letter styles and size, spell check and centre text. Move the mouse pointer to your document's left margin, click it, and a menu appears enabling you to select text, change margin size or add comments to the document.

Preview

The Preview Windows feature shows you how changes to columns, margins, line spacing etc. will look before you make them. A whole library of ready-written macros comes with WordPerfect, automating a variety of tasks.

QuickFinder

A PC installed in a busy workshop will quickly accumulate a stack of internal document files. The Quick-Finder feature locates them instantly, eliminating those time-wasting searches for urgently needed information.

QuickCorrect

The QuickCorrect feature corrects mistyped or misspelt words as you type. If you type 'adn' for example it's automatically replaced by 'and' when you press the space bar or type a comma, full-stop or semicolon. QuickCorrect can expand abbreviations automatically.

QuickSelect

This feature gives you flexibility to select text precisely by choosing whole words, sentences and even paragraphs.

Drawing

WordPerfect Draw includes all the 'tools' required to create professional-looking graphics, charts and

diagrams, both two- and three-dimensional. You can insert pictures into the text. The Draw guide manual shows you how.

Other Features

Built-in spreadsheet facilities enable you to use the program to keep your accounts. Nearly a hundred built-in formulae and automatic calculation facilities are included in this feature. There's a simplified mail merge program for those who send out mail shots to raise new business: it enables you to personalise each letter with the customer's name and address and any other personal details.

Thesaurus and Spell Check

An excellent thesaurus enables you to check for alternative words (synonyms) to use or for words that have the opposite meaning (antonyms). The Speller function checks for misspelt words and locates typing errors. When a WordPerfect foreign language program module is added a thesaurus and speller in that language is automatically available.

Grammatik 5

WordPerfect 6.0 comes with Grammatik 5. This proofreads your documents for grammar, style and spelling mistakes. You can alter the level of formality and create your own writing style. It has one fault however. When checking subject-verb relationships it says that some plural words are singular and some singular words plural. This is a shame, since Grammatik 5 is the best grammar checker I've tried. Grammatik 6, which may have been released by the time that this is read, should overcome the problem.

Fax Facilities

To fax documents with WordPerfect 6.0 a fax driver program that runs under Windows and a modem must be installed. Received faxes can be stored on a floppy disc and viewed on the PC's monitor later. This is useful when a fax consists of pages of unwanted advertising that would otherwise use reams of your expensive fax paper.

Sound Facilities

The impressive sound facility

enables you to enhance a document with sound effects and music. A microphone can be used to add spoken messages to a document. You can thus create multimedia documents for presentations, educational purposes or product tutorials. A plug-in sound panel has to be fitted to the PC's motherboard. A little picture of a loudspeaker appears in the margin where sound, music or speech is stored in a document. Click on it with your mouse and you'll hear the sound.

Printing

The finest program in the world is useless if it won't operate your printer. To match a printer to WordPerfect 6.0 you select the correct printer-driver program. This enables several hundred printers to be used. If yours isn't listed, phone WordPerfect for help.

Mastering the Program

You may think that with all these features WordPerfect 6.0 is difficult to learn. It isn't. WordPerfect Coaches are built into the program. These help you by means of step-by-step instructions: it's rather like having a personal instructor sitting by your side and prompting you as you work. A built-in tutorial program and the helpful Learning WordPerfect manual guide you gently through the program's various features. As you do this you'll discover more about WordPerfect 6.0.

In Conclusion

WordPerfect 6.0 for Windows is an exciting new wordprocessor program that's packed with highly advanced features. Once you have used it I don't think you'll want to return to a less comprehensive program. At £329 plus VAT for a single copy it costs no more than many less powerful wordprocessor programs. Upgrades from WP5.1 for Windows cost £89 plus VAT.

My thanks to Vivienne Wilson and Caroline Gage of WordPerfect UK who have been most helpful in providing the Demo program and information for this article.

Availability

The program can be obtained from WordPerfect UK, Weybridge Business Park, Addlestone, Surrey KT15 2UU. Telephone 0932 850 500.

Buying Second-hand Stock

David Chaplin

Renting out and/or selling second-hand TV sets and VCRs can be more profitable than dealing in new goods. The financial outlay is less, and the percentage profit usually higher. This assumes of course that the goods can be made serviceable without undue additional expense. The following guidance will help to ensure that the goods you buy are at minimum cost and without major defects.

Prices

The prices at the various wholesale warehouses can vary quite a lot. It's worth looking around all the outlets in your locality in order to obtain best value for money.

Sets often arrive at the warehouse nowadays without handsets. Most wholesalers stock new, compatible ones. The last two warehouses I visited both stocked Philex remote control units. One charged £8.50 each for them, the other £5.

More of these traders will accept payment by cheque or credit card nowadays. But beware: one place I visited recently accepted either at no extra cost while another charged £3 for a cheque and four per cent on top of the bill for payment by credit card.

Buying TV Sets

TV sets can be bought as workers, non-workers for repair or spares, or off-the-pile sold untested. Personally I like to buy working sets, and test them on sight before parting with the ready. Incidentally these sets come with no guarantee and you'll get no refund for any reason. 'Working' means that a set will switch on, tune in a programme and display a picture with sound. It's left to you to find any defects, missing parts or damage.

Try to find out when deliveries are made to the warehouse. If possible be there when they arrive. This way you'll have the pick of the load (minus any that get spirited off to the back room) instead of only those no one else wants.

Most ex-rental sets are sold off these days because they are faulty in some way, not simply because they are past a certain age. The trick is to find out why the set has been sold. If

a set has no other obvious faults the reason for sale is usually a low-emission tube. Some tubes retain good emission but the focusing becomes poor. This loss of sharpness cannot be corrected by adjustment.

Careful examination of the picture will go a long way in telling you which sections of the receiver are working correctly or otherwise. Check the following points:

- (1) That the picture tunes in correctly without patterning or ghosting.
- (2) That the purity is good, with each gun giving a good output.
- (3) That the grey-scale/RGB drives can be set up all right to produce good picture colour.
- (4) That the picture locks correctly, both vertically and horizontally.
- (5) That the scan linearity is o.k., with no pincushion distortion.
- (6) That the focus is acceptable.

Also check the picture to ensure that it's clear of teletext interference, flyback lines, vertical corrugation or any other unwanted symptom.

Check the sound for clarity, absence of distortion and crackling, adequate volume range and the ability to be turned off and/or muted.

I will sometimes buy a set that's obviously faulty – if I know the cause. The set was probably discarded because of this fault and is otherwise sound. For example I recently bought a Philips KT3 set that could be tuned in to give a lovely picture – until the tuning drawer was pushed home. The a.f.c. was out of adjustment, seriously marring the picture. So the set had been shunned. A quick adjustment back at my workshop soon had it working perfectly.

I'm extra careful about buying a set that's in a really clean, unmarked condition – unless I know that I'm the first person to look at it. There's bound to be a snag. This is even more important when buying off-the-pile. Ask if you can remove the back cover. Then make sure that nothing is missing or damaged. Also check for

any signs of overheating, and excessive work having been carried out.

If you are buying sets to rent them out, it's best to stick to a limited number of models that are:

- (1) Known to be reliable.
- (2) Easy to work on.
- (3) Easy to obtain spares for at reasonable prices.

This way you'll get to know the sets' peculiarities and any shortcomings. It will thus be easier to pick out good sets. In time you will have to scrap some of the sets for various reasons: they will provide a useful source of spares.

When you've found a set that works satisfactorily and has a good, undamaged cabinet, check that all the controls work properly. If the set has a mechanical push-button unit, check that all the buttons work all right. If time allows, tune in each channel and check for drift or flickering. Make sure that all flaps and covers are present and undamaged. Before rejecting a set because covers are missing ask the salesman whether he has removed them: at many warehouses all flaps and covers are removed to prevent pilfering – they are replaced when you buy the set. If you purchase a set with a missing cover with the intention of buying a replacement make sure that it's still available – many aren't. Try for a price discount if you propose to buy a set that's obviously defective or has a part missing.

Sets with black cabinets are in demand at present. Many dealers are recovering their second-hand sets with black self-adhesive vinyl in order to satisfy this demand. If you intend to do this, look for sets with black or silver fronts in order to get the best effect. A set with a scratched cabinet will often look as good as new when covered and should come at a cheaper price. If the c.r.t. glass is scratched look for another set.

One last thing to check is the condition of the back cover. There is often a large hole where a meter has been fitted and later removed. This will have to be repaired for safety

reasons before the set is sold or rented out. If you can't find a good set with an undamaged back, ask if you can take the back from another set. The mains lead was of course the first thing you checked before connecting the set to the mains supply – wasn't it?

Buying VCRs

Make sure that you have plenty of time when buying stock, especially when testing VCRs. As warehouses are sparse in my part of the country (Chesterfield) I usually travel over forty miles to make purchases. To make the journey worthwhile I buy as many machines as possible, which can take up a surprising amount of time.

VCRs have many functions and ideally each one should be checked before you purchase a machine. The salesman will often try to rush you into buying a VCR without fully testing it. His job is to sell the goods, but if you make it plain that you won't be rushed he will leave you alone.

What to Test

With a VCR there will again usually be some fault or defect that's the reason for the machine being sold off. You will of course test the recording and playback to ensure that the video heads are serviceable. But remember that audio heads are often more expensive, so listen carefully to the sound track playback as well. This is even more important with stereo machines. Low sound playback level compared with the E-E level, muffling or distortion should make you have serious doubts about the machine.

A careful study of the playback picture can provide valuable clues as to whether or not the various parts and circuits are working properly. An effect similar to a TV set with loss of line hold shows that the drum servo isn't locking at the correct speed. Regular interference every few seconds, consisting of one or more bands of snow flashing on the playback picture, indicates a similar fault in the capstan servo. Both faults could be caused by a dirty control head: any other cause is usually much harder to rectify.

A poor picture in the search mode can often be an early indication of significant head wear. Play back a recording made on another, good machine and ensure that acceptable tracking can be obtained. Check that the playback picture is free of

patterning, and pay special attention to the colour.

Test the fast forward and rewind functions. Ensure that the speed is up to spec and that the machine doesn't struggle and stop when winding a full tape. The pause/still frame facility should be checked to make sure that the results are up to standard for the particular model – don't expect a machine with a simple pause to give a perfect still picture however.

Motors are expensive to replace, so listen for excessive noise or rough running. These could indicate bearing wear.

Check that all the controls work normally. Pay special attention to any plastic buttons built into the front cover to operate touch switches. These usually pivot on hinged plastic which, after a few years, tends to break. The only permanent cure for this is often to fit a new front cover, which can be very expensive.

Check that all the flaps are present and undamaged. Another item that often suffers from rough treatment is the coaxial socket. This is usually built into the r.f. modulator, which is another extremely expensive item to replace.

Some front loaders are prone to cassette carriage damage or wear: check for smooth tape loading and ejection.

Electronic faults are less common

than mechanical ones but are usually more difficult to cure. So carry out as many checks as time allows. Set the clock to the correct day and time. Set up a timer recording to be going while you start to check another machine. Check that the tuning section is o.k.

I recently had in for repair a Ferguson 3V31 which the owner had bought a few days previously. As it appeared to be in perfect condition he'd given it only a brief mechanical check. Later he discovered that none of the even channel numbers would light up, the clock couldn't be set and the timer couldn't be programmed. On inspection we found that the channel buttons must have received a hefty blow – the PCB behind had been smashed to smithereens.

I don't usually risk buying an untested VCR. But if I did I would insist on removing the covers and at least ensuring that nothing was missing or damaged. I would also make sure that the risk involved was reflected in the price paid.

In Conclusion

There are lots of second-hand bargains to be had at the trade warehouses. But take your time and check them out systematically. Remember that if you buy in haste you may well repent at leisure.

BACK COPIES

We have available a limited stock of the following back issues of *Television*:

1992 February, April, May, July, August, September, October, November and December

1993 January, May, June, July, August, September, October and November

1994 January, February, March, April, May, June, July, August, September, October, November and December

Copies are available at £2.75 each including postage.

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Letters

WHAT PRICE NICAM?

If you look at the BBC Ceefax Engineering Information Page 698 you'll find details of how the development of the Nicam service is proceeding. At the bottom of the sub-page it says "There are no known dates for other BBC main transmitters". Why this slow progress? Apparently the BBC is updating its transmitters for Nicam operation only when the installed equipment reaches the end of its planned life. As a result, large areas of the country could have to wait for twenty years or more for stereo sound on the BBC channels.

Not every viewer will welcome Nicam in the way that colour TV was received. But this doesn't, to my mind, relieve the BBC of its obligation to press on with the nationwide installation of the facility. If the transmitter conversions are not completed within a reasonable time scale, the point has to be raised that for the same licence fee people in parts of the country are getting an inferior service. Perhaps the licence fee for those in such areas should be reduced? It seems unlikely, but imagine the outcry that there would have been if some parts of the country had had to wait twenty years for colour!

The BBC's latest 'hard sell' relates to the development and testing of DAB (Digital Audio Broadcasting). In an article in the issue of *New Electronics* dated 25th October 1994 David Boothroyd complained of the deficiencies of f.m. broadcasting and RDS, commenting that "... RDS is by no means ideal, which is not surprising given that f.m. radio broadcasting was originally designed in the Fifties, specifically to operate in mono, for people at home with rooftop aerials". This view is technically naive and misleading for those who don't know better, taking no account of the many tremendous improvements in receiver technology which have been introduced over the last forty years. I have in my car an RDS radio that functions admirably on f.m. The proliferation of f.m. transmitters has obviously helped, producing an f.m. stereo radio infrastructure which works pretty well over most of the country. DAB may improve stereo broadcasting in various ways (and allow for additional facilities), but as far as the public is concerned it will be perceived initially as a step from stereo to better stereo, not a great leap forward like Nicam which takes us from mono TV to stereo TV that can handle surround-sound signals as well.

I contend that the BBC should complete its programme of transmitter conversion to Nicam before committing large amounts of the licence revenue to other developments. The licence payers are the punters, who rightfully look for the best value for money, Nicam included. Perhaps the BBC would get the message if the TV trade, at local and national level, protested vociferously.

Keith Cummins,
Holbury, Hants.

IN PRAISE OF THE TRADE

What a load of sour grapes, that letter headed "enter the trade? - don't" in the December issue. Take no notice of anyone who tells you that becoming a TV/video service engineer is a waste of time. It's a great life.

I've worked all over the world as a TV, video, computer, office equipment and industrial equipment electronic

serviceman and have found it very satisfying. There are many much worse occupations that one could choose, and if you are dissatisfied with this one you are unlikely to be satisfied with anything.

When I worked in the antipodes I quickly discovered that the main reason for the British being unpopular is that we're a race of whiners. I learnt that the best way to get on with people is to try your best at whatever you have to do and treat everyone the way you would like to be treated.

If you are a square peg in a round hole, then get out if you must. But don't try to spoil it for the rest of us. There are a lot of round pegs out there who will slot in.

Just think of all the wonderful things that we can do with electricity, of all the fantastic things that have been produced and the advances that have been made. Computers, fax machines, toys, space travel, satellite transmission, lasers, robots - 2,000 years ago we would have been gods!

So if you are thinking twice about entering electronics after reading that letter last month - don't! It can be a great life. And just in case you think I'm one of the lucky ones or superbly gifted - I'm not. I have C&G in TV, radio and electronics, am registered with the NZERB as a radio serviceman, and have a handful or so of in-house trade certificates. So I'm not even an engineer, properly speaking.

John Hopkins, *The TV Workshop*,
Felixstowe.

THE AMSTRAD DOUBLE-DECKER

Here's a tip for those who have to repair that marvel of modern technology the Amstrad double-decker VCR type 8900.

It may occasionally be necessary to carry out voltage/waveform checks on the bottom deck. This can be difficult for those who, like me, don't possess a set of extension leads. A colleague told me that it's possible to operate

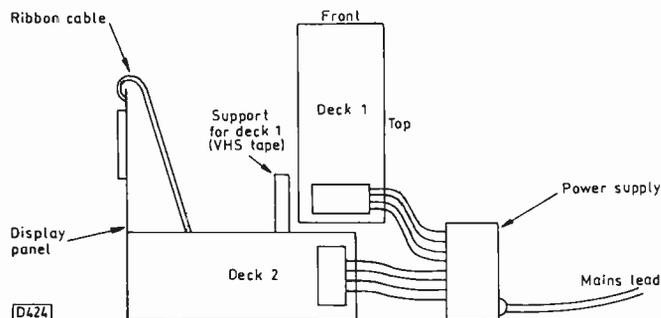


Fig. 1: Way of arranging the Amstrad 8900's two decks to enable checks to be carried out on the lower one.

the bottom deck on its own provided the display panel is connected, but you can't see what is happening on the monitor as the modulator electronics are on the upper deck. A way around this would be to exchange the mechanics of the two decks but, being inherently lazy, I looked for another way to operate the bottom deck and maintain the signal path from the bottom deck to the modulator (and scart sockets) while the decks are separated. It can be done as follows.

Split the decks as you would normally, then remove the power supply module from the bottom deck assembly. Up-end it at the rear right of the bottom deck (output plugs uppermost).

Refit the LED display to the front of the bottom deck and connect to it the lead from the bottom deck timer control panel.

Place the top deck carefully on its back, using the rear of the bottom deck to support it (see Fig. 1). Pass the left-hand lead from the top deck through its normal hole and connect it to the bottom deck. Pass the right-hand lead from the top deck through the hole in the right-hand side of the top deck and connect it to the power supply. Likewise connect the lead from the bottom deck to the appropriate power supply plug. Leave the timer board lead from the top deck disconnected.

A VHS tape in the recess at the rear of the bottom deck will prevent the top deck falling down on you while you are prodding around on the lower deck.

Here are some other points to note. When reassembling the decks ensure that the cable restraint over the audio-control head leads is in place. Make sure that the machine is disconnected from the mains supply when connecting/removing the leads to the display panel – unless you want a power supply fault on your hands as well. The machine will operate without the small plug from the LEDs on the front panel being connected to the top deck (they are the deck status lamps).

My need to do all this arose from a rather perplexing fault with one of these machines. The symptom gave the impression that an audio/control head was dirty, but after cleaning and setting up the machine the fault was still present. When the machine was naked however it behaved impeccably. After much work with the screwdriver I found that the fault appeared when a certain screw was inserted into the machine's bottom cover. The screw concerned is the one that connects the power supply chassis to the base.

Although hardly professionally correct, I thought let's leave the screw out. But when the top cover was placed on the machine (placed not screwed) the fault reappeared! I suspected that the cause of the problem must be some kind of hum pick-up. To cut a long story short, it transpired that the connector which feeds the control pulses to the signals board was dry-jointed.

*Andrew Tebbutt,
Saltburn, Cleveland.*

AKAI MODIFICATION KITS

In the December issue J. Luniss wrote about the cost of the Akai modification kits for the VSF30/33. He said that replacing C446 when the clock display is dull works every time. While this may work every time it should be noted that the capacitors supplied by Akai are of a special high-temperature type. An ordinary capacitor will fail again very soon. In addition it's not generally considered to be worthwhile replacing just one of the 120 μ F capacitors as the other one will inevitably fail. Akai puts a lot of time and research into resolving problems: I believe that it knows what it's talking about!

The high-temperature capacitors are available from a parts distributor in the UK, but the cost of the capacitors alone is roughly the same as Akai's full kit. I recommend that if the clock display is dim a full kit should be fitted. This will avoid overrunning the heater windings in the display.

An ex-Akai engineer.

DISCHARGING RESERVOIR CAPACITORS

At the end of his article on Mains Isolation and Workshop Safety (November issue) Eugene Trundle suggests using a 1k Ω resistor to discharge the mains rectifier's reservoir capacitor. I think this must be incorrect. Some years ago I used a higher value resistor with a reasonable power rating

(I think it was 22k Ω , 5W) to discharge such capacitors, which charge to approximately 320V. It worked for only about half a dozen times then burnt out, giving me a shock when I thought I'd discharged the capacitor.

*E.R. Richards,
Auckland, New Zealand.*

Eugene Trundle comments: The 1k Ω resistor I use is actually a 5W wire-wound type. The discharge is very rapid, so no damage is done. The main point is not simply to use a screwdriver. A 100k Ω , 1W resistor could be used, which would be appropriate (just about) for a continuous 320V d.c. supply, but the discharge would take a little longer.

AMSTRAD

The telephone number for Amstrad PLC given in our Autumn 1994 Spares Guide, published with the October issue, is incorrect. The number should have been given as:

0277 209 508

Please note this and amend your copy of the Spares Guide. The number given in the Guide is that of a private telephone subscriber who has been seriously inconvenienced by calls intended for Amstrad.

Our apologies to everyone who has been caused inconvenience as a result of this error.

Answer to Test Case 385

– see page 174 –

As in many chassis, the analogue control functions (colour, brightness etc.) in the Hitachi G8Q are controlled by a microcomputer chip which produces squarewave outputs with a variable duty cycle. The mark-space ratios of these outputs are determined by the remote-control handset keys and, often, by the front-panel controls. The squarewaves are integrated by low-pass RC filters whose time-constants are long enough to smooth out the pulses, leaving a steady d.c. voltage for application to a VCA (voltage-controlled attenuator) in the signal processing chip. In this particular case the voltage is applied to pin 5 of the colour decoder chip.

The cause of the fault was the fact that the colour-control integrating capacitor C522 (2.2 μ F) at pin 5 of IC501 was open-circuit. A replacement provided a complete cure. With no integration, the pulses themselves were being applied to the chip's saturation control system. They were switching it between the no-colour and fully-saturated colour conditions three times per scanning line. Why did the vertical colour stripes move slowly sideways across the screen?

The control squarewaves are generated within the microcomputer chip IC1501 by division of the clock frequency produced by the 4MHz crystal X1501. It just happened that this division came out at very close to three times the line frequency. During playback the VCR's line frequency (again controlled by a free-running crystal) was a few Hz away from the broadcast standard. Hence the movement of the colour stripes in the opposite direction.

VCR Clinic

Reports from Philip Blundell, AMIEEIE, Eugene Trundle, Alfred Damp, Brian Storm, Nick Beer, David Belmont, Keith Evans, John Edwards, Michael Dranfield, Bob Meade and Colin McCormick

Panasonic NVJ47

This machine had a broken sub-loading arm. When a new one had been fitted the deck worked fine – until you rewound the tape back to the start, when the end sensor didn't operate (hence the broken sub-loading arm). The waveform across the tower LED was low: tracing back, I found that R6612 (22Ω safety resistor, part no. ERD2FCVG220) was open-circuit. Replacing this restored normal operation. **P.B.**

Grundig VS220

This machine would accept a cassette but wouldn't thread up. The threading ring would start to move, then the threading motor would stop. It seemed as if the mechanism was jamming, but when it was moved by hand it was quite free. This was a late model, with the E47 syscon EEPROM. In these machines the syscon waits for the back-tension arm to move fully to the left (interrupting the light through the back-tension optocoupler) before continuing to thread up. The arm was too stiff: a drop of oil on the back-tension pivot was all that was required. When refitting the circlip don't press it down too hard, otherwise the arm will again be too stiff: leave a bit of up-and-down movement. **P.B.**

Mitsubishi HSB32

This machine was dead with no 5V output (at pin 3 of connector PZ) from the power supply. The reference voltage was present at pin 5 of PZ. IC901 (LA6324) was faulty. **P.B.**

JVC HRD540

With this model and those that use a similar tape deck you may encounter an intermittent fault condition in which the entry tape guide stops short of its locating V block. When this happens there's gross mistracking and, sometimes, tape damage. The cause may well be that the fastening pin ('stopper 2') is not pushed fully home into the pole base assembly on the deck's underside. Thus the loading pusher arm (32 in the JVC parts diagram) 'flops' on the shoulder of the pole base. **E.T.**

Hitachi VTM640

The CTL pulses were of reduced amplitude. After wrongly accusing the audio/control head we eventually found that C631 (47μF, 16V) was leaky. **A.D.**

Ferguson 3V35/JVC HRD120

This machine's owner said that the timer wouldn't set up correctly. When it was on the bench I was unable to set the clock and the timer flag was flashing continuously. The cause of the problem was D10 in the timer UPC voltage-stabiliser circuit. Because it was open-circuit the supply to pin 21 of the UPC was high at 8.5V instead of 4.8V. **A.D.**

JVC HR7350

The reported fault with this rather elderly machine was that

it ran fast. The capstan motor was indeed running fast. We found that the capstan FG signal reached the servo board but got no farther because C65 (10μF, 16V) was open-circuit. **A.D.**

Ferguson 3V55

This machine came into the workshop with the tape deck in the fully-laced position and the cassette housing in the eject position. When we applied power the mode-control motor tried to drive the loading arms past the fully-laced position. Replacing the mode sensor cured the fault. **A.D.**

Panasonic NVSD30

This machine would lose control of its capstan motor, frequently playing back as though in the cue mode. Suspecting that the main systems and servo chip IC6001 was at fault we fitted a replacement. This of course made no difference. The culprit turned out to be the XRA6439P capstan drive chip. **B.S.**

Panasonic NVFS90

The complaint was of intermittent fine horizontal patterning. This type of fault is often associated with a CCD delay line. Sure enough we found that C3311, which decouples the oscillator circuit associated with the 1H delay line in the HQ pack, was the culprit. A new 10μF, 16V capacitor cured the fault. **B.S.**

Panasonic NVSD40

This machine's playback picture was marred by a horizontal swaying effect. Voltages were measured, oscillograms were examined and hair was torn from heads! IC6001 was replaced, then IC2505. Capacitors were checked. Eventually we found that the cause of the trouble was the regulator transistor Q2505, which supplies 12V to the capstan stator: it seemed to have some sort of internal leak. A new 2SD601 cured the fault. **B.S.**

Panasonic NVHD100

This machine would very occasionally slow down and stop, usually after many hours of operation. When the fault eventually put in an appearance we were able to condemn the XRA6439P capstan drive chip IC2505. **B.S.**

Ferguson FV61/62/67/77 (R2000 Mechanism)

Permanent or intermittent loading problems are common with these machines. With a normal, working machine the front loading is very tight and smooth. Faulty ones are initially recalcitrant then load. They unlace perfectly then stutter and get stuck when they try to unload the cassette. The cause of the trouble is the loading motor. When o.k. it reads about 13.5Ω. When intermittent the reading drops to 10Ω or so then, when the motor is turned an armature section at a time, the reading drops to a few ohms. A perma-

nently faulty motor reads short at certain points around its rotation. Be warned – I've had faulty replacement motors.

In a couple of cases the drive chip IT60 had overheated, discolouring the PCB. A replacement was required. **N.B.**

Samsung VIK320

This brand new machine went dead within minutes of installation. The input fuse F101 was black and the DG06M bridge rectifier BD101 was short-circuit. **N.B.**

Ferguson FV45LX

The symptoms with this teletext machine were wildly incorrect lip sync and severe mistracking. They occurred intermittently and had me fooled for a while – no matter how much I moved the audio/control head laterally I couldn't correct the lip sync: the sound led the vision dramatically. I came to the conclusion that something must be causing an extension of the tape path between the drum and the AC head. This was confirmed when the slant pole on the exit side was found to be loose, turning very intermittently. A new guide base and AC head, which was by now worn, put matters right. **N.B.**

Sony SLV425

I've had a few of these Grundig clones that use the Panasonic G mechanism all with the same fault. When a tape is inserted it starts to lace but fails to reach the half-load position: it then unlaces and is ejected. In each case the cause has been an open-circuit solenoid. **D.B.**

Matsui VX1000Y

The sound was very poor. A check showed that the sound from the phono sockets was good. The r.f. converter turned out to be the culprit, a replacement restoring good sound. **D.B.**

JVC HRD790

The problem was intermittent failure to record with loss of the E-E picture. In the fault condition the machine would search but not lock to any station. There was plenty of video from the tuner/i.f. board but no sync. Eventually we found that Q21 on the tuner board was open-circuit when cold. **D.B.**

Panasonic NVHD100

There was no microphone sound on audio dub. The customer had succeeded in blowing up the mic. sound amplifier chip IC7701 by feedback from his TV set. Replacing IC7701 put matters right. **D.B.**

Sony SLV625

This machine chewed tapes when ejecting them. The cause was loss of the 9V supply because Q203 had burnt out. **D.B.**

JVC HRD720

If a tape was rewound to the beginning it would then be ejected. If a new tape was inserted it would be ejected immediately, but if a partially used tape was inserted the machine would work. Suspicion fell on the BOT sensor, but scope checks in this area showed that the sensor's output was influenced by the EOT sensor and vice versa. Checks around the microcontroller chip led us to a subpanel where

we found that D611 had been fitted the wrong way round. Refitting it correctly restored normal operation. **D.B.**

Panasonic NVSD30

The complaint with this machine was that when certain prerecorded tapes were rewound it would fail to go into fast rewind. This is a quirk of the machine, recognised by the manufacturer. The cure is to change the microcontroller chip to type MN67434VRSH. **D.B.**

Matsui VX2700

There were no control track pulses because the relevant section of the audio/control head was open-circuit. Replacement cured the problem. This is becoming a very common fault. The audio section of the head can also go open-circuit, the symptom then being no sound. **D.B.**

GoldStar GSE1290

This machine wouldn't accept tapes and displayed an error message consisting of two triangles. The cause of the fault was lack of voltage at the loading chip because D521 had gone open-circuit. GoldStar recommends replacing this diode with a link. There was also no E-E output because Q701 was open-circuit. **D.B.**

JVC HRD830

A common fault with this and other JVC machines that have the tuner/i.f. board mounted at the rear left-hand corner is intermittent loss of the E-E sound and picture. The usual cause is transistor Q02, which goes open-circuit intermittently. A 2SD1207AE is a suitable replacement. **D.B.**

GoldStar GSE1290

A rolling picture was the customer's complaint. So we suspected a tape path alignment problem. After trying various tapes of different lengths, types and quality however the fault complained about failed to put in an appearance. We cleaned and inspected all the usual bits and checked the back tension – most important – then returned the machine to the customer. A week later it was back with the same complaint.

More time was spent operating the unit. Eventually the fault appeared, and at this point we carried out a very careful inspection of the tape path. It was immediately apparent that the back-tension arm hadn't moved into its operating position fully. Thus little or no back tension was present. Inspection beneath the deck showed that the loading cycle hadn't been fully completed and that the tension arm was being prevented from moving any farther. The mechanism was brought to its correct operating position by turning the loading motor shaft a few turns by hand. We felt that the mode selector switch could be the cause of the trouble. When we removed it we found that it was sitting in a bath of oil. Cleaning the seating and fitting a new switch put matters right. **K.E.**

Mitsubishi HR304

This old faithful has been through our workshop a few times over the years. Its latest problem almost led us to tell the customer that it was by now past its sell by date. The playback picture was sometimes obliterated by herringbone patterning. The severity of this patterning was reduced when

a hand was brought near the head drum or surrounding area: it would almost disappear when any metal part was touched.

Having had similar problems with other makes of VCR, where earthing (common) links between the chassis and PCBs made a difference, we set about checking the earthing around the head drum. Sure enough the drum connector PCB has an earthing land which relies on the fixing screw making connection with the deck. Fitting a star washer and tightening the screw produced a vast improvement but didn't cure the problem completely. A friendly Mitsubishi engineer suggested that we scrape away the protective goo around the head amplifier chip, as with time it causes leakage between the pins. Doing this finally put matters right. **K.E.**

Mitsubishi HS303

Because the loading belt was slipping there was a fully laced up tape stuck in this machine. All functions were restored when a new belt had been fitted. In playback however the drum was hunting at a regular cyclic rate. I didn't have the circuit, but the signals present at the AN6350 servo chip IC4A0 seemed about right when a comparison was made with the same type of chip in a machine from a different manufacturer. So I decided to take a chance by marking the position of the slider of the drum discriminator preset VR4A0 then slowly adjusting it back and forth. Fortunately a locked picture was obtained after only the slightest adjustment. **J.E.**

Panasonic NVG45

This machine would accept a cassette half way then eject it: because the cassette flap opener had become dislodged from the carriage assembly, it didn't lift the flap as the cassette was being lowered. Simply clicking the opener back into place put matters right, and numerous test runs proved that all was well. When the machine was returned to the customer's home the teenage son decided to load a tape. He did this by placing the tape in the slot then, sitting on the floor with his back against a settee, pushing the cassette home with his foot – which he also used to operate the function buttons. I pointed out to his father that the guarantee terms were subject to 'normal' use, but this was greeted with a grunt. Back in the workshop the copy invoice was retrieved and a note was made about this in case of a guarantee claim in the future. **J.E.**

Ferguson FV67

This machine was dead with no clock display or anything although the outputs from the power supply were all correct. We found that the 5V supply to the microcontroller chip was missing at transistor TT26, though there was 6.5V at its collector. Its base bias comes from IT25, which is a 16-pin surface-mounted device on the servo PCB. As the manual simply shows this as a 'black box' we don't know what it does, but replacing it cured the fault. The type number is U2559B – there's also a standard 16-pin DIL version that can be ordered using the same part number! Both types are kept in stock by Willow Vale. **M.Dr.**

Samsung SI3240 and SI3260

Cassettes being jammed in the housing intermittently, poor eject, the housing going out of sync and other housing faults can be cured by replacing the whole right-hand side of the cassette housing with a new, modified version, part no. 62203-0025-01. Don't mess about ordering new cogs

for the old one: the whole side chassis costs just over a pound! **M.Dr.**

Amstrad VCR4600 Mk 1

The capstan speed was very slow in the fast forward and rewind modes. Play was even worse. We found that the voltage across the capstan motor was around 2.5V, the current being only 50mA. This ruled out the motor. Our next checks were at IC504, where the 18V supply was o.k. at pins 7 and 8 but the voltage at the control pin 4 was low. The voltage status here is determined by the BA718 chip IC302, which turned out to be the cause of the fault. **M.Dr.**

Sharp VC750

Only the lower channels could be tuned in and there was tuning drift. A check showed that there was only 10V at the 33V regulator chip IC1405. C1411 was leaky. **B.M.**

Panasonic NVG50

Living near a US air base, as I do, I've had several of these multi-standard machines in for repair. The cause of a dead machine is usually C1003 (1 μ F, 100V) in the power supply going open-circuit. Alternatively the STRD1806E chip can go open-circuit or short-circuit. In the latter case it takes the bridge rectifier (D1004) with it. **B.M.**

Saisho VR1600/Matsui VX880/Hinari VXL4

Slow drum rotation then coming to a stop is usually caused by IC01 (BU2716S) being faulty. **B.M.**

Ferguson FV20

This machine wouldn't load a cassette. We found that the right-hand deck infra-red sensor was open-circuit. **B.M.**

ITT VR3946

The chopper power supply worked intermittently: it often wouldn't start up after a loss of power or disconnection from the mains supply. Checks showed that C701 and C702 (both 47 μ F) were low in value while D22 was open-circuit. Replacement of these three components followed by a good service restored full operation. **B.M.**

Toshiba V81B

There were no results at all apart from a momentary flash of the a.f.c. LED under the tuning flap at power up. All the supplies appeared to be in order and the r.f. booster was working. A scope check on the clock display chip's crystal showed that it was working, so I figured that the clock display really ought to be illuminated: a new TC47C410 clock chip solved the problem. **C.McC.**

JVC HRD520

Had I been more thorough this one wouldn't have bounced on me. There had been mistracking because the exit guide locking grub screw had been loose. The guide had rotated when the owner used a cleaning tape. I reset the guide and locked it. A few weeks later it was back with a similar problem, this time because the same thing had happened to the input guide. **C.McC.**

Help Wanted

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

Wanted: TA7152P field timebase chip used in Toshiba and Philips models. John Ely, 495 Tynong North Road, Tynong North, Victoria, Australia 3813. Phone 059 428 340.

Wanted: HV block (with H stat control) for the Sony Model KV1820. D. Jordan, Central Electronics, 6 Queen Street, Stirling FK8 1HN.

Wanted: Sanken SI-11225HD audio output module for the Rotel RMA80 amplifier. Circuit diagrams for the Huanyu Model 37C-3 CTV and Samsung V1710 VCR. Andie Wilkes, 34 Tideswell Road, Great Barr, Birmingham B42 2DT. 021 605 0720.

Wanted: Pressure/pinch roller assembly for the Toshiba Model PC-X-15 cassette deck. M. Rafferty, 222 Goddard Avenue, Hull HU5 2BY.

Wanted: Operator's and/or service manual for the Philips Model PM3240X scope. D.G. Griffiths, 2 Uplands, Gowerton, Swansea SA4 3ET. 0792 872 239.

Wanted: Information/circuit diagram for the Zenor Model MDL 9103 KDR 14in. TV set service ref. no. KDRX-0612-019, or name of agent/parts supplier. Also source for an MN15245 SAY-1 chip. O. Purvis, 39 Carville Terrace, Willington, Crook, Co. Durham DL15 0HQ. 0388 745 198.

Wanted: Line output transformer for the Rediffusion Mk 5 CTV (SP2 chassis). Circuit ref. T602, index 81326. Dave Mackrill, 13 Tower Road, St. Leonards-on-Sea, East Sussex TN37 6JE. 0424 427 996.

Wanted: Data sheet for an MN010 EEPROM, also information on the SE5561 chip. G. Smith, 83 Avenue Vivian, Fence Houses, Tyne/Wear DH4 6HZ. 091 385 2316.

Wanted: Circuit diagrams or source of same for the Victor 2117 series and CA&G VG1490 computer monitors. Mr. Knight, Electronics Dept., Calderdale College, Francis Street, Halifax HX1 3U2. 0422 357 357 ext. 9219.

Wanted: Manual, teletext module and on/off switch for the Philco Model TC722GB. M. Saleem, 14 Florian Gardens, Southcote, Reading, Berks RG3 3QG. 0734 613 682.

Wanted: G90AE panel for the Philips Model 21GR2550. D.F.A. Hambidge, 55 Flora Road, Hay Mills, Birmingham B25 8BH. 021 706 8752.

Wanted: Manual for the Marconi TF2303 deviation meter and Trio TS130S. Will copy or buy. Peter Pitts, G3GYE, Westmoors, Trezelah, Penzance TR20 8XD.

Wanted: Servo circuit for the ITT Telerecorder (portable VCR) Model P3833. Alternatively does anyone know of an equivalent (JVC/Ferguson) or the causes of fast drum rotation in play/record? Servo circuit for the JVC HRS10 portable recoder also required. S. Cummings, 7 Cranbourne Road, Chorlton, Manchester M21 8AP. 061 860 7566.

Wanted: LOPT for the Teleton Model CPL161 – part no. 930702252. Brian H. Lippert, 26 Kingsley Crescent, High Wycombe, Bucks HP11 2UL. 0494 531 215.

Wanted: LOPT for the Bush Model TV125 dual-standard TV receiver (Rank A336 chassis). Steve Pendlebury, 67 Laburnum Park, Bradshaw, Bolton, Lancs BL2 3BX. 0204 306 194 (home).

Wanted: Circuit diagram for the Ingersol XK512B colour TV/radio. A.C. adaptor for the Sharp Model VC2300H VCR. Circuit diagram for the Akai ACM370D hi-fi stack system. E.J. Edwards, 43 Hoose Court, Market Street, Hoylake, Wirral, Merseyside L47 5AB. 051 632 0614.

For disposal: Sony SLC9 VCR in good order apart from a minor tape creasing problem. Free, with remote control unit, to anyone willing to collect it. Telephone 0753 852 634 (Paul Sant, Windsor).

Wanted: Mains transformer for the Fairmate Model CR1177 radio-cassette recorder, or possible source. W. Milne, 20 Graham Road, Wimbledon, London SW19 3SR. 081 543 9542 (evening, weekends).

Wanted: Circuit diagram/service manual for the Pioneer Ansafone Model AF2300F. Hannu Siipola, Vehmaan-suontie 370, 90900 Kiiminki, Finland. Tel. int+358 81 5501898.

Wanted: On/off knob and U465B prescaler chip for the Rediffusion Mark 4 chassis. Manual for the Telequipment S51E scope. AV in/out kit and r/c kit for the Philips VR2020 VCR. A Murphy V789 or V783 TV set. Dave Hazell, 126 Sevenfields, Highworth, Wilts SN6 7NQ. 0179 376 5390.

Wanted: LOPT for the Panasonic Model TXC21 (U4 chassis), part no. TLF14574F. Gary Burt, 3 Randall Close, Calmore, Southampton, Hants SO40 2SE. 0703 872 297.

For disposal: Complete set of copies of *Television* from early 1995 back to 1980. Any offers please by mid January. Also, free, some copies dating back to 1967 plus many copies of *Practical Wireless* and *Practical Electronics*. Collection will be necessary. Ronald Lewis, 49 Brockman Rise, Bromley, Kent BR1 5RA. 081 698 5465.

Wanted: Circuit diagram or any relative information for a disc-drive Chinon FZ-502 5.25inches. G. Cannon, 16 St. Cuthbert's Road, Holy Cross, Wallsend, Tyne & Wear, NE28 7JF. 091 262 0712.

Wanted: Transistor type GET1, made by GEC in 1950s, for a period construction project. Other point-contact transistors may be suitable. Also Pam 710 transistor radio, any condition. Good price offered. Required for restoration and display. Bob Smallbone, 14a Scott Street, Bognor Regis, West Sussex PO21 1UH.

Wanted: Operating and service manual with circuit diagram for the Hewlett-Packard HP1722A scope, S/N 1634A00968. Also a scrap unit for spares if possible. Pat Foran, Knockeen, Castleisland, Co. Kerry, Ireland.

Wanted: Viewer section of Telefunken 850 video camera, lin. c.r.t. and associated circuitry. Alex Gregory, 13 Combe Avenue, Portishead BS20 9JR. 0275 847274.

Wanted: Amstrad Model TVR2 (or similar) complete, in working or repairable condition. Fair price paid. Village Vision, 238 Chessington Road, W. Ewell, Surrey KT19 9XF. 081 394 1400 or fax 081 661 7590.

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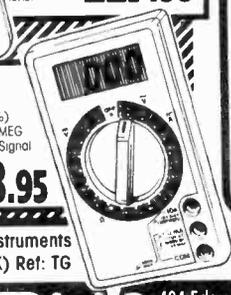
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AC Volts 0 - 750V
DC Current 0 - 20A
AC Current 0 - 20A
Resistance 0 - 40M
Capacitance 0 - 400µF
Frequency 5Hz - 40MHz
Temperature -40 - +1200C

Price:
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+ £17.33
V.A.T.

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CAPACITANCE METER DM9023
3 Ranges Opf (with set zero) to 20,000µF * Large, 3.5 Digit, 18mm LCD Display
Price: £57.50 + £10.13 V.A.T.

LCR METER LCR195
3.5 Digit LCD Display * 7 Capacitance Ranges 0 - 200µF
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5Hz - 1.3GHz * 8 Digit LCD * High Sensitivity
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* Data Hold * High Accuracy
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FM-AM Signal Generators * Colour Pattern Generators * Video Signal Analyser * Video Timing Analyser * Video Noise Meter * Distortion Meter * Waveform Monitors * Vectorscopes * Audio Generators * Wow and Flutter Meters * Electronic Voltmeters * Digital Multimeters * Function Generators * Frequency Counters * Bus Analyser * Resistance Attenuator * Oscilloscopes * Fully Programmable Digital Storage Oscilloscopes * Regulated D.C. Power Supplies

The following is just part of the vast range of Kenwood equipment, all of which is available from B.K. Electronics. A full catalogue and price list is available on request.

OSCILLOSCOPES

CS 1305 5MHz, 1 Channel, Low Cost
CS 4025 20MHz, 2 Channel, General Purpose
CS 4036 40MHz, 2 Channel, High Brightness, General Purpose
CS 5260 60MHz 3 Channel, 8 Trace, High Performance with Cursors (PAL & NTSC) Synchron. Circuit
CS 6040 150MHz, 4 Channel, 10 Trace, High Performance, Multi-featured
OCS 8200 50MHz Real - 20Ms Digital 2 Channel

WAVEFORM MONITORS & VECTORS

CV 1255 Vectorscope PAL
CV 1245 Waveform Monitor PAL (NTSC Versions of above are available. POA.)
SIGNAL GENERATOR
SG 5110 100KHz - 110MHz AM/FM Standard RF Generator (FM Stereod)

COLOUR GENERATORS

CG 932 PAL Colour Pattern Generator, Video & RF O/Ps, Calibrated & Adjustable Levels, Interlaced and Progressive Scanning, Full Range of Patterns
CG 922 Battery Portable PAL Pattern Generator, Video, RF and Sound Outputs, Full range of Patterns.

AUDIO GENERATORS

AG 203A 10Hz to 1MHz Low Distortion (0.1%) Audio Generator, Sine & Square Wave

AUDIO GENERATORS (Cont.)

AG 252 10Hz to 1MHz Ultra Low Distortion 0.004%, Full Attenuator O/P.

ELECTRONIC MILLIVOLT METERS

VT 171 AC Millivolt Meter, 1mV - 300V
VT 176 Dual AC Millivolt Meter, 0.3mV - 100V

GENERAL PURPOSE

DL 7113.5 Digit Auto Bench / Portable Multimeter, Approx 3000 hrs Battery
FG 273 Sweep Function Generator, 0.2Hz - 2MHz
FG 758 Frequency Counter 1.3GHz

POWER SUPPLIES

PD 35-10 0 to 35 Volts, 0 to 10 Amps
PR 19-3A 0 to 18 Volts, 0 to 3 Amps
PS 20-54 0 to 20 Volts, 0 to 54 Amps

KENWOOD PRICE LIST

CO 1305	£210.00 +	£26.75 V.A.T.
CS 4025	£359.00 +	£62.83 V.A.T.
CS 4036	£565.00 +	£98.88 V.A.T.
CS 5260	£1,195.00 +	£208.13 V.A.T.
CS 6040	£2,395.00 +	£419.13 V.A.T.
OCS 8200	£2,495.00 +	£437.33 V.A.T.
CV1255	£2,249.00 +	£393.58 V.A.T.
CV 1245	£1,598.00 +	£279.83 V.A.T.
SG 5110	£1,825.00 +	£319.38 V.A.T.
CG 932	£735.00 +	£128.63 V.A.T.
CG 922	£445.00 +	£77.88 V.A.T.
AG 203A	£195.00 +	£34.13 V.A.T.
AG 252	£399.00 +	£69.83 V.A.T.
VT 171	£235.00 +	£41.13 V.A.T.
VT 176	£475.00 +	£83.13 V.A.T.
DL 711	£149.00 +	£26.08 V.A.T.
FG 273	£450.00 +	£78.75 V.A.T.
FG 758	£555.00 +	£97.13 V.A.T.
PD 35-10	£645.00 +	£112.88 V.A.T.
PR 19-3A	£235.00 +	£41.13 V.A.T.
PS 20-54	£1,610.00 +	£281.75 V.A.T.

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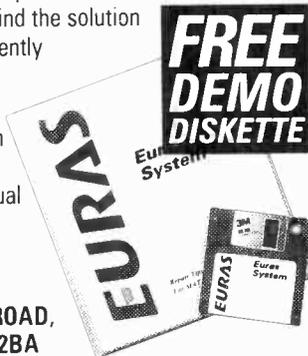
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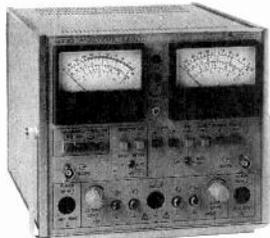
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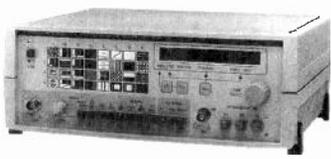
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Audio Analyser
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Multi-function meter. Measures distortion, wow & flutter, stereo power, signal levels in & out; generates audio test signals. Features include large clearly marked analogue meters. Performs the work of many individual instruments. £ 490



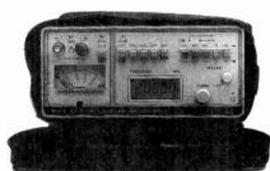
Television Pattern Generator
Model GV-698/11

32 patterns, 32 internal memories. PAL/NTSC/SECAM standards, with I, B, G, H, M, N, D & K, NICAM, teletext all in one instrument. Optional on screen logotype. (Other pattern generators available from £ 210). £ 1428



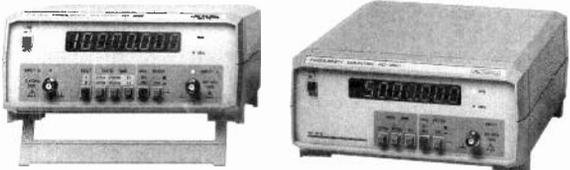
Television Pattern Generator
Model GV-298

Compact high performance generator, RF and video outputs. Frequency range same as GV-698/11, 37 to 865 MHz. Circle pattern included. £ 433



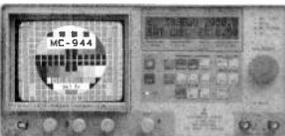
TV & Satellite Level Meter
Model MC-360

Ideal instrument for the professional installer of FM/TV aerials and satellite TV dishes. Covers 48 to 856 MHz and 950 to 2050 MHz. Lightweight, compact and rechargeable battery operated. £ 654



Frequency counters Models FD-250 & FD-252

FD-250 covers 20 Hz to 160 MHz and FD-252 covers same plus, 100 MHz to 2.4 GHz. Large L.E.D. display. Wide performance at low cost. £ 153 & £ 206



TV & Satellite Level Meter
Model MC-944

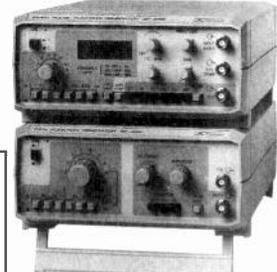
This meter has everything for the top flight installer of aerials, dishes, CCTV, MATV, SMATV and others systems. Features include TV monitor, spectrum analyser, sync pulse, teletext, printer output. 99 memories, tuneable audio subcarriers, etc. Full autocorrection for superb, unequalled accuracy!. RS-232 as standard. £ 1895

The company has been producing test equipment in Spain for over thirty years, earning a strong reputation for excellent engineering, quality performance at budget prices. The equipment is supported by Alban Electronics from their St Albans facility. These products are suitable for only professional and educational applications.



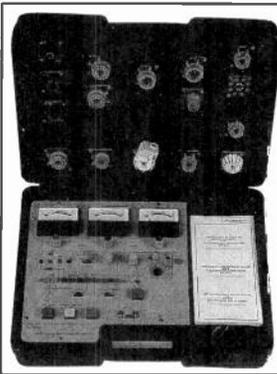
Low Distortion Low Frequency Generator
Model GB-212

20 Hz to 200 kHz, harmonic distortion 0.02 % maximum over audio band. Frequency counter resolution as high as 0.1 Hz. 600 ohms impedance. Output level attenuation range 60 dB, with analogue meter for setting accuracy. Excellent output level flatness. £ 219



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Models GF-230 & GF-232

Two versions available: 0.1 z to 1 MHz and 0.2 Hz to 2 MHz. Producing sine, triangular and square waveforms, with variable symmetry. Excellent performance. £ 153 & £ 206



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Model TA-903

Similar to TA-901, but has three meters to monitor cathode current. Special technique allows repeated rejuvenation of CRT. Supplied in attaché style case, for easy field and workshop use. £ 498



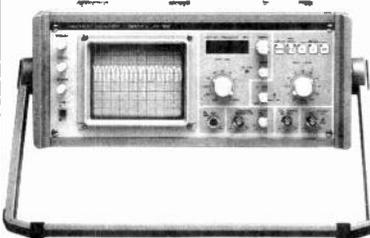
CRT Rejuvenator
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An essential tool for every TV workshop. Promax have made many thousands. Supplied complete with a set of base adaptors. £ 235



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Model MC-160B

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Prices shown exclude VAT, but includes UK delivery. Most items available for immediate despatch.



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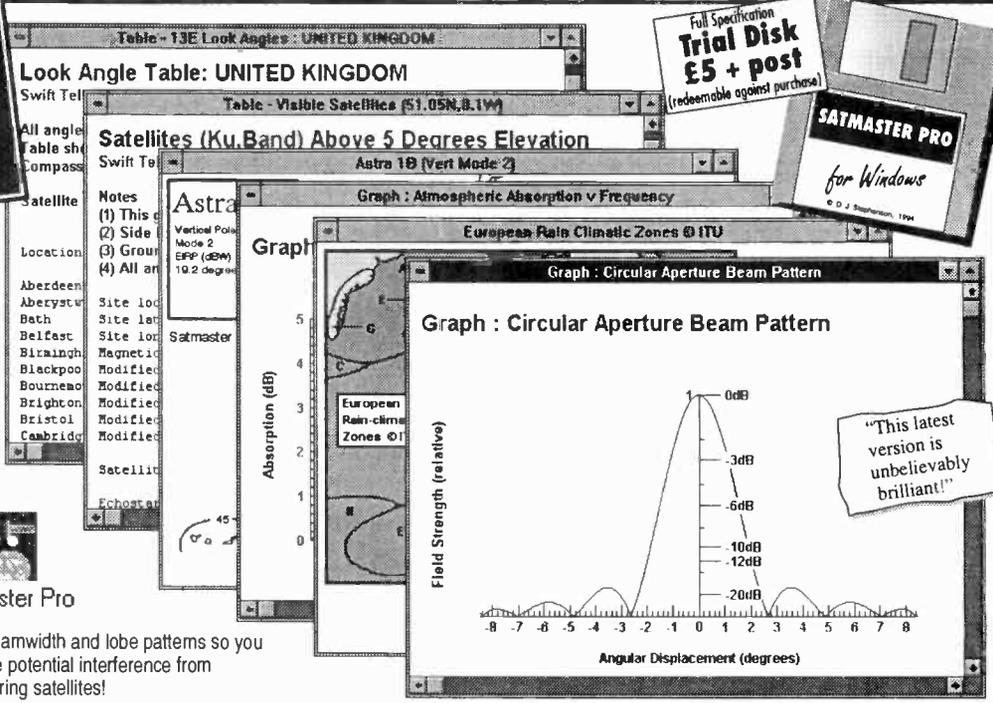
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Complete kit to convert a standard 35mm camera into a 3D version, enable you to take 3D colour slides with your own camera! Kit contains a prism assembly for the front of your existing lens, a sample 3D slide, a 3D slide viewer and 2 different lens mounts 49mm and 52mm, (other sizes available from photo shops at about £3 ea) all you need is standard slide film. Price for the complete kit is £29.99 ref 95/30.

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Excellent quality modern units, (like wise 50.9) 2xRS232, 20 function keys, 50 thro to 38,400 baud, menu driven port, screen, cursor, and keyboard setup menus (18 menus). £29 Ref NOV4.

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HY243H, 24VAC adjustable from 0-3 hours. £8.99
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ASTEC SWITCHED MODE PSU BM41012 Gives +5 @ 3.75A, +12 @ 1.5A, -12 @ 4A, 230V110, cased, BM41012. £5.99 ref AUG6P3.

TORRODIAL TX 30-0-30 480VA. Perfect for Mosfet amplifiers etc. 120mm dia 55mm thick. £18.99 ref APR19.

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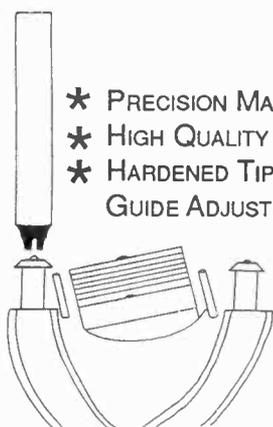
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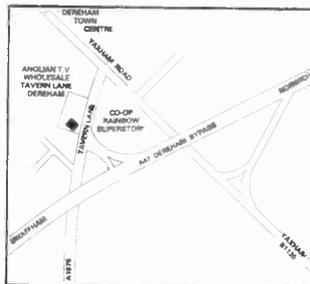
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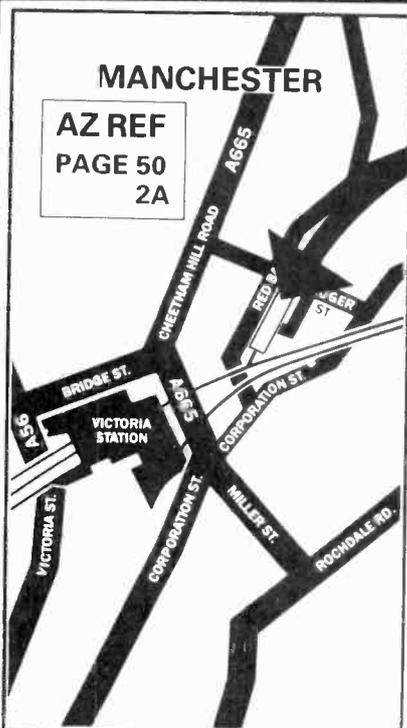
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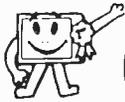
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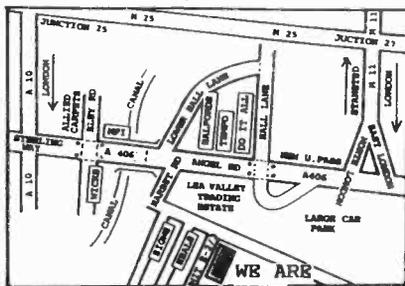
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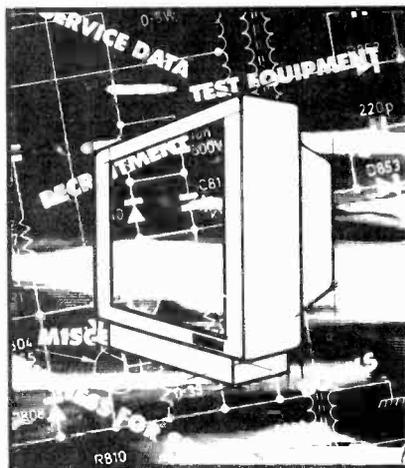
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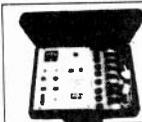
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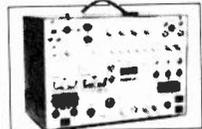


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All New Types	£1.00	BU 508AF	£1.00	CT 9511	£5.00	TDA3591	£1.00
SFE 6 Meg. Filter	25p	BU 508DF	£1.00	CT 9234	Hand sets	TDA3592A	£3.00
CDA 6 MHz Filter	25p	BU 808DF	£1.00	CT 9455		TDA3650	£7.00
SFE 5.5 MHz Filter	25p	BU 801	60p	CT 2233		TDA3651	£3.00
455 Filters	25p	2SD 1398	£1.00	CT 938		TDA3651AQ	£3.50
480 Filters	25p	2SD 1428	£1.00	CT 9268A		TDA3652	£3.50
Tuners		2SD 1556	£1.00	CT 9384		TDA3653AQ	£2.00
U/V 615	£10.00 each	2SD 1844	£1.00	CT 9194		TDA3654	£2.00
U/V 616		TDA 2600	£1.50	CT 9296		TDA3654Q	£2.00
Tuners		TX90 Mains Transformer	£10.00	CT 9186		TDA3710	£3.50
Nat. Pan. Small		TDA 3560	£2.00	CT 9187A		TDA3800	£4.00
UHF/VHF	£3.00	TDA 3654	90p			TDA3803A	£4.00
U321 - U341 - U342 - U343 - U344		TDA 3653AQ	£1.00			TDA3180	£2.00
Tuners	each £5.00	TDA 3562A	£1.00			TDA4260	50p
U 411 Tuner	£5.00 each	STR 4211	£6.00	AMSTRAD Long Chassis		TDA4501	£3.00
U 412		STR 6020	£6.00	Display Panel 1992/1993	£4.00	TDA4505NE	£3.00
LNB'S MARCONI		STR 6602D	£4.00	Amstrad Tuner UE33-B01	£3.00	TDA4420	£2.00
Ex Rental Black Cap	£3.00	01 M4-412-001-RUI		TX10 Focus Units	6 for £10.00	TDA4439	£2.00
No Guarantee		8 Way Pre sets for TX10-TX100	£3.00	Conversion Kit ITT Teletext	£8.00	TDA4600	£3.00
Bridge Rectifiers	10 for £1.00	Philips Handsets		Burglar Alarm Siren 12 Volt	50p	TDA4601	£2.00
Matsumi Miniature Infra Red		RC 5353		Amstrad 6000 Head with		TDA8190	£3.00
Receiver	£1.00	RC5300	£8.00	motor LP	£10.00	TDA8703	£3.00
Turntable Satellite Modulator TV	£1.00	RC 5176	each	Good Lower Drum	£3.00	TDA8349	£3.00
Sound 5.5 MHz MPM 1000T	£1.00	RC5177		HITACHI sets etc		TDA9403	£1.50
Sound 6.0 MHz MPM 1040	£1.00	Philips 36832 2A LOPT.	£15.00	STR454	£2.00	TDA9503	£3.00
FEROX		2433274 LOPT	£12.00	STR6020	£6.00	TDB2033	£1.00
RF Filter Clamp for Coax Cable	£2.50	Line Transformers		S2000AF line o.p.	£1.00	TDD1610S	50p
Circuit for detecting R.F. Send for Circuit		Green Spot		2SC940	£1.00	TD6306P	£2.00
using clamp	25p each	White Spot	£12.00	BU105/04	80p	TDA1060	£3.00
Ferguson Switch Mode Transformer		Blue Spot	each	BU108	£1.00	TEA1009	50p
TX85, TX86, TX100	each £3.50	Yellow Spot		BU124	80p	TEA1039	£2.00
ICC5 Ferguson Switch Mod Trans 3112-		FERGUSON		BU126	80p	TEA1060	£2.00
338-32642	£4.00	KT3-K30 Tripler	£5.00	BU180a	65p	TEA2029C	£3.00
12v DC and 24v DC power supply		U/V Tripler	£4.00	BU204	60p	IK7 ST6391 B1	£3.00
regulated	£2.00	Grundig Tripler with Focus Pot	£7.00	BU205	75p	ST 6393 B1/1M	£3.00
Philips		BG 2087-642-1005 Triplers	£7.00	BU206	£1.00	BYX10	10p
Text Decoder K40	£8.00	BG 2032-642-3002	£7.00	BU207	£1.00	BYX38/300	25p
ICC5 Tube Base on panel		PERDIO PV 1188 Hand sets	£3.00	BU208	80p	BYX55/350	10p
ICC5 Decoder panel	each £5.00	HANDSETS		BU208A	£1.50	BYX55/600 (Bead)	10p
KT3/k30 T/Text Hand Set	£8.00	Amstrad Export	£3.00	BU208D	90p	BYT71600	15p
KT3K30 Full Remote	£15.00	Amstrad U/V	£3.00	BU222	£1.00	BYV95B	10p
Pye & Philips handset		Amstrad 6800	£4.00	BU326	£1.00	BYV95C	12p
KT3-K30 chassis		Amstrad 6000	£15.00	BU407	60p	BYV96D	10p
No. RC5150-RC5176-RC5071-RC5177.		Amstrad 4700	£5.00	BU508A	90p	BYZ106	10p
Special Price	£13.00	Amstrad 4600	£3.00	BU508AF	£1.00	BPW41	15p
RC4001 KT3 and Teletex	£12.00	IO081 GEC	£3.00	BU508D	80p	BYW56 2A/100lvG11	8p
TX10 Hand Set Text	£12.50	FERGUSON	Hand sets	BU705	£1.00	BYW29/50	15p
TX9 with Text	£12.50	BSB	£1.50	BU806A	£1.00	BYW95C	10p
TX9 & TX10 button print	£1.00	ICC5	£5.00	BU807	£1.00	2SC3795	30p
TX10 Focus Pots	£4.00	1K2000	£5.00	BU808DFI	£1.00	2SC3973B	30p
Mains Stand By Switch with Coil	£1.00	1K7000	£5.00	BU826	£1.00	2SC4313	£1.00
Nicam Boards		SRD 2	£1.00	BUK454/600	£1.00	2SC7350	15p
Texas Instruments MkII	£15.00	SRD 3	£1.00	BU824	50p	2SD180 TO3 80v/6A	15p
Toshiba Nicam Board	£6.00			BU811	50p	2SD200	£2.00
Ferguson Nicam Board	£15.00			BUT11AF	£1.00	2SD401	£1.00
Text-Type				BUT13 600V-28A	£1.00	2SD716	£1.00
Replace Hand Set for Philips KT3-K30,				BUT18AF	£1.00	2SD787	30p
K4 etc	£6.00			BUT18AF	£1.00	2SD789	30p
Thorn Handsets				BUT18AF	£1.00	2SD820	£1.00
9000-9600-TX9-TX10-TX100				BUT18AF	£1.00	2SD868	75p
Text and NonText	£10.00			BUT18AF	£1.00	2SD880	30p
Philips RC5171 (Handset)	£8.00			BUT18AF	£1.00	2SD1264	£1.00
Sanyo Magnatron				BUT18AF	£1.00	2SD1266	£1.00
Type 2M218H	£10.00			BUT18AF	£1.00	2SD1398	£1.00
Samsung & Orion Video decks with				BUT18AF	£1.00	2SD1415	£1.00
heads	£16.00			BUT18AF	£1.00	2SD1427	£1.00
TV & Video hand set	£2.00			BUT18AF	£1.00	2SD1432	£1.00
Orion TV and video hand set	£2.00			BUT18AF	£1.00	2SD1453	£1.00

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